Personal Computer World
JULY 1995

Personal Computer World

July 1995 £2.50
Overseas Price £2.95
France 58 FF Germany DM 17,00
Italy 13,400 Lire Spain 925 PTS
Holland HFL 14,25 Belgium 272.00 BFr
Finland FIM 39.50
VNU Business Publications

Tim Nott on Windows 95
Page 628

157,544 readers can't be wrong • Britain's top-selling personal computer magazine

Fast Movers

Pentium notebooks with attitude

Colour scanners
18 tested from just £299

Six-speed CD-ROM
Plextor's speed merchant

ISDN update
Fast comms, but does it work?

7 Web browsers p558
Catching the perfect wave

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Personal Computer World • Fast Movers • Pentium Notebooks • 18 Colour Scanners • Six-speed CD-ROM • ISDN update • 7 Web browsers

July 1995
Volume 18 Number 7

Contents

Pentium Notebooks

Portables go for top performance with Pentium power

438

PCW Cover Photography by Bruce *Mackie*

Cover Disk or CD-ROM

CUTTING EDGE

Features

Personal Computer World

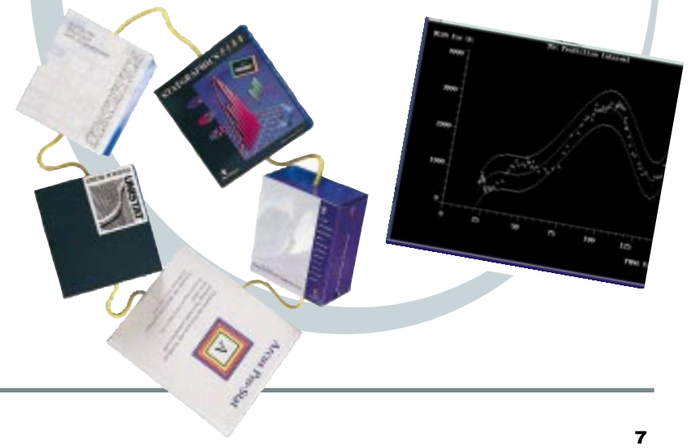
First Impressions

Long Term Tests

Regulars

Hands On

Group Tests



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157,544
JUL-DEC '94

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BACK ISSUES
We keep a stock of past issues and can provide individual copies at a charge of £5. Call **Tom Costin (0171 316 9714)**.

VNU House, 32-34 Broadwick Street, London W1A 2HG.
Main Switchboard Tel 0171 316 9000.

Advertisement typesetting by Typematters, London N1.
Origination by Latent Image, 6 Balmoral Grove, London N7.
Printed and bound in the UK by St Ives plc, Plymouth. Distributed by Comag, Tavistock Road, West Drayton, Middlesex **(01895 444055)**.

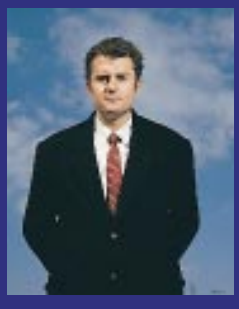
Editorial

After a shaky start, the Pentium processor is emerging into the mainstream. This month's cover story show how much progress Intel has made with the chip. The latest Pentiums are smaller, cooler and lower voltage than before, at last allowing them to be built into notebooks without overheating or battery life problems. The six Pentium notebooks reviewed on page 438 still aren't cheap but I'm prepared to bet that prices will drop below £1,500 before the end of the year.

• Five years ago there weren't any flatbed colour scanners. The only way to get colour scanning done was to fork out tens of thousands of pounds on a drum scanner. Once the image had been scanned, it had to be manually planned into the film that was eventually sent to the printing plant. Using colour photographs, even in magazines like *PCW*, was very expensive.

That's why the flatbed colour scanners reviewed in this issue of *PCW* (page 460) are such a huge step forward. Armed with a PC, a DTP package, a colour scanner and an inkjet printer, it's now possible to knock out professional-looking colour artwork at very little cost. We're currently testing colour inkjet printers for our August issue and we've been staggered at the quality of the output.

• Until now I've resisted the temptation to add my contribution to the millions of words already written about the Internet. But a conversation the other night has driven me to it. Somebody was talking about an online discussion and said "it's just like real life, lots of people adding their contributions, discussing a topic". I'm sorry, but that's exactly what it's not like. If I go to a pub, I don't sit and talk to hundreds of people simultaneously waiting for one elusive entertaining, interesting or informative comment to crop up. The Web Browsers reviewed on page 558 have made using the Internet much easier. What they still can't do is filter out the dross.



Ben Tisdall
Editor

Next Month

Colour Printers

21 colour printers from as little as £209

Quad Speed IDE CD-ROM Drives

the new budget standard

FLOWCHARTING

Software packages round-up

Software packages round-up

August issue
— On Sale Thursday 6th July

September issue
— On Sale Thursday 3rd August
• 90MHz Pentiums
• Anti-virus software

PCW Cover Disk

Chris Nixon introduces this month's program-packed cover disk, which includes a spreadsheet, the *PCW* Back Issues Index, an electronic reader survey and the files from this month's Low Level Gomoku article, a business PIM, and two superb games.

Installing and running the PCW Cover Disk

To install the programs, insert the disk in drive A: or B:, and from either DOS or Windows run the file SETUP.EXE in the root directory of that drive. Please note that this is a Windows installer, and does not run the programs directly from the disk.

• As-Easy-As

[Minimum requirements: 286 processor, DOS 3.2, 640kb RAM]

This software first appeared as Shareware as far back as the mid- to late-eighties, when few had even heard of the concept. Today, As-Easy-As is still the spreadsheet of choice for many computing professionals and hobbyists alike, because of its uncompromising power and low cost. It is now the standard by which other Shareware is measured.

The latest version of As-Easy-As still looks much as it did seven or eight years ago, belying its sheer power and flexibility. Definitely not a DOS application to sneer at, it boasts features still not to be found on many high-profile Windows applications costing ten times more.

For example, on the charting front, Bar, Line, Pie, Stacked, Strip, Wall, Radar, Delta and Polar are just some of the graph types available in the registered version. Having said that, As-Easy-As has always offered more functionality in its Shareware form than virtually any other program. In fact, in many ways, As-Easy-As could be renamed "Better-Than".

• PCW Back Issues Index

[Minimum requirements: 286 processor, Windows 3.1, 2Mb RAM]

Since its early days *PCW* has been your constant guide through the fast-changing world of personal computing. Throughout this time our exclusive articles and unbiased reviews have been a valued source of information for amateur computer users and professionals alike.

Now you can use the latest *PCW* Back Issues Index to quickly locate any review in your collection, using any keyword or topic you like. Searching is fast, and the information clearly presented.

When the program starts it displays the Windows File Open dialogue box, and you will be asked to select a database to load. There will already be one showing, so double-click on this and the data will be read in before the main screen appears. Full instructions can be displayed by clicking on the Help button once the program has loaded.

• ESP

[Minimum requirements: 286 processor, DOS 3.2, 640kb RAM]

ESP stands for Electronic Sales and Prospecting. Nailing down sales is probably the most crucial activity a small business will undertake. It can be costly, and the results can critically affect the health and profitability of your business.

However, ESP may just give you a competitive edge by converting more prospects into actual customers, and by improving existing customer loyalty.

It maintains comprehensive contact details, produces automatic correspondence (mail merge), tracks activities with your clients and prompts you when you need to make timely follow-ups.

Primarily intended for business users, ESP is equally suitable for personal and club use, working on standalone PCs, networks or notebooks synchronised to an office-based system.

We suggest you check whether the Data Protection Act applies to you for any data you store using this program.

• PCW Reader Survey

[Minimum requirements: 286 processor, Windows 3.1, 1Mb RAM]

Complete and return our unique computerised survey form and win a fantastic top-of-the-range PC. Filling in the survey is so easy and you can either print out the complete survey and mail it to us, email the survey back to us, or just send the disk back to us once the survey has been saved. See the program's Help file for further details.

(Electronic survey format is Pinpoint for Windows. For sales support call Longman Logotron on 01223 425558, or see page 556 for more details. For your full working version of Pinpoint for Windows, see next month's CD-ROM.)

• Trolls

[Minimum requirements: 386 processor, DOS 3.2, 4Mb RAM, sound card optional]

In this exciting arcade platform game you take the part of a rather angry troll who's faced with the unenviable task of rescuing stolen baby trolls which, by some evil piece of trickery, have been scattered throughout this colourful Toyland world.

In your search for your missing relatives you must defeat all manner of beautifully-animated nasties, from tin soldiers to pulsating mounds of slime! The many power-ups scattered around the level are a real bonus, and you'll need every one to complete the game.

The main game keys are:
Left arrow — move left
Right arrow — move right
Up arrow — jump
Esc — quit

Featuring smooth 256-colour graphics and a stunning soundtrack, Trolls is one of the very few games good enough to take on the likes of Zool and Jazz Jackrabbit, and give them a good run for their money.

• Low Level source code

[Minimum requirements: 286 processor, Windows 3.1, 2Mb RAM]

This is the documented source code for the games featured in this month's Hands On "Low Level" column.

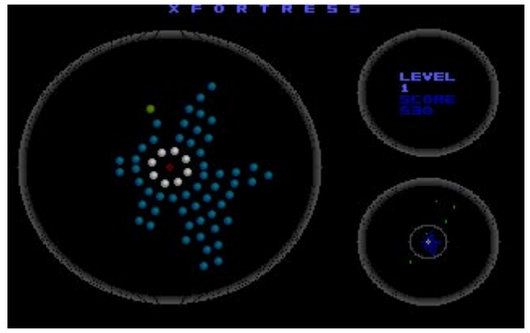
• XFort

[Minimum requirements: 386 processor, DOS 3.2, 2Mb RAM, sound card optional]

X Fortress is a compulsive game of strategy set in deep space. Your space fortress is being constantly bombarded by falling asteroids, attracted by the high gravitational field surrounding the station. Luckily your hull is made of pretty strong stuff, and can take the titanic strain as ton after ton of space debris piles up outside.

But if the accumulation of rocks grows high enough, even your massive defences will fail and you'll pop like a grape. Don't worry! If you can rotate your ship so that the falling rocks fit neatly into existing gaps in the growing pile, then each time you fill a complete ring it will disperse into so much space dust, giving you some much needed breathing space.

The game keys are:
Left shift — rotate left
Right shift — rotate right



Above *Your chance to win a top-flight PC*
Above Right *Will you be able to protect X Fortress?*
Right *Trolls should keep you amused for hours*

Important details

If you have problems with the cover disk, such as receiving a "Cannot read from drive A:" error, please return the disk to the duplicator: TIB PLC (*PCW*), TIB House, 11 Edward Street, Bradford, BD4 7BH (who may be contacted on 01274 736 990) together with a stamped addressed envelope and two 25p stamps. Where it is a duplication fault, the postage will be returned along with the replacement disk.

However, you should note that if your problem is not due to a faulty disk, and a phone number is shown for the publisher of the program in question, then it will probably be quicker for you to call them first as they will be able to provide direct assistance on their own programs faster than might otherwise be possible. Alternatively, ring our hotline on week days between 10:30 and 4.30pm on 0839 715929. Calls are charged at 39p per minute cheap rate and 49p at all other times.

The *PCW* cover disk is virus checked at every stage of production. However, neither VNU nor *PCW* will accept liability for any problems arising from the use of the disk. Installing or running any of the programs on the disk indicates your agreement to this condition.

You are advised not to install any software on a networked PC before checking the disk. While *PCW* maintains a high standard of quality control, disks may be damaged in transportation. Check the disk's shutter before inserting it in the drive by sliding it to the left and allowing it to spring back.

If you have received the cover disk but would prefer the CD-ROM, please write to KP Mailing, Block D, Unit 15, Barwell Business Park, Leatherhead Road, Chessington, Surrey, KT9 2NY enclosing a cheque for 80p made payable to VNU Business Publications Ltd to cover postage and packing. Please allow up to 14 days for the receipt of your CD-ROM.

Alternatively, why not subscribe and save money at the same time? See page 354 for details.

Shareware

Some of the games on this month's cover disk are released as Shareware. This means that you are free to evaluate the software for a certain period, normally of 30 days. If you wish to continue using the software after this time you must pay the author a registration fee, normally a modest amount, in return for which you will normally receive a copy of the latest full release, and often a printed manual too, as well as other benefits such as software support.

PCW Interactive CD-ROM

Chris Nixon introduces this month's packed CD-ROM, including the very best of the latest demos, animations, videos, music, and a whole lot more.

Installing and running PCW Interactive

[Minimum requirements: 4Mb free RAM (swapfile acceptable), 386SX/33 processor, Windows 3.1. (Users with less than this should at least be able to run the DOS programs on the CD-ROM using the batch file DOSMENU.BAT.) Recommended: 8Mb installed RAM, 486DX/50 processor, Windows 3.11]

To run PCW Interactive you no longer need to install any part of it to your PC (other than Video for Windows if you wish to view the movies). All you need to do is select your CD-ROM drive and run the file PCWI.EXE in the root directory for PCWI to run.

• Using the CD-ROM from DOS
If you don't have Windows, or experience any problems running some of the DOS software from Windows, you can run the batch file \DOSMENU.BAT from DOS, but don't try running it from a Windows DOS prompt. It will then display a menu from which you can select any of the DOS programs and run them, using either the cursor keys and Return, or a mouse.

• Using PCW Interactive
The magazine has been designed to look and feel like you're reading a printed publication. For example, at the bottom left and right of each page you'll find a Page Turn icon for turning a page backwards or forwards. In addition there's a set of 10 tabs which appear down the left- and right-hand side of each page. Clicking on any of these will take you directly to the page in the magazine where the indicated magazine section begins.

• Video for Windows
On page 1 you'll have the opportunity to install the latest version of Video for Windows, so that you can view the digital movies on the CD. If you haven't installed Video for Windows from a PCW Interactive CD before, then you *must* install this new version, as it contains the latest drivers which deliver higher quality, a larger size and a faster playback rate. If you don't install the new version, some videos will display the message "Cannot display this video", or similar.

We strongly recommend you install this every time you use a new issue of PCW Interactive as we always try to ensure the very latest programs and drivers are on the CD-ROM.

Throughout PCW Interactive you'll have the opportunity to run or install programs, get further details on a particular program, try out demonstrations of programs, play videos, listen to audio files and much more. When any of these options is available an icon will be displayed indicating the fact. All you need to do is click once on it to activate the choice.

• MSCDEX
Microsoft's CD-ROM extensions (called MSCDEX.EXE) provide the interface between your PC and your CD-ROM drive. There are two versions in common use, 2.22 and 2.23. If you are using 2.22 you'll find that data is pulled off your CD-ROMs much more slowly than with version 2.23. Also, slightly faulty discs can be read using version 2.23, which 2.22 (with less sophisticated error correction) usually can't read.

To enable you to upgrade to the latest version, from the MSCDEX directory of the CD-ROM, run the file RUNME.COM. This will automatically install the new program on your hard disk in the directory MSXDEX2.23. Your AUTOEXEC.BAT file will also be modified. However, the old MSCDEX driver will remain on your hard disk should you wish to return to it, while a backup copy of your AUTOEXEC.BAT file will be saved as AUTOEXEC.SAV.

We strongly recommend you upgrade to the new driver as it will enable you to run most CD-ROM programs you may have had trouble with and you'll find that if digital videos play jerkily, they should become much smoother, while loading data and running programs will be much quicker.

• Testing your CD-ROM
If you suspect your CD-ROM may actually be faulty (i.e. damaged) you can run the file CDTEST.EXE in the SYSTEM directory of the CD-ROM. The program will then examine every byte of data on the disc to see if it can be correctly read. The process lasts up to 35 minutes and generates a verification code if the disc passes the test. If the CD-ROM fails this test please contact the support hotline as you may need to send for a replacement.

• Getting help
Detailed help on most of the programs is available when you run them. For further details on using the magazine itself click on the Help side tab at the top right of any page.

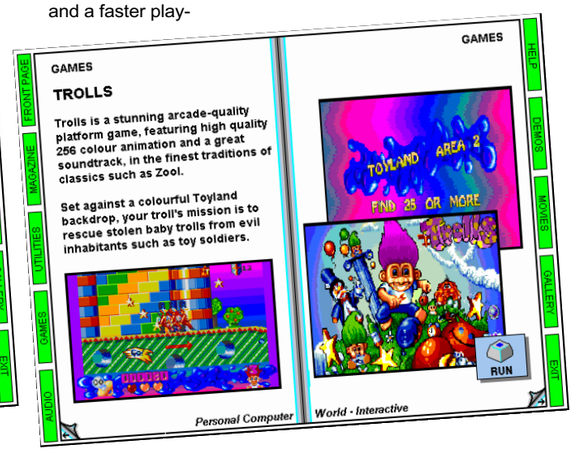
• Troubleshooting
*** The videos are jerky**
If you have a single-speed CD-ROM drive consider upgrading to a double-speed or faster drive. You could also try selecting Control Panel | Drivers | Video for Windows. Then uncheck the "Skip frames if behind" entry. We would also suggest that seeing as the very latest version of Video for Windows is on this month's disc (version 1.1d, released less than 10 days before the CD-ROM was pressed), you should install it over your old copy in order to gain higher quality playback with less jerkiness.
*** DOS programs will not run**
You must have at least 575kb free RAM in a Windows DOS box in order to run all the software on this CD. If you have less, much will work but some won't, so you may prefer to quit from Windows and (if you have DOS 6.0), use MEMMAKER.EXE to increase the free base RAM. If you don't have DOS 6.0, try removing all TSRs and unused drivers from your AUTOEXEC.BAT and CONFIG.SYS files by placing a REM command in front of them. Alternatively, you could boot up from a backup of your DOS System disk, which will give you just about the maximum amount of free base RAM possible without using a memory manager. Note that there is now a DOS menu to access DOS programs on each CD-ROM. It's called DOSMENU.BAT and you'll find it in the root directory.
*** The computer crashes or hangs**
*** Sound effects and music stop playing**
Neither of these should happen. However, with the huge amount of software supplied on this CD and the inherent instability of Windows, after using several of the programs in a single session, any unexpected problems can generally be corrected by simply exiting from and restarting Windows.
*** PCW Interactive runs slowly**
We are now using Macromedia Director as the multimedia engine for PCWI as it offers a speed increase of several hundred percent over the previous system. However, to achieve this speed it requires 4Mb free RAM. So, if you have 4Mb or less RAM you may experience delays when turning pages as up to half this RAM may already be in use by Windows and DOS. The solution is to add extra RAM to your PC (which will also make all your other CD-ROMs run faster) or, at least, to ensure you have a permanent swapfile of an additional 4Mb RAM. Also, make sure you read the section about MSCDEX in this article.

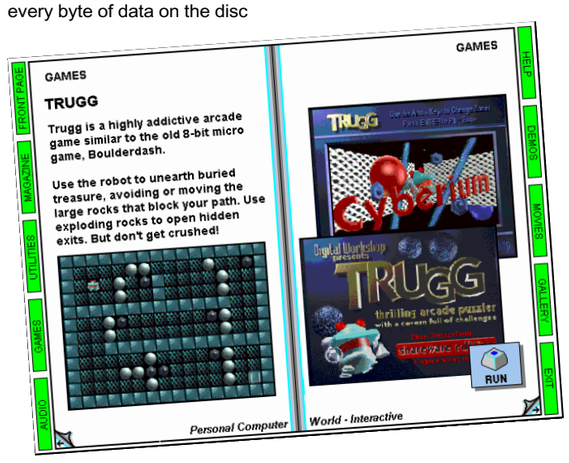
CD-ROM advice & contacts

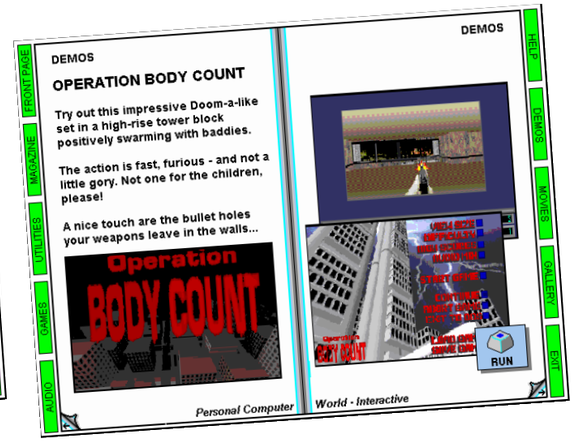
The *PCW* CD-ROM is virus checked at every stage of production. However, neither VNU nor *PCW* can be deemed liable for any problems arising from its use. You are advised not to install software on a networked PC before checking the disc.

For technical support on the CD and the programs on it call Advice by Telephone on 01708 641 454, or email them at PCWCE@MFL.ORG.

To give feedback on the CD-ROMs or cover disks you can email the PCWI team at either: rnixon@cix.compulink.co.uk or CompuServe: 70007,5547 (Please note that these are not the correct email addresses for technical support or subscription enquiries.)







PCW

Newsprint

Cable company crawls onto Net

A major UK cable company has jumped into the Internet business, promising access at local phone rates for 90 percent of the population within a year – but at only 28.8kb/sec, a tiny fraction of cable potential.

CableTel, the fourth largest cable company in Britain, has set up Cable Online, which will establish up to 80 points of presence across Britain. The first will be at its franchise areas in West Surrey, Bedfordshire, Hertfordshire, South Wales, Glasgow and Yorkshire.

Several cable companies have been experimenting with Net access and Web server provision, but they have no coherent strategy for national provision beyond talking about a UK backbone.

They have the hardware and financial resources to dominate Net access in Britain, and with a combination of strong local and global links (they are largely US owned) would appear to be obvious candidates to do so. But they are undergoing a crisis of confidence, facing stiff competition from wireless providers, and under heavy criticism in the US. So they are wary of stepping into unfamiliar territory.

Cable Online director Philip John said people would prefer his service to others because of its breadth and quality. CableTel and other companies have been experimenting with broadband services but he could not say when they would be introduced.

"The techniques people are looking at vary widely. I don't think they need to be standardised. One cable company can use cable modems, another can use a mixture of ATM and Ethernet. What's needed is a standard for connectivity."

In fact, cable companies are loathe to provide a cheap broadband service because they make so much money from high-bandwidth private networks. Phone companies are also worried about undercutting their own voice networks.

Clive Akass

Compaq joins battle of the super floppies

Compaq made a surprise entry last month in the battle for supremacy in a potentially huge market for a new type of device – the super floppy, offering random-access read-write storage of 100Mb or more.

Iomega has got in first with its £150 Zip drive, now available here and said to be walking off the shelves in the US. It takes 100Mb disks costing about £10, and comes in parallel-port and SCSI versions. First impressions, from *PCW* tests are favourable.

Syquest was expected to counter late last month with a 100Mb version of its popular SQ3270 drive, which takes 270Mb cassettes.

Now Compaq has said that it is joining with Matsushita and disk maker 3M to launch a 120Mb floppy drive this year. It will be slower than a quad-speed CD, but faster than a standard floppy. Its big selling point will be that it will also read and write standard floppies.

Kevin Bohren, vice-president of desktop marketing, admitted that the announcement was timed to head off Iomega, but denied that the drive was vapourware. "This has been under development for two years. We are shooting for the fourth quarter."

Syquest's European sales director Pierre Esnau dismissed both the Iomega and Compaq drives as "too slow. Our drive will have an access time of 12ms. You can use it like a hard disk, but swap disks like a floppy."

● Nine major companies have backed a Philips plan for a re-writable CD format. CD-E (for erasable) drives will be able to read existing CDs, but old drives will be unable to read CD-Es.

Win95 on for August

This is Bill Gates giving his keynote address at Spring Comdex , which looked very much a launchpad for Windows 95, with a host of developers showing applications. Gates did not guarantee an August launch but repeated that no major bugs remain. UK sources say Win95 day is August 24. Full story page 358.

More Comdex news pages 362 and 363

NEWS Contents

Short Stories

Win95 'spy virus' shock

● Beta versions of Windows 95 include a virus-like program called Registration Wizard which interrogates every machine on a system and notes what software is being run on which machine, according to a story in the US magazine Information Week.

The program reports this information to Microsoft as soon as the user signs on to the Microsoft Network, which is due to open this year, says the magazine.

Customers must actively disable the routine if they don't want it to run, according to the story which broke as we went to press.

Microsoft product manager Andre Lee said: "All we done is to give users the option of registering online."

New IBM notebooks

● IBM has launched three new notebooks in its ThinkPad range. The 755CV has a see-through screen that lets you view it using standard overhead projectors. It comes with an infra-red mouse including 22 special effects

The high-end 755CX has a SuperVGA TFT screen and a 75MHz Pentium processor.

The 370C has a 10.4in TFT colour screen.

EXE show

● We printed the wrong number for the EXE software developers show: the ticket hotline is 0181 710 2190.

Countdown starts for Windows 95 (at last)

Windows 95 is unlikely to slip far from its projected August shipping date. The Spring Comdex show in Atlanta showed an industry and a market primed for its arrival.

Microsoft chairman Bill Gates, in a keynote address at what was co-billed (so to speak) as the Windows 95 show, repeated his warning that the new operating system will not ship until it is bug free.

He later told reporters that beta-testing was still turning up bugs "but they are a lot of little things — nothing we cannot sort out in a day."

The general feeling seemed to be that Microsoft can hardly delay the release much beyond autumn, even if it has to ship an imperfect product. User impatience, reflected in defections to IBM's OS/2 operating system, is not the only factor.

Delay may whet the market's appetite but it is costly for third-party companies who have invested millions in developing Windows 95 applications.

In the UK, upstart retailer Escom sounded a warning note by announcing that its PCs will be sold pre-loaded with Warp OS/2 (see story below).

And Brad Chase, general manager of Microsoft's personal systems division, said that only a major problem would prevent Microsoft from hitting a 24th August deadline.

News analysis, page 378.

Scanners redefine the office

Bundles of scanners and software are challenging the idea of the basic office needing a telephone, fax, copier, printer and PC.

Delrina's Winfax scanner, announced at Comdex and due to ship here shortly, bundles Winfax Pro 4.0 and Xerox Textbridge text-reading software with Fujitsu's ScanPartner Junior. It acts as an ordinary fax machine and can be connected to a printer to act as a copier. But it has the added advantages of PC fax management. The US price is $299.

Fujitsu is offering bundles with the same scanner, with an emphasis on document management. Options include Textbridge, Watermark document imaging and management software, simple fax facilities and a Fujitsu M2512a magneto-optical drive that takes 230Mb disks costing £25 each. A bundle of the software and the scanner costs £800. The MO drive with free ClarisWorks costs £699. Other options include the PaperClip document management package.

A humbler package comes from US-based Visioneer. It is a scanner called the PaperPort, designed to fit between a keyboard and a PC; bundled software includes a contact manager that reads information off business cards. UK price is £369, from Computers Unlimited — see the review in next month's *PCW*.

Delrina 0181 207 3163; Fujitsu 0181 573 4444; Computers Unlimited 0181 200 8282

Escom backs Warp in shops launch

Escom opened 100 High Street computer shops throughout Britain last month in what could be the biggest shake up of PC sales in years — if its claims are to be credited. The German vendor already has 27 shops in the UK and will open a further 100 by the end of this year as it completes the conversion of the Rumbelows chain, bought in April.

Escom points out that only 15 percent of homes own a PC, and only 17 percent of these are bought in shops. It aims to attract first-time buyers using a £6m advertising campaign stressing its staff training, which Escom sees as its big advantage over vendors such as Dixons.

The launch was a big boost for IBM because Escom will pre-load all its PCs with OS/2 Warp. Asked whether this might not confuse first-time buyers with Win95 on the horizon, Escom chief Manfred Schmitt said: "It is Microsoft that is confusing buyers. Warp is an excellent 32-bit multitasking operating system and it is here, now. Microsoft has yet to come up with Win95."

… and makes Amiga possible

Escom will continue making and selling Amigas after buying the "intellectual property" of Commodore in the US. President Manfred Schmitt said they would be targeted at families who want their children to have a computer but cannot afford £600 for a PC. See *News Analysis page 375*.

New rules ring change to cheaper modems

A new approvals procedure could lead to cheaper modems within a year – and ultimately to a much-needed standardisation of European telecoms.

The slow and costly procedure of getting BABT approval made UK modems much more expensive than near-identical models in the US, leading to a multi-million "grey market" in unapproved models.

Jeremy Hunt celebrates the victory of the modem makers

Costs were pushed up further for manufacturers by the need to get separate approval for each European country. Other telecoms equipment varies widely from country to country, reducing potential economies of scale.

The new set of rules, the first of a series of new national technical regulations (NTRs), were announced last month by Technology Minister Ian Taylor. They will be an alternative to BABT approval rather than a replacement of it.

They are something of a victory for the Modem Approvals Group, which includes BT Datacoms, Cray Communications, Faxback, Microcom, Modular Technology, Motorola-Codex, Pace, Penril Datability, Psion Dacom, PSL, Racal Datacom, Rockwell International and Tricom. MAG chairman Jeremy Hunt said the rules were "a vindication of the long campaign we have been fighting to secure a better deal for UK modem manufacturers and suppliers."

He said the NTRs could have been simpler still were it not for the need to get all the European countries in line, but they are expected to be ratified by the EC. "Basically the European Commission have been getting a lot of stick because they failed to liberalise telecommunications. They see it as a start in getting modems liberalised."

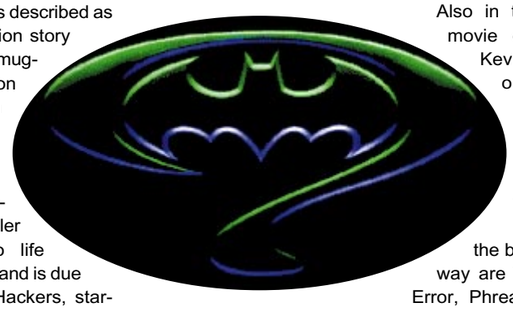
Clive Akass

Prepare to overdose … Hollywood has gone bats over cyberspace!

The PC is becoming the star of Hollywood, which is rushing out a host of films about computers, virtual reality and cyberspace.

Johnny Mnemonic, starring Keanu Reeves, is described as a cyberpunk action story about a courier smuggling information that has been downloaded into his brain. Virtuosity, starring Denzel Washington, is about a killer who springs to life from a computer and is due out in August. Hackers, starring Lorraine Bracco, is about a gang of teenage computer whizzes tracking down a corporate. The Net stars Sandra Bullock, of Speed fame, as a systems analyst whose identity is wiped out after she discovers a classified program.

Part of it was shot at last summer's MacWorld in San Francisco. The Last Hacker is a story about Kevin Lee Poulsen who played so many online pranks that he wound up on the FBI's most wanted list.



F2F is a thriller about a killer who stalks his victims online, and A Perfect Husband is a love story about a woman and her ideal program.

Also in the pipeline is a movie entitled Catching Kevin, which focuses on the hunt for the alleged cybervillian Kevin Mitnick (see *Newsprint*, April 1995).

And that's only the beginning. On their way are The Matrix, Fatal Error, Phreaking and CyberJack.

● The film Batman Forever has its own Web page (inset) at http://batmanforever.com.

Short Stories

Dixons launches schools aid plan

● Dixons is running a scheme to help schools buy IT equipment. Parents who buy computers can collect points for their children's schools. The schools then cash in the points in the form of discounts.

For every £1,000 spent by parents, Dixons are offering 30 points, which translates as £30 off equipment for schools.

Dixons 0181 449 9965

Asterix stars

● Asterix the Gaul has won EuroTalk the Queen's Award for Export. He appears on CD-ROMs teaching English to, among others, Spanish, Chinese, French and Hungarian speakers. Two-CD packs of *Apprenez le francais avec le fils d'Asterix,* and *Aprende espanol con el Hijo de Asterix* are both £76.

EuroTalk 0171 371 7711

Video tool

● Asymetrix has launched Digital Video Producer (DVP), a digital video capture and editing tool. It has a drag and drop interface and an intuitive timeline to make assembly easier. It costs £279, or £129 before July.

Asymetrix 0171 712 9363

D-I-Y editor

● Visual Tools has released two packages for software developers. VisualWriter Pro lets you build text editing into your applications; Formula One 32-Bit, builds in a spreadsheet component which can read and write Excel 4.0 files. Both cost £195.

Visual Tools 01892 834343

Compaq boom

● Compaq's sales shot up 30 per cent to $3 billion in the first quarter of this year.

Compaq 0181 332 3000

Easy going

● EasyCad has entered the Windows environment with version 4.0. New ease-of-use features include descriptive layer names and context-sensitive help. It costs £125.

FastCadd 01923 246427

Comdex Shorts

Low-cost video authoring kit

● Sigma Designs, which pioneered PC video with the ReelMagic MPEG board, offered what it claimed was the first video authoring system for less than $4,000.

The ReelMagic Producer system includes a 32-bit PCI audio/visual MPEG encoder board, a frame-accurate recorder controller, Adobe Premiere video editing software, and the Caligari 3D animation and graphics package.

The system uses the AVI editable MPEG format which allows easy addition of titles and animation and produces an MPEG1 data stream.

Sigma Designs (US) 510 770 2998

Small CD jukebox

● Regal announced what it claimed was the world's smallest 5-disk CD jukebox. The quad-speed CDC-4X is just 75mm high and swaps CDs in a maximum of 5.5 seconds.

Regal (US) 408 988 2288

Just the job

● Winway is preparing a UK version of Resume 3.0 for Windows, designed to help jobseekers with CVs and letters. The $40 package includes a simulated interview.

Winway (US) 916 965 7878

New Uninstaller

● Microhelp showed a new version of Uninstaller. It can move and archive packages *en bloc* as well as delete them.

Microhelp (US) 800 777 3322

Faster serial

● Hayes announced a driver enhancement that can push up to 9.216kb/sec through its enhanced serial port.

Hayes 01252 775500

SVGA card

● Colorgraphic showed a PCMCIA card providing a SuperVGA port for portables.

Colorgraphic (US) 404 455 3921

High-res TFT

● Computer Dynamics offered a 1024x768 colour TFT screen that can be driven from a standard SVGA signal.

Computer Dynamics (US) 803 877 8700

Media focus shifts to object-oriented Cairo

Convergence was the buzzword at Comdex – and not in the fashionable sense of converging computing, line and broadcasting technologies.

It was the convergence of still-to-emerge Win95 and its sibling Windows NT that cropped up repeatedly in reporters' questions. The answer could radically change the future of the PC, because NT is not tied to the Intel platform (see page 373).

Microsoft chairman Bill Gates went little further than to say NT, launched as a rival to the corporate workhorse Unix, would get a similar look and feel to Win95.

This is set to happen in a hybrid release this year. Gates was quoted shortly before the show as saying that this release would bring a step closer the goal of making NT the core of future operating systems.

Microsoft watchers, like Kremlin watchers of old, read all manner of subtexts into official statements, and the message they got was that Gates sees NT and not Win95 as the operating system of the future.

NT needs 16Mb of RAM and, as yet, lacks Win95 attractions like plug and play, but is otherwise more efficient and versatile, and almost certainly more robust.

Even IBM, steadily plugging Warp at Comdex, took up the theme. David Barnes, senior personal software products manager, made a witty assault on Win95, which he described as "a band-aid to hold the market until they fix NT."

He said the problems with Win95 went deeper than minor bugs: they were architectural, stemming from Microsoft's attempt to reconcile the 32-bit operating system with its 16-bit predecessors. Also, Barnes said, Win95 is not truly object-oriented. One result is that pointer icons can lose a file if it is moved.

A beta release of an object-oriented version of NT, called Cairo, is slated for February.

Clive Akass

The family album goes multimedia

This shows the opening screen of a CD which US pundits predict will be a big success for developer Delrina. Echo Lake is a redesign of the traditional family album, except that you are not limited to storing words and pictures in it. Video and sound clips can be included; so can password-protected diaries. And every member of the family can join in with contributions which can continue from generation to generation. The style is North American kitsch, but Delrina (0181 2073163) plans to Anglicise sections before selling it over here.

Meeting of giants boosts NT

Windows NT got an extra endorsement at Comdex at a meeting of the two self-made giants of software: Bill Gates and Charles Wang. The latter is head of Computer Associates, which is second only to Microsoft in sales revenues, though most of its money is made in unsexy and unsung backroom code for enterprise systems. The two men announced a port of CA Unicentre management software to NT, which was seen as a signal that the latter has come of age as a mainstream corporate operating system.

Comdex coming to London

Comdex is coming to London next year. It will be take place at Earls Court on four days from 23rd to 26th April.

It will be aimed at "computer professionals, people who come to buy and make purchasing decisions" rather than the general user, says Peter Shaw, English-born marketing vice president of Softbank Comdex, the Japanese-owned firm that has bought up the show.

Oddly, in a world where the biggest tends to be American, Comdex is actually smaller than the European trade show, Cebit. It has made two forays into Europe before, with little success. But, according to Shaw, the English market is now mature enough for the show.

Softbank chairman Masayoshi Son said he also plans a "year-round, online Comdex" as well as real events in the US, Brazil, Canada, Mexico and Singapore as well as Britain.

● More than 100,000 visitors attended the Atlanta show to see exhibits from more than 1,000 companies, according to Softbank. Next year, when Atlanta stages the Olympic games, the Spring Comdex will be in Chicago.

Pilot's eye view of the future

This is how a pilot sees an airport before landing, with the aid of a virtual-reality display from the US Centre for Atmospheric Research. The yellow blob is an area of wind shear. Above it is some turbulence.

Data to build up the picture is carried by a new, "very fast Backbone Network Service" (vBNS) set up by US phone comms giant MCI. It was one of the uses cited by MCI chief Bert C Roberts, in a keynote address in which he announced the vBNS, set to operate initially at 155Mb/sec but soon to be boosted to 600 Mb/sec.

Curiously, some of the video links with which he illustrated his talk were jerky and out of sync, despite using the new data highway. Like Britain's SuperJanet it will be used as a testbed for the Infobahn of the future.

Utility vendors strain at the Windows 95 leash

Utility developers at Comdex were buoyant about the imminent arrival of Windows 95 even though the new operating system bundles features traditionally provided by third parties.

Gordon Eubank, head of Symantec, which now owns the rival PC Tools and Norton utility packages, told a Comdex press conference that Win95 offered many opportunities for utility developers because it provided a solid base for their work.

And he warned: "I think people have seriously underestimated the demand there is going to be for Windows 95."

Improved multitasking meant that many operations that involved suspending normal computer work under Windows 3.x could be done in the background under Win95, Eubank said. To prove his point, a Win95 version of Norton Utilities was shown at the Microsoft stand defragging a disk in the background.

Similarly Mark Epley, chairman of LapLink developer Traveling Software, pointed out that comms could be done reliably in the background (see below left).

Symantec is offering an alternative file-handling system for Win95, to be called Norton Navigator. It is a successor to the one in Norton Desktop for Windows.

● Symantec warns users of old PC Tools or Norton Utilities, not to use them under Win95 as their low-level actions can trash your files.

Long and short of LapLink 95

The new version of the PC-to-PC comms package, LapLink for Windows, can perform the tricky task of reconciling long Win95 filenames with the classic 8.3 format used by Windows 3.x and DOS.

Win95 filenames are truncated when viewed from a Windows 3.x PC, but LapLink can preserve the long name when a file is passed back and forth.

It is now a fully-fledged Windows package, though it can access DOS machines. New features include remote control of Windows 3.x, Win95 and DOS machines. The new version shows the kind of problems thrown up for third-party developers by the continuing delays to Windows 95

Traveling Software chairman Mark Epley, while not criticising Microsoft, pointed out that the LapLink code could not be finalised until that of Win95 was finalised.

So the present release is called 6.0a, with a b version to follow if necessary when the Win95 is "set in stone", said Epley.

Other new features include support for network pooling of modems and of various infra-red devices.

Traveling Software 01753 818282

Novell homes in on BMG

Novell has joined forces with European entertainment company BMG to produce titles for the home market under a new PerfectHome brand.

They will include a new version of PerfectWorks, an integrated suite which includes features normally found only in fully-fledged applications.

Novell claims it is more versatile than any product of its kind. Other Home products include a learn-to-read CD and a detective game based on the death of Marilyn Monroe.

BMG is part of the Bertelsman Group, which includes RCA Records, and publishers Bantam, Doubleday and Dell.

Novell 01344 724000

Comdex Shorts

Smallest ever PC fits on a card

● This may well be the smallest Windows-class PC in the world. The Cardio 386, from S-MOS, is the size of a type 3 PCMCIA card, and is now available in a 486 configuration. The i/o pins are on the long edge, unlike a normal PC card. The cards are designed for embedded applications.

S-MOS (US) 408 922 0200

Thanks for the memory...

● Two companies were offering utilities claiming to effectively double available memory. Ram Doubler for Windows, from Connectix, uses several tricks to do this, including minimising the use by Windows of memory below the critical 640kb DOS limit. It costs $99. Gamma Research offered MoreMem 4.0, a $49 device driver that forces DLLs into extended memory.

Computers Unlimited 0181 200 8282; Gamma Research (US) 205 533 7103

Big picture

● Epson showed its new Stylus ProXL, due to ship in August, which offers claimed photographic quality colour printing of images up to 12.7in x 18.3in for an expected street price of less than $2,000.

Epson 01442 61144

Smart move

● The latest version of UnInstaller, announced by Microhelp, will intelligently move and archive a suite of program files as well as uninstall them.

MicroHelp (US) 404 516 0899

Master disk

● Dynatec offered a dual-speed CD mastering system including DiskMaster software for just $1,695.

Dynatec (US) 902 832 3000

Short Stories

Virus attacks more common

● Computer virus attacks have doubled in the past four years, says Price Waterhouse. Six percent of 200 top financial houses have been affected in the past year, compared with only 28 percent in 1991. Only one in five companies knew the origins of the infection: two main sources were staff-owned disks and those from outside the organisation. The latter are thought to be responsible for a third of virus attacks. Sources included banks, consultants, auditors, customers, and educational institutions.

Adele Dyer

Internet gender gap narrows

● The gender gap among Internet users, long believed to be about nine men to one woman, has narrowed to a ratio of less than two to one, says a survey from Matrix Information & Directory Services.

It found that only 64 percent of commercial account holders were male, and the ratio was only 59 percent among users in educational establishments.

Board modem

● US Robotics' Sportster 28,800 faxmodem is now available as a halfcard for £299.

US Robotics 01734 228200

File converters

● Two new file conversion packages are now available: DataViz has launched version 3.0 of Conversions Plus for about £90; Word for Word v7.0 from the Software Compatibility Centre is £39.

DataViz 001 203 268 003; Software Compatibility Centre 0181 319 1478

Delphi translator

● Visual Basic MAK, FRM and BAS files can be converted on a "best fit" basis to Borland Delphi equivalents, according to distributor, Softwerk UK.

Softwerk 01462 832244

Bubba meets Bob

Bubba, a take-off of Microsoft's "social Interface" called Bob, comes from tiny US shareware publisher Ososoft. Like Bob, it allows you to run programs by clicking on familiar pictures. Click on the ancient-looking typewriter and Bubba starts up Windows Write. Bubba often offers little bits of drawling advice. Ososoft's excuse is that there is not enough humour in the PC world. You can download Bubba from CompuServe using the command Go Ososoft.

Microsoft gives away software to beat pirates

Fifty percent of companies see the eradication of illegal software copying within their organisations as a major priority, according to a Spikes Cavell survey conducted on behalf of Microsoft.

Touched by their concern for its lost revenues, Microsoft is offering a free training and software package called LegalWare.

This shows how companies can keep track of the software (not only Microsoft's) used on their PCs.

It also points to tools and services available from approved third-party audit specialists such as fPrint UK.

Microsoft has also announced a companion package for Windows 95 designed to enhance the look and performance of the new operating system. Microsoft Plus! will ship within 60 days of Win95 and will run only on a PC with a 486 chip or better.

It also adds 40Mb to the 70Mb taken up by the full Win95 suite, and requires at least 8Mb of RAM to run it.

It includes a new version of Drivespace which will compress up to 2Gb at a ratio of up to 3:1. A system agent utility can launch programs at specified times, and a utility called Desktop Themes allows you to alter the cosmetics of Win95. The suite is expected to cost less than £40.

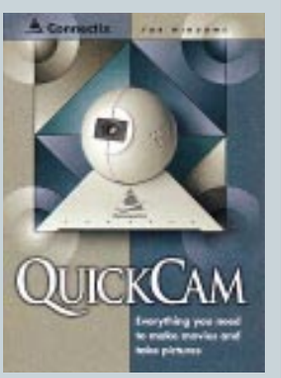
LegalWare response line 0117 9447790; fPrint 0181 563 2359

● *News Analysis page 378*

Microsoft is not the only company concerned with keeping track of assets. Hardcat has launched a Windows version of its system for tracking all kinds of hardware, using software management and barcodes.

Hardcat 01276 675566

Cheapest PC camera yet



Connectix showed at Comdex what must be the cheapest camera yet for the PC. The QuickCam looks rather like a glorified golf ball. It can take stills or handle 6-bit greyscale video, at up to 15 frames per second, at a resolution of 320x240 pixels. The US price is $99 (the UK price was not available at the time of going to press). The QuickCam connects to a standard PC parallel port and so can be easily used with portables – at a fraction of the price of at least one similar product on the market. The QuickCam comes complete with software that can save images in BMP or TIFF formats.

Computers Unlimited 0181 200 8282

Macromedia graphics suite

Macromedia has gone into the suites business with a bundle of leading graphics software. Graphics Design Studio, announced at Comdex, includes Freehand, Macromodel, Fontographer, Pixal's Renderman and Fractal Design's Painter for a US price of $995.

The company also announced a full 32-bit Windows version of Freehand 5.0, the files of which will be binary compatible with their Mac equivalents.

Macromedia 01344 761111

Short Stories

Clock this

● Atomstyle has come up with a PC add-on version of the attendance clock, which records when employees start and finish work. Prices start at £1,495.

Atomstyle 0181 801 1838

Dead safe

● Security Intelligence is readying a product, provisionally called Deadlock, which encrypts and decrypts files to and from a logical drive on the fly, hiding them even from hackers who read disks at the byte level.

Security Intelligence 0171 589 4567

Technomatic sold

● Connecticut-based Micro Warehouse has bought the UK Technomatic computer dealer for an undisclosed sum.

New Reunion

● Reunion 4, from S&N Genealogy, includes new features such as the ability to produce illustrated family histories. Demos are available from S&N.

S&N 011252 378054 or 01252 510486

Cap that!

● Capscan claims that its Capscan Zapcode is the only UK rapid-addressing software to pass the Microsoft Office compatibility test.

Capscan 0171 267 7055

Cheaper Toshes

● Toshiba has cut the prices of its notebooks by between 12 percent and 17 percent.

Toshiba 01276 675566

MO offer

● Elonex has launched a range of Pentium machines, fitted with Fujitsu's magneto-optical drive, which take £25 230Mb disks. Prices start at £1,385 for a 60MHz model.

Elonex 0181452 4444

SCSI converter

● Data Design Cables is offering kits to add an external port internal-only SCSI board, or to double up an existing external port. Prices start at £7.99.

DDC 0116 2341222

New net service offers cheap deal for families

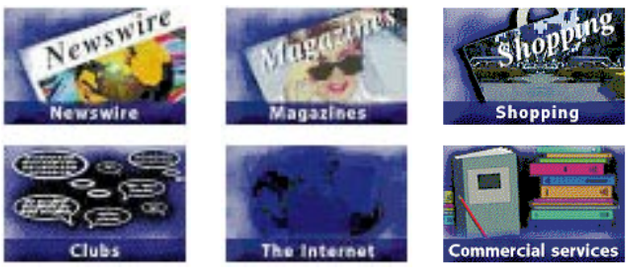
UK Online, the Olivetti-backed project to create a mass market, family-orientated British-centred online service, has announced prices and technical details.

It will be based entirely on standard Internet protocols, giving advanced users a broad choice of access tools. Access to the wider Internet can be restricted if necessary.

There will be two basic prices: £9.99 a month (including VAT) will buy ten hours' worth of individual access; the family account, at £14.99 per month, provides unlimited access and an email account for up to four people. ISDN access will be available at no extra charge as will a commercial Windows Web browser and support. Downloadable games and financial information will cost extra, and other premium services may be added. But as many services as possible will form part of the basic package.

An initial dial-in point in London is scheduled to go live in August, depending on how the beta test goes. By the end of the year the company hopes to offer broad national coverage like that of Demon and Pipex. **David Brake**

UK Online 01749 333333, fax 01749 333310; http://www.ukonline.co.uk/



Some of the options on UK Online's home page

Easynet poaches Davies

Easynet, the Internet dial-up provider linked with three British cybercafés, has greatly increased its national coverage with a tie-up with British Telecom, and has poached Graham Davies from Demon Internet. Davies, who becomes managing director of Easynet, co-founded Demon, a pioneer of Internet in the UK.

Under the new deal, BT customers who request dial-up access will be referred to Easynet; and Easynet customers who want a leased line will be referred to BT. BTnet, and through it Easynet, plan to provide access at local rates to 80 percent of the population, rising to 95 percent by the year end. BTnet still plans a consumer service of its own — probably starting in the autumn.

● A fourth UK franchise of Cyberia's cybercafé design is planned in Manchester, for the middle of June. **David Brake**

Pipex boosts coverage

Pipex, one of Britain's biggest commercial Internet providers, has signed a deal with Mercury which allows it to offer a local-rate service to eight in ten of the population, via 170 new points of presence (POPs). The network will also benefit customers of a number of Pipex resellers, including CityScape and the BBC Networking Club. The deal, as with Demon's tie-up with Energis and Easynet's with BT (see above), allows Pipex to make better use of its modems because they can be concentrated in one place and calls from any of the POPs can be routed to them.

Pipex 01223 250120; http://www.pipex.net

Electronic stationery 'saves a fortune'

Companies could save millions a year by printing stationery on the fly, claims Hewlett Packard. Pre-printed forms and letterheads cost up to eight times as much as plain paper, and that is not counting the cost of storage and distribution, nor of stationery which has to be scrapped because of outdated information.

Many businesses can benefit from electronic stationery; forms and logos stored in printer flash memory modules, says Ian McRae, development manager of HP's JetCaps service, which aims to help clients implement such systems.

Stationery can be printed at the same time as the information that is to go on it, with the added advantage that different paper is not needed for different tasks. This can be done with a standard setup, but flash memory allows both a network and a printer to be used more efficiently by storing the stationery data at the printer — the point at which it is used.

HP has just announced 2Mb and 4Mb flash SIMMs for its LaserJet 4 series (not the 4L) and the 5P and 5MP; recommended prices are £399 and £599 with software, but a £250 1Mb SIMM would suffice for most needs.

Hewlett Packard 01344 369222, fax 0171 735 5565

Short Stories

QIC solution

● The Panther Mini tape system, from Tanberg Data, backs up 1Gb of uncompressed data to a single QIC minicartridge and supports major operating systems. Prices start at £500.

Leasing scheme

● ICL has teamed up with Sorbus Business Systems in a scheme to lease PC systems, with a 24-hour help desk and 24-hour replacement service. The ICL-Sorbus scheme, aimed at executives, costs between £125 and £200 a month for systems built round either a Panasonic CF-41 notebook, or an ICL Ergo Pro D5/90P desktop machine.

ICL Sorbus 01734 634830

Laser aid

● The Third World charity Actionaid has launched a scheme to recycle some of the £28m worth of used laser printer cartridges that are thrown away each year. The charity will arrange for cartridges to be picked up, and sells them on to the UK Cartridge Recyclers Association for up to £5 each.

Actionaid 0117 9298818

Remote chance

● Version 2.0 of the remote control package Netsupport now offers dial back, dial request, and database connectivity. It supports DOS machines and does not require a memory-hogging TSR under Windows.

Interface Business Resource 01223 234233

Wild Oscar

● Adamson Computers is offering the 100MHz Pentium-based Oscar AC-P100 PC, with 16Mb RAM, 64-bit PCI 2Mb S3 Windows accelerator, CD drive, sound card and 540Mb hard disk for £1,795.

Adamson 01707 391392

Intuit megadeal hangs in balance

The fate of the biggest software deal in history will be decided by a US judge at a hearing starting on 26th June, in San Francisco.

The merger deal between Microsoft and Intuit, publisher of the Quicken range of accounts packages, was worth an estimated $1.5 billion when it was announced last year. That estimate has since climbed to $2 billion due to the increase in the value of Microsoft shares.

But much more than software is at stake. The deal would place Microsoft chairman Bill Gates up to his neck in online banking; an area set to explode. (One US bank is already charging customers for talking to human assistants.) Now, somewhat ironically, the US Justice Department is trying to block the deal having been criticised as being too easy on Microsoft over allegations of monopoly abuse. The hearing is expected to last about 20 weeks and Microsoft is pushing for a speedy decision.

Games writers look to PCs in confusion over platforms

TIM BAJARIN at the E3 show

Nintendo has held back the release of its 64-bit Ultra 64 games machine which had been expected to make its début here, at the first Electronic Entertainment Expo, better known as the E3 show.

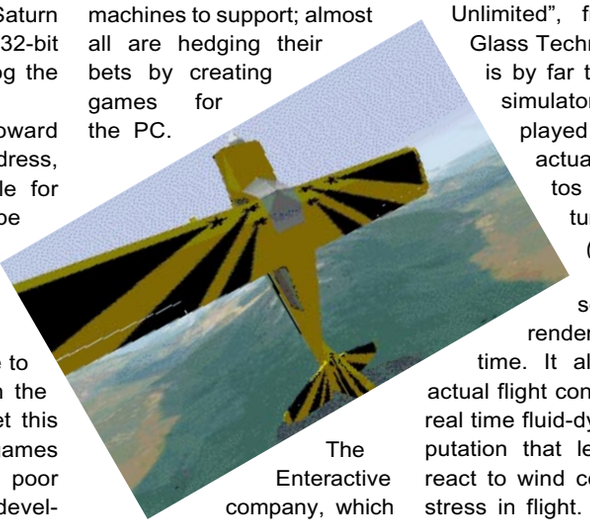
This has left Sega's Saturn and Sony's Playstation, 32-bit games machines, to hog the limelight at 3DO.

Nintendo boss Howard Lincoln, in a keynote address, said the next big battle for games makers will be Christmas 1996 when many more games for the new systems should be available.

Sega and Sony hope to gain valuable ground in the $6 billion games market this year. But the 64-bit games system, coupled with poor response from games developers to the new Sega and Sony systems, could allow Nintendo to leapfrog the pack.

Sony is shipping its Playstation in September for $299 ($100 less than expected).

Sega has countered by bringing forward the launch date of its Saturn to late May (see *Screenplay*, page 621). This has left games developers in a quandary over which machines to support; almost all are hedging their bets by creating games for the PC.



The Enteractive company, which is based in New York, showed a CD-ROM, entitled "Jean-Michel Cousteau's World. Cities Under The Sea", about coral reefs in Fiji. It uses seven different laboratories to explore various aspects of the ecosystem. One laboratory looks at the various fish; another takes a close look the reef as a habitat. Using the research submarine, a viewer can see the reef through Cousteau's eyes.

Also showing was "Flight Unlimited", from Looking Glass Technologies. This is by far the best flight simulator I have ever played. It uses actual aerial photos and 3D texture mapping *(left)* to provide landscapes rendered in real time. It also simulates actual flight conditions, using real time fluid-dynamics computation that lets the plane react to wind conditions and stress in flight. The program offers 30 hands-on lessons with digitised speech to teach complex maneouvres such as spins, loops, and the notorious Immelman turn. It will ship soon for less than $60.

Enteractive (US) 212 221 6559; Looking Glass Technologies (US) 617 441 6333

Low-cost net video system

A British firm has developed a system that distributes high-bandwidth signals such as video, to a local network. Mediagate, from a startup called Mycom, cuts the per-user cost of conferencing systems by placing expensive items such as ISDN links and codecs in a central hub. This needs only one conection to the outside, yet any net user can access its resources. Mycom (0171 711 1000) is looking for dealers interested installing Mediagate systems, which it believes will be of particular interest to companies with international links. A 16-user Mediagate costs £3,650, plus £735 per PC.

NT 'opens window for PowerPC to beat Intel'

A split between Microsoft and Intel and the convergence of Windows 95 and NT will see PowerPC chips grabbing a lion's share of the market, says a bullish Motorola.

"Microsoft and Intel are not in a marriage; each is jealous of the other one siphoning money from the pockets of their customers. We've got an opportunity to drive a wedge between them. PowerPC is that wedge," said Jack Browne, director of marketing.

Eight in ten of the 55 million PCs set to ship this year will have Intel processors. IBM and Motorola aim to grab a 30 percent share, while their PowerPC partner Apple looks to increase its share from eight percent to 25 percent.

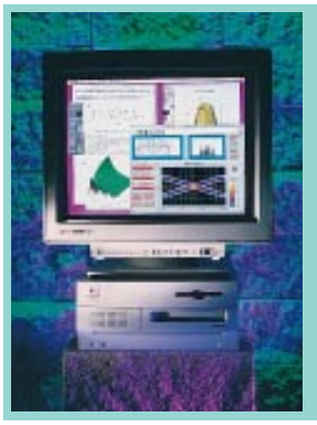
"Remember that PCs are only in 4 percent of homes worldwide. Look where the market is heading. Most Pentiums have been bought by consumers and not business." says Browne. "The killer applications are multimedia and the World Wide Web, both of which will need the power offered by the PowerPC."

Browne says most people care more about their software than the hardware they run on it. PowerPC all major operating systems except Windows95.

The PowerPC group is banling on the advent of Cairo, which will combine Windows95 and NT. "I don't think it matters to Microsoft whether its software runs on X86 or RISC chips. The company is in a win-win situation," says Browne. Meanwhile, the PowerPC group expects many Win95 applications to be ported to Windows NT in the PowerPC because recompilation is relatively simple.

Browne has no illusions about the task the PowerPC group has set itself: "It's going to take to take five to ten years to break the market and it'll be a case of taking customers one by one. But we've got deep pockets."

George Cole



Picture this

National Instruments is offering a free demonstration disk of its Mac-based HiQ software for numerical analysis and data visualisation. The program has its own programming language called HiQ Script to help scientists and engineers. Minimum requirements are a Mac with a floating points unit, 6Mb of disk space, 5Mb of RAM. Freephone 0800 289877 for details.

Top 10 Windows and DOS

	Product	Manufacturer	Last month
1	MS Office 4.2 U/G	Microsoft	2
2	Cleansweep	Quarterdeck	1
3	First Aid for Windows	RMG	3
4	Quicken 4.0	Intuit	-
5	MS Office 4.3 U/G	Microsoft	8
6	Delphi	Borland	-
7	QEMM 7.5	Quarterdeck	6
8	WincheckIt	S&S	-
9	Smartsuite U/G	Lotus	-
10	The Perfect Office U/G	Novell	-

Top 10 DOS

1	QEMM 7.5	Quarterdeck	1
2	DOS 6.22	Microsoft	2
3	Sterling Payroll	Sage	-
4	Anti Virus Monthly	Dr Soloman's	-
5	Gardeners World	Europress	-
6	Pegasus Solo Accounts	Pegasus	5
7	MS Flight Simulator	Microsoft	3
8	Turbo C++ 3	Borland	8
9	PC DOS Version 7	IBM	-
10	WordPerfect C/U	Novell	-

Top 20 Windows

	Product	Manufacturer	Last month
1	MS Office 4.2 U/G	Microsoft	2
2	Cleansweep	Quarterdeck	1
3	First Aid for Windows	RMG	3
4	Quicken 4.0	Intuit	-
5	MS Office 4.3 U/G	Microsoft	7
6	Delphi	Borland	11
7	WincheckIt	S&S	18
8	Smartsuite U/G	Lotus	-
9	The Perfect Office U/G	Novell	4
10	CorelDraw 3 CD	Corel	5
11	Ventura v5 U/G	Corel	-
12	Quickbooks v3	Intuit	16
13	Encarta 1995	Microsoft	8
14	Quicken 4 Delux Homepack	Intuit	-
15	Family Tree Maker	RMG	14
16	Applications Trade In	Microsoft	-
17	Business Plann Builder	RMG	-
18	Visio 3	Shapeware	-
19	OS2 Warp 3	IBM	-
20	Quicken 4 Business Pack	Intuit	-

Figures, supplied by Software Warehouse, relate to bestsellers for April 1995.

Short Stories

Native Windows port rumoured

● SoftPC developer Insignia Solutions is working on projects to get Windows 3.1 and Win95 running native on PowerPC processors, according to ClieNT Server News.

The company is being helped by Microsoft, which had previously dismissed the idea of porting Windows to non-Intel platforms because of the need to rewrite machine-specific code, the online publication claims.

David Angwin, Insignia's European marketing manager, said: "Over the years we have developed a number of relationships with major industry players. I cannot comment on projects."

Insignia 01494 459426

New Quicktake gets in close

● Apple is shipping its Quicktake 150 digital camera, an upgrade of the model 100, in the US. It can be used with Macs, PowerMacs and PCs.

It offers WSYIWYG close-ups with the aid of a snap-on lens, 640x480 base resolution and the ability to store 32 standard quality or 16 high-quality colour images.

The US price is $739. UK pricing and shipping date is not yet known.

Apple 0181 589 1199

New Stylewriter

● Apple has also announced the StyleWriter 1200, a $269 enhancement of the StyleWriter II.

Apple 0181 589 1199

NEWSPRINT Feedback

Email your news and views to **clive_akass@pcw. cmail. compuserve.com**, or to **cakassa** on CIX. Please note that we cannot monitor all Usenet groups, so if you see anything we might be interested in, do drop us a line.

We are also interested in good screenshots or other pictures. Any email will be considered for publication unless you request otherwise.

Not drowning but waving

Amiga has been saved from going under a second time. Its saviour on this occasion is German company Escom AG, which plans to put Commodore and Amiga machines back on the market for sale mainly to Russia and China.

The history of computing is littered with corpses. Names like Dragon, Exidy, Ohio, Oric, Osborne, Sinclair and Sol. Each had its moment of fame and then died. But not Amiga, which has been twice rescued — first by Commodore, a decade ago, and now by Escom.

Escom AG is a German assembler and retailer of PCs, founded by Manfred Schmitt in 1987. The company has paid more than $10m for Commodore's intellectual properties, which were auctioned by a US bankruptcy court. Earlier, Escom had paid about $1.3m for trademarks and other rights, sold by a court in the Bahamas. Ownership of other assets, including Commodore UK and a factory in the Philippines, remains unresolved for the moment.

In the aftermath of dreadful losses, Commodore started its "orderly voluntary liquidation" in April 1994. There were hopes that the firm would be sold off quickly, so that users and software developers would remain loyal, and so that new machines — already on the drawing board — could be manufactured in time for Christmas. Creditors who were owed more than $100m might then have recouped more than $20m.

Alas, the sale proved more difficult than anyone had suspected. Commodore UK's joint managing director, David Pleasance said: "To say that the situation with Commodore and all the subsidiary companies is complex, is a major understatement. All the companies have cross-shareholdings and trading arrangements."

Commodore UK, for example, was owned by a Dutch company, Commodore Holdings BV, which was in turn owned by Commodore International, and its subsidiary Commodore Electronics, both registered in the Bahamas. That might have been efficient for tax purposes, but wasn't ideal for selling it off.

Confusion reigned for a year as a variety of potential suitors picked over the remains. They included Amstrad, Philips, Samsung and Creative Equipment International of Miami (which later teamed up with Dell). But Commodore UK seemed the favourite, with its management buy-out attempt, and at one point sent out invitations to a victory party. Prematurely, as it turned out.

Christmas came and went, and lots of new systems were launched. With the CD32 stalled and ageing, Commodore's value was declining every month.

Escom now has to get machines back onto the shelves. To do this it will form a new company, perhaps called Commodore-Amiga. The existing range of Amigas is being put back into production, as is the venerable Commodore 64, mainly for sale to Russia and China. The Commodore brand name, which was popular in Germany, may also be used on a range of Pentium-based PCs built by Escom. Amiga manufacturing will be carried out as a joint venture with Tietsin Trust & Investment Co (which has a factory near Beijing), but Escom is keen to license chipsets and boards to anyone who wants them.

Escom says its first Amigas will use the same electronics as before, though it may develop new cases. While it does not yet understand the technical details well enough to make decisions, it knows it must produce new systems to stay competitive. It wants to put an Amiga on a card for PC users, and also hopes to produce RISC-based versions of the Amiga that will run a 32-bit operating system; probably Microsoft's Windows NT or IBM's OS/2, as well as recompiled versions of current Amiga software.

Much may depend on Bernard van Tienen, the managing director of Escom's UK operation, which recently made headlines by taking over the leases of former Rumbelows shops. Van Tienen used to work for Commodore, and was responsible for sales of Amigas in the Netherlands and Benelux countries. The other key figure at Escom is Dr Peter Kittel, who spent 11 years at Commodore; he has been put in charge of worldwide engineering.

Much may also depend on what happens to Commodore UK, run by David Pleasance and Colin Proudfoot. They abandoned their buy-out attempt having seen the size of Escom's cheque-book. But having kept the Amiga alive in the UK, while all the other national distributors have been liquidated, the company hopes to be taken over as a going concern. It argues that to do so would give Escom a flying start.

Amiga — given a third chance by German company Escom AG

Manfred Schmitt wants his Commodore-Amiga business to achieve $1billion worth of sales revenue in three years. To manage that, he'll need all the help he can get.

Jack Schofield

ANALYSIS

On the trail of the mobile user

A study of mobile computer users and their needs has enabled Microsoft to make Win95 more mobile friendly. Could the major innovations which have been included eventually result in the portable PC becoming a primary computing device?

ANALYSIS

Microsoft's long awaited Windows 95 should be of interest to all mobile computer users.

To make Win95 more mobile friendly, Microsoft believes it must offer an operating system which allows users to get the most out of their portable PC hardware. For the past three years, Microsoft's large staff of technical and marketing personnel have been examining mobile users and what they need to make them more efficient on the road.

Perhaps the major new feature built into Win95 for mobile users, is plug and play. This is an architecture that was co-designed by Intel, Microsoft, Compaq and Phoenix Technologies. The problem with current operating systems and portable PCs is that existing systems don't handle configurations very well. Today, it is very difficult to change from a docked configuration to an undocked configuration, or to set up different video and network configurations for "in the office" or "on the road".

Windows 95, by virtue of plug and play, is a dynamic operating system. It can load and unload drivers and other system-level components on the fly and can even detect and adapt to hardware configurations. So, rather than having to manually re-configure your system's settings when you un-dock, or switch peripherals or PCMCIA cards, the system does it for you.

Another addition to Win95 for portable computing is dial-up networking. Mobile computing research reveals that staying connected is a big user need. What Microsoft has tried to do with Windows 95 is to enable remote network access always to be available when users need it. And if you try to access a network server to which you don't have direct access, Windows 95 walks you through the process of making a dialup connection.

Remote networking is built directly into the core of Windows 95's network architecture. With current implementations you need to leave your computer alone while it's carrying out network operations.

With Windows 95, a PPP connection gives you a "pipe" to the remote network, just like a physical LAN. Since everything is in 32-bit protected mode, it's fully multitasked. Networking recedes into the background just as if you are on a physical LAN.

You can use your computer for "real work" while file transfers proceed in the background, and you can even multitask network operations, such as downloading a file and sending email over the same network link.

To help keep you organised, Microsoft has created "Briefcase" — a feature which the company claims breaks new ground in terms of usability and functionality.

Briefcase is important for two reasons: first, it simplifies file synchronisation procedures and exposes them in the base operating system. More people can take advantage of the software to help manage their files in the mobile environment.

Secondly, Briefcase introduces an OLE interface for file synchronisation. This lets software vendors have a consistent, documented method of adding file synchronisation to their applications.

Since Win95 provides an OLE interface for all Win95 applications, that type of cross-application updating will now be automatic in file synchronisation.

With Briefcase, Microsoft makes it easier to stay organised, whether you're working on a desktop or a portable machine. Just hook them up, push the file synchronisation button and the files will always be the same.

Most important, in terms of mobile computing, is that Win95 is the first mainstream operating system where mobility has been designed directly into the base product. This type of integration shows up in Windows' network architecture and in its hardware support. It is also evident in the messaging architecture, with remote mail support provided via Exchange, and in the user interface, with Briefcase and networking.

It is even evident in the virtual memory system, where you can tell the paging/swapping subsystem that you are running on a portable PC. Microsoft has provided an operating system that will virtually allow a user to view their portable PC not as a second class citizen, but rather as one that could very well be a primary computing device.

And, who knows, with portable PCs becoming more powerful all the time, it may only be a matter of time before they take over the desktop anyway.

Tim Bajarin

The heady early eighties, when the only thing larger than portable PCs were their users' trouser-bottoms. Win95 could well bring a smile back to this man's face

Microsoft and the movable f-word

From a recent Bill Gates quote, it could be inferred that we may not now see a final version of Windows 95 until November. What lies behind Microsoft's latest strategy in announcing the Win95 companion package, Microsoft Plus?

ANALYSIS

Amid the reports from Comdex, in Atlanta, stating that Bill Gates had said Windows 95 was still on target for August, there was an interesting little quote: His Billness actually appears to have said "on target to be *finalised* by August".

Now, it *may* be possible that this was a slip of the tongue, but company chairmen have to be careful what they say in public, so it is also possible that it wasn't. Bill knows the differences between "announced", "finalised" and "shipped", even though it may sometimes sound as if he doesn't. So, if the f-word had been carefully selected, he was evolving his position significantly from the one he'd apparently held in previous weeks.

This implies that there might be some slippage that could mean Win95 going gold in July rather than June, but that this wouldn't interfere with it shipping in August.

We'd reckon that Microsoft needs between six to eight weeks' production from gold to shipping date to be able to get products to users, so July is tight, and "finalising" in August probably means November in actuality.

Finalising in August means dealing with the beta feedback on a very tight schedule, and it's quite possible this will be exceeded. A big push at Comdex in November is vital, so we might well see what is, effectively, a pre-release version 1.0 shipping gently in November and an improved version 1.1 shipping in January '96.

So we have a crime-count that runs approximately as follows: in late 1993, Microsoft announced that Chicago (as it then was) would ship in 1994, so there wasn't much point in users looking elsewhere in the meantime. In late 1994 it got renamed Windows 95 and slipped to the first quarter of this year, but there still wasn't much point in users looking elsewhere.

If Microsoft pulls this stroke again in 1995, people might well start to notice something. We have argued that it might not matter if Windows 95 never shipped anyway, a scenario which is plausible only if Microsoft's antics don't become sufficiently obvious to cause amusement. A dud product in November that doesn't ship in volume until 1996 might start them off; pulling it and renaming it would probably make people laugh harder.

Meanwhile, we have a special announcement from Microsoft personal systems group general manager Brad Chase: "Microsoft Plus is mag wheels and chrome trim for Windows 95."

Microsoft has two such "vehicular" improvement programs for Windows 95 under way: Microsoft Plus and the Windows 95 Game Software Developers Kit (SDK). The SDK is probably most interesting because it provides game developers with access to a standard set of direct hooks into the hardware. Win95 on its own clearly isn't a great games development environment after all; it might just suffer from something similar to the soggy steering that Windows 3.1 imposed on games which lead developers to continue hitting the hardware through DOS.

But hitting the hardware isn't generally viewed as a good thing these days. There are implications for stability, and for open systems. Microsoft is offering the SDK as a royalty-free development environment. This means that Microsoft owns it, and is still resolutely on its old kick of defining its own standards as open because it owns them, and therefore they're standard; whereas everybody else's open standards are proprietary, because nobody owns them, and they can vary. Microsoft has, in the past, tried to assert rights to undocumented aspects of its products that other companies have used, as happened in the case of the disk-doubler Stacker. But with Windows 95 it's trying to make this policy official.

But it's only games, right? Wrong — all sorts of stuff goes a lot faster in less hardware if you hit the silicon direct; the audio-video hooks available through the SDK will come in very handy for multimedia networking. They'll also end in low-resource set-top boxes which will almost certainly turn out to be proprietary to Microsoft. The SDK looks like a serious assault on open systems.

And Microsoft Plus? Taken with the SDK it helps you build a picture of the classic Microsoft approach to construction: you put together a base operating system, adding things that look neat, kick holes in it to make parts of it run at an acceptable speed, then bolt more stuff onto it, eventually making it impossible for the user to figure out what broke.

Microsoft Plus will add 40Mb to the 73Mb install at which we clocked Windows 95. Microsoft's strategy seems to be run by hyperactive magpies.

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Michael Hewitt

Sounding off

Last week, while up a tree, I successfully contacted CIX using a Psion 3a/3Faxmodem combination, a standard cellphone, and an acoustic coupler. "Big deal," you yawn, and yes, I agree: I don't for one moment believe that my example is going to inspire others. I simply did it to prove to myself that it could be done, in much the same way as I once cooked an M&S ready-meal in a dishwasher. The impressive thing here isn't the tree — it's a rather nondescript sycamore which I climbed only to overcome lousy reception at ground level.

The main point is that I didn't use a cellular interface as advised, yet nevertheless achieved a fairly respectable 1,200bps connection.

A couple of years ago, I would regularly bore for England on the subject of how difficult "comms" was, and how those difficulties were compounded if you tried to get your modem to exchange pleasantries with a foreign telephone system.

Back then, it was genuinely difficult; like attempting to persuade two pandas to mate. So if I succeeded, I was wont to give myself a well-earned pat on the back. But not so today, as four things have changed.

Firstly, the front-end communications software has largely become so cuddly and "intuitive" that even a PR person can operate it.

Secondly, more and more hotel rooms worldwide have become "modem friendly": when, three years ago, I first visited the Hotel Borg in Iceland, for instance, it still had bakelite phones, hard-wired into the wall. When I returned last year, the place had been restored to its thirties splendour — every room, bathroom included, was equipped with an Art Deco RJ-11 socket. If that's the way the frozen north is going, I should imagine the majority of what used to be data "arid zones" have already gone, or if not, will soon go the same way.

The third, and to my mind equally important change, concerns hardware: not so much what it does or the way in which it performs, but that it now does it without putting its owner in traction. Portable computers and their peripherals have largely followed the trend set by catwalk supermodels. In the Claudia Schiffer heyday of the early nineties, PCs were mostly rather large and inclined to spill out all over the place. But now that the Kate Moss look is the norm, laptops and their appendages are equally svelte and petite. When I go to Verona next week, for instance, all the essential items, including the computer, its modem, and plugs, will fit comfortably into my jacket pockets. And if previous experience is anything to go by, they won't even set off the metal detectors at the airport.

The acoustic coupler is my chosen fourth most significant improvement over days gone by. Three years ago, I would rather have subscribed to an Internet magazine than admitted to relying on one of these — people used to throw parties if they ever achieved a durable connection much over 300bps using one. With the new generation, however, 19,200bps isn't just something to aspire to, like an Aga cooker or a five-door hatchback, it tends to be a fact of life.

So, God forbid, if my room at the Grand Hotel, Verona, has no phone socket, then rather than rip the place apart and try to hard-wire as was once my custom, I'll happily strap an acoustic coupler to the receiver. You can even use them relatively transparently with programs such as Ameol or WinCIM, notwithstanding extraneous noises outside your window.

While on the subject of noise, although I realise that most *PCW* readers would probably baulk at taking an acoustic coupler into a free-fire zone, I'd like to climb back up my tree for a moment: on the day of my CIX cellphone connection, the locals were out in force shooting rabbits. A crowd of them, armed with a variety of firearms, was advancing in my general direction — each (very loud) gunshot made only a minimal impact on my data throughput. Only occasionally were there a couple of dodgy blocks in my X-Modem download to indicate that there was one less bunny in the world. The CP+ coupler is so well insulated, and the volume control so finely adjustable, that you'd probably have to detonate a small grenade next to it before it really started to complain. So if it can handle that sort of thing and still work, crackly phone lines and parties in the room next-door are going to cause it no problems whatsoever.

Comms is getting very easy and soon, it will get easier still. Within ten years I imagine that every hotel room, airport lounge, and bus station will have dedicated data sockets. His Bill Gatesness will most likely be growing even richer on a global computer data network, accessible from all parts of the civilised world and operating transparently from within Windows 2005. And international businessmen scattered throughout different continents will, no doubt, routinely send themselves memos via their satellite-linked, Pentium-based, VGA colour palmtops.

And a good thing, too, because by then, I will be too old and decrepit to go tree climbing any more. PCW

Tim Nott

Homefront

A short history of the PC is littered with significant milestones for the end-user: graphic interfaces, WYSIWYG word processing, scalable fonts, drag-and-drop editing and file management, for instance, have helped to make PCs easier and more intuitive to use. Now, the arrival of 32-bit operating systems and plug-and-play has freed us from the legacy of the DOS 640kb memory limitation. Gone too is the hassle of messing about with interrupts and jumpers and such amateurish bodge-ups as having to remember to exit Windows to check the health of the hard disk.

Running out of resources, with plenty of memory to spare, or having to sit and twiddle our thumbs while files are being copied are further examples of the "bad old days".

Maybe I'm jumping the gun a little here, but let's take an optimistic scenario. In a few months' time you'll be able to buy a state of the art PC, with full plug-and-play capabilities, shove in a sound card, and it will work. Just like that. Plug your portable into a docking station, and the screen resolution will adjust itself. Just like that. Carry it into a room containing an IRDA (Infra-Red Developers' Association) printer and it will be ready to print without loading drivers or having to make a physical connection.

But wait: drop your eyes for a moment from the splendours of the SVGA display and look downwards — what do you see? Yes, it's our old friend the keyboard, and as Lady Caroline Lamb said of Lord Byron, it's "Mad, bad and dangerous to know".

Mad? Well, let's consider the origins of the layout. In a saga of backwards-compatibility that spans more than 120 years, the QWERTY layout was invented by Charles Latham Sholes in 1872. The 52nd inventor to attempt the task of constructing a typewriter, Sholes produced the first really workable prototype. The only problem in the beta version was that the mechanical arrangement of keys, levers and typebars couldn't keep up with the speed of a competent operator: keys would jam together, resulting in the machine grinding to a halt. Indeed, Sholes should also be credited as the inventor of the "general protection fault". As he was unable to improve on the hardware, he decided to solve the problem from the interface end, and make the layout so bizarre and so difficult that it would slow the user down. He thus inaugurated another fine programming tradition — the ingenious kludge that doesn't actually address the real problem.

Somehow, Sholes' absurd layout, rather like the 640kb Intel/DOS limitation, became an industry standard. Even though others have tried to improve on the layout — notably August Dvorak, who took the revolutionary step of putting letters used in frequent patterns next to each other — no alternative schemes really took off, and the Sholes tradition was carried over reverently from the mechanical typewriter to the present computer keyboard.

The computer giants have done their best to preserve the madness of the original layout, while adding some special, proprietary, touches of badness. The numeric keypad was a wonderful breakthrough, but irritating as hell for the spreadsheet user; the equals sign is still back with the main array. Other keys, such as the Scroll Lock, SysRq and the thing that produces an "L" on its side are seemingly long obsolete.

More useful would be dedicated keys for left- and right-handed quotes, for instance, so we don't have to rely on Smartquote software or remember arcane Alt+ number combinations. And why is the key that deletes the last character known as the "backspace" key? And logically, shouldn't it be sited so as to mirror the forward delete key? And why have they made it so that only a contortionist can comfortably manage a Shift or Ctrl+ function key single-handed? And why is it so damnably easy to hit the caps lock key by mistake?

Dangerous to know? Ask an RSI (repetitive strain injury) sufferer, rather than a judge or company lawyer: it is estimated that there are more than 150,000 sufferers in the UK alone, so it shouldn't be too hard to find one. Or just try putting your hands on a standard keyboard: note how your hands are bent outwards. Feel that little twinge of discomfort in your wrists..? In your forearms..? In your shoulders..? Hardly reassuring, is it, that a technology which can process millions of instructions a second can't offer a more comfortable way of inputting those instructions.

Apple's split keyboard and Microsoft's Natural Keyboard do go some way to addressing the problem. I use one of the latter and find it far more comfortable than a flatty. But both of these are too little, too late. Notwithstanding advances in speech recognition, finger-powered input devices are going to be around until we can plug the brain straight into a PC.

I don't want to wait that long before having a keyboard that is logical, good and safe to know. PCW

Straight Talking

Barry Fox

If, like me, you have a cupboard full of modems which cost a few hundred pounds each a few years ago and now have no resale value at all, and in any case crawl along at a snail's pace, you will very reasonably be asking the same questions: where will it all stop? When will it be safe to buy a new modem? The answer is that it will not stop until practice catches up with the information theory formulated by Claude Shannon, of Bell Labs in the US.

But this will never happen, just as hi-fi designers can never achieve "perfect" reproduction.

Shannon's theory explains that there is a finite limit on the amount of information that can be carried by a transmission channel. This limit is governed by the channel's bandwidth, its susceptibility to unwanted background noise and the strength of the required information signal. So far, all telephone data systems have fallen a long way short of the Shannon limits.

Fifteen years ago, electronic mail modems had a signalling frequency of 300 baud. Using warble tone modulation they sent 300 pulses per second down an analogue phone line. Each on-off pulse conveyed one bit of information, so they could drive only 300 digital bits of data per second. The Shannon limit was a signalling frequency of around 2400 baud. But 2400bps modems were too expensive for consumer use, and we were very happy to get 1200bps.

Modem designers developed circuits which could recognise two different levels for each pulse, between the extremes of on and off. This enabled a 1200 baud signalling frequency to deliver 2400bps, and raised the Shannon ceiling to 4800bps.

In the mid-eighties, the telephone networks modified their line filters. These had been limiting the bandwidth to 3kHz, to reduce noise during speech. But as digital trunk lines spread, the network grew quieter and bandwidth could be opened up to 4kHz. This pushed the Shannon limit to a signalling frequency of 3500 baud. Modems can now recognise eight or even nine step changes for each pulse. So the data rate has risen to 28,800bps.

The much higher communication speeds sometimes quoted rely on text compression: matching modems send short codes to represent commonly used words, rebuilding their dictionaries as a document is transmitted. The Video on Demand systems, which British Telecom is testing, use multi-carrier modulation techniques to carry megabit streams. But they only work over runs of a few kilometres between home (or office) and the local exchange.

The exchange gets its megabit feed from a server by fibre optic link, much like the ISDN system which uses a twisted pair of ordinary copper phone wires to carry 64kb/sec streams over the last leg into the subscriber's premises.

Current thinking is that existing modem technology on POTS (plain old telephone system) can be pushed to 31,500bps or perhaps even 33,600bps. The next step is for the telephone networks to open up their filters a bit more and use a new technique which synchronises the bits as they pass through the exchange. If the data streams are always in step with each other, it is easier for the modem to detect very subtle changes in the bit pattern. Details are still under wraps but this trick should push the data rate to 50,000bps, which is right on the Shannon limit.

So, within a couple of years we should be able to communicate by domestic POTS lines at data speeds which are close to those currently available only with ISDN lines. You can bet that when this happens, BT will reduce the absurdly high installation cost and quarterly rental charge for ISDN lines. This in turn should encourage hardware firms to increase production of ISDN interface cards, and make them affordable for home use.

Like computer memory or hard disk space, these data rates will never be enough. The merger of communications and entertainment creates the need for megabit streams into the home which can deliver sound and pictures to a PC in real time. Ask anyone who has spent an hour downloading a few minutes of music from the Net; or waited while some pointless illustration lumbers down the line and onto the Web screen.

In the US, architects are specifying optic fibre in the vertical columns of new buildings. This then branches off horizontally with copper wires into the rooms. In the UK, cable TV companies are already laying coaxial feeds into subscribers' homes. These feeds are intended to carry analogue video but they can equally well carry megabit data. Once homes, as well as offices, start to consume megabit streams, the telephone network lines and call routing switches will creak, groan and crash under the load.

Metropolitan telephone exchanges in the US are already using 5 or 10Gb streams. Once they start switching video, instead of digitised speech at 64kb/sec, the number increases by a factor of 100. The Web is growing by a factor of around 100 a year. And it is dealing with calls from throughout the world, not just local traffic.

But I now feel safe to buy a 28,800bps modem. We are close enough to Claude Shannon's limits to know a 28.8 box won't be obsolete before we get it home. PCW

Nick Beard

Business Matters

When is software development not software development? When it is prototyping? When it is database configuration? This month, I have been pondering these questions as I try to explain to myself why I have broken one of my own rules by having commissioned a piece of in-house software development. Although it is small, and may be temporary, it is happening — I confess.

In general, it is better to buy off-the-shelf software and work with it; changing processes and work-practices to complement it.

Custom software and software developed in-house are generally bad ideas. The bigger the system, the worse the idea. Software development should be left to software companies (preferably those making packages) rather than bespoke systems people. Sadly, this is a lesson the NHS still has to learn, along with many other institutions labouring under the arrogant fantasy that their particular requirements are so unique, they cannot possibly work with any currently available packages.

This type of thinking generally costs a lot of tax-payers' money and to date there is precious little to show for it. Most big bespoke development projects end up late and over budget. Often, the resultant systems are simply scrapped as unusable.

The fantasy goes like this: it starts with the IT fairy story of the seventies and eighties; "the user always knows best". At the time, IT or IS departments often consisted of programmers and computer operators (VAXherds and the like) labouring away in glass-walled spaces or basements. In this tale, user departments are computerised by automating existing processes — that is, by automating the way in which staff currently work.

According to this view, when automating a filing area, you ask Mabel, the filing clerk supervisor who has been in the post for 30 years; she'll know. Rubbish. This is a good way to waste money: implementing a system which makes no improvements. At best, it wastes an opportunity for real improvement.

Good packages change the way in which people work, making business processes more effective and more efficient. Of course, you have to ask Mabel what she thinks. She and her team (assuming they are not being fired or moved) will have to work with the system, and so will need some involvement to ensure a good feeling towards the new approach such as one of "ownership".

The key lies in this new approach: people will be working differently. This is a core notion in business process re-engineering (BPR). Although the term, BPR, is already becoming a little jaded and over-used, it is still relevant. This tiredness merely reflects general misuse like: "open", "client/server" and "object-orientated" — terms which seem to have fallen into that hallowed category of the unqualified "good".

So, building a system around Mabel's particular approach to working (even one which is open, client/server, object-orientated and runs under Unix) is a good way to spend a lot of money, firmly embedding old, probably inefficient practices into the fabric of the company. Design of information systems is too important and too specialised to be left to filing clerk supervisors.

Good off-the-shelf software is flexible, well tested, and well supported. And I am talking here about applications more complex than word processors and contact managers. But there is no reason why word processors should not be flexible. Of course, there are packages out there which are not all of these and they should be identifiable by reference checking before purchase.

So, why is my company taking this step into the dangerous realms of software development? Because we have a very simple, short-term need, which can only be met by off-the-shelf software costing much more than the simple solution we need. Moreover, our requirements are not entirely clear, so we are using a design based on a requirements specification inferred by the IS Department's study of the process being automated. This will serve as a prototype to be tested and refined, after which a firm specification will be agreed. The whole process should take no longer than a month. Being written in Microsoft Access, the whole investment will be fairly small.

Maybe these are the rules: if it can be done in a clean, well-supported database, supporting "compiled" run-time versions; if the whole thing can be completed in less than two months; if it includes documentation and a firm specification developed halfway through (if it is not developed beforehand), then it might be safe to do in-house development work. But I am still not convinced. PCW

Letters

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Have your say about Europe

I enjoyed the *Cutting Edge* "Focus" about political parties online (*PCW* May). The European Parliament's Socialist Group is the first and, at present, only pan-European political group to be online with the intention of using email to bring Europe closer to the people. We are making documents available by email. We are also actively consulting the public, via email, on priorities for the 1996 Intergovernmental Conference to revise the EU treaties.

The 221-strong group's initial position on the 1996 conference is available for downloading, in English, from CompuServe's UKFORUM politics library and from the international library of the Politics Forum. It is available in French and Spanish in the Europe Forum (Go Euroforum), and in German on the Spiegel Forum.

We invite *PCW's* readers to send us their views on what they think the 1996 Intergovernmental Conference should do. All serious contributions will be referred to our 1996 monitoring committee, which includes such Euro MPs as Elisabeth Guigou (the former French European Affairs Minister who negotiated the Maastricht Treaty on France's behalf).

The Socialist Group wants the European Union to be far more open and responsive to its citizens' priorities. The decisions of 1996 will be important and the people must have their say.

Tony Robinson
Spokesman, European Parliament Socialist Group

Stunned by Acorn

I read with interest Ian Burley's review of the new RISC PC 486 card in the June issue of *PCW* and I confess to being a bit gobsmacked at the revelation that PC enthusiasts love Acorn computers. Or did he mean that they love to deride them and call them school toys? Thanks to your magazine, one of only two PC magazines to report on Acorn and ARM developments and products, maybe your readers are more enlightened and do not think of them as toys.

Ken Dulieu
Skegness

Now dis-Organized

I read, with great anticipation, Geof Wheelwright's review of Lotus Organizer 2.0. And there, in the same post as my May issue of *PCW*, was my upgrade of Organizer from version 1.0 to the long-awaited version 2.0, so I read the review while loading the upgrade onto my system.

At first glance the upgrade looked great, and I was particularly pleased with the enhancements to the address book section. It looked like Geof's review was right on the mark. I then spent several hours updating my calendar for the year, along with the year planner and anniversary section.

All finished, it was then time to print out the year in the same old format I had always used: a week's view to two pages. That is, Monday to Wednesday down the left-hand page, and Thursday to Sunday down the righthand page. But there is no option to print this. I have always assumed it to be the most useful view one could have — especially for a Filofax user. In fact, the only options approximating to this were: a week to a page (too cramped and unreadable); or a day to a page (too many pages for a whole year).

And then came the final blow. Lotus has trumpeted the enhanced ability of version 2.0 to show through all the details of other sections into the diary (something you could already do in version 1.0). But what Lotus didn't tell us is that you can't print them. So all my work in setting up my planner for the year, and all the special dates I entered in the anniversary section, was wasted. It will no longer print out in my diary — something it did quite usefully in the previous version. In fact, Lotus has completely eliminated the "WYSIWYG" facility of Organizer, previously so useful in version 1.0.

When approached, Lotus UK was supportive; yes, the company was aware of these problems but had no idea how the Lotus masters in the US were going to fix it. My complaint would be passed on.

I don't feel I'm asking a lot. Most of the enhancements are fine, although mostly bells and whistles, especially for stand-alone users like myself. But Organizer has always been touted, rightly or wrongly, as being Filofax friendly. There are still many of us out there who carry those bits of leather around and who depend on Organizer to get them through the week. Sometimes an upgrade can be an improvement-or-three too many.

Larry Trachtenberg
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Horses for courses

On one side of the room there is a computer; small and old by today's standards with a CD and a 14in screen. On the other, there is a hi-fi system with a CD player and speakers. Next to that is a very large television. Using this ancient gear I can play — dare I say it? — films. The reproduction is superb, and the technology is well proven and reasonably priced.

In most computer magazines, I see details of companies urging us all to buy a brand new CD player that will play films on a tiny PC screen, which is not very good quality anyway. And they want me to listen to music through speakers on either side of that screen. Why should I use my computer for these things when there is an infinitely better arrangement, elsewhere in the room, which leaves my computer free for that purpose for which it was designed: letters, spreadsheets and the odd game. Who's kidding who?

Frances Dare
Eastbourne

Free Corel maintenance

I read June's letter from HG Harris ("Nice package, shame about the service") with interest. In an ideal world, software bugs would not exist. But as in reality they do exist, Corel takes a reasonable approach and provides free maintenance releases to registered users on request.

Often, the problem lies in finding out about these maintenance releases, and it is in this area that a user group such as the CVU comes into its own by informing its members of the availability of maintenance releases. Mr Harris has been unfortunate with the problems he has encountered with CorelDraw 5.0 but I note that he is using version E2. For two or three months the CVU, which provides support for CorelDraw, Ventura and PhotoPaint, has been publicising the availability of the F2 maintenance release for CorelDraw to all its members.

We have done this through TAGline, our 32-page colour newsletter sent to all members ten times a year, through our regular meetings (six per year in London) and various local group meetings, as well as through our members' helpline.

The maintenance release, which is free to registered users of CorelDraw, can be obtained by calling Corel customer service, free, on 0800 581028.

If Mr Harris or any other user of Draw, Ventura or PhotoPaint would like further information on the CVU they should contact Anne Gray, CVU, 49 Olney Road, Emberton, Olney, MK46 5BU (telephone 01234 241234).

Ed Brown
TAGline, CVU newsletter
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An imperfect solution

In view of all the pre-launch hype about Novell's PerfectOffice 3.0, I thought you might be interested in hearing from a former WP/Novell fan who is now more than a little disgruntled. The so-called Professional version is composed of the same applications as the standard version but includes Paradox 5.0 and AppWare.

My first grumble is that although most of the suite, including Paradox, has been supplied on disk (35 altogether) as advertised, AppWare has been supplied on CD, which was not mentioned in any of the advertisements. Since none of my computers has a CD-ROM drive, I cannot use the software. The installation section of the AppWare User's Guide speaks of seven disks, and gives no mention of a CD.

My second grumble is that although this is supposed to be an integrated suite, neither the standard nor custom installation setup procedure includes or even mentions Paradox of AppWare, so that neither of them appears on the Desktop Application Director. It's almost as if Novell has used the same documentation and just chucked in seven separate Paradox disks and a CD without any thought of telling customers how to install them so that they are fully integrated with the rest of the suite. None of the Readme files cast any light on this. After two lengthy phone calls (10 minutes each in the queue) to Customer Support I have got no further because it's obvious that Novell's UK staff have not been fully briefed.

Considering this amateurish performance, the product should be called Imperfect Office UnProfessional and be described as a Disintegrated Suite.

Terry Hart, Lincoln

David Bennie, Brand Marketing Manager PerfectOffice, replies: *We are most concerned to hear of the problems you have experienced. Firstly, regarding the AppWare CD in the Professional version. Appware is a high-end development tool. Research has shown that the typical AppWare customer does have a CD drive. This is indicated on the front of the PerfectOffice Professional Package, "all applications are provided on 3.5" diskettes except AppWare which is provided on CD-ROM. See the Up and Running Guide inside for information on Optional Media." We do however have AppWare on 3.5in disks and will be happy to supply them.*

With regard to the integration of the product, our integration among applications in PerfectOffice is well documented and has been the result of numerous industry awards. The installation procedure to include Paradox and AppWare were not added due to the limited time and resources before shipment. However, our area of emphasis in integration has been on the interoperability of the applications.

Paradox and AppWare can be easily added to the Desktop Application Director (DAD) including any other applications currently on users' hard drives. This is outlined in the Up and Running Guide.

Our customer support department is constantly trying to keep fully trained on our fast-moving new technology, and we apologise if you spoke to someone who you feel was not fully briefed.

Manual matters

I am rather concerned about the way integrated packages are being marketed. I have recently taken delivery of Novell PerfectOffice Professional and Microsoft Office Professional. I need to keep up to date with these products to support my clients' applications.

When I explored the Novell box I discovered to my dismay that Paradox was supported by only one manual, the User's Guide, even though the real benefit of Paradox is the facilities provided by its integrated programming language, ObjectPal. The only reference to ObjectPal in the User's Guide refers you to the ObjectPal documentation. In fact, the User's Guide says the documentation included with the package includes a "Guide to ObjectPal" and the "ObjectPal Quick Reference".

There was no such documentation included. I contacted Novell and explained that their advertisements gave no indication that the documentation was incomplete and it was reasonable for me to expect full documentation. It was, after all, the "professional" package and the version of Paradox 4.5 I had previously bought came complete with all the manuals. Novell was not overly concerned, saying that this was how the package was supplied by Borland, the problem was between Borland and myself, and I should call them myself (they gave me the Borland number). Borland were not impressed with my argument, and offered to sell me the documentation.

I encountered the same problem with Microsoft Office Professional. The macro writer for Word has no documentation either, although the manual refers you to the Microsoft Word developer's kit should you want to do any more than record a macro.

I find this policy objectionable. If you buy a full professional package it should include complete relevant documentation. If a package doesn't, the adverts should say so and give the buyer an opportunity to work out the complete cost of acquiring the software in a usable form.

Peter Beard
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Maths group test doesn't add up

Work it out in your head

As an inveterate and long term user of mathematical software packages, I was drawn to Eric Adler's group review in the June issue of *PCW*. At last, a comparative review of the dazzling systems that will play a significant part in the mathematical education of present and future generations of science and engineering students.

I didn't expect to agree with the Editor's Choice, nor did I. I am in the fortunate position of having access to all these packages, so I simply choose whichever is the most appropriate to the job at hand. There really is no best overall bug-free package: even the modest Derive system can do things that Maple cannot. However, what really disappointed me, as a teacher and researcher, was the lack of any sense of the profound revolution that these systems have brought about in mathematics. The reviewer's approach was rather too matter-of-fact and constrained for my taste.

Aside from the exciting work being done in mathematical research and applications, there are challenging implications for the teaching of mathematics. Surely it is significant that an engineer no longer has to invert a matrix, solve a linear differential equation, or invert a simple Laplace transform. Instead, he only needs to know how to pose these problems in his favourite maths package and an answer pops out as if by magic — that is, until he comes up with a problem it cannot solve. It is surely a concern that many GCSE, A-level and university mathematics examination questions can be easily solved using the comparatively small Derive.

When these systems are employed in black-box mode, there's an analogy with the use of electronic calculators for simple numerical calculations, and the decline in our ability to perform mental arithmetic. I am sure that many other readers will be concerned about the implications of the use of such powerful packages in education and the applications of mathematics. I would welcome any correspondence on such matters.

Dr Nigel Backhouse
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The wrong answer

As makers of Mathematica, featured in June's maths software group test, we were frustrated by the review's inaccuracy and wish to correct a few of its unfounded statements.

In the introduction, Eric Adler puts Mathematica "under the heading of numeric computation and visualisation for pure mathematics". At best this is five percent accurate, this being the fraction of users who are pure mathematicians; most are in engineering, finance and computer science. Moreover, surveys show as great a use for symbolic calculations and programming as for numerics and visualisation.

Adler deems Mathematica less suitable than other products for education despite its greater use in this area. Educational resources include 53 books, a journal and several UK government-funded courseware projects.

On a technical note, Eric Adler asserts that command line input is primitive, failing to realise that fixed menus are not convenient for operating large numbers of functions or sizeable programs. This perhaps explains why all products in his review with over 500 functions or programming use command line input. We entirely refute the other attacks on Mathematica's ease of use and will explain the reasons to anyone who enquires: space here does not permit.

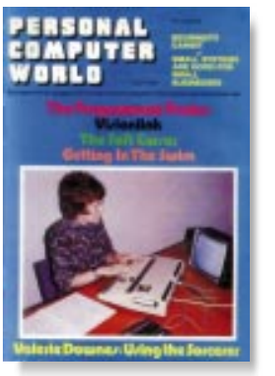
But the omissions dwarf even these misunderstandings. Applications to real life problems, vastly differing programming facilities, reliability of symbolic results and quality of support are not examined but are crucial to users of maths software. In these areas Mathematica excels. Finally, the price is £795 and not £995 as Eric Adler reported.

Conrad Wolfram
Wolfram Research Europe, Long Hanborough, Oxfordshire

Eric Adler replies: *Compared to every other similar package, Mathematica is difficult to use, and difficult to learn to use. One can forgive Derive having a cheap interface, it is not an expensive program. Mathematica, at £795, is not a cheap program. In order to run the PCW tests I found I needed technical assistance from Wolfram on several points which took the Wolfram helpline over half an hour to sort out; the equivalent question from Maple took less than two minutes, Mathcad and Macsyma required no helpline on the questions, the answers being quite obvious from the program. This is not because Mathematica helpline personnel are untrained, but because the language of Mathematica is difficult.*

Again, the problems arose running the factorisation tests: neither the handbook nor the help files pointed to the "correct routine", and it took the helpline over forty minutes to find it.

Hindsight



July 1979

I was looking for a low-cost microcomputer that wasn't just a toy and which would give sufficient facilities for expansion to a full diskette system via an S100 bus (when finances allow). Already having a TV and cassette recorder in the house, I did not see why I should pay for duplicating these items. The Sorcerer seemed to fill my requirements, offering a Z80 processor with 32kb user RAM, all for £859 plus VAT.

Update

The Conservative government had only been in power for a month and VAT remained a modest eight percent. Even so, the same amount would now buy you a fully-featured PC with all the things the Sorcerer didn't have, like a monitor, hard disk and floppy drive.

July 1984

At last, from desktop to lap and no compromises. In recent months, Hewlett Packard has accelerated its move into the personal computer market. It now presents the HP110, a particularly well-endowed micro which features the biggest screen yet available on a portable micro and which is fully compatible with its predecessor.

Update

At the time, no compromises meant an Intel 8086 processor running at 5.33MHz, 272kb RAM and a blurry 80 column by 16 line display. Although Hewlett Packard was soon to dominate the personal computer laser printer market, it's only recently that it has begun to make much impact on the PC and notebook market.

First Impressions

Products Reviewed

Welcome to our new-look First Impressions, including the absolutely fabulous "Gadgets" spread on page 438. Full review highlights include Dell's first Pentium 120, the world's fastest production CD-ROM drive, and the latest version of Adobe Acrobat.

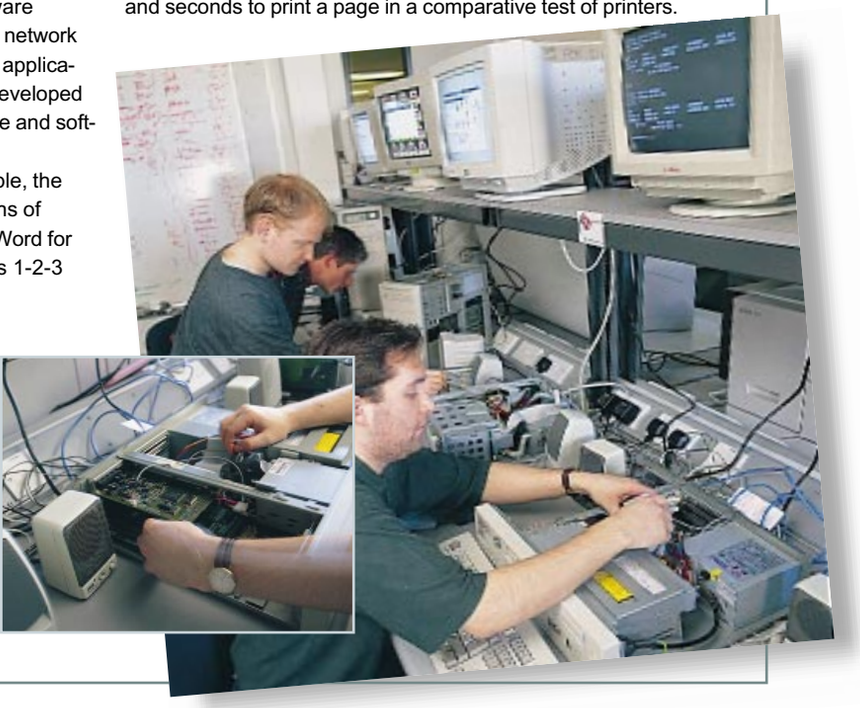
VNU European Labs

VNU Labs tests cover every kind of hardware and software including PC hardware, printers, network products, modems and software applications. The tests are continually developed and enhanced to reflect hardware and software developments.

Our tests closely simulate real-world use. For example, the suite of PC hardware benchtests uses complete versions of industry-standard applications like Microsoft Excel and Word for Windows, WordPerfect 6.0 (DOS and Windows), Lotus 1-2-3 version 3.4 (DOS) and FoxPro (Windows and DOS).

Application tests are the backbone of all the VNU Labs system evaluations but it's nearly impossible to pin an application result to a specific machine component. Only system-level tests (also known as low-level tests) can reliably tell the difference. VNU Labs' system-level test suite is called Euromark. The tests, which are mainly Windows-based, quickly size up a hard disk, sound card, motherboard, display adaptor and printer, and give individual and overall figures.

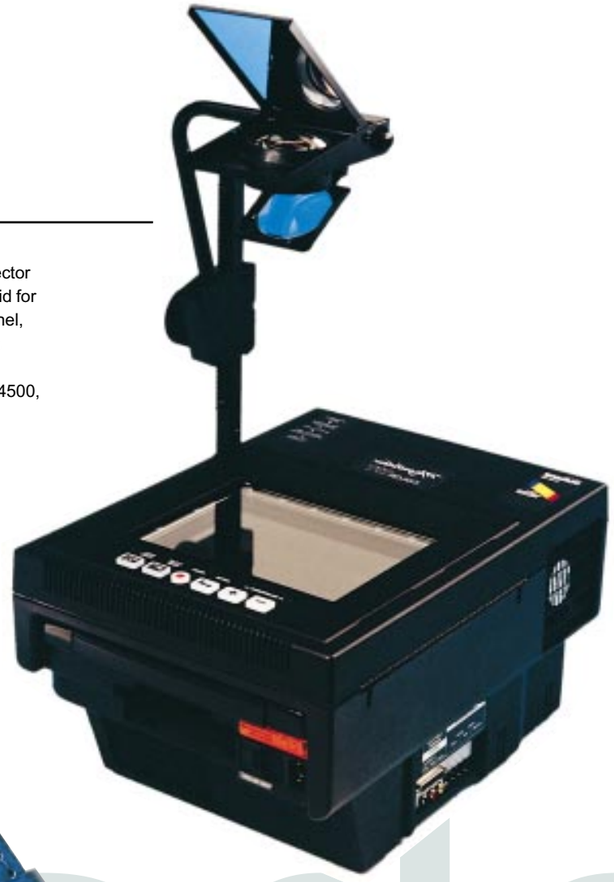
● To make them easy to read at a glance, all the graphs in *PCW* are now drawn so that the bigger the bar, the better the result. Normally we'll also include the original data we worked from: for example, the time in minutes and seconds to print a page in a comparative test of printers.



Gadgets

Dukane's MagniView 864

Dukane's MagniView 864 multimedia projector does for overhead projectors what Dualit did for the toaster. It sports a built-in TFT LCD panel, high-intensity metal halide lamp, and folds neatly away into a 30lb portable package. £4,995 from GB International on 01908 504500, fax 01442 874 006.



Swatch Beep

The Swatch Beep claims to be the world's smallest beeper. You can carry it with you everywhere, and once you've paid for it you'll never have to spend a penny more on rental. It's just a shame that it's about 50% larger than an ordinary watch and it's largely made of plastic, which makes it look rather tacky. Unlike a regular beeper, it only has one, rather fiddly control — the crown on the side. £119.95 inc VAT from Swatch on 01703 237779, fax 01703 224455.

PCW Photography by Bruce *Mackie*

Logitech MouseMan Sensa

Phwoar! Guaranteed to perk up your pointer, Logitech's MouseMan Sensa range shows just how sexy a PC mouse can be. Its ergonomic textured body fits neatly into most hands, and a smooth ball rolling mechanism is great for fast or slow wrist action. A MouseMan that is truly a man's mouse and costs £42 from Logitech on 01344 894300, fax 01344 894303.

Alps Glidepoint

Alps' Glidepoint isn't a new idea. The Psion MC200 pioneered the idea back in 1990, but this latest iteration will plug into a desktop PC. It's not pressure sensitive, takes a bit of ge ting used to, and costs £62 inc VAT from Alps Electric on 00353 29 70677, fax 00353 29 70603.

AlfaCrystal Trackball

No space on your desk for an unwieldy mouse? Want something a little different? How about the AlfaCrystal trackball from AlfaData. Its crystal globe glows with the hue of mahogany or emerald when either button is pressed. Guaranteed to impress fellow pointing devices and brighten up any confined space. Yours for £39.95 from Golden Image on 0181 900 9291, fax 0181 900 9281.

HARDWARE

Dell Dimension XPS P120c

An amazingly fast 120MHz Pentium computer with a high internal specification. Nick Lawrence delves into its innards to reveal its advanced features.

The Dimension XPS P120c is only the third 120MHz Pentium we've come across (see the Viglen/Gateway shoot-out, in *PCW*'s May issue, for information on the other two). This is still a cutting-edge technology and in fact our review model was a prototype. Although the 120MHz is Intel's fastest x86-compatible chip yet, NexGen, manufacturer of the P90-compatible Nx586, is rumoured to soon be launching an equivalent to the Pentium 120.

The standard-sized tower case is easy to release with a thumbscrew at the back, and inside there is a standard array of peripherals. The motherboard takes up the bottom half of the case, with four ISA and four PCI slots (one shared). One of the former is taken up with a Sound-Blaster 16 card, and one of the latter with a Number 9 Imagine 128 with 4Mb of VRAM. The maximum resolution with this specification is 1600 x 1280 in 256 colours non-interlaced, or it can achieve 1024 x 768 in 16m colours (24-bit) at 100Hz. It is also expandable to 8Mb for real power users who want true colour at 1600 x 1280.

The motherboard itself is a new design, being an Intel Triton chipset on an Aladdin board. The chipset consists of four chips to control the system memory, the data path bus, and the I/O bus. It has been designed specifically with the Pentium in mind, and has advanced features which will eventually become the norm.

The main features of the Aladdin board are: support for EDO memory (of which 16Mb is supplied); and for pipeline burst SRAM on the motherboard-level cache (of which there was 256kb on the test model, but shipping versions will have 512kb). The former is a slight modification to standard fast page mode RAM, but with an average reduction of wait states from three to two. Pipeline burst cache is much like an ordinary (asynchronous) cache, except that instead of a 3-2-2-2 pattern of reads (where the first takes three clock cycles and the following reads take two) it typically has a 3-1-1-1 pattern. It is able to do this through being clocked and therefore operating synchronously with the processor. Mode 4 PIO timings are another feature of the Triton chipset, allowing, in theory at least, up to 16Mb/sec transfer from the integrated bus-mastering EIDE controller. PCI bridge support is the other high-spec component in the chipset, providing more efficient data transfer between the 32-bit PCI bus and the 16-bit ISA bus.

The PSU is situated at the top left of the case and there are two spaces for hard drives by its side, one of which is filled with a 1Gb Western Digital Caviar 3100 hard drive. This is connected to the onboard EIDE interface on the PCI bus. At the top right are the bays for drives that need access to the front of the case: there are three 5.25in bays and one 3.5in. The top bay is unusually filled with a combination 5.25in and 3.5in floppy drive, and the one directly below has the quad-speed IDE CD-ROM drive; an NEC 271. It's a shame that such a high specification machine has been fitted with a cheap IDE CD-ROM drive together with its associated problems (see page 438 of *PCW* April issue for details), but at least the EIDE bus, provided, can support two channels to get around this.

The Dell 21F monitor supplied was a back-breaking 21in monster: a flat screen and good contrast were its strong points; its lack of controls were the weaker ones (only horizontal and vertical size and positioning, with degauss). But those who are serious enough to consider image quality and are prepared to shell out the money for a 21in monitor, will probably want to choose the brand.

Unfortunately, this machine did not complete the NSTL tests, collapsing under WordPerfect for Windows. Because it is a pre-release system with a new motherboard chipset (and thus a new BIOS), this is understandable although rather a shame. Certainly from a subjective viewpoint, just playing around with the system, it seemed an amazingly fast computer. Under File Manager I searched for *.* across all directories from the root down (of which there were quite a few) and the results came back within two or three seconds; the fastest I've experienced. Although this particular operation covers only hard disk performance, this reflected the machine's very high internal specification.

The price of the unit, as supplied, is £3,359. With a 15in monitor instead of the 21in supplied, the cost would be £2444 which is not at all a bad price for a system of this quality that includes a quad-speed CD-ROM drive, a 1Gb hard disk and an Imagine 128 PCI graphics card. No doubt this system will appeal more to the corporate user, who should probably also consider Compaq's excellent revamped range of DeskPro XLs for ease of network usage. But as a standalone system, this looks like a very good deal.

PCW *Verdict*

Another fine product from the Dell range. Just make sure there is 100 percent compatibility in the release version.

Price £3,359 (£2,444 with a 15in monitor)
Contact Dell Computer Corporation 01344 860456. Fax 01344 860187

SOFTWARE

Adobe Acrobat 2.0

David Brake judges the performance of this latest version of Acrobat, highlighting the new bits of its act.

Acrobat is one of the few packages which created a new product category when it was launched. Adobe had started with PostScript, the leading platform-independent way to print, and in retrospect it was only a matter of time before it produced the first mainstream product designed to enable information distribution in purely digital form.

At the time of Acrobat's launch, the biggest drawback to its acceptance was the fact that no component of it was available free of charge. As a result, everyone likely to use an Acrobat document had to buy a copy of the reader software — sharing Acrobat documents with people outside a company would be next to impossible. Fortunately, Adobe quickly spotted the error of its ways and allowed a limited version of its reader to be made public. This allows reading, copying and printing of documents but little else.

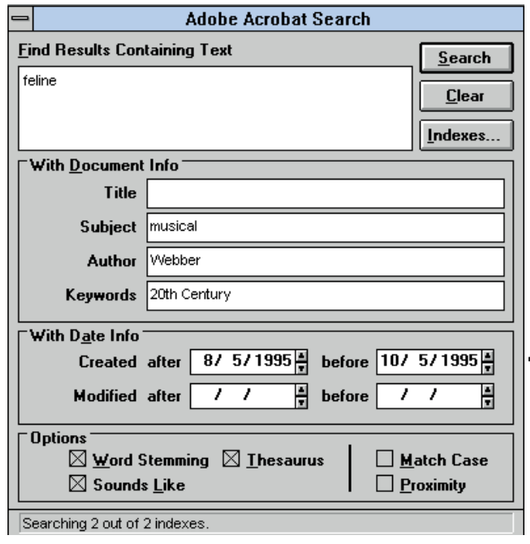
Acrobat normally works by saving layout information, compressing any pictures in a document using standard algorithms, and substituting special "multiple master" fonts for those in the document. These special fonts are designed to match as closely as possible the size and shape of the originals for which they are substitutes. The resulting file can be sent anywhere as a 7-bit ASCII file and can be read on Mac, Windows, even DOS and some Unix machines. Because of the size and sophistication of Acrobat's software, users cannot create self-viewing documents, with the viewer embedded in the file.

Portable Document Format (PDF) documents can be created in two ways. The "professional" way is to use a PostScript printer driver and save the results to a file, then use Adobe Distiller to process it. Distiller is part of Acrobat Pro, which costs £485 and is designed to work unattended. Just drop a PostScript file into the "in" box and Distiller will analyse it and create a PDF file in the "out" box. For individual users, the "quick and dirty" way is to use the PDF Writer, a printer driver in Windows or the Mac. This is more straightforward: print using the driver, specify a filename and it creates a PDF file. This provides a more limited number of options and may result in larger files than the Distiller produces. Users with a large number of existing non-PostScript document files will find the job of batch translation has not been improved in version 2. The printer driver insists on being given a filename by the user, so it is not possible to set your word processor or DTP program going overnight to print multiple documents to PDF format. You can't edit the file that results, either, but you can copy formatted text or pictures from it into other documents and now in version 2 you can use OLE 2 to embed the whole file. In version 1, you were able to add "sticky notes" to the file: the handling of these has been improved in version 2 and you can consolidate all the notes about a document, automatically, into a separate Acrobat document. Notes can be labelled and coloured to make it more obvious who is making contributions (users of the free Reader can't make annotations).

The first version of Acrobat allowed you to password protect a document, but the new version offers more flexibility — you can prevent people from printing, copying or adding and editing notes (unfortunately, you cannot set several different passwords for different levels of access).

One of the most interesting new features in Acrobat 2.0 is the ability to create hyperlinks within documents. You can draw a rectangular box around any feature on a page and when people click in that box, it will either go to another area of the document or open a different one altogether. It can even be used with a new plug-in (in beta testing at the time *PCW* went to press) to link to an Acrobat file on the Internet via the World Wide Web. But the feature has a few limitations: links cannot be labelled, so unless your original document has text in it called "link to marketing document here" or something similar, they can be difficult to set up. Links to external documents are not dynamic, so if the linked file moves, the link will break.

The initial version of Acrobat contained a simple "find" function to locate text within a file, but clearly this needed enhancement if users were going to use Acrobat as the main storage mechanism for documents. Acrobat Search in version 2.0 is a feature licensed from Verity, a company specialising in text search engines. It is an indexing tool which allows some users to search indexes which span several PDF files using a variety of criteria, and is one of the most powerful such tools we have seen, although it doesn't always work as expected. It can handle "stemming" (search for "run" and it can find "running" as well); there is a thesaurus (search



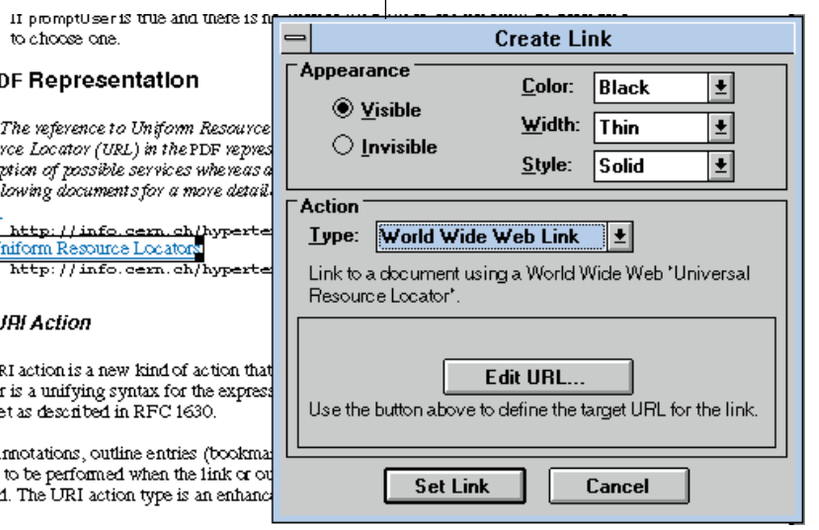
The Verity search engine in Acrobat 2.0 offers a variety of powerful ways to find the document you seek

for “destroy” and it can find “remove” as well); and it has a rather erratic “sounds like” feature (“create” sounds like “card” according to this). Rather than letting it suggest substitutions manually, it is better to use Word Assistant to display suggestions for keywords. Searches will display a list of matching documents in rough order of relevance and you can add additional keywords to narrow down the searches even further.

To create an index, you need to buy Acrobat for Workgroups, which costs £1,300 and comes with Acrobat Distiller and 250 licences for Exchange (the full reader and writer software). Users of the free Reader won’t be able to use an index: anyone wishing to distribute a lot of Acrobat-format data and planning to provide an index will need to buy a license to distribute “Exchange LE” (a Reader which can also handle searches).

The “Acrobatting” of corporate information will not be complete until tons of paper documents are turned into PDFs. Fortunately, that day is approaching: Adobe Capture, which we intend to review next month, is supposed to allow users to scan in paper documents and automatically turn them into PDFs.

The hypertext link feature will allow you to link your Acrobat document with others across the Internet



PCW Verdict

The new version of Acrobat Exchange adds vital features for group working and document management, but still needs improvement before it will replace paper altogether.

Price Acrobat Exchange £160, Acrobat Pro £485 (includes Distiller), Acrobat for Workgroups £1,300 (includes Catalogue, Distiller and a 250-user Exchange license)
Contact Adobe UK 0181 606 4000. Fax 0181 606 4004

HARDWARE

Plextor PX-63CS Six-Speed CD-ROM drive

In the race for CD-ROM performance, Plextor is the latest contender to be in pole position on the grid. Gordon Laing takes this fast CD-ROM drive for a spin.

Last April, *PCW* published a group test of CD-ROM drives. We wanted to cover doubles, triples and quad speeds but discovered that the vast majority of manufacturers had abandoned the slower drives in favour of quad. So did this mean that all CD-ROM drives would be expensive? No way. With the acceptance of IDE as the bus to use at the budget end, the cost of such quad speeds has plummeted to around £150.

So what is the new high end of the market for CD-ROM? As quad speed becomes the budget standard, we now have to rely entirely on Plextor to push forward CD performance by releasing what many manufacturers have left on the lab bench: not yet eight-speed, but nevertheless a highly respectable six-speed drive. We looked at the internal model, costing £420. An identical drive, in the external version, is available for £571. Both drives are SCSI-2 devices but supplied without a SCSI card.

Anybody who thinks that one CD-ROM drive is the same as any other is unaware of several factors, one of which is clearly performance; two figures are typically measured and quoted. The first figure is average access time, measured in milliseconds, which represents how fast the drive’s head can access a requested piece of information. The second

figure is sustained data transfer rate, measured in kilobytes per second, and represents the typical throughput of information. They're the same measurements as applied to hard disks, but usually significantly slower.

Compact discs started out as carriers of digital audio. When CD-ROM was first introduced, the data transfer rate was the same as for CD digital audio. Surprising as it may seem, this rate was (and still is for audio) a paltry 150kb/sec; also known as single speed. With improved disc handling, error correction and general raising of quality control, it became possible to spin the disc at twice the speed, resulting in a transfer rate of 300kb/sec; known as double speed.

Guess what? Quad speed spins at four times normal; a rate of around 600kb/sec. Sounds almost good until you put it into perspective: your basic IDE hard drive will achieve between 1Mb/sec and 1.5Mb/sec; and remember how infuriatingly slow your floppy drive is? Well, that's doing around 150kb/sec. In theory, Plextor's Six-Speed should turn in a rate of around 900kb/sec — fast approaching the transfer rates of low end hard disks.

And the good news? Our lab results measured the Plextor's sequential transfer at just under a mighty megabyte per second (910kb/sec). Random access results were very strong too. One aspect that few labs test is the hit on the processor — the amount of strain a peripheral, such as a CD-ROM drive, puts on your precious chip. Our labs tested a number of CD-ROM drives, connected through SCSI, IDE and sound card interfaces. We found that the latter variety, in particular, mercilessly hammered the processor. If such news can be described as good, the Plextor Six-Speed was no worse than any of the quad IDEs and SCSIs we tested — and initially, this was on an Adaptec 1510 ISA budget SCSI controller. Switching to a bus mastering Adaptec 2940 PCI SCSI card significantly improved the results.

Physically, one internal CD-ROM drive looks pretty much like any other and this Plextor isn't much different: like most pioneering high performance CD-ROM drives, it's a caddy loading device. There are two audio transport control buttons at the front, the usual Walkman-sized headphone jack, and a rotary volume dial. Of course, you'll need a spare 5.25in drive bay to slot it into.

Plextor's manuals are always amusing, although I'm certain this can't be deliberate. Each section is headed by a box containing three statements: your task; your objective; and your method, below which is a wad of helpful text. It's always better to have more help than no help at all but the first page, describing transportation, is perhaps a little too much. Your task: save your box. Your objective: have a secure container in which to ship your drive back to Plextor if necessary. Your method: find an empty space in your home or office — fill it with the Plextor box. Hmmm...

When you consider the price of SCSI quad speed only a year ago, the Plextor Six-Speed represents remarkable value for money and is indeed a totally unique product. I quizzed Pioneer (a company which, as its name suggests, is at the cutting edge of technology) but a representative said the market isn't ready and doesn't yet need faster than quad speed. But then, this was the company that released quad speed about two years before anyone else even thought about it. So the next units down the line in this part of the market are the (slightly above average) 4.4 times speed SCSI drives, available right now from Toshiba and Pioneer. The former scored highest in the *PCW* April group test and the latter is reviewed in next month's *First Impressions*. Both sustain 670kb/sec, and Pioneer quotes a price of only £220.

But you make the choice: Plextor's Six-Speed is currently the fastest CD-ROM drive available, and in use it simply flew: opening big Photo CD files — no problem; zipping through databases and encyclopedias, circle elements, CD versions of games — all brilliant. And it is, of course, White Book and multi-session compatible. But if you can't afford the very reasonable price, you'll still get fabulous performance out of the recent 4.4 x SCSI drives from Pioneer and Toshiba.

PCW *Verdict*

It's official. The fastest CD-ROM drive we have ever tested, boasting a transfer rate of just under 1Mb/sec; not far off the performance of an average hard disk. If you feel the need for speed, this must be your only choice.

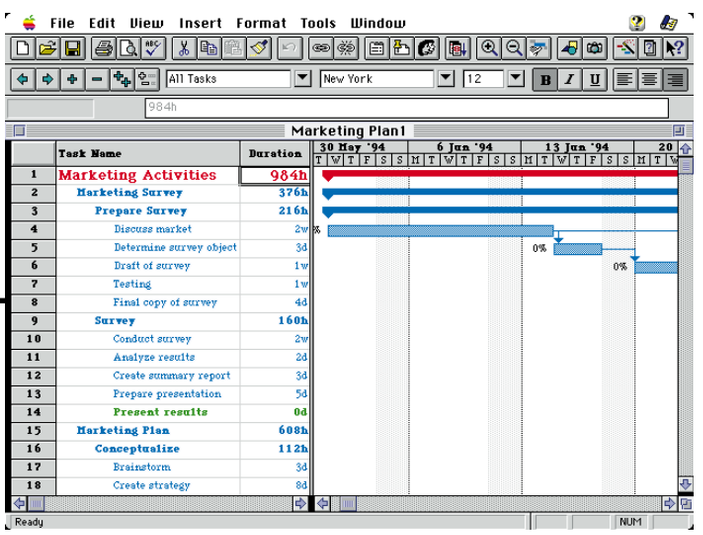
Price £420 internal, £571 external
Contact Tekdata 01782 577677.
Fax 01782 823881

SOFTWARE

Microsoft Project 4.0 for Macintosh

The latest version of this software aims to bring the art of project management within reach of the non-specialist. Cliff Joseph tries it out.

Project management programs have never enjoyed the mass-market acceptance of word processors and spreadsheets, largely because the jargon is only understood by people who have had special training in that field. But



Project 4.0's main view is a Gantt chart that combines a task list and a graphical time-line for the entire project

Microsoft is attempting to change all that with version 4.0 of Project. The focus of this upgrade (which although still in beta version is nevertheless stable and fast) is on usability to make the program accessible to anyone who needs to plan projects and meet deadlines.

The first step in the development was to modify the program's interface: Project 4.0 uses the same toolbars as other MS Office products, so anyone who has used Word, Excel or PowerPoint will recognise many of the features provided by Project. Other Office features, such as support for OLE 2.0, have been added as well so you can drag and drop information from Word or Excel straight into Project, and even embed objects such as QuickTime movies into the program.

The main view that is presented when you launch the program is of a Gantt chart — a split screen display that contains a list of tasks down one side of the screen, and a graphical time-line (that looks like an office year planner) on the other.

The task list is a cross between an outliner and a spreadsheet: you enter information, such as the name of the task itself and its start and end dates, into cells similar to those on a spreadsheet. The tasks can be grouped into headings and sub-headings, and then collapsed or expanded to show different levels of detail as required.

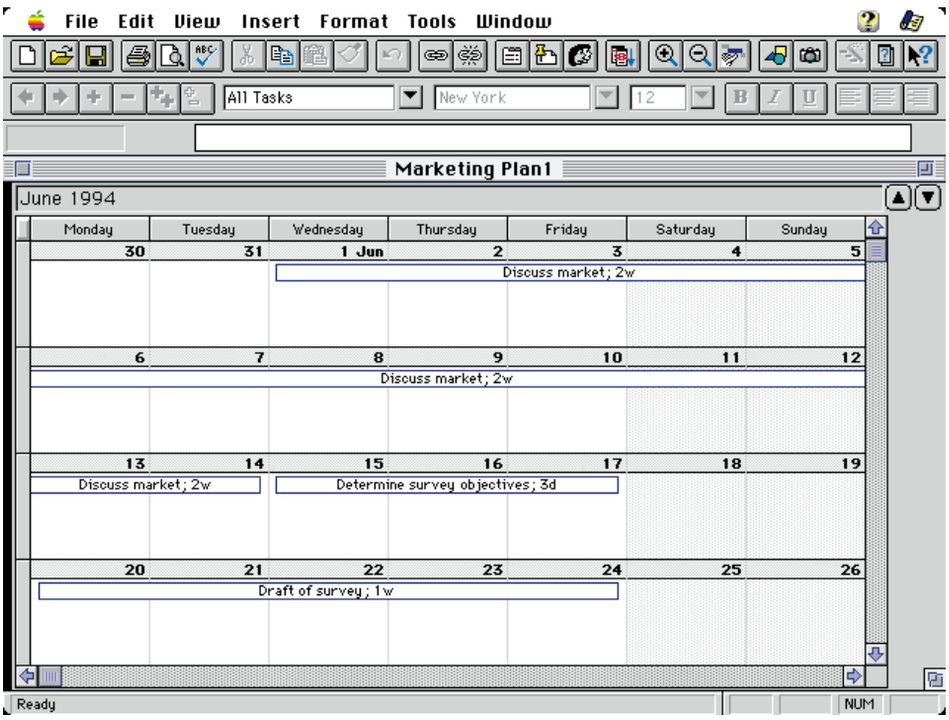
As you fill out the task list, each task is automatically added to the graphical view on the other side of the screen. Tasks are placed in their correct time slots and shown with any relevant links to others. If you're uncertain how to proceed at any time, you can now call up Cue Cards, which provide an interactive tutorial, to guide you through the various stages of planning a project. You're given a lot of flexibility to modify a project as you can alter details either by using the keyboard to edit the task list, or by dragging the tasks around the chart using the mouse.

Like Excel, Project includes a wizard that can be used to guide you through the process of creating different types of charts. If you're not used to Gantt charts you can switch to either a standard calendar view or an alternative type of chart, called a Pert chart, that presents your project as a flow chart rather than a time-line. You'll need some project management experience to make sense of the Pert chart, but the calendar view is much simpler to understand. Even so, the latter can get pretty cluttered if you've got a lot of tasks to cram into a relatively short time scale.

The key to mastering Project is the toolbar, as it allows you to call up additional sets of tools that can be used to manage different aspects of a project. These can be used to track the progress of your work, marking the percentage of tasks completed, or to assign resources (such as members of staff) to specific tasks. Additional options, such as cost listings and report printing, are also available at the click of a button.

Microsoft's IntelliSense technology has been used to provide the program with a degree of intelligence. If two or more tasks are linked so that one must be completed before the others can begin, the Planning Wizard will automatically warn you whenever you make any changes to one task that might affect the others. If you still want to make those changes, the Wizard will adjust the schedule accordingly, altering dates and moving tasks around as required.

All these features do achieve the desired result, which is to make Project 4.0 simple to use, but they don't alter the fact that a dedicated project management program such as this will be too much for many people. Large projects that involve many tasks, varied resources and cost-



The same project (see previous page) can also be viewed in other ways, such as the new Calendar view added to this version

ings, will certainly benefit from Project's versatility. However, there are lots of people whose daily workload consists of many small, often unrelated tasks rather than a single large project. These people would probably get all the help they need from the To Do list of a decent personal information manager — and at half the price. Personally I'm a great fan of Symantec's outliner, More III, and I can't see Project usurping More when it comes to helping me manage my work.

That's not to say that Project 4.0 is a poor project management program: on the contrary, it's very good at what it does. But despite Microsoft's attempts to widen the program's appeal, its features still seem more suited to projects involving tasks spread over several weeks, rather than the daily mish-mash of small tasks with which most of us have to cope.

PCW *Verdict*

Dedicated project management program for large projects; will be too much for the more modest everyday workload.

Price £350
Contact Microsoft 01345 002000

HARDWARE

Panther 2000

This budget priced machine performed well enough to make Nick Lawrence purr with contentment.

Panther Computers should not be confused with Carrera's range of Panther computers: the former is a company in its own right. Founded two years ago, it employs nine people and has a turnover of £1.2m per annum. MD, David Hemming, says that Panther is NexGen's guinea-pig in the UK and as such is building a unique relationship, with favoured prices and technical support.

The Panther 2000 machine reviewed here has a NexGen 586 processor; a chip that has been the subject of a great deal of controversy, for its alleged lack of full compatibility for 32-bit applications and operating systems. Early PCs using this chip were unable to utilise Photoshop 3.0, due to the latter's need for the Win32s extension, but this has been put down to troubles with the BIOS on the early machines. Equally early 486 chips — and currently Pentiums — had teething troubles and it is likely that Intel clones will also have problems and that they won't be restricted to NexGens only. Certainly, the problems I had heard about did not occur on this machine and when I ran PhotoShop extensively I only had one GPF that was almost certainly one of those "random" problems that pop up with any application every once in a while.

We have seen few NexGen PCs at *PCW* and it is worth looking into the exact nature of the chip. NexGen is a company which makes clones of Intel's x86 range of processors. The Nx586, as its rival to the Pentium is called, differs in that the 90MHz version really runs at 83MHz and has no floating point processor as the Intel chips do. It is therefore slower than a Pentium 90, particularly for applications that can use a maths co-processor, but makes for good value among the lower-end machines. Its main feature is cost: although new chip pricing for Q2 hadn't yet come into effect when the system was supplied, by the time you read this, Intel P90s will have dropped from $546 to $377, and Nx586s from $399 to "around 20% less than the current price," according to NexGen's Marketing Manger.

We reviewed the 2000 inside a minitower case — it is also available in a desktop version, with no difference in price. Four drive bays allow room for disk expansion, and with the 3.5in floppy and the Aztech 2X CD-ROM drive, there is one of each kind remaining.

An OEM version of the SoundBlaster 16 fills one of five 16-bit ISA slots, and one of the two VESA slots is occupied by a Diamond Stealth 64, 2Mb DRAM. The other is taken up with a multi-purpose I/O card, featuring Enhanced IDE connections for four IDE devices (two of which are used by the Quantum Maverick 540Mb hard drive and the CD-ROM drive), and support for two floppy disk drives. Two of the six SIMM slots are filled, to make 16Mb RAM.

The monitor is a CTX 15in FST; a common OEM model. It is of good quality, with the kind of controls you would expect on a monitor of this type. A combination of the monitor and graphics card supplied yields resolutions of up to 800 x 600 x 16m with no discernible flicker, though the latter reduces Windows resources to a quivering wreck.

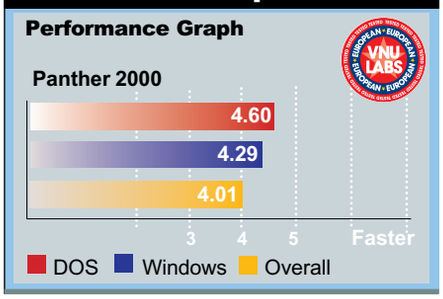
With a system this cheap, however, there are drawbacks: there is VESA local bus instead of PCI, and a lack of speakers — although headphones are supplied instead and 80-watt speakers are an optional extra for £30. The Nx586, in place of a Pentium, results in less speed but this is not too serious and in general use seemed no slower than a Pentium 90 with applications that do not use the co-processor. Only the need for a co-processor and/or a mistrust of Intel clones in general, or NexGen in particular, would encourage the average user go for a product with Intel inside.

Performance was very respectable, turning in an NSTL score of 4.01 overall, with 4.29 under Windows and 4.60 under DOS. This compares favourably with many of the machines in our recent P90 group test, but no doubt the 16Mb RAM had something to do with this (most suppliers charge around £200 for the 8Mb upgrade). Having made a quick call to a selection of the budget PC manufacturers in *PCW*, we found that the next cheapest equivalent was around £1,800. Although some did offer minor improvements over the system supplied here, the Panther 2000 is a remarkably good deal. Even better is the price of only £1,503 for a Diamond Stealth 64 with VRAM instead of DRAM, 16550 UART chips on both serial ports, and a hard disk upgrade to a Western Digital Caviar 850Mb model.

Even if this particular model is not to your taste, Panther is worth watching for

Labs Report

Performance Graph



PCW Verdict

A great deal for those who want good speed and multimedia at a rock-bottom price.

Price £1,470
Contact Panther Computers
01442 253811. Fax 01442 250657

HARDWARE

NEC monitors

A top-quality monitor does not have to be based around a Trinitron tube, as the new NEC range proves. Ben Tisdall describes his viewing pleasure.

NEC has revamped its entire monitor range into three ranges all incorporating plug and play: the budget XV range, the intermediate XE and the professional XP range. Prices start from just over £300 for the 14in MultiSync 2V to two and a half thousand for the 21in professional model. I tried out two 17in models: the MultiSync XP17 at £1,299 and the mid-range MultiSync XE17 for £989.

All the new models use NEC's Opticlear surface which, as NEC claims, does virtually eliminate glare. All comply with European power management standards. The plug and play support means that your system can automatically identify and configure the monitor attached to it, provided your system is fully plug-and-play compatible. The top of the range XP monitors also use Access.bus which is, to quote the manual, "fast becoming the industry standard for device communication" for monitors, keyboards and mice, and the system. Well, so far it seems that it's fast becoming the NEC standard for monitor-to-system communication, as no other manufacturers have yet produced any access.bus devices. NEC has apparently consulted Microsoft over the new standard, and the standard itself was developed by DEC and Philips. Compaq, Dell, IBM and Logitech are among the companies expected to start shipping access.bus compatible devices and systems by the end of the year. Access.bus also aims to simplify the business of linking devices to your PC. For example, you could put your system under your desk and plug your keyboard into your monitor and your mouse into your keyboard — something like a sophisticated version of Apple's ADB.

So what else do you get for the extra three hundred pounds that separates the two models? The XP17 supports a higher vertical refresh rate of up to 76Hz at its highest resolution of 1280 x 1024. The XV and XE can only manage 1024 x 768 at 80Hz. The XP range also comes with Monitor Manager Software which lets you customise and store an unlimited number of monitor settings. Calibration with colour printers is provided by the Colorific Color Enhancement System. Adjusting either monitor is a cinch. Pressing the curiously named "proceed" button on the front of the monitor brings up a menu (see photograph) which allows you to adjust size, position and basic and advanced geometry. It also allows you to move the menu itself around the screen, though why anyone would want to do this beats me.

Round the back of the XP17 is the access.bus connector, which looks like a phone socket, a set of BNC connectors and both PC and Mac D-SUBs. These mean you can have your monitor connected to two PCs, perhaps a desktop and a notebook or a Mac and a PC, and switch between the two. The cheaper XV lacks the Access.bus or the BNC connectors and has a single captive lead with a standard VGA D-SUB connector on the end.

Both monitors passed all the standard benchmarks of monitor performance with flying colours. At their top resolutions the screen images were pin sharp, which means that the three electron guns were hitting the spot and eliminating what are known as convergence problems. Image geometry was also good with straight edges to the whole image and black screen borders which could be cut down to just a few millimetres. Contrast was good, colours were bright. In short, both monitors demonstrate that a top quality monitor doesn't have to be based around a Trinitron tube.

PCW *Verdict*

NEC has got just about everything right with its latest range of monitors and I was sorry to see the XP17 go. At £1,299 list though, it's fast approaching cheap 20 inchers.

Prices

MultiSync XV Value Series:	
15in	£399
17in	£799
MultiSync XP Professional Series:	
17in	£1,299
21in	£2,499
MultiSync XE Efficiency Series:	
15in	£559
17in	£989
21in	£1,899

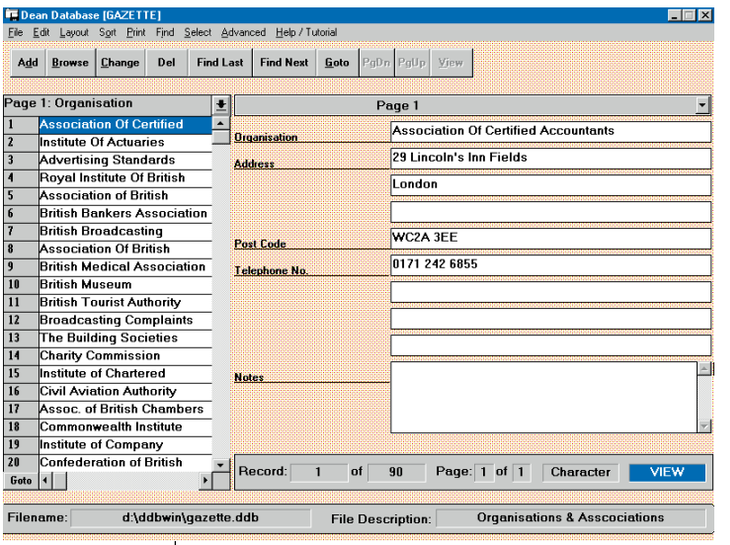
Contact NEC 0181 993 8111.
Fax 0181 992 7161

SOFTWARE

Dean Database for Windows

Paul Begg doesn't like databases, so he seemed just the person to try out Dean Database for Windows. And guess what? He liked it!

I remember the first time I saw a fully-featured database. It baffled me completely. That was in the antediluvian days when Windows was but a gleam in Bill Gates' eye, and since then I've not only gained more experience but databases have become easier to use. Nevertheless, I continue to have this deep psychological fear of databases — a feeling similar to the one I have about dentists. Anything that claims to make starting a database easy is therefore a Good Thing in my opinion, rather like anything that makes a filling painless.



Fear of databases? Dean Database helped Paul Begg overcome his

Dean Database for Windows is the flagship product of Dean Software's new Load & Go range of software, and Dean say it's so easy you'll be up and running in under 90 seconds from opening the package.

I'm not sure I agree with the 90 seconds, but installation certainly isn't a slouch and the database was indeed up and running quite quickly — though I must say the Help screens ran like glue and seemed a little buggy (I couldn't switch from the Help screen to my word processor without minimising the Help screen first, for example).

Dean Database for Windows is otherwise a fast, flat-file database which includes 90 fields per record and 99,000 records in a file. And frankly, I didn't like it at first. After a while, though, it began to grow on me, so much so that I began to seriously consider using it for various little record-keeping jobs I do. Certainly it made a very serviceable address book and would handle a record of my video tapes and books: there's even a long field for making fairly extensive notes.

Creating a new database is easy. You first select Create New File from the File menu or select the New File button on the Open a Dean Database screen, then name the file (for example, "Books"). There are a couple of minor details, such as selecting a drive and directory which is easiest achieved by accepting the defaults. Then you give the file a description, choose an icon from the selection provided, and choose how many pages you want. One page equals ten fields, so you can have up to nine pages/ninety fields. Then click on OK. It's that simple.

I was going to say almost that simple, because you have to name the fields. But Dean Database for Windows does not force you to do this. It is pretty essential, however, and I would strongly advise it. The Change Field Names option in the Layout menu allows you to name or rename the fields. You simply type in the name of the field — or the new name if you are changing a name — in the boxes displayed on the lefthand side of the screen. If for some reason you decide not to carry on, you can abort the operation and abandon changes by simply clicking on Cancel or pressing the Esc key. To save the changes, click on OK or press F10.

The database is fairly basic, data entry being on the right of the screen and a list of entries given on the left; but there are some fairly sophisticated tricks behind the simple façade.

A Find Globally option available from the Find menu is used to find a piece of data anywhere in any field of any record. In other words, if you are looking for London and don't know where it is, just use the Find Globally option and Dean Database will search for any occurrence of the word London and display the first one it finds. You can use the Find Next and Find Last buttons to look for any other valid records. Or you can search by giving conditions such as less than or greater than, or by searching within a specified criteria such as between specified dates. And there's a Quick Find feature.

Dean Database for Windows offers some pretty nifty printing features. There's a label printing facility which lets you select your own label style and design and print one or more labels, plus you can designate the font and size. A simple letter production facility lets you take data from one or more records in a file and insert it into a letter. You can copy the information to the clipboard or use the Export Data function on the Advanced Menu to transfer data to a word processor. Best of all, you can produce Reports. This is simply a list of pre-selected fields with, if required, column totals. Once you have defined the report, you can print all or a selection of records.

As I say, Dean Database for Windows grew on me. If you have simple database needs, it's worth looking at and is at an affordable price.

PCW *Verdict*

Affordable, easy to use, good for basic record keeping jobs.

Price £49 (inc VAT)
Contact Dean Software 01594 544588. Fax 01594 542643

HARDWARE

Kamco Picasso

For a totally customised system without the trouble of putting it together yourself, Picasso might be the answer. Chris Cain assesses whether or not Kamco has got it down to a fine art.

Kamco is based entirely in the UK and specialises in supplying highly customisable PCs direct. Its machines are available in various sizes, offer seemingly infinite RAM, video and storage options, and customers are free to mix and match components to suit their pockets. The company's most expandable product is the Picasso, designed specifically with the power user in mind.

Supplied in a cube case measuring 340 x 440 x 340mm, the Picasso could easily be mistaken at first sight for a small fridge. The overall build quality is solid and the casing looks as if it could easily take the knocks of day-to-day usage.

Our review model was supplied with a Cherry Softouch 102 keyboard and a Sony 17in SE Trinitron monitor. It is capable of displaying a maximum resolution of 1280 x 1024 pixels at 74Hz and offers a pin sharp picture. It worked well with all graphics modes tested. Should the picture need adjusting, a full set of easy-to-use controls at the bottom of the display allows you to correct it from just about any angle. Kamco also offers a range of Idek monitors with its systems, but once you've seen the Sony you probably won't want anything else.

Our machine was built around a 90MHz Pentium motherboard, with three PCI and five full length ISA slots. Only four of the latter were accessible, but the test configuration had both a PCI and an ISA slot spare for future use.

Along with 16Mb of RAM and a hefty 250-watt PSU, the Kamco was fitted with a Creative Labs AWE-32 sound card. An expandable WaveTable synthesiser delivers excellent sound and is a current favourite with multimedia authors, PC musicians and games players. Creative Labs bundles a range of utilities and demos with the hardware which shows off its capabilities.

A 28.800 internal faxmodem sat next to this on the review model, together with a high performance Adaptec PCI 2940 SCSI controller. One notch down from the top-of-the-range 2940W version, this card offers one internal and one external 8-bit interface and supports up to seven SCSI devices. Its custom PhaseEngine technology can deliver data rates between 3Mb and 10Mb per second depending on your setup. The 2940 was connected to a 2Gb Seagate hard disk, a Toshiba quad speed CD-ROM drive and an HP 35480A DAT drive.

A DAT drive is ideal for backing up large quantities of data, especially on a network, and can store approximately 8Gb on a single 90 minute cassette. HP claims a maximum of 11Mb/sec sustained data transfer rate to and from the tape.

The video in our machine was handled by a VideoLogic PCI Movie. The Weitek 9100-based board is a great all-round solution and supplies SVGA resolution up to 1280 x 1024, and improved AVI playback in Video for Windows applications. It provides a VESA Media Channel connector, to which a VideoLogic MPEG adaptor was fitted on our review machine. This allows the Picasso to play White Book Video CDs and any PC software with MPEG1 video sequences.

Setting up the Kamco ready for use took no more than five minutes, with most of this time spent plugging cables into appropriate connectors. Both Windows and OS/2 Warp were installed, and switching between them was just a matter of rebooting and selecting from the OS/2 boot manager.

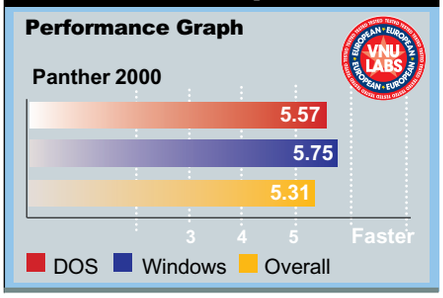
The PC came with a good selection of pre-installed applications including: the *PCW* award-winning Microsoft Office 4.2; Encarta 95; WinFax Pro from Delrina; Systos backup software; and a whole raft of programs from Creative Labs. There were some video CDs too for testing the MPEG option (although these are not supplied as standard). The unit did extremely well in the VNU Labs tests and scored an outstanding 5.75 under Windows routines and a healthy 5.31 overall figure.

A Picasso with the configuration supplied here will set you back £6,999. A top-of-the-range version costs approximately £9,300, and a low end expandable basic specification model is priced at around £3,400. These figures are guidelines only — the prices obviously vary according to specification. All machines carry a one year on-site warranty.

If you want a totally customised system without the hassle of putting it together yourself and you don't mind spending that little bit more, then Kamco

Labs Report

Performance Graph



PCW Verdict

A well made, if expensive, customisable solution.

Price £6,999 (for review specification)
Contact Kamco 01734 820088.
Fax 01734 810969

SOFTWARE

Overture for the Mac

Ian Waugh composes his thoughts to bring you his impressions of Opcode's dedicated score writer with a wealth of features.

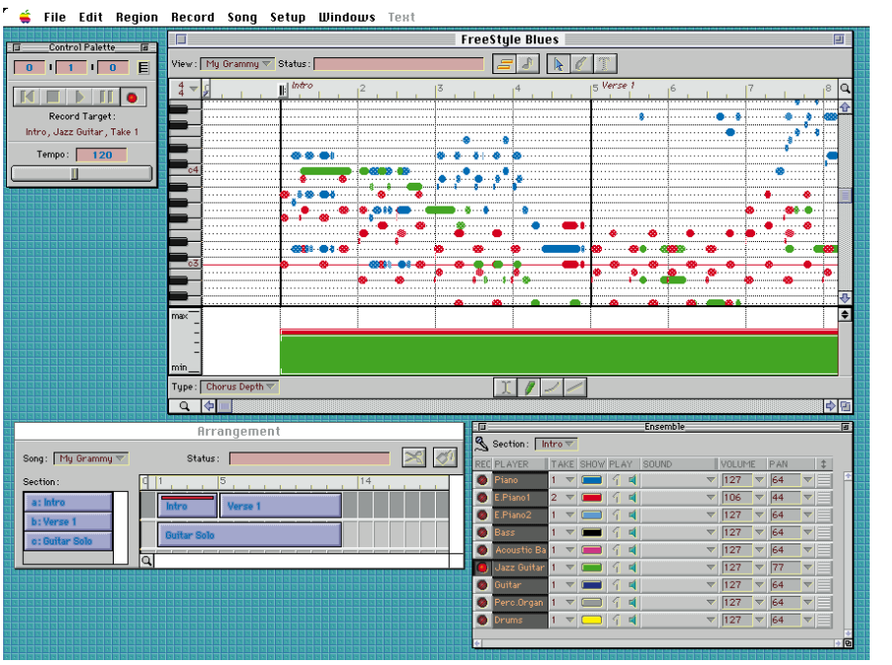
During the past few years, sequencers have not only become increasingly powerful but more complex as well. Many now include sophisticated scoring facilities and most users find these quite adequate for their printing jobs. However, if your main requirement is to produce scores rather than MIDI sequences, you may find you need a more flexible solution such as a dedicated score writer like Overture.

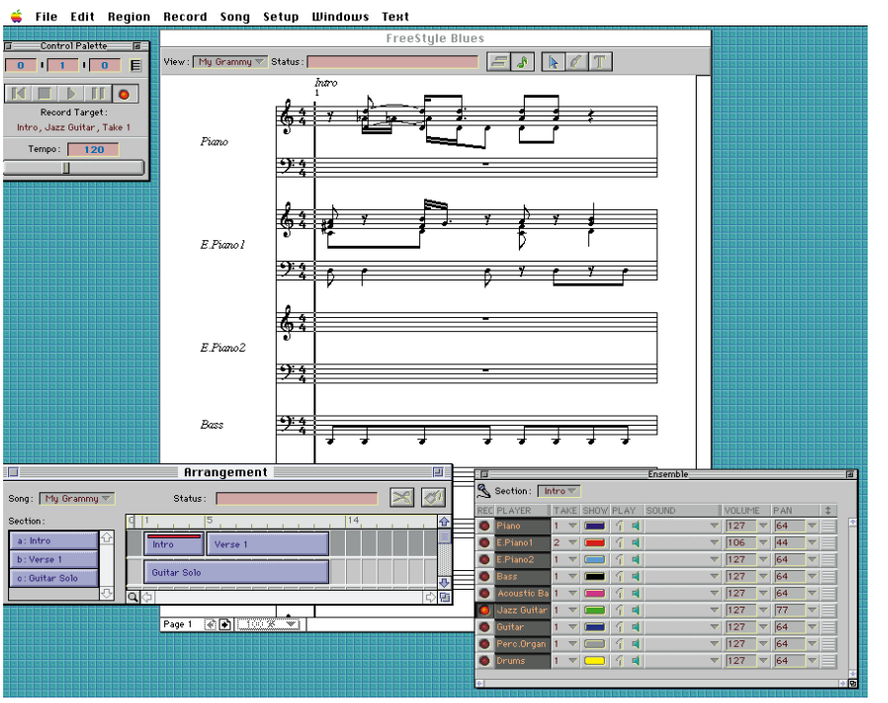
The manual says the minimum requirements are a 68020-based Mac, System 7.0 or later, 2Mb of RAM and 2.5Mb of hard disk space. But let's be sensible: there's a lot of graphics work here so you need a fast Mac and you'll need at least 4Mb of RAM, preferably more. A large colour monitor is nice but not essential. Copy-protection uses a hard disk authorisation system and you get two installs.

Opcode sets out to make operation easy and succeeds remarkably well. There are three excellent manuals which will get you up and running and entering a score in no time at all. Once you're familiar with the basic functions, you'll find the interface quite friendly. That's not to say that it's completely plug-in-and-go: the program has a wealth of features, so give yourself a while to check them out.

You can enter notes by clicking them into the score with the mouse or from a MIDI keyboard in real-time or step-time. You can also import MIDI files. All methods work very well, particularly if you activate the Auto Position function which automatically places the notes in the correct position in the bar. You can move them afterwards if you wish, and there are various functions to realign notes and adjust the bars should you make a pig's ear of it. Dig a little deeper and you'll find Allotment Tables and Beat Charts which are used to set the amount of horizontal space used by the notes. You may not need to use these but it's nice to know they're there.

There are a dozen tool and symbol palettes which you can tear off and place anywhere on the screen. You can also





Top *Overture's score window with the track list and some detachable palettes*
Right *Overture's score window, graphics editor and chord input window*

select note durations, for example, from the Mac's keyboard and this further speeds up note entry. The palettes include all major music symbols as well as ornaments, articulations, dynamics, bar lines, alternate note heads, tablature and note groupings. You can import PICT files to create your own symbols, too. You can insert text and there's a dedicated lyrics editor available which makes it easy to align the words with the notes. Anything you insert can be easily adjusted. When you move the mouse pointer over a symbol, the pointer changes to a drag cursor which can be used to move the object.

The program is supplied with 15 templates for brass, ensemble, vocal and orchestral scores although it's fairly easy to create your own. Each stave can support up to eight voices which you can either edit individually, or all together.

Before printing, Overture can check whether or not all the bars have a full compliment of notes and will notice if any parts contain notes beyond the range of the instruments for which they have been written. The parts written for transposing instruments are automatically transposed by the program.

There is no problem if you want to write a lead sheet: play a chord on a MIDI keyboard and the program will analyse it and put the name above the bar. There's a chord library containing some horrendously complex chords which you can drag to the score as required. The program uses the Aloisen font for the music and the printout on a laser printer is excellent. You can save part of the score as a PICT or EPS file to export to other programs.

So far, we have a pretty comprehensive score writer but Overture handles MIDI playback well, too. It can link with the Opcode MIDI System which is supplied (along with a very detailed manual) and with which many sequencers are now compatible. You can assign each stave (and even each voice in a stave) to a MIDI channel, a program change number, and a volume level.

A particularly interesting point is that MIDI playback follows music instructions such as the dynamic markings, ornaments and trills. Some instructions are ignored but perhaps they will be included in the next update.

There is a grid editor and a controller editor should you wish to tweak the MIDI data. The MIDI facilities aren't as comprehensive as a dedicated sequencer — which is fair and to be expected — but they provide good control over the music output. You can export the score as a MIDI file if you want to tweak it in a dedicated sequencer.

Inevitably with such a large program, there are niggles, but these are few and limited to minor items. They don't detract from what is a most accomplished program; enjoyable, easy to use, and well suited to the production and printing of high quality music scores.

PCW Verdict

A comprehensive score writer with lots of nice touches and a pretty intuitive interface. It has good MIDI facilities for both recording and playback. If scores are more important to you than MIDI sequences, I think you'll like it.

Price £449.95
Contact MCMXCIX 0171 723 7221. Fax 0171 262 8215

SOFTWARE

TeleMagic for Windows 1.05

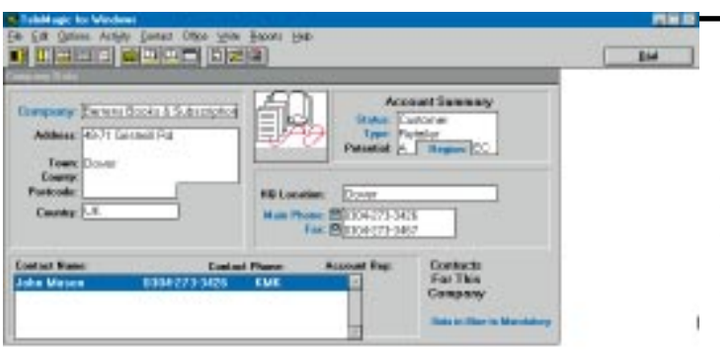
Keeping tabs on your contacts can seem like a full-time occupation without a good contacts manager. Paul Begg has been looking at the latest version of Sage's TeleMagic.

Sage is best known for its accounts software, but some years ago the company recognised the potential of contacts management as a not particularly obvious related add-on and in 1993 bought Remote Control International, a California-based company which had authored a contacts manager called TeleMagic.

A contacts manager is a database designed to record information about people and the companies for which they work, as well as keeping track of all one's dealings with them — that includes appointments, meetings, phone calls, letters, and assorted information that you might want to have to hand, such as price lists.

There are several contact managers available. Some are very simple computerised versions of a Filofax or rolodex cards. Others are very complicated, some being so sophisticated as to be beyond the understanding of mere mortals. TeleMagic falls between these extremes, veering towards the latter.

TeleMagic isn't out-of-the-box usable. You'll need to sit with the manuals, which include a 200-page Quickstart Guide and a Master Reference manual that



TeleMagic is an impressive piece of software that will provide salespeople in particular with full customer histories at their fingertips

runs to over 500 pages. One reason for this complexity is that TeleMagic is highly customisable. You can get it to store information in almost any way you want. You can even include the company logos of your clients.

If you've never heard of TeleMagic, don't worry. In my opinion it lacked the attractive ease of use of Act! and the multi-functionality of Tracker, two of the competitors in TeleMagic's price range.

However, TeleMagic is distinguished from the competition by being designed with salespeople in mind, particularly telesales people. This makes TeleMagic ideal for people who make all or most of their contact work from their desk and want a full customer history at their fingertips with a keystroke or two.

TeleMagic combines the two main areas of contact management, a contact database and an activity manager (in simple terms, a glorified address book and appointments diary), with word processing links and report generation.

The Contacts Manager Database is a three-level relational database. This enables you hold in a single record the details of multiple contacts: for example, when you may deal with various people within a single company; somebody in sales, somebody else in accounts, sometimes the MD, and so on.

How you choose to record information and what you choose to record is largely up to you. You can add or delete fields, change their order, design new screens of information, record and date stamp all business activities, and automatically transfer commitments to the activity manager. You can also attach external letters, spreadsheets and graphics using OLE (Object Linking and Embedding).

The Activity Manager is fully integrated with the Contact Manager database, which means that meetings, appointments, and to-dos with your contacts are automatically transferred to your diary and updated. Calendars come in daily, weekly and monthly views and there's a separate to-do list manager.

So much for what TeleMagic is. Existing users will be most interested in what this new upgrade has to offer. The answer is: nothing of massive significance. But this is not to say that this isn't a significant upgrade. It is jam packed with user wants!

The primary introductions are seamless links to Sage Sterling Accounts, and improved word processing support for mailmerge using Microsoft Word, Lotus Ami Pro and WordPerfect 6.1. There's a much needed Activity Browse screen which lets you review completed and/or uncompleted activities, and Quick Report gives you speedy access to information needed for individual customer analysis. Finally, there's a system for internal electronic mail.

Other changes are largely cosmetic, though existing users will find some changes to previous versions.

The Contact Manager has undergone some interface changes and there's a simplified Goto screen with additional features such as the ability to change databases on the fly. The Activity Manager has a few changes too. A status bar has been introduced telling you the name of the current open database and informing you who the current user is. If you don't have a modem and therefore can't use the automatic dialling feature, you can now select "none" when choosing a communications port. This means you will still have to manually dial the number, but clicking on "Dial" while dialling will link the calls to your schedule,

Installation was painless. The seven disks and hefty documentation are safely stored in a sturdy slip case. TeleMagic requires Windows 3.1 or later (it seemed to work well under a beta of Windows 95), but otherwise demands quite a high specification machine — a 486SX and 8Mb RAM. The Network version will run on any NetBIOS system. A DOS version is available.

Overall, while I value TeleMagic's customisability, and its power is impressive, I still feel that a contacts manager must have out-of-the-box usability. TeleMagic isn't immediately easy to use, which perhaps wouldn't be such a problem if the product was less expensive. This said, it is a very impressive piece of software that will almost certainly handle anything you can throw at it. Existing users might have wished for some "light up the sky" features, but should be very happy with the large number of enhancements.

PCW *Verdict*

A powerful contact manager with a hefty price tag, but if your business depends on your contacts it is certainly worth taking a serious look at.

Price £595 (the DOS versions are TeleMagic and TeleMagic Professional costing £299 and £595 respectively)
Contact Sage UK 0191 201 3000.
Fax 0191 201 0308

HARDWARE

Maxtor MobileMax PCMCIA hard drive

This tiny package holds four disks, together storing 171Mb of data. It's an impressive technical achievement, says Simon Rockman, but at a price.

The idea that you can get a hard drive into a space no bigger than a credit card and 10.5mm thick is still, even after you've had one for a while, something which takes a while to get your head around. Inside this tiny box are four tiny disks spinning at 4464rpm. The intricacy of construction is much greater than anything Fabergé dreamed of, and it's all done in class 10 clean rooms. The whole lot weighs only 65g yet it will store 171Mb. The best things really do come in small packages.

The only people who think that

PCMCIA works easily are those who have never used it. We have a variety of cards and machines which pass through the labs at *PCW,* and getting any individual notebook to work with any individual card is always hit and miss. The problem usually lies in the socket services. Some notebooks, like those from Toshiba and Dell, seem to work with pretty much everything, and as manufacturers' experience improves, the quality of drivers and the ease with which new PCMCIA devices can be added, increases. But you often need to resort to updating the socket services or downloading new software from a bulletin board to get a system working, so it's surprising that the MobileMax does not come with a driver disk.

It is equally surprising that the manual, and the instructions on installing the card, is so thin, with only generalised information for most brands of card services. Equally surprising is that this coped with most circumstances, the only problem being a minor memory conflict which was rapidly identified with a call to customer services. Ideally, PCMCIA should be better sorted and it would not need a call to tech support or for the config.sys to be edited, but the PC is still growing up and needs the occasional nursemaiding. The situation is far more complicated if you have an IBM ThinkPad, as the drivers need to be installed from the PCDOS disks and this leads to a lot of messing about.

Once installed, the device works seamlessly. It appears to Windows as a floppy drive, albeit a 171Mb floppy, and can be inserted and removed with the same forethought as a genuine floppy — you shouldn't try while actually reading something from the drive, but otherwise it's OK. This makes it an ideal transfer medium. I wanted to move some large files from one notebook to another and the Maxtor drive would have been ideal if the second machine had not been an IBM.

Sending a 171Mb disk across a town might take an hour. This equates to nearly 400,000bps, substantially faster than any modem. The transfer rate to and from the PC isn't spectacular: at 750kb/sec it isn't up to the speed of an internal hard disk but it's still better than most ways of transporting data. The seek times — 16ms — are similarly poor by the latest disk standards, but then, this isn't a drive for heavy use. If you really need to thrash a database hard on a notebook, you should use the MobileMax to move data from machine to machine and copy to the local hard disk.

Using the drive noticeably affected the battery life of my notebook. The spin-up uses 3W and idle consumes 560mW, which seemed to shave about 20 minutes off the three and a half hours a Dell Latitude usually runs for on a charge.

The MobileMax is ideally suited to applications where you have to do a lot of presentations. 171Mb is a lot of Powerpoint slides, with each presentation held on a separate disk. This is of course expensive — the drive costs £344 + VAT.

PCW *Verdict*

Technically stunning and easy to use, but expensive.
Price £344
Contact Maxtor 01483 747356
Available from Amber Systems 01296 311300

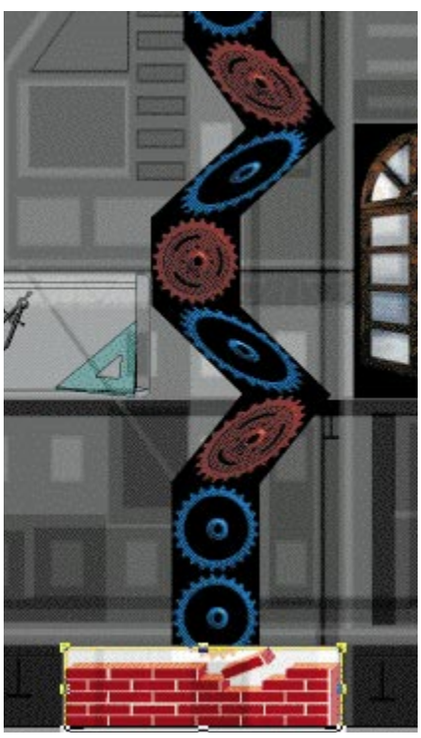
SOFTWARE

Specular Collage 2.0

This latest upgrade of the aptly named Collage represents a significant improvement over the previous version. Mike Collins sketches in the details, leaving you to draw your own conclusions.

Collage is an image composition package which, loosely speaking, aims to do for Photoshop what PageMaker does for Word. The general idea is that having prepared bitmap images using your favourite graphics software, you can then create complex compositions for brochures, adverts, and general graphic design projects by importing those images into Collage, just as you would import your text into PageMaker to combine with graphic elements and work on your layout. There are no painting tools, no colour-correction tools, and no photo retouching tools — Collage just focuses on bitmap image assembly, and as such, is a great complement to software like Photoshop.

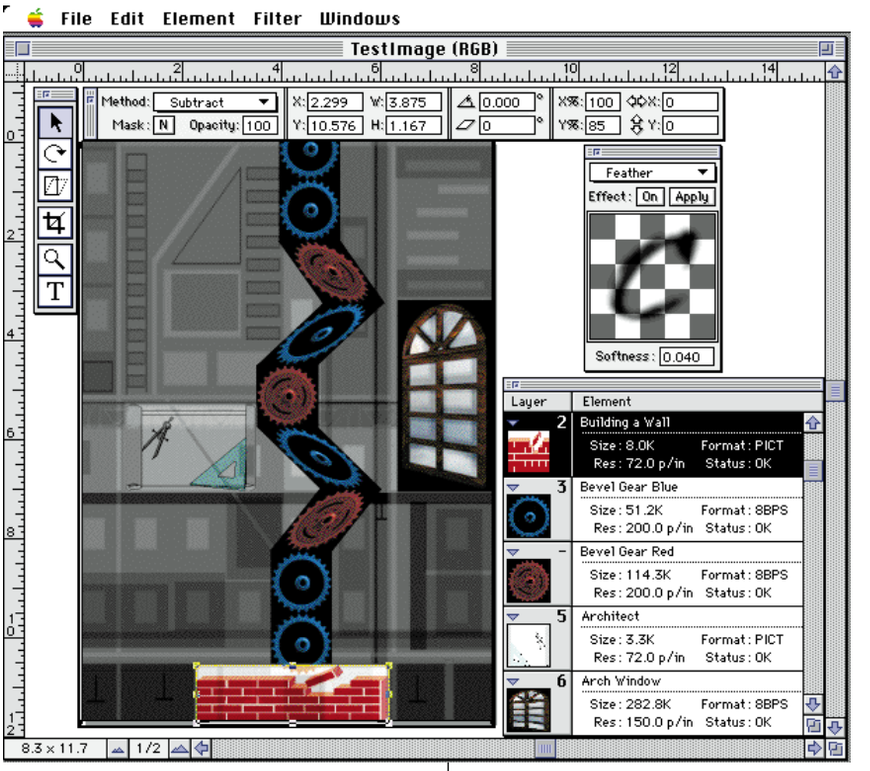
Collage handles each element on the page as a separate object, so you can move, add effects, or change the angle of one object without affecting the others. You can manipulate elements directly by clicking and dragging on screen, or by entering values numerically into the



Information Palette. You can easily create drop shadow or feathering effects, use masks or filters and apply various transfer methods to the images on your "canvas". You can even vary the opacity of different elements to achieve more effective blending of one image into another. The image types supported by Collage are RGB PICTs, RGB and CMYK TIFFs, RGB and CMYK Adobe Photoshop 2.5 files — all with or without alpha channel information. Specular Infini-D and other 3D programs usually export images in PICT format, while scanners export TIFF, so all the most common Macintosh graphics file types are catered for here.

The program is designed to let you work with imported images that have high resolutions, without sacrificing processing speed or using up large amounts of memory. A magazine or brochure graphic typically needs 300dpi to print a clean image, but most computer screens can only display 72dpi. For instance, a 5in x 5in 300dpi image needs 1500 x 1500 pixels, which is more than any typical computer screen can display. To display such an image at a 1:1 ratio onscreen, its resolution must be reduced enough for it to fit. To avoid the problem, Collage produces a proxy of the image and this is used for on-screen work. Once you have assembled a composite image to your liking, you render this to a high resolution PICT, TIFF 6.0 or Photoshop 2.5 file. The use of proxies means that operations which might otherwise take minutes in a high-resolution file, can be completed in seconds on the proxy. Additionally, you can lay out images at a 1:1 ratio even if they have very high resolution.

The Collage screendump, above, shows the details of the user interface with floating palettes displaying the manipulation tools at the left, Information Palette along the top, Element Palette at bottom left, and the Effects Palette on the right. A composite image has been assembled from various graphic images imported into the Elements Palette. The Skew tool was used to change the orientation of various copies of the red and blue bevel gears. The Subtract transfer method was applied, and the feathering effect was used on the brick wall and architectural images to make them blend more effectively into the backdrop image. Most features of Collage are pretty intuitive to use, especially if you already have some familiarity with other graphics software — users could feel pretty much at home with the software after one evening's work preparing a similar example image to the one shown here.



The Collage user interface

Specular Collage has just been upgraded to version 2.0, so existing users will want to know what's new. Firstly, Collage 2.0 is now Power Macintosh native, and runs up to 300 percent faster than its 680x0 counterpart. Collage 2.0 ships as a fat binary application so users with either type of machine will benefit from the new changes, and users of Power Macs will see a dramatic speed increase. Aside from speed optimisations gained from Power Macintosh support, Collage also has enhanced type composition routines that speed up the program overall. A new blurring function, used for soft shadows, feathering, gaussian blur and unsharp mask, is now between three to eight times faster than the previous version of the program and this dramatically reduces rendering times for Collage 2.0 users. Another optimisation, for users with large amounts of RAM installed, allows Collage to do all the transformation work to the elements and hold them in RAM, so the program does not have to re-do unnecessary work. This means that most changes can be carried out within seconds.

Collage 2.0 now supports both RGB and CMYK colour models and enables users to work directly with CMYK scans. Users can create their own CMYK Display tables, from settings in Adobe Photoshop, using the Collage CMYK Table filter found on the master diskettes. So, a screen display in Collage can be made to match the colours displayed in Photoshop. There is also a new colour picker which is more intuitive and easier to use than Apple's standard HSB colour picker and allows the user to work in CMYK colour with complete precision.

The previous version of Collage was designed to handle images no larger than 140 x 140 at 300dpi, whereas the latest version can handle much larger images; up to 530 x 530 at 300dpi — or approximately 16,000 pixels x 16,000 pixels. Other useful enhancements allow you to change the document size having first set up the project; selectively remove filters applied to images within Collage; or export images as Photoshop 2.5 files when rendering a high-resolution image.

PCW Verdict

With this upgrade Specular has significantly improved on the initial release of Collage, and the software is now worthy of a place in every graphic designer's set of computer tools.

Price £270
Contact Gomark 0171 731 7930.
Fax 0171 736 1215

Long term tests

PCW How You Can Contribute To The Long Term Tests Section

We welcome contributions from readers for our Long Term Tests section. If you've been using a piece of hardware or software intensively for some time, just write a 450-word article (for hardware) or a 750-word piece with screenshot — GIF format — for software and send it on disk, in MS Word (Mac or PC) or ASCII format, to: The Editor, *Personal Computer World*, VNU House, 32-34 Broadwick Street, London W1A 2HG. Mark your envelope clearly "Long Term Tests". We'll pay for any contributions we use.

HARDWARE

Acorn Archimedes A310

7 YEARS TEST

Jonathan Barnes is happy to continue using his seven-year-old Archimedes and sees no reason to change, as it suits his purposes admirably. He finds it simple, reliable and unobtrusive while he is working.

I cannot be one of the computer industry's favourite sons; my desktop machine remains the Acorn Archimedes which I bought from Watford Electronics in December, 1987.

I hope I am not noted for my parsimony as I am just as prone to techno-lust as the next person, hence my choice of the Archimedes: the first mass-produced RISC computer (Apple, please acknowledge).

However, I do not believe that the software which would be applicable to my needs, has yet evolved to the stage where a hardware change would make sense. Being an author, I need something that allows me to produce and reproduce text with ease, and this the Archimedes does. Because it is simple, reliable and unobtrusive in use, the computer does not get in the way of the creative process: text composition is as "transparent" as it used to be on my typewriter.

The Archimedes has its own multi-tasking GUI in ROM, which is ideal for desktop publishing. The operating system, RISC OS, is likewise in ROM: when you switch on, the machine is almost immediately ready to use. Among the other goodies in ROM is a handy, structured Basic with a built-in assembler and full access to RISC OS.

A second, 5.25in disk drive was included by Watford Electronics as part of the deal; except for a RISC OS upgrade and the addition of a hard disk and fan-silencer, the thing remains (like myself) entirely unreconstructed. Its monitor is a Hitachi green-screen, handed down to me by my brother when he junked his Apple II. The display is crisp, clean and rock-solid. The Archimedes is robust and well designed. True, the Caps Lock key stopped working in 1991, but otherwise the machine has been entirely trouble-free. Software crashes have always been my fault.

Acorn has made little impact on any but the education and hobbyist markets, and I think that this is a classic example of our national failure to exploit our own technologies. Inept and prejudiced coverage in certain areas of the press (but not *PCW*) hasn't really helped. But proselytising Acorn owners have become the pub bores of the nineties. Yet I must say, that were I a self-employed person looking for a very fast machine today, I would not buy a Pentium. But I would buy an infinitely upgradable and versatile RISC PC: this is about the same price and is served by lots of excellent and affordable native-mode software. With the PC emulator or an on-board 486 processor, a RISC PC would also run Windows, should you wish it to.

And if I couldn't afford a RISC PC, I'd buy a second-hand Archimedes.

Eureka! The Archimedes is still going strong in the Barnes household

PCW Verdict

As good today as it's always been.
Price The A310 is no longer in production
Contact Acorn 01223 254254

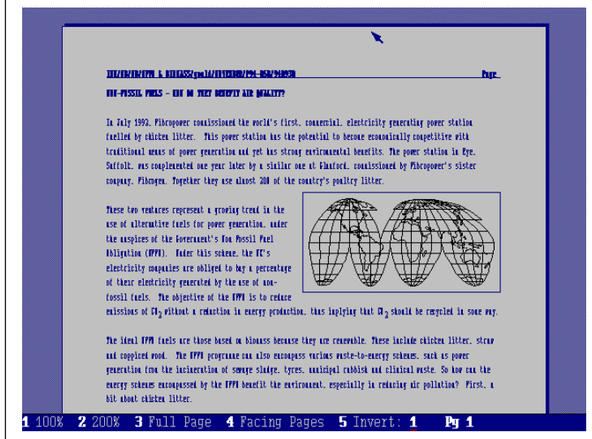
SOFTWARE

LetterPerfect 1.0

5 YEAR TEST

LetterPerfect must be one of the few pieces of vintage software never to have needed or received an update, reckons Rick Gould. He continues to enjoy using it for its qualities of flexibility and its range of essential features.

Write on!



Who needs Word for Windows? Not me, writes Rick Gould

What do Hollywood film directors and software developers have in common? The answer is that they are never satisfied with their creations, so within a year or two they come up with bigger, punchier sequels. An example of this is Highlander III and PerfectOffice respectively. Both are similar to the previous versions, except that there is a bit more magic and some extra sharp bits. I'm sure I'd enjoy them both equally, although PerfectOffice would be more useful, bearing in mind that the pen is mightier than the sword.

Meanwhile, being a bit of a minimalist, I'll keep writing with PerfectOffice's sibling, LetterPerfect for DOS. This must be one of the few pieces of software which has not gone beyond version 1.0 since its inception five years ago, unless you consider a new box to be an upgrade. Does this mean that the WordPerfect Corporation got it right when it streamlined WordPerfect 5.1 to make LetterPerfect 1.0? I think so. It was designed to complement WordPerfect 5.1, especially for mobile users, considering that in those days many portables did not have hard drives. But they do now and LetterPerfect has still not been left behind — so why not?

Despite its age, LetterPerfect is a flexible piece of software which spans many generations of hardware and software. It will run happily on an XT with one floppy drive, and will work seamlessly with most of the major word processors. It is even fast on an XT — a tribute to its compact programming.

As a word processor it offers many essential features such as mailmerge, spell-checker, macros, thesaurus, outliner, search-and-replace, headers, footers, word count, cut-and-paste, footers and endnotes. It also has the necessary features for formatting text, such as emboldening, subscripts, italics and special characters such as Greek. It has graphics facilities for incorporating charts and pictures, as well as a conversion utility for converting and importing .WPG files. In fact, it has all the necessary features for most writing tasks in a package which makes few demands on hardware — a significant advantage for power-mobile users.

LetterPerfect is not merely a simple text editor; it has many useful features. For example, many scientific reports I write are full of complex chemical compounds and technical jargon, so the subscripts, Greek characters and macro facility are indispensable.

One of the major problems with old software is that it goes stale as other software evolves. But relative antiquity does not hinder LetterPerfect: it saves files in ASCII and WordPerfect 5.1 format (a common standard which is the *lingua franca* of word processing). My associates and industrial clients mostly require files in WP 5.1 format. Some want them in Word format, but I can always load a WP 5.1 file into a Windows word processor and convert it that way.

I use LetterPerfect on both my portable and office PCs. The core of the latter is a 486 DX33 clone with 8Mb of RAM coupled to an NEC 17in screen. Ninety-five per-cent of the time I use it to run my writing tools: LetterPerfect, WordPerfect for Windows and MS Office. If I have to produce a finished report or manual, then LetterPerfect can cope with most of the formatting functions and produce something quite presentable, including charts and figures. If I start a project using WordPerfect or Word, then I can still work on it using LetterPerfect although it will not recognise some codes such as tables. As a rule, I start by writing nearly all of the text using LetterPerfect and then edit and work on embedded graphics using WordPerfect or Word.

LetterPerfect does not handle tables or columns although the codes for them are retained if I flip between LetterPerfect and a Windows word processor. But the simplicity aids efficiency: the LetterPerfect screen presents the writer with the blank page familiar to millions of WordPerfect 5.1 users. Even Word 6.0, replete with its graphical gems, has copied this minimalist feature. It allows the writer to focus on the most important part, the text and the subject it portrays, without being distracted by screen buttons and bars. Yet LetterPerfect still has a WYSIWYG print preview.

I regard LetterPerfect as my most important piece of software. It is easy to learn and use and has more than justified the relatively small sum I paid for it in the middle of 1990.

PCW Verdict

If it ain't broke, don't fix it: this is still an excellent package.
Price £35 (street price)
Contact WordPerfect 0800 177277.
Fax 0800 525321

Pentiums on the road

Pentium notebook computers certainly deliver the power, if you are willing to pay the price. Simon Rockman puts six portables on the rolling road to see how they run.

PCW Photography by Bruce *Mackie*

Intel chips are not the only things that run fast: the company itself now has a faster development cycle than ever before and new processors are appearing with increasing frequency. But with the emphasis on desktops and getting chips out into the mainstream, the notebook always trails a little way behind. Just as 120MHz Pentium-based computers are beginning to break cover, the Pentium Notebook is becoming a realistic proposition.

Intel's processor of choice for notebooks is the 75MHz version, but power users will always want more, so the machines we review here use the 90MHz and 100MHz variants as well. The 75MHz chip is available in a special thin-film package designed to ease heat dissipation in the close confines of a notebook. But it was the move from 0.8 micron to 0.6 micron designs, when the 90MHz and 100MHz Pentium processors were introduced, which really made notebook Pentium machines possible. When the voltage requirement dropped from 5v to 3.3v, increased battery life was another benefit. The biggest achievement in this area is the Ergo: it will be a while before we see 120MHz Pentium-based notebooks in the mainstream, since the newest Intel chip runs at 3.45v and requires some motherboard re-engineering.

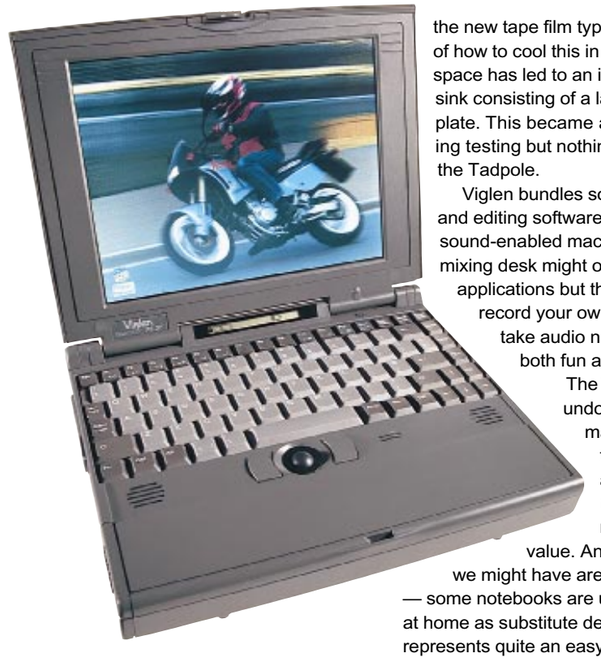
Improvements in battery life, a result of better power management and better battery technology, are a contributing factor too. But designing a system which delivers the performance to justify the price is still a significant engineering problem. The six machines here show how the first manufacturers to approach the problem have gone about it.

Viglen Dossier P90

This machine is part of the family of Viglen Dossier notebooks and shares the usual comprehensive list of features including an LCD panel which shows battery charge, sleep mode, the settings of the Num Lock and Caps Lock keys, and when the disk is being accessed. The hard disk in the review machine was 340Mb; bigger disks are available to cope with fatter software. There is a comprehensive selection of ports and connectors including audio jacks for the SoundBlaster support and two speakers built into the keyboard. There is a type III PCMCIA socket which can be used as two type II sockets. Extensive use failed to expose any weakness here.

The area between the keyboard and the front of the computer is flat and large enough to provide support for your wrists as well as an area for the trackball. The hard disk controller is supplied by Western Digital and sits on a local bus to give fast 32-bit access. The video display processor is a Chips & Technologies 65545.

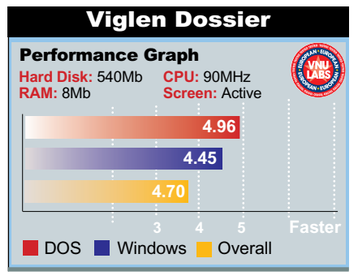
The chip inside the Viglen is a standard PGA ceramic package and not the new tape film type. The problem of how to cool this in a confined space has led to an innovative heat-sink consisting of a large, flat, metal plate. This became a little warm during testing but nothing like as hot as the Tadpole.



Viglen bundles sound recording and editing software with all its sound-enabled machines. A 90MHz mixing desk might only have limited applications but the ability to record your own .wav files and take audio notes makes it both fun and useful.

The Viglen is undoubtedly a good machine. It's blisteringly quick and, for a Pentium-based machine, good value. Any reservations we might have are hard to quantify — some notebooks are used in offices or at home as substitute desktops, but this represents quite an easy life compared with notebooks which often get used in airplanes, trains and hotel rooms and are therefore more likely to get knocked and battered. Without long-term testing it's difficult to tell; but the Viglen doesn't appear to be as robust as the Toshiba or the Dell. High-end machines such as these are usually cherished and don't have to put up with abuse; the Viglen certainly offers the performance but possibly not the durability.

If the Viglen were a car it would be a Sierra Cosworth: very quick for the price, a little brash, but something most people secretly lust after.



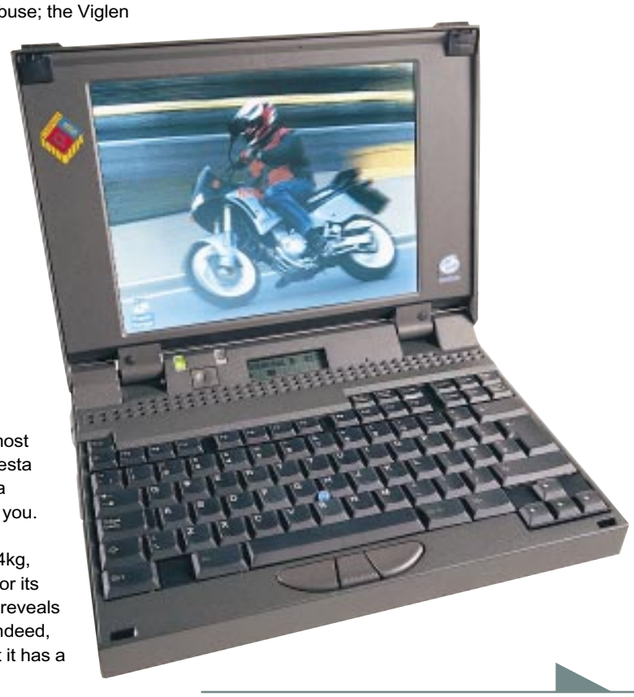
Tadpole P1000

If you feel that you should get your money's worth when you are spending almost the price of a Ford Fiesta on a notebook, then a Tadpole P1000 is for you. At first glance it's a machine which, at 3.4kg, seems a little heavy for its class. A second look reveals that it is very heavy indeed, when you realise that it has a magnesium case and the floppy disk drive is external, as is the power supply. While most manufacturers are seeing processing power in their Pentium machines never before dreamt of, Tadpole is used to more MIPS than you can shake a stick at.

The company has been making RISC notebooks for a while now and they use the same case for portable Unix stations. The battle-hardened case also serves as a heatsink but this means the power of the Pentium is transferred straight through your trousers when you use the P1000 on your lap. The three-button trackball was designed for running Unix on the Tube, and you will need the manual dexterity of Richard Clayderman to cope with the Trackpoint nipple and three separate mouse options.

Solaris really needs chock-a-block buttons. Under Windows, where you perhaps don't need more than the left-hand button, the trackpoint is excellent although even this is overshadowed by the wonderful Lexmark-sourced keyboard which was easily the best in this test.

The 2000mAh Nickel Metal Hydride battery pack is lightweight and custom made for the machine. The manufacturer's estimate of two hours' life seems generous — we achieved little more than half that time without overworking it. In common with the more mundane models in this



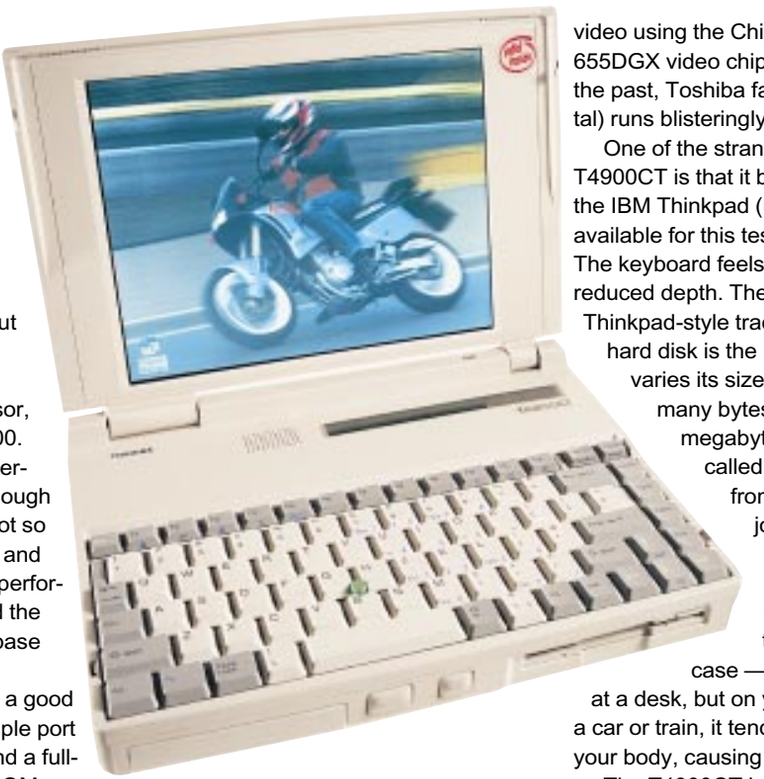
test, there is a PCMCIA type III slot which can accommodate two type II cards.

The screen is large and clear. At 10.4 inches it's one of the biggest available, and of course quite power-sapping, but a 640 x 480 display is only adequate for Windows and it is too small for X-Windows. A colour active matrix is good to look at but not as quick as you'd expect in view of the Western Digital WD90C24 video display processor, on a local bus, to the Pentium 100. Unusually for a notebook, the internal drive is an 810Mb SCSI. Although this is great for expansion, it is not so good for keeping the price down and doesn't seem to do anything for performance. But for big transfers, and the kind of activity in which big database users are involved, it is superior.

Surprisingly, the Tadpole has a good choice of docking stations: a simple port replicator which adds SCSI-2, and a full-blown system which has a CD-ROM drive, two ISA slots and an Ethernet connector. The bells and whistles extend to built-in sound. There is bundled software for MIDI and .wav manipulation, microphone, speaker and jacks if you are a little more serious about sound, but an internal floppy disk would be a better option.

Performance is pretty much what you'd expect from a machine with a processor which is ten percent faster than a Pentium 90, but you have to wonder whether or not this is worth a price delta of 30 percent, plus. A significantly cheaper option is to buy the version of the same machine badged by Adams technology: this has a smaller hard disk (a 540Mb drive) but costs £5495, representing a considerable saving.

If the Tadpole were a car it would be a Bristol: an oddball, hand-built using very expensive components, but discreetly fast. Only for the gentleman who is going places. Quickly.



Toshiba T4900CT

The Toshiba T4900CT is currently the standard issue notebook at Microsoft and it's a flash workhorse. The software, particularly the Maxtime power management software which ties in with the LCD above the keyboard, gives an air of robustness, and the suspend mode is rock-solid.

The Toshiba has a 50MHz motherboard and addresses its RAM at the full 64-bits wide of a Pentium. This is no ordinary RAM either; it's EDO (Extended Data Out) RAM which, having a little cache built into the RAM chips, should make each access very much faster. The result is a system, which according to the champions of EDO RAM, doesn't need a second level cache. The 8Mb review machine was a slightly strange configuration. Most potential customers would not choose a machine with just 8Mb of RAM: if performance is important, they will opt for at least 16Mb even though, for the moment at least, only the first 8Mb will be EDO.

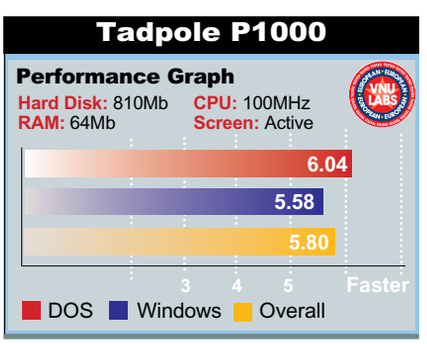
Windows offers 32-bit acceleration for those machines with a Western Digital hard disk controller. In tests, this has a huge effect: Windows 3.11 does not work optimally with the T4900CT but Windows 95 is more likely to make the best possible use of specific features, which makes the T4900CT a good bet for the future. Windows tests show that the local bus video using the Chips & Technologies 655DGX video chipset for the first time (in the past, Toshiba favoured Western Digital) runs blisteringly quickly.

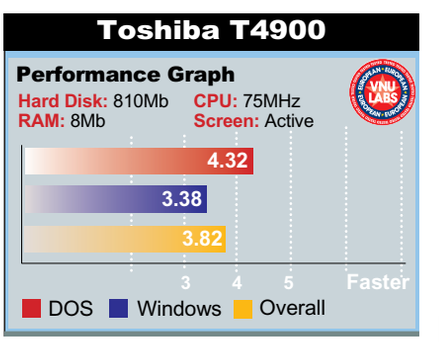
One of the strange things about the T4900CT is that it borrows so much from the IBM Thinkpad (unfortunately not available for this test) and yet feels better. The keyboard feels great, despite its reduced depth. The pointing device is a Thinkpad-style trackpoint nipple. The hard disk is the IBM device and this varies its size depending on how many bytes you have in a megabyte, but which is often called 810Mb. The screen is from the IBM/Toshiba joint venture IDT, and yet this Toshiba feels more solid. The trackpoint has its button at the front of the case — great if you are typing at a desk, but on your lap, particularly in a car or train, it tends to knock against your body, causing the cursor to wander.

The T4900CT is unusual in having separate type II and type III PCMCIA ports. This is not only ideal for reducing battery life, but great if you want to copy data from a network using one PCMCIA slot, to a PCMCIA hard disk, using another two. You cannot fit three type II cards. It all works seamlessly, just as PCMCIA should but rarely does. The computer has high speed serial ports with 16550 UARTs.

The T4900CT has excellent built-in sound. It uses the Microsoft sound system and can deal with both .wav and .mid files. But there is only one speaker, so you may need to plug speakers into the jacks at the side. The battery life is a reliable two and a half hours but Lithium Ion batteries are unavailable.

If the Toshiba were a car it would be a BMW: expensive for what you get but robust, sporty and quick. Something you know makes sense but which your peers may think an extravagance.





NEC Versa P75

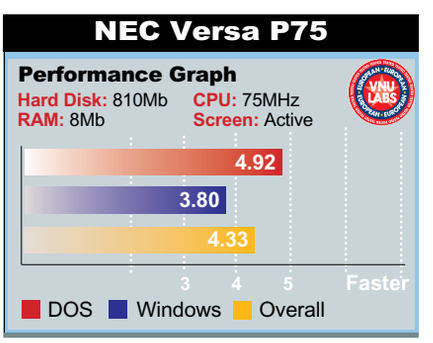
The Versa P75 has an 800 x 600 LCD — to anyone used to a CRT, this may seem mundane. But to those who understand the significance of doubling the number of transistors on a panel, it is a significant development which really sets the Versa apart from the rest. Bigger LCD panels have been available in the Japanese market for some time now; the demands of Kanji and Katakana characters means that it is awkward to fit any meaningful text into a 640 x 480 display.

Although a screen which has twice as many transistors is more expensive to buy, the effect of using the higher resolution screen is amazing: in comparison it makes using other machines' screens seem like peering through a porthole. Using Windows at anything other than full screen capacity becomes possible, and this is particularly useful if you need to see Windows Help while working with a program.

Physically, the screen is no bigger: just 9.5ins. As all the pixels are that much smaller, the definition has to be good enough to cope with the smaller size — a problem the NEC handles with aplomb. The hard disk controller is a Picopower PT86C78: 32 bits wide but on a local bus, and the video display controller is a Chips & Technologies 65545. The battery should give a reliable hour and a half or perhaps two hours, depending on what you are doing, with a maximum life of five hours.

The rest of the machine is less interesting but well finished. The keyboard is good, although not up to the standards of the Toshiba or the Tadpole, and there is the standard set of features. There are two PCMCIA slots which double up as a single type III, proper audio with jacks for sensible sound, and a microphone. The CPU is a 75MHz Pentium, using the film carrier packaging. The machine does get a little warm but not excessively so. The trackball and associated buttons are mounted at the front of the machine, leaving them rather exposed and vulnerable if you are using it on your lap. The build quality seems good — better than the Viglen and the Opti but not as industrial as the Tadpole.

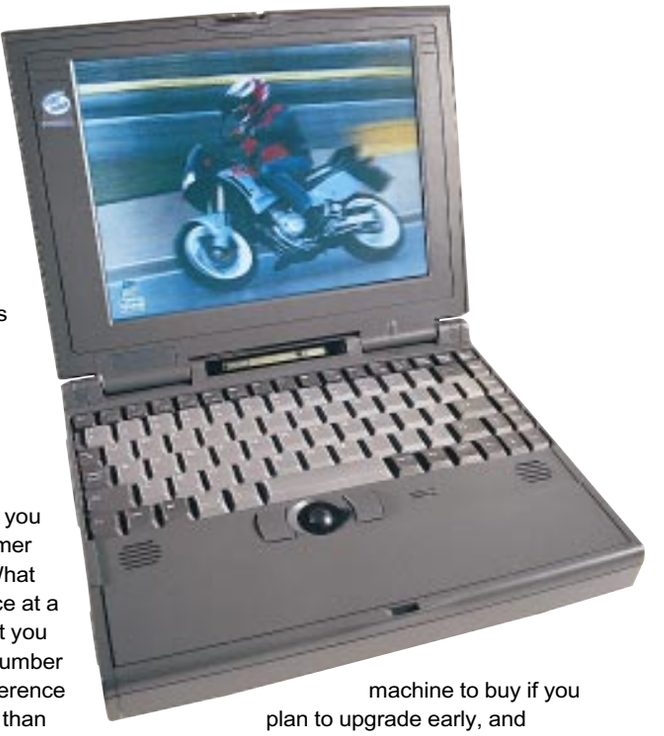
If the NEC were a car it would be a Lexus: the executive's choice. All the power you need, with plenty of Japanese innovation to conquer the dominant makes.



Ergo Pentium 120

This machine nearly didn't make the deadline for review and perhaps it would have been best if it hadn't. This is a 120MHz Pentium and was supplied with the maximum 40Mb of RAM, so it is surprising that the performance was worse than that of the 100MHz Tadpole and amazing that it failed to live up to the abilities of the 90MHz Viglen. We had much higher hopes for it; the Ergo 120 proved to be only a little quicker than the 90MHz machine. (The machine isn't made by Ergo: the company just badges and sells the unit.)

It's a well featured machine, supplied with Windows sound system, a microphone and speakers (albeit pretty low-fi ones). It is also SoundBlaster compatible. The local bus hard disk is a 32-bit EIDE device using Toshiba drivers. The 1Mb VRAM video display processor also sits on the local bus, which is based on a VL design. This is simpler than the PCI technology utilised by the Toshiba and could explain some of the benchmarking test results. While a PCI bus is buffered so that the processor can run full tilt, VL is not. Under ideal circumstances, the lack of anything between the processor and the peripheral will lead to better performance, but in the real world — and that's what NSTL (the VNU Labs testing system) tests — the video and the hard disk both want a look-in at the processor. Without a buffer, one must stop to allow the other access. Causing a peripheral to



wait is Not A Good Thing. It seems that a machine originally designed to be optimal at 90MHz has reached the top and has had to stop. Intel charges 50 percent more for a 120MHz Pentium than it does for a 90MHz one, and in this case, the extra expenditure would be wasted.

There didn't seem to be any heat problems. The computer ran happily all day without causing concern. To do this, of course, it had to be left plugged in — the Nickel Metal Hydride battery proved to only be good for less than a couple of hours, despite APM.

The rest of the machine is equally unstimulating. The keyboard is okay, but that still makes it the poorest of the bunch, and the trackball is a little awkward. It's also larger than A4. The fun software, including Icon Hear-it which squawks at you when you do something silly (like exit Windows) does only a little to redeem this system. Ultimately, a machine that we wanted to like and which had a sexy specification, failed to deliver.

If the 120MHz Ergo was a car it would be a Dodge Viper. Loads of potential power but with the inability to use it.

Opti Pantera

Déjà VDU strikes the notebook. If the Opti has a familiar feel it's because it's from the same Far Eastern source as the Viglen. It similarly has a 90MHz CPU and exactly the same build quality.

The better quality of the Viglen screen might be attributable to tighter quality control or better preparation of review machines but is probably down to the random variance of build qualities. It stretches the definition of A4 at 279 x 216mm and is 51mm high, but the extra depth allows room for the trackball. This works well enough but isn't as good as the nipple on the Tadpole or the Toshiba. The video chip story is much the same as elsewhere with the Chips & Technologies 655DGX, but as with the Viglen it's the disk performance which shines thanks to the excellent enhanced IDE system.

Battery performance is as unspectacular as any of the machines tested; a sensible 90 minutes. The maximum RAM limit is a little meagre at 24Mb. This may sound like a vast amount of headroom but it wasn't long ago that 4Mb was beyond the dreams of many.

Build quality is not a concern and you don't get the Video for Windows puff for Viglen, which comes with its stablemate. Ultimately, the hardware is the same. What you don't get is the Viglen customer service or documentation. What you do get is the performance at a low price. It's more likely that you will find the Opti wearing a number of other badges, but with reference to the British importer rather than the Taiwanese manufacturer. It's better to know where a machine came from so that you can be sure of spares and service — if the company which badges the Opti stops selling it, you can continue to obtain bits like batteries.

The manual claims that Nickel Metal Hydride doesn't suffer from "memory effect". Leaving aside the argument that what people call memory effect is really voltage depression, this statement is not true. NiMH is very much better at dealing with irregular charging but is not immune to it — all batteries will curl up their toes if mistreated.

If the Opti was a car it would be a Nissan 300ZX. A quick oddball which offers a lot of the features and performance of a Ferrari or a Porsche but lacks the ultimate pose value or quality.

Conclusion

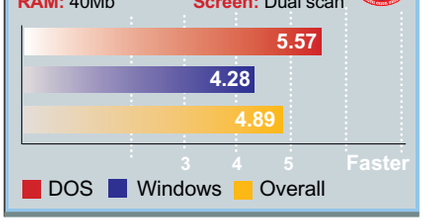
This proved to be an interesting test. At the start it seemed as though the Toshiba would have it all its own way — it may be the most sensible buy and is what companies buying in bulk should go for, but it's not the best in any one field. In terms of value for money, the Viglen Dossier is the winner; well up in the performance stakes with good sound and backup, it's the machine to buy if you plan to upgrade early, and frequently, to keep ahead in the power race. But the Viglen performance and the Toshiba build quality are both surpassed by the metal menace from Cambridge; the Tadpole is a real heavyweight and eats MIPS for breakfast. The money problem can be alleviated somewhat by buying from Adams Technology, but it is still expensive.

The NEC notebook came top of the test. Performance may be disappointing but the screen is a real breakthrough. Even when it is physically small, the 800 x 600 display is seductive and will make you more productive. You pay a premium for this: the SVGA machine costs £5,445 and the 640 x 480 version is a mere £5,145, but both machines have the 810Mb hard disk and both are highly desirable. Whichever one you take away, you'll be making great tracks.

Ergo Pentium

Performance Graph

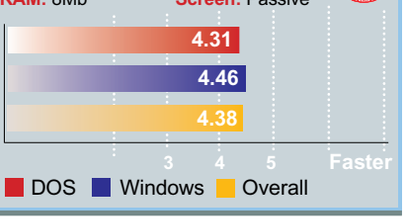
Hard Disk: 773Mb **CPU:** 120MHz
RAM: 40Mb **Screen:** Dual scan



Opti Pantera

Performance Graph

Hard Disk: 360Mb **CPU:** 90MHz
RAM: 8Mb **Screen:** Passive



PCW Details

Viglen Dossier P90
Price £3,619
Contact Viglen 0181 758 7000

Tadpole P1000
Price £4,860 (8Mb), £7,310 (64Mb)
Contact Tadpole 01223 428200

Toshiba T4900CT
Price £5,395
Contact Toshiba 01932 828828

NEC Versa P75
Price £5,445
Contact NEC 0181 993 8181

Ergo Pentium 120
Price £2,450 (8Mb), £3,455 (40Mb)
Contact Ergo 0115 9452565

Opti Pantera
Price £2,450
Contact Opti 0181 507 1818

WAITING IN THE WINGS

ISDN explained

The Integrated Services Digital Network (ISDN) is a technology that has spent ten years waiting to fulfil its promise as a digital highway. But if its benefits are to be capitalised on, greater attention needs to be paid to its support and promotion. Terence Green goes into detail, and presents a selection of currently available products.

The Integrated Services Digital Network (ISDN) has the reputation of being inaccessible and expensive. It is, but the changes already underway could see ISDN becoming the digital highway it has always promised to be during the last decade.

Today, interoperability between ISDN devices is minimal. And it's expensive to install and rent the lines from BT. Vendors complain that BT makes ISDN too expensive but the manufacturers have been slow to move away from proprietary standards. However, a co-ordinated move towards open standards, by hardware and software vendors, could see ISDN becoming really useful in 1996. The standard is virtually in place, interoperability testing is beginning, and fully compliant products should begin to emerge later this year. Of course there are still two standards that match this description (see "ISDN Applications") but heck, at least it's progress.

If BT then acts as expected and prices ISDN less like a premium service and closer to ordinary telephone charges, who knows? We could, like the Germans, have 500,000 ISDN lines instead of the 50,000 that exist in Britain today.

Promises, promises

ISDN promises much — a single digital pipe into your premises for all communications with a potential 144kb/sec available in its basic two-wire configuration, and up to 2Mb/sec over four wires. Specifically designed to be delivered over existing copper cables, ISDN extends the digital trunk network right into your premises using wiring that already exists outside your front door.

Providing higher bandwidth than a modem and charged on a usage basis, ISDN is equally appropriate to business use, home or home-office use. Home users get multiple lines for voice and data services, for instance: telephone, home banking, educational, leisure. Home-office users can attach to remote LANs but only incur call charges when they're accessing LAN services. Businesses can attach branch offices to the network without paying the fixed cost of a leased line.

Intended as a worldwide upgrade to full digital status for the Public Switched Telephone Network (PSTN), and as a platform for advanced digital services, the first standards for ISDN were established over ten years ago, but provision has grown very slowly. ISDN has been hanging around as a niche market for leased line backups and bulk file transfers for years. According to BT, over 20 percent of ISDN traffic consists of data transfer, with LAN interconnection and remote LAN accounting for 12 percent each.

Pros and cons

ISDN provides significantly greater capacity for data communications but it also enables existing analogue equipment, such as faxes and telephones, to be used alongside ISDN devices. This allows for a phased transition from the analogue telephony world to an all-digital communications network. In theory, this means a single carrier over which existing voice, data and fax applications can be integrated with new applications such as Group 4 fax, video conferencing, remote networking for teleworkers, and home banking and shopping.

In reality, ISDN is today characterised by limited applications and hardware interoperability, expensive hardware, and for British users, BT's high installation and rental charges. Mercury's call charges are significantly lower but BT owns the copper up to your front doorstep and sets the entry fee with its standard £400 installation charge and line rental costs which are twice that of a standard phone. Mercury will cable you at some expense in city-centre locations for Primary Rate ISDN, but offers an indirect Basic Rate connection via an existing BT ISDN line.

BT says the charge reflects actual installation costs for which they are obliged to charge by Oftel. But charges should fall by the end of this year thanks to new exchange equipment. It may happen even earlier if BT's forthcoming end-user Internet access service supports ISDN access. This is a fair bet: CompuServe has said it will provide ISDN access, and BT is also involved in providing the Microsoft Network that will be delivered with Windows 95 and will include ISDN access. Basic support for ISDN will ship in the first release with more complete support to follow early in 1996. Many ISDN vendors are working on providing support in Windows 95, and BT will itself be releasing a set of its own end-user packages, designed to take the mystique out of ISDN.

British Telecom takes a fair amount of stick for its charges, and rightly so, but another significant disincentive to ISDN is the fact that it is a hard task master. To be successful, ISDN applications must fully integrate hardware and software; mixing and matching ISDN equipment too often leaves you tweaking arcane command line entries, only to discover some obscure incompatibility between different vendors' software or hardware.

True shrink-wrapped ISDN applications, for anything other than simple file transfers, are as rare as hens' teeth. Unless you live and breathe ISDN you'll want to be very sure that the hardware on both sides of any connection comes from the same manufacturer, and that you're running software that's explicitly supported by that hardware.

ISDN Technology

A single ISDN channel delivers 64kb/sec, twice the bandwidth of the fastest possible analogue modem. ISDN service is supplied via the carriers through either Basic Rate or Primary Rate interfaces. This article concentrates on ISDN Basic Rate interface (BRI), which provides two 64kb/sec bearer B-channels, and one 16kb/sec data D-channel, per physical ISDN line. This is delivered via a single pair of copper cables which already exist at one's premises.

With 30 B-channels and two 64kb/sec D-channels, Primary Rate interface (PRI) delivers up to 2Mb/sec (1.5Mb/sec in the US & Canada) for intelligent PBXs and bandwidth on demand for high-bandwidth applications. PRI is available from BT in packages starting with six bearer channels, and running up to 30.

Call charges are per B-channel. When both B-channels are in use, each is racking up call charges. Within Britain, these charges are the same as for the PSTN but international calls attract a premium.

Under the ISDN specification, several bearer services for the transmission of data are defined, as is a range of supplementary services such as Caller Line Identification. Both have priority subsets which most ISDN providers now deliver. A full implementation of all defined bearer and supplementary services is being rolled out during 1995 and 1996.

Most ISDN users will use circuit-switched bearer services, but packet-mode bearer services are provided for compatibility with X.25 services. Circuit-switched B-channels handle the transmission of data, speech, video and the like which support circuit-switched speech, 3.1kHz audio and unrestricted 64kb/sec.

The 64kb/sec mode is basically a raw ISDN B-channel pipe, but speech and audio modes are also carried over B-channels. While speech mode supports digital telephones, audio mode provides backwards compatibility for analogue devices such as PSTN telephones, modems, and Group 3 faxes. They can only be connected, however, if the ISDN device provides an analogue port and digitising circuitry. A fourth mode, B-channel aggregation to give 128kb/sec (2xB), is not available from the majority of service providers and must therefore be implemented in the software application or ISDN device driver.

Packet-mode services, which provide compatibility with existing X.25 packet-switched services, can be carried over either B-channels or the D-channel. In most countries, these services are not yet provided and the D-channel is used solely for signalling. France is the exception, where the D-channel is widely used for packet switched data.

It is believed that BT will open up the D-channel for data in the near future. In addition to X.25 access it could be used for low-bandwidth applications, such as credit card enquiries, by shops and small businesses. The physical ISDN installation consists of a BT network terminator with two RJ-45 sockets for the B-channels to which the two incoming copper wires are attached. Thanks to the RJ45 socket, ISDN can be patched into and distributed via standard Category 3 and 5 premises' wiring systems. An ISDN device can either be connected to each channel and used simultaneously, or the two channels can be aggregated (sometimes called inverse multiplexing) to give 128kb/sec throughput.

Although ISDN service is delivered via two wires, it is distributed by an eight-wire bus called the S-Bus. This supports up to eight attached devices, any two of which may be in use simultaneously. There are various signalling schemes available which will route an incoming call to a particular device and these schemes form part the basic set of defined supplementary services. They include calling line identification, direct dialling inward (DDI) and multiple subscriber number (MSN). In the UK, British Telecom charges for all supplementary services.

ISDN Applications

ISDN applications have been slow to develop because there have been few generally accepted non-proprietary standards. That is not to say that there isn't a choice of standards — in fact, there are lots. However, even within ratified and *de facto* standards it is possible to create interoperability problems by supporting different levels of a standard.

The original ISDN application, if it can be called that, was leased-line backup and it's still quite popular because an ISDN call can be set up in less than a second. As soon as a failure is detected, the ISDN line recreates the connection. ISDN is also widely used in conjunction with a leased line to provide on-demand bandwidth, so if one user starts a megabyte file download, for instance, the ISDN line pops up and everyone else gets to carry on as normal.

Another very popular application at present is LAN interconnect via an ISDN bridge or router. Both allow LANs to be connected at speeds of 64kb/sec or higher and have the advantage over leased lines in that you only pay for the time you're actually transferring data.

Most bridges and routers will allow you to filter out status and keep-alive broadcast packets so that the link is only activated when data is being transferred. The trick is in ensuring this "spoofing" works properly on your network so that you don't end up with a permanently active ISDN line.

The amount of time you can spend online via ISDN (before call charges become uneconomical) as opposed to a leased line, varies with the call charge band: currently, it can be as little as three hours or as much as eight hours, according to whether the call destination is local, national or international. Many *ad-hoc* LAN interconnects and remote LAN nodes would find ISDN more effective and also less inflexible than a fixed point-to-point leased line.

Some applications are obviously suited to ISDN's *ad-hoc* connections because they transfer data on an intermittent basis. For example, Microsoft is hoping to use ISDN for Microsoft Mail. For roaming mobile remote LAN nodes, which cannot always rely on finding an ISDN line, the situation is less clear, but there are moves afoot to implement solutions via ISDN's X.25 packet-switched bearer service.

PCW Photography by Bruce *Mackie*

ISDN Interoperability

One of the trickiest problems facing potential ISDN users is discerning whether the equipment and software they purchase will interoperate with similar ISDN devices. Some manufacturers have taken steps to ensure that their devices interoperate, but others leave it to the customer's software to handle such issues and this can lead to tears.

Terminal adaptors

Terminal adaptors typically support V.110 or V.120 rate adaptation; a scheme devised to allow existing communications software to control the terminal adaptor as though it were a modem. Terminal adaptors are not modems; they emulate a modem for the benefit of modem communications applications such as ProComm and CrossTalk. External TAs connect to a PC's COM port, while internal TAs include a COM port in the same way as an internal modem. This allows communications applications to talk to the TA using a standard asynchronous modem control set such as the Hayes AT command set.

This is fine in theory but each vendor's TA implements the system in subtly different ways: some support only V.110 which has a maximum speed of 19,200bps, or 38,400 if the TA supports data compression which is usually through the V.42bis standard. This hardly makes use of the potential 64kb/sec in a B-channel.

Other manufacturers support V.120 which has a maximum speed of 57,600bps (more with compression) and may or may not support V.110 in addition. External TAs are also limited by the serial port of the PC while internal TAs are free to go as fast as their vendor pleases. Most TAs use only one B-channel of the pair in a BRI, but there is a Bandwidth On Demand (BonDing) proposal for V.120 which will overcome this deficiency once it has been widely implemented. Less easy to overcome is the variety of V.110/V.120 implementations and users are best advised to have the same kit at either end.

Bridgers and routers

Bridges and routers present an Ethernet network interface and should be able to spoof unnecessary broadcasts such as watchdog packets. Unless they are filtered out, these informational packets will keep the ISDN line active even though no data is being passed.

ISDN bridges are internal PC adaptors, or external boxes, which may be used to link LANs with LANs or to allow remote users to attach to a network over an ISDN line. For small workgroups and lightly-loaded LANs, a bridge is cheap and easy to use and can be implemented using a relatively inexpensive ISDN adaptor which simply presents an ethernet interface to the network across an ISDN link.

ISDN routers are more expensive, generally include onboard processing capability and can handle multiple network protocols. Routers may also obviate the need for special software because they have the ability to filter out extraneous packets which would keep the ISDN line active even though no data was being transmitted.

For the most part, bridges currently use proprietary device drivers but the Common Applications Programming Interface (CAPI) allows some ISDN software to work with several vendors' ISDN bridges. Most proprietary software automatically handles spoofing and channel aggregation but a proposal currently underway for the Point to Point Protocol (PPP) is being adopted by most of the industry and should foster ISDN applications which work seamlessly with any similarly-endowed ISDN bridge. The same proposal will also lead to less proprietary routers.

In summary, terminal adaptors emulating COM port modems and bridges and routers using CAPI or PPP represent the way forward but as yet neither CAPI nor PPP are completely implemented in ISDN software and hardware. Researching hardware that will interoperate using either of these standards is something of a moveable feast. Drivers may be updated if the supplier has committed to support CAPI or PPP interoperability, and hardware with flash ROM can be similarly updated.

PPP and CAPI 2.0

Currently, most applications rely in part on proprietary solutions and this limits flexibility when choosing hardware or software. Having recognised this problem, the industry is engaged in a widespread exercise to improve interoperability and working solutions can be expected later this year, or early next year.

The two leading contenders are: the Internet Engineering Task Force (IETF) Point to Point Protocol (PPP) which is a standard method for implementing operating system-independent multi-protocol routing; and CAPI 2.0 which provides a device dependent API layer for ISDN applications. In time, CAPI 2.0 interfaces for DOS, Windows, OS/2, Novell NetWare and Unix will be available.

CAPI

CAPI originated in Germany and has been proposed to the IETF as an ISDN standard. Much ISDN software and hardware originates in Germany and supports CAPI. Unfortunately, the support is spread between CAPI 1.1 and the latest CAPI 2.0 specifications which are incompatible so it is still possible to have a CAPI-supporting application and an ISDN card with a CAPI driver yet still find them to be incompatible.

Nevertheless, CAPI is big in Germany and supported by both Novell and Microsoft. But Microsoft will initially only ship CAPI support with German retail Windows 95. The latest PPP software will go into WIndows NT first (later on this year) and thereafter into Windows 95.

Novell's server-based ISDN multi-protocol router supports CAPI and the company is putting the finishing touches to a CAPI Manager NLM for telephony applications. Novell also supports ISDN connectivity via Hayes AT commands.

PPP

The Point to Point Protocol is defined by a series of IETF RFCs (Request for Comment), some ratified, some still in draft. In theory, only one should be able to use PPP-supporting software to set up connections between any two PPP-capable ISDN devices. In practice, there are several issues concerned with whether the ISDN devices present as network (ethernet) or serial (COM port) interfaces. Network interfaces (commonly bridges and routers) use fewer CPU resources than serial port (terminal adaptors) interfaces.

Additionally there are issues surrounding security authorisation, the use of multiple ISDN B-channels, and compression which are still being worked out. Once these are finalised and the driver software ships, you should be able to connect using PPP-supporting devices from any vendor.

Bleak as things may seem, this is not to say that ISDN is not useful today, because it is: it's just poorly promoted and poorly supported by the industry. The signs are that a change is underway and that the industry will actually capitalise on the benefits of ISDN rather than extract a premium for delivering a service that currently disguises most of the potential advantages that ISDN could make available to all.

Integration skills

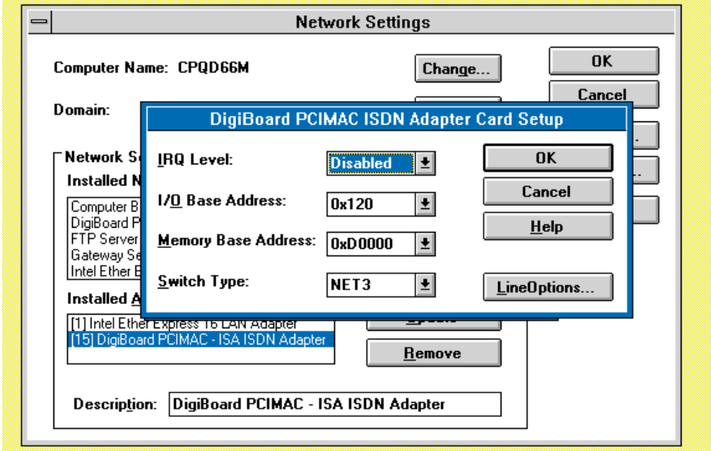
In general, ISDN still requires too many integration skills to be seen as a serious end-user proposition. This is ironic because the basic aim is to provide a single communications pipe into one's premises, at the same time supporting existing analogue equipment if necessary to allow users to make a staged transition.

Selected ISDN products

DigiBoard

Digi International's PCIMAC is an internal PC adaptor which provides an ISDN network interface with PPP support. The PCIMAC board can be used in client or server configurations with Microsoft Windows NT Remote Access Server and Novell NetWare. It is supplied with DOS ODI and NDIS PPP drivers for NetWare and Windows for Workgroups clients, with client and server drivers for Windows NT and with NetWare server drivers for ODI or Novell's Multiprotocol Router software.

With appropriate software such as Windows for Workgroups' 32-bit TCP/IP stack, NetManage Chameleon etc, any ISDN terminal adaptor can dial into a Windows NT RAS server with a PCIMAC. Digi also sells ISDN hubs for multiple connections and ISDN Ethernet LAN bridges.



PCW Details

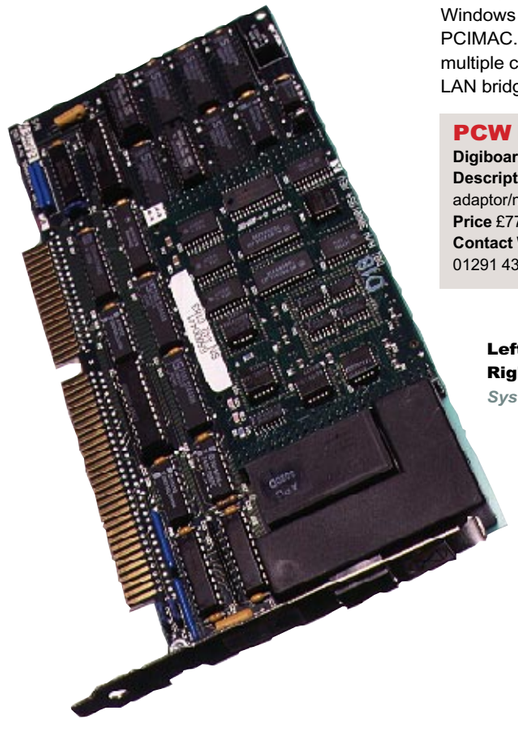
Digiboard PCIMAC
Description ISDN BRI terminal adaptor/network interface
Price £770
Contact Westbase Technology
01291 430567. Fax 01291 430 484

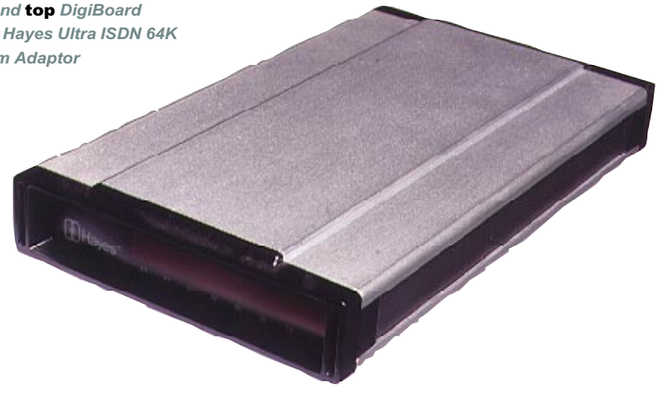
Hayes Ultra ISDN 64K System Adaptor

The Hayes terminal adaptor supports B-channel circuit switched data and packet switched data and D-Channel packet switched data. An X.25 PAD is included. The Hayes Ultra TA supports synchronous connections to 64kbps and asynchronous links with rate adaption for V.110 (up to 38,400bps), V.120 (up to 115kbps) and X.25. It does not include hardware-based compression.

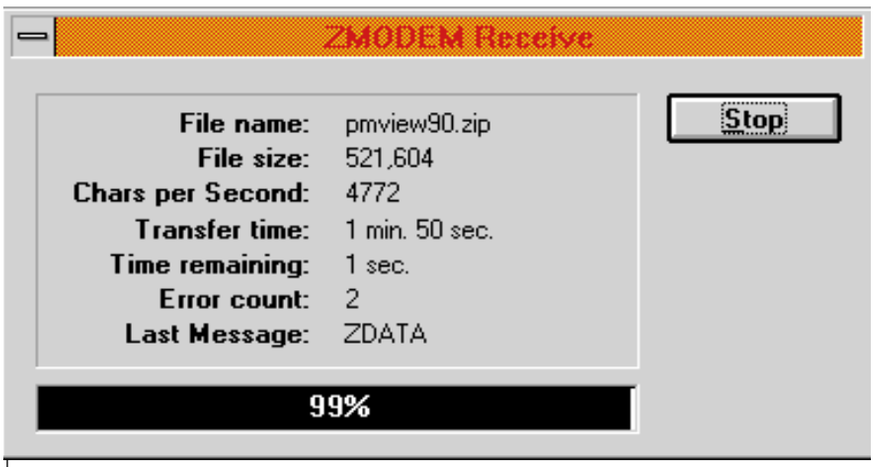
Housed in the same case as Hayes modems, it connects to a PC via a COM port and can be used for LAN interconnection, remote LAN nodes, and file transfers.

When used for asynchronous file transfers, ISDN terminal adaptors running at 57600bps without compression provide similar throughput to V.34 modems with V.42bis compression, about 5,700 characters per second. However, for compressed files and binaries which V.42bis does not compress, the through-





***Left** and **top** DigiBoard*
***Right** Hayes Ultra ISDN 64K System Adaptor*



The Hayes Ultra ISDN 64K at work

put falls back to under 3,000cps for V.34 modems while an ISDN TA maintains 5,700cps. The digital link is also more reliable than an analogue modem which rarely maintains its rated speed due to fluctuating analogue line conditions.

PCW Details
Hayes Ultra ISDN 64K
Description ISDN terminal adaptor
Price £799
Contact Hayes UK 01252 775577.
Fax 01252 775511

Dataflex Desktop Diamond

The Dataflex Desktop Diamond is a desktop terminal adaptor which connects to the PC via a COM port. The Desktop Diamond supports synchronous links up to 64kbps but it only supports asynchronous V.110 rate adaption up to 38,400bps, making it not much faster than a V.32 modem. On the positive side, the Desktop Diamond does have two analogue ports so you can attach analogue devices such as ordinary telephones, fax machines and modems, and make calls over ISDN to other analogue devices. This is particularly useful for home and small business users who want ISDN speed and reliability without the hassle of having to maintain a PSTN line for their analogue devices.

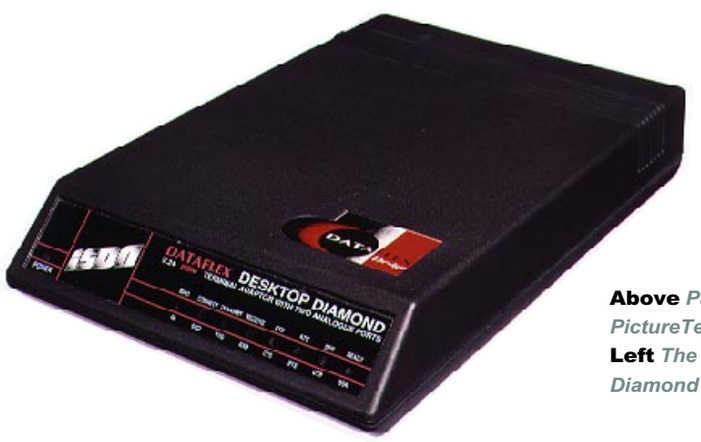
The Desktop Diamond operates with regular communications software via the Hayes AT command set. The company plans to ship in due course a Windows 95 driver which will support the full 64kbps per channel capability.

PCW Details
Dataflex Desktop Diamond
Description ISDN terminal adptor with two analogue ports
Price £699
Contact Dataflex 0181 543 6417.
Fax 0181 543 7029

PictureTel PCS/100

Video conferencing is an emerging ISDN application only in the sense that it is now being developed to work on desktop PCs at a reasonable price. Group conferencing is already commonplace using ISDN in addition to other transmission technologies. Standards for desktop video conferencing such as the ITU T.120 standard for sharing applications data are still being defined.

PictureTel is the leading supplier of group conferencing systems and it is now bringing its technology to desktop systems. The PCS/100 is expensive but it includes a camera, a digital telephone,



Above *Parts of the PictureTel PCS/100 system*
Left *The Dataflex Desktop Diamond*

3Com-Sonix Arpeggio PC

two PC adaptor cards (one for the video, one for ISDN), and software for application sharing.

The PCS/100 complies with the international H.320 standard for video-conferencing which allows calls to be made between systems from different manufacturers if their equipment is H.320-compliant. PictureTel recently introduced a cut-down ISDN-only version of the desktop system called the PCS/50 which retails at £2,500.

PCW Details
LIVE PCS 100
Description Desktop video-conferencing software and hardware package
Price £3,495
Contact PictureTel 01753 673000.
Fax 01753 673010

3Com-Sonix Arpeggio PC — Remote LAN Workstation

Sonix, recently purchased by 3Com, has a range of ISDN terminal adaptors, LAN bridges, and routers under the Arpeggio name. The Arpeggio PC is at the bottom of the range, an internal PC card terminal adaptor which can operate as COM1 through COM4. It also has an analogue port for attaching a telephone, modem or fax.

The Arpeggio PC may also be programmed directly though its API. Sonix provides drivers for use as an NDIS client to a Microsoft or IBM server and for access via NETX to an Arpeggio ISDN Bridge on a Novell NetWare LAN. CAPI 2.0 drivers are in preparation.

In terminal adaptor mode the Arpeggio PC supports V.110 rate adaption with V.42bis compression, and has a Sonix proprietary mode which supports speeds up to 115kbps and a throughput in excess of 10,000 characters per second using V.42bis compression on a 64kbps B-Channel.

PCW Details
3Com-Sonix
Description V.110 terminal adaptor and network interface card
Price £1,095
Contact 3Com-Sonix 01285 641 651.
Fax 01285 642 098

ISDN for Workgroups

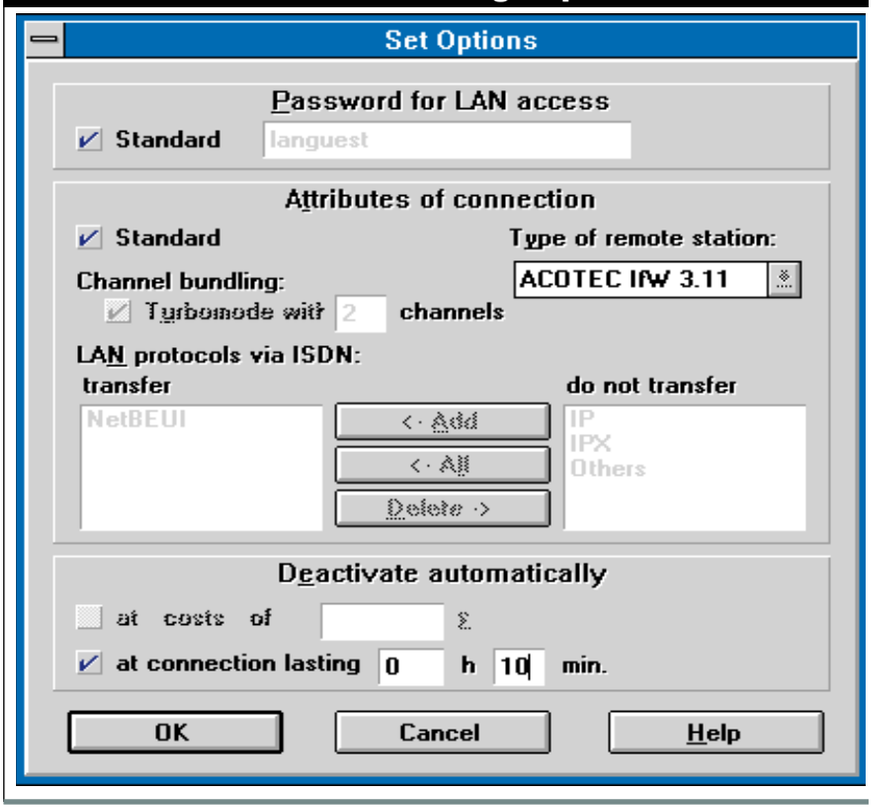
ISDN for Workgroups is a software addition to Windows for Workgroups developed by Acotec, a leading German ISDN company. IFW is available in single-user and multi-user versions. Multi-user IFW acts as a gateway and must run on a PC with a supported ISDN adaptor installed.

Users running single-user IFW can access resources on another WFWG network via the multi-user gateway in a number of ways. If they're dialing in from a remote PC they need an ISDN adaptor installed. If they're in the same workgroup as an IFW multi-user gateway, they don't need an ISDN card as they can call out to a remote WFWG network or to a remote WFWG PC via the gateway.

Soon to appear in a Windows NT version too, ISDN for Workgroups can bridge NetBeui, TCP/IP, and IPX traffic while keeping the ISDN line active only when data actually needs to be passed over the ISDN link.

PCW Details
ISDN for Workgroups
Description ISDN remote networking add-on for Windows for Workgroups 3.11
Price Groupgate single-user £295; multi-user £695. Basic ISDN card £395
Contact PPCP 0181 893 2277.
Fax 0181 893 1182

ISDN for Workgroups



Scantastic

PCW Scanner Photography by Bruce *Mackie*

Many of the latest flatbeds are getting close to the publishable quality produced by expensive, professional drum scanners. Gordon Laing puts you in the picture and reports on the results of rigorous tests on 18 popular models.

Affordable desktop scanners are no longer merely devices to get images inside a computer. As standards have improved, superior units are being touted as serious alternatives to expensive drum scanners.

Particularly noteworthy is the new breed of 30-bit and 36-bit flatbed scanners, claiming not paltry millions, but *billions* of discernable colours. This massively expanded range is said to be different from the old breed, and closer to the fabled drum scanners necessary to produce professional quality, publishable images.

Many of the scanners tested here are playing the numbers game of 30-bit and 36-bit colour depths. Others claim they can match this performance by fine tuning conventional 24-bit engines.

Some things never change; most of the scanner manufacturers are making huge claims in terms of resolution, interpolated of course, where numbers often appear to have been pulled out of a hat.

One thing is certain: nothing can hide from the results of our tests presented over the following pages. We put 18 colour flatbed scanners in the labs and hit them with the toughest tests yet seen at *PCW*.

We grouped the flatbeds into three price ranges: budget at less than £700 RRP; the highly competitive mid range from £700 to £1,400 RRP; and those over £3,000 which should perform nothing short of miracles. Here we give the results of our comprehensive testing, explain how scanners work, what different types of scanners are available, what you can use them for, and also discuss colour management and correction.

Whether you have £299 or £3,495 to spend, we have a colour flatbed recommendation for you.

How scanners work

All scanners work on the same principal of reflection or transmission. The image is placed before the scanning head, consisting of a light source and sensor; in the case of a digital camera, the light source could be the sun or artificial lamps. The amount of light reflected by or transmitted through the image is picked up by the sensor, then converted to a voltage proportional to the light intensity: the brighter the part of the image, the more light is reflected or transmitted, resulting in a higher voltage. This is finally converted by an analogue to digital converter into information the computer can understand.

The sensor in many scanners is a charge coupled device (CCD). A CCD consists of many photo-sensitive elements, arranged in a grid in the case of a video or digital camera, or in a long, thin line in the case of desktop scanners. The more photo-sensitive elements per unit length, the higher its resolution.

A desktop scanner claiming a horizontal optical resolution of 300 dpi and a maximum document width of 8in will have 8 x 300, or 2,400 usable elements on the CCD. The CCD itself is usually around 4in wide, so an optical system in the scanning head focuses the light down to the correct size.

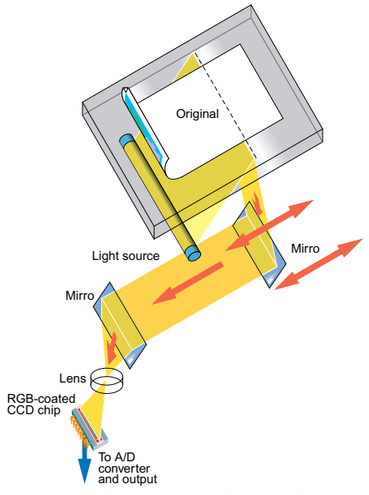
The vertical resolution of a desktop scanner is dictated by the degree of fineness with which the head can be physically directed over the image. In the case of a flatbed scanner, the head is driven by a stepper motor; a device which turns a pre-defined amount and no more, every time an electrical pulse is fed. It's common that the maximum vertical resolution may exceed the horizontal resolution thanks to the stepper motor being highly geared; an optical resolution of 300 x 600 dpi is not unusual.

The optical resolution represents the maximum resolution of the CCD and the stepper motor as described above. It is, however, possible for the apparent resolution to be increased using a technique known as interpolation, which under software or hardware control guesses intermediate values and inserts them between real ones. Some scanners do this much more effectively than others.

Colour scanners have three light sources; one each for red, green and blue primary. Some scanning heads contain a single fluorescent tube with three filtered CCDs, while others have three coloured tubes and a single CCD. The former produce the entire colour image in a single pass, while the latter will have to go back and forth three times. Older three-pass scanners were slow and used to suffer from registration problems, but modern three-pass units are much improved and sometimes even faster than today's more common single passers.

The range of colours or shades captured by a scanner is down to the dynamic range of the analogue to digital converter, along with the purity of the illuminating light and any system noise. In theory, a 24-bit scanner offers an 8-bit range of 256 levels for each primary colour, a 30-bit scanner offers a 10-bit range of 1,024 levels, and a 36-bit scanner stretches to a 12-bit range of 4,096 levels.

The human eye is said to be incapable of discerning more than 256 grey levels, while most printers would be hard pushed to produce anything like that number. However, in practice, a few of the least significant bits are lost in noise, while any subsequent tonal corrections reduce the range further still. Consequently a 30-bit or 36-bit scanner stands more chance of capturing the subtleties in highlights and shadows which can be later enhanced, while still ending up with at least 24 usable bits to play with.



The scanner driver usually filters the higher bit rates down to 24 bits for use in an application, so any tonal or colour corrections should be made at this point where there's a larger range to play with. All scanners in this group test were provided with TWAIN compliant drivers for Windows. Macintosh scanner drivers are usually provided as Photoshop compatible plug-ins. TWAIN is not an acronym, it is a very important standard in image acquisition, developed by Hewlett Packard, Kodak, Aldus, Logitech and Caere. With TWAIN, only one driver file is required for each device. Developers need only make applications TWAIN compliant to be able to access and control any TWAIN devices.

In practice, you would select the Acquire option in the File menu of an application such as Photoshop. The user would be prompted to select a suitable TWAIN source, after which Acquire would launch the device's own driver, all without leaving the main application. After scanning, the driver automatically closes, leaving the scanned image open in the main application. There's no unnecessary quitting, launching, or saving of potentially large and possibly useless files. Not all TWAIN drivers are the same. It is up to the device manufacturer to write a driver and decide what options it should offer. All scanner drivers offer a preview which quickly displays a small representation of the image to be digitised. From here the scanning area may be adjusted along with the resolution and pixel depth.

Better TWAIN drivers offer a high degree of overall image adjustment such as brightness, contrast and colour. In addition, several offer Gamma correction. This allows adjustments to be made to specific ranges of tonal values, either as a whole, or to each primary colour in turn. Monochrome line art requires only 1 bit per pixel: on or off, black or white. An 8-bit greyscale image is eight times larger at the same resolution. A full colour, 24-bit file is 24 times larger than a 1-bit file at the same resolution. Line art is best scanned at very high resolutions, while most colour or greyscale images are fine scanned between 100 and 200 dots per printed inch. If your original is going to appear twice as big in print, double your scanning resolution. If it is to be reproduced at half the size, halve the scanning resolution.

Other types of scanners

Hand scanners

The budget route to reasonable quality scanning is the hand-held unit. Most offer optical resolutions of up to 400 dpi and 24-bit colour depth, although cheaper greyscale models may still be available.

They get around the high cost of flatbeds by requiring the user to drag the whole device manually over the image. An additional sensor detects the speed at which the head is being dragged and compensates for varying speed. The higher the resolution, the more slowly you must drag.

Another cost saving comes in the scan window, which in most cases is only 4in wide. Software is often supplied to stitch together several small scans to make up a whole one, with varying degrees of success. In practice, 4in is not all that limiting and the scans themselves are up to the same high standard as many flatbeds. In addition, a hand scanner is small and convenient.

Handhelds are available from Logitech, Mustek (Evesham Micros) and Reveal (Western Systems).

Sheet feeding scanners

Sheet feeding scanners have a fixed scanning head over which the image is fed. A fax machine is a low resolution, monochrome sheet-fed scanner. In addition, many flatbed scanners offer a sheet feeding option (ADF, or automatic document feeder) for multi-page OCR work.

High-end document image scanners, designed to scan around 40 pages per minute (ppm) in black and white, are available from companies such as Panasonic. Umax has just announced its PageOffice greyscale document scanner, ideal for SoHo users at £399; contact IMC.

Drum scanners

Drum scanners offer the highest quality of all the devices mentioned here. Unfortunately their high price and sometimes equally high learning curve has seen them used exclusively in high-end publishing. Most good bureaux have access to a drum scanner and offer the service at a cost which reflects the quality.

Drum scanners consist of a cylinder into which the image is placed and curved to fit. For this reason, they are not ideal for scanning thick or unbendable originals. Reflected or transmitted light is split and fed to three photo multiplier tubes (PMTs), one each for red, green and blue. PMTs offer a very wide range of levels, far surpassing any CCD-based scanner.

IMC distributes a relatively cheap drum scanner; the Scanview-Scanmate Magic, from £10,350.

Film scanners

Film scanners are designed to digitise transparency film. The scanning process is transmittive rather than reflective, in that the film lies between a uniform white light source and the scanning head; otherwise the process is exactly the same. For this reason, many flatbed scanners have optional transparency adapters which are little more than alternative lids with built-in illumination.

Film images are usually smaller than paper-based pictures. Since the resolving power of the flatbed does not increase magically with the attachment of a transparency scanner, you must be prepared for a loss of quality when scanning film; unless of course your flatbed offers an extremely high optical resolution, or the film to be scanned is medium format or larger.

Dedicated film scanners exist which offer optical resolutions of up to 4,000dpi; ideal for even 35mm transparencies. Nikon offers a 35mm film scanner small enough to fit in a standard 5.25in drive bay. Kodak produces a high quality and extremely fast film scanner for it's Photo CD process. Film scanners of this quality can cost thousands of pounds.

Photo CD

The cheapest and easiest way to scan film is to have a Photo CD made. Developed by Kodak, Photo CD is a standard for storing around 100 high-quality photographic images on a multi-session special recordable CD.

35mm film is scanned at a resolution of around 2,000dpi in 24-bit, resulting in a 18Mb file. From this, four smaller versions are made, each half the resolution of the last; these five versions together total around 24Mb. Kodak then feeds this information to a workstation

which compresses the 24Mb to around 6Mb, using a visually lossless system. With 680Mb available on a recordable CD, more than 100 images may be stored. Being multi-session, all 100 do not have to be recorded at the same time.

Each blank disc costs around £5, while individual images cost from 50p to £3 each, depending on where you get them done and how long you want it to take. A later extension is Pro Photo CD which offers a highest resolution twice as large as normal Photo CD, ideal for storing medium format film scans. This highest 72Mb file obviously reduces the number of images per disc.

Any multi-session CD-ROM drive can read a Photo CD, which makes it the cheapest way to get high quality scans onto your computer. With suitable software they can be read on any platform. Colour management applications such as Binuscan, distributed by IMC and tested in this month's *Hands On Graphics & DTP*, do a good job of colour correcting, sharpening and separating Photo CD images for professional printing.

Digital cameras

Digital cameras are like other cameras except for a matrix array CCD where the film would usually go. Numerous still digital cameras exist, varying vastly in price and quality. Most digital cameras contain some kind of storage system like a PCMCIA hard disk on which several images may be held before transfer to a computer.

Unlike a scanner, a digital camera can capture an image of any size larger than A4, and is mobile. One obvious application is in international photo-journalism, where a picture could be taken and sent down a phone line direct to the publisher's DTP package, without developing, in a matter of minutes.

At the low end of the spectrum are models from Logitech, Canon, Kodak and Apple, available for between £400 and £1,000. Kodak offers several digital versions of the Nikon F90 and Canon EOS-1 SLR cameras between £7,000 and £25,000. The space where 35mm film normally lies is replaced by a high resolution CCD capable of producing colour images suitable for newspaper or magazine reproduction.

At the high end, Hasselblad and Rollei offer very high resolution CCD backs for its medium format cameras. This example is studio based with a direct SCSI connection to the computer.

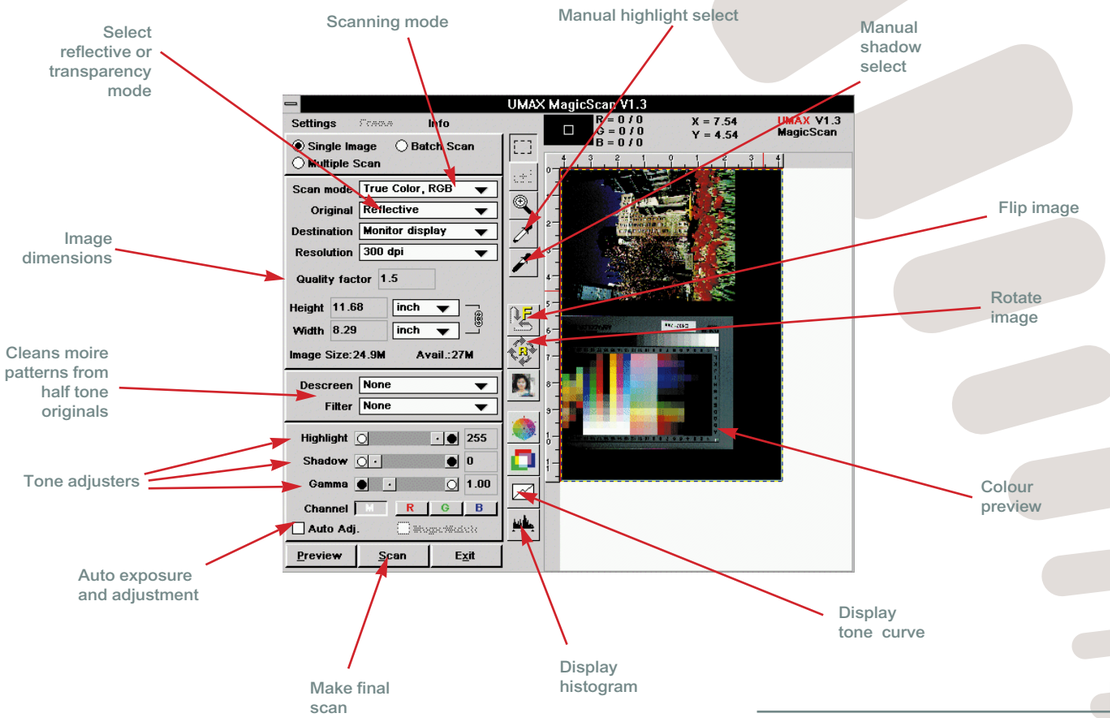
Barcode scanners

As the name suggests these are used for scanning barcodes, using a variety of means from pens to those devices used at supermarket checkouts. Call Paradigm or Scanner Technologies for more details.

PCW Contacts

Logitech 01344 894300
Kodak 01442 61122
Canon UK 0181 7733173
Apple 0181 5691199
IMC 01753 830999
Panasonic 0500 404041
Western Systems 0181 8458383
Evesham Micros 01386 765500
Nikon UK 0181 5414440
Paradigm Technology 01235 862400
Scanner Technologies 01734 770808

Anatomy of a twain driver



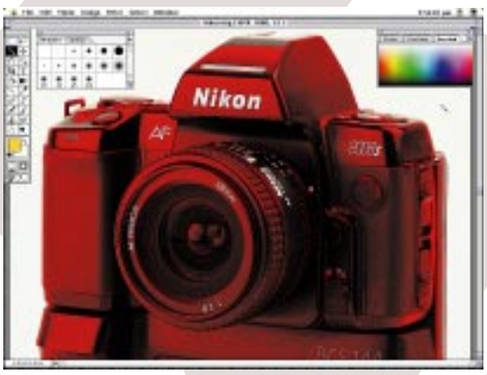
Digital photo retouching

Digital retouching is the process of manipulating a photographic image with a computer. This could be to brighten or darken an image, alter the overall colour balance, sharpen or blur it. Any of these effects may be applied globally or to selective areas.

You can be more specific and actually paint over the original image, perhaps to remove scratches or undesirable marks on the original. In advertising, photo retouching is used routinely to whiten bloodshot eyes or smooth away spots and wrinkles. It may also be used scientifically to emphasise subtle details by applying false colours, or representing the image as, say, a three dimensional map of tones.

In short, it is a digital darkroom where you can work in the comfort of your own home or office, without the red safe light and smelly chemicals. All you need is a scanner to capture your images and a suitable photo retouching application.

Buy any of the 18 scanners reviewed here and you'll be in luck, since every one of them comes with a photo retouching application capable of producing any of the effects described earlier. Of course



some are better than others. Generally accepted to be the best around, and Editor's Choice in our April photo retouching group test, is Adobe Photoshop.

Version 3, currently out for both Windows and Macintosh, was bundled with many of the scanners in one of two forms: full and cut down, known as LE. This light version lacks the more sophisticated professional publishing options, but is still highly usable and a great introduction to the genre. It may be upgraded to the full version for £179.

Colour photographic images look best displayed in more than 256 colours. Most modern graphics cards have the ability to do this but you may have to reduce the screen resolution. If your graphics card offers a resolution of 1,024 x 768 pixels in 256 colours (8-bit), it should be able to handle the lower resolution of 800 x 600 pixels in 65,536 colours (16-bit), or even 16,777,216 colours (24-bit), at 640 x 480 pixels; it's all about sharing the resources of your graphics card between resolution and number of colours.

Remember that 24-bit files are 24 times bigger than 1-bit, or three times bigger than 8-bit files at the same resolution, so make sure you have lots of spare disk space if you get into it.

Adobe 0181 6064000

OCR and tracing

When used correctly, an Optical Character Recognition (OCR) package can save hours of typing. Current packages feature impressive "adaptive recognition" algorithms. Adaptive recognition is based on complex and custom designed neural networks that have the ability not only to translate whole characters from paper to screen, but to recognise badly presented or incomplete symbols. Before release the network is exposed to thousands of fonts and typestyles, on everything from faxes to laser printouts, and it then creates its own generalisation as to what characters should look like. Some even learn as they work, and correct commonly found mistakes without constant interaction from the user. Allowing the software to make up its own mind about character shapes works far better than trying to lay down specific rules as not every document looks the same.

Most OCR packages take columns into account, while some recognise and retain various styles or formatting. OCR output varies between basic text files, or formatted documents. Either way, the

technology has not reached the extent where you can happily save the file without editing at all. The question of whether to OCR or not depends on the quality of your original document and the accuracy of your scanner and software.

Common uses for OCR software include scanning and storing electronic copies of large faxes, forms and such like. At *PCW,* we use OCR techniques to bring readers' letters into Microsoft Word for editing.

A good scanner is essential for reliable OCR. Typically they scan in line art mode at between 100 and 200dpi depending on the original type size and quality — trial and error is a big factor.

Some flatbed scanners have the option of an ADF, which sits on top of the scanner and feeds the pages through like a photocopier or fax. There are even scanners dedicated exclusively to scanning large numbers of pages very quickly. These are not so much for OCR as for digitising records for databasing. Instead of sifting through paper-filled cabinets, you search for the documents electronically and view them on-screen.

In a similar vein to tracing the outlines of characters for OCR, it is also possible to scan a logo, use a tracing application such as CorelTrace or Adobe StreamLine, and end up with a scalable, device-independent EPS; handy for all those signatures at the bottom of letters.

How we did the tests

Objective colour testing of scanners is difficult. Many reports only consider the on-screen, side-to-side appearance of digitised colour photos. Unless you are working in a highly calibrated environment, on-screen colour bears little resemblance to what you see on the printed page, and besides, comparisons made in this way are always subjective.

With this in mind we developed a new set of testing methods in an attempt to remove as much subjectivity as possible. Much of the continuous tone greyscale and colour analysis can be made using the histogram facilities offered in photo retouching applications. We used Adobe Photoshop 3 running under Windows 3.1 and Macintosh System 7.5, both in 24-bit colour depth.

All original scans were made on the Windows platform, using the provided TWAIN driver, acquiring images into Adobe Photoshop 3 for Windows. Our test PC was a Western Systems Pentium 90 with 16Mb RAM. A fast Adaptec 2940 PCI SCSI host adaptor was used to connect all scanners; the 1Gb Seagate hard disk was connected in the same SCSI chain. We also tested all the scanners for compatibility with the significantly cheaper Adaptec 1510 ISA SCSI host adaptor. All but the Mustek and Trust scanners worked with both adaptors, while these required the use of the supplied 8-bit card.

All scanners were left on for at least 60 minutes to warm up before any tests were carried out.

We scanned a 5in x 7in colour print at 100dpi in 24-bit on all scanners, with the TWAIN driver set at its default settings. If there was a simple one button or taggable "auto-exposure/adjustment" command, we used it. The aim was to test the quality of raw scans made with the least effort.

Next we scanned the Agfa IT-8 colour reference target, again using the default settings. Selecting the colour squares portion and analysing the histogram reveals exactly which colours have been captured, how full the range is, and whether any undesirable clipping has occurred on the highlight and/or shadow areas.

Comparing raw scans can prove highly subjective, but comparing histograms of raw scans is perfectly reasonable. High quality colour correction requires that a full, smooth and unclipped range is present and this is immediately obvious when looking at the histogram. We looked at the histograms of the IT-8 target and the colour photograph.

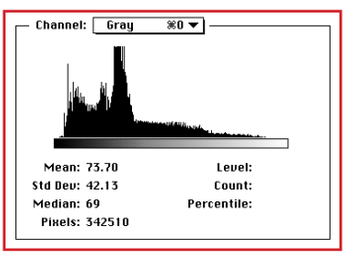
The results of colour correction and calibrated separations are presented in this month's *Hands On Graphics & DTP*. (Histograms were discussed at length last month).

Selecting the greyscale portion of the IT-8 and making a histogram reveals the number of levels resolved, how well they are defined and how much noise is present. We counted the number of well-defined, separate levels, and commented on any poor or outstanding results in the reviews.

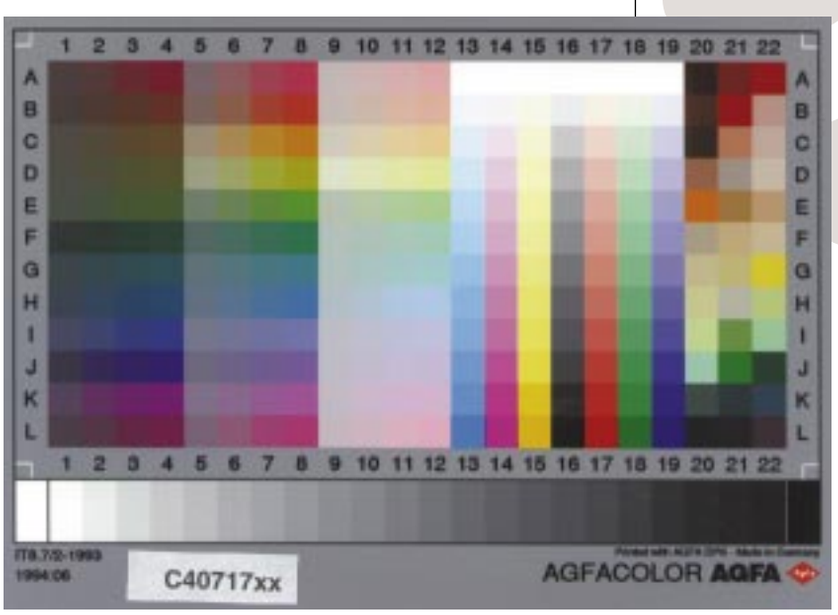
Line art resolving power is much easier to test and subjective opinions rate highly. Last year we printed the scans of a six-point letter g made at each scanner's highest interpolated resolution. This year we scanned the same character, but twice: first at the highest optical resolution and again at the highest interpolated resolution of each scanner. A character around 2mm high may be unfair for OCR, but it is a good test for resolving power.

While all the scanners tested offered either 300 x 600, 400 x 800 or 600 x 1,200 optical resolutions, the variety of claimed interpolated resolutions was enormous. Don't take the advertiser's word for it: turn to the page of g's and see straight away which scanners do the best job of interpolating. Below each result is the resolution at which the manufacturer claimed it was made: notice how some of the highest claims are more than ambitious.

Speed is an important factor. The proper speed of a scanner is the time it takes to make a final, usable scan. If you have to make several attempts, then the scanner is slow. Since this is difficult to measure, we timed how long it took to make a colour A4 preview, an A5 100dpi colour scan, an A4 mono preview, and an A4 150dpi mono scan. The results are presented on the same page as the number of greyscales resolved, and should be treated with caution. We also placed emphasis on the quality, ease of use and facilities offered by each TWAIN module; this is your interface with the scanner and there's usually no alternative.



Below, the Agfa IT-8 reference target. It was scanned on each unit and the histogram analysed. **Left** is a typical histogram, revealing an uninterrupted range but rolling off at each end



Budget scanners

Microtek ScanMaker II

The veteran Microtek ScanMaker II has now appeared in three *PCW* scanner group tests and is looking a little tired.

We looked at the ScanMaker II package, shipping with Photoshop 3 LE, OmniPage Direct 2 and a SCSI card. The XE version comes with full Photoshop.

It's a 24-bit, three-pass scanner with an optical resolution of 300 x 600dpi, interpolatable to 1,200 x 1,200dpi. The colour preview is slowest on test, taking a seemingly eternal three minutes; so opt immediately for the greyscale preview, requiring a far more reasonable 36 seconds.

The ScanMaker II scored below average on line art, and clipped both ends of the colour range, especially in shadow areas. Despite this, raw colour scans were reasonably accurate, if a bit soft. Check out this month's *Hands On Graphics & DTP* to judge it against the Agfa Arcus II, costing five times as much, before and after colour correction.

Once a frequent winner, the ScanMaker II offers no competition to the Umax T-630 which costs only £30 more.

PCW Details

Microtek ScanMaker II
Contact Computers Unlimited
0181 200 8282
Price RRP £665

Mustek MFS 6000CX

While there is a newer single-pass version of this unit, we're looking at the old, three-pass version. Anyone considering the single pass 6000SP should upgrade to the 8000SP reviewed elsewhere in this test.

The 6000CX produced a pretty slow colour preview — switch to greyscale straight away. Unusually the final colour scan was 25 percent quicker than the colour preview.

This 24-bit, optical 300 x 600 scanner ships with iPhotoPlus and WordLinx OCR. An 8-bit SCSI card is supplied, which as with the 8000SP was the only means by which we could get the scanner to work. As with last year's Mustek scanners, no communication was achieved with any of our Adaptec cards.

OCR is possible with the 6000CX, but don't look for good line art performance.

Moving on to colour; the 6000CX turned in a clean, unclipped range with good definition. Not complete to the extreme edges, but certainly usable.

Distributor Evesham Micros doesn't quote RRPs, but the 6000CX's street price is the cheapest in this group test and an excellent introduction to budget colour flatbed scanning.

PCW Details

Mustek MFS 6000CX
Contact Evesham Micros
01386 765500
Price (Street price) £299

Mustek MFS 8000SP

The latest model from Mustek is the cheapest 30-bit scanner in this group test. Distributor, Evesham Micros, doesn't quote RRPs, but the 8000's street price is pretty low.

SP stands for single-pass and the 8000 turns out an optical resolution of 400 x 800dpi, interpolatable to a somewhat ambitiously claimed 6400 x 6400dpi. Retouching is supplied by the dubiously titled ImagePals Go!, while OCR is covered by WordLinx.

An 8-bit SCSI card is fortunately included as standard since the 8000 refused to communicate with any of our Adaptec SCSI cards, despite claimed compatibility. Interestingly this seems to happen with all Mustek scanners, including those we tested last year.

The 8000 is a reasonably quick unit, turning in a full colour range with a little clipping in the shadows. The auto settings produced one of the most discoloured raw scans, but all the colours were present to be corrected if desired. Magic Calibrator was included to do the deed. The line art result was not good and demonstrates how claimed high interpolated resolutions are often meaningless.

PCW Details

Mustek MFS 8000SP
Contact Evesham Micros
01386 765500
Price (Street price) £499

Budget scanners

Trust Imagery 1200

Personal Computer World HIGHLY COMMENDED

It looks like a Mustek 6000 and indeed it is, identified for all to see, on a SCSI ID scan. But the 1200 did communicate with our Adaptec SCSI card, when all Musteks appear to refuse point blank. However, the 1200 experienced subsequent difficulties and was far happier with the supplied 8-bit SCSI card.

The 1200 is a three-pass 24-bit unit offering an optical resolution of 300 x 600dpi, interpolatable to 1,200 x 1,200dpi. The standard package ships with iPhoto Plus, WordLinx OCR, and of course, that SCSI card.

Curiously the 1200 was a bit faster than the Mustek 6000 in all but the A4 line art tests; more importantly it was faster than the slightly more expensive 2400 model.

The 1200's line art quality results weren't very good, but better than the Mustek 6000, while colour scans displayed a similarly wide range, missing only the darkest shadows. Raw colour scans lacked ultimate vibrancy, but were certainly workable.

And look at the price, the 1200 comes highly recommended for anyone wanting a budget colour flatbed.

PCW Details

Trust Imagery 1200
Contact Aashima Distribution 01376 501146
Price RRP £375; street price £309

Trust Imagery 2400

It looks like a Mustek 12000 and indeed when your SCSI bus scans the IDs, there it is: Mustek 12000. So what's different? For a start, the Trust unit, paradoxically for a rebadge, actually worked with our Adaptec card — although it experienced some later difficulties. An 8-bit alternative is provided, as with the Musteks, just in case.

It's a three-pass 24-bit unit with an optical resolution of 600 x 1200dpi, interpolatable to 2,400 x 2,400, and very cheap at a typical street price of £429. This includes Photoshop 2.5 LE, WordLinx OCR and a reasonably equipped TWAIN module bearing a remarkable resemblance to the Mustek 12000s.

Interpolated line art was well below par, although at the optical maximum, it scored similarly to other 600dpi units. The colour range was missing the top and bottom five per cent of levels, but otherwise smooth. Raw colour scans were lacking vibrancy, but fairly accurate.

The 2400 is very slow, in fact slower than its cheaper counterpart, the 1200, which you could consider instead.

PCW Details

Trust Imagery 2400
Contact Aashima Distribution 01376 501146
Price RRP £499; street price £429

Umax Vista T-630

Personal Computer World EDITOR'S CHOICE

The T in the name of the cheapest of the three current Umax Vista scanners stands for three-pass. It's a 24-bit model and a little boxy looking, but don't let appearances put you off: this scanner is wonderful.

A modest 300 x 600dpi optical resolution is offered, interpolatable to 1,200 x 1,200dpi. Photoshop LE, great TWAIN module and a SCSI card are supplied as standard, but no OCR software. We had to use the supplied SCSI card, because despite claimed compatibility, we couldn't get it to work with any of our Adaptec cards.

It's not as quick as the speedy three-pass Nikon, but at half the price you'll be able to wait 33 seconds for a colour preview. Interpolated line art is not brilliant, but good for the price. Like the other better-than-average budget scanners, the T-630 scores well on a wide and unclipped colour range. Raw colour scans are accurate, bearing a great resemblance to the originals and easily corrected.

This is our budget best buy, putting many more expensive scanners to shame.

PCW Details

Umax Vista T-630
Contact IMC 01753 830999
Price RRP £695; street price £449

Mid-range scanners

Agfa StudioScan II

Another replacement from Agfa, this time for the original StudioScan. Model II looks like the original, but that's where the similarities end.

A street price of around £650 buys a 30-bit unit with an optical resolution of 400 x 800dpi, interpolatable up to 2,400 x 2,400dpi. Software includes Adobe Photoshop 3 LE, OmniPage Direct 2, and the light version of the superb FotoTune colour management package, upgradable to the full version for £250.

The StudioScan II ships with the same highly competent TWAIN module, FotoLook, as the Arcus II. Speed of previews wasn't the quickest, but acceptable and final scans were a little slow.

Interpolated line result came fourth, joining the best of the rest. Grey levels were well resolved, and despite missing the top few highlight levels, the raw colour results were excellent.

The StudioScan II stood an excellent chance of a Highly Commended award until we learnt of the forthcoming StudioScan IISi, which will be five times faster thanks to improved firmware. Certainly one to look out for.

PCW Details

Agfa StudioScan
Contact Agfa UK 0181 2314200
Price RRP £995; street price £650

Canon IX4015

The Canon IX-4015 is tiny: the footprint is just larger than A4 and it measures less than 8cm tall. If desk space is at a premium, this is the only scanner to go for.

£699 buys a single pass 24-bit unit with an optical resolution of 400 x 800dpi, interpolatable up to 1,200 x 1,200dpi. It is shipped as standard without OCR software, but does come with Ofoto and a SCSI card. Ofoto has its moments as a photo retouching application doing neat tricks like automatically rotating the image until it is square.

The Canon is quick, turning in 10-second colour-only previews; final scans don't take much longer. Interpolated line art wasn't the best, but certainly good enough for most situations. Colour scans contained a smooth unclipped range, only falling off at the top five percent of highlight levels, while raw scans were quite accurate.

There are units costing the same which outperform the Canon by far, but it's easy to fall for its smallness.

PCW Details

Canon IX4015
Contact Canon UK 0181 7733173
Price RRP £699

Epson GTx 8500

Latest in the Epson flatbed range, the 8500 is a lower resolution and slightly slower version of the 9000 also reviewed in this feature.

The 8500 offers 30-bit depth and an optical resolution of 400 x 800dpi interpolatable to 1600 x 1600dpi. The standard package ships with an Adaptec 1510 SCSI card, Photoshop LE and OmniPage Direct 2; parallel port connection is offered.

The 8500 is quite nippy, with 10-second previews and reasonably timed final scans. Raw scans are accurate, with a full range bar the top couple of levels. Line art performance is above average too.

As with the 9000, a day's free training worth £299 has been available for anyone buying an Epson scanner since the beginning of this year. Training is given at Epson UK in Hemel Hempstead; it's a hands-on class, for a maximum of eight people, covering OmniPage, Photoshop basics and colour correction.

The 8500 is a brilliant package, bettered only by the 9000. The only downside is its maximum A4 scanning area. If it cost a little less, it would have cleaned up in our budget group.

PCW Details

Epson GTx8500
Contact Epson UK 01442 61144
Price RRP £729

Mid-range scanners

Epson GTx9000

Higher resolution and slightly quicker than the 8500, the Epson 9000 is a superb scanner let down only by its huge size and maximum A4 scanning area.

It's a 30-bit, 600 x 1200dpi unit, interpolatable to 2,400 x 2,400dpi. Shipped as standard are an Adaptec 1510 SCSI card, Photoshop LE and OmniPage Direct 2; you can also connect it through a parallel port if required.

Raw colour scans are highly accurate and contain a full range apart from the top highlight levels. Interpolated line art results are with the best of the rest, and everything happens very quickly.

Best of all is that a day's free training worth £299 is on offer to anyone buying an Epson scanner at the moment. Training takes place at Epson UK in Hemel Hempstead; it's a hands-on class, for a maximum of eight people, covering OmniPage, Photoshop basics and colour correction.

The Epson GTx 9000 is an excellent package with everything you could want apart from legal size scanning area and a small case. A clear winner.

PCW Details

Epson GTx9000
Contact Epson UK
01442 61144
Price RRP £859

Hewlett Packard ScanJet 3c

Superseding the highly successful IIcx which won last year's scanner group test, the 3c looks similar in styling with the same unusual slotted effect around the edges.

The 3c boasts 30 bits and a high optical resolution of 600 x 1200dpi, interpolatable to 2,400 x 2,400dpi. Included as standard is a SCSI card, Calera WordScan and the curious choice of the standalone Corel PhotoPaint 5. A colour photocopy utility is included offering an excellent partnership between the 3c and, say, the new HP DeskJet 850c printer.

The TWAIN module is perhaps a little too easy to use, sometimes hand holding a little too often, but great for beginners or those who don't want to mess around.

Raw scans were a little bright, but contained a full range. Greyscale performance was excellent with superb definition, while line art was up with the best. It's very quick too.

A hot contender for the top prize, but slightly better results and a package deal from our winner knocks the ScanJet 3c into its, highly recommended, second place.

PCW Details

Hewlett Packard ScanJet 3c
Contact Hewlett Packard 01344 369222
Price RRP £839; street price £660

Nikon ScanTouch AX-1200

Coming from probably the most respected 35mm SLR manufacturer in the World, the first flatbed scanner from Nikon is certainly something to look forward to.

It's a well built 30-bit unit, with a high optical resolution of 565 x 1,200dpi, interpolatable up to 1,200 x 1,200dpi. Nikon quotes 565dpi, claiming honesty when others conveniently round up to 600.

The scanner ships with Photoshop LE, OmniPage Direct 2, an excellent TWAIN driver and an Adaptec 1510 SCSI card.

Curiously the ScanTouch is a three-pass unit, but speeds along with the best of them. There are certainly no registration worries.

Interpolated line art was average, although grey level performance was excellent. A full range of colours was captured with only the slightest clipping. The raw result was good despite being perhaps a little over-brightened by the TWAIN module's auto adjustment option.

Unsurprisingly, the ScanTouch is most at home with continuous tone photographic images. In line with the rest of Nikon's pricing policy, the ScanTouch is slightly overpriced.

PCW Details

Nikon ScanTouch AX-1200
Contact Nikon UK 0181 5414440
Price RRP £1,195

Mid-range scanners

Panasonic FX-RS308C

This veteran of two previous *PCW* scanner group tests is a single-pass, 24-bit, 300 x 300dpi unit with PhotoFinish, TextBridge OCR and the DeCarte archival package. Throw in a Future Domain SCSI interface and you have the Panasonic Business Pack.

Our greatest surprise was the speed at which this old-timer produced its results. It beat every other scanner in this test by coming up with a colour preview in an unbelievably quick eight seconds. Normal scanning was quick too, with the colour test taking a highly commendable 14 seconds.

Sadly, the 308 shows its age with a poor interpolated line art result and very noisy scans, resulting in random dots and confused details. It did turn out a reasonable range of colours, but the level of noise present would not encourage the user to make corrections.

Panasonic is selling this Business Package at an overpriced £873, and even considering its street price this scanner has had its day.

PCW Details

Panasonic FX-RS308C
Contact Panasonic 0500 404041
Price RRP £873; street price £650

Sharp JX-330P

The Sharp is the only scanner in our group designed to be used turned 90 degrees clockwise, so you'll need wide deskspace. Build quality is excellent, but its RRP of £1,395 is the highest in this section.

You get a 24-bit scanner with an optical resolution of 600 x 600dpi, interpolatable up to 2,400 x 2,400 and an Adaptec 1505 SCSI interface. The 330 is unique in that both ADF and one of two transparency adaptors may be fitted simultaneously, if perhaps a little precariously.

Sharp supplies a variety of software options: a standalone application, TWAIN module and even Photoshop for Windows plug-in. Curiously, Sharp supplies the 330 not with Photoshop, but the now discontinued Aldus PhotoStyler; Adobe will upgrade this to full Photoshop for a bargain £155.

The 330 is extremely fast. Line art results were up with the best of the rest, but colour scans came across as dull due to the lack of the top ten percent highlight levels. If it were a 30-bit scanner, correction would be viable, but for 24-bit it is overpriced and should only be considered for fast document scanning.

PCW Details

Sharp JX-330P
Contact Sharp Electronics 0800 262958
Price RRP £1,395; street price £1,099

Umax Vista S8

Personal Computer World HIGHLY COMMENDED

This is the top of Umax's recent Vista range. The other two models are the mid-range 300 x 600 dpi S6 and the budget T-630 which is reviewed elsewhere in this test. All three are 24-bit, but S stands for single pass and the S8 boasts an optical resolution of 400 x 800dpi, interpolatable to 1,600 x 1,600.

The S8 ships with Photoshop LE, MagicMatch colour calibration and a SCSI card, but no OCR software. The TWAIN module isn't as good as the PowerLooks, but is still brilliant, putting most others to shame.

The S8 is extremely quick, but in no way compromised quality. Colour range was full and smooth with no clipping and the raw result was excellent for a 24-bit unit. Interpolated line art was remarkably good, second only to the stunning PowerLook.

It is quite expensive at an RRP of £1,195, especially since the standard lid is thin enough for the light to be seen through it. However street prices are very promising at £750. Combined with high speed and performance, the result is another winner from Umax.

PCW Details

Umax Vista S8
Contact IMC 01753 830999
Price RRP £1,195; street price £750

High-end scanners

Agfa Arcus II

Easily the biggest and most substantial scanner in the group test, looking like a slightly scaled-down stadium, the Agfa Arcus II is the highly anticipated replacement for the once dominant but now dated Arcus plus.

At an RRP of £3,250 it's one of the most expensive units we've looked at, but consider what you get for your money: a built-in transparency adaptor as standard, full Photoshop 3 and OmniPage Direct 2. High optical resolution of 600 x 1,200dpi, interpolatable up to 3,600 x 3,600. Perhaps most interesting of all is that the Arcus II is only one of two 36-bit flatbed scanners available — the Microtek ScanMaker III is the other.

Raw colour scans were about as good as they can be, with a full, unclipped range. Excellent correction was provided by FotoTune light, upgradable to the full version for £250. Interpolated line art was excellent, beaten only by the unusually good Umax Powerlook and S8.

Early criticisms of speed are quashed by the updated FotoLook TWAIN driver, well equipped and much speedier.

A flatbed with superb build and performance.

PCW Details

Agfa Arcus II
Contact Agfa UK 0181 2314200
Price RRP £3,250; street price £2,600

Microtek ScanMaker III

The world's first 36-bit colour flatbed scanner comes from established manufacturer Microtek.

The very solid ScanMaker III has a 600 x 1,200dpi optical resolution, and ships with full Photoshop, OmniPage Direct 2, a SCSI card and colour calibration package, DCR. Given the fact that the transparency adaptor costs £450 extra, the ScanMaker III spec and package is very similar to our Editor's Choice Agfa Arcus II (and indeed the Umax PowerLook) differentiated only by its 30-bit range.

Sadly the similarities end there. It's slower than the Arcus II and produced a disappointingly over-saturated raw colour scan. The full range was present but was clipped at both ends. Greys were well defined, while line art was good, but again beaten by the other two.

The ScanMaker III would be a great scanner if we didn't have the Agfa Arcus II and Umax PowerLook with which to compare it. For around the same price, these outperform it in every respect.

PCW Details

Microtek Scanmaker III
Contact Computers Unlimited 0181 200 8282
Price RRP £2,995

Umax PowerLook

You can buy the PowerLook without the transparency adaptor, but for fair comparison with the Arcus II and ScanMaker III we reviewed it as the Pro package. This retails at £3,495 and comes with transparency adaptor, full Photoshop 3 and trial copy of the superb Binuscan ColorPro colour management package. There's no OCR package in this configuration.

You do get one of the best TWAIN modules around, named MagicScan, offering everything you could wish for including a great autocorrect. A competent calibration utility, MagicMatch, is also included.

Surprisingly for the most expensive scanner in the test, the PowerLook is only 30-bit. Our tests, however, showed its colour range to be complete, with only the slightest clipping on the highlights. The Arcus II only just beats it on colour.

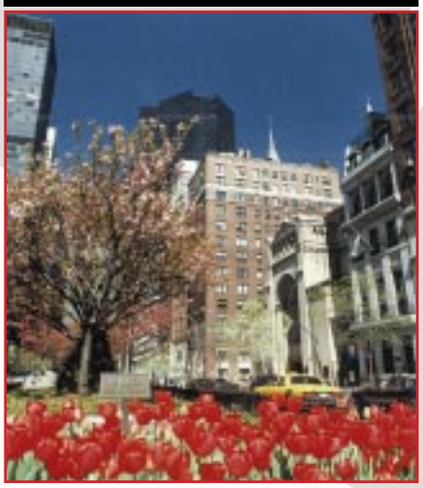
In line art, the PowerLook rules supreme, turning out an extraordinarily good result with its 600 x 1200dpi optical resolution, unbeatably interpolated to 2,400 x 2,400dpi. It's super quick too, and comes highly recommended to anyone who doesn't demand the ultimate top colour quality of the Arcus II.

PCW Details

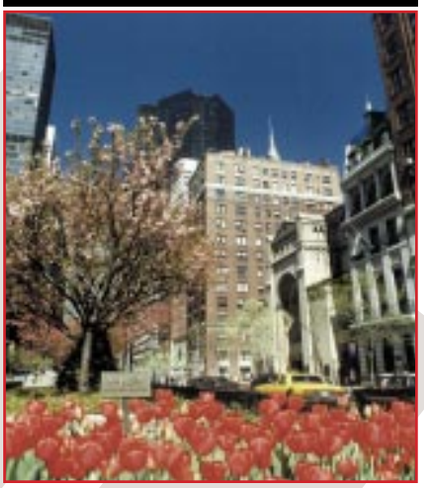
Umax PowerLook
Contact IMC 01753 830999
Price RRP £3,495

Colour result

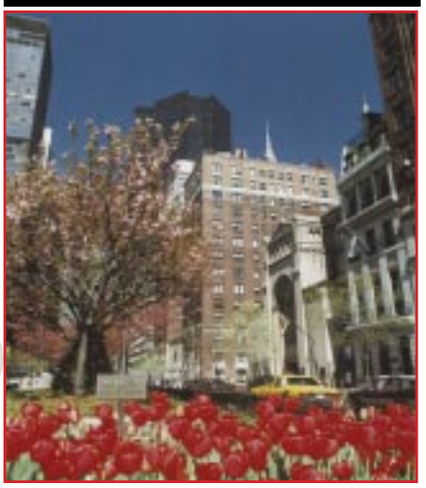
Agfa Arcus II



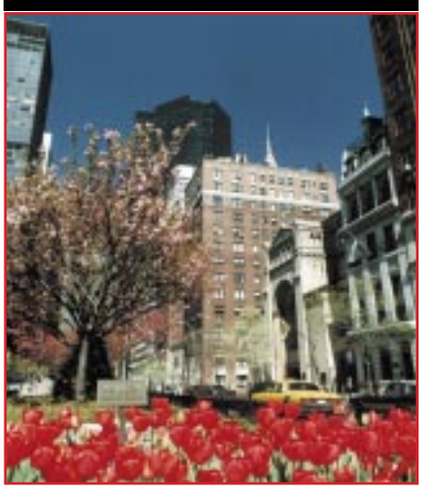
Agfa Studio Scan II



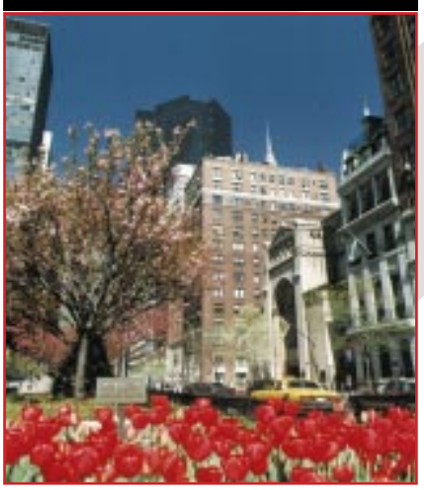
Canon IX4015



Epson GTx 8500

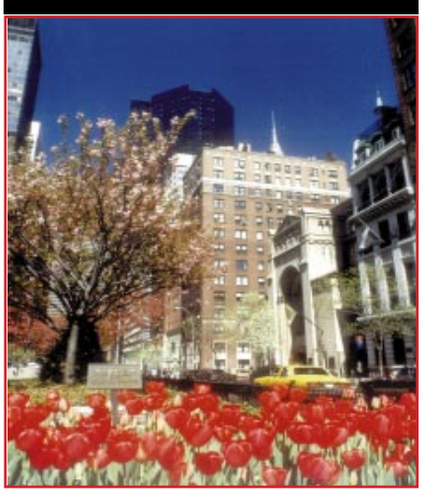


Epson GTx 9000



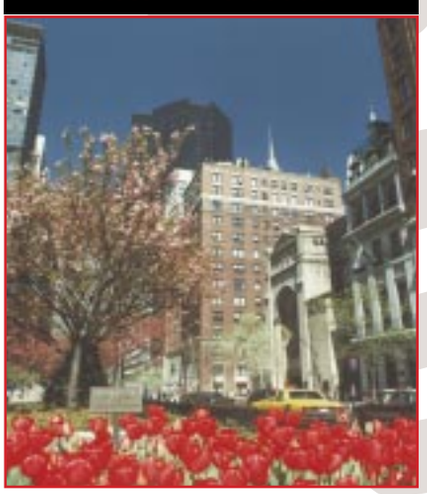
Hewlett Packard ScanJet 3c

Microtek Scanmaker II



Microtek Scanmaker III

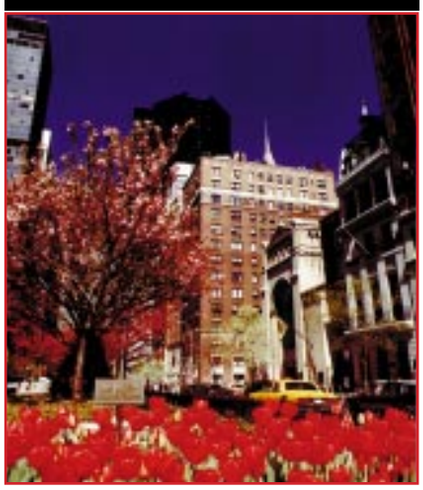
Mustek MFS-6000CX



Here are the raw scans made with each driver's default settings. If there was a single button to auto expose or adjust, we used it. All scans were made at 100dpi in 24 bit of a 5 x 7" original photograph. This is not a completely fair test of each scanner's capabilities, since all could

Colour result

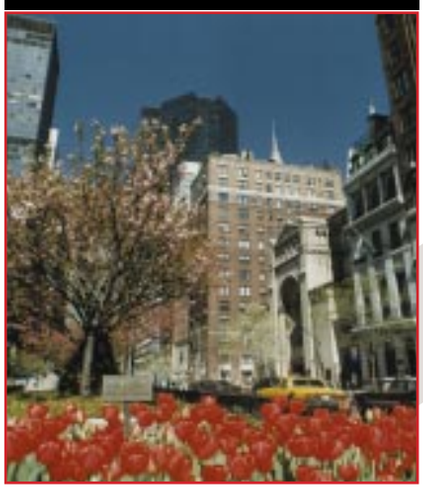
Mustek MFS8000 SP



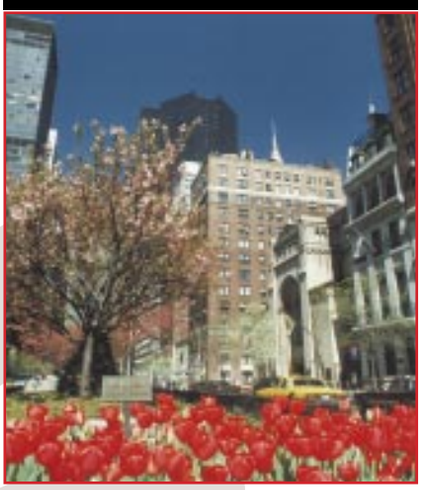
Nikon ScanTouch

Panasonic FX-RS308C

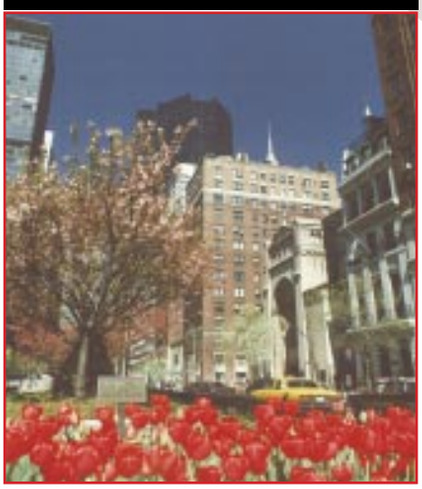
Sharp JX-330P



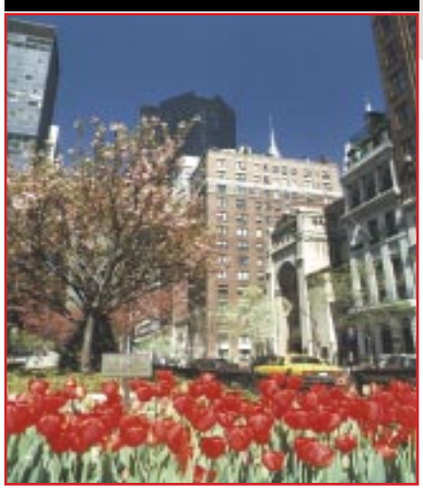
Trust Imagery 1200



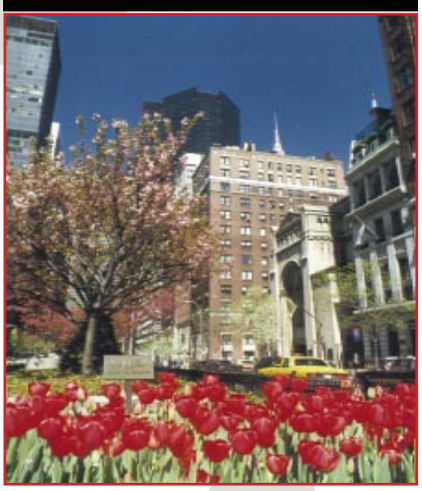
Trust Imagery 2400



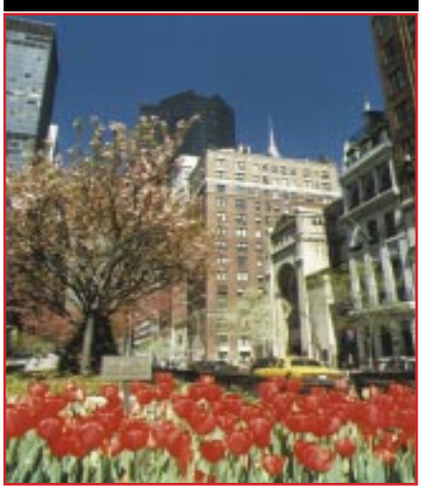
Umax Powerlook



Umax T-630

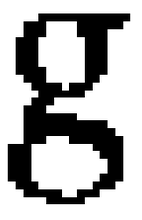
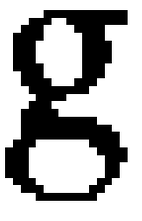
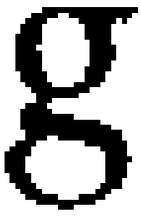
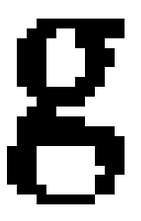
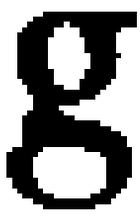
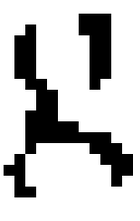
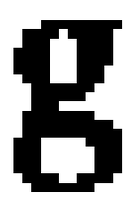
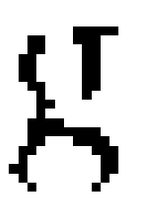
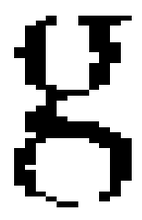
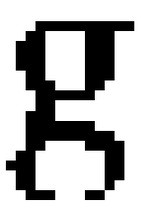
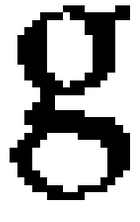


Umax Vista S8



be corrected. It does however display the results made with the least effort. Results of colour correction can be found in this month's *Graphics & DTP* column in the Hands On section.

Line art result

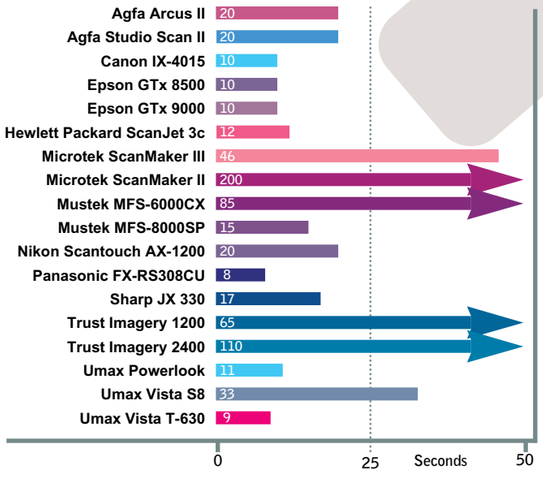
Agfa Arcus II		Agfa Studio Scan II		Canon IX4015	
					
600 x 1200	3600 x 3600	400 x 800	2400 x 2400	400 x 800	1200 x 1200
Epson GTx 8500		**Epson GTx 9000**		**Hewlett Packard ScanJet 3c**	
					
400 x 800	300 x 600	600 x 1200	2400 x 2400	600 x 1200	2400 x 2400
Microtek ScanMaker II		**Microtek ScanMaker III**		**Mustek MFS6000 CX**	
					
300 x 600	1200 x 1200	600 x 1200	1200 x 1200	300 x 600	1200 x 1200
Mustek MFS8000 SP		**Nikon ScanTouch**		**Panasonic FX-RS308C**	
					
400 x 800	6400 x 6400	565 x 1200	1200 x 1200	300 x 300	600 x 600
Sharp JX-330P		**Trust Imagery 1200**		**Trust Imagery 2400**	
					
600 x 600	2400 x 2400	300 x 600	1200 x 1200	600 x 1200	2400 x 2400
Umax PowerLook		**Umax Vista T-630**		**Umax Vista S8**	
					
600 x 1200	2400 x 2400	300 x 600	1200 x 1200	400 x 800	1600 x 1600

The same 6 point letter g was scanned twice for each unit. Left are the results at the true optical resolution, right are the results at the highest interpolated resolution of each unit. Below each result is the manufacturer's claimed figures

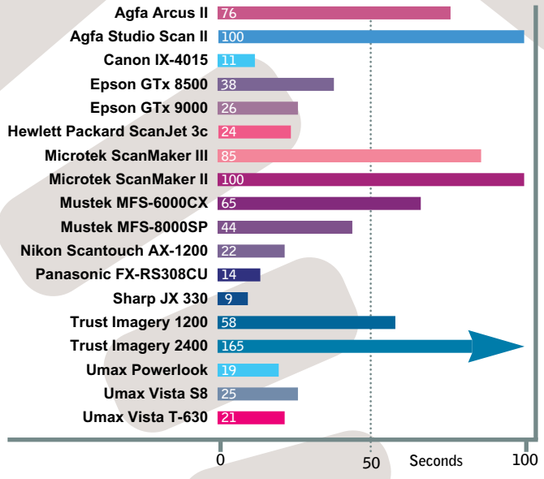
Results

Grey levels

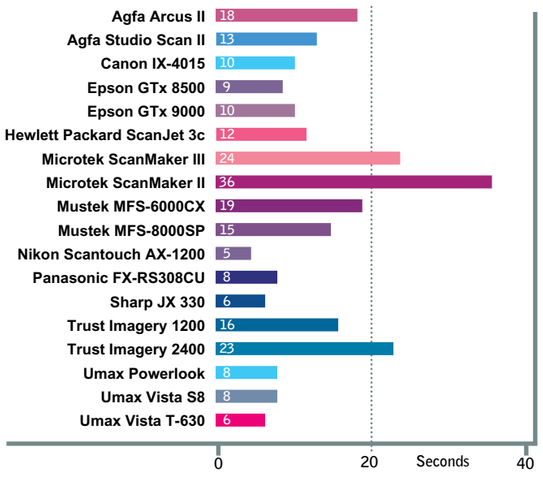
Colour preview time



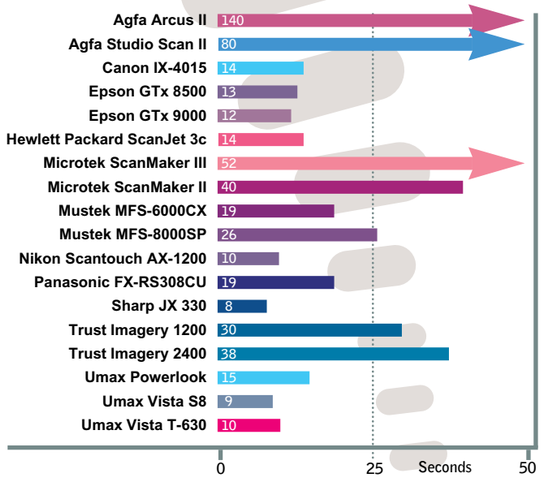
Colour time



B & W preview time



B & W preview time



Editor's Choice

We considered the 18 scanners in three distinct RRP categories: below £700; between £700 and £1,400; and top-of-the-range models above £3,000. There is a big difference from last year's group test: last year all the scanners were 24-bit models, whereas this year we have 30-bit and even 36-bit models; indeed the former have representatives in all three price brackets.

In theory, a high bit scanner should capture a larger range of shades and colours, giving it much more to work with. Every time any tonal or colour correction is made, let alone mode changes, several levels are permanently lost. If you want a good 24-bit range after all manipulations, it pays to start with 30 or 36 bits. It's rather like buying a car with a top speed of 120mph so that it will perform well at 70mph.

If you want to pull out details in high-light or shadow areas, then the extra range claimed by high bit scanners should help too. Our results proved that the best ranges tend to be achieved by the high bit scanners, but not in every case. We saw some 24-bit models that clearly outperformed certain 30-bit units.

Still on the subject of colour, most manufacturers have recognised the potential problems and produced some superb TWAIN drivers with very effective auto-correct facilities. Others included colour calibration and management software, some of which produced excellent results.

Resolving power has improved, with many relatively cheap units boasting high optical resolutions of 600 x 1,200dpi. Sadly, some absurdly high claims of interpolated resolutions are still to be found — don't be fooled.

At the budget end, below £700 RRP, we had six contenders. The Microtek ScanMaker II was showing its age, but its colour performance was certainly usable and the £665 XE package did get you Photoshop LE. Mustek's new 8000SP was our cheapest 30-bit unit with a street price of £499, but failed to impress. Mustek's old 6000CX represented much better value at a street price of £299, but we preferred the Highly Commended, rebadged, Trust Imagery 1200 version. For a tenner more it was a tad faster and happier with our Adaptec card, and also better than the more expensive Trust 2400 model.

Our Editor's Choice in the budget section is the Umax Vista T-630. It just squeezed into this section at an RRP of £695, but its street price of £449 gets you a superb all-round performer. A mention must go to the Canon IX-4015 for being so tiny, and nippy too; the only choice for small desks. Officially, it sits on the boundary of our budget and mid sections, but the price will probably fall soon as the announcement of a new model is imminent.

The middle section, between £700 and £1,400, was the most competitive with no less than nine models battling it out. Panasonic should either stick to making its super-efficient document scanners or reduce the price of its ageing FX-RS308C. Sharp's new JX 330 is very well built and extremely quick, but its average colour performance and RRP of £1,395 recommends it only as a document scanner.

Nikon's ScanTouch was a good colour performer, but overpriced compared with other models in this range. The Agfa StudioScan II stood a good chance of winning something until we heard about the forthcoming IISi version, said to be five times faster.

At the more expensive end, the Umax Vista S8 impressed us in every respect and is a Highly Commended choice for anyone with a little more to spend. Hewlett Packard has once again produced a wonderful scanner with it's new ScanJet 3C, which was a potential winner. As it is, it earns itself a Highly Commended second place.

Epson has impressed us this year with its superb products; difficult to choose between. Both Epson scanners came with Adaptec SCSI cards, Photoshop LE and best of all, a day's free training worth £300. The GTx 8500 is the cheaper £729 RRP 400 x 800dpi version, while £859 RRP gets you the slightly faster 600 x 1,200dpi GTx 9000. The former would have cleaned up the budget priced group if it had been slightly cheaper and should be seriously considered. However it was the GTx 9000 which impressed us enough to award it Editor's Choice: an excellent package deal offering superb results.

At the high end, we looked at three top models. Since the 36-bit Agfa Arcus II comes with its transparency adaptor fitted as standard for an RRP of £3,250, we considered its two competitors with their adaptors included. The Microtek ScanMaker III, also 36-bit, costs £3,449 RRP, while the 30-bit Umax PowerLook will set you back £3,495. All three are 600 x 1,200 optical units and come with full Photoshop 3 and some kind of colour management software.

The ScanMaker III would be impressive if it weren't for the other two, which are in a different class. But how to choose one? The PowerLook is quicker and offers the best interpolated line art result in the whole group test. The Arcus II with its 36-bit colour depth captured a wider range, but only just. The PowerLook came with a demo copy of Binuscan ColourPro colour management, which does an excellent job, but then so does FotoTune light, shipped with the Arcus II. The latter is much cheaper to upgrade to the full version.

Umax TWAIN drivers are always excellent and the PowerLook's is no different. Agfa's FotoLook was also very good, but additionally offered handy colour management and CMYK separations within the driver, negating the need for Photoshop altogether if desired.

Its edge on colour work and its cheaper price tag swung the balance to the Arcus II, which wins Editor's Choice, but there's not much in it. Unless you absolutely need the colour accuracy and range of the Arcus II, go for the quicker Highly Commended PowerLook with its better line art performance.

More importantly, both flatbeds attain such a level of performance that when used with colour management, they represent a serious alternative to expensive drum scanning when reproducing anything other than full A4.

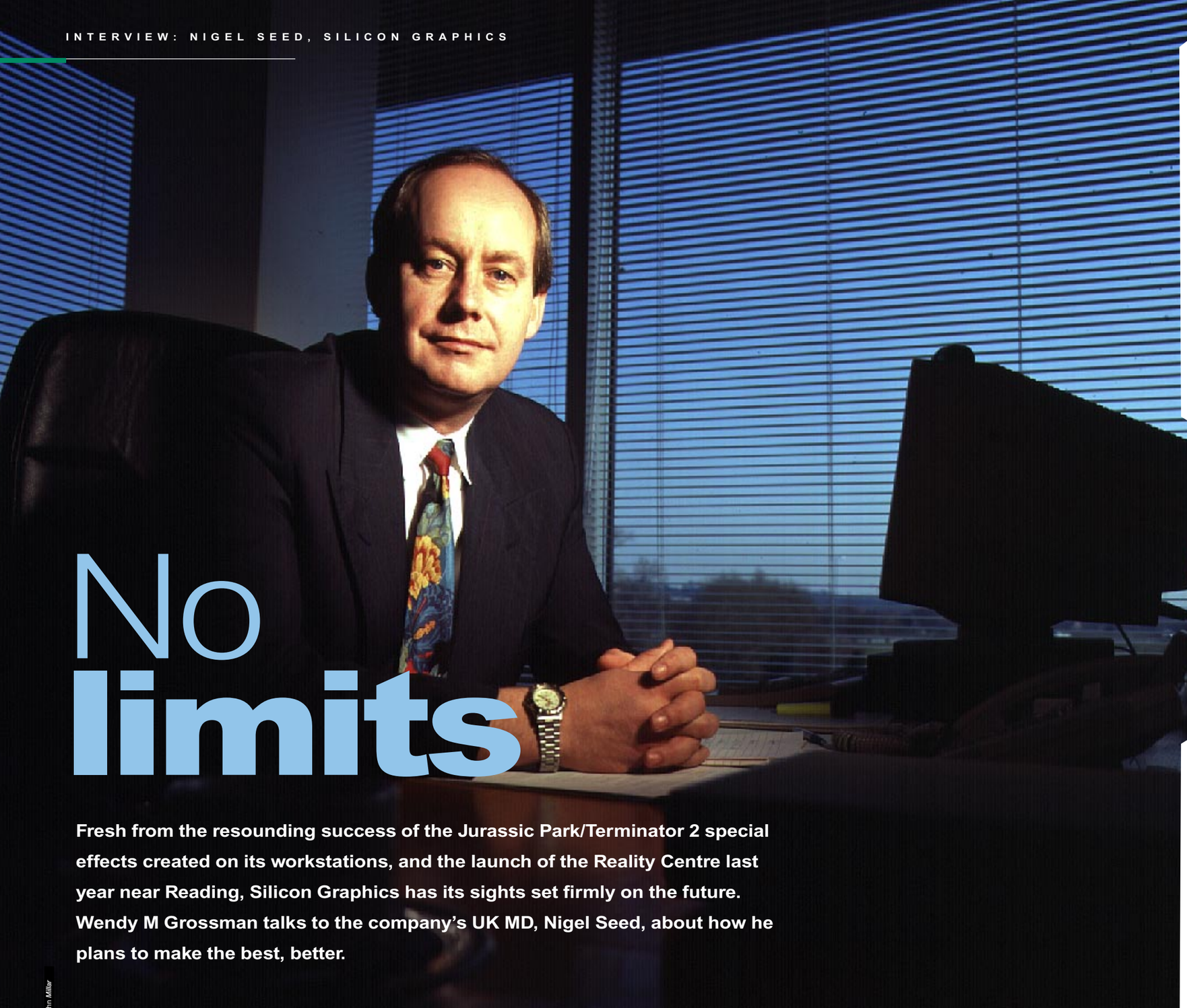
TABLE OF FEATURES SCANNERS

Yes ● No ❍

Manufacturer	Agfa	Agfa	Canon	Epson	Epson	Hewlett Packard
Model	Arcus II	Studio Scan II	IX-4015	GTX 8500	GTX 9000	ScanJet 3c
Bits	36	30	24	30	30	30
Passes	1	1	1	1	1	1
Optical resolution	600 x 1200	400 x 800	400 x 800	400 x 800	600 x 1200	600 x 1200
Interpolated resolution	3600 x 3600	2400 x 2400	1200 x 1200	1600 x 1600	2400 x 2400	2400 x 2400
Retouching software	Adobe Photoshop	Adobe Photoshop LE	Ofoto	Adobe Photoshop LE	Adobe Photoshop LE	Corel PhotoPaint 5
OCR Software	OmniPage Direct 2	OmniPage Direct 2	mne	OmniPage Direct 2	OmniPage Direct 2	Calera WordScan
SCSI card	❍	●	●	Adaptec 1510	Adaptec 1510	●
Transparency Adaptor	included	£ 400	n/a	£ 545	£ 545	£ 550
ADF	n/a	£ 450	£ 269	£ 435	£ 435	£ 400
Weight	16.1kg	9.2kg	6kg	8kg	12kg	9.9kg
Dimensions	600 x 410 x 200mm	545 x 386 x 143mm	405 x 286 x 79mm	575 x 332 x 132mm	595 x 383 x 170mm	585 x 368 x 105mm
Reflective scan area	210 x 355mm	216 x 356mm	216 x 297mm	216 x 297mm	216 x 297mm	216 x 356mm
RRP	£ 3,250	£ 995	£ 699	£ 729	£ 859	£ 839
Street	£ 2,600	£ 650	n/a	n/a	n/a	£ 660
Contact	Agfa UK	Agfa UK	Canon UK	Epson UK	Epson UK	Hewlett Packard
Telephone	0181 231 4200	0181 231 4200	0181 773 3173	01442 61144	01442 61144	01344 369222

	Microtek	Microtek	Mustek	Mustek	Nikon	Panasonic
Model	ScanMaker III	ScanMaker II	MFS-6000CX	MFS-8000SP	Scantouch AX-1200	FX-RS308C
Bits	36	24	24	30	30	24
Passes	1	3	3	1	3	1
Optical resolution	600 x 1200	300 x 600	300 x 600	400 x 800	565 x 1200	300 x 300
Interpolated resolution	1200 x 1200	1200 x 1200	1200 x 1200	6400 x 6400	1200 x 1200	600 x 600
Retouching software	Adobe Photoshop	Adobe Photoshop LE	iPhotoPlus	Image Pals Go!	Adobe Photoshop LE	Photofinish
OCR Software	OmniPage Direct 2	OmniPage Direct 2	WordLinx	WordLinx	OmniPage Direct 2	Textbridge
SCSI card	●	●	●	●	Adaptec 1505	Future Domain
Transparency Adaptor	£ 450	£ 450	£ 299	tbc	£ 495	n/a
ADF	£ 475	£ 475	£ 299	tbc	n/a	£ 525
Weight	11.2kg	7kg	7kg	7kg	12kg	7.8kg
Dimensions	610 x 376 x 128mm	513 x 343 x 117mm	551 x 340 x 135mm	551 x 340 x 135mm	599 x 376 x 159mm	516 x 343 x 130mm
Reflective scan area	211 x 356mm	216 x 297mm	216 x 356mm	216 x 356mm	216 x 356mm	216 x 356mm
RRP	£ 2,999	£ 665	n/a	n/a	£ 1,195	£ 873
Street	n/a	n/a	£ 299	£ 499	n/a	£ 650
Contact	Computers Unlimited	Computers Unlimited	Evesham Micros Ltd	Evesham Micros Ltd	Nikon UK	Panasonic
Telephone	0181 200 8282	0181 200 8282	01386 765500	01386 765500	0181 541 4440	0500 404041

	Sharp	Trust	Trust	Umax	Umax	Umax
Model	JX 330	Imagery 1200	Imagery 2400	Powerlook	S8	T-630
Bits	24	24	24	30	24	24
Passes	1	3	3	1	1	3
Optical resolution	600 x 600	300 x 600	600 x 1200	600 x 1200	400 x 800	300 x 600
Interpolated resolution	2400 x 2400	1200 x 1200	2400 x 2400	2400 x 2400	1600 x 1600	1200 x 1200
Retouching software	Aldus PhotoStyler SE	iPhotoPlus	Adobe Photoshop LE	Adobe Photoshop	Adobe Photoshop LE	Adobe Photoshop LE
OCR Software	none	WordLinx	WordLinx	none	none	none
SCSI card	Adaptec 1505	●	●	●	●	●
Transparency Adaptor	£ 995	n/a	£ 229	included	£ 595	£ 595
ADF	£ 499	n/a	n/a	n/a	£ 395	£ 395
Weight	13kg	7kg	7kg	9.2kg	8kg	8kg
Dimensions	560 x 387 x 155mm	551 x 340 x 135mm	551 x 340 x 135mm	539 x 334 x 138mm	526 x 336 x 131mm	526 x 336 x 131mm
Reflective scan area	216 x 355mm	216 x 356mm	216 x 356mm	212 x 297mm	216 x 297mm	216 x 297mm
RRP	£ 1,395	£ 375	£ 499	£ 3,495	£ 1,195	£ 695
Street	£ 1,099	£ 309	£ 429	£ 2,349	£ 749	£ 449
Contact	Sharp Electronics	Aashima distribution	Aashima distribution	IMC	IMC	IMC
Telephone	0800 262958	01376 501146	01376 501146	01753 830999	01753 830999	01753 830999



No limits

Fresh from the resounding success of the Jurassic Park/Terminator 2 special effects created on its workstations, and the launch of the Reality Centre last year near Reading, Silicon Graphics has its sights set firmly on the future. Wendy M Grossman talks to the company's UK MD, Nigel Seed, about how he plans to make the best, better.

PCW Photographs of Nigel Seed by John Millar

American high schools teaching "driver's education" used to show an animated film starring one of those human-sized brown cartoon dogs. It was a Jekyll and Hyde scenario: as a pedestrian, the dog ("Mr Walker") would amble aimlessly out into the street with all the time in the world to spare; then he'd get into his car (now, as "Mr Wheeler") and turn into the sort of person who rears up behind you at 100 miles per hour and runs you off the road.

Similarly, there's Nigel Seed, managing director of Silicon Graphics UK. He seems a quiet and pleasant "Mr Walker" while talking about having to think in multiple currencies when he visits the US to exchange reports, although he says some of his employees would probably disagree with this assessment. His office is sparse and not particularly fancy — there's just one of the company's desktop machines sitting on his desk with the inevitable video camera perched on top.

Then you hear him talk about the £2m Reality Centre downstairs and he turns into "Mr Wheeler": "It's the world's best video arcade game. The adrenaline starts pumping. I've flown that thing, and I've been chasing tanks along the ground and shooting at them and getting a real buzz when I've hit them and they've blown up. It's a very sad thing to admit, but I am only a man."

Clearly, the man has far better toys than the rest of the world: just try, once, sitting in the fancy, joystick and button-laden leather chair in the middle of the room with the screen wrapping all around you, and you're liable to find yourself hooked.

Silicon Graphics (SGI) is the company on whose workstations the liquid-metal man in Terminator 2 and the dinosaurs in Jurassic Park were created by the legendary Industrial Light & Magic. Its machines are covered in strange colours, like teal and purple. And it bundles video cameras and libraries of complex, graphical routines to speed the techniques needed for computer animation. All this explains why, as far as Seed is concerned, there are two kinds of computer companies: the "boring" ones, and the one he works for.

Seed's career started normally (and boringly) enough in the mini-computing world. He joined Sun Microsystems in 1985 because he was intrigued by the possibilities of networking workstations. He had what he calls "four fabulous years" at Sun, and then wanted to become a country manager where he would have profit and loss responsibility. He had two options: Silicon Graphics and Solbourne. Solbourne looked attractive, and Seed thinks it wouldn't have failed if Sun hadn't hit a plateau in its own growth.

But he chose Silicon Graphics for a variety of reasons. First of all, there were internal warnings at Sun that SGI was a company to watch out for — it had good technology and was winning some deals. A bigger factor, though, was "getting my hands on the technology; just understanding fundamentally what SGI is trying to do, which is change the way that people use computers," a phrase he cheerfully admits is an industry cliché. So Seed joined SGI in 1989. Since then, the UK company has grown from 12 people and £5m a year in revenue to 150 people and £70m in this fiscal year. He expects next year's revenue to top £100m, and plans to add another 100 people in the next 18 months. Internationally, the company has three factories: one in Mountain View, California, where the company is based, one in Switzerland, and one in Japan. The British desktop machines are made in Switzerland, but the high-end stuff comes from California.

Seed thinks people tend to underestimate the overall usefulness of the company's technology. He remembers with great fondness, for example, the Sun manager who five years ago described the company as a little niche company, "into boutique graphics". Since then, he says: "We've seen a deployment of graphics and high-performance multimedia applications across a wide spectrum of applications, to the point where we're now defining the ground rules." Products of all kinds, from new Walkmans to the Boeing 777, are being visualised and designed on computers. In fact, he says, the Boeing 777, which was designed on a variety of computers (not just Silicon Graphics') never even went to a prototype: it went straight into production off the "electronic drawing board".

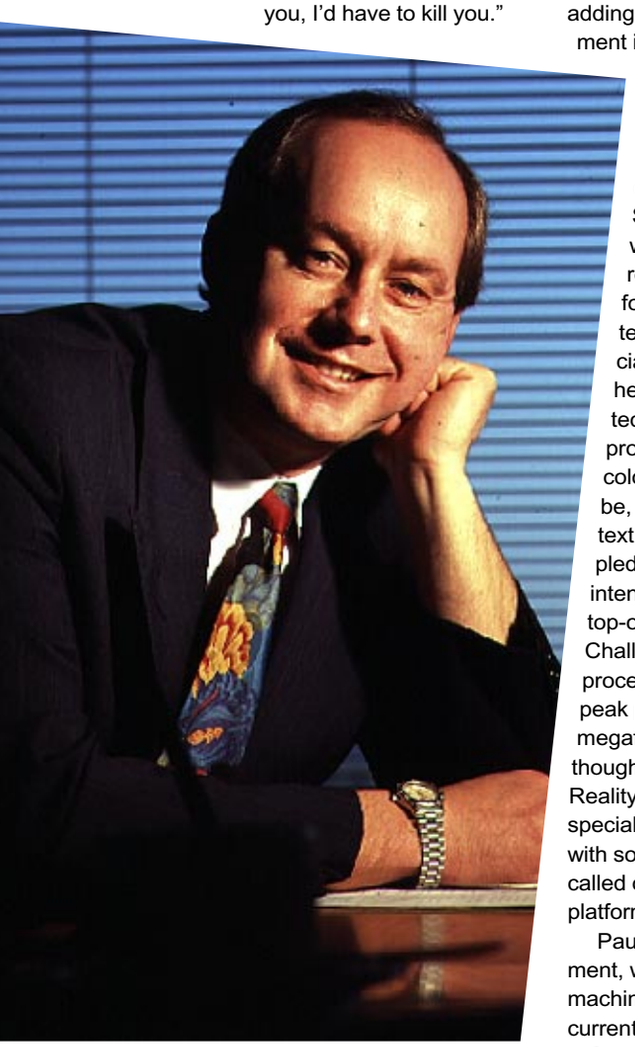
"In the very near future" says Seed, "you will see surgeons doing things like virtual surgery and planning operations on workstations." He adds that hospitals and universities around the world are experimenting with techniques to allow surgeons to work with a scanned-in 3D representation of a human being so they can plan, and even practice such elements as where the incision should be and how far in they'll need to drill. "It's fun to be involved in," says Seed. "It's not about gas bills. It's about leaving our mark on society."

That's entertainment

In fact, Seed claims that what drives technological development at SGI is the entertainment industry, even though the capabilities requested are typically dismissed, at first, as unnecessary for general use. So, four years ago, ILM wanted not only transparency for the water creature in The Abyss; it wanted reflectivity, both for that and for the liquid metal man that came after it. Now, for example, engineers using CAD/CAM find translucency useful, as they can design a gear box and then hit a button to turn the casing transparent to see the machinery inside it.

A couple of years later, ILM was asking for realtime texture-mapping, which was needed for Jurassic Park's dinosaurs, and now it's moving into

CAD/CAM. The difference in hardware terms, says Seed, is several orders of magnitude of computing power. "If it takes you 30 minutes to render one frame of the liquid-metal man, it would take you five hours to render one frame of a dinosaur." And, as he agrees, there were a lot more frames of dinosaurs, and a lot more dinosaurs in a given shot. He won't say what ILM is asking for now. "If I told you, I'd have to kill you."



But he's happy to give examples of how realtime texture-mapping can be used in the real world. He starts with designing airplane engines, but moves on quickly. "You need it to design a Sony Walkman," says Seed, taking a convenient example from the table in front of him. "Without realistic texture-mapping, you could not show what this thing really looked like. You want the image to be so real on-screen that you can reach out and touch it. You need to be able to prototype reality." In the near future, he adds, it should be possible to put sensors inside a data glove so that you could run your fingers virtually across the surface and feel the texture. Beyond that, visualisation techniques and graphic modelling are moving into areas like financial trading. You could, for example, have a three-dimensional graph of the US dollar versus the Japanese yen, versus copper prices. Spot the wrinkles, and take advantage of the opportunities they represent.

"It's in the near future," Seed says, adding that most of this type of development is secret. "Some of the trading houses are beginning to develop really cool algorithms and visualisation techniques." It may be gambling, but: "In terms of market opportunities in the short-term of SGI, we can provide the gamblers with ways of cheating." The point to remember is that SGI is first and foremost a hardware company. Its technology rests on two things: specialist hardware that can do the heavy number-crunching required by techniques like rendering — the process of calculating exactly what colour every pixel in a frame should be, based on the colour, reflectivity, texture and shape of the object coupled with the colour, direction, intensity, and beam of the light. SGI's top-of-the-range machine, the Power Challenge, uses up to 18, 64-bit RISC processors, and up to 16Gb of memory; peak performance is claimed to be 5,400 megaflops. The heart of the graphics, though, lies in the company's proprietary Reality Engine subsystem, which adds in specialist graphics processors, coupled with software library routines that can be called on by software developers for the platform.

Paul Williams, director of Arc Development, which used Silicon Graphics machines to create all the graphics in its current World Cup of Golf game, says the software available for the platform is the key. (He adds later, though, that without the SGI hardware the software wouldn't even exist.) These packages aren't available on the PC or on any other platform. This may change: Microsoft bought SoftImage at the end of 1994, and speculation in the industry is that the company will now try to convert it from Silicon Graphics' Unix-based graphical operating system to Windows NT. But even then, says Williams: "If they do, I don't think they'll be much of a competitor. PCs just aren't geared up to moving high-polygon models around." He explains that one scene may have as many as 100 models in it, each taking up 100,000 to 180,000 polygons, the blocks which define the 3D surface of a graphic image. "PCs can't handle that throughput. Silicon Graphics can." The same problem exists with rendering. Arc Development has a Challenge machine that sits in a corner and churns out graphics all day; he does not believe a PC can be beefed up enough to handle this kind of volume. The one problem with Silicon Graphics, he says, is the cost of the machine: a Challenge machine costs upwards of £100,000.

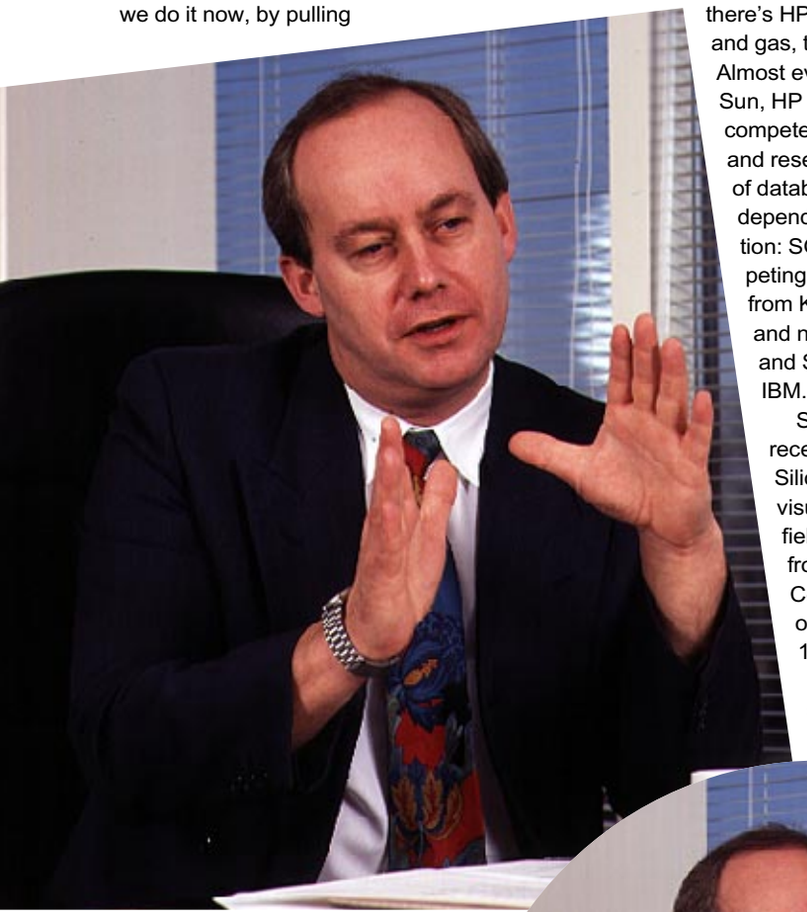
Graphics giants

Lack of competition may be the simple reason for this. Seed says: "There's no-one today selling computers that have the graphics power of our top-end systems." He's not the only one saying it; Williams agrees with him, and so does Ian Turnbull, development manager for Ocean Software, the company that created the games based on the movies Jurassic Park, First Blood, and Batman. Williams does say that the power of PCs is beginning to approach that of SGI's bottom-line machines, though like Turnbull, he says the software available for PCs doesn't have the image quality or versatility.

Seed agrees: "We respect Microsoft and we can't question its achievements, but by buying SoftImage and essentially trying to shoehorn such a broad package as SoftImage into this tiny little space that exists within the PC..." Words fail him for a moment, then he starts again and names what he thinks are two "fundamental road-blocks": Intel chips don't have the power and won't have the power in the near future; and while Microsoft has been moving into the entertainment business, so has SGI. Not long after Microsoft's acquisition of SoftImage, SGI announced it was to merge with Alias and WaveFront, the two other biggest names in computer animation software for the SGI platform. On top of that, SGI has a series of alliances that bring it into the mass entertainment business. SGI has a joint venture with AT&T called IDS, which is providing the set-top boxes and media servers, plus the ATM switching capability for Time-Warner's interactive television pilot scheme in Orlando, Florida. SGI collaborated with Walt Disney to produce a virtual-reality ride based on the animated film Aladdin.

SGI has joined up with Nintendo to develop a 3D, 64-bit interactive entertainment machine. It has a deal with Japan's Nippon Telegraph and Telephone (NTT)

to create an interactive information services system. And finally, its most recent announcement is an alliance with NetScape, the company behind the leading World Wide Web browser, to bundle Netsite server software with SGI's own new Web authoring tools to give users secure communications and, Seed forecasts, the ability to pull down 3D models. The idea, he says, is that technology will be designed into NetScape so that the image you pull down is defined by calls on your own system rather than the way we do it now, by pulling down an image file and running a viewer: more detail, but less to download. In fact, there was already a connection between Silicon Graphics and NetScape, since the two companies share a founder; James Clark.



Seed calls this overall area "Silicon Studio". It's not SGI's only focus, but it's the most obvious. Forty per cent of the company's revenues are from manufacturing, particularly mechanical engineering; other key areas for the company are education, research, oil and gas.

Besides, says Seed: "Our machines are actually great database servers — they're big number crunchers." They also use scalable parallel processing, so, "Here in the UK and particularly in North America, we're getting involved in the newly emerging science of data mining." You take, he says, 15 years' worth of corporate data and comb it for trends.

In such areas, SGI has a variety of competitors; even PCs in some cases. "You can struggle along with a Pentium, or get a man-sized computer and do the job properly," Seed half jokes. In mechanical engineering (CAD) there's HP and Sun; in oil and gas, there's IBM. Almost everyone, DEC, Sun, HP and IBM, competes in education and research. In the area of database servers, it depends on the application: SGI could be competing against anyone from Kendall Square and nCube to Sequent, and Sun, HP, and IBM.

Some of SGI's recent visibility in the Silicon Studio and visual simulation fields has come from the Reality Centre, which opened in June, 1994, in Reading.

It was, Seed says, "the biggest personal risk I ever took, because I knew exactly what I wanted to do with it, but couldn't persuade my European colleagues to join in on the funding of it." In the end, he built it and prayed that when the European managers came to see it they would be so impressed that they would agree to help fund it. Fortunately for him, they did: it was a £2m investment. The idea behind it is to demonstrate, to people who are interested, what the technology can do, even if they're not prepared to shell out £200,000 for an Onyx machine. The centre, he says, has been so successful that they're thinking of building a second one somewhere; next door, or in London or perhaps even Paris or Frankfurt.

Technically, Seed says the company isn't facing any major barriers. "There are peripheral things we need to clean up, like the display technology that all computers use — it's like fifties TV tubes. We're just about to roll out a new flat-panel display; it has glorious colour and wonderful quality and doesn't take up the space. You can take the back off and put it on a projector. In five years' time you won't see any of these antediluvian things" — he waves his hand generally at his desk, where an Indigo sits under an ordinary monitor. "You'll probably see them on PCs, but not on real systems." Other than that sort of thing, he says, "There is no theoretical limit to the amount of computing power we can squeeze out of our existing chipset. The architecture and manufacturing techniques are all there. Everything scales. There is no 64K limit and no glass ceiling." He estimates that the RISC chips SGI uses are about a third as complicated as the Pentium; that makes them simpler, smaller, and faster and easier to make.

There are software improvements, of course: "The next goal is to make the user interface even more intuitive and easy to use, to put artificial intelligence into the operating system so that if it spots you making the same mistake three times it taps you on the shoulder and suggests a new way of doing things." Overall, though, "There is no technology stopping us. We just have to execute well," says Seed. PCW

The man from Delrina

Mark Skapinker, boss of software success story Delrina, rightly holds no claims to false modesty. Here, he happily reveals his personal business philosophy and the secrets of his company's success to Geof Wheelwright, and outlines his plans for the company's future in the Internet and consumer markets.

Mark Skapinker has some advice for anyone intending to pursue a career as an entrepreneur in the highly-competitive PC software business. And it's probably worth listening to, as Skapinker appears to know his stuff. He is the co-founder and president of Delrina, the company which is an archetypal software success story. His company spotted a gap in the software market and just kept filling it until it achieved the biggest market share, then set about diversifying.

The gap which had existed in the market was for communications software that allowed PCs to send and receive fax documents. Delrina is probably best known as a purveyor of the PC fax software package called WinFax which enables fax messages to be sent directly from PCs using a faxmodem. But the seven-year-old communications software house is also a company on the fast track. It has achieved a compound annual growth rate of more than 100 percent in each of the past four years. Last June, it hit the Can$102m mark. So, with more than 600 employees and offices in Toronto, San José, Washington, the UK, France and Germany, this once small Canadian company is now receiving lots of attention.

Skapinker is happy to capitalise on that attention and dole out advice to anyone hoping to emulate his success: "Find a category of software that fits a niche with huge potential for mass market acceptance," he advises. "Create a product that defines this market and has the potential to establish itself as a market leader, and then wait for that market to explode."

Delrina's formula for success stood Skapinker in good stead when it came to allaying fears of a potential threat to his company from industry giant Microsoft: last year Microsoft announced that it would build base-level fax send and receive capabilities into its forthcoming new release of Windows 95. Industry analysts suggested that this would pose a serious challenge to Delrina's flagship, WinFax Pro, product line.

Skapinker says that his initial fears were dissipated after a face-to-face conversation with Microsoft's Bill Gates, whom he met at a formal industry trade show dinner in Las Vegas two years ago. He says that Gates was very up front with him about his plans for fax capabilities in future versions of Windows. This convinced him that the way Microsoft was setting up those capabilities would not conflict with Delrina's plans or seriously take away market share from either WinFax or WinFax Pro.

"Our initial reaction was that if Microsoft was going to give away fax software for free, how could we compete? We were concerned about what would happen to our market," he admits. "But the functionality that Microsoft is adding to Windows 95 is about the same as that provided with the fax software that people get anyway when they buy a fax modem today."

Skapinker says that although this may make some impact on Delrina's OEM (original equipment manufacturer) business — selling cut-down versions of WinFax to manufacturers for inclusion with their modems — it is unlikely to affect the bulk of the company's business; those demanding high-performance fax management software. He says that in terms of value, only ten percent of WinFax sales passes through the OEM channel and even so, many users nevertheless upgrade to WinFax Pro.

But Delrina isn't just resting on its laurels with fax software. The company has also entered the fax service business with fax broadcast and fax mailbox enterprises. Employing the broadcast service, users can request Delrina to perform a mass fax broadcast on their behalf to a preset mailing list. The mailbox service allows users to pick up their faxes by dialing in to a central point from anywhere in the world.

For a monthly charge of Can$10 Delrina provides a fax mailbox to which all the subscriber's faxes are sent. The first 20 pages received are included in the basic fee after which a charge is levied per page.

Skapinker also revealed that Delrina will shortly begin shipping a low-cost scanner to make it easier for WinFax users to send paper documents using WinFax. "We are in the process of launching a small personal scanner," he says. "It will be sold as an add-on for WinFax with a price of less than $300. It has been designed to compete strongly at the low end of the fax products market." Skapinker intends to launch this product at Spring Comdex '95 in Atlanta.

Delrina continues to diversify its non-fax product lines as well, and Skapinker has lately been taking a great interest in the Internet and how to make it more secure.

Get the message

"Messaging will be the first Internet area on which we will concentrate. We want to develop a method of receiving messages that is just as easy to use as WinFax," Skapinker enthuses. "And we will have two versions: one will be for business and the other will be a more consumer-based version. We are currently working towards a new product line which we are calling Delrina Communications Suite. It will be aimed at the mass market and will comprise of WinFax, a telephony component, some online aspects of the Internet and will additionally have a web browser. We are working on the basis that we need a combination of front-end and back-end services because it is not just one or the other that is needed to ensure

the success of Internet products."

Skapinker's plans for the Internet are born of his frustration with its current state: "You only have a 90 percent guarantee that your messages will get through," he warns. "As for security, it is *not* secure to communicate on the Internet — someone else can read your message." Skapinker says he is worried that many Internet newcomers will get the impression that it is safe to do such things as give out credit card details over the Internet to make online purchases. He suggests that early, unfortunate experiences with a non-secure Internet environment would leave consumers feeling extremely disatisfied and so retard the growth of online commerce.

"In the area of banking and commerce, many electronic banks and traders are opening up for business," says Skapinker. "But while they are asking for your business, you must satisfy yourself as to how safe they are. The Internet is hacker city, literally a nerd's haven. It is just like the Wild West — a haven for outlaws and outcasts. Last year, when a hacker cracked a previously unbreached security code, the solution was out on the Internet within a day, throughout the world."

If Skapinker sounds as though he has a feeling for the issues that concern the consumer market, it should come as no surprise that his roots belong in the Commodore 64 consumer software business. In the early eighties, Skapinker was director of product development at a Canadian company called Batteries Included. Among other things, this company produced the well-known Commodore 64 word processor called PaperClip until the business was acquired by US-based Electronic Arts.

Outside expertise

Following the sale, Skapinker got together with fellow Canadians Bert Amato and Dennis Bennie, along with American Lou Ryan (head of sales at Borland at the time). In 1988, these four jointly established Delrina and managed to persuade many of the brightest and best employees of Batteries Included to work with them on developing products for the new company.

"We started with only a few people and we four founders are still the seniors in the company," he says. "It has been exciting for all four of us to be able to maintain the company and achieve sales growth within those areas on which we have focused. And, we have managed to attract many people from technical, managerial and sales backgrounds to maintain the level of sales."

But Skapinker was not always so sure of himself or his co-founders. Earlier this decade, he actively considered a merger with a pioneering player in the PC software market. "There was a time when we thought the company needed to attract outside expertise," he recalls. "A few years ago we thought of merging and had a long-running set of discussions with WordStar. The merger would have meant a major management reshuffle for us and we realised that it would be better to maintain our management positions, so the deal didn't go ahead. It built our self-confidence and convinced us that we had the wherewithal to run a software company of this size. We are now probably around the tenth largest business PC software company in North America."

> "We started with only a few people and we four founders are still the seniors in the company. It has been exciting for all four of us"

Although Delrina is best-known for WinFax, the company has actually been built around three key elements. The first element is WinFax and its associated applications, including the WinCommPRO communications suite released towards the end of last year.

Second is the PerForm and FormFlow electronic forms software applications that allow people to design, complete and route forms electronically.

Thirdly there is Delrina's screensaver business, which has been built around its Intermission proprietary screensaver engine. Intermission is used to deliver the company's Opus 'n' Bill, Far Side and Dilbert screensaver collections.

In developing these businesses, Skapinker says the key has been to identify and understand the trends that would have the greatest impact on PC computing. "Today, we strongly believe that there are four dominant trends likely to have such an impact. Our existing products are well positioned, not only to take advantage of the emerging technologies but also to continue appealing to the mass market," he says. "These four trends are: the increasing popularity of Windows; the widespread adoption of PC communications; the growing use of computers in the home; and the maturation of the PC industry."

Crossroads

So Skapinker's next big area of development is in the consumer market where he expects to draw heavily on his pioneering experience in the Commodore 64 sector. "This is not the first time we have been through an uncontrolled explosion of home software," he recalls. "In the early eighties, the prices of the so-called home computers of the day fell to such a point that they entered the mass market. The marketers of these products created the renowned software guilt ads; 'if you don't buy this new home computer for your children, they will not succeed in school or in life'. The only problem was that most of the software of the day was extremely low quality and much of it required specialist hardware to run."

Skapinker warns that manufacturers and dealers must beware of this happening again. "The word on the street now is that about 30 percent of CD software is being returned because users cannot get it to work," he says. "All the new computer users are now sitting in front of their new computers and the same rot is beginning to set in — the same story as in the mid-eighties. I believe we are at the crossroads of the consumer market: either the software market will stabilise and provide its customers with a way of being comfortable with their choices, or we will have a similar implosion of the market as we had ten years ago."

And he should know. There are many thousands of hard-working people who suffered shrapnel wounds from events in the home computer market of the eighties, and Skapinker doesn't want to dodge yet another major commercial catastrophe. He barely escaped the first. PCW

Calculating the odds

PCW Statistics Software Photography by Bruce Mackie

Stats Software Contents

There can be so many variables involved in choosing a statistics package that buyers need to be really sure of what they want from the software. Eric Adler reviews the field but finds no clear winner.

Installing a statistics package on your computer will no more turn you into a statistician than installing a word processing or accounts package make a writer or an accountant out of you. But while most word processing packages offer similar basic features, the range of available statistics software is far broader. So it is far more important to know exactly what you require from your statistical software in order to be certain of choosing the package that is most likely to suit your purpose.

Statistics is the collection, classification and interpretation of qualitative data. The choice of a statistics software package should begin with the question of what type of data is likely to be available: does it concern patient records, pharmaceutical treatments, a customer database or sales records for example?

Thereafter, a host of other factors needs to be taken into account before the final choice is made — are you interested in predicting future events or analysing past events? Will you be analysing data by categories or discerning factors? How much data do you have, and in what form is it held? Do you require SQL connectivity?

Because spreadsheet packages such as Excel, Lotus 1-2-3 and Quattro Pro offer a range of basic statistical functions, the role of the specialist statistics package is no longer clear. If this specialist software is a tool, then what is it supposed to be used for and who is supposed to use it? Further considerations in your choice of package are the output quality required, whether analyses will be graphical or numerical, and the user's likely level of expertise.

All the statistics programs tested here are high quality precision products featuring a range of distribution functions, parametric and non-parametric tests. All offer ANOVA facilities, except for Microfit, so consider whether a basic ANOVA would be sufficient or whether you might need three-way analysis of variance. All the packages offer regression routines as standard, but do you really want regression diagnostics, or would a set of ARIMA routines be more useful?

Finally, you must consider carefully whether your need for statistical data processing is likely to grow and if you want a general purpose package with many procedures and routines. You might find it is better to start with a base and add more modules as the need arises.

Arcus Pro Stat 3.23

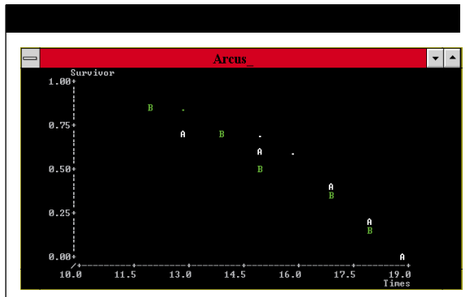
Since its inception, Arcus has been an easy-to-use statistical package aimed squarely at those who are neither statisticians nor computer experts. While so many programs seem to sprawl over the hard disk and require increasing amounts of RAM, it is refreshing to find one which is able to reduce its requirements without sacrificing usability or range of functions.

Using a spreadsheet and database manager, Arcus will import data files in a variety of formats, and as it has its own pop-up calculator as well (which now includes logit and antilogit functions) Arcus is better equipped than many of its more expensive rivals.

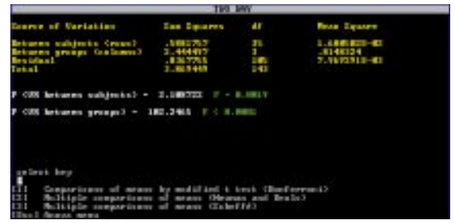
In terms of statistical function features, the Arcus suite is now almost complete and has all the expected features. And, as well as the cross tabs, chi square and correlation analysis, survival analysis is now available with a choice of routines including Kaplan-Meier, Simple Life, Peto's Log-Rank with trend test, Wilcoxon test, and the Wei-Lachin analysis. There are two other welcome additions: the logistic regression facility which allows investigation of the relationship between one or more predictors and a binary outcome or response; and the principle component analysis module which helps to identify the most important variables when a normal regression is not applicable.

This is a package designed for medical researchers who are more concerned with the quality of the analysis than whether it was processed on a Windows package, for instance. Arcus is well documented, and has online help screens: there is a section on statistical method selection and another on experimental design.

Last year when *PCW* reviewed Arcus Pro Stat 2.0, we commented that Arcus was probably the first and only package most researchers, and especially those in medical fields, would ever need. This still holds true today.



Arcus includes advanced survival analysis



Arcus can be run in a DOS window

PCW Details

Arcus Pro Stat 3.23
Price £139
Contact Medical Computing 01695 424034. Fax 01695 424645

Good Points Well featured.
Bad Points DOS. Poor graphics.
Conclusion Might leave enough money in your budget for a laser printer.

Microfit 386 3.21

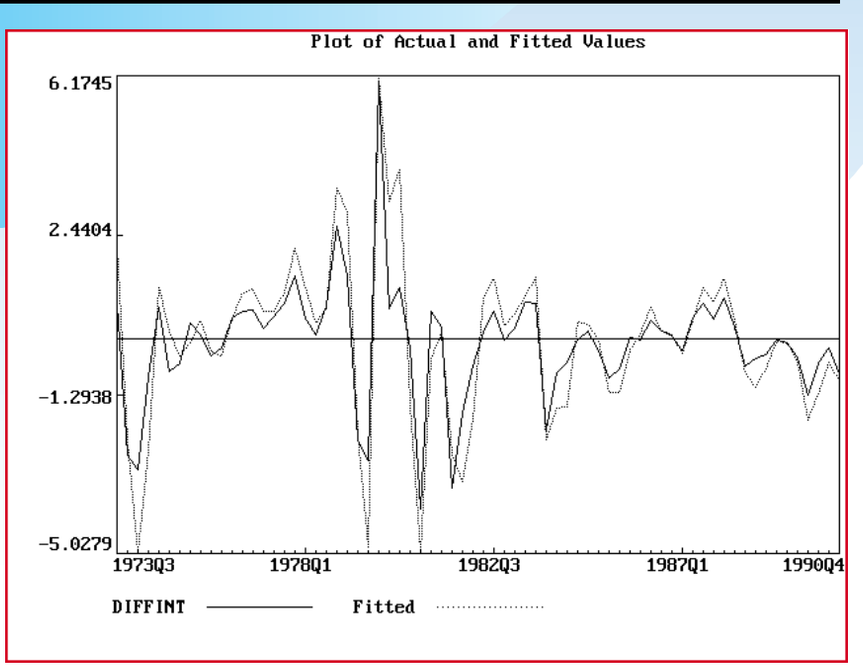
Microfit is a fully-functioning PCDOS version of the Unix program used by the Bank of England and the Treasury to predict and control the UK economy. As the ultimate linear multiple regression package, Microfit offers a vast range of procedures and diagnostic tests.

It can create seasonal dummy variables, measure trends, and calculate a variety of regressions. By making comparisons of actual and predicted values it can perform upon the residuals. Variables can be added or omitted, data series can be lagged, and if there has been a mis-specification, the program will point it out. If there is an omitted variable, this will also become apparent. Microfit has a vast range of diagnostic procedures and will produce confidence intervals for the explanatory variable coefficients, as well as for the regression line, and supply a wide range of checks on the form and strength of the correlation.

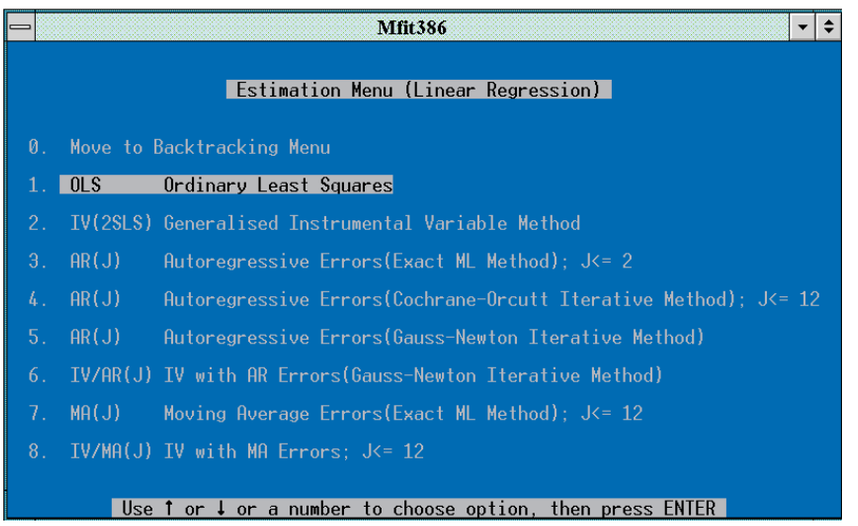
The key point about Microfit is that it offers a wide range of sophisticated analytical routines which are not provided by less specialised programs. And these advanced procedures are made available without sacrificing ease of use.

Microfit 386 is well documented and the handbook tutorial provides lessons in data analysis as well as a description of each of the tests included with the package. Although the program is easy to use, being entirely menu driven, the lack of online help may be seen to be a disadvantage.

There are various levels of Microfit, ranging from the student version (£40) to the full version which is able to run regressions with 42 variables and 3,000 observations per variable.



Microfit is a very precise analytical tool



Seen here running in Windows, Microfit is menu driven

PCW Details

Microfit 386 3.21
Price £375
Contact Janet Caldwell, Oxford Electronic Publishing 01865 267979. Fax 01865 267990

Good Points Advanced facilities yet easy to use.
Bad Points No online help file. It can only import ASCII files.
Conclusion Excellent for business people as it uses the same routines as the Treasury.

S-Plus for Windows 3.2

If you are looking for a simple, quick and easy-to-use Windows statistics package with click-on options, then forget S-Plus. But if you want one package which will do everything and are prepared to invest the time to learn new methods, then you might find that S-Plus is right for you.

S-Plus is a rich graphical data analysis system. It is the result of more than 15 years' research and development at AT&T's Bell Labs, plus a further four years' product development. The resulting package takes up over 20Mb of hard disk space and comes with six volumes of documentation totalling over 2,000 pages, and more than 1,600 functions. S-Plus claims to set new standards of data analysis and this is not a trivial claim. The package offers functions such as least median regression fits, which others don't seem to have heard of, and facilities for handling complex numbers, vectors, matrices and other aspects of mathematical computing not normally found in a statistics package.

Although S-Plus is not easy to use, its strength lies in the breadth of features available. The range of statistical routines and functions is impressive by any standards and is by far the broadest of any of the statistics packages tested in this review. With the exception of high level econometric diagnostic functions to be found in Microfit, S-Plus can match virtually every routine, or the equivalent, offered by any other package tested here. It even produces a binary response tree equivalent to the gains chart of the CHAID (chi square automatic interaction detector) module, and it can map index data with a brush option.

Other functions include cluster analysis and many modern regression methods. The range of variance analyses, time series and survival analysis is equally impressive.

The command set is a functional language which evaluates each function call in an expression, in a separate frame of memory. The package is supplied with a library of development tools which can interface with Fortran or C to produce object oriented specific applications within the Windows environment.

There is even a developer's toolkit and a 450-page Programmer's Manual with routines for loading dynamic link libraries. Although there are no additional statistical function modules, there is an interface module to run the package on a Novell network with a module to interface S-Plus with the Maple Kernel.

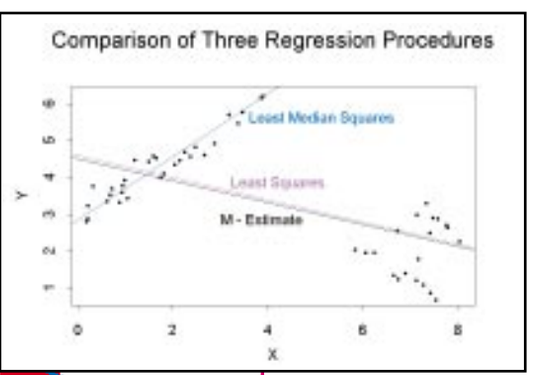
Potential users of S-Plus would be those with experience of using other statistical packages and who are familiar with object oriented programming languages. Despite this being a Windows program, there are no pulldown menus, no toolbars and not much to click on. S-Plus is purely a command line driven package, even more so than Mathematica, and is closer to Matlab than to the other Windows statistics packages reviewed here.

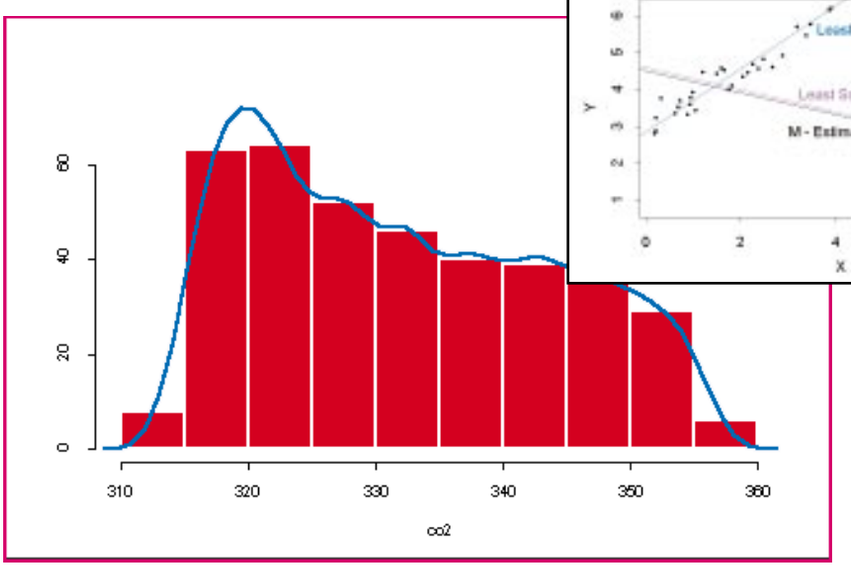
The reason is that the ten pulldown menus, each offering ten features, covers less than ten percent of the available 1,600 functions. The existence of multiple menus also gives rise to problems of navigation, hence the strict adherence to the command line interface.

Such gripes aside, this is a powerful package which will take everything you can throw at it, if you take the trouble to learn how to use it properly. StatSci offers training courses at the Department of Statistics at Oxford University, provides a telephone help line manned by a PhD statistician, and copious online help files. The excellent documentation supplied is pitched at a reference level rather than a tutorial level.

MathSoft, which produces Mathcad, has taken over the S-Plus project, so hopefully future versions wil reflect the MathSoft approach of combining multiple toolbars and pulldown menus with command driven operation. The appeal of S-Plus 3.2 in its present form seems limited to statistical specialists or to those who have experience of C+ programming.

***Right** S-Plus has routines not found in other programs*
***Below** An advanced spline smoothing routine*





PCW Details

S-Plus for Windows 3.2
Price £1,195
Contact Statistical Science Europe 01865 61000

Good Points Vast range of functions and routines.
Bad Points Poor interface, command line instruction set.
Conclusion Not for beginners.

Personal Computer World HIGHLY COMMENDED

SPSS for Windows 6.1

For as long as anyone can remember, SPSS has been one of the top statistical software packages for professional use. With the accent firmly on survey analysis, the SPSS slogan “Real Stats, real easy” does indeed describe the philosophy of this program in which many of the most advanced up-to-date tests are rendered as click-on options. In addition to survey analysis, the package seems to be oriented towards database market research, analysis of customer mailing list response rates and other aspects of consumer behaviour.

The basic system consists of a shell with everything necessary for data input, preparation and manipulation, coding and analysis, and there is a facility to analyse multiple response data. The graphics feature includes more than 50 types of chart.

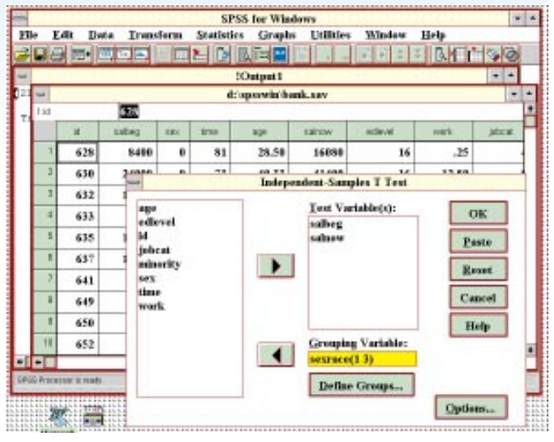
SPSS 6.1 provides full 32-bit data processing and makes extensive use of toolbars. There are large, clear, easy-to-use dialogue boxes and a click-on facility to recall the previous 12. Files of data can be imported and exported in a range of formats including Excel, Lotus.wk, dBase, and ASCII field and tab-delimited. Together with the SPSS developer’s kit module, it offers full OLE2, DDE, Windows API, ODBC and SQL connectivity. Other modules are applied to this Windows shell as seamlessly integrated building blocks.

The range of modules covers many aspects of advanced data analysis and document presentation. The tables module, for instance, is almost completely self explanatory and allows the generation of automatically formatted, tabulated summary or frequency data ready to be pasted into a word processor or presentation package. The Professional Statistics module provides descriminant analysis, factor analysis and procedures such as logistic regression. The Advanced Statistics module includes routines for medical and social science data analysis such as MANOVA. The Survival Analysis methods include implementations of life tables, Kaplan-Meier, and Cox's regression with the option of time dependent co-variance analysis.

The CHAID (chi square automatic interaction detector) module is used to identify database subgroupings as an alternative to regression analysis and is particularly suitable for use with categorical non-parametric data. Using CHAID, up to 64,000 variables can be analysed, with results presented in a GAINS chart format — another advanced feature of SPSS 6.1 which enables data results to be interpreted and implemented at a strategic marketing level.

The Mapinfo module presents a way of displaying direct marketing or survey analysis data which includes subjects’ post codes on a map. Data can either be displayed symbolically or by colour codes on maps displaying boundaries, urban areas and street names.

Although the idea is that each user can choose which modules he or she needs, the knowledge of which modules to actually choose requires a certain degree of expertise. SPSS is most helpful in running seminars to enable potential users to determine their exact needs. The company also provides two and three-day training courses; the two-day courses (£445) cover usage of the base module and the three-day courses (£595) promote familiarity with various modules.



Left *SPSS has large, easy-to-use dialogue boxes*
Below *Mapinfo provides a graphic way of displaying analytical results*

PCW Details

SPSS for Windows 6.1
Price £695 base, £1,385 base plus three modules
Contact SPSS UK 01932 566262. Fax 01932 567020

Good Points Good range of routines.
Bad Points Pricey.
Conclusion The top package, if you can afford it.

Personal Computer World HIGHLY COMMENDED

Statgraphics Plus for Windows 1.1

Among those statistics packages available for Windows PCs, this is the most easy to use. There are clear dialogue boxes, simple menus and fast graphics. A few mouse clicks will produce perfectly formatted output of every basic statistical routine. For example, when working with a column of data, the drag and drop and click-on graphics features enable descriptive histograms, scatterplots, symmetry plots and such like to be produced in an instant. A mouse click will select the diagrams to be examined, discarded, edited or saved and printed.

Having selected distribution fitting for example, clicking the right mouse button will provide a choice of five distribution functions: in other words, normal, log-normal, exponential, extreme value and Weibull. Having selected the distribution function, a click on tabular options, with the selection of “all”, gives chi square and Shapiro Wilkes tests for normality, goodness of fit, tail areas and critical values, formatted and ready to print for the previously selected distribution function. This certainly represents easy-to-use, high quality output, but are five distributions sufficient? There is no facility to plot them all at the same time on one histogram of the data. There is much to be said for goodness of fit tests but there is much to be said for the comparative evaluation approach as well. Ease of use and simplicity has its price and in this case it is at the expense of available functions and flexibility.

This same click and easy approach applies to other functions of the base module, such as analysis of variance, regression, categorical analysis and choices for data plotting routines — all give the user the option to click on and identify individual points in a graph which makes it easy to identify outliers and important clusters.

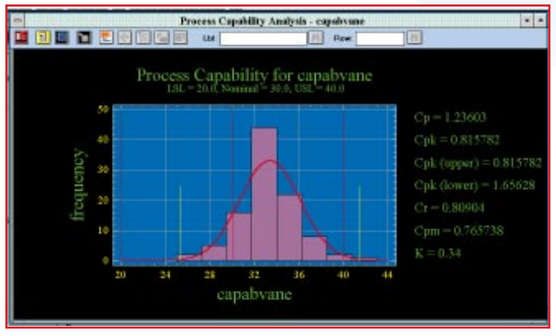
The ANOVA routines allow for either single factor or multi-factor designs. The multiple regression reports produce correlation matrices, procedure summaries including conditional sums of squares, and ANOVA of the regression, in addition to the detailing of unusual residuals and influential points. The click-on graphics options include component effects, observed or residuals versus predicted, row number and x, and interval plots.

There is no compromise on the number of features in the quality control and time series analysis modules. The former has almost every conceivable quality control method with 16 forms of analyses ranging from X-bar and R-charts through process control, OC charts, to tolerance analysis and more.

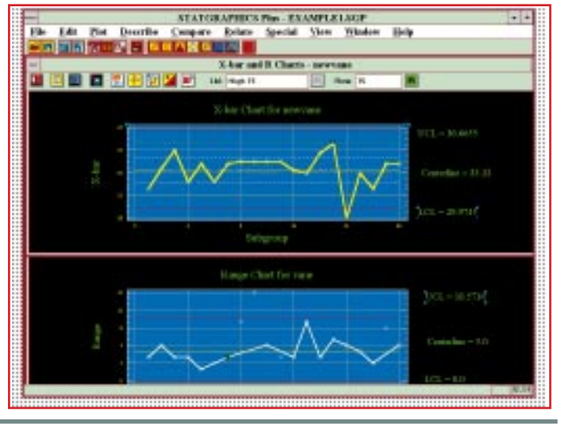
Both modules are extremely well documented with their own handbooks arranged as tutorial reference guides. Someone with only a passing knowledge of forecasting or quality control could use these works to form the basis of a working familiarity and knowledge of the techniques described. At the top end, the listing of available features takes several pages and only an experienced quality control or forecasting specialist would be able to evaluate such a combination of analytical tools. The computer interface, like the base module, is quite excellent and the integration is seamless.

In terms of “click-on-ability” Statgraphics is one of the best Windows applications in any category. But the limited range of functions would be a disadvantage unless you had the good fortune to be a quality control consultant or were involved in forecasting.

Statgraphics for Windows offers clear statistical graphics



The quality control module is most impressive



PCW Details

Statgraphics Plus for Windows 1.1
Price Base system £540, modules from £320
Contact Bloomsbury Software Company 0171 436 0524

Good Points Fast to learn and easy to use.
Bad Points Limited range of distribution functions.
Conclusion Well worth considering.

Statistica for Windows 4.5

This is a package for professional statisticians. Its floating module construction means that you can have six or more open at the same time, each with a separate spreadsheet, each with a different data set, or each with some alternative aspect of analysis. These can be layered, tiled or iconised.

Statistica is widely used in US Government statistics departments and one can well imagine a user of this package informing 12 different callers to the department that he has their data "on screen right now". Additionally, this feature enables on-screen comparisons to be made between different data sets running the same procedures in different windows. The Probability Calculator, a feature unique to Statistica, is especially useful for such comparisons — the whole package can be personalised to suit the style of the user. Menus, floating menus and toolbars can be edited, hot-keys defined and redefined, or used in conjunction with macros. These macros can also be used to enable other packages, such as MS Word or Lotus Ami Pro, to call specific module routines using the Statistica command language. The advantage of its independent module construction is that a module can be called without the base, thereby reducing memory overhead and permitting DDE access to other programs, for example Excel from Ami Pro, without exceeding an 8Mb RAM limit.

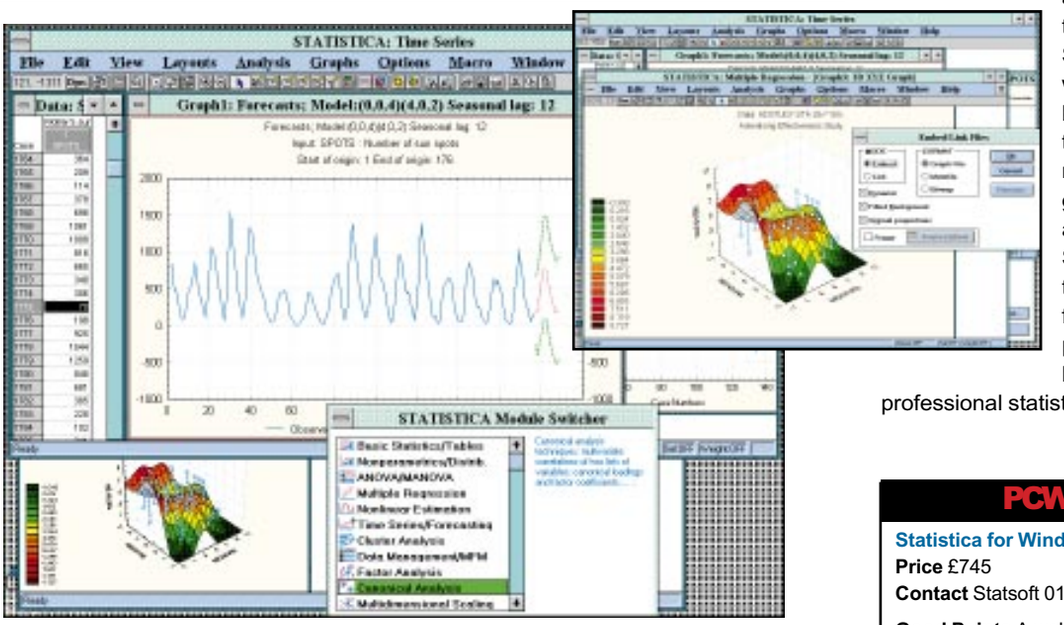
The comprehensive range of statistical functions range from correlations and crosstabs, to non-parametric distributions, to multiple and non-linear regression and from canonical to process analysis and experimental design. With 19 distribution functions and the instant probability calculator (included in the free demo), this package is no slouch and the capacity for multitasking facilitates the background printing of graphs and charts.

Statistica is justly famous for its range of graphing and charting functions and features over 600 graph types. These include rarely seen features such as hanging histobars (which provide a visual test of normality) and categorised normal probability plots (which examine normality aspects of group homogeneity). In the graphical aspects of the fit analysis it is possible to plot a non-linear fit on to box plots of time series data. Categorical data can be represented as vertical slices (panes) which display the relative data spreads on a spectral graph.

Another unusual feature is that distributions may be fitted to multiple histograms on the same graph. All these graphics options are fully customisable. Edited formats can be saved as templates, and graphics can either be saved in a choice of formats or used as embedded objects — for instance, Statistica provides OLE2 linkage to Microsoft Word 6. Most of the statistical information obtained can be arrived at by purely numerical methods but the advanced graphical options of Statistica enable the user to actually see what is happening. There are times when a visual portrayal of the data may be worth more than a collection of numerical results.

The package is well documented with four volumes of handbooks totalling more than 3,000 pages. There is online help which, in addition to the usual files, features a statistical advisor to suggest which methods to use.

In addition to the full Statistica package, Statsoft also distributes Quick Statistica for Windows which includes the basic statistical functions with full data management and graphics capabilities, at a cost of £395. Statsoft offers monthly training seminars and for registered users provides a freephone help line, manned by a professional statistician.



*Statistica's floating modules permit several independent screens to be open simultaneously. (**Inset**) Statistica's 3D graph option, here illustrating a multiple regression*

PCW Details

Statistica for Windows 4.5
Price £745
Contact Statsoft 01462 482822

Good Points A well featured package.
Bad Points Not the easiest to use.
Conclusion Try out the free demo.

Personal Computer World
HIGHLY COMMENDED

Unistat for Windows 4.0

Unistat version 4.0 features OLE2 access to Excel 5 and MS Word 6 as a means of achieving formatted presentation output. The main advantage is that the user no longer has to send statistics output to a fixed-width font text editor, as in an old mainframe. In the past, results printouts were often included in a folder at the end of a presentation. But what if you needed to include a summary of the data, with charts and tables, in the main body of the document? These would require pasting and formatting, and even packages offering OLE2 import facilities would require the chart to be named and saved in advance, which can be more time consuming than the actual data analysis.

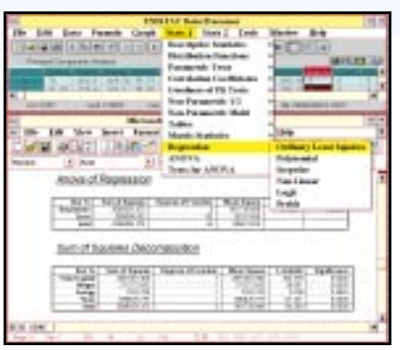
With Unistat 4.0, however, selected output can be automatically formatted into Word 6 or Excel-type tables. Graphics and charts can be exported to MS applications where MS editor tools can be used for the final formatting, or all graphics editing can be carried out from within the drag-and-drop Unistat graphics editing environment. There is also the possibility of calling Unistat from Excel to perform advanced analysis upon a data object, with output formatted directly back into Excel as the host application.

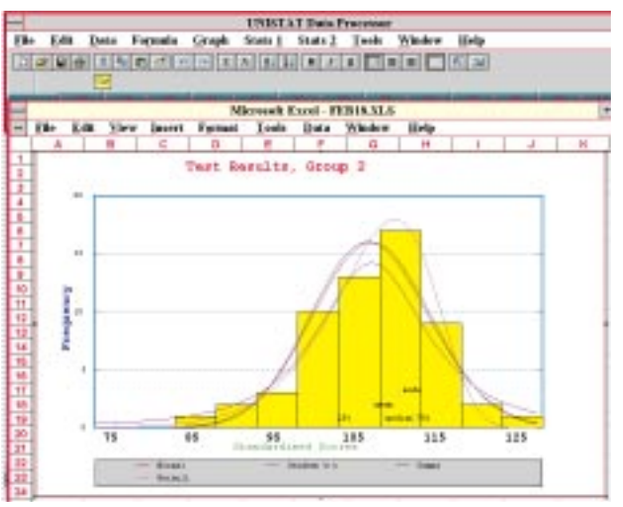
New procedures in version 4.0 include enhanced experimental design options, comparison of regression slopes and intercepts, non-parametric multiple comparison tests for Friedman two-way ANOVA, Quade tests, and multiple comparison tests for medians and variances. And there is a feature for interactive selection terms for unlimited factor ANOVA multiple. Other new features include the option of spreadsheet selection of data columns for analysis and redesigned dialogue boxes in the style of MS Wizards offering intelligent prompts. For users of other spreadsheets and editors, the data processor retains its menus and allows data to be pasted from Lotus 1-2-3 or any other Windows spreadsheet, and through DDE (dynamic data exchange) permits a two-way interchange of data with other programs. An online database connectivity module is included.

All statistical routines can be accessed either via a choice of pull-down Windows menus or from the Unistat main menu, which traditional Unistat users will be pleased to note remains as a click-on alternative at the far right of the toolbar. The main menu ribbon in version 4.0 includes an undo and repeat function, and the choice of output control is a simple Microsoft-style item adjacent to the main menu on the toolbar.

High quality documentation is included with full details of all algorithms. There is online help as well as a telephone help line. Unistat 4.0 can, as the previous version, be used as a compact standalone program in Windows 3.1 on a 386 with 4Mb of RAM. OLE2 implementation outputting to either Word 6 or Excel 5 runs effortlessly on a 486 with 8Mb of RAM. Full OLE2 implementation outputting to Excel and Word simultaneously requires 16Mb of RAM.

Unistat version 4.0 features 19 distributions, to permit data histograms to be plotted with fitted distributions such as “normal” or “students” superimposed over the histogram. In this way, six distribution functions can be plotted and superimposed on the original histogram, providing a visual check on best possible fit. The 150-plus procedures include multivariate and cluster analysis, descriminant analysis, principle components factoring and a range of multivariate plots. The time series analysis uses ARIMA with Browns, Holts, and Winters routines, while the survival analysis includes life table, Kaplan-Meier analysis and Lee Desu comparison statistics. There are 15 types of control chart and the package even offers Fourier transforms. It all makes for excellent value for money for both beginners and experienced statisticians.





Left *Unistat 4.0 output to formatted Word 6 tables*

Centre *Unistat 4.0 multiple distribution plotting output to Excel 5*

Top right *This toolbar is used to direct output from Unistat*

PCW Details

Unistat for Windows 4.0
Price £595
Contact Unistat 0181 964 1130.
Fax 0181 964 0531

Good Points Wide range of functions and features, Choice of output options.
Bad Points No single click-on graphic of observed “v fitted” values.
Conclusion A value-for-money package which does not require additional modules and will produce great-looking output.

Editor's Choice

Although the programs reviewed here offer the most advanced mathematical statistical routines, not one of them would have made it to the *PCW* Editor's Choice column had they been an equivalent spreadsheet or word processor package. Statistical software users are entitled to expect the same assurance of overall quality, completeness and value for money as any other. Unfortunately, this assurance is not apparent.

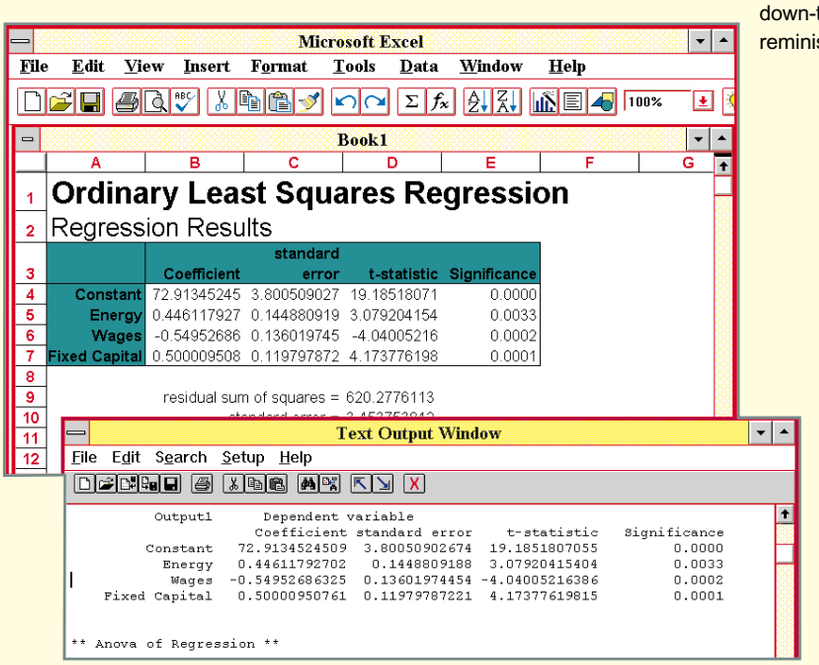
SPSS 6.1 gets a *PCW* Highly Commended award. It is an excellent program with a wide range of functions; but at £3,560, for the base plus a full wardrobe, it cannot be seen as offering sufficient value for money to deserve the ultimate software accolade.

Statgraphics Plus 1.1 also merits a Highly Commended award for its ease of use. Unfortunately, this fast, easy-to-use Windows application has not enough modules available and this restricts its range too much to put it in the running for first position.

On the basis of value for money and statistics features, we were left with a showdown between Statistica 4.5 and Unistat. These are both well-featured programs, providing a full range of routines, with a choice of functions and customisable graphics. And as they both offer free fully-functioning demos, the reader is advised to try them both before buying.

As a Windows application, Statistica 4.5 is showing its age and does not make sufficient use of the GUI. Unistat 4.0 makes the best use of the Windows environment and is a considerable improvement on Unistat 3.0, which itself offers excellent value for money. Unfortunately, the Editor's Choice cannot be awarded on the basis of an undocumented beta version or without the full documentation for version 4.0 being available (prior to its official release on 1st June), so Unistat achieves only the rank of Highly Commended on the basis of a well-documented review copy of Unistat 3.0.

Although Arcus 3 and Microfit 3 provide specialist routines at down-to-earth prices, they both feature DOS interfaces reminiscent of the late eighties.



With the imminent release of Unistat V4, seen here outputting to MS Excel, statistics packages will begin to look up

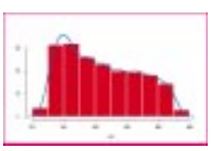
Personal Computer World EDITOR'S CHOICE

Minitab for Windows

Unfortunately Minitab for Windows was not available in time to meet our deadline. We'll be reviewing the 32-bit Release 10 version when it ships this summer. Minitab is available from Clecom on 0121 471 4199.

Programmability in statistics programs

There is a welcome tendency for statistics programs to include suites of developer's tools. These are often installation options offered in addition to their own programming languages, which can be used to create macros and to call up routines from other programs. The Windows version of S-Plus, for example, offers all the connectivity of its Unix parent. As an object-oriented language, S-Plus combines a programming language with full function statistical and graphics tools for the development of statistical end-user applications. The base package includes a 400-page Programmer's Manual, an interactive debugger, and a library which can interface with Fortran or C/C++ to produce object oriented specific applications. As an interpreted language, S-Plus has the advantage of incremental development which makes it ideal for prototyping. The tools developed may then be compiled in C and the compiled code incorporated into the S-Plus application.

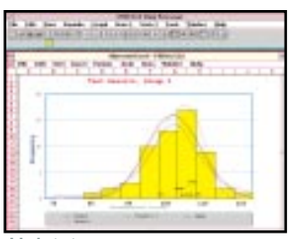


S-Plus

Statistica 4.5 has its own command language (SCL) and includes a development environment as standard. It provides a library of procedures with source codes in C, Fortran, Pascal and Quick Basic which permits the design of custom procedures to interface with Statistica modules, each of which can be called independently of the base.

In addition to its own command language, SPSS 6.1 provides programmability via the SPSS Developer's Kit. Available as an add-on module, the kit provides software components which enable the developer to build applications in C/C++, Visual Basic or OLE2 API Excel applications.

Unistat offers OLE2 and DDE connectivity and even includes an ODBC (online database connectivity) application development disk free with the program.



Unistat

PCW

The right mix

Here's one he prepared earlier — Richard Wylde gives his budget recipe for cooking up a stable Internet link using inexpensive ingredients.

For some time now, I have wanted to provide an inexpensive link to the Internet for colleagues working on a small (10 machine) NETbios Ethernet-based LAN. The primary aim is to provide email as well as allow FTP/Telnet access to the Net. Automatic collection and distribution of mail was a requirement and the current operation of the network could not be disturbed.

One can obviously go to Microsoft, Lotus or Novell, but their email programs and gateways are quite expensive (for example, US$3,319 for MS's Mail Gateway for SMTP) and there will either be gaps in them — only email, with no FTP — or a big bill from CompuServe.

My aim here is to demonstrate that, with a little effort and a budget of less than, say, £1,500 for software and hardware, a stable Internet link can be created using solid software from freeware/shareware/GNU Public Licence domain. The pieces already exist, they just need to be put together. Running costs should be a few hundred pounds a year to the Internet service provider and the phone company.

The Internet was built around Unix machines talking to one another, and the core of this solution is based around Linux, a version of Unix which is free and runs on a PC. I have been very impressed with the solidity of Linux. It just works, in a way that Windows, with its fairly frequent General Protection Faults, does not.

So how is it done? Basically, with the Linux box connected to both the LAN and the Internet via a modem. Linux collects and sends out the mail to both the local users on the LAN and the rest of the world. The solution outlined here is not a unique one, and no doubt can be improved by people with a deeper networking knowledge, but it works. I make no claim to be a TCP/IP or Unix wizard as my "C" is non-existent.

Having said that, you should not expect to put it together in an afternoon: a week or two's work will be required to collect the software, load it up and debug it. Expect a few mishaps on the way as well. In addition, a reasonable knowledge of computing is required: if IRQs and CONFIG.SYS files leave you cold, and you want an Internet/LAN connection, then your cheque book will be required.

The "ethics" of the Internet is such that most people will help and answer your queries if you are polite and show that you have put some effort into solving the problem youself. A request for general help: "My machine don't work" will have much less effect than "the widget driver is giving me a XYZ error: My hardware is .....".

The right ingredients

A number of ingredients are necessary for this piece of Internet cookery. You will need a PC to run the Linux. Any 386 or above will do, but 4Mb of RAM is necessary and 8Mb will help. You don't need a fancy screen; in fact, some modern accelerated cards may get you into trouble. Avoid Diamond cards if you want to run X-Windows, MIT's graphical front-end for Unix.

Ideally you should have a 100Mb disk, although you could get away with 40Mb. A good serial port is required, and by this I mean one equipped with a 16550A UART. The program MSD in MSDOS will tell you what you have. If you have a 16450, bad luck. Replace it for perhaps £30 if you want your modem connection to run at much faster than 9600 baud.

A CD-ROM drive will be necessary (mine is a Panasonic CR562B at about £100 or so), as will an Ethernet card: I chose a 3C309 from 3COM, but Linux will drive most standard cards.

You will need a modem. I use a Zoom 14.4, costing about £140. A total outlay of about £1,200 (plus VAT) should acquire the whole shopping list, but it is worth befriending someone who is getting fed up with his old 386.

A copy of Linux completes the list. I got mine from Lasermoon, about £40 for the CD-ROM. I have the Slackware 2.0 version, which is now out of date but that's the nature of Linux. In biological terms, it's evolving quite fast. The latest version will run on a Pentium and support the PCI bus, but such a machine is not required for email, though X-Windows will fly.

At the PC client end, I use NDIS drivers to allow me to run both my LANtastic NETbios and TCP/IP protocols together. The TCP/IP collection in Windows is provided by Trumpet, a $25 shareware program, and the front-ends by Eudora for email and WIN/QVT for Telnet and FTP. Details of how to obtain these are in the "*PCW* Contacts" panel on page 538.

Setting up Linux

Begin by assembling the hardware. Run DOS and check that it all works: that the modem dials out; that the CD-ROM can read a disk, and so on. I had to play around with the address of the CD-ROM interface card so that it did not conflict with the Ethernet card. Although this may be quite familiar to some people, the next step is a jump into the unknown. In fact, the Linux installation and Getting Started Guide (by Matt Welsh), which you should certainly read, opens with the quote from Crowther and Wood's "Adventure": "You are in a maze of twisty little passages, all alike..." and it will feel like that at times. This book and the general FAQs in the distribution should be studied before starting on this.

I profited from reading *Serial HOWTO*, *Linux System Administrator's Guide*, *Network Administrator's Guide*, *Linux NET3 HOWTO*, *CD-ROM HOWTO*, *MAIL HOWTO*, and *XFree86 HOWTO (for X-Windows)*, which can be found on the CD-ROM.

Decide how you want your hard disk partitioned. I had a large enough disk to allow a DOS partition as well as two Linux partitions: the main one and a swap partition. You can forgo the DOS partition (which can be read from Linux) but I think it's worth having.

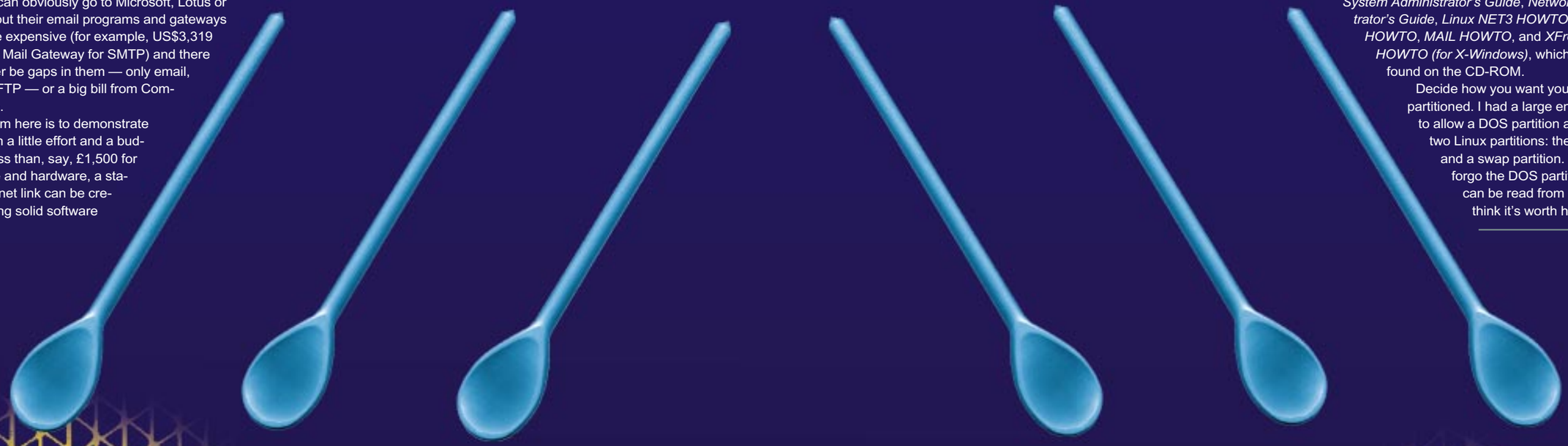


Fig 1 Partition table

```
899 CLY, 15 HEADS, 62 SECT: 428.1 MB total

/dev/hda1 set to  1 to 282 131099 6 DOS 16bit>=32M
/dev/hda2 set to  283 to 865 271095 83 Linux native
/dev/hda3 set to  866 to 899 15345  82 Linux swap
```

Fig 2 'rc.local' in /etc/rc.d

```
#! /bin/sh
# Put any local setup commands in here
/etc/rc.d/rc.serial
echo 'Loading keyboard map "uk.map"...'
/usr/bin/loadkeys /usr/lib/kbd/keytables/uk.map
```

If you have the space, using a DOS floppy boot disk, run FDISK to create a DOS partition on the hard disk. Format this partition using Format C: and reinstall DOS. Then create two boot disks to load an initial kernel and installation root image. Then use fdisk to set up two Linux partitions on the hard disk — a Linux native (type 83) and a Linux swap (type 82).

On my (albeit excessively big) disk, I was left with the partition table in Fig 1.

Now make the Linux swap file by issuing the command

```
mkswap -c /dev/hda3 15345
```

from the command prompt.

I decided to use the recommended ext2fs filing system so ran

```
mk2fs -c /dev/hda2 271095
```

as well to finish formatting the hard disk.

Run the Linux setup program "setup" to load as much or as little of Linux as you want. You will need the base system and parts which deal with TCP/IP. I also loaded parts to do with X-Windows, which provides a very nice front-end but is, for a mailserver, unnecessary. I gave the games a miss.

Assuming you are using a CD-ROM, you will need to load parts which give a kernel which boots the CD-ROM. "Setup" also asks you to give information on the machine and domain name, IP numbers and netmask you wish to use. I have taken the trouble to register a domain name (gigahertz.co.uk, in this article, although for security reasons not my actual domain name) and have been given a Class C address by someone called a Hostmaster (say 999.999.124 for what follows). The Class C address allows for about 250 machines on a single domain. The UK hostmaster's email address is given in the *PCW* Contacts panel, and you can email him to obtain a form to request an IP class C address and register your chosen domain name.

"Setup" will produce a final bootable floppy disk from which Linux will start up. I chose to use this method of booting, rather than LILO, a hard disk booting routine, but that is a matter of choice. If the floppy disk is not in place, then DOS boots up.

You should be left with a number of files in /etc and /etc/rc.d which control the operation of Linux. In /etc/rc.d, for example, my 'rc.local' was as shown in Fig 2.

The serial port should be instructed to operate at up to 57600 bps with the command

```
setserial /dev/cua1 spd_hi
```

in 'rc.serial', assuming the modem is on COM2.

My 'rc.inet1', which contains the TCP/IP information, was as shown in Fig 3.

My rc.inet2 which starts up a series of daemons, including the important inet

Fig 3 'rc.inet1' containing TCP/IP information

```
#! /bin/sh
#
# rc.inet1  This shell script boots up the base INET system.
#
# Version:  @(#)/etc/rc.d/rc.inet1    1.01     05/27/93
#

HOSTNAME=`cat /etc/HOSTNAME`

# Attach the loopback device.
/sbin/ifconfig lo 127.0.0.1
/sbin/route add 127.0.0.1
# IF YOU HAVE AN ETHERNET CONNECTION, use these lines below to
configure the
# eth0 interface. If you're only using loopback or SLIP, don't include
the
# rest of the lines in this file.

# Edit for your setup.
IPADDR="999.999.124.1"       # REPLACE with YOUR IP address!
NETMASK="999.999.255.0"      # REPLACE with YOUR netmask!
NETWORK="999.999.124.0"      # REPLACE with YOUR network address!
BROADCAST="999.999.124.255"  # REPLACE with YOUR broadcast address,
if you
# have one. If not, leave blank and edit below.
#GATEWAY="" # REPLACE with YOUR gateway address!

# Uncomment ONLY ONE of the three lines below. If one doesn't work,
try again.
# /sbin/ifconfig eth0 ${IPADDR} netmask ${NETMASK} broadcast ${BROAD-
CAST}
/sbin/ifconfig eth0 ${IPADDR} broadcast ${BROADCAST} netmask
${NETMASK}
#/sbin/ifconfig  eth0 ${IPADDR} netmask ${NETMASK}

# Uncomment these to set up your IP routing table.
sbin/route -n add ${NETWORK} netmask ${NETMASK}
#/sbin/route add default gw ${GATEWAY} metric 1

# End of rc.inet1
```

Fig 4 'rc.inet2'º with active parts

```
#! /bin/sh
#
# Constants.
NET="/usr/sbin"
IN_SERV="lpd"
LPSPOOL="/var/spool/lpd"

# At this point, we are ready to talk to The World...
echo "Mounting remote file systems..."
sbin/mount -a -t nfs          # This may be our /usr runtime!!!

echo -n "Starting daemons:"
# Start the SYSLOGD/Klogd daemons.  These must come first.
if [ -f ${NET}/syslogd ]
then
echo -n " syslogd"
${NET}/syslogd
echo -n " klogd"
${NET}/klogd
fi

# smail is started here
/usr/bin/smail -bd -q30

# Start the INET SuperServer
if [ -f ${NET}/inetd ]
then
echo -n " inetd"
${NET}/inetd
else
echo "no INETD found.  INET cancelled!"
exit 1
fi


# Start the various INET servers.
for server in ${IN_SERV}
do
if [ -f ${NET}/${server} ]
then
echo -n " ${server}"
${NET}/${server}
fi
done
```

superserver, had the active parts shown in Fig 4.

My HOSTNAME file in /etc is set to Newton. It is often quite fun to look at the header of email to see what odd names people have chosen to name their machines. Star Trek and The Hitchhiker's Guide are popular sources, but more exotic ones exist: for example, Wolfram Research (the suppliers of Mathematica) seem to use insect names, like Dragonfly. Being patriotic, I am sticking to British physicists — Newton, Faraday, Dirac, Boyle.

Linking up

A good book on TCP/IP, the glue which holds the Internet together, should be digested before starting on setting a link up. A knowledge of IP numbers, netmasks and the like is likely to be very helpful. I used *Teach Yourself TCP/IP in 14 Days* by Timothy Parker.

An Internet service provider needs to be chosen and an account purchased. There are now a number of providers. I chose to use CityScape because they were running a month's free trial at the time, and I used that time to confirm that I could make the connection work. Their address is in the *PCW* Contacts panel and the cost of the service is £15 a month.

They use PIPEX to give them their POPs (Points of Presence, the place where they have a room full of computers and modems waiting to take your call). I have found their service very reliable: I hardly ever fail to connect, even at 14.4kb.

The service provider will give you a phone number for your modem to call, an account number and a password. These will all be entered into your login script so that the connection is made automatically. You should also get the IP number of the service provider's Domain Name Server (DNS, in the jargon), a machine which resolves — i.e. converts — Internet names into IP addresses if the Linux box does not know their address.

There are a couple of protocols available to make connections to the Internet: SLIP (Serial Line Internet Protocol) and a subset called CSLIP, for Compressed SLIP. The alternative is PPP (Point-to-Point Protocol) which is a more recent development. I gather there are some technical differences between them: for example, PPP can support dynamic IP allocation. I chose to use PPP because I read that there were plans to support ISDN (Integrated Services Digital Network) connections, which I would like to use in the future. I also had a general feeling that being more modern, it was likely to be better constructed.

I obtained a copy of PPP2_1_2b.tar.gz (the b version is important — the 'a' version has a bug in it) and unpacked it using 'gunzip' followed by tar xvf into a directory /usr/rjw.

PPP support is built into the kernel. You can confirm this as Linux boots because you get the messages, shown in Fig 5, flashing across your screen.

I then studied the FAQ and HOWTOs on PPP written by Michael Callahan and Al Longyear. It outlines how PPP uses another program, 'Chat', to make the phone call and tell the service provider that PPP is desired. Then I started work.

The modem port, in my case /dev/cua1, was linked to /dev/modem. A null file 'options' was placed in /etc/ppp directory. A script file 'scapefast' to call PPP had the following text:

```
/usr/etc/pppd connect  'chat -v -f
  /usr/etc/dialer' /dev/modem
38400 defaultroute noipdefault
  crtscts modem
```

This instructs the PPP daemon to run a chat script 'dialer' found in /usr/etc, using /dev/modem as the device. The connection rate should be 38400 baud. The other comments ensure that the phone line is dropped after the connection is finished and that the provider should issue two IP numbers, one for each end of the connection. My Chat script 'dialer' is shown in Fig 6 .

Fig 5 Message confirming PPP support

```
Swansea University Computer Society NET3.014
IP Protocols: ICMP, UDP, TCP
PPP: version 0.2.7 (4 channels) NEW_TTY_DRIVERS OPTIMIZE_FLAGS
TCP compression code copyright 1989 Regents of the University of
California
PPP line discipline registered.
```

Fig 6 Chat script 'dialer'

```
ABORT BUSY ABORT "NO CARRIER" "" ATZ OK AT&C1&D2S0=0 OK
ATDT9,0223576101 CONNECT "" ogin: cisxxx word: yyyyy ocol: PPP
(cisxxx is where my account number is placed and yyyyy where my password
sits)
```

Fig 7 The contents of 'Config'

```
hostname=Newton.gigahertz.c.uk
visible_domain=gigahertz.co.uk
more_hostnames=Newton.gigahertz.co.uk
smart_path=boris
smart_transport=smtp
smart_user=${user}@r.wylde
postmaster=r.wylde
smtp_accept_max=10
```

Chat scripts are basically of the form 'output' followed by 'expected response'. So, after the ABORT section to deal with dialing failures, I initialise the modem with the standard Hayes 'ATZ' command and wait for the Response 'OK'. Other modem parameters are set up to deal with the lines and disable auto answer. The number is then dialed and a return sent after the 'CONNECT' string is received.

The chat script then sends out the account number followed by the password and finally the required protocol, before returning control to PPP. PPP then negotiates a link and collects the required IP numbers.

Assuming all of this works, you should be able to Ping, Telnet and FTP to other machines on the Net. Problems here can often be diagnosed with the Unix commands ifconfig and netstat -nr.

The Hosts file in /etc should be set up with the names and IP numbers of regularly required machines on the Net. The list should include the DNS server and the mailserver you will use.

To allow Internet names to be resolved into their IP addresses through the Domain Name Server (DNS), /etc/host.conf should contain

```
order hosts, bind
multi on
```

and my /etc/resolve.conf was

```
domain gigahertz
nameserver 999.999.244.5
```

Linux email connections

Having set up a connection, I added user accounts for all the local LAN users who wish to make use of the service. The program "adduser" will do this for you.

Another tricky part looms: setting up "smail", the mailing daemon. The program itself is supplied as part of the Slackware 2.0 distribution. You need to edit a couple of files in /var/lib/smail to tell smail where to deliver mail. smail will deliver internal mail to directories /var/spool/mail and put outgoing mail for the Net into /var/spool/smail/input to wait for a PPP connection to come up.

After a little hacking, the two important smail files, 'Config' and 'routers', were left with the following active text:

```
I have to say I am not sure why,
but the art of computing is the
science of how not why. It works.
```

See Fig 7 for what 'Config' had in it. And a section of my 'Routers' file is shown in Fig 8.

I arranged the default mailing address to be a mailserver in the University where I work part-time, but service providers will also provide a mailserver.

smail should be linked to sendmail, runq and mailq, using the Unix command ln: running 'mailq' will tell you what is waiting in the spool area waiting to be shipped out and 'runq' activates this process.

Once this process is finished, you should be able to email internal accounts with a Unix email front-end such as Elm. If you address someone outside your LAN, it should wait in

```
/var/spool/smail/input.
```

When a PPP connection is active, smail (which is run as a daemon from rc.inet2) will ship the mail out.

That deals with the process of sending out mail. It also needs to be collected. I use the POP (Post Office Protocol) to collect mail. Linux comes equipped with a POP client and one can write script files to instruct the client to collect the mail. My script file 'POPxxx' is at Fig 9.

Here the -3 indicates POP3 protocol, xxxx is my account number and yyyyy my password. /var/spool/mail/r.wylde is the destination of the mail and boris the University's mailserver: Popclient finds the IP address of boris from /etc/hosts.

Running POPxxx while a PPP connection is 'up' should collect any mail and place it in /var/spool/mail/r.wylde. The PC client logging on extracts the mail from here.

Automating the process

It is now possible to tie some of these processes together to automatically ship out and collect mail. A shell script, 'collectXXX' (Fig 10) does this for me.

It sets up the link using scapefast and waits 50 seconds to make sure it is up. Assuming that it is, it runs 'runq' to ship the mail out and runs a series of popxxx's to collect my and my colleague's mail. A script 'holdlink2' ensures that the link remains up while there is still mail to send out, and shuts it down when there is no more mail to be sent.

My 'holdlink2' is at Fig 11. Here, a couple of temporary files, 'holdlinkfile' and 'mail_queue', are created whose aim is to ensure that all the mail is shipped out within a specified time. This specified time, some 240 seconds in 'removeholdlinkfile'

Fig 8 A section of 'Routers' file

```
# If the smart_path attribute is not defined, this router is ignored.
smart_host:
     driver=smarthost,                # special-case driver
     transport=smtp;                  # by default deliver over SMTP
     path=boris.qmw.ac.uk,            # alternate, set path in this
                                      file
```

Fig 9 'POPxxx' script file

```
#! /bin/sh
popclient -3 -v -u xxxxx -p yyyyy -o  /var/spool/mail/r.wylde boris
```

Fig 10 'collectXXX' shell script

```
#!/bin/sh
cd /usr/etc
sleep 2s
/usr/etc/scapefast
sleep 50s
if [ -f /var/run/ppp0.pid ]
then
    /usr/bin/runq
    /usr/etc/popxxx
    /usr/etc/popxxx2
     ..........
    /usr/etc/holdlink2
else
echo "ppp link not set up"
fi
```

Fig 11 'holdlink2'

```
#!/bin/bash
touch /tmp/holdlinkfile
/usr/etc/removeholdlinkfile &
mailq >/tmp/mail_queue
while test "`cat /tmp/mail_queue`" != ""  -a -f /tmp/holdlinkfile; do
   echo "going round loop";
   runq;
   sleep 10;
 mailq >/tmp/mail_queue;
done

/usr/etc/stop.ppp

if [ -f /tmp/holdlinkfile ]
  then
     echo "unsent mail awaiting next connection"
  else
     mv /var/spool/smail/input/* /var/spool/smail/stuckmail
exit 1
fi
sleep 3;
```

```
sleep 240;
rm /tmp/holdlinkfile
```

makes certain that any 'rogue' mail can't hold the link up and increase the profits of the phone company significantly.

The script file 'stop.ppp' is shown in Fig 12.

I use a crond daemon to run 'collectXXX' once an hour between 7am and 6pm. The crontab file can be edited using vi with the command crontab -e. My entry looks like

```
37 7-18 * * * >>/var/log/messages
  2>&1 /usr/etc/collectXXX
```

At 37 minutes past the hour between 7am and 6pm 'collectXXX' is run. Standard messages are placed in /var/log and error messages in /var/adm/syslog. There is nothing special about the choice of the 37 minutes. It is worth avoiding an obvious time like 0 or 30 minutes past the hour which other people may choose.

The PC client end

All of this Unix stuff is fine, but the users sit on PCs with Windows. They can talk to the Linux box using TCP/IP and the Linux box can be made to act as a POP3 server to the PCs.

To make the Linux box do this, uncomment the following lines:

```
# Pop mail servers
#
#pop-2 stream   tcp
nowait root     /usr/sbin/tcpd
/usr/sbin/in.popd
pop-3  stream   tcp
nowait root     /usr/sbin/tcpd
/usr/sbin/in.popd
#
```

in the 'inetd.conf' in /etc to run a POP3 server when required.

Now the PCs: Collect together the MSDOS/Windows software — NDIS Ethernet card drivers, pkt_drv.dos, Trumpet, WinQVT/Net and Eudora. Trumpet provides the Windows WINSOCK environment which many Windows Net programs require.

Now move to a PC which is to act as a Client. Start by getting the current network software to run with an NDIS driver. In my case with LANtastic, I added the following lines to my config.sys file:

```
DEVICE=C:\LANTASTI\PROTMAN.DOS
  /I:C:\LANTASTI
DEVICE=C:\LANTASTI\AEXNDIS.DOS
```

and added a PROTMAN.INI file with

```
[PROTMAN]
  DRIVERNAME = PROTMAN$
  DYNAMIC = YES
[AEXNDIS_NIF]
  DRIVERNAME = AEXNDS$
  IOBASE = 0x300
  INTERRUPT = 15
```

In my 'startnet.bat' file,

Fig 12 'stop.ppp' script file

```
#!/bin/sh
# stop.ppp: kill the PPP connection and hang up the telephone.

# Where is the pppd pid stored?
pidfile=/var/run/ppp0.pid

# Kill pppd or complain that it's not running.
if [ -f $pidfile ]; then
    /bin/kill `cat $pidfile`
else
     echo 'PID file not found - "pppd" is not running.'
fi
```


Acknowledgements

A number of people have helped me connect all these pieces together. In particular Adrian Bateman of CADlogic helped me with Linux, Michael Callahan of the Maths Department at Oxford got PPP going, and the Computing Services department at QMW improved my knowledge of TCP/IP and introduced me to Eudora and WinQVT/Net. I use a 486/66 clone supplied by RTM Systems Ltd (0161) 743 9333 with 8Mb of RAM, a 16550A UART and a Panasonic CR562B CD-ROM.


```
AEX IRQ=15 IOBASE=300 VERBOSE
```

was replaced by

```
LOADHIGH AI-NDIS NO_BIND
  BIND_TO=AEXNDIS_NIF
```

Having checked that it still worked, I added a NDIS to Packet driver shim to the "config.sys'" file

```
DEVICE=C:\WINSOCK\NDISPKT.DOS
```

and the following lines to the PROTMAN.INI file

```
[PKTDRV]
 DRIVERNAME=PKTDRV
 BINDINGS=AEXNDIS_NIF
 INTVEC=0x60
```

and got 'startnet.bat' to load the Trumpet packet driver:

```
Winpkt.com 0x60
```

After checking that LANtastic still worked, I loaded up Trumpet by running TCPMAN in Windows. It demanded a Machine IP address, netmask and name-server gateway addresses, as well as the domain name.

Once Trumpet was operational, the two front-end packages, WINQVT to give FTP and Telnet operation, and Eudora to give email, could then be installed.

WINqvt/Net provides Telnet and FTP operation. Telnet allows one to log on to the Linux box as a user and then make an Internet connection. FTP from within Linux is then possible and we use it to transfer large CAD drawing DXF files across the world. WINqvt's FTP extracts downloaded files on the Linux box to the PC.

Eudora is a very good Windows email front-end. The quality of the front-end is important if email is to be used by people who are not interested in computing but just want to use the service. Nicknames, mail-boxes and automatic collection of mail from the Linux box are all there. I set my collection time to a mail check every five minutes.

MIME support is also present, which allows the emailing of files themselves through the Net. MIME involves the coding of files into ASCII before transmission and the decoding on reception. This is necessary as email messages can only be made up of ASCII characters.

Conclusion

You should allow two to four weeks of work to put all of this together, depending upon luck and your interest and knowledge of Unix. Technical revolutions are driven by falling costs and, as this article shows, the cost of connecting a set of people to the Net and allowing seemless email is not high. Join the revolution.

Biography

Richard Wylde splits his time between academic work as a senior visiting research fellow of the Physics Department, QMW, University of London, and running two small toolmaking and scientific instrument businesses. His research interests lie in the design of MM-Wave and Far Infrared optics for plasma fusion diagnostics, astronomy and earth remote sensing.

PCW Contacts

• ***Teach yourself TCP/IP in 14 Days*** by Timothy Parker is published by SAMS Publishing, 1994: ISBN 0-672-30549-6

• **Linux** can be obtained from Lasermoon info@lasermoon.co.uk, tel 0329 826444, fax 0329 825936. They also have an FTP server, ftp.lasermoon.co.uk, which should carry Slackware.

• **PPP2_1_2b.tar.gz** can be found in the Networking section of the CompuServe (CIS) Unix forum.

• **AINDIS.ZIP** can be found in the Patches and Drivers section ARTISOFT forum on CompuServe, as well as on their BBS 001 602 293 0065

• **Artisoft UK** tel 01753 554999, fax 01753 551325

• The **NDIS packet driver** can be found in oak.oakland.edu (141.210.10.117) in /simtel/msdos/pktdrvr as dis_pkt9.zip

• Both **Eudora** and **Trumpet** can be found in the PC Internet S/W section of the INETRESOURCE forum.

• **WinQVT** can be obtained from biochemistry.bioc.crwu.edu (129.22.152.44) and lies in /pub/qvtnet: qvtne394.zip is the Windows 3.1 version I use. Trumpet can also be found there, in /pub/trumpwsk.

• The **suppliers of WinQvt** are QPC Software, PO Box 226, Penfield, NY 14526, USA. Tel 00 1 716 377 6010, fax 00 1 716 377 8305. It's shareware and costs $40 a copy.

• **Trumpet** is shareware at $25 a copy, Trumpet Software International GPO Box 1649, Hobart, Tas, Australia 7001. Tel 00 61 02 450220, fax 00 61 02 450210.

• **Eudora 1.4** can be found on ftp.qualcomm.com (192.35.156.5) in the quest directory. It is postcardware — you need to send Jeff Beckley a postcard to register it:
Jeff Beckley, QUALCOMM Inc,
6455 Lusk Blvd,
San Diego, CA, 92121-2779, USA

• The **UK hostmaster**, to obtain a registered IP number, is hostmaster@nosc.ja.net
Duncan Rogerson and Kevin Hoadley, tel 0171 405 8400 and ask for JIPS NOSC.
Fax 0171 242 1845 Attn JIPS NOSC

• **CityScape** is at Sales@CityScape.co.uk, CityScape Internet Services Ltd, tel 01223 566950, fax 01223 566951

Fig 1 Setting properties on various parts of the form

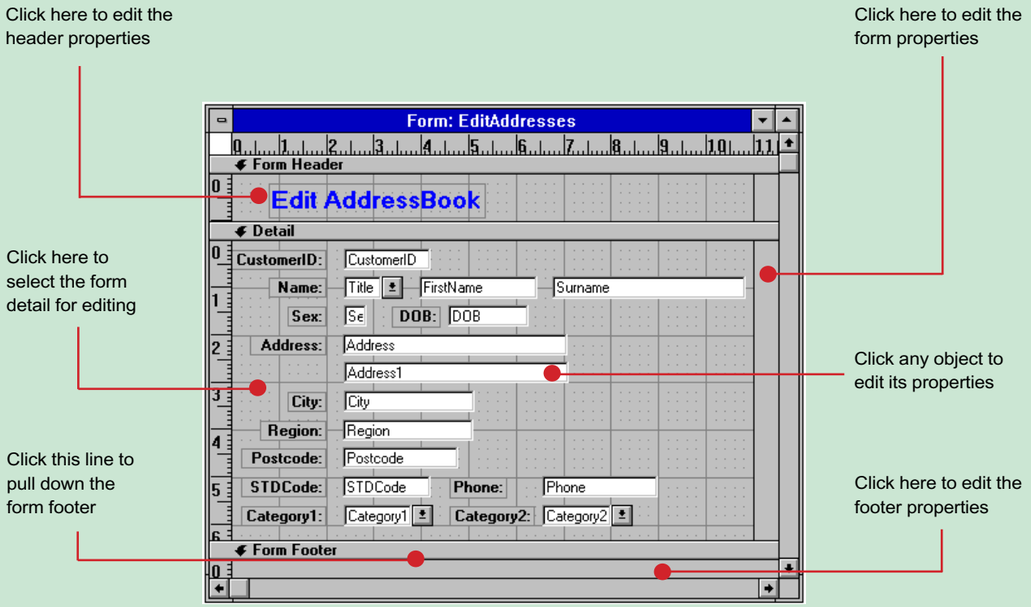
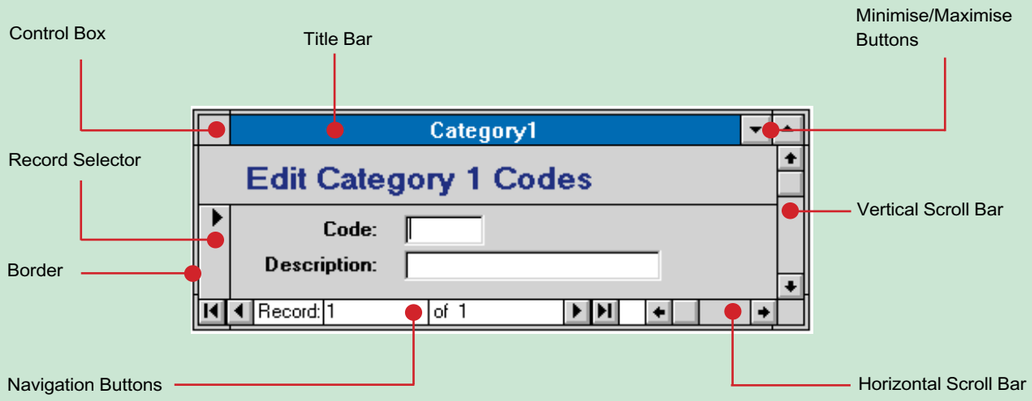


Fig 2 Elements of a form whose properties can be set



On top form

In the second part of their series on Microsoft's popular Windows database, Access 2.0, Iain Summers and Angus MacKellaig explain how to set form properties, add more buttons and write Basic code modules.

Last month we started to create a database application. We created the three tables AddressBook, Category1 and Category2, together with forms EditAddresses, EditCat1 and EditCat2 to edit each. We modified the EditAddresses form, adding "Combo Boxes" to assist data entry for the Title, Category1 and Category2 fields.

The database is supplied on the cover disk as ARTICLE1.MDB, which is at the stage where your own database should have been at the end of the first article. It also allows new readers to pick up the series at this point.

This month we'll study setting form properties: giving further functionality to the form by adding extra buttons; and writing Access Basic code modules.

These activities are all interlinked, as buttons require you to both edit form properties and hook them to Access Basic functions. The buttons and their associated routines are designed to be reusable so you can add identical functionality to any other form in any database application by a simple cut-and-paste operation.

The code module is supplied on this month's cover disk as the text file EDITFORM.TXT. Since various references will be made to the code, load the file into Windows Notepad and print it before you start following the steps in this article.

Setting form properties

A good deal of the work of creating forms in Access applications involves setting properties on the form and its underlying objects. Form Wizards automatically create headers and footers for a form. If you create your own form using the New Form option in the Form Wizard and wish to use the routines supplied here, you will need to manually add a form header and footer by selecting the Form Header/Footer option in the Format Menu.

The standard form layout produced by the Form Wizard is displayed in Fig 1, which is the familiar EditAddresses form displayed in design mode. As shown, you can set properties such as scroll bars or records selectors, as well as its header, footer and main section (form detail) and the individual objects by clicking on the relevant parts of the form.

The property sheet shows only the properties specific to the object or section selected. As you can see, there is no footer on the form produced by the Form Wizard, so open the EditAdresses form in design mode and pull down the footer by dragging the line shown in Fig 1.

Form Properties

Several parts of the form enable you to modify its appearance or access records in a table/query that the form uses. Fig 2 illustrates these.

The Control Box, Title Bar, and Minimise and Maximise Buttons are the same as those for all windows, for example a document window in Word. The Title bar is the only mandatory component which cannot be disabled as it contains the title of the form. If the form is too small to display all the form detail, then it will require either a horizontal scroll bar, a vertical scroll bar, or both.

The navigation buttons are used to select a particular record for display/editing and to move through the records in the table. The record selector is used to select the entire record, usually for deletion. Lastly, you can resize the form by using the form border. These components can be configured in the form's properties dialogue.

We will be adding buttons to the form that will replace all the functionality of the navigation buttons and record selectors, so these will not be required.

Since a good deal of effort usually goes into the design and creation of a form, you should prevent others from ruining your layout. By disabling the Borders, and the Minimise and Maximise buttons, we can prevent anyone from resizing the form, so we can also discard the scroll bars. Setting these and similar properties allows the programmer to control exactly what the user can do with a form and its underlying data.

Let's demonstrate this by editing the properties of all three forms. Load each form in design mode, set each of the form properties as shown below, toggling between Design mode and Form View mode to see the effect.

Some of the changes will take place only when the form is saved and reopened in Form View.

Property	Value
Views Allowed	Form
Scroll Bars	Neither
Record Selectors	No
Modal	Yes
Navigation Buttons	No
Border Style	Thin
Minimise Button	No
Maximise Button	No

See the completed form in Fig 5 for an example.

Access Basic modules

There are two possibilities for adding functionality to forms: macros or Access Basic code.

Many of the objects, as well as the forms themselves, have configurable properties tied to events. Events are triggered by actions on the form, or an object in the form (e.g. loading/closing the form, clicking on a button). These events can

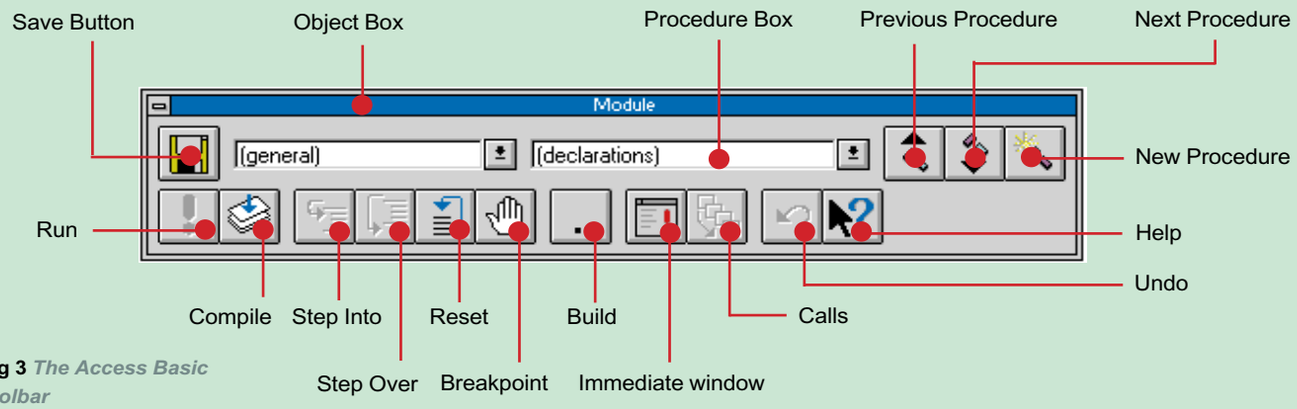


Fig 3 *The Access Basic toolbar*

be set up to run a macro or an Access Basic function automatically.

Microsoft's recommended method of incorporating Access Basic code to handle these events is to use event procedures. In the properties dialogue of the associated object is a list of possible events that can occur for that object, e.g. On Click, which is activated when the object is clicked with the mouse.

Clicking on the event's selection field in the Property Sheet presents a list of macros and Event Procedure. Select Event Procedure to use the event procedure facility. Clicking on the ellipsis [...] at the right of the property allows you to create/edit the event procedure. The event procedure's name will comprise of the object name and the event name, e.g. ExitButton_Click.

Personally, we prefer to write standalone Access Basic modules as they can be accessed by more than one form, are easier to find and maintain, and can be exported to different databases.

Creating a module

From the Database Window, click the Module tab, then Click the New button; Access displays the Access Basic toolbar, shown in Fig 3, and a text window which allows you to enter Access Basic code. This window only displays one function or procedure in the module at any one time.

The Save button allows you to save an updated module. The Object Box presents a list of event procedures for the currently selected object on the form. The Procedure Box presents a list of procedure and functions in the module, allowing you to select the procedure or function to be edited in the text window.

The Previous Procedure and Next Procedure buttons cycle backwards and forwards alphabetically through the available functions and procedures. New Procedure asks the programmer for the name of the new routine and if it is to be a procedure or function. It then writes the procedure/function header, speeding up the process of creating new routines.

Run, Compile, Step Into, Step Over, Reset, Breakpoint, Immediate Window and Calls are tools to assist debugging. Undo and Help are self explanatory. Build is a very useful tool for constructing complicated expressions, such as referring to objects in forms.

We will now load the text file supplied on this month's cover disk as a Basic module. Select the Modules tab in the Database window, then click the New button, to create a blank module window. Select Load Text... from the File menu; select EDITFORM.TXT in the Load Text file selector, then click the Replace command button (this replaces all the code in the currently loaded module). Click the Save button on the toolbar, and enter the name EditForm in the dialogue box.

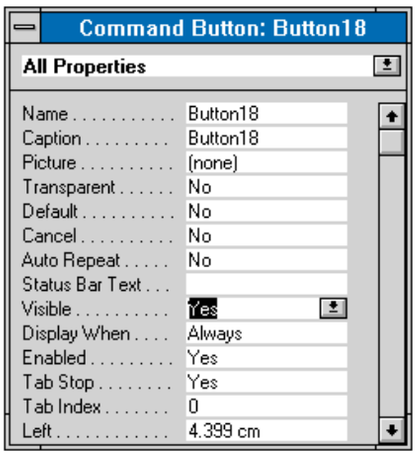
Experience has shown that it is easier to design a form on paper, write the Access Basic code to handle all the events the form will use, then create the form. This will become clear as the form nears completion.

Adding buttons to the form

Whenever a new control is added to a form, Access will run a Control Wizard to lead you through the creation process. The wizard will prompt you for various attributes in a user-friendly manner, then automatically set the control's properties for you. Since we know the properties we wish to set for each control, it is quicker to disable the Control Wizards.

Load the EditCat1 form in design mode. If the toolbox is not visible on the screen, click the Toolbox button on the toolbar. Click on the Control Wizards button on the toolbox. It should not appear to be depressed. When adding buttons to a form, they can be placed in the main body of the form itself, or they can be placed in the form's header or footer.

Fig 4 *The properties sheet for a Command Button*



In our three forms we will be adding command buttons to the headers and footers, so that when a user is editing data in the form, the command buttons can't be accidentally selected using the TAB key: they have to be specifically selected by clicking on them with the mouse. The disadvantage is that clicking on a button makes either the header or the footer the active part of the form, so you have to click on the main body before adding or editing records.

To add a new button to the form header that will allow us to exit from the form, click on Command Button on the toolbox, then drag out the button on the righthand side of the form's header (see Fig 5).

Button properties

The attributes of a command button are set in the command button property sheet. Ensure the property sheet is visible on the screen, and if it isn't, click on the appropriate button on the toolbar. If required, also display the Palette tool on the screen. Edit the command button

properties as detailed below. (Object

Property	Value
Name	ExitButton
Caption	E&xit
Status Bar Text	Exit to Main Menu
On Click	=EditExit()

names are case sensitive, so pay particular attention to capitalisation.)

Adjust the Exit button to an appropriate size and position.

The On Click property "traps" the event of a mouse click on the button. The property value can be set to the name of a macro, Event Procedure, or as in the above example the name of a Basic function (not a procedure). The "=" specifies that a function is to be used. The parentheses must be included, even if the function has no formal parameters. In this case, clicking the button with the mouse will run the EditExit() function from the

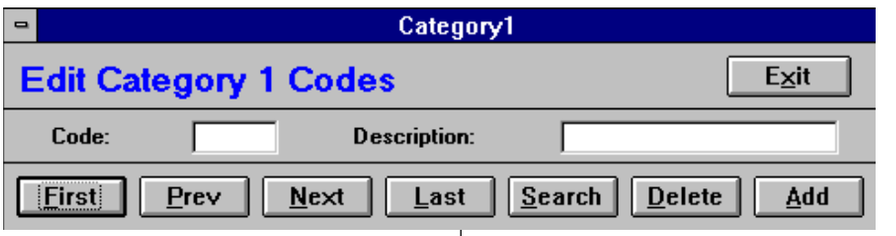


Fig 5 *The completed EditCat1 form, with added buttons, and unwanted properties disabled*

Property				
Name	FirstButton	PrevButton	NextButton	LastButton
Caption	&First	&Prev	&Next	&Last
Status Bar Text	Goto first record	Goto previous record	Goto next record	Goto last record
On Click	=EditFirst()	=EditBack()	=EditNext()	=EditLast()

Property			
Name	SearchButton	DeleteButton	AddButton
Caption	&Search	&Delete	&Add
Status Bar Text	Find a record	Delete current record	Add a new record
On Click	=EditFind()	=EditDelete()	=EditAdd()

EditForm module.

We will be investigating different event types in next month's article.

To save some time and effort, we can create the remaining controls by copying the Exit one, then modifying their properties. Select the Exit button and type ^C, or select Copy from the Edit menu. Select the form footer (dragging it down if there is no footer); type ^V, or select Paste from the Edit menu seven times, once for each button to be used in the footer. Set the properties for each button from left to right as detailed above. (See Fig 5 for details.) Click the Save button on the toolbar to save the form.

Writing reusable code

The code in the EditForm module is written in such a way that it can be used for any form. Examine the EditBack() function in the code listing you printed at the start of this article. This is run by the On Click event for the Prev button. The DoCmd executes an Access action — essentially a built-in command, such as you might see as a step in a macro.

The GoToRecord A_FORM action jumps to a particular record in a form. It requires the name of the form to act upon as there may be several forms loaded at the same time.

A typical line in a Basic module might be:

```
GoToRecord A_FORM,"EditCat1",
 A_PREVIOUS
```

which skips to the previous record in the form "EditCat1".

This function would need to be duplicated with a different name for each form where we wished to have the command button. The different function names would need to be set in the On Click entry for the button on each form.

Our function refers to the form as Screen.ActiveForm.Name which asks Access to supply the name of the currently active form. As a result, we can use the same routine in any form, as it does not refer to any specific form name.

The On Error Resume Next in EditBack() prevents the function being aborted if the current record is the first in the file. All the other "navigation" functions use the same method to move through the records in the form.

There is similar reusable code for deletion of a record — examine the EditBack() function in your code listing. The function references Screen.ActiveForm and uses the RecordsetClone property of the form to access the table edited by the form, again allowing the function to be used with any form.

When a record is deleted, each field contains #DELETE, so the MoveNext part of the code onwards skips to the next record and forces the form to redisplay this "new" record. The entire routine is enclosed within an if statement that prompts the user for confirmation of the deletion. The EditFind() function selects the Find option from the Edit menu which is form independent.

Using the same buttons on other forms

You can use these buttons in other forms by copying them (and their associated properties) into the clipboard and then pasting them into other forms. This can be done in a different database, providing each one has the EditForm Module in it.

If required, open the EditCat1 form in design mode. Select the Exit button in the form header. Hold down the Shift key and select all the buttons in the form footer. Type ^C, or select Copy from the Edit menu. You can now close the EditCat1 form if desired, and open the other form in design mode (e.g. EditCat2). If required, drag down a form footer; click on the form header; type ^V, or select Paste from the Edit menu.

All the buttons should now have been pasted into the header and footer as in the original form. You may need to adjust the position of the objects in the main part of the form to make it look acceptable. We now have a database with forms that allows you to create and edit records in various tables.

Next month we'll look at extracting information from the database via reports.

PCW Contacts

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Stretch the fax

In the third and final part of his series on Procomm Plus for Windows, Stephen Rodda uses the scripting commands to extend fax capabilities.

Last month we looked at a CIX script for Procomm for Windows; this month, in the third and last of this series of articles, we'll see the ways in which we can extend Procomm for Windows' fax capabilities.

Meanwhile, I've installed Windows 95 on my machine and I was expecting to have to reinstall Windows 3.11 or to write this article on a machine with Windows 3.11 on it, since Procomm for Windows does one of the most difficult things under Windows: it uses the communications port. The only thing I found I had to do to make Procomm for Windows work was to reinstall the dstask.386 driver into the (386Enh) section of Windows.

Straight out of the box, Procomm for Windows has a reasonable fax system, although it lacks some of the more complex features which we have come to expect from dedicated fax packages. It does, however, support simple faxes and management of these reasonably well. The scripting commands can be used to increase the functionality of the Procomm for Windows fax applets.

As it stands, Procomm for Windows comes with automatic fax and data recognition (assuming you have a Class 2 fax modem) and allows voice call recognition if the modem is also capable of voice functions. We shall be looking at the programming of the underlying control of these fax applets.

The first thing I thought Procomm was missing in the fax management routines was a method of organising faxes by category — business folders or directories, perhaps, so that you can group send and receive faxes by work category for example. Our routine will first look at the directory structure of the received fax area. To do this, we shall be using the filing functions which Procomm for Windows provides. These are: mkdir, copyfile, deletefile and dir.

The first thing we shall do is to code the directory creation handling routine, which simply consists of a dialogue box asking which directory to create:

```
integer Event
integer Check
string Caption
string ret_dir
string new_dir
string Drive
string cPath
string Result

proc main
Caption = "Create New Directory"
Drive = "C:\"
cPath= "PROWIN2"
dialogbox 0 30 44 198 85 2 Caption
   text 1 18 9 159 23 "Type the name
of the directory you wish to create"
center
   editbox 2 28 36 126 12 ret_dir
   pushbutton 3 28 57 40 15 "OK" ok
default
   pushbutton 4 114 57 40 14 "Cancel"
cancel
enddialog
 while 1
 dlgevent 0 Event
 switch Event
  case 0
  endcase
  default
   strlen ret_dir Check
    if Check < 1
    exitwhile
    else
    new_dir = Drive
    strcat new_dir cpath
    strcat new_dir "\"
    strcat new_dir ret_dir
    usermsg "%s" new_dir
    mkdir new_dir
    usermsg "%s" Result
    endif
   exitwhile
  endcase
 endswitch
endwhile
dlgdestroy 0 CANCEL
endproc
```

Dialogue box for the entry of a directory name to create

There are a few important points about this ASPECT script. The first is that we have built up a dialogue box simply to ask for the name of a directory to create. We could do this by adding a list box of directories, but that would be too complex for this tutorial. Note the use of an OK box and a Cancel box.

We check the size of the string entered where we check the length of the string entered into the box. Although Procomm for Windows does not support names larger than eight characters, Windows 95 will.

You could always limit the size of the directory string to eight characters by following the editbox . . .ret_dir entry with the number 8, which will limit entry in an editing box to the number of characters typed in the command.

Once we have created the directory, all we have to do is actually use it. But that may be more of a problem than you think. First of all, we will have to create a fax viewing script (using the fax viewing program included with Procomm for Windows) so that we can be sure that the fax at which we are looking at is the correct one. Then we shall build the browse boxes for the directories and copy and then finally delete the copied fax file automatically.

Now we shall use a combination of dir, faxlist and faxview. Faxlist requires to know first whether the fax has been sent or received; and secondly, the number of the fax in which we're interested (the sequence number displayed by the filename of the fax).

```
string ret_var
string T_ext
string fax_str
integer faxnum

proc main
T_ext = "*.FAX"
dir T_ext ret_var
endproc
```

In the code fragment above, ret_var contains the name of the file (e.g. recv0000.fax) which we chose. Another method of checking whether the file name returned is valid (or null) is to use the nullstr function.

We may use it simply in an "if" statement:

```
if nullstr ret_var
 exit
else
 strright ret_var fax_str 7
 substr fax_str ret_var 0 3
 atoi fax_str faxnum
 faxlist RECEIVED faxnum fax_str
 faxview fax_str
 endif
```

Now I appreciate that this coding may be somewhat tortuous; but we do want to extend the routine to the filing of sent faxes too, so this depth of checking is necessary as we need to know whether a fax has been sent before filing it. If incoming faxes were only to be filed, we should merely have had either sdlgfopen or dir "*.FAX" ret_var as the search command.

We now need to build the copying and deletion commands, so that we may move the fax files from the received or sent directories to their destinations.

We shall do this by using the copyfile and faxremove commands.

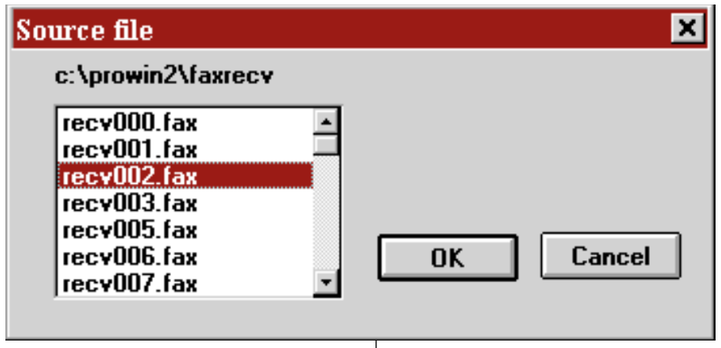
There is, unfortunately no way in which we can keep the note which Procomm attaches to the fax, so it may be worthwhile to keep a note of the number of pages each fax contains, just for security's sake. We shall be building a time and date display, so that we know when each fax was sent or received.

The first part of the code to do the copying of the files might look like this:

```
integer Event
string m_Caption
string initfile
string Sourcefile
string Initdir
string destinit
string destdir
string dpath1
string dpath2

proc main
Initfile = "*.FAX"
Initdir = "C:\PROWIN2\faxrecv"
destinit = "C:\PROWIN2"
m_Caption = "Source file"
dpath1 = "C:\PROWIN2"
dialogbox 0 82 95 198 85 2 m_Caption
   pushbutton 3 104 55 40 14 "OK" ok
default
   pushbutton 4 150 54 40 14 "Cancel"
cancel
   dirlistbox 1 13 17 80 58 Initfile
single Sourcefile
   dirpath 2 12 3 129 9 dpath1
enddialog
 while 1
  dlgevent 0 Event
  switch Event
   case 0
   endcase
   case 1
   endcase
   default
    exitwhile
   endcase
  endswitch
 endwhile
 dlgdestroy 0 CANCEL
dpath1 = Sourcefile
Initfile = "*.*"
m_Caption = "Destination"
dialogbox 0 82 95 198 85 2 m_Caption
   pushbutton 3 104 55 40 14 "OK" ok
default
   pushbutton 4 150 54 40 14 "Cancel"
cancel
   dirlistbox 1 13 17 80 58 Initfile
single Sourcefile
   dirpath 5 12 3 129 9
enddialog
 while 1
  dlgevent 0 Event
  switch Event
   case 0
   endcase
   case 1
   endcase
   default
    exitwhile
   endcase
  endswitch
 endwhile
 dlgdestroy 0 CANCEL
dpath2 = Sourcefile
 endproc
```

But this is repetitive and although it will work perfectly well, I shan't let you develop untidy methods. We shall condense all of this into a procedure, which we can call whenever we want a



The file open dialogue box we have created

dialogue box, allowing us to choose from some files or directories. There are two types of procedure: that which simply carries out a series of specified actions and that which does all of that and returns a value. Since we require a result — that of the selected file or directory — we shall use the latter.

This is called a function. We can structure it like this:

```
integer Event
string m_Caption
string Initfile
string Sourcefile
string Initdir
string destinit
string destdir
string dpath1
string dfile
string dpath2
string fChosen_file
string Chosen

proc main
Initdir = “C:\PROWIN2\faxrecv”
destinit = “C:\PROWIN2”
m_Caption = “Source file”
dpath1 = “C:\PROWIN2”
m_Caption = “Source file”
Initfile = “*.FAX”
call Get_filename with m_Caption,
Initfile into dfile
usermsg “File = `”%s`”.” dfile
m_Caption = “Destination”
Initfile = “*.”
dpath1 = Get_filename (m_Caption,
Initfile)
usermsg “Path = `”%s`”.” dpath2
 endproc

func Get_filename : string
param string fCap, fInitfile
dialogbox 0 82 95 198 85 2 m_Caption
   dirlistbox 1 13 17 80 58 Initfile
single Chosen 2
   dirpath 2 12 3 129 9 dpath2
   pushbutton 3 104 55 40 14 “OK” ok
default
   pushbutton 4 150 54 40 14 “Cancel”
cancel
enddialog
 while 1
  dlgevent 0 Event
  switch Event
   case 0
   endcase
   case 1
   endcase
   case 2
   endcase
   default
    exitwhile
   endcase
  endswitch
 endwhile
 dlgdestroy 0 CANCEL
return Chosen
endfunc
```

This will make the previous script more elegant. Note that in the second call the script has been given the parameter “*.” In order that it might choose only directory names, we have also used the function calling method of “dpath2 = Get_filename (m_Caption, Initfile)”. This is more compact and elegant. It is also totally compatible with the original function call. Note that the dirpath operator is deceptively simple. We have to link the dirpath to the dirlistbox by specifying its box number to the dirlistbox command; we also have to ignore the change of directory event that dirpath generates, in the lines “case 2/endcase”, so that we have the complete directory path returned to us in the variable dpath2.

The script is incomplete; we are doing nothing with the variables once returned. We shall have to use the copyfile and deletefile operators in order to do the actual file move.

Put simply, we only have to use:

```
copyfile dpath1 dpath2
deletefile dpath1
```

There is one problem here: a multi-paged fax is a collection of files; the *.FAX and a *.nnn where nnn is the page number. This means that we have to use Procomm for Windows’ string handling capabilities to parse the file name into “RECVxxx.*” where xxx is the fax number (not the page number). All we want to do is to remove the last three characters and replace them with an asterisk.

Procomm’s available string operators which we shall use are strlen, substr and strcat:

```
string dpath1
string delfax
integer len_string

proc main
strlen dpath1 len_string
len_string = len_string - 3
substr delfax dpath1 0 len_string
strcat delfax “*”
endproc
```

As far as the annotation of the fax is concerned, we have to look at the log file which is generated by the fax sending and receiving applets. After some examination using Norton’s Utilities, I found that the contents of .LOG files correspond roughly to the table below.

The dates and times of the faxes are probably also stored in the portions which I didn’t decode, and I didn’t bother doing so, since the same information is also available from the file’s own time and date stamp which is certainly more easily accessed. The code I wrote for the exploration of the log file follows:

Inside the log files

Index into file	Length	Data
1	6	Not known
7	7	Fax Name (e.g. RECV000)
14	1	Space
15	1	Number of pages (hexadecimal digit)
16	98	Details (Telephone Number)
114	18	Not known

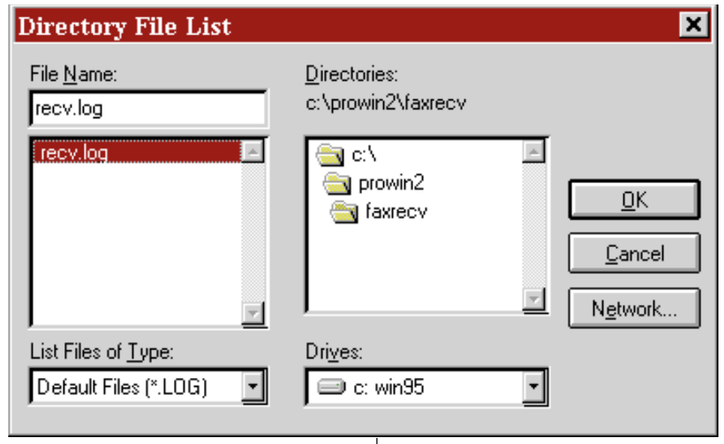
```
string log_file
string fdata[5]
integer filnum
integer recurse
integer pages
integer first_char

proc main
dir “*.log” log_file
fopen 0 log_file READ
while 1
fread 0 fdata[0] 6
fdata[0] = “Null”
fread 0 fdata[1] 7
fread 0 fdata[2] 1
fread 0 fdata[2] 1
strgetc fdata[2] 0 pages
itoa pages fdata[2]
fread 0 fdata[3] 97
strspn fdata[3] “ “ first_char
first_char = 96 - first_char
strright fdata[3] fdata[3] first_char
fread 0 fdata[4] 18
fdata[4] = “Null”
for recurse = 0 upto 4
usermsg “Data %s” fdata[recurse]
endfor
endwhile
endproc
```

Notice that here, I took the easy option and used “dir” which allows a directory listing and returns a file name. This would not have been available when choosing the destination directory for the file copy above, since the dir command doesn’t return a value when only a directory is selected. There are also a few other bits and pieces which I haven’t explained before; mainly the use of arrays, usermsg and the other functions.

Arrays

Arrays can be defined to hold any form of data type, but unlike some implementations of the array data type, the whole array must be of the same data type. They may also have up to 12 dimensions, although the brain tends to go fuzzy when dealing with more than three, since that is all we can visualise. You will note at the top of the listing I defined an array with seemingly six elements, but only appeared to acess five of those. This is because Procomm for Windows uses the human-readable number when defining the number of elements in an array, but uses the computer’s numbering method when accessing them (that means it starts at zero).



The directory open box we used for the .LOG file

Usermsg

There are a few built-in functions which are used to display error messages, user messages and so on. These take C-like formatting strings as well as simple variables. Usermsg is quite a useful little function, especially for debugging. Note above that the format of the command is used either with a string or without.

Repetition

In the above example I have also used a for . . . next type of loop (used in Procomm as for . . . endfor) which enables us to define a certain number of repeats so that the program can be told only to carry out a set of instructions a finite number of times. You have probably already come across this construction in BASIC, so there is no need to labour the point here.

Date and Time

We access this with the fileget operator. All we need to supply is the file name, what we require and the name of a variable in which to store it:

```
fileget faxfile DATE dattim[0] [num]
fileget faxfile TIME dattim[1] [num]
```

Note above that we are using an array called dattim to hold both the date and time; this may be saved to disk within our own log file, since Procomm’s own will be updated when we execute the faxremove command.

The rest of the programming can be completed using standard commands which we have gone through already; I’d suggest counting the number of faxes and saving that number into a file; the new array may easily be dimensioned from the number of faxes held and the contents reload whenever we want to access them.

It would make a lot of sense here to write only the data that we know about, becuase it is pointless to store the redundant data. And we could write a procedure to do this from the following code fragment:

```
PROC FAXARRAY
fopen 0 faxlog CREATE
fwrite 0 numfaxes
for count = 0 upto numfaxes
call ritecontents(count)
endfor
endproc

proc ritecontents : integer
param integer index
strlen faxarray(index) no_chars
fwrite faxarray(index) no_chars
endproc
```

This example is the most compact and elegant method I could find. You might be able to do better, though.

PCW Contacts

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On the CUTTING EDGE

Welcome to **Cutting Edge**, the section in *Personal Computer World* that combines our regular reviews of games, books and CD-ROMs with features bringing you the latest news about computing and consumer technologies and online services.

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CUTTING EDGE

Weaving through the web

As well as being a whole lot of fun, the Internet can also be frustrating. David Simpson helps you avoid the furrowed browse with a review of the main tools you can use for successfully surfing the Web.

So you want to browse on the World Wide Web? There are currently no less than seven significant graphical browsers, available for Windows, from which to choose.

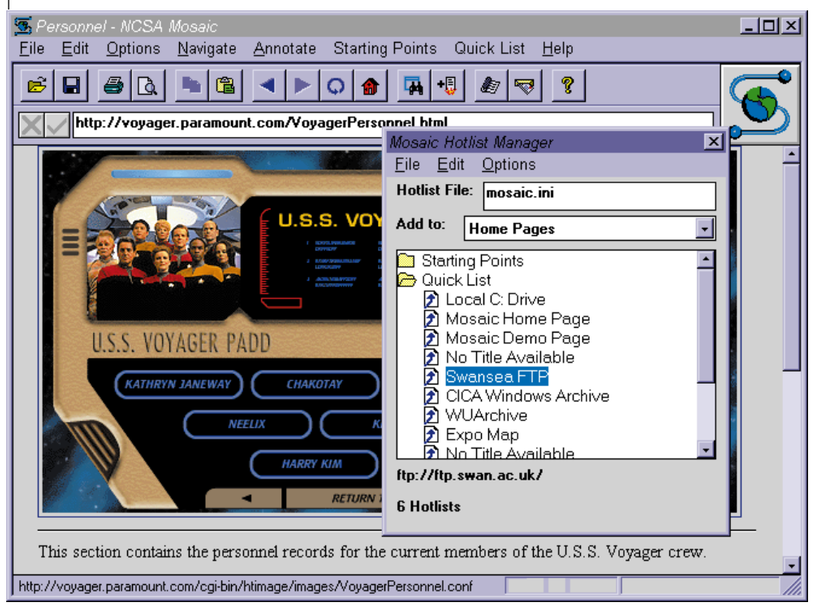
In rough chronological order of appearance there is Mosaic, Cello, NetScape, Internet Works, WinWeb, Spry Air Mosaic and Quarterdeck Mosaic. In the two years since Mosaic became widely available on the Internet, there have been nine alpha and four beta releases in addition to the many other browsers available, for just about every platform.

The Web was initially developed, in 1989, at the CERN nuclear laboratory in Switzerland. The proposal was for a new HyperText Transmission Protocol (HTTP) to provide a client/server solution for document retrieval. This was based on standard 7-bit ASCII files with formatting codes to contain information about layout (text styles, document titles, paragraphs, lists) and hyperlinks. The new formatting language, known as HyperText Mark-up Language (HTML) is loosely related to the Standard Generalised Mark-up Language currently in use on the Internet.

Three years after CERN's original proposal, the National Centre for Supercomputing Applications (NCSA) began a project to create an interface to the World Wide Web. This was based on NCSA's mission to aid the scientific research community via the creation of widely available, non-commercial software. So NCSA's Software Design Group developed a multi-platform interface, known as Mosaic, which became available on the Net in 1993.

Although the source code is available for many different platforms, we'll concentrate here mainly on World Wide Web (WWW) browsers for Windows on a PC.

Mosaic 2.0b4 provides the best graphics and has a new Hotlist Manager



NCSA Mosaic

Mosaic was the first of the widely available WWW browsers available for Windows, X-Windows and the Macintosh. It's now available in Version 2.0 Beta 4.

Mosaic Beta 4 can be downloaded from a number of FTP sites including NCSA's. It's a 32-bit application which requires the Win32s sub-system to be first installed under Windows 3.1 and 3.11.

Microsoft makes this freely available to all registered Windows users and it can be downloaded from most sites holding Mosaic.

However, if you already have Win32s on your system, beware: Mosaic Beta 4 will only run with the very latest release, namely v1.25 with OLE2 v.2.02. After having downloaded w32sOLE.zip, it must then be unzipped with the d switch to create two installation disk images. Win32s can then be installed using the normal file/run setup.

Installation on Windows 95 or Windows NT doesn't require Win32s.

Before Alpha 8, there was no setup provided for Mosaic. Installation was simply a matter of copying the mosaic.ini file to your Windows directory and creating an icon in Program Manager to point at mosaic.exe.

More recently, Mosaic has provided a Windows installation program which creates the Program Manager icon and prompts the user for personal information, email address, news server, and so on.

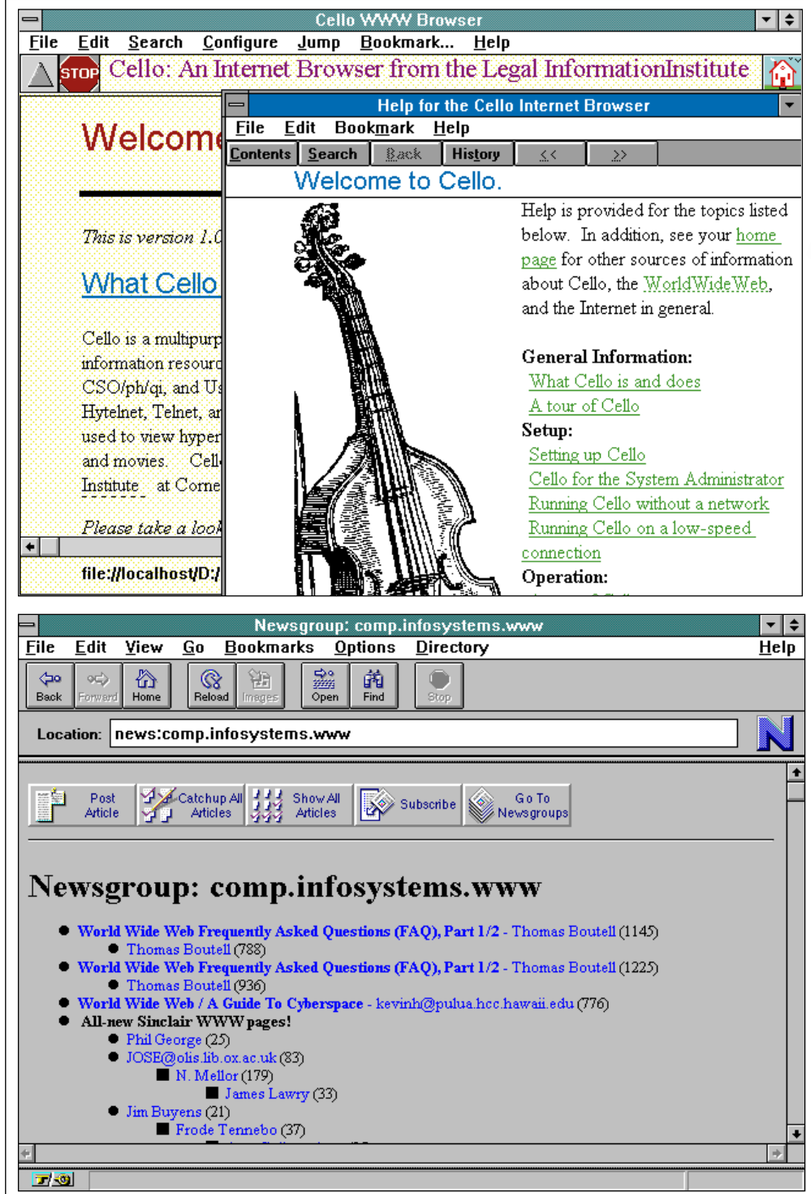
The user interface of Beta 4 is little different from that of the late Alpha versions. Beneath the familiar menu is a toolbar to access the more useful functions. Below this, there's a box with the address of the current document displayed as a URL (Uniform Resource Locator). It is this that provides the browser with the information needed to read the document. It includes the type of document (the first part of the URL), as well as its location and name. The box also allows you to type in a URL if you have an address to hand that you want to try.

To the right of the toolbar and URL box is the usual Mosaic globe. The globe spins while Mosaic is talking to a remote server; typically when you open a new URL. This provides a very important visual feedback to let you know that Mosaic is still with you and that the machine is active — very important when dealing with Windows 3x.

The status bar at the foot of the screen fulfils two roles. Firstly, when the mouse is moved across a hyperlink on the displayed document, it displays the URL of that hyperlink. This provides an indication of where the link will take you and allows you to avoid links to America, say, in the middle of the afternoon (which is likely to be very slow). The second role of the status bar is to provide information concerning document retrieval: what's being transferred, how much of it has been transferred, and how much remains.

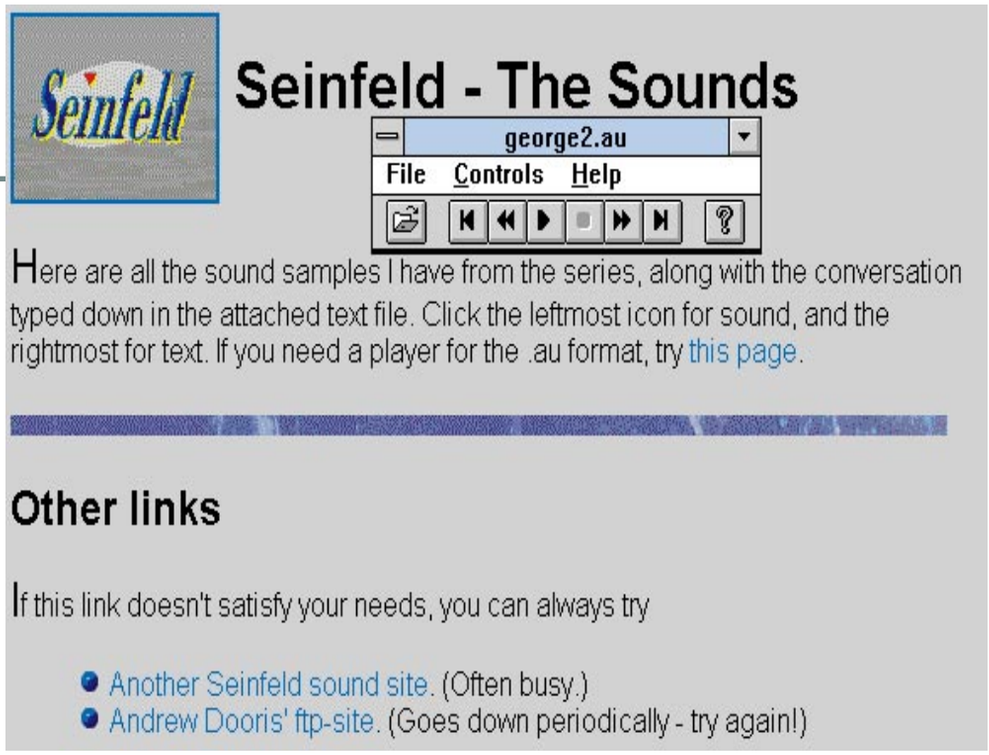
There are 15 buttons on the toolbar, two of which are Open and Save. There are also Print, Print Preview, Copy and Paste options and two arrowed buttons for moving through documents. Reload allows you to reload a document from the

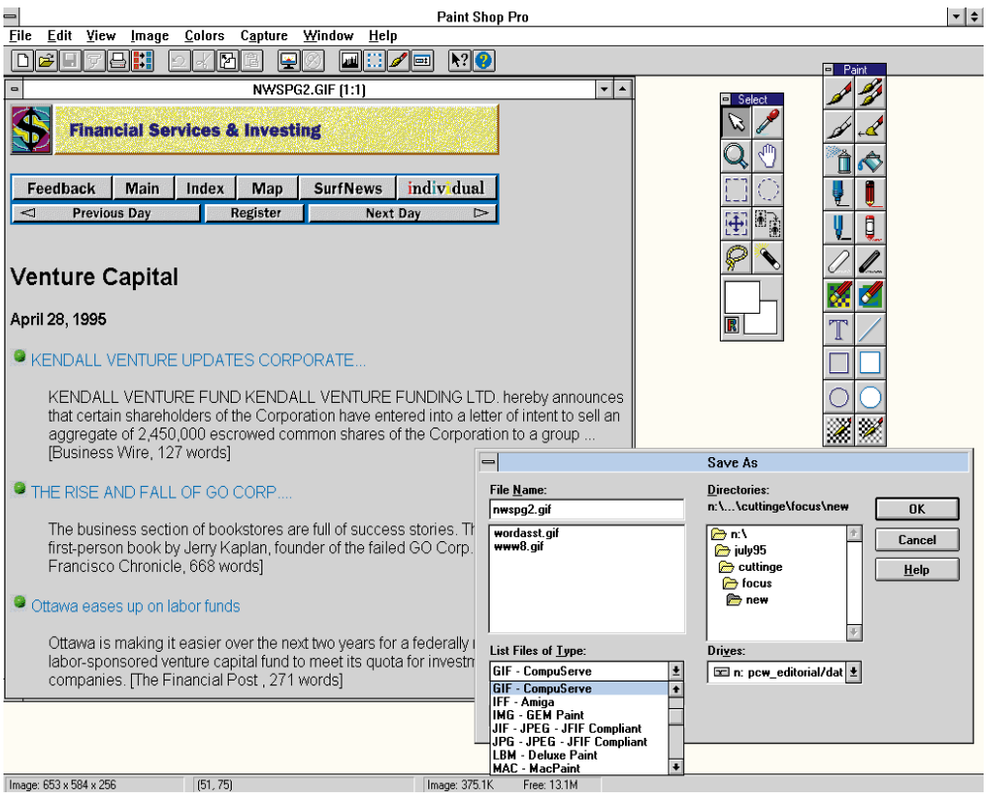
See Cello Run



Top *Cello has a default yellow background and a useful local help file*
Above *NetScape provides a nicely designed interface for its newsreader*

Top *NetScape includes its own sound player*
Bottom *GIF and JPEG images are a breeze in Paint Shop Pro 3*





server and Home takes you to the home page defined in the mosaic.ini. This is initially set to NCSA's home page but can be altered to your local server.

The Find button is probably used to locate text within the active document but it wouldn't work for me. The News and Mail buttons are for accessing newsgroups and email.

Add To Hotlist provides a quick method of retaining hyperlink information by storing the URL and document title for quick retrieval using the Open URL menu. This is a particularly handy feature that is implemented in most of the browsers.

One new feature available in the Beta 1 version is the ability to dynamically change the font size in the current document. Pressing the plus and minus keys increases or decreases the point size.

External viewers

From the outset, one of the great design features of Mosaic has been its use of external programs to deal with certain types of data.

Mosaic itself provides support for showing inline images in GIF and, with effect from Beta 1, in JPEG format. Playback of audio files in the NeXT AU format is also supported. This audio format is used by the vast majority of Unix systems and is hence the *de facto* standard for audio on the Internet.

However, for these and other data-file formats, Mosaic allows you to set up viewer applications that are called automatically when data of that type is received. A number of these are set up in the mosaic.ini file by default, so, for example, audio files in WAV file format will be loaded into the Windows Media Player.

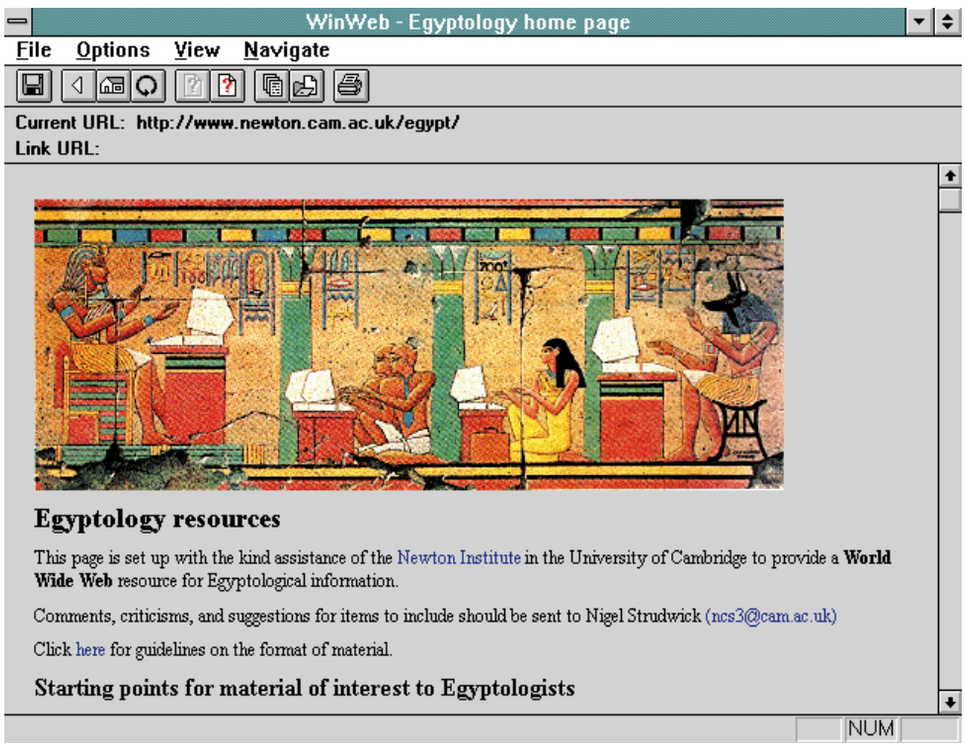
There are a number of viewer applications that have been designed for use with WWW browsers. For example, Lview31 has become the preferred external viewer for graphics files. It supports virtually all file formats including JPEG, and it's freeware. See the "Where To Find Them" panel on page 572 for a list of major viewers.

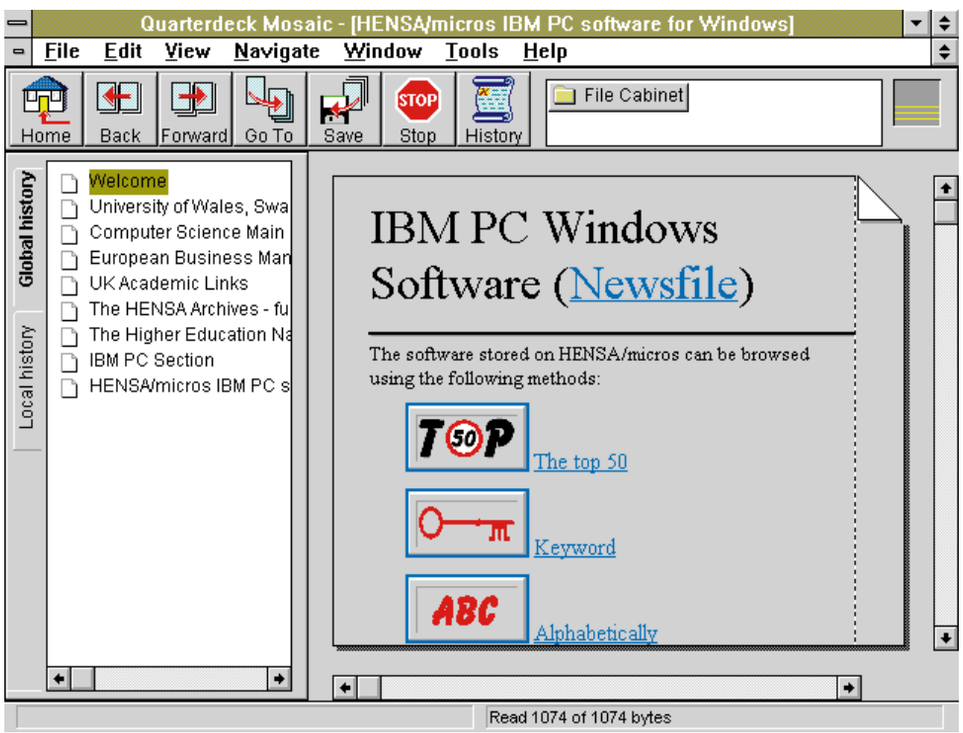
Previously, setting up additional viewers used to require mosaic.ini to be edited so as to set the MIME type and the external application name and path. This has been superseded in Beta 1 with a well implemented dialogue, complete with Microsoft-like tabs.

The problems with FTP URLs, apparent in earlier versions of Mosaic, have now been ironed out and there was no problem using FTP with the

CUTTING EDGE

A historical aspect





Top *The rather plain interface of WinWeb*
Above *Quarterdeck's unusual interface with the history window open on the left*

Beta 1 version.

Although Alpha 7 proved itself as a pretty stable piece of software, there were problems reported with Alpha 9. There is a great deal of discussion on this topic within the Usenet WWW. *Newsgroups: comp. infosystems.www* is an excellent source of browser information, tips, and new WWW sites.

Reported problems with Alpha 9 included GPFs, troubles with the Win32s OLE implementation, poor image handling, excessive disk access, and a failure to release resources when exiting the program. Beta 4 claims to have fixed all these bugs, and a few others in addition. Nevertheless, I have had little trouble with Alpha 9 through to Beta 4 running on both Novell Lan Workplace with Windows 3.11 and Microsoft's TCP/IP under Windows 95 (beta 2).

Mosaic, like most of the other browsers reviewed here, does some quirky things from time to time. So, it must be remembered that these are still beta software releases, although one has to suspect that there never will be a full release. The continued release of beta versions often provides the developers with a cop-out clause for any bugs which occur.

Cello — an old tune

Cello, produced by the Cornell Legal Information Institute, has not been updated since April 1994. Although there has been talk of a version 2 release in the near future, it has yet to materialise.

The original interface is now somewhat dated in comparison to the other browsers available. There's no button bar, for example, but there is a rather strange-looking status bar.

Nevertheless, Cello does provide a number of interesting features. It was the first browser with local HTML documents to provide up-to-date information and a staging board for further exploration on the Net. Internet Works has further developed this feature to provide a very attractive user interface. All the fonts can be independently configured for the screen and the printer, in typeface, size and colour.

FTP implementation works well and has not experienced the difficulties suffered in this area by other browsers — Mosaic for instance. It also provides a local Windows Help file which is a significant bonus as it overcomes the annoyance of all help for Mosaic being online at NCSA — its site is irritatingly slow at most times of the day. It also provides a document search facility, and bookmarks. These are favourite sites on the WWW that you can save,

Browsers — Where To Find Them

- **Mosaic Beta 4**
  Anonymous FTP from ftp.ncsa.uiuc.edu in directory PC/Mosaic.
  Or from src.doc.ic.ac.uk in directory packages/Mosaic/Mosaic/Windows/mos20b4.exe (1.1Mb) and win32s version 1.25 from same directory w32s125.exe (2.3Mb).
- **Cello**
  Anonymous FTP from ftp.law.cornell.edu in directory /pub/LII/cello cello101.zip (290kb).
- **NetScape**
  Anonymous FTP src.doc.ic.ac.uk in directory /packages/Netscape/windows ns16-100.exe (ver. 1.0) (706 kb).
  Or http://www.netscape.com/Netscape's WWW home page — you need to go here to find out just what is the latest version (1.1 beta 3 at the time of writing).
- **Internet Works**
  anonymous FTP from ftp.booklink.com in directory /lite/ beta7.exe (2.2Mb)
- **WinWeb**
  Anonymous FTP from ftp.einet.net in directory /einet/pc/winweb winweb.zip (600kb).
- **Spry Air Mosaic**
  Available from the Spry home page http://www.spry.com/wmosdemo.exe (1Mb).
- **Quarterdeck Mosaic**
  Available from the Quarterdeck WWW page on http://www.qdeck.com/qmzip3.exe (1Mb).
- Microsoft Internet Assistant
  Available from ftp.microsoft.com in directory /deskapps/word/winword-public/ia/wordia.exe (1.1 Mb)

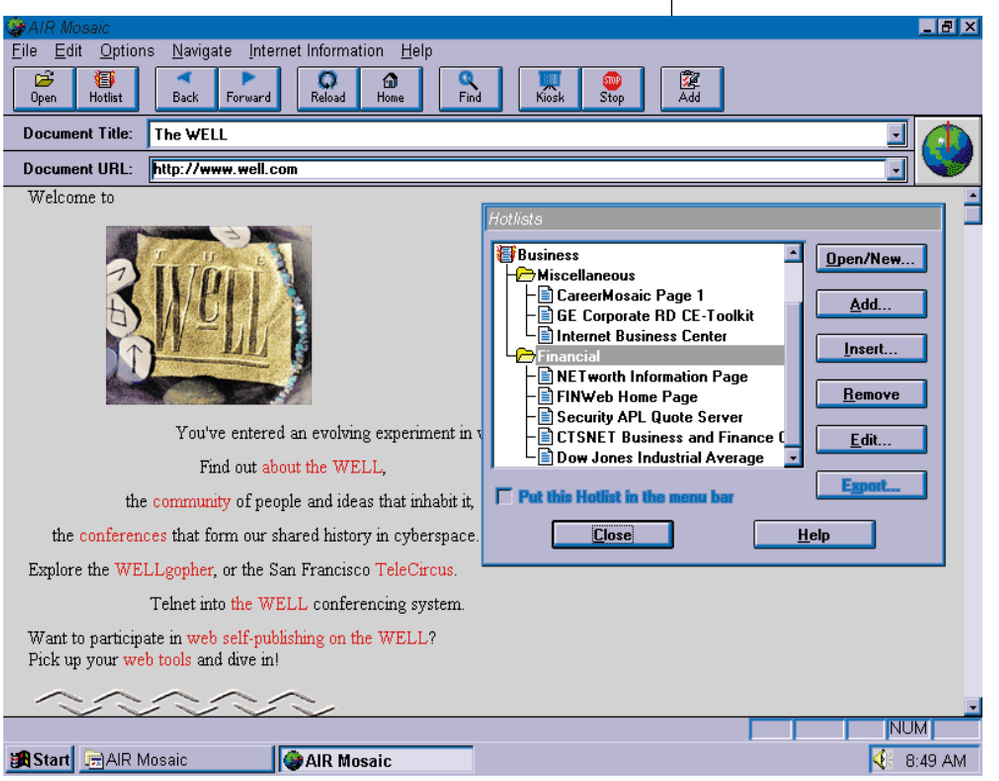
so as to gain immediate access later.

The downside of Cello is its age. Being an older browser, it does not support newer HTML functions such as Forms and Mailto. Lack of support for forms is now a major deficiency, with so many sites using forms for search tools and feedback.

Navigating with NetScape

In 1994, Marc Andreesen left NCSA (along with a number of other Mosaic developers) to start NetScape Communications. The result of this move was a number of Alpha versions which culminated in NetScape 1.0. This year, three beta versions of version 1.1 have followed — keep your eyes firmly fixed on NetScape's home page for further developments.

Spry's Air Mosaic provides a folder-oriented Hotlist structure



NetScape is provided free of charge for academic use and for evaluation by individual users. No evaluation time period is specified. The registered version costs $39 (version 1.0 only) and provides software support. It also includes an upgrade to the full release of version 1.1 when this becomes available.

NetScape 1.0 is a 16-bit application and does not require Win32s. Version 1.1 Beta 1 comes as a 16-bit application for Windows 3x and as a 32-bit application for Windows 95 and NT. The 32-bit version won't run on Windows 3x with Win32s as it uses API calls specific to the 32-bit operating system.

The 16-bit version provides a program which installs NetScape to the desired directory and creates a Program Manager group. (There is no setup facility provided for the 32-bit version.)

Improvements in the 1.1 beta 3 release are mainly in the area of bug fixes and performance. However, 1.1 now supports a number of extended HTML formatting tags, including tables and dynamic documents: web pages that update themselves.

The user interfaces for all three versions are virtually identical and very similar to Mosaic. But the first thing that strikes you is the replacement of Mosaic's spinning globe with a rather less fetching upper-case N which moves in and out of relief as NetScape retrieves a document.

The other obvious difference is the row of buttons that appears below the URL location box. These are particularly powerful since they all initiate links to important sites on the Net. For example, Guided Tour is an online hypertext manual held at NetScape's main site; and What's New provides tips on some of the latest and hottest sites to have appeared

on the Internet.

The Questions button takes you to the program's FAQ (frequently asked questions) and acts as a supplement to the online manual. Net Search is the most useful button as it links you to all the main search engines for the WWW — a real necessity given the thousands of sites currently available.

Net Directory provides a comprehensive list of important hypertext links around the world which provide good starting points for further exploration. The Newsgroups button changes NetScape into a fully-functional newsreader. Although other browsers provide news-reading facilities, NetScape goes one step better in providing an excellent news interface.

Another noteworthy feature of NetScape is its ability to first load the text of a WWW document followed by the images. Although Mosaic Beta 1 does this too, those who have used older versions will remember resenting the need to wait for inline images to be downloaded, before being able to read the text or select another link. Well, with NetScape you can jump to the next page before the current one has finished loading, and this is a real plus point.

Bookmarks are implemented particularly well in NetScape. Adding a bookmark for the current document is simply a case of selecting that function from the menu. But NetScape really scores with the Bookmark editor, accessible via the View Bookmarks menu.

Selecting Edit from the View dialogue extends the dialogue to allow editing of all aspects of each bookmark, including the date it was added and the date it was last visited. The bookmarks are stored in an ASCII file in HTML format, and the dialogue offers the option to load the bookmark file as an HTML document. You can also import and export bookmark files, and create new menus for them in a similar manner to NCSA Mosaic.

Other features of NetScape include the ability to save a page to file after it has been downloaded. The design of the Preferences section, on the Options menu, allows you to configure NetScape using dialogue boxes — no more editing of .ini files. This allows you to set the viewer fonts, email address and server information, and external viewer applications.

In the case of fonts, the dialogue box only lets you select the base font for proportional and non-proportional text. The sizing of headers is left to NetScape. This is different from Mosaic where the font and size of every header level can be independently set. The NetScape method simplifies setup, of course, but the greater degree of control provided by Mosaic is preferred by many professional Net surfers.

On the negative side, NetScape doesn't handle inline images as well as Mosaic, the main problem being that of colour. With many inline images, the colour map doesn't correspond to that of NetScape and this leads to some psychedelic colour effects, especially with faces. NetScape must be switched (via an option in the Preferences dialogue) to dither its palette, although this leads to grainier pictures.

By default, NetScape builds up inline images as it downloads. Many people like this effect but it can be rather irritating — luckily it can be switched off.

NetScape's support for the advanced features in HTML 3.0 is much more comprehensive than Mosaic's. Format commands, such as those affecting font size adjustments and variable width horizontal lines, are used in many up-to-date WWW pages. Ignored by all the other browsers, these are nevertheless read and interpreted by NetScape which leads to more aesthetic page layouts. This support has been further extended in 1.1 Beta 1.

NetScape performs in a very similar manner to Mosaic and in terms of its speed there is little to choose. On a 486 DX50 local bus system Mosaic just shades it, but on others NetScape outperforms it. On my system, I run the Novell Lan Workplace TCP stack and this seems to favour Mosaic. Using Windows 95 with the Microsoft TCP stack, Mosaic won out: it started up somewhat faster than NetScape and decoded inline images faster.

Another feature of NetScape worth mentioning is the way it handles unknown data-file types. If Mosaic receives a file it doesn't understand, it merely attempts to display it on the screen; something which usually results in a screen full of garbage. But NetScape pops up a dialogue box to inform you of the received data type. You then have the option to select a viewer, save the file to disk, or cancel the operation; so, viewers for all the different data types can be set up on the fly in NetScape. The dialogue also displays a message indicating the type of file being sent from the HTTP server — this is a particularly useful debugging tool.

Security on the Web

Initially the Internet, and later the World Wide Web, were designed as open access academic systems for the sharing of information around the world. There are no restrictions or written rules, no policing or management. It is this openness that has made the Internet so popular.

Commercial organisations have been using the Net for quite some time, but until the present only as a means of providing information — a form of advertising for the company. Rather than provide free services, which cost them money to create and maintain, the companies would prefer to make money directly from the Internet.

Two different approaches can be used: the first is to provide subscription services over the net — for example, web servers that require user validation before access is allowed. The second is to use the net for home shopping, which requires the ability to send credit card or electronic cash details across the Net.

The ability to check user validation on the Web was written into the specification for HTML 3.0. This feature is effectively supported by all those browsers that support forms. The greatest security risk lies in the transfer of sensitive information across the Net, such as the dissemination of credit card details. Information travelling between your computer and a server uses a routeing process that can extend over many computer systems. At each point, your data is susceptible to interception. In essence, the Internet does not provide built-in security as it was designed as an open system.

This shortcoming has been addressed by two of the browser companies, namely NetScape Communications and Spry. Each provides a method of data encryption from the browser to the respective server. NetScape's system, SSL (Secure Sockets Layer) works between NetScape Navigator and the Netsite Commerce Server. It is based on a 40-bit key RC4 algorithm developed by RSA Data Security. A number of higher grade security codes are available from the US version, but these are not licensed for export and so only the RC4 encryption is available in the UK. NetScape claims the average time to break this code is a year using a 64mips processor. SSL is an open specification so other developers may implement the technology, and as a result it seems likely that SSL will become the de facto standard in the future.

Spry has also developed an encryption system between its browser and server. You are invited to register for the full version of Air Mosaic by submitting a form, with your credit card details, to Spry using S-HTTP (Secure HTTP) which it calls "SafetyWeb". The server is in beta form at present and is not yet available outside the US. This suggests that they are using one of the more secure encryption keys which is not for export.

Internet Works

This WWW browser is a relatively new item from Booklink in the USA. Booklink was acquired by America On-Line (AO-L) last December, in its bid to enter the Internet jungle.

At present, the latest beta version is available for evaluation free of charge, but it is anticipated that the full release will be a commercial product with a price tag of around $99.

Booklink, along with NaviSoft, another AO-L subsidiary, are also developing a VBX/DLL version of Internet Works to provide core functionality into other products. This is already being used in AO-L's Windows client as well as in Microsoft's Internet Assistant for Word 6.

Internet Works is presently in beta 7 and can be downloaded from Booklink's site — it is preferable to do this early in the morning, before the whole of America wakes up. Internet Works' FTP server is currently running on an NT machine which can't handle large volumes of network traffic. This is a particularly important point because Internet Works is all the rage at present. It took me a few tries to get the thing downloaded, and I succeeded only when I started the transfer at 8.00am GMT.

Internet Works has an excellent setup program which installs two icons in Program Manager. In addition to the browser, there is the Messager Application; essentially a self-contained email and newsreader application used by the browser to access news and email.

The thing that strikes you when you fire up this package for the first time is the elegantly designed interface and initial home page. This latter is the term given to the first page that auto-loads as the browser is started.

Internet Works makes extensive use of the HTML files stored on your hard disk to provide a slick, professional interface to external links on the Net. The home page uses an attractively designed hotspot graphic to provide access to many topics: News, Arts, Literature, Sport and more. Each of these leads in turn to a local file with greater detail.

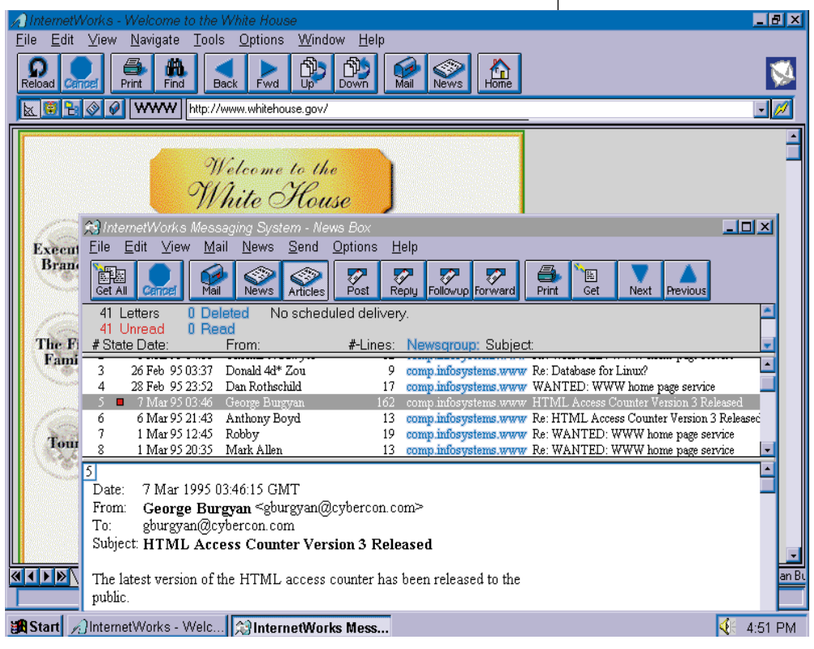
For example, choosing the News item on the home page brings up another with links inviting you to choose either magazines or newspapers. Selecting the latter provides a list of some 30 home pages for various newspapers around the globe.

Internet Works uses a rather nice tab system to access previously loaded documents. Each document is assigned a tab key at the base of the screen above the status bar. Clicking any of the tags jumps you directly back to that document. Scroll arrows are provided to move through the vast number of tabs you might build up in one session. One tab, available from the outset and labelled "Card Catalog-All", displays all the current tabs in the main window. Further Card Catalogs can be created to list favourite stop-off points.

Internet Works is clearly designed as a commercial product. It has a slicker, more professional interface than the other available browsers and seems squarely aimed at the home user. It is clear that the initial links on the home page are entertainment based, with little reference to information retrieval or WWW search tools. Further evidence of its home user market aspirations can be gleaned from the installation instructions: these concentrate on connection using Serial Line Internet Protocol over a modem.

When I first downloaded the previous beta 6 version, I couldn't get Internet Works to work with my Lan Workplace TCP stack. Interestingly, Booklink provides telephone and email support for all the beta versions, and an email to Booklink confirmed my fears that Internet Works wasn't compatible with Lan Workplace. The new beta 7 is compatible however and the installation program sets up everything automatically from the start. It even recognised our news server and email system.

Internet Works with its messager application running on Windows 95



Spinning with WinWeb

WinWeb is produced by EINet, part of the US firm Microelectronics and Computer Technology Corporation. Currently in version 1.0 alpha 2.2, it provides a similar interface to all the other browsers.

Being a Visual Basic application it requires vbrun300.dll in the windows\system

directory which is supplied in the ZIP file. As a result, the interface is a little less responsive than that of the other browsers reviewed here, but it does feel reasonably good to use overall. And, it does include the majority of features applicable to other browsers.

One serious omission though is its lack of support for news articles which cannot be accessed from the current beta version of WinWeb.

EINet also produces MacWeb, a favoured viewer for the Macintosh. But the PC version is not quite in the same league as Mosaic and NetScape.

Air Mosaic fit and Spry

Air Mosaic is one of a number of Internet software packages, produced by Spry, which includes "Internet-in-a-Box".

The company was bought recently for $100m by CompuServe and this is an indication of just how seriously CompuServe is taking the Internet boom. Additionally, CompuServe is seriously side-stepping any potential threat from America On-Line (AO-L) with its acquisition of Booklink and Internet Works. Spry provides competitive upgrades from AO-L software in the US.

Air Mosaic is available as a fully functional demo version from Spry's server. It is limited however, to six external URLs. By this, the company means six URLs not on its server or held as local files. After the sixth URL you are invited to register for the full version, via credit card over the Internet, at a cost of $29.95. This is carried out using Spry's Secure Encrypted Transactions system (a rival system to NetScape's SSL).

Air Mosaic is provided free to members of CompuServe, so account holders can now access the Web.

The interface of Air Mosaic is suspiciously similar to that of NCSA's Mosaic Alpha 4 (Mosaic's last 16-bit release). The same interface design, including an identical button bar is used, along with virtually the same menus. Instead of the spinning globe, there is a version with a 360-degree wiper which moves around like a clock hand to indicate document loading.

The Hotlist is an improved version of that in NCSA's Mosaic which gives you folders with documents (URLs) inside. Each folder can be assigned to the menu bar and saved as a file. Air Mosaic has a number of hotlist files of useful topics providing a similar range to Internet Works.

Air Mosaic also supports drag-and-drop of URLs into other packages. This will dump the source into, say, Notepad, where it can be viewed, edited or saved.

Air Mosaic performed well, although it was not as fast as the 32-bit browsers. Functionally, although it is almost identical to NCSA Mosaic, the improvement in the Hotlist manager is a real advantage.

Quarterdeck Mosaic

Quarterdeck, better known for its memory manager products, has now ventured into the Internet race. Mosaic is the first of a promised suite of Internet applications which includes web page creation tools as well as the more mundane applications such as FTP.

Quarterdeck Mosaic is currently in Pre-Release version 3 and is available from the Quarterdeck Web server. However, by the time you read this it may have finished beta testing and become a commercial product for which you will have to pay. The pricing policy for Quarterdeck Mosaic is yet to be revealed.

The interface of Quarterdeck's browser is a little different from that of the others reviewed here in that it uses an MDI (multiple document

Viewers — Where To Find Them

- **LView31 (freeware)**
  An excellent freeware graphics file viewer which supports all common file formats including JPEG. Anonymous FTP from ftp.ncsa.uiuc.edu in directory PC/Mosaic/tools.
  Or from unix.hensa.ac.uk in directory /pub/mosaic.comm.corp/windows/viewers.
  Or from ftp.sunet.fi in directory /pub/pc/windows/viewers/image.
- **LView Pro (shareware; $30)**
  Extended and improved version of LView.
  Ftp from src.doc.ic.ac.uk in directory packages/Mosaic/Windows/viewers/lviewp1a.zip (305kb).
- **Wplany (freeware)**
  Stands for Windows Play Any file. An audio file player that supports both WAV and AU file formats. Once the file has been downloaded it is just played; i.e. no window is opened, and hence there are no editing or file save facilities.
  Ftp from src.doc.ic.ac.uk in directory packages/windows3/sounds/wplny11.zip (300kb).
- **Ghostview (freeware)**
  A Windows interface for Ghostscript which allows viewing of PostScript files in Windows. Particularly useful if you download a lot of documents which are generally in PS format.
  Available from micros.hensa.ac.uk in directory micros/ibmpc/win/i/i012/gsview10.zip (180kb).
  Also, you will need ghostscript from the same site in directory micros/ibmpc/win/c/c132/gs261win.zip plus other associated files.
- **MPEGPlay (shareware; $25)**
  An MPEG movie player for Windows. MPEG is the most widely used movie standard on the Internet.
  This is a 32-bit application and thus requires Win32s.
  Ftp from src.doc.ic.ac.uk in directory packages/Mosaic/Mosaic/Windows/viewers/mpegw32h.zip (640kb).
- **Paint Shop Pro (shareware; £49)**
  The best shareware graphics viewer and manipulation tool there is. Currently on version 3.0, it is available from most software archives including Cica, SimTel and Hensa in the UK.
- **GoldWave 2.11 (shareware; $25)**
  This is the best shareware program I have found for audio manipulation and playback. It supports a large number of file formats inluding AU.
  Available from many sites including: src.doc.ic.ac.uk in packages/windows3/sounds/gldwav21.zip.0.
  Or garbo.uwasa.fi in windows/sound/gldwav21.zip (280kb).
- **Wham 1.33 (donationware; $15)**
  Another Windows audio application that supports AU.
  Adequate, but Goldwave or WPlany are the better choices.
  Ftp from src.doc.ic.ac.uk packages/windows3/sounds/wham133.zip (140kb).

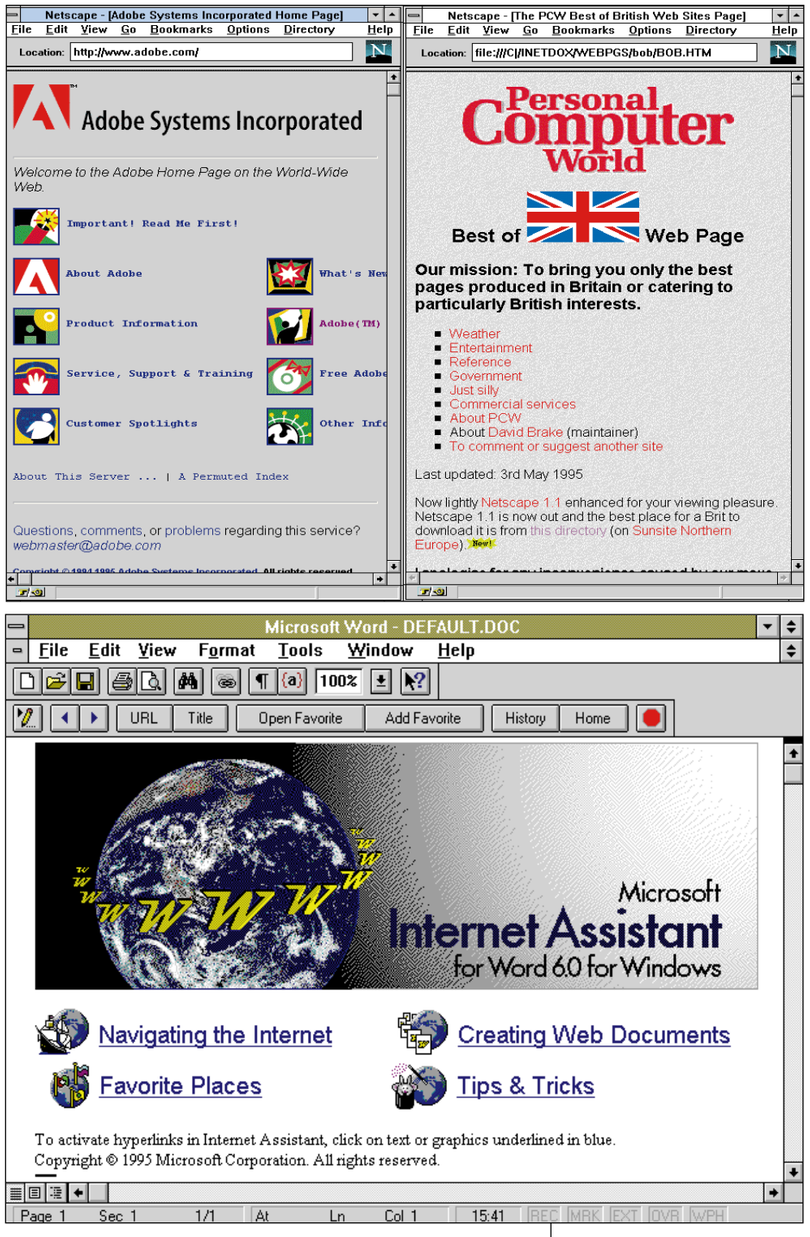
interface) format. All the other browsers are of SDI (single document interface) design — only one document is present in each window — though NetScape has a New Window menu item. Internet Works provides its tabbed card system; two methods of circumventing the limitations of an SDI interface, but only Quarterdeck's Mosaic is truly MDI.

Quarterdeck is thus more akin toapps like Microsoft Word, where each document has its own "child window" (a window within the application's main window). This format allows you access to all the previously loaded documents in a session, though there has to be a limit on the number of child windows that can be created — Windows eventually runs out of resources.

The usefulness of this feature is questionable. Users tending to browse the Web will, of necessity, create many child windows. Most of these are useless for reference as they are merely steps in a path taken to reach a goal which does interest you. In practice, a history list is of more use to the browser than a collection of child windows.

A number of features are not implemented in this beta release, such as Mailto, News, Telnet, and View Document Source, as well as security methods. But these are all promised for the full release.

Quarterdeck Mosaic organises documents using a Filing Cabinet which is a system similar to Spry Air Mosaic. The Filing Cabinet icon contains any number of information folders, each containing URL links to various sites. Like Spry, Quarterdeck comes with a large selection of predefined links to start you on your exploration.



Top *The way NetScape provides multiple windows can be confusing*
Above *Internet Assistant can be run as a browser but allows the option of switching to edit mode*

Internet Assistant

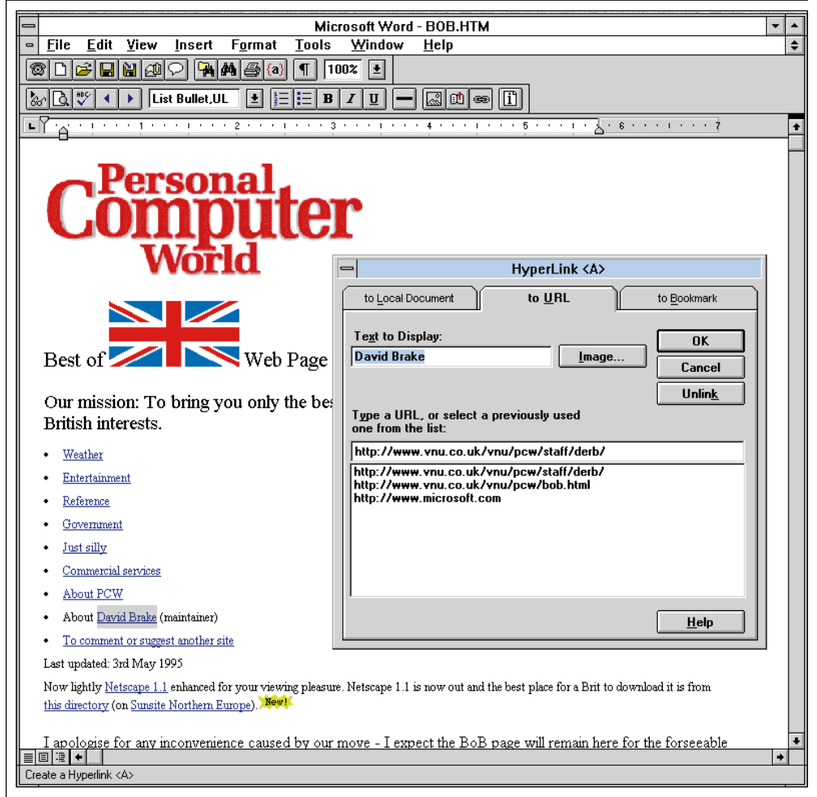
Although not a WWW browser as such, Internet Assistant should be considered for the sake of completeness. It is a set of Word 6 macros designed for writing HTML documents.

Now, there are many HTML assistants, but what makes Microsoft's worthy of consideration here is the inclusion of the Booklink Internet Works DLL. This effectively turns Word into a fully functional WWW browser. The Internet Assistant template adds the item Browse Web into the File menu. Word also lets you change between browse and edit mode — this makes it extremely easy to plagiarise someone else's Web document.

As a browser, Internet Assistant falls some way behind the best of the other browsers. Its visual appearance is stark and it's also somewhat slower than other browsers, due to the lack of HTML decoding speed in the macros.

Internet Assistant is certainly worth consideration, especially if you are involved in creating HTML documents. It perhaps provides a glimpse into the future of Web browsers as they become integrated into the computer desktop. Web connectivity is to be built into Windows 95, and Novell also plans to produce something similar to Internet Assistant for WordPerfect.

A Word in your ear



Microsoft's Internet Assistant allows you to use Word to create Web documents with point-and-click ease

Which web browser?

There is no clear winner but the three main contenders, in our opinion, are Mosaic, NetScape and Internet Works. Spry Air Mosaic is a good browser and perhaps a good choice for those with CompuServe accounts. Which one to use is a difficult decision. Judging by the newsgroups, NetScape is certainly the most popular viewer.

There are some key features which are all-important for extended browsing of the net. Firstly, the browser should allow scrolling of partly loaded documents. It should also offer the ability to interrupt a document load with a new document request — that is, being able to click on a hyperlink before the current document has finished loading. Both NetScape and Internet Works can do this.

NCSA Mosaic 2.0 Beta 1 was the first version of Mosaic with this ability, although issuing a new document request during a document load was a somewhat flaky process. Beta 4 performs significantly better but is not completely free from problems. It works fine most of the time but occasionally ignores your request, so you must click on the spinning globe to kill the current load. Nevertheless, Mosaic still retains favour, mainly due to its superior handling of graphics; plus the fact that it's freeware, even for commercial users.

It would be worth trying at least these three mentioned, if not all the browsers — after all, they are currently free for evaluation. It's rather like being able to download Word 6, WordPerfect, Ami Pro and PageMaker for free, try them all out and keep them afterwards. How long this opportunity will continue is anybody's guess, as the Internet starts to become a commercial concern.

One final point though: each of these browsers tends to have a new alpha/beta release every two or three months. So, it's important to stay abreast of the latest releases when deciding which browser you prefer.

Into the future

At present, Mosaic and NetScape are the only 32-bit WWW browsers. They both install directly onto Windows NT and Windows 95 and will run on these systems as fully pre-emptive applications. This holds some important implications for the serious web surfer, something to which anyone who has used Mosaic on a decent X-Windows system can attest.

Picture the scenario: you've just got onto that elusive American site and have started downloading what you hope is a glorious JPEG image. It looks like it could take a long time, but you dare not switch the focus away from your browser in case the server times you out while waiting for a response as you lock up the system using another application.

This won't necessarily happen often but I always used to get really nervous starting up Word, with Mosaic in the background. And a Visual C++ compilation was an absolute no-go area. With a pre-emptive system such as NT, Windows 95 or any Unix system, this doesn't happen — you can simply switch away from Mosaic and get on with something else.

In fact, Mosaic for X-Windows provides an additional function not found on its PC counterpart. The Clone feature immediately creates a replica of the currently running Mosaic, complete with the document. This allows you to send one copy off on a new hyperlink while you read the document showing in the other version.

So, we can all look forward to the imminent release of Windows 95 (probably August). The benefits of true multitasking are highly desirable while surfing the biggest waves of the Internet. Meanwhile, those of us lucky enough to be running a Windows 95 beta version can sit back with a browser, downloading junk in the background while appearing to be really getting on with our work. PCW

net.answers

Cache of the day

Using NetScape to browse World Wide Web pages can be addictive, eating up connect time and, consequently, bank balances. Of course, if you come across a page that is particularly interesting you can use the Save As command on the File menu to store the file in html format (the special formatting language that combines text, hypertext links, and images on Web pages). When you are offline you can load any html file into NetScape with Open File and view the contents. However, the .htm format only saves the text and layout of the page, not the graphics images.

While html preserves pointers to pictures, referred to as inline images, it does not store them. They reside in separate files that are not downloaded to your computer when you use the File Save command. As a result, what looked like a cool page of pictures and text online appears offline as just text and some boxes containing the "broken image" icon.

The first time you see this phenomenon it might come as a surprise. After all, you know there is a whole lot of disk drive activity each time you jump to a Web page when you are online. It certainly looks like NetScape is downloading those GIF images to your machine. This is, in fact, what happens. NetScape downloads both the html data and the inline images to your computer, but it places them in a subdirectory of the NETSCAPE directory called CACHE. And it doesn't give them handy file extensions like GIF and HTM. It uses MOZ.

There is a reason for this. The primary purpose of the CACHE directory is to hold recently viewed pages, including inline images, so that when you skip backwards through recently viewed pages they will be loaded from your local hard disk, not the remote server. This dramatically reduces traffic on the net and speeds up response time for users. You can adjust the size of the cache using the Cache and Network setting in the Preferences dialogue box, accessed from NetScape's Options menu.

The contents of the cache are constantly changing while you are online, as older data is deleted to make way for new. When you are offline you can use the Back command to view some of the recent pages, but there is no easy way to access all the pages in the cache.

Or at least there wasn't until Netcache came along. This is a clever piece of Freeware from Neil Mottershead (nmott@cix.compulink.co.uk). The program copies all files from the NetScape CACHE directory into a separate directory of your choosing, then renames them with DOS names. The program then parses all the html files and converts page and image references to file references. It does this very intelligently, generating a report of missing and orphaned images plus a NetScape history file of all available cached pages.

Once configured, Netcache can be run by entering the program name at the DOS prompt (you do not have to close down Windows to do this, as Netcache will run in a DOS window). The program will then process all files in the CACHE directory, modifying them and copying them to the Netcache directory. To view the results switch to NetScape — you don't have to be online. Now use the Open File command on the File menu (shortcut Ctrl+O). Select the Netcache directory to display a list of available pages and select the one you want to view. The page will be displayed complete with inline images.

Note that once the NetScape cache has been processed, the contents can be deleted. Also note that there may be missing images — not a fault of Netcache, but a result of occasionally erratic online activity. If this happens, NetScape will attempt to retrieve the file from the server. If NetScape is offline, it will not be able to contact the server and thus will appear to hang. In that case, click on NetScape's Stop button to abort the connect.

Netcache is a great utility to have and the documentation contains interesting technical information about the way NetScape manages data files.

ftp://ftp.demon.co.uk/pub/ibmpc/netcache/netcache.zip

Business on the Internet

"I run a small business and have several questions about using the Internet. What marketing can I safely do on the Internet? What would it cost? How difficult would it be? What results could I expect?"

These are good questions, and you are certainly not the only small-business owner who is asking them right now. They deserve fairly lengthy answers and so we will make a start this month and continue next month. A complete, in-depth treatment of commerce and the Internet takes hundreds of pages. Here are several useful books that you might want to check out, listed by title, author(s), and publisher: *Doing Business on the Internet*, Cronin, Van Nostrand Reinholt; *The Internet Business Book*, Ellsworth, Wiley; *The Internet Business Companion*, Angell, Addison-Wesley; *The Internet Business Guide*, Resnick, SAMS.

For a responsible and business-oriented treatment of the Internet as a whole, consider investing in *The Internet Unleashed* from SAMS. Don't be intimidated by the size — regular readers of *PCW* should be in excellent shape to heft this 1,400-page tome. It is not just another "Let's get wired and surf the net" book. For example, it is one of the few general Internet books to devote more than a paragraph to security and there are several very useful chapters on doing business on the net. The only Internet-related subject where the book is a little light is the World Wide Web, for which SAMS offers a companion volume, *The World Wide Web Unleashed*. Bear in mind that the Internet is not the only online option for businesses. You might also want to consider your own bulletin board (see *Bulletin Boards for Business*, Wood and Blankenhorn, Wiley).

From the way you ask, we detect that you are already aware that marketing on the Internet is somewhat controversial. In part, this is because commercial use of the Internet is a relatively recent phenomenon. As you probably know, the origins of the Internet can be traced back to the sixties, and during the seventies and eighties it was an academic and government entity. Indeed, it was only in 1990 that the Federal Networking Council, part of the Internet's "governing body", dropped the requirement that organisations applying to be connected to the net obtain sponsorship from a US government agency. This heralded the "commercialisation" of the net and the rapid growth of .com sites, as opposed to .edu and .gov and so on.

Some of the people who got onto the net before 1990 resent this change and resist what they see as "creeping commercialisation". In fact, the main practice to which they object, flagrant advertising within news and discussion groups, is also discouraged on commercial services such as CompuServe. You can do your company a lot of good by making positive and informative contributions to group discussions, but you must stop short of asking for business.

Suppose you work for a company that sells an Internet firewall product. Whether you participate in a discussion of Internet firewalls in the NCSA Information Security Forum on Compuserve, or in the firewalls discussion group hosted on the Internet by Great Circle, you are not permitted to make overt plugs for that product. In this situation you can, and probably should, mention that you work for a company that sells a firewall product, but you cannot plaster the discussion with digs at the competition or quotes from your sales literature. If you do, you will find that the old marketing maxim "there is no bad publicity" no longer holds true. You will also find that your postings are zapped by the forum sysop or newsgroup moderator.

Something like this happened recently when a person who sells an anti-virus product started responding to every new question in the Anti-Virus section of the NCSA Forum with a canned sales pitch for his product. The sysop simply zapped the salesman's messages, but not before they had annoyed several potential customers. Similarly offensive is collecting email addresses from a discussion group and doing a mass emailing touting your product or service.

In short, there are some areas of the net where marketing activity has to be subtle to say the least. However, there are other areas where you are free to blow your horn as loud as you like, the most obvious being the World Wide Web. In this case you are creating a new patch in cyberspace and you get to call the shots. This is quite different from visiting areas that other people have created and scattering a bunch of sales brochures. Essentially, you hang out your shingle and if people want to visit you, it's their choice. It is up to you to make your Web presence as interesting as possible in order to attract visitors and hold their attention.

How many visitors will you attract? We talked to American Motor Works whose Web pages were featured in a previous column. This is a relatively small company in Florida that is hoping to become the next Harley-Davidson. They calculate that their Web pages average about 1,000 "hits" per day. A hit happens when the Web server registers a request from another computer to display a Web page. This information is logged by the software on the server. There is no way of knowing whether the person who requested the page actually read it, but the AMW pages have a form which browsers can use to request a catalogue. AMW received "several hundred" catalogue requests in this way during the first two months it was on the Web.

Next month we will discuss the various options you have if you chose to establish a presence on the Web, from pages on someone else's server to a Web site of your own.

Here is the news

Another commonly asked question is: Do you need to be on the Internet to get Usenet newsgroups?

The answer is no. Since Usenet newsgroups are one of the most popular Internet resources, there are many ways to get at them. There are at least 11 "ordinary" bulletin boards across the UK that carry some or all Usenet newsgroups — so do CompuServe and CIX. You can even get some Usenet newsgroups delivered to you via electronic mail. Not all ways of reading Usenet are created equal, though. In some groups, the volume of contributions is massive — hundreds of messages a day. If you receive them as email or using an unsophisticated interface like CompuServe's, it can be a chore reading through them to find the ones you want. Terminal-based access, which is the usual approach for BBSs, is more powerful, but can still be difficult to use.

Both of these approaches are particularly limited when it comes to downloading binary files. Some Usenet groups contain pictures and programs, and downloading these using the systems described so far can be a difficult and time-consuming process.

CIX's interface is also terminal-based, but fortunately CIX also has a powerful and easy to use offline reader, Ameol. You have to download all the messages in the groups you are interested in, but it batches them all together into a single file before downloading, which makes the process faster; and once you have downloaded them, it makes it easy to avoid reading uninteresting messages or to extract files from the messages. Both CIX and CompuServe charge by the hour for Internet access, though, so reading a lot of messages can become expensive.

For the ultimate in Usenet news-reading pleasure, there is no substitute for a full TCP/IP connection at a flat rate. You will still have to pay for the cost of a call to a local service provider, but you won't have to pay any more for the time you spend reading news. Sophisticated tools which make it easy to read only those messages you want or to extract files, are available now, too.

Stephen Cobb

CUTTING EDGE

net.surf

A good Time Out

The Time Out group now has a Web site, Time Out net. The index page appears to weight London equally with the six other cities Time Out has information for, but London is the city with the greatest depth of information.

Selected reviews are available from most of the categories the paper magazine offers, from art to television. The film section listed five 200-word reviews and the television section had five programme and three TV film reviews. There's also tourist, dining and shopping information.

Time Out's listings bring you the world (but mostly London)

Opportunities for feedback, discussion and submission of listings and reviews are scattered around the pages, though at press time they were not yet operational.

The listings are just a subset of the whole content of each week's issue, so the Web pages are no substitute for purchasing the magazine each week. But this is still one of the most valuable Internet resources available in the UK.

Time Out:
0171 813 3000
http://www.btimeout.co.uk/
net@timeout.co.uk

E-zine does it

The Internet has spawned hundreds of "e-zines" — magazines that exist only, or primarily, in electronic form. The base cost of publishing online is very low, but producing a magazine which is of interest to a broad public still tends to require a serious investment of time and a staff with a variety of skills.

While most e-zines are American-based, a few British ones have begun to emerge. London Calling and Muse are two leading ones, both run by people from journalistic, music and computing backgrounds. For the moment they are free and contain little advertising, but their goal is to become self-financing once there are enough readers to make them attractive to advertisers.

London Calling has a fairly comprehensive set of cursory reviews of films, some music and book reviews, a small art gallery and features about London; recent issues included a tour of Portobello Road market and an article on loft living.

The Muse is one of several Web publications being run by Information Hyperlink in Covent Garden. It draws from a pool of 16 writers it shares with four other publications and has a full-time editor.

At present it is a straightforward, fairly highbrow magazine, with reviews of books by Hanif Kureishi and Martin Amis, jazz, opera, dance and art reviews and a feature about Prague. In future, its editor intends to generate custom Web pages for subscribers based on their interests and wants to add more sound, music and photographs.

E-zines do have a place, but they will be hard pressed in the future to compete head to head with major television and radio companies once they bring their vast resources of talent and material online. In the case of London Calling and Muse, they are up against Time Out.

London Calling:
http://www.demon.co.uk:80/london-calling/content.html
Muse:
http://www.hyperlink.com/muse/

If all you buy a listings magazine for is to find out where a film is playing, CINEASC may be what you need. Run by volunteers, it provides a comprehensive guide to films playing in London and selected cities across the UK.

CINEASC
http://www.gold.net/users/ae37/cineasc/index.html

Yellow means business

American Business Information, which publishes business directories across the USA, plans to put its database of more than 11 million business telephone numbers onto the World Wide Web by the time you read this.

YellowNet is translating the database into online form, and will be looking for similar partners across the world. An entry giving a company's name, address and telephone number is free of charge. Making an entry bold costs $45 a year, adding a fax and freephone number costs $90, a full-screen advert linked to an entry costs $360 a year.

Yellownet: 001 303 781 6121
http://www.yellownet.com/

The latest news

Dozens of newspapers and magazines are now online, giving samples of text or even all of it away. Even services which intend to charge eventually are giving their services away to beta testers now — and usually anyone who wants a look can be a beta tester. The latest quality freebie is NewsPage from Individual Inc. It receives 15,000 stories a night from 460 sources (PR newswires, magazines and newspapers, mainly out of the US) and sorts them into 1,000 topic pages. Between eight and 10,000 people per day access the server.

By 15th July NewsPage expects to start charging for the full text of articles, but a brief summary of each item with citation will continue to be available free of charge, paid for by sponsors of each page. By that time, keyword searching of the database should also be possible. Individual also offers First!, a customisable delivery of news from a larger pool of sources to corporations for a fee that starts at £5,500; Headsup, which costs $40 per month and delivers up to ten NewsPage topics by email; and iNews, which is similar, but costs $9.95 per month and only draws from five broad-ranging news sources.

Individual Inc 01491 638 123
info@individual.com
(blank message)
http://www.newspage.com/

Crisis management

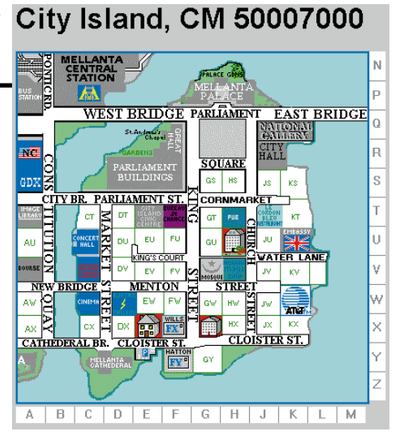
After the Oklahoma bombing, ad-hoc Web pages and usenet discussion groups sprang up offering information and discussion, just as they did with the Kobe earthquake and other disasters.

The haphazard nature of the response inspired an Arizona Internet provider to create the Internet Disaster Information Network (IDIN), a non-profit storehouse of information about the Oklahoma bombing and any future catastrophes.

When we went to press, IDIN had pointers to information from 29 different sources in the Internet, including *Time* magazine and two local television stations, and digests of information from these and other sources (including the *Sunday Telegraph*).

Of course there will be many disasters which IDIN will be unable to cover, as it is primarily an index to information available elsewhere on the Internet, which is still predominantly accessed by people from developed nations.

IDIN:
info@disaster.org
http://www.disaster.org/



Above If something goes wrong anywhere in the world, IDIN is where to look first
Right Be something in the city...

Gisajob

VNU, which publishes 18 magazines in the UK, including this one, and has various media interests across the globe, has launched its first official British venture on the Web. Job.net is a spin-off from *Computer Contractor*, a fortnightly free magazine. It offers a searchable database of around 1,500 IT positions, plus a selection from the editorial content of the magazine. There's an email service which will allow subscribers to receive all the daily updates every morning.

Messages containing "subscribe" to:
contracts-request@mpn.com
Messages containing "get assignments" for today's assignments only to:
contracts-quick@mpn.com
(http://www. vnu.co.uk/vnu/cc/

London Mall

You don't have to be global on the Internet. The London Mall, as its name suggests, has information about an eclectic selection of retail shops and services in the London area, including the Comedy Store, a golf club, Hampton Court Palace Festival and some financial software. It adds to this a limited amount of (not terribly good) creative writing. The London Mall intends to address this weakness by recruiting writing talent from the Internet at large. Would-be famous columnists should submit their work by 15th June to column@micromedia.co.uk.

London Mall:
0171 356 0871 or
enquiry@micromedia.co.uk
http://www.micromedia.co.uk/

Best of British

City Island in the fictional country of Mellanta is an attempt to create a mesh of Web links with a British flavour. To get onto the site you can rent space, and you then show up on the map of the city with the picture of your choice. When other users click on your icon they will be transported to your Web page on City Isle or elsewhere, or can send you email. You can use the Web to construct your own "virtual building" on your "plot" — making the "sales office" link to the email address of your sales director, while the "main building" links to some marketing information about our product.

Some useful info is already available: the British Embassy includes links to some British political sites and the casino contains an interactive blackjack game. At time of writing, free space was available in the apartments at One King Street.

City Isle: GX, or
http://www.demon.co.uk/gdx/50007000/gx.html to give it its full name.
http://www.demon.co.uk/gdx/50007000/index.html

The English are often reticent to invite even friends into their own homes, but it seems our manners change on the Internet. A group of Oxford students may be the first people in the world to give anyone on the Net a guided tour of their house at 19 Museum Road. Not particularly useful, but fun.

19 Museum Road:
http://www.linc.ox.ac.uk/~musrd19/

Finally, for up-to-date information, check out the new address for *PCW*'s remarkably successful Best of British Web page.

Best of British:
http://www.vnu.co.uk/vnu/pcw/ bob.html

PCW

net.news

compiled by David Brake

Free Market Communications — free email

In about nine months' time, millions of people throughout North America will be able to exchange electronic mail for free, if Free Market Communications' project succeeds.

The company will be giving away email software which picks up messages from a central server via a toll free number. The cost of sending and receiving mail will be paid for by advertising. Each time a message is sent, received or composed using the software, an advertisement will be displayed somewhere on screen. The ads will not all be the same: users will provide demographic information about themselves, and the messages that are displayed will vary depending on the type of user the advertiser wishes to target.

Because the initial mail package works by direct dialling instead of via the Internet, it cannot easily be adapted for use in the rest of the world. But Free Market Communications (FMC) hopes to find partners and expand internationally, once its formula has proved successful in North America. It has been endorsed by leading American advertising agencies.

Despite the fact that a freely available service is open to abuse at any time, FMC doesn't plan to limit its use. It is counting on the fact that it will be targeting the 15m to 20m modem-owning Americans, rather than the heavy mail users of existing services. The software is not expected to support automatic file attachment.

The company is also working on a Web-like free interactive brochure service for North America which will follow in the middle of next year, but this will not be a "piggy-back" service like email — you don't get anything free in exchange for looking at marketing info, except whatever discounts the marketers choose to give.

Testing of the service by a small number of users is due to take place this summer, and mass marketing will begin in the first quarter of 1996.
For more information call 001 617 492 6600, or email noni@productview.comhttp://www.productview.com.

Worlds Inc

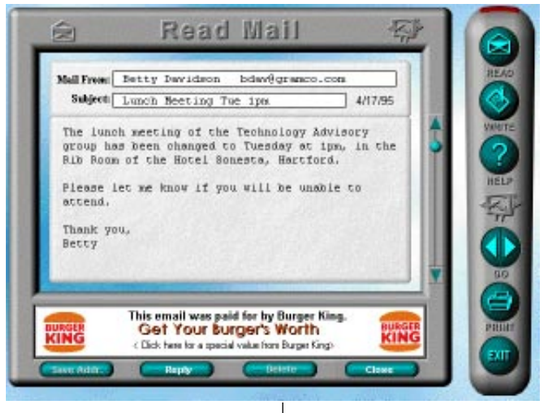
Virtual reality has commonly been viewed as something for the far-off future, but limited "Virtual Worlds" were developed by the British, have been available to the public for 15 years, and have been available on the Internet since 1988. Known as MUDs (Multi User Dungeons), MUCKs and MOOs, these are a collection of text descriptions of individuals and environments.

Moving around them will remind some of the kind of text-based puzzle and adventure games that were popular in the early days of personal computers.

The difference is that in addition to pre-programmed "robots", you can run across and converse or interact with other users around the world who are connected at the same time. Most of the environment around you is described (and therefore "created") by the "wizards" of the server to which you connect, but skilled programmers who have been given permission can create their own "domains" within these worlds.

A year ago, I saw the World Wide Web, whose graphical interface is gradually sweeping away the text-only worlds of FTP and gopher. This month, I ran Worlds Inc's Worlds Chat software, which threatens to have the same effect on the virtual worlds of the MUD. It is the closest I have yet encountered to the kind of VR environment you see in movies.

Players of DOOM and other games featuring 3D environments will find it familiar. It allows the same kind of interaction with people that you get with MUDs, but instead of typing "move north" and reading a screenful of text describing what you see next, Worlds Chat puts the virtual world on your screen and lets you move around it using the cursor keys. At the moment, when you see someone you still have to type your "hello" and read their response, but software to transmit speech digitally already exists, and will be available at a later date.



Free email will be available across North America

As *PCW* went to press, the software was still being tested and the motion was jerky. It needs at least a 50MHz 486 to work (a Mac version is due this spring), and the initial environment up for testing is just a succession of empty rooms and corridors, but wandering around it is fascinating and gives you an idea of the shape of things to come.

It is being tested on CompuServe with plans to release in July — more details are available by typing GO AWAY while online, and the software is downloadable from Worlds' web server.
Contact Worlds Inc techsupport@kaworlds.comhttp://www.kaworlds.com/

Internet Profiles, NetCount O'Reilly

One of the difficulties in promoting commerce over the Internet is that statistics of any kind are hard to come by. Nobody has a firm idea of how many potential customers there are. Considering the World Wide Web, which was not originally designed for commercial use, it is difficult to gauge how many people have looked at what you have to offer, let alone who they are, where they are and how much money they have to spend.

Three companies, O'Reilly, Digital Planet and Internet Profiles, are working on separate projects to solve some of these problems.

O'Reilly Associates and business partners are employing Trish Information Services to produce the first survey that attempts to gauge the size of the Internet with some statistical rigour. To back up traditional polling techniques across the Internet, it will be calling up 20,000 or more people at random to find out whether they are connected, and will collect statistical information about 1,000 Internet users and 500 users of online services. The bad news is that the survey will initially only cover the US, and only the sponsors will receive the full results, which should be ready by mid-June.

A European and Asian study is expected to follow, towards the end of the year. But different polling methods will be used because many European countries forbid random dialling.

The Internet Profiles Corporation has launched I/Pro, which measures the popularity of Web sites more accurately, and gives companies an opportunity to compile information about people who view their sites. I/Pro comes in two versions: I/Count, as its name suggests, keeps track of who has contacted a site; and I/Code allows servers to ask those who connect, to answer questions about themselves, putting the results into a database for analysis.

The I/Code software will make things easier for users as well, allowing Web information offered to be filtered to meet their needs, and saving users a lot of re-typing of personal data as they move from site to site — they just say "yes" to the server's request for information and the software automatically returns the information they have entered. Users can choose what data they wish to make available.

Because the I/Pro approach relies on its customers electronically sending back information on their accesses to Internet Profiles for analysis, it will also allow the company to assemble a large database of information about Web use in general. This will be used to allow companies to compare the popularity of their site to others in the same location or industry. I will also enable the company to provide general information about the industry, to the media.

I/Count should be available by the time you read this, and its price will vary between $250 and $3,000 per month. I/Code should ship in the third quarter of this year.

Fewer details are available about Digital Planet's NetCount, but it claims that its testers include MCA, MGM/UA and Young & Rubicam, all of them large corporate customers in the US.

For information, call 001 707 829 0515 or email O'Reilly on netsurvey@online.ora.com or florence@ora.comweb http://www.ora.com/survey/
Email Digital Planet on pgrand@digiplanet.comweb http://www.digiplanet.com/
Call Internet Profiles on 001 415 322 9600 or email info@ipro.comweb http://www.ipro.com

Apple sells Web servers

Apple is following the lead of Sun Microsystems and Silicon Graphics and offering a range of "shrink wrapped" Internet servers based on Macintosh servers. While most Internetters would agree that Unix is the "top dog" when it comes to support, Apple has some key advantages. Its machines are famously easy to use (Unix machines tend to be notoriously difficult to use but they are improving). They are also considerably less expensive than a workstation.

The machines are no different from ordinary PowerPC-based Apple Workgroup Servers: the key to the package is a CD-ROM of Internet software which includes the NetScape Web browser (for reading Web pages), MacHTTP server software for publishing Web pages to the Internet, and BBEdit for creating and editing Web pages. Also included is Adobe Acrobat Pro, AppleSearch 1.5 which indexes local files for retrieval by network workstations, and can be linked to Web pages for access by the Internet, and Apple RAID software. MacDNS, a domain server for the Macintosh, is expected to be available by mid-summer.

Servers vary in price from £2,495 to £8,440, depending on their configuration.

For further information call 0800 127753 or email abs.net-info@applelink.apple.comhttp://abs.apple.com/Products/Internet.solution/index.html.

RealAudio

Progressive Networks, a US company, claims to have developed software that will allow users to listen to sounds as they download them from the Internet, rather than having to wait until a sound has been downloaded, before loading it into a player program. The RealAudio player will be built into future versions of NetScape and other web browsers or downloadable free of charge. The company plans to make its money by licensing the server software which sends the sounds out over the Internet.

In order to deliver sound "real time" over V.32bis modem links, a lot of sound quality is lost. Its focus is on delivering speech, not music, and when we tested the beta software, it was only just good enough to allow you to discern accents and tone of voice.

Nonetheless, some of the biggest sites on the Internet have committed to using RealAudio's software, including HotWired (the online multimedia spin-off from Wired magazine), Global Network Navigator, Metaverse (which is a music-oriented web page run by an ex-MTV employee), and Hollywood Online. Understandably, some big American radio networks are also using this technology, including National Public Radio and ABC.

For more information: Web http://www.realaudio.com/

Security row defused

Two main kinds of security for transactions across the World Wide Web have been proposed — each backed by powerful companies. It now looks like a truce has been called. NetScape, the leading maker of Web browsing software, uses a "Secure Sockets Layer" or SSL approach, which can provide security for a broad range of Internet applications — not only Web browsers, but also telnet and other programs. It has the backing of Apple, Microsoft and Novell, amongst others.

EIT (maker of WinWeb), Spry (maker of Spry Mosaic) and several other companies have backed Secure HTTP (S-HTTP) from Terisa Systems, which is only applicable to the Web.

Each approach doubtless has its own merit and NetScape pledged to support S-HTTP. But the resulting confusion has led to worries that users might need several different browsers on their machines, depending on which "shops" they want to visit on the Internet.

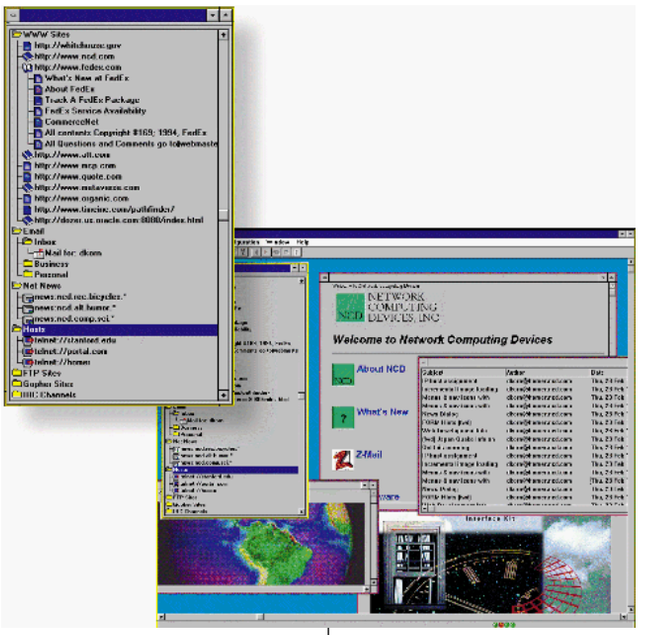
Now NetScape, IBM, CompuServe and America Online have bought stakes in Terisa, and the company plans to incorporate both security methods in a single development package.

Mariner

NCD, a company better known for making X terminals and X software, is branching out into the provision of shrinkwrap Internet software. The package, which should be available shortly, will include a wider-than-usual range of Internet applications — FTP, Usenet News, email, gopher, telnet, Internet Relay Chat and, inevitably, the World Wide Web.

NCD claims that the package will use a File Manager metaphor which will allow users to store all the information gathered from a variety of Internet sources together in one place, and it has been designed to work offline. Versions for both the Macintosh and Unix should be available by the end of this year. A 60-day trial version should be available for downloading in June.

When it ships, Mariner will cost $99, until September



A unified interface, from Mariner

when its price is scheduled to rise to $125.

For further information call 001 800 416 1956 or email mariner@ncd.comhttp://www.ncd.com/.

Spry Internet in a Box

The purchase of Spry, a leading Internet software house, by CompuServe, the leading online service, has provided an unexpected bonus for prospective British Internet users.

Not only has it enabled CompuServe to offer free, preconfigured software to its members, but Spry plans to offer its Mosaic in a Box software, as well as an Internet subscription bundle, to people in the UK using CompuServe's access nodes.

The Spry bundle consists of: Spry Mosaic, a Windows Web browser based on NCSA Mosaic; a mail package that should be downloadable free of charge for Spry customers by the time you read this; and connection, for a monthly charge, to one of CompuServe's dialup nodes.

Pricing has not yet been decided for the UK, but Spry's new North American subscription is $9.95 per month, including seven hours of free access, plus $1.95 for each additional hour.

For more information, call CompuServe on 0800 289 378 or email 70006.101@csi.compuserve.comwebhttp://www.compuserve.com.

France Telecom

The French, who were the first to come up with a mass-market online service, Minitel, are also the first to implement a system for encrypted online banking.

The new "Magis" models of France Telecom's Minitel terminals feature a built-in smart card reader. Many French people already use smart cards for banking and other services.

They cost FF10 (£1.28) a month more than existing terminals to rent, and so far there are only 40,000 terminals online (compared with 6.5m Minitel terminals).

Only a few French companies online take advantage of the new capabilities for secure transactions: the state railway and airline companies, and some book, record and flower shops.

Shopping from home

CompuServe has launched its UK home shopping service. Household names like Dixon's, Tesco, WH Smith, Virgin and Interflora will all offer a range of products to CompuServe members. But at launch, the range of products is extremely limited. Virgin's CD selection runs to just 13 disks, WH Smith's book-list includes just 250 well-known titles, and Tesco's contribution is for wine only.

CompuServe's Shopping Mall has been available in the US since 1984 and has not been a big success. CompuServe still refuses to release its sales figures.It is clear that the large retailers are using CompuServe as a way of testing out the viability of home shopping.

However, CompuServe expects to sign up another 15 retailers by the end of this year and some of the existing ones intend to expand their range. WH Smith expects to offer its entire range of 1,500 titles soon. To try out home shopping just log onto Compuserve and type Go.

KidMail

There have been drawing programs and even word processing packages aimed at children: now the first electronic mail package for kids has been launched. KidMail Connection has three "communication centres" from which to chose — Dinosaur, Secret Agent, and Outer Space. If your child is a slow typer (or just lazy) it comes with a choice of 50 prewritten messages, and parents can limit the amount of online time the child can have. At the time of going to press, it only worked with CompuServe, MCIMail and Prodigy (not available outside North America). An Internet version is in the pipeline, though.

KidMail costs £30 for the CD version and £35 for the floppy. TSF 2000 Ltd 0181 880 4088 http://www.connectsoft.com/products/kidmail.html

India gets the Internet

India's state owned monopoly long distance telephone company, VSNL, is offering full Internet access this month for as little as £10 per year for student dialup access. Initially, the service will only cover Bombay and Delhi.

French Game net

The first European experiment in transmitting computer games online, for rental, is taking place in France. Game Net has been available in 500 Paris homes since the beginning of April: for FF90 (£11.55) a month on top of an existing cable television bill, subscribers can download games provided by Sony, Sierra and Virgin to their own PCs and then play for several weeks. The games are protected from piracy as they will only work while the computer is connected to the network.

Payment is made via the "Visiopass" decoder, which is already in use for pay-as-you-view movies and premium movie channels. The service is being tested until the end of September.

Comms

All part of the CompuService

by Stephen Cobb

By now most CompuServe subscribers will have received the free copy of WinCIM 1.4 that was included with the May issue of the CompuServe magazine. This is the most significant upgrade of the last two years and all users of older WinCIM versions should upgrade (to check the current version number use the Help, About WinCIM command). The top level menus and icons remain pretty much the same, but there is more flexibility in the use of fonts. You will notice this right away because the default font for WinCIM dialogue boxes is different from previous versions.

Don't worry if you don't like it, as you can now change font settings for each of the following: dialogue boxes, list boxes, editing boxes (fixed and proportional), and printing (fixed and proportional). WinCIM no longer attempts to determine whether or not the text in menus and articles is column data, so you can switch to a fixed font by pressing Ctrl-T if you get column data that does not line up properly (Ctrl+T lets you toggle between your fixed and proportional font choices).

Also new is CompuServe Hypertext. The release notes suggest: "You can enjoy interacting with... hypertext documents.... full of colour, fonts, graphics, and hot links.... read them online or save them in the filing cabinet to read later." Not many are available at the moment and the samples provided by CompuServe (Go ESM) are not exactly impressive if you've browsed the World Wide Web. However, look out for CompuServe sections such as What's New to feature this hypertext approach in the near future.

WinCIM 1.4 takes a big step forward for those who want to log into CompuServe via the Internet. In previous versions the connections were not always reliable and tended to rely on third-party products like ComT. The new Internet network connection uses WinSock, which is already installed on any PC that connects to the Internet from Windows, either via TCP/IP or PPP dialup. You can also connect Telnet to Internet hosts using full VT100 terminal emulation. I have found this new connection much more reliable.

What WinCIM 1.4 does not provide is any enhancements to the Filing Cabinet. There are no commands for searching, archiving or indexing the contents of the cabinet. For the heavy duty WinCIM user the Filing Cabinet becomes a critical and often voluminous collection of data. Better tools for organising and accessing this information are urgently needed. Fortunately, the next major upgrade, described by CompuServe as "a new generation of CompuServe Information Manager", will address these issues. It should appear around November this year.

The mark of SATAN

About the middle of March, Unix security expert Dan Farmer brought to the Internet a program provocatively titled SATAN. Farmer's face appeared in newspapers all over America, alongside a highly magnified program icon portraying the devil himself and the following comment: "Unfortunately, this is going to cause some serious damage to some people."

So what is SATAN? According to CERT, the Computer Emergency Response Team at Carnegie Mellon University, SATAN is "a testing and reporting tool that collects a variety of information about networked hosts." Basically, a networked host is an Internet site, typically a Unix computer providing Internet access. This does not include PCs connecting to hosts using dial-up PPP.

When Farmer started getting a lot of negative feedback he was able, with a simple search and replace, to alter the program's name to SANTA. The original name, SATAN, stands for Security Administrator Tool for Analysing Networks. Essentially it is a tool for investigating system vulnerabilities. Here is how John Fisher of CIAC (the U.S. Department of Energy's Computer Incident Advisory Capability) describes SATAN: "Systematically moving through a given Internet subdomain, it probes for weakness in each responding system. The vulnerabilities uncovered are then reported to the user."

Released in April, at no charge, SATAN is the joint work of Farmer and Wietse Venema of Eindhoven University of Technology in the Netherlands. Dan Farmer was working for Silicon Graphics shortly before SATAN was released, but SATAN is a private project not connected with SGI or EUT. Farmer and SGI parted company last March because of differing opinions about the distribution of SATAN.

There is no doubt that Farmer and Venema want to improve the overall security of the Internet. Like many other Unix experts they have been warning for a long time that the Internet, which is expanding at a phenomenal rate, is built upon shaky ground. Unix can be a very secure operating system, with some versions certified for top secret government systems, but it require proper installation and administration. Straight out of the box, Unix has a lot of holes. Although Farmer and others have been providing security tools for administrators for some time, it is obvious that many systems are still being operated without sufficient safeguards against hacking attacks. SATAN was designed as a security tool for system administrators.

SATAN not only reports vulnerabilities but also gathers general network information such as types of hardware and software being used on the network, its topology, and the services being run. By releasing the program, which was preannounced within the Unix community almost 12 months ago, Farmer and Venema have forced the hand of systems administrators who have failed to bring their systems up to scratch, simultaneously making it easier for them to do so and easier for hackers to find systems that are still under-protected.

While SATAN is very helpful for the system administrator, the program also has a clearly documented exploratory mode that allows it to probe hosts other than those within the administrative domain of the person running it. In fact, you don't have to specify a particular host at all. You can define a range of hosts, based on the IP addresses. Indeed, the program default is to scan all hosts on the Internet. According to CERT: "SATAN is also likely to be used to locate vulnerable hosts for malicious reasons." CERT points out: "It is also possible that sites running SATAN for a legitimate purpose will accidentally scan your system via SATAN's exploratory mode."

Many people feel that tools like SATAN should have only limited distribution to legitimate users such as system administrators. However, this goes against the grain of much traditional Unix thinking which favours "full disclosure" and the free and open exchange of ideas. There is a strong scientific case for saying that no networked computer system can ever be 100 percent secure. Consequently, people who want to protect their systems, as well as the people who use them, have a right to full knowledge of the current state of play.

Those who subscribe to this view tend to see encryption and authentication schemes, such as digital signatures, as the preferred approach to information security. For example, if you pick up a copy of

Get thee behind me, SATAN

Not long after SATAN was launched, a program called Courtney was released to defend against SATAN and other similar tools. Courtney monitors the connections to the ports probed by SATAN. When an attack by SATAN takes place, the offending host will be reported. Courtney was developed by CIAC, the U.S. Department of Energy's Computer Incident Advisory Capability.

Established in 1989, shortly after the Internet Worm, CIAC provides various computer security services free of charge to employees and contractors of the DOE. It is located at Lawrence Livermore National Laboratory in Livermore, California, and is a part of its Computer Security Technology Center. CIAC is also a founding member of FIRST, the Forum of Incident Response and Security Teams, a global organisation established to foster co-operation and co-ordination among computer security teams worldwide.

Another response to SATAN is Gabriel, released by security specialists Los Altos Technologies. Gabriel is a free SATAN detector which gives the system administrator an early warning of a possible network intrusion by detecting and identifying unauthorised network probing. Gabriel is complete and ready to run software that does not require Perl or any other public domain programs. It contains a built-in mechanism to send real-time alerts via pager, phone call, email, or online displays. The company states: "By combining SATAN with Gabriel, a system administrator can get all the benefits of running authorised SATAN scans without the risks of unauthorised and undetected network probing."

CUTTING EDGE

the excellent *Network and Internetwork Security* by William Stallings (Prentice-Hall, 1995) you will see that it contains a lot more about cryptography than it does about physical locks and keys or even access controls. A book called *Cryptography* by Seberry and Pieprzyk (also Prentice-Hall) is actually subtitled An Introduction to Computer Security.

Diabolical liberties

Unfortunately, it is possible to extend this Unix-centric, full disclosure perspective to the point where it almost coincides with the prevailing hacker creed: "Any system which can be broken into deserves to be broken into." But in my opinion, and that of quite a few other people in the industry, there has to be dramatic change in attitudes towards what we might call "inter-computer ethics". This position has a problem with SATAN's lack of safeguards against abuse. It holds that making uninvited visits to other people's computers is impolite. It is trespassing, an unauthorised use of someone else's computing resources and a violation of the integrity of their system.

Arguing, as some hackers do, that it is okay to conduct uninvited exploration of someone else's machine as long as you don't copy or damage any data, is like saying it is okay to walk into people's houses at night and look around while they are asleep, as long as you don't touch or take anything. And it is no good saying that "computers are different" because they are not. Like every other new technology that has become widely available, computers will eventually have to conform to the underlying ethics of our society.

If this shift in attitudes does not happen and the hacker ethic prevails, then computer systems will eventually turn into armed camps. We will see a steady escalation of hacking tools countering security tools, just as we have in the war against viruses. The overhead in terms of transmission data required to assure the confidentiality and integrity of information passing between systems will soak up bandwidth and retard response times. The progress of the Internet will stall. It is possible that companies who carry data will start charging by the packet and the net will become the playground of those who can afford the high rates required to assure security.

It's a fair COPS

The idea of using software to search for system vulnerabilities is not new. COPS, also written by Dan Farmer, has been around for a while (the name stands for Computer Oracle and Password System). It reports many common vulnerabilities on a single system, by analysing the system on which it resides. Tools which probe for vulnerabilities on remote systems are not new either. The Internet Security Scanner (ISS), written by Christopher Klaus, has been available in both public and commercial versions for several years. The public version of ISS was not particularly powerful. It lacked a user interfac, and provided a limited set of attacks. SATAN is considerably more powerful, and uses a World Wide Web client to provide a friendly, graphical interface. Extensive information is provided that explains what vulnerabilities are being identified, and how those vulnerabilities can be removed.

How SATAN works

The following detailed description of SATAN comes courtesy of CIAC. SATAN is made up of HyperText Markup Language (HTML) documents, C code, and Perl scripts which generate HTML code dynamically. It requires an HTML viewer (Mosaic, NetScape, or Lynx), a C compiler, and PERL version 5. The user simply interacts with a WWW client, entering necessary data into forms. The control panel for SATAN provides four hypertext options: Target Selection, Reporting & Data Analysis, Documentation, and Configuration & Administration.

Through Target Selection, the user can enter a machine or a domain of machines to attack, and the extent of the attack (Light, Normal, Heavy). A Light attack will simply report what hosts are available, and what Remote Procedure Call (RPC) services they offer. A Normal attack will probe the targets by establishing finger, Telnet, ftp, WWW, gopher, and SMTP connections. These will establish what the operating system is and the vulnerabilities available. A Heavy attack will additionally search for other known vulnerabilities, such as writable anonymous ftp directories or trusted hosts.

Once the targets and extent of probing are established, a simple mouse click will begin the analysis. The user finds the results in the Reporting & Data Analysis link. SATAN is highly customisable and extendible. Through configuration files, numerous default values can be modified. New probes to be performed on each host may be added by writing a program (or script) with the proper input and output, and naming it with an extension of ".satan". This will allow users to write their own attacks tools, and add them to SATAN in a plug-and-play manner.

Here is a summary of vulnerabilities that SATAN exploits, taken from the SATAN documentation:

- Unprivileged NFS Access
- NFS file systems exported to arbitrary hosts
- NFS file systems exported via the portmapper
- NIS password file access from arbitrary hosts
- REXD access from arbitrary hosts
- Arbitrary files accessible via TFTP
- Remote shell access from arbitrary hosts
- X server access control disabled
- Writable anonymous FTP home directory

By configuring a system correctly, installing all the latest patches and monitoring system usage, most of SATAN's techniques can be countered, or at least detected. Unfortunately, complete protection is difficult. Some vulnerabilities do not have satisfactory solutions, short of stopping the vulnerable service, or placing a firewall around the vulnerable set of hosts.

One indication of attacks by SATAN, and other tools, is evidence of a heavy scan of a range of ports and services in a relatively short time. Many Unix network daemons do not provide sufficient logging to determine if SATAN is probing the system. TCP wrappers, the TAMU tools, and Swatch can provide the logging you need.

Where to find further documentation

SATAN documentation is available from ftp://ftp.win.tue.nl/pub/security/satan_doc.tar.Z. Additional documents on SATAN are available through a mail server set up by Wietse Venema, one of its authors. Send mail to: majordomo@wzv.win.tue.nl. Put the following text in the body (not subject):
get satan mirror-sites
get satan release-plan
get satan description
get satan admin-guide-to-cracking.101

The last document contains Improving the Security of Your Site by Breaking Into It, a 1993 paper in which the authors give their rationale for creating SATAN.

The following documents are provided by CERT to offer guidance on improving security:
ftp://info.cert.org/tech_tips/security_info
ftp://info.cert.org/tech_tips/anonymous_ftp
ftp://info.cert.org/tech_tips/packet_filtering

CERT advisories and bulletins are posted on the USENET newsgroup comp.security.announce. Past advisories, CERT bulletins, information about FIRST representatives, and other information related to computer security are available for anonymous FTP from info.cert.org.

You can get Gabriel via the Web: http://www.lat.com or ftp://ftp.best.com/pub/lat. Alternatively via ftp at ftp.lat.com. To join the Gabriel mailing list send mail to Majordomo@lat.com with the command "subscribe gabriel" in the body of the email message.

COPS and ISS can be used to check for vulnerabilities and configuration weaknesses. COPS is available from ftp://info.cert.org:/ pub/tools/cops/*. ISS is available from ftp://ftp.uu.net:/usenet/comp.sources.misc/volume39/iss. CERT advisory CA-93:14 and CA-93:14.README contain information about ISS. Courtney info from http://ciac.llnl.gov/ciac/ToolsUnix NetMon.html#Courtney.

TCP wrappers can provide access control and flexible logging to most network services. These features can help you prevent and detect network attacks. This software is available by anonymous ftp from ftp://info.cert.org:/pub/tools/tcp_wrappers/*. The TAMU security package includes tools to check for vulnerabilities and system configuration weaknesses, and it provides logging and filtering of network services. This software is available by anonymous ftp from ftp://net.tamu.edu:/pub/security/TAMU/*.

The Swatch log file monitor allows you to identify patterns in log file entries and associate them with actions. This tool is available from ftp://ee.stanford.edu:/pub/sources/swatch.tar.Z. The Security Profile Inspector (SPI) from CIAC provides a powerful suite of security inspections, using a straightforward menu-based interface. More information about SPI is available from http://ciac.llnl.gov/cstc/CSTCProducts.html#spi. The Network Intrusion Detector (NID) provides a suite of security tools for detecting and analysing network intrusions. More info from http://ciac.llnl.gov/cstc/CSTCProducts.html#nid.

net.newbies

Getting started on the Net

If you don't know what a "newbie" is, you probably are one. These pages are designed to be an easy-to-use reference guide to the Internet for the novice — or newbie, as hardened netters will call you.

If you don't understand what's written here or you have any suggestions, please don't hesitate to mail me at derb@pcw.cityscape.co.uk, or via "snailmail" — Internet-speak for paper mail — at *PCW*.

Meanwhile, here's an easy-reference guide to the tools which will help you make the most of the Internet.

What is it?

The Internet is a global network of computers which share a common method of communication. Not everyone on the Internet has access to the same communications tools. The best-connected people can use the Internet to talk to one another, view film clips and "surf" through connected databases of text illustrated with pictures. The simplest connections only let you send and receive mail electronically, as plain, unadorned text.

The population of the Internet is difficult to measure for a variety of reasons, but the number of those across the world who can at least send an electronic mail message is estimated at 30 million, and this number appears to be doubling annually.

What do I need to get on?

The best possible choice for accessing the Internet is a Unix-based workstation connected directly to the Internet through a "leased line" (such lines cost from £10,000 a month). You will be relieved to hear that you can get a perfectly adequate connection for a good deal less money than that. For starters, some businesses, a few schools and most further education establishments already have a full-time direct connection to the Internet available to their members (see TCP/IP later). Even if you aren't connected, there are many organisations which will connect you for a price.

A personal computer of almost any age can be connected to the Internet as long as you can plug it into into a modem. You don't even need to be able to view graphics on your machine to look around (though it certainly helps).

You will need a fast modem, though. A 2400 baud V.22bis model would be fast enough to exchange electronic mail messages, but to send and receive files or use the more exciting services on the Internet, a modem which supports at least 14,000 baud (V32.bis) is vital. Fortunately, these have plummetted in price over the last few years and now cost as little as £100. If you have the money, I would recommend spending even more on a 28,800 baud (V.34) modem. When you are using the Internet, the speed that things work is more likely to be limited by the speed of your modem than by the speed of your computer.

For a modem to pull down information, it has to have a number to dial. This is where the third element you need comes in — the "service provider". Typically, you can get limited access for around £7 a month, "all you can eat" Internet access for £10-£15 a month, and access to the Internet plus connection to a large online service's own information tends to cost £6-£10 per month plus around £2 per hour. On top of this, you obviously have to pay your phone costs unless you are lucky enough to get free local calls through a cable company. If you do not have a company offering Internet access near you, you may have to pay long distance phone rates. Once connected, though, it doesn't matter where the information you are getting comes from — you are charged at the same rate.

Service Providers

If you are connecting using a modem, there are three main ways to get onto the Internet:

Terminal-based

You dial a bulletin board and access Internet resources by typing commands to the host machine.

Advantages:

• Works with any communications software, avoiding setup hassles.

• Gives text-only access to almost any services.

• Using a local BBS this way can be your cheapest route online. The BBS or online service often has its own local community and local resources, as well as providing access to the wider world. Because it is difficult to charge for information on the Internet, you will often find that valuable information is only available through online services like CompuServe, CIX and Delphi.

Disadvantages:

• You can't use any of the graphical tools emerging for navigating the Internet. Long-established services like CIX or CompuServe put a graphical "gloss" on some of the services, though, and Delphi is working on one.

Sample providers:

CIX 0181 390 8446, cixadmin@cix.compulink.co.uk (optional TCP/IP service planned)

CompuServe 0800 289 378, 70006.101@compuserve.com. Also see TCP/IP.

Delphi 0171 757 7080 uk@delphi.com

Xanadu 01203 361599 — free!

UUCP

This stands for Unix to Unix Copy Protocol (though these days you can use it to connect almost any machine to another). It isn't used much any more, as the tools for offline TCP/IP connection have improved.

Advantages:

• The protocol is very simple and robust, and the software that uses it is well established, making for hassle-free connection.

• It works "offline" — you call and get all of your files in one go, which saves on phone bills.

Disadvantages:

• UUCP gives you access to files, newsgroups and electronic mail (anything that can be batched together and sent as a file) but not to Telnet or other "interactive" services (anything where you and the host computer interact "live"). Some services allow you to combine terminal-based and UUCP-based connection.

Sample providers:

The Direct Connection 0181 317 0100 helpdesk@dircon.co.uk

Exnet 0181 244 0077 sysadmin@exnet.co.uk

PC User Group 0181 863 1191 info@ibmpcug.co.uk

TCP/IP

The "lingua franca" of the Internet is the TCP/IP network protocol. The best way to access the Internet... in theory. Also, often the cheapest if you plan to use it a lot: you can get unlimited TCP/IP access for as little as £10 per month.

Advantages:

• Once you're set up, you can use any of dozens of sophisticated Internet applications, including graphical World Wide Web browsers (the sexiest Internet tool around), Internet Voice Chat (using the Internet as a telephone), and even rudimentary video-conferencing applications. Most of these are given away free across the Internet.

• The normal way to access it is using PPP or SLIP which allow you to connect using a modem via a host, but if you are willing to pay for it (or if your company or university supplies it) you can connect at Ethernet speeds. Already some cable TV companies in the US are offering this as an add-on service through set-top boxes, and cable companies here look like providing similar services in future (see *Newsprint* May and June 1995).

• CompuServe is now offering three free hours of Internet use per month via TCP/IP, and CIX plans to offer TCP/IP as an option as well, perhaps by the time you read this.

• If the software you are using allows it, you can do several things at once when using TCP/IP — read your mail in the foreground while downloading a file, and search for a document in the background.

Disadvantages:

• Can be difficult to set up, though this is getting easier all the time as software is more advanced.

• The access software can be unreliable, even when it is commercial software.

Sample providers:

BBC Networking Club 0181 576 7799 info@bbcnc.org.uk

Cityscape 01223 566950 sales@cityscape.co.uk

Demon 0181 349 0063 internet@demon.net

What can I do once I'm connected?

Mail

Almost every BBS and online service can offer you some kind of gateway into the Internet for electronic mail (email) — it is the "lowest-common-denominator" service. The standard way of addressing Internet mail is person@organisation.something.something, but the way you send mail out from a local system varies from system to system.

On CompuServe, to send a message to me at CIX you'd type "internet:derb@cix.compulink.co.uk" in the address field. To send a message from the Internet to my CompuServe account (70007,5442), you'd send to "70007.5442@compuserve.com".

Because many users are limited to electronic mail-only access to the Internet, a number of ways have been devised to allow email-only users to read newsgroups and search for and download files. These methods tend to be clumsy, though, and are not to be recommended unless you don't have any choice.

One of the most commonly asked (and understandable) questions about the Internet is "how do I find a person on the Internet?". There are at least ten different ways of doing this, none of them particularly reliable. It is a subject in itself: to get a mail message giving some of the options, send mail to mail-server@rtfm.mit.edu with "send usenet/news.answers/finding-addresses" in the body of the message.

It is hardly surprising that finding people is tricky, since there is no central authority with which every user has to register to get online, the population of the Internet is growing incredibly quickly, and many companies and individuals don't want their internal electronic mail addresses listed.

Mail was Tool of the Month in last October's Internet column.

Newsgroups & Mailing Lists

The ability to read and post to these is probably the second most popular service after mail. They are the equivalent of forums or special interest groups on bulletin boards, and cover every special interest imaginable.

In both cases the idea is simple: any subscriber can post queries or comments which can be read and replied to by all other subscribers across the globe. It can also be used to broadcast files, though it is clumsier than other methods.

A mailing list, as the name suggests, uses email, which has the advantage that anyone with mail can use it; accessing newsgroups requires a newsreader program and access to a "news server", usually provided by your service provider. Some service providers will censor your news feed,

as this is one of the most common ways to send erotica and/or pornography.

Specialist newsgroups such as bionet.molbio.embldatabank (discussion about the EMBL nucleic acid database) generate a manageable number of messages each day. But a popular newsgroup like rec.arts.movies generates thousands of messages a month from its huge readership, estimated at 100,000 in May last year, which means it could be twice that now. Reading through a couple of newsgroups of that size without sifting through them beforehand could be a full-time job and run your phone bill into the stratosphere.

WWW — the World Wide Web

This tool was designed at CERN (the European Laboratory for Particle Physics) in Switzerland. It is by far the sexiest interface to the Internet, and if someone wants to produce an impressive Internet demo, nine times out of ten they'll use WWW to do it.

The good news is that it can provide a graphical front-end to almost any Internet resource, and like Gopher (next column) it provides links to information all over the Internet. The bad news is that unlike Gopher, it lacks mature search tools to allow you to find just the item you want. Instead, it encourages you to browse from link to link. This is a good way to learn and have fun, but a poor way to get things done.

There are many WWW searching tools you could try — the best one is probably the Yahoo search page at http://www.yahoo.com/search.html. If this doesn't find you what you want, there is an index of indices at http://home.mcom.com/home/internet-search.html.

The WWW's graphical interface requires a lot of speed. Unless you have a V.32bis modem, you may as well forget about the pretty pictures, alluring sounds and even video clips on the Web. A large number of the more interesting resources on the Net are arriving on Web servers, so it's worth knowing that a much faster, if less glamorous, connection to the Web is available via telnet (see the telnet entry later).

CompuServe subscribers now have WWW access (three free hours a month, plus more if you pay), and most other BBS-based services like Delphi and CIX offer at least text-only access. For full graphical WWW access, you need a TCP/IP connection (ask for it by name).

Gopher & Veronica

Gopher, designed in 1991 at the University of Minnesota, is called that because it "goes for" information and because the football team at the college is called the Golden Gophers.

It resembles the WorldWide Web in that it provides a way of linking together different information resources. While the WWW provides links in the form of "hot buttons" on pages of styled text with pictures, Gopher takes the form of a series of menus and submenus on each server, some of which lead to other Gopher servers.

CIX and some other service providers allow you to run it from their systems, but if your provider doesn't have it set up you can download your own Gopher client software and use it, or telnet to gopher.ebone.net to try it out.

Rather than wander through the maze of menus to find the information you are interested in, you can use Veronica to search through all the menu entries on all the world's Gophers (in theory) for the information you want. To use it, direct your Gopher software to info.mcc.ac.uk and select the Veronica menu item.

Gopher and Veronica were featured in the Internet column of *PCW* August 1994.

Anonymous FTP & Archie

Both these services are all about files — how to find them and how to get them. FTP stands for File Transfer Protocol. It is "anonymous" because FTP servers require a username and password before you can connect to them, but often allow you to connect to parts of them by giving them a login name of "anonymous" and your email address for a password.

Once you are connected, looking around the server for a file usually works much like DOS. DIR or LS tells you the contents of your directory, cd directoryname puts you into that directory.

There are several graphical interface programs available to make FTP easier to use.

Many files stored on other servers are compressed or encoded in various ways, indicated by an extension at the end of the file name. .HQX, .TAR, .ZIP, .SIT and .ZOO each indicate a different kind of file requiring one or more utility programs to convert them.

Finding the file you want on the Internet is not as hard as finding the person you want, but it is still not straightforward or dependable.

There are several tools available to help you find specific documents, but Archie is, as far as I know, the only tool which helps you find the file you want from the 2.5 million or more binary files in its database. You can use it via mail (send mail to archie@doc.ic.ac.uk to find out how), via telnet (to archie.doc.ic.ac.uk or one of 23 other Archie servers), via the WWW (http://src.doc.ic.ac.uk/archieplexform.html) or using one of several pieces of front-end software.

If you know the name of the file you are looking for, your task is fairly easy. Archie allows you to search for exact file names or files containing a set string.

If you don't know the name and it isn't obvious, life gets more difficult. There is a database which indexes files by keyword — it's called "whatis" — but it isn't very well kept.

Archie is supposed to provide a complete index of publicly accessible files, and each of the several available servers should have the same data.

This is not the case in my experience. Each night, the servers index one thirtieth of the files on the Internet, so they should be a maximum of a month out of date. Unfortunately, the Internet is growing so fast that being a month out of date can exclude many files. Also, not every publicly accessible file archive is indexed. Demon, a service provider for personal and small-business use, maintains a 5Gb archive of useful software at ftp.demon.co.uk. Because of a technical problem, Archie used to be unable to index Demon's files, but it now can.

Lastly, each server seems to have a slightly different database, so if you're sure a file is out there somewhere but you don't find it on one of the UK servers, try one in the US.

Telnet

This is probably the easiest command to understand. Telnet to a site by running one of the many available telnet programs (in many cases, this is as easy as typing telnet <site> from the prompt of the computer you normally dial into) and you will be confronted by the login prompt of your target computer. Whatever you type will be transmitted directly to the remote computer as if you were typing on its keyboard, and its replies are sent back to your screen.

Normally when you log in like this, you either have an account on the target machine already or it is set up to give you access for specific tasks. To see what you can do, try telneting to telnet.w3.org (a computer in Switzerland). This gives you text-only access to the World Wide Web. The Web program runs on the Swiss machine, but you can manipulate it from the comfort of your chair. PCW

Innovations

Sound proofing

Loudspeaker manufacturer Bose has developed a package for predicting *exactly* how a sound system will perform in a given venue — if necessary, before the venue is even built. Tim Frost likes the sound of it.

Until the start of the nineties, predicting what the acoustics of a new hall would be like was a fairly crude business, and sound systems were installed by engineers on the basis of their experience and instinct.

Recently, however, the understanding of how sound works has leapt forward, as computers have given acousticians and theorists the tools they need to test their ideas. The result of all this activity has been the creation of several PC and Mac packages — mainly by the large loudspeaker companies like Bose and JBL — that help the installers predict how a sound system will perform.

By creating mathematical models of the way loudspeakers radiate sound and the way a particular hall will reflect or absorb the sound, these modelling packages help predict loudness and intelligibility, the two primary requirements of any sound system. The user loads the computer with a plan of the hall and details about the type of surfaces used. Speaker systems are placed in various positions in this virtual room, which can be an existing venue or one yet to be built, and the program uses techniques not a million miles away from ray-tracing to get a graphical and text printout of the way the system will behave in that space.

The end result has been a general improvement in the performance of the new sound systems in these basic areas. It is now unusual to have a new, large installation with areas where the sound cannot be heard, and speech is usually delivered with clarity. Even so, there's a problem: these software systems tell engineers how loud and clear the sound will be, but they give no clue as to how *good* it will sound.

Enter the new generation of hardware/software modelling systems. Bose has come up with the Auditioner package which combines the acoustic ray-tracing models with digital signal processing hardware, all run on a Mac. Information about the venue's size, shape and surfaces is fed into the program in the same way as before, but instead of just producing an on-screen graphical display of the result of the calculations, Auditioner feeds the information to a DSP card which then has a pure recorded signal played through it from the computer's hard disk.

This signal, which can be anything from a voice to a full orchestra, will have been recorded in an anechoic chamber — so-called, because it absorbs all the sound hitting its walls. The recording is therefore just of the sound coming from the instrument with no other sound being reflected off walls, so the sound being fed into the system won't carry the imprint of any other existing room or hall. The Auditioner card overlays the additional reverb and frequency response changes, created by the virtual room under test, onto the audio track. So, by listening through headphones, and placed anywhere you like within the virtual room, you will hear a realistic impression of the sound of that source in the hall being played through the proposed sound system.

Auditioner is not a home-user system. At the moment it is offered as a service rather than a product and the first major UK venue to benefit from it was the recent installation at Tottenham Hotspur's White Hart Lane football ground. This was designed using the graphical Modeler system and run through Auditioner in the US, before the design was finally confirmed and installed.

Without Auditioner, the graphs and diagrams produced by the acoustic consultants in such a situation would help the experts design a better sound system, but would require a lot of interpretation by the non-expert people who have to make the decision actually to buy the system. Even though the clients are about to write a cheque for many thousands of pounds for a new sound system, with the graphical modelling systems they are really none the wiser as to what they are going to get at the end of it.

With Auditioner, they can listen to it first and evaluate its performance long before the first speaker is ever installed. The software system already seems sufficiently mature for the manufacturers to have the confidence to offer a money-back guarantee. If the real building doesn't sound as good as the virtual one, the clients don't have to pay for it. PCW

Tim Frost

Horizons

Get real

For some time, virtual reality has been more the preserve of Hollywood blockbusters than domestic entertainment. But this Christmas should finally see the arrival of VR in the home, writes Simon Rockman.

Technologies, like rock stars, often take several years to become overnight successes. But the day of virtual reality is nearing. Most of the major toy companies have looked at the commercial possibilities of systems and the arcade machines are well established.

Just as the term "multimedia" has become corrupted to mean anything with a sound card and CD-ROM, the term "virtual reality" has taken on the meaning of anything where a virtual world exists within the machine — a definition which could include 3D Monster Maze on the Sinclair ZX81. A more sensible view of virtual reality is not one which models a world, but one which models a world with you within it, and which takes in enough information about you to provide some immersion.

These total immersion systems consist of a headset usually providing stereoscopic vision and some other form of input — a joystick or glove. The headset not only contains separate eyepieces but provides motion tracking so that the software knows the orientation of the head. The best systems track all three axes. Good sound helps cover up the limitations of poor visuals, so most headsets also contain headphones. The problem with the other form of input is providing something which is easy to monitor and feels natural.

Total-immersion virtual reality will become mainstream over the next year. Systems such as the W industries arcade machine, originally based on a Commodore Amiga with a custom graphics card for each eye, cost many thousands of pounds. The Sense8 system, designed for use with workstations, allows architects and designers to build virtual worlds, and a number of medical imaging systems provide 3D environments; but these are all niche markets. For virtual reality to become a mass-market product it needs to be cheap and aimed at the high-street shopper. Until now, the problems with doing this have been technological; the necessary components have been too expensive.

VR systems use LCD screens of the type employed by pocket televisions. These don't give a good enough resolution for a realistic feel. If a person's eyesight was as poor as that through a VR headset, that person would be legally blind and would qualify for a disability allowance. Higher-resolution displays are prohibitively expensive.

The motion-tracking technology which has been tried so far often fails to track accurately. The systems use infra-red, radio, and the interference between magnets mounted on the headset, and there are also externally mounted systems, but they all lag behind the movement. This might only be a couple of frames behind the actual positioning of the head but the brain is quick to spot such discrepancies, and the lag, known as latency, is disconcerting. Engineering systems which eliminate latency have proved expensive.

The new generation of headsets which will hit the market later this year don't solve these problems — they circumvent them. The cheapest system will be the Nintendo VirtualBoy. This isn't so much a virtual reality system, as a stereoscopic GameBoy. The player looks into a hood which contains two monochrome LCD screens giving a 3D image, but the device is not attached to the head.

Some head-mounted displays avoid the cost and complication of motion-tracking altogether, but the greatest saving from the manufacturers' viewpoint has been the elimination of the stereoscopic view. In tests it was found that the benefits of a separate image for each eye were not worth the vast processing overhead. Users were quite happy with the same view in each eye. This could be translated into a system which just had one screen and split the vision for each eye optically. We will see systems which do this in time for Christmas, and we will also see add-ons for consoles from Sega and Atari, both of whom have demonstrated prototypes.

One major problem with headsets is the weight, and this has been tackled in the two-screen system from Virtual I/O, a company funded by Paul Allen, co-founder of Microsoft. This device has a sunglasses-type headset but is intended for serious use. The real benefit for PC users will come when the toy-market products are mass-produced. When they are established we'll see VR for the home at under £300. PCW

Simon Rockman

CUTTING EDGE

New Horizons

Worlds of adventure

The development of virtual reality modelling language means that we will soon be visiting and interacting with 3D worlds on the Internet. The first VRML worlds are already available for exploration by net surfers with the right software. Azeem Azhar gets you ready for the trip.

The star of the World Wide Web conference at Darmstadt, in April, was the virtual reality modelling language (VRML) which was showcased by Silicon Graphics Incorporated (SGI), manufacturers of high-end 3D computing systems.

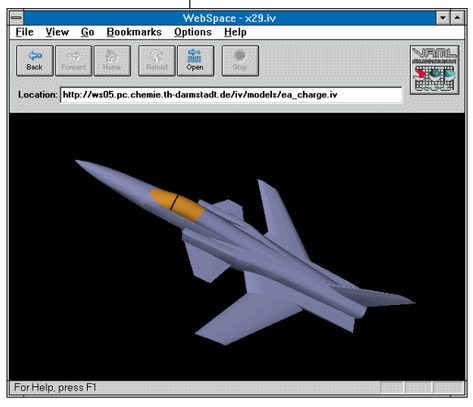
VRML is a low-level, platform-independent, 3-Dimensional, interactive modelling language which sits on top of the Web. To you and me, this means we will soon be able to wander around a realistic 3D world whose data is stored on the Internet, and be able to interact with it naturally by using the objects we find there. A VRML scene might contain books, televisions, radios or computers as well as neatly arranged potted-plants and seductive lighting. Clicking on a book might load up an ordinary document in the hypertext mark-up language (HTML) already used on the Web. Touching the television might download an MPEG video for us to watch.

Azeem Azhar

Although VRML was demonstrated by SGI at Darmstadt, it is nevertheless an open standard developed by a loose group of programmers, led by Mark Pesce of the Community Company. The heart of VRML is SGI's Open Inventor standard, a scene-description language already used to create 3D computer models. Open Inventor, and its relative, VRML, are simply ASCII text files which describe a scene in terms of basic components known as primitives — cubes, spheres and other polyhedrons. These primitives are to VRML what letters and numbers are to HTML, the language that describes ordinary Web pages.

All that a VRML document needs to describe a world are simple instructions such as "place a red box two metres to the left with a green pyramid sitting on top of it". But this doesn't mean that VRML worlds are going to look as if they are made from Duplo bricks. Being such a low level description of a 3D scene, it just means that to achieve an acceptable degree of visual realism, designers will have to work a little harder to make objects look realistic.

This was sent as a description, not a picture, so can be manipulated freely



Gavin Bell, one of the authors of Open Inventor, explains: "A high-level ambiguous instruction such as 'put any old chair at this point in the scene' makes about as much sense as trying to describe a paragraph in a text document as 'insert a paragraph about parakeets here'."

The current specification for VRML allows for primitives to be combined to make more complex objects, so several hundred polyhedrons might be pulled together to make a chair. You can map images onto objects to give realistic textures, or place multiple light sources in a scene. In the future, libraries of common shapes, rather like clip-art libraries, will be available which could be stored on your local machine to allow quick access.

Entering a VRML world takes two steps. Using your normal Web browser you click on the hyperlink in a normal Web page that leads to the world (or jump straight to its uniform resource locator, or address); then your browser will launch a VRML viewer, which will allow you to navigate the scene. Unfortunately, the only browser available at the moment is SGI's WebSpace which only runs on its high-end computers. However, WebSpace is being ported to Windows and Macintosh platforms by Template Graphics, with an expected release date of mid-May.

Mark Pesce is working on a browser called Labyrinth which should be available for Windows and Macintosh platforms by the time you read this. Both Labyrinth and WebSpace will have simple interfaces — you just use a mouse to move around the world. In WebSpace, objects connected to hyperlinks flash when you hold the mouse pointer over them and will act just like hyperlinks in HTML pages, downloading text, sound or video, or taking you to a new location on the Web.

Like all things on the Internet, VRML will be best enjoyed on a high bandwidth link to the Internet (rather than via a telephone connection). Nevertheless, Pesce claims that he has "tried to optimise [VRML and Labyrinth] for 14.4kb/sec connections" that are common in the home. This means that when you access a VRML world you will be able to choose an appropriate level of detail for your connection — for example, you might choose not to download texture maps or objects below a certain size. But VRML worlds are nonetheless enormous: typically in the range of hundreds of kilobytes. Although this would mean several minutes' downloading via a modem, once completed, a VRML world may be explored at leisure.

There is a further concern for potential visitors to VRML worlds and that is the issue of processing power. Traditionally, 3D rendering has taken seconds (or even minutes) to produce only a single frame; for VRML to be even vaguely realistic, it needs to produce several frames or more per second. SGI avoids this problem with its WebSpace viewer because it runs on SGI's blindingly fast desktop machines. Labyrinth uses technology from the British firm Rendermorphics (now owned by Microsoft) to generate each frame: an efficient code produces excellent results, even on a 486. But the best results would be achieved by reducing some quality settings in a scene.

The first VRML worlds are already available for exploration. Net surfers with the right software can enter over a dozen, ranging from a model of the US Holocaust Museum, to VirtualVegas, a casino that features a 3D fruit machine; and from models of organic chemicals that you can "fly" around, to a tour of the fictional town of Fairmount. WaxWEB, an interactive movie on the Web featuring more than 90 minutes of video and sound, and the Internet Underground Music Archive have both gained a third dimension. However, VRML isn't just about being able to visit imaginary worlds and enjoy a hypermedia movie; it has tremendous commercial potential, according to Pesce.

His Community Company is a member of CommerceNet, an organisation trying to drive business on the Internet. Businesses attempting to trade over the Internet will be able to provide accurate examples of their products if they use VRML, says Pesce. Rather than relying on a couple of pictures and a description, customers will be able to "fly" around items. The possibilities are endless: estate agents could put 3D models of all their properties online, ready for prospective buyers to vet them from the comfort of their own PC; and online shops could provide more interesting environments for visitors, and better product information.

In the future, VRML specification will be developed to allow improved interaction, so that visitors to a world can affect it by moving, destroying or creating objects in it. More excitingly, if you and I were looking at the same world we might be able to see one another (providing our line of sight wasn't blocked by a building), or talk to each other.

Addtionally, VRML may gain the latest features of computer animation, such as objects that appear and interact to move according to the laws of physics. Pesce believes that VRML is a stepping stone to a "collaborative shared virtual reality" or "consensual hallucination" — phrases which science-fiction buffs will recognise as being synonymous with "cyberspace". VRML is the solution to the problem that the Internet is computer-centred ("http://www.demon.co.uk/ pcw/bob.html", for example) rather than human-centred ("I'd like to see *PCW* magazine's Best of British Awards"). It allows us to visualise the Internet, which according to Pesce, is simply a spatial object exhibiting a boundary and content (defined by the hosts). VRML allows us to locate ourselves with reference to this spatial object rather than as a computer address, and lets us acquire data in terms of what and where it is, rather than on which computer it resides.

Pesce's cyberspace protocol is still several months away, so we will have to content ourselves with isolated worlds. But this is nevertheless a good deal better than blinking text and a couple of inline graphics.

Java jive

"HotJava is here and it rocks" claimed dozens of Net posts throughout April — and they were right. HotJava, from Sun Microsystems, is the first of a new breed of worldwide Web browsers. Whereas most new browsers send clever tables and lurid backgrounds as well as pictures and text, HotJava sends whole applications to the browsing machine. These applications can do practically anything: they could be a video conferencing tool, a 3D visualisation package or a game. Sun has already demonstrated a HotJava application that retrieves up-to-the minute stock quotes, as well as a disembodied head that bounces randomly around a Web page.

At present, Web browsers simply take text and pictures and throw them around in a particular way on the page. Modern desktop machines are barely stretched by formatting such documents so HotJava exploits this processing power by sending small pieces of software to run on the client computer. These programs are then interpreted on the client computer, and because they are interpreted rather than compiled, they are platform-independent and so will run with any HotJava-compliant browser.

Although this may sound like a recipe for an epidemic of viruses and dangerous programs, it isn't. Since the downloads are interpreted by HotJava, it can put strict limits on what it will and won't understand — you won't find an application that will wipe your hard drive (yet).

HotJava is only available on Sun's Sparcstation series at the moment, although ports to MacOS and Microsoft Windows platforms are under way. You can get further information from http://java.sun.com.

Azeem Azhar

Above right Through Java, these stock market indices are all updated at once in real time

PCW Contacts

The Community Company is at http://www.net.org/~tcc/. **The main VRML discussion group** is at http://vrml.wired.com/. Another **VRML repository** is at http://www.sdsc.edu/vrml/.

CUTTING EDGE

Bluesky

That is illogical, captain

As products increasingly attempt to emulate humans, engineers are abandoning classical logic in favour of fuzzy thinking. Nick Beard traces the concepts which help to blur the boundaries.

Fuzzy logic has been a big hit in engineering. The list of appliances, gadgets and products which include some fuzzy widget or other is growing constantly. Arch-postulant of Fuzziness Bart Kosko lists more than 30 products or groups of products in his book Fuzzy Thinking. These range from air conditioners and anti-lock brakes through dishwashers and tumble-dryers to rice-cookers, shower systems and video camcorders.

There is a pleasing completeness in the efforts of struggling lawyers to find ways of tightly defining fuzzy systems to enable patents to be granted (pleasing except for the amount of hot air being generated, highly inefficiently and at great cost). Why have so many products been invested with fuzzy capabilities? The basic reason is simple: it works.

The first publication on fuzzy logic, often cited as seminal, was a paper by Lofti Zadeh, who wrote in Information and Control some 30 years ago: "The fact remains that ... imprecisely defined 'classes' play an important role in human thinking, particularly in the fields of pattern recognition, communication of information and abstraction." In another paper, he stated the Principle of Incompatibility: "As the complexity of a system increases, our ability to make precise yet significant statements about its behaviour diminishes until a threshold is reached beyond which precision and significance (or relevance) become mutually exclusive characteristics." Or put another way: "The closer one looks at real world problems, the fuzzier its solution."

So Zadeh offers two main reasons for adopting fuzzy logic. First, he argues that it avoids some of the inordinate complexity that can be incurred when trying to regiment informal argument. Far more radically, though, he claims that this is the proper way to acknowledge that the values true and false are imprecise and fuzzy.

This is certainly in keeping with day-to-day human experiences. Many aspects of our lives are not readily expressed in a crisp fashion. Reasoning in human style is therefore hard to imitate with computers, which are logical beasts, preferring (usually demanding) explanations in black and white. Statements are either true or false: it is the Law of the Excluded Middle, dating back to the ancient Greek philosophers. Yet the problem is that the world has a middle, and a mathematical law which excludes it is a problem for maths, not the world. Einstein wrote: "So far as the laws of mathematics refer to reality, they are not certain. And so far as they are certain, they do not refer to reality." The same can be said of classical logic. The tightly defined, constrained notions of classical logic require reality to be "squeezed" to fit into the available categories.

Consider "tallness". To define tallness with precision is not easy. "A person is tall if that person is male and over 6ft high." Probably true. 5ft 10in? 9in? Female and 5ft 9in tall? There is no reasonable definition of tallness which has any numerical precision. One approach to this difficulty is to supplement classical logic with an additional feature: degrees of truth. Truth can then vary between absolute falsehood, and absolute truth. It can be represented by attaching a number to the truth value. This gives us in effect a many-valued logic, which can be further developed into a fuzzy logic.

In a many-valued logic, the set of truth values is represented by a set of points on the interval between (0,1). Zadeh does not allow for an infinite number of values in this continuous range to be used as this could lead to unmanageable complexity. Instead, he employs a set of fuzzy subsets of the interval, which are referred to as linguistic truth values. This set (let us call it TV) is countable, which means that it has a finite number of values. It is of the form: TV = {true, false, largely true, largely false, rather true, mainly true, substantially true...}. This set is generated from the term "true", and the definition of truth from which the set is generated is motivated by the specific topic under consideration.

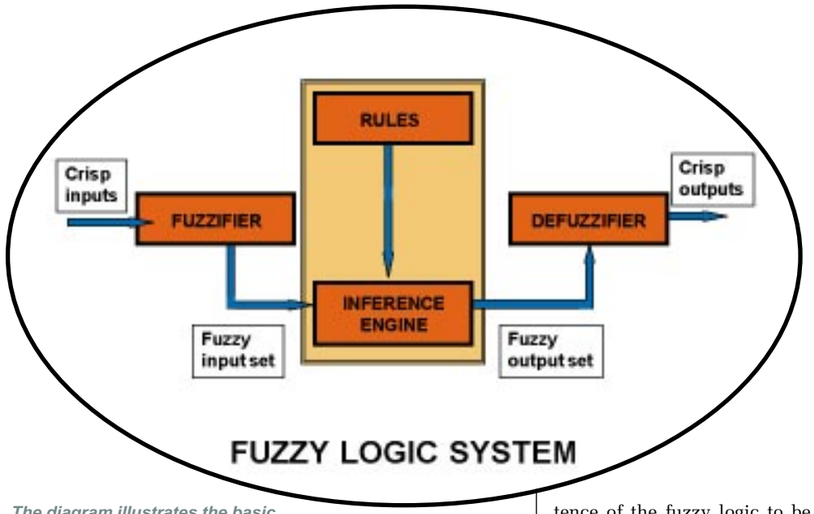
This is important: fuzzy logic is not merely a multi-valued logic. The move from classical to fuzzy logics is a two-step process. The first step involves introducing (or allowing) vague predicates (a predicate is a quality, a notion, an attribute that can be either true or false when applied to some situation). Like tallness in the example above, they are rarely precisely true or false.

CUTTING EDGE

Having introduced predicates with more than two values, the second step is the bigger one: introducing a vagueness to the very notions of truth and falsehood. Both steps are important, but it is the second that is by far the most controversial.

Introducing vague predicates produces a non-fuzzy many-valued logic. This can be called the base logic. To fuzzify the base logic, the meta-linguistic predicates (so-called because they are ultimate concepts, which transcend any specific language or representation) are themselves fuzzified. Truth and falsehood become less exclusively defined. "How can this be?" you might ask "...and how can this apply to the precise world of engineering?" Well, here's a highly fuzzy yet apparently precise engineering concept: bandwidth. Yes, the meaning of a 19.6 baud line may be precisely definable, but is that a high or low bandwidth line? Yes? Rubbish — think of a T1 line. No? Rubbish — just try getting even a reliable 9.6 out of some countries.

In practice, fuzzy logic is built into fuzzy logic systems (FLS). In general, an FLS is a non-linear mapping from an input data vector to a scalar output. Once an FLS has been developed, it can usually be expressed as a mathematical expression — as a combination of fuzzy basis functions (details of which are beyond the scope of this article — for details, see the IEEE Special Edition in the Resource Guide). It is a non-linear function approximator, a characteristic it shares with feedforward neural networks. This is very powerful — it enables the underlying basis of the FLS to be derived from numerical data or linguistically expressed knowledge, and cast in the form of a series of IF-THEN rules.



The diagram illustrates the basic structure of an FLS, which consists of four components. The rules come from experts, or are taken from available data

The basic structure of an FLS is made up of four components: a fuzzifier, a rule base, an inference mechanism, and a defuzzifier. The system is assumed to take crisp inputs (specific values, button presses), and return crisp outputs ("Do I turn that dial or not? Do the lights go on now or not?"). The rules come from experts ("When the pink light comes on and the room feels muggy, hit the green button. Don't ask why, it just works that way") or are extracted from available data.

The fuzzifier maps crisp number inputs to fuzzy sets, in order to activate the rules in the rule base. The inference engine maps fuzzy sets to fuzzy sets, and, just as humans use many different mechanisms of reasoning, the inference engine may incorporate many inference techniques. The defuzzifier maps the output fuzzy sets to crisp numbers: the clear answer that switches and computers like to achieve.

Fuzzy logic, like any other aspect of mathematics, computing or engineering, is not a solution to all remaining problems — it is another tool in the software engineer's toolbox. There are constraints to consider. In a classical logic, the semantics of the logic guarantee that each sentence generated by the language of the logic will be associated with a specific element of the set {True, False}. Similarly we would like each sentence of the fuzzy logic to be associated with an element of the set TV. It is not the way of fuzzy logic to be so precise. No such association can be guaranteed by the syntax of the logic. Instead, each element in the set TV has associated with it another element, its so-called linguistic approximation. This means that the traditional ideas of consistency and completeness are "peripheral" to fuzzy logic (a system of logic is consistent if it is not possible to generate a contradiction from it, and it is complete if all possible conclusions are generated from it). For example, the inferences proven for one fuzzy logic system might not apply to another, since the sentences might not be associated with truth values in quite the same way. This makes it harder to use research results from the automated theorem proving community, for example.

There are, of course, a number of detractors from the fuzzifiers, and this is one of the grounds for detraction. In fuzzy logic, the validity of an argument can only be characterised semantically, that is by reference to the meanings of the symbols it employs, not syntactically as in classical logic, where the symbols can represent almost anything.

Of course, there is a simple existence proof of the utility of fuzziness, and this is the great array of products which are today successfully using it in the real world. PCW

PCW Resource Guide

Fuzzy Thinking
Bart Kosko, Harper Collins.
A provocatively written and accessible backgrounder in fuzzy logic, its motivations and applications. Big but readable.

Engineering Applications of Fuzzy Logic: Special Issue of Proceedings of the IEEE, March 1995
A collection of papers on modelling, fuzzy control, hardware, industrial applications and other topics.

Logics for Artificial Intelligence
Raymond Turner, Ellis Horwood.
A survey of non-standard logics, including a critical look at fuzzy logic, and the applications of non-standard logics in expert systems development.

Fuzzy Computing: Theory Hardware and Applications
MM Gupta and T Yamakawa (eds), North-Holland.
A collection describing theoretical fuzzy logic results and applications such as decision support and image processing.

CUTTING EDGE

Didn't they do well!

In 1984 the Amstrad CPC 464 was the young pretender of the home computer market, yet the machine which set Amstrad on the road to £1billion status had a shaky start. Simon Rockman looks back.

Alan Sugar decided that the way forward for Amstrad was to do for the computer market what he'd done for audio tower systems: provide something which looked the part and performed adequately at a price which would attract the mass market. He recruited some computer designers and set the in-house people about the task of working on the case and keyboard. The launch was scheduled for the summer and the first public showing was to be at the *PCW* Show in 1984.

From its inception, the machine was to have a monitor. It had to look the part, but the rest of the initial specification was poor. Very much modelled on the VIC20 it had a 20-column screen and a 6502 CPU. But the designers had problems. They couldn't get it working and eventually they absconded.

This left Amstrad with a healthy order book for the new machine, and a smart case with nothing to go inside it. The company was based in Brentwood, and in the past had used the skills of the men at the local electronics company. They hoped the people there could pull the computer project out of the mire.

Roland Perry, William Poel and Chris Anstey were recruited to form AMSOFT, the computer division of Amstrad Consumer Electronics, but perhaps the most important thing they brought with them was a set of contacts. Roland had been at University with Richard Clayton who went on to found Locomotive Software, and they had all been to school with Mark Eric Jones who worked on circuit design, his eponymous company being MEJ Electronics.

The three companies embarked upon a tight schedule. They decided that the work which had already been done was scrappable, and worked from the ground up. The only limitation on the design was the need to use the keyboard which had already been commissioned.

The new design was a Z80, chosen partly because Locomotive had produced BBC Basic for the BBC Micro Z80 second processor, and partly because it provided a low level of compatibility with the Spectrum, which despite Mr Sugar's later "pregnant calculator" taunts was very much the dominant system at the time. The choice of a Z80 also left the way open for future CP/M compatibility. Amstrad initially wanted the machine to have no expansion, but the designers realised that the nominal cost of an edge connector would help extend the life of the machine.

The name was chosen at a time when Commodore was replacing the Commodore 64. The new Commodore machines had three different keyboard types and three RAM configurations. The 116 would have been a cheap keyboard with 16kb RAM: the 232, a medium keyboard with 32kb RAM; a 264, the same keyboard with 64kb RAM; and the top of the range would have been the 364 with an extended keyboard and 64kb RAM. Calling the Amstrad the 464 was probably an attempt to outwit Commodore, but in the end such moves were unnecessary since Commodore shot itself in the foot with those machines.

The development of the Amstrad machine was frantic. Most of the logic was combined into a single MEJ-designed gate array. To produce development machines and give the leading software houses something to work with, 50 machines were built with the gate array simulated in conventional chips. Modern gate arrays are so complex this would be impossible now, and even then the GAS boards were very precious. The 50 machines (I have number 13) were used to ensure that the likes of Quicksilver and Software Projects could produce games ready for the launch. This was all shrouded in secrecy — the machine was codenamed Arnold to give the impression that Arnold Weinstock, chairman of GEC, was behind the project. This later led to rumours that Amstrad was to be bought by GEC. The codename also happened to be an anagram of Roland, and as a nod to this a number of the initial games were to feature characters called Roland.

When the machine was launched, the press assumed that deliveries would be late. Every major machine had been late, but William Poel was better informed and announced that if they were late he'd eat one in Trafalgar Square. The CPC 464 was on time, although the disc (sic) drive which arrived the following Christmas was in very short supply for quite some time. The machine, with its built-in tape unit, was complemented by the 664 with a built-in disc drive the following year and the 6128 (with 128kb RAM) a little after that. Plans for a true sequel, Arnold Number Two (or ANT) were shelved when it became clear that a PC clone was the way to real fortunes.

Locomotive Software expected the machine to sell around 10,000. The moulds which were used were good for 700,000 machines. The CPC broke the mould twice — well over a million machines were produced. PCW

CUTTING EDGE

BOOKS

How to Make a Fortune on the Information Superhighway
Author: **Laurence A Canter and Martha S Siegel**
Publisher: **Harper Collins**
Price: **£6.99**
ISBN: **0-0-638678-4**
Rating: ✒✒✒✒✒

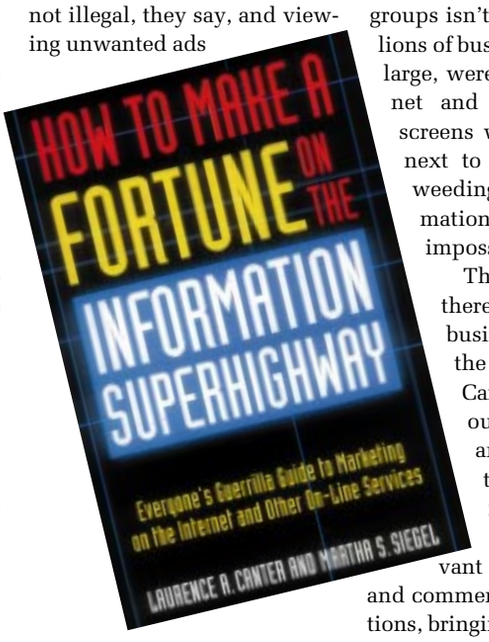
I had some difficulty in deciding how, or indeed, whether to review this book. Its authors, Canter and Siegel, have become notorious across the Internet as the proponents of intrusive digital advertising, thanks to their repeated posting of an advertisement for their legal services across most of Usenet, the Internet's main discussion area.

This book was written to justify their actions and to explain to the non-technical business person how to follow in their footsteps. As such, it is viewed by many as an irresponsible, even wicked book. Canter and Siegel in their turn do little to endear themselves to their critics — the book repeatedly refers to regular users of the Internet, even those they turned to for help in putting their business online, as "geeks" and "smart Alecs" and those who opposed them as "vandals" and "self-appointed dictators".

I am naturally reluctant to give such an inflammatory book any further publicity, but inevitably there are many who will be tempted to buy it regardless, attracted by its garish title, its trendy subject or the notoriety of its authors.

Canter and Siegel's case, simply put, is that the Internet is not a community whose codes of practice one should adhere to: it is just a medium of communication. Advertising on it the way they did (touting help in getting American citizenship into groups discussing everything from programming to fishing) should not be banned because free speech is protected under the constitution. In their words, "in true communist countries, advertising is not allowed except by the government, who owns everything. Maybe it's worth more of a fight than you thought."

Junk mail and junk faxes are not illegal, they say, and viewing unwanted ads



costs the recipients just a few pennies worth of online time; much of the Internet is full of "junk" chatter in any case. They claim that by spending $10 worth of online time sending their message, they had 20,000 enquiries and received $100,000 worth of new business, thereby demonstrating that the "silent majority" doesn't oppose advertising.

Unfortunately, their very success is the reason that their approach is wrong. As they point out, advertising on the Internet is "the business bargain of the century." While a 30-second nation-wide advert on a top-rated soap opera in the US would cost $45,000 and deliver 4.4m households, a leased line, full-time connection to the Internet would cost $1,000 and could be used to get a message to a potential audience of 30m.

If nobody balked at unsolicited advertising on the Internet it would quickly grow out of control. It's true that ignoring a few advertisements randomly inserted in one's electronic mail and discussion groups isn't costly, but if millions of businesses, small and large, were to join the Internet and fill up people's screens with ads that cost next to nothing to send, weeding out useful information would be almost impossible.

That is not to say there is no place for business promotion on the Internet at all. As Canter & Siegel point out, the common and approved way to advertise is to monitor discussion groups relevant to your business and comment or answer questions, bringing your product or service into the public gaze in the process. Those who want to find out more about your company can then easily email a representative or check out a public information archive on the Internet. So on the Internet, advertising defers to marketing and public relations.

Leaving aside the justification of indiscriminate advertising, the core of the book; explaining the Internet and how to exploit it commercially, is well-written and informative. It explains in layman's terms how to get your company connected, what each of the main Internet services are and how each of them can be adopted for commercial use. It has several useful suggestions for businesses which lend themselves to promotion across the Internet and it even provides good summaries of the Internet's "codes of practice" while encouraging you to ignore them. The authors publish their own suggested guidelines for advertising at the end of the book.

Being laymen, they occasionally get things wrong, and because they are writing for Americans, the prices they quote can give British readers only a rough idea of costs. Because the book was written last year, it is short on information about the World Wide Web. If it weren't for its cynical point of view, it could be a useful book to the would-be Cyberspace salesman.

David Brake

Surfing on the Internet: A Net-Head's Adventures Online
Author: **JC Herz**
Publisher: **Abacus**
Price: **£9.99**
ISBN: **0 349 10614 2**
Rating: ✒✒✒✒✒

Although *PCW* tries to include information about fun resources on the Internet as well as useful ones, there are a few which we have yet to cover. On a notional map of the world of the Internet, they would be marked "Here Be Dragons".

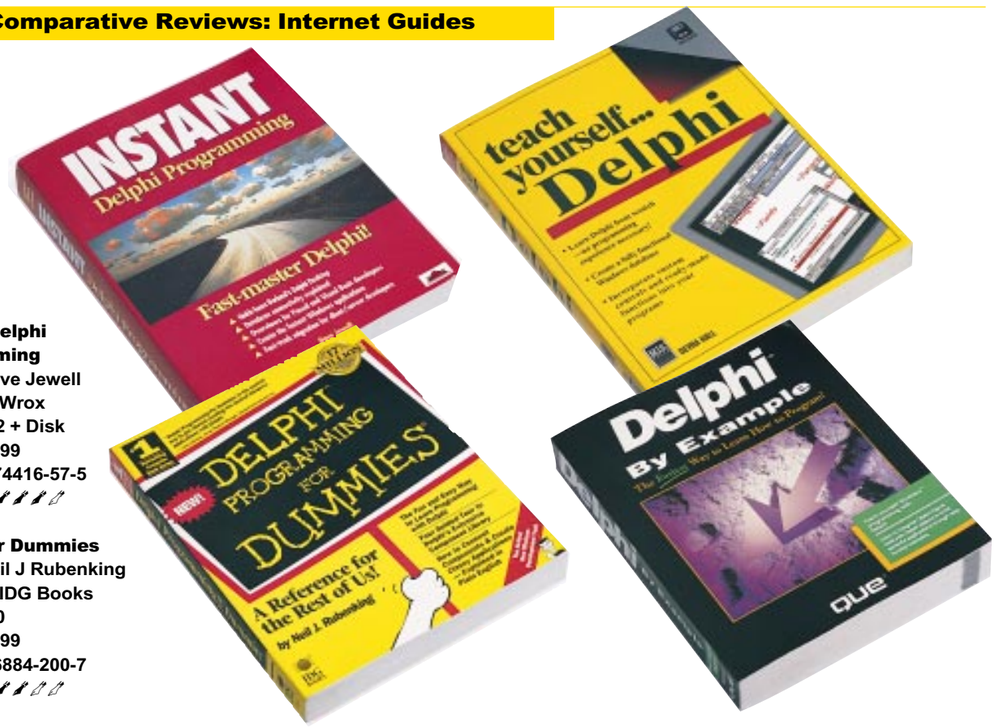
Now the curious can get a taste of what they are missing without turning on their computers. J C Herz's extraordinary virtual travel book gives a vivid guided tour of the wild side of the Internet, taking in such things as gender confusion and online sex, UFOlogists and conspiracy theorists, flame wars, the virtual worlds known as MOOs and Internet Relay

Chat. The book is a lively first-person narrative, with numerous chunks of text captured from online sessions and a keen understanding of the online counter-culture. Its author also brings an unusual perspective to the story — she is one of the first women to stray into this predominantly male domain and stay to describe it. It is written in the best "new journalism" tradition of Tom Wolfe and Hunter S Thompson; as you read it, you will learn something of how it feels to stay online all night, fuelled only by stale cola and noodles.

Although hackers and crackers make their appearance, the focus is on the online slackers who have created bizarre subcultures. You could spend a few months online, visiting LambdaMOO, propping up the #IRCbar, and following alt.religion.kibology but why bother? J C Herz has done it for you, and from it has distilled a thoroughly entertaining read.

David Brake

Comparative Reviews: Internet Guides



Instant Delphi Programming
Author: **Dave Jewell**
Publisher: **Wrox**
Pages: **472 + Disk**
Price: **£22.99**
ISBN: **1-874416-57-5**
Rating: ✎✎✎✎✐

Delphi for Dummies
Author: **Neil J Rubenking**
Publisher: **IDG Books**
Pages: **400**
Price: **£18.99**
ISBN: **1-56884-200-7**
Rating: ✎✎✎✐✐

Delphi by Example
Author: **Blake Watson**
Publisher: **Que**
Pages: **536**
Price: **£27.49**
ISBN: **1-56529-757-1**
Rating: ✎✎✎✐✐

Teach Yourself Delphi
Author: **Devra Hall**
Publisher: **MIS Press**
Pages: **320 + Disk**
ISBN: **1-55828-390-0**
Rating: ✎✐✐✐✐

Object Pascal Language Guide
Publisher: **Borland International**
Pages: **296**
Price: **£19.00 (with Visual Component Library Manual)**
Rating: ✎✎✎✎✐

There is a hungry market for Delphi books. A cost-conscious Borland decided to ship the product without a language reference, an especially odd decision given that Pascal is unexplored territory for the many Delphi users switching from Visual Basic or C/C++. The product itself has been well received, and this interest combined with Borland's scrimping creates an instant readership for third-party books. Here's a look at the first few contenders.

Instant Delphi Programming by Dave Jewell takes a tutorial approach, dealing by turn with the interface, menus, graphics, error-handling and more. The author is an expert on Windows internals, and it shows: he slides easily into the Windows API, and even in the first chapter has you programming an owner-draw listbox, rather than the standard Delphi item. The book veers between elementary and advanced programming, uncertain of where its readership lies.

That said, there is a large amount of useful material, covering all the main elements of Delphi and with valuable asides on subjects like maintaining portability between 16-bit and 32-bit Windows. Along the way you create several working utilities, including an icon viewer, a task manager, a doodle program, and a more elaborate drawing application.

The emphasis is on driving Windows through Delphi, rather than the Pascal language itself, although there is an appendix for Visual Basic programmers switching to Delphi. There is a skimpy chapter on database programming, making *Instant Delphi Programming* unsuitable for database work. One gripe is that it has hardly heard of object-oriented programming. Since object-orientation is one of Delphi's best features, it is strange that this and other tutorials make so little of it.

There are apparently 17m "Dummies" books in print, which must say something about the computer book market. Neil Rubenking's *Delphi for Dummies* is aimed at the hobbyist programmer and insists that Delphi is really easy. It's a good-humoured approach with large jaunty subtitles, icons and cartoons. The snag is that you know and I know the underlying premise is false: good programming is never easy, and Delphi does not completely protect you from the underlying complexity of the Windows API. But Rubenking does a good job of getting beginners started with programs that work, the idea being that they will be encouraged to tackle the more serious stuff when they feel ready.

There is an emphasis on interface-building and using components, partly, one suspects, because these are easier and more fun to explain than grappling with code. Non-beginners will find it verbose and shallow, although there is plenty of good common sense beneath the chatty prose. Database programming gets only a brief outline.

Publisher, Que, places Blake Watson's *Delphi by Example* halfway between "casual" and "accomplished" in its user-level thermometer. The title suggests something like *Instant Delphi*'s series of small programming projects, but in fact the "examples" are usually small snippets of code rather than working applications.

Blake Watson takes the opposite approach to *Delphi for Dummies*, playing down the visual side of things and concentrating on the Pascal language. He assumes nothing, and the first two chapters explain the fundamentals of computing, from machine language to objects, in a few pages. This is the nitty-gritty of programming: loops, data types, procedure and variable scope, conditions, sorting data, file handling and the rest.

Depending on your point of view, *Delphi by Example* is either a sound basis for programming or hopelessly old-fashioned. I incline to the former view, since too many rival books have beginners merrily placing components on forms but give them no real idea of how to write the code that will drive the interface. That doesn't excuse *Delphi by Example* for being so dry, or for failing to communicate the significance and possibilities of component-based visual programming. As for the Borland Database Engine, it gets no coverage at all. But *Delphi by Example* is a good Pascal primer and complements the printed manuals.

Devra Hall's *Teach Yourself Delphi* got off to a bad start. The first half of the book is illustrated by a simple application which displays pictures, and the program is supplied on an enclosed disk. The program uses hard-coded directory names, and seems to have been created with a pre-release version of Delphi, so did not compile on the first attempt. When finally running, it displayed a crude interface and had a bug which prevented proper termination on exit.

A sample database application is equally poorly designed. The book is aimed at beginners, and covers a sensible range of topics, from Pascal basics to forms, graphics and database work. With four chapters on database programming it is better balanced than the other titles here, although it adds little to the *Database Developer's Guide* supplied with Delphi. Beginners would be better served by the *Dummies* title.

The most valuable Delphi books to date are available not from third parties, but from Borland. Two supplementary books in particular are on offer: the *Object Pascal Language Reference* and the *Visual Component Library* manual. Both are likely to be essential for advanced Delphi developers, although only the former was available in time for this review. There is considerable overlap with the Delphi online help, but the printed manuals contain more detail. In particular the last eight chapters of the language reference have no direct online equivalent, and cover topics such as using null-terminated strings, writing DLLs, memory issues, and optimising strategies. Professional developers need these books, which really should have been part of the basic package.

Overall this first wave of Delphi books is disappointing. Two points stand out. First, despite Borland's positioning of Delphi as a database tool, there is nothing here that will assist the serious database developer. Second, nobody has grasped the opportunity to write a tutorial that treats object-orientation as the norm, rather than as a tacked-on extra feature of the Object Pascal language. If OO really makes programming easier, Delphi should be an ideal platform for a suitable introductory book.

Tim Anderson

Top Ten Books: April 1995

Author	Title	Publisher	Price	This	Last
Jewell, Dave	Instant Delphi Programming	Wrox	£22.99	1	3
Lemay, Laura	Teach Yourself Web Publishing with HTML in a Week	Sams	£19.50	2	2
Minasi et al	Inside OS/2 WARP, Version 3 (book, CD-ROM)	New Riders	£37.49	3	—
Minasi et al	Mastering Windows NT Server 3.5	Sybex	£40.99	4	6
Ethington et al	Introducing Microsoft Windows 95	Microsoft Press	£11.99	5	4
Getz et al	Microsoft Access 2 Developer's Handbook (book/disk)	Sybex	£41.17	6	1
Orfali et al	Essential Client/Server Survival Guide	VNR	£21.50	7	—
Jennings, Roger	Database Developer's Guide with Visual Basic 3 (book/disk)	Sams	£41.67	8	5
Welsh & Kaufman	Running LINUX	O'Reilly	£18.50	9	—
Schofield, Sue	UK Internet Book, 2nd Edition (book, disk)	Addison-Wesley	£19.95	10	—

Prices include VAT on Disks/CD-ROMs.
List supplied by The PC Bookshop at 11 & 21 Sicilian Avenue, London WC1A 2QH.
Tel: 0171 831 0022. Fax: 0171 831 0443.

CUTTING EDGE

CD-ROMs

Some more or less useful business clip art, plus a heavyweight encyclopedia and two geography lessons find their way into this month's round-up.

- **Borders and Backgrounds**
- **Business**
- **Inspiration**

Clip art is much derided in many quarters, and in some instances, rightly so. These three CDs represent the best and the worst of their kind:

two of them are distinctly suspect and the third is a real gem.

Borders and Backgrounds and Business, from VCI Software, are both composed entirely of poor-quality cartoons with a seventies feel. The title of Business is quite misleading. If you want your work to be taken seriously, you would do well to avoid this package.

The 97 images on the CD could only be of use in a document sending up the business world. Between dollar bills that have sprouted wings and a janitor who has stepped in a bucket, you would be hard pushed to find anything that would be of any real use. It is at least relatively cheap, at only £14.99.

Borders and Backgrounds reminds me of the kind of writing paper that was popular when I was a wee girl, with a border so large (and so unutterably tasteless) that you barely had room to squeeze in the address. The cartoons feel outdated and somewhat sexist. The so-called "angel" is a brazen hussy with a passion for seventies retro, surrounded by twinkling stars. The "bouquet" border is in delightful shocking pink and bright blue. The package seems to have undergone a taste bypass operation. Again, this CD is redeemed by being cheap, but it could be fun for those with a penchant for kitsch.

Left Borders and Backgrounds fails the taste test **Below and above right** Handy images from Inspiration

Inspiration, by contrast, is a blessed relief. The whole package is infinitely superior in quality, both in the professional look of the images themselves and in the quality of the reproductions. There are 114 illustrations and backgrounds and four striking alphabets, all of which you could use in business and still look your MD straight in the eye.

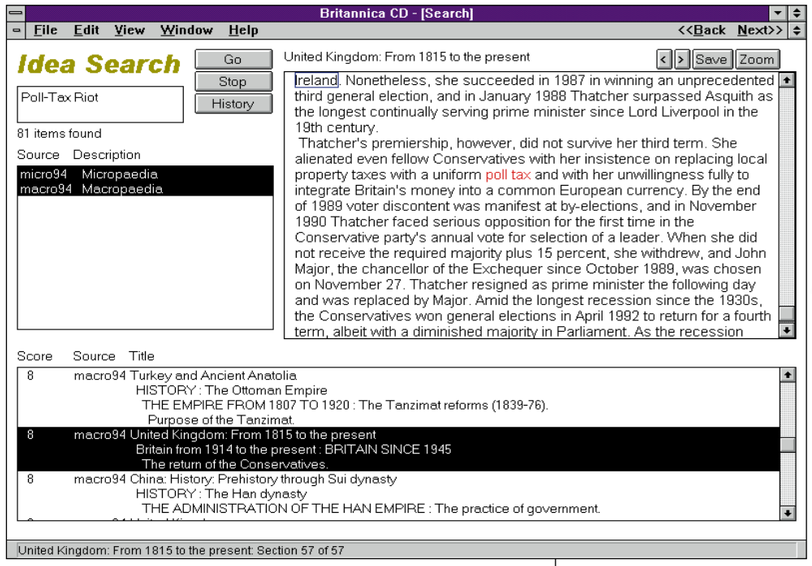
The images are marketed as powerful and symbolic, and coming from a Swedish company some of the illustrations, such as the photo-negative images of trees, do have a certain Bergmanesque moodiness about them. Others however, such as the technology montage, have a usefulness which far outstrips anything to be found on Business.

Adele Dyer

Borders and Backgrounds/ Business
Contact VCI Software
01923 255558
Price Borders and Backgrounds £14.99; Business £14.99
Rating ●○○○○ each

Inspiration
Contact Provektor
(+44) 46 31 40 15 57;
fax (+44) 46 31 40 56 26
Price 395 Krone
Rating ●●●●●

Britannica CD-ROM



In a class of its own: the Britannica CD has a vast amount of information, including up-to-date political articles

There are several encyclopedia CD-ROMs already on the market and many are thrown in free when you buy a new PC. The best ones are Grolier, Comptons, Hutchinsons, and of course Microsoft Encarta. All are glossy, well-presented multimedia products, packed with information, pictures and moving images.

The Britannica Encyclopedia CD-ROM does not really fit into the same category. The space on this CD-ROM has not been used for whizzy moving pictures, but instead is filled with pure text. This is the electronic version of the entire Encyclopedia Britannica. It contains 82,000 articles, 16 million references and 70,000 definitions. Essentially, this CD-ROM combines the entire text from the paper version, with a search and retrieval system to help you extract the information you need.

The main screen called IDEA SEARCH is simply laid out and easy to use. It consists of a series of windows; one to enter your search criteria, one to display a list of article titles and one to display the actual text of the article currently highlighted. The search results are ranked in order of relevance to the query, with the most relevant placed at the top of the list.

This front-end search system allows you to get to information in many different ways. You can enter just one word, a combination of words, a phrase or even a question and the input is matched up against every instance in the encyclopedia. With a volume of this size, a badly specified search can lead to hundreds upon hundreds of references, and a search which is too narrowly specified can lead to nothing.

However, you get better at searching when you've used the system for a while, and the resulting information makes it well worth the effort. I tried searching on a variety of obscure philosophical subjects and found a complete and comprehensive history of metaphysics, philosophy of language and cognitive science complete with references to modern researchers. There's a vast amount of information available on practically any academic subject, and there are up-to-date articles on recent political events. A thesaurus and dictionary are also included which are invoked by double clicking on any word in the resulting text screen.

The text data itself is split into two different databases, one called Micropaedia which gives short descriptions on certain topics, and another called Macropaedia which contains longer articles on larger subjects. The dictionary included is based upon the Merriam-Webster's Collegiate Dictionary and also includes related reference works such as a thesaurus, foreign word and phrase dictionary.

This is not the cheapest CD-ROM encyclopedia around — but then, it's in a different class to anything else on the market. The full book version costs £1,438; the CD-ROM costs £695. In terms of content, the only difference is that the CD-ROM version is missing pictures and illustrations, but in terms of finding information, the CD-ROM searching tool gives you lots of advantages over the normal paper system of indexes and tables of contents. If you need a serious academic reference tool, this is the best encyclopedia CD-ROM on the market.

Eleanor Turton-Hill

Contact Brittanica
0181 669 4355
Price £695 inc VAT
Rating ●●●●○

Virgin's One World Atlas and Virgin's One Tribe

Virgin's One World Atlas is a comprehensive tour of the world, a CD-ROM gazetteer with a few additions you can't get from a book. Sadly, the additions are probably insufficient to make it a replacement for a book unless you want your geography served up with baby food digestibility.

The Atlas interface does not conform to the usual Windows menu bar at the top of the screen. Instead you navigate from the opening or "Finder Screen". This screen is dominated by an open book containing the names of every country and continent. Just find the country you want and a double mouse-click on the name will take you there. You first go to a full-screen map of the location: click on the United Kingdom and you are shown a map of Britain with a few major cities indicated. Click on a place name and you are taken to a

CUTTING EDGE

Above One World serves up geography with baby food digestibility **Left** One Tribe zooms in on London

series of full-screen photographs — Tower Bridge, a red London bus, Buckingham Palace. You can access a database of information such as land area, currency, life expectancy and infant mortality, relevant to the country.

Around the book on the Finder Screen are a number of pictures. Clicking on these takes you to various areas of special interest. You can look up the highest mountains, deepest lakes, largest cities, and so on, for the selected place name.

A click on the photographs takes you, logically enough, to a series of photos; a click on the sunglasses takes you, for some reason, to satellite photos of the Earth.

There's also a collection of music and sound effects. These play automatically, although they can be turned off. However, the music is disappointing. There isn't very much of it; it represents only a few countries; and it doesn't even truly represent the music of the countries it features.

This is a pity. A paper gazetteer can provide all the important database information, but can't explore the social features of a country as fully as is possible on CD-ROM. A handful of pictures and a few scraps of music don't exploit the medium fully and this detracts from the overall value of the disc.

One Tribe is somewhat different. This is really a kind of interactive video. Here you navigate from a living room where a documentary presentation is given by Pip Dann (a presenter on MTV, the satellite pop music channel) which gives you some idea of the "feel" of the disc (both discs, in fact).

Clicking on various objects around the room takes you to much the same information categories as are available with One World: photographs, satellite images, a database of information, the biggest, the smallest. There's music, mainly obscure and in my opinion again unrepresentative of the countries or geographical areas to which it is supposed to belong.

Finally, I found both discs slightly buggy. Installation proved a problem. I received an error message to the effect that a .dll file could not be loaded. This may have been the cause of various problems with the One Tribe disc. The problem even happened with a replacement CD-ROM. More annoying, however, was the program's failure to exit properly. After running, I received "out of memory" messages every time I tried to run another program, such as my word processor.

Now, I have lately been having a spot of bother with my computer, so maybe the cause of the problem rests with my machine (I haven't had the opportunity to run a test on another machine), but it is perhaps better to be warned of possible problems. Otherwise, while both discs try, and to some extent succeed, in presenting geographical material in an interesting way, neither exploits the medium of CD-ROM and therefore disappoint. I'd rather buy a paper gazetteer.

Paul Begg

One Tribe
Contact Virgin Sound and Vision 0181 960 2255
Price £59.99
Rating ●●●○○

One World
Contact Virgin Sound and Vision
Price £44.99
Rating ●●○○○

Kids' Stuff

Visits to a doll's house, an American diner with cherry pie, and Britain in the 1930s were on Paul Begg's schedule in this month's foray into the fast-growing world of children's software.

The educational and informational entertainment markets for children are certainly boom areas this year. Even the major manufacturers in the business have entered the kids market.

Both Microsoft and Novell have a growing range of children's and family titles. Another large corporation, Electronic Arts, has its own kids "edutainment" division, EA Kids. And Mindscape has a newly-created division called Mindscape Kids.

Maxis, a publisher perhaps best known for its SimCity software titles, has announced a new range of children's entertainment software called Software Toys for Kids. The new Maxis range kicks off with SimTown and a science teaching title called Widget Workshop.

Mindscape has signed a deal with Frederick Warne and Company to create a collection of children's interactive CD-ROM titles based on Beatrix Potter's *Peter Rabbit* books. Both companies are part of the Penguin Group.

While on the subject of children's classics, Disney Interactive has signed a deal with the Media Station company to bring *Hundredacre Wood* to the computer screen. The chosen tale is *Winnie the Pooh and the Honey Tree* and from what I've seen, it looks just like the Disney video and even has the voice of Paul Winchell as Disney's Pooh. In addition, Disney and Media Station are collaborating on the tie-in with the next big Disney animated movie, Pocahontas.

Increasingly, toy manufacturers have been lending their names to software products: Etch-a-Sketch and Fisher-Price for instance. The latter has leant its name to a new range of software titles produced by a California-based company, called Davidson & Associates, which specialises in software for kids. UK distribution is handled by ABLAC, who produce children's and educational software. Given this combination one would expect the Fisher-Price range to be good, and so it is.

Inside The Dream Doll's House

Fisher-Price Dream Doll's House: explore one of these rooms

The kitchen: explore, help, learn

I was particularly pleased to see the Fisher-Price Dream Doll's House as there's very little software available specifically for young girls. This is designed for the three to seven-year-old age group. But although it will entertain across the stated age band, its main market should really be pre-school children.

An on-screen doll's house provides six rooms to explore. A mouse click on some objects activates special sounds or animations. Others can be moved around with the cursor and placed anywhere on the screen. Some, like a toy box, grocery sack, or hamper can be unpacked.

Pictures of Friends appear at the foot of the screen and they will come and play at the click of a mouse. Or there are the Sprites: Sparkle, Flora, and Turnabout. They can change some objects, such as a kitchen carpet, into a giant pizza. And when your child has finished playing, a click on the vacuum cleaner icon will restore the room to the way it was in the first place.

Additionally, there are the Mice. Children must first find the mousehole, then click on it to go inside and explore. Do mice like asparagus ice cream? Inquisitive children must go down the mousehole to find out.

Finding the holes from a clue provided by mouse-clicking a piece of cheese is just one of the problems your child will have to solve — there are others such as looking for books to replace on a bookshelf. And you can invent games to play with your child to develop language and counting skills as well.

Easy as ABC

I took a look at the Fisher-Price ABCs for the pre-school age group, which has been designed to introduce young children to letter sounds and shapes.

This is achieved through a variety of games. For example, in the Letter Hip Hop game, clicking an on-screen alphabet key causes that letter to be spoken. Upper and lower-case images are shown, together with an object name using that initial letter. Additionally, the name of the object is then spoken. Older children can switch to the harder, Challenge, mode in which a picture is displayed and the child is asked to click the initial letter of the object.

My chief criticism of both programs is that the accents, language and environment are strongly American. This applies especially in the case of the Fisher-Price ABCs software, which is set in a US diner, complete with chocolate malted drink and cherry pie. Apart from this critiscism, I would say that both programs have the potential to fulfil their promise.

Past Pictures

Last month, I mentioned a disc from HMSO Electronic Publishing called Cocoa

Not too much going on to detract from the learning, but enough to keep a young child interested

CUTTING EDGE

and Corsets. Although the series of discs called PictureBase is produced along similar lines, the difference is that this isn't simply a collection of pictures with accompanying captions. Instead, the captions form a sequential narrative. For instance, the section on World War II on the disc Britain Since 1930, provides a snapshot view of life in Britain during that time.

The pictures are closely linked to the text and have been carefully chosen to convey the atmosphere of the period. A picture speaks a thousand words and these Picturebase discs can be used by teachers and parents to accompany all kinds of projects to help children acquire the feel of a period or event in history. An example of this is that on the day the discs arrived, my daughter had visited a local museum with her school, as part of learning about World War II. She and her classmates had to go on the trip dressed as war evacuees. When she arrived home, I was able to use the Britain Since 1930 disc to show her some photographs of real evacuees and this led to looking at some other pictures — including some movie footage. She then told me what she'd learned and I told her what I knew of those times.

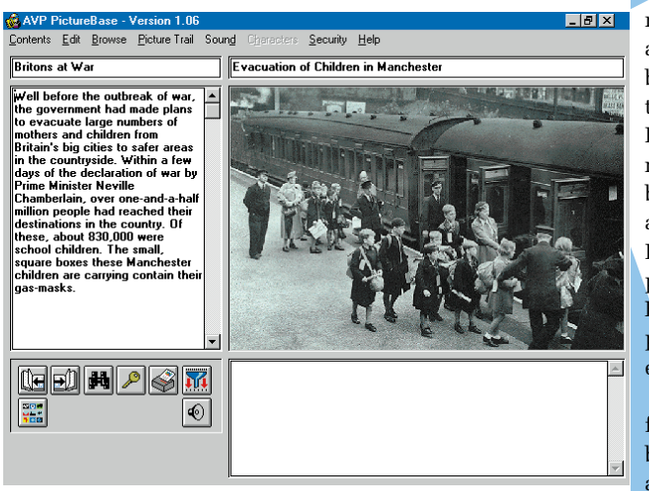
I'm not saying that this couldn't have been achieved with a book, but the advantage of using this disc is that your child could transfer pictures to a word processor document and then produce an illustrated essay.

The text is brief but informative and narrated in an English accent to help children with the pronunciation of unfamiliar words.

The PictureBase series of discs is available on floppy disk or CD-ROM. It runs under Windows and there is an Acorn version available, but you'll need RISCOS 3.00 or higher.

As a footnote, every year the Department of Education, in conjunction with the National Council for Education Technology, chooses a few software titles which it recommends for use in primary schools. Last year it selected Victorian Britain. This year it has selected Britain Since 1930. The discs conform to Study Unit 3a and 3b respectively in the History National Curriculum.

British history in words and pictures



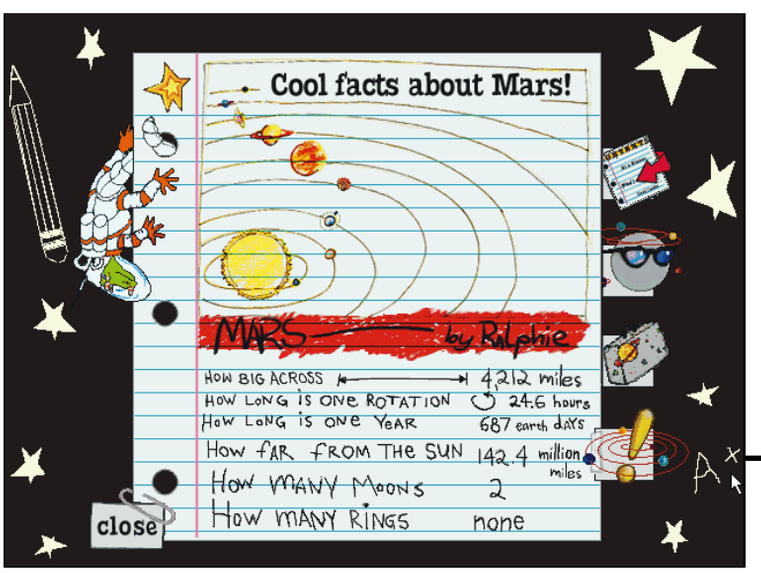
Evacuees — a picture speaks a thousand words

It's Magic!

For some time now, I have been meaning to tell you about two great programs from Microsoft: The Magic School Bus Explores the Solar System and The Magic School Bus Explores the Human Body.

These are too good to keep back any longer, so here's a brief idea of what they are about.

Based on a series of books, these discs owe a lot to the Living Books from Broderbund series: clicking anywhere on the opening screen (a classroom) produces a response. But that is where the similarity ends. What you get afterwards is as much a cartoon as anything else, especially when you click on the school bus and it launches into space, or even into the human body.



The Magic Bus goes to Mars

But behind all the cleverness, excellent voices, music, and super script, there is a solid body of information. I spent time with The Solar System. Here you join in with an exploration of the sun, our neighbouring planets, satellites and asteroids. The idea is to find Ms Frizzle, the teacher, who inexplicably vanished at blast-off. Each visit to a planet is accompanied by a game and a science experiment.

The programs are designed for six to ten-year-olds and are bulging at the seams with fun and learning. They suffer only from showing non-European units — miles instead of kilometres. This suited me just fine, but does not meet with the needs of today's children.

Apart from this one gripe these are great discs, and if you are looking for something special to occupy your children's hours during the summer holidays, check these out.

PCW Details

Fisher-Price Dream Doll's House
Fisher-Price ABCs
Price £34.95 each
Contact ABLAC Learning Works Ltd 01626 332233
Fax: 01626 331464
Rating Fisher-Price Dream Doll's House ★★★★☆
Fisher-Price ABCs ★★★☆☆

PictureBase:
Victorian Britain
Britain Since 1930
Price £99 (other titles available)
Contact AVP 01291 625439
Fax: 01291 629671
Rating ★★★☆☆

The Magic School Bus Explores the Solar System.
The Magic School Bus Explores the Human Body
Price £45
Contact Microsoft 01345 002000
Rating The Magic School Bus Explores the Solar System ★★★★☆
The Magic School Bus Explores the Human Body ★★★★☆

Win a **HP colour printer,** a **Psion 3a** or **LapLink for Windows**

Psion 3a 2Mb

The Psion 3a has been the best choice in pocket computers since its launch over a year ago. With a built-in Word-compatible word processor, a spreadsheet, database and stacks of optional software, what more could you want? Extra RAM, of course. So that's what Psion has done — made a 2Mb version.

It still has an 80 hour battery life and the best screen we've seen from a PDA in its class, boasting a 480 x 160 resolution. Backing up your data is a breeze with PsiWin, a brand new Windows applications that lets you move files between the 3a and your PC. It also has compression utilities for storing data in flash memory cards.

To win this deadly desirable piece of kit, just tell us what Psion's previous PDA was called. Was it:

(a) Psion Series 3
(b) Psion Organiser 3
(c) Psion Portable 3
(d) Psion Pocket 3

Hewlett Packard DeskJet 660C

Hewlett Packard is replacing the world's best-selling colour printer, the DeskJet 560C, with the brand new DeskJet 660C, and we've got one of the first to give away. Although it looks pretty much the same on the outside, HP has re-worked the bits under the cover to include a new four-colour ink cartridge, a faster processor, twice the memory and improvements to software. All of this means you can print near photographic images at astonishing speeds, but at half the cost per page of previous models.

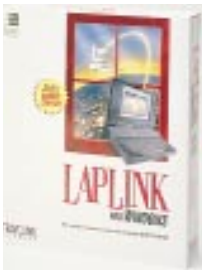
Since the 660C has a four-colour cartridge, there's no need to change the ink should you only want to print a mono document. Resolutions up to 600 x 600dpi can be achieved in mono, and there's the ability to apply HP's Resolution Enhancement technology, or REt.

The new DeskJet has been designed for hassle-free use so you don't need a degree in computer science to operate it. There's no complicated control panel to get your head around and the software installation is just one simple step.

To win this fabulous new printer, simply tell us what REt stands for. Is it:

(a) Resolution Engineering technology
(b) Resolution Enhancement technology
(c) Random Edge technology
(d) Something else?

LapLink for Windows



We've got three LapLink for Windows kits to give away, thanks to Traveling Software. Since the release of the Windows version, LapLink lets you do a whole lot more than transfer files between two PCs. It now has extensive remote features allowing you to access files and use applications from a remote PC. This can be done using the standard parallel link which is part of the kit, or, more likely, over a modem. It is also possible to view several machines when using a modem. Another new feature is SpeedSync. This increases modem file transfer speeds by up to eight times. Instead of transferring entire files, it recognises any changes and updates only the modifications. For example, if you need to update your database from a remote server, you don't have to copy the whole file, just any changes. This can save a lot of time and keep call costs down.

To win a copy of LapLink for Windows, tell us when Traveling Software was founded. Was it in:

(a) 1973 **(b)** 1929 **(c)** 1982 **(d)** 1983

How to enter

To enter any or all the competitions simply call 0839 777722 to leave your answers. Calls will be charged at 39p per minute cheap rate and 49p at all other times.

Rules of Entry

The competition is open to all readers of *Personal Computer World* except for employees, and their families, of VNU Business Publications, Hewlett Packard, Psion and Traveling Software. All entries must be made by 20th July 1995. The Editor of *PCW* is the sole judge of the competition and his decision is final. No cash alternative is available in lieu of prizes.

screenplay NEWS

I bet he plays..

Virgin has announced a new budget range called the White Label Collection, and its first bargain release is the Temptation compilation. Priced at £44.99, this comprises big hits The 7th Guest, Lands of Lore, Hand of Fate and Indy Car Racing — four classics currently still selling out at full price.

Look out for more bargains soon.

Virgin 0181 960 2255

Saturn runs rings around the competition

Following massive success in Japan, Sega is set to release its next-generation CD-based console, known as Saturn, in the UK. The new hardware will be launched first in the US on "Saturnday" 2nd September, and a slightly restyled European version will arrive here shortly after.

Despite fierce competition from the new Sony Playstation, Sega claims to have already shipped 750,000 Saturns. Even more impressive is that at time of writing, Virtua Fighter is the only big title available for the machine. Other Sega coin-op conversions on the way are the smash hit race game Daytona USA, and Virtua Fighter 2.

For the technically minded, Saturn boasts twin 32-bit RISC CPUs, 2Mb work RAM, 1.5Mb VRAM and a double-speed CD-ROM drive with 512kb cache. Graphics resolutions range from 320 x 224 to 704 x 480 pixels, and a 32-voice Yamaha sound chip is provided for true arcade sound.

Sega 0171 373 3000

Spread your Wings

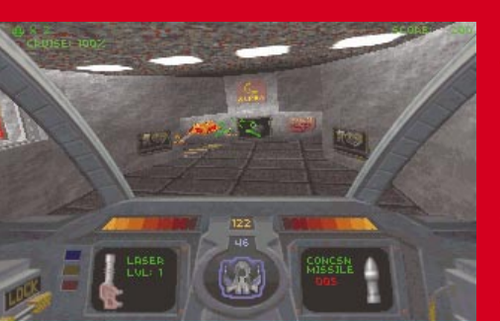
Just when you thought your PC was powerful enough to run the latest games, Origin is rumoured to be working on Wing Commander 4. Despite needing at least a Pentium to run at a decent speed, Wing Commander III was one of the biggest selling games ever. This latest follow-up promises to be even better.

Rumoured features include more SVGA graphics, an enhanced combat engine and a sharper, more realistic flight model. The project has apparently been given top priority over everything else, and could well see the return of Mark Hamill, aka Luke Skywalker, as front man.

For more info call Electronic Arts on 01753 549442.

Games on the Mac attack

Following a small but possibly profitable explosion in the Mac games market, leading PC players Interplay and Virgin are set to convert their latest hits for Apple users. Interplay is about to launch the 3D network-able blaster Descent, while Virgin is currently converting Dark Forces, a Doom-style CD-ROM designed by LucasArts and based on the Star Wars universe. For full reviews of the PC versions see *PCW* June 1995.

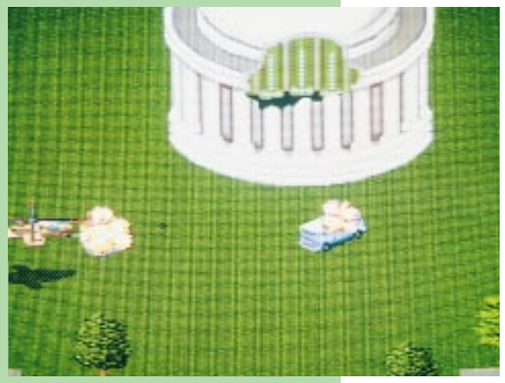


Virgin
0181 960 2255
Interplay
01235 821666

Screenplay

Jungle Strike

It has no fancy graphics, but this fast and furious fight to save the US president will exert a strong pull over even humble 386 owners, says chopper pilot David Brake



Eight exciting missions are variations on a theme — only the names have been changed

It is clear that most game designers are provided with the very latest PCs on which to produce new titles, and they quickly grow to rely on the power these machines offer to bring increasingly sophisticated graphics to the public. This is particularly evident in the case of shoot'em up games like Doom. Even owners of 486SX machines with 4Mb of RAM, mid-range computers only last year, find they cannot run state-of-the-art games like Magic Carpet and Tie Fighter at all, or only with all the "gloss" features turned off.

Fortunately, one company at least has not forgotten how to pack fast and furious action into a package which even 386-owners can enjoy. Gremlin Interactive's Jungle Strike is a straight port of a SNES video game, even down to the rather drab introduction screens to each mission. You almost expect to be asked to insert 10p before you can play. Though it lacks 3D rendering and full motion video clips, it is addictive.

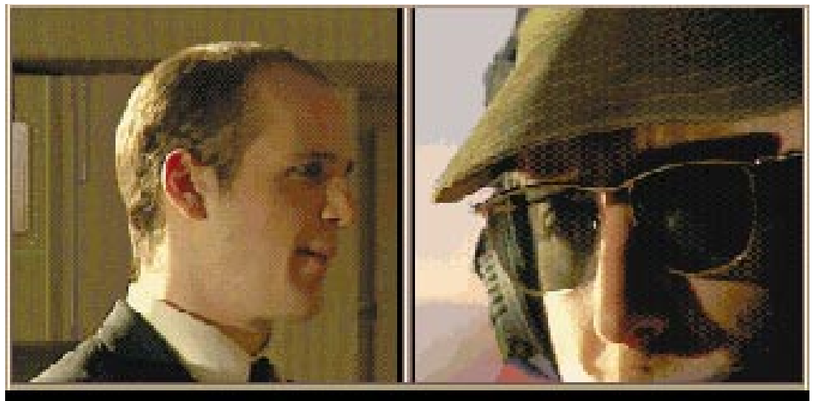
As in its predecessor, Desert Strike, you play a helicopter pilot who must single-handedly protect the President of the United States from terrorists, then destroy a succession of their bases to prevent them from building atomic weapons. Though you spend most of your time in a helicopter, you will from time to time have to leave it and make your way around on a hovercraft, stealth fighter or "assault motorcycle".

These look and perform differently, but are controlled in much the same way. Each vehicle has three different weapons which you use to destroy a variety of targets, needs to be refuelled and re-armed by picking up objects strewn en route, and can rescue (or capture) various people you come across. Eight campaigns are variations on the same theme: you have to destroy some things and pick up other things. All that changes is the kind of enemies you are fighting (tanks, nuclear submarines, anti-aircraft guns), the names of the things you have to pick up (nuclear power plants, scientists, green berets) and the scenery.

Nonetheless, I found myself drawn into the game; the graphics are well drawn, and the missions are difficult enough to be interesting, but not so difficult that you give up in despair.

Jungle Strike will not win any awards for originality or sophistication, but like the best Hollywood "B" movies, it is certainly an entertaining way to pass the time.

System Requirements: 386 or 486, 2Mb of memory, four free Mb of hard disk space.
Price: £34.99
Contact: Gremlin Interactive
0114 275 3423



Marathon

At last, you too can enjoy colourful explosions and the scream of flying bullets. Chris Cain hails a gripping adventure for Mac users with destructive leanings

While PC users have been happily blasting away in 3D for over a year, Mac people are starved of death and destruction. It's as if some games world top dog has decided that Apple users only like flight simulators and weird adventures. Thankfully US based Bungie is having none of it and has come up with the goods.

Marathon is a fully texture mapped 3D scrolling game in a similar vein to Doom on the PC. As usual the player is cast as humanity's last hope; the idea is to retake control of an interstellar spacecraft invaded by aliens. All you have on your side are your wits, a motion tracker and big guns.

On arrival you're sent in armed with a simple pistol, extra ammunition for which can be found scattered around the craft. Further exploration may lead to the discovery of much bigger weapons, including a mighty rocket launcher, grenades and even an alien gun. Obviously the better armed you are the more likely you are to succeed, but you'll need to take care as there's a limited supply of bullets. If the worst comes to the worst you can resort to punching your opponents — just don't expect to get that far.

As you wander around looking for trouble the ship's computer can provide maps to help you explore and pass on clues about various puzzles that need to be solved on each level. Unfortunately, thanks to some sneaky alien programming, it has a split personality and its other half has decided to back the opposition. It will attempt to thwart your plans with masses of disinformation, broken doors, moving platforms and generally user-unfriendly behaviour.

Graphically Marathon is excellent, with fast panoramic scrolling, smooth moving sprites and colourful explosions. The game can be run in both eight and 16-bit colour, with differing amounts of detail, and supports high or low resolution displays to suit the power of your machine. Extensive shading techniques create a real 3D environment and five-way movement really puts you there.

The game is one of the first titles to make use of the new audio facilities in QuickTime 2.0. Plug in stereo speakers and

you'll hear bullets fly in all directions, as well as MIDI music and atmospheric alien sound effects. The sound quality can also be tailored to suit your hardware, but while the Power Mac version runs in native mode the audio side still uses 68K emulation. This slows the action down in some cases.

Gameplay is the main thing, and this is where Marathon really shines. It's just as addictive as Doom and can be played across a LocalTalk or Ethernet network with up to eight players. Rumour has it that this has gone down particularly well at Apple HQ, with meeting rooms being booked to disguise a quick session. Gamepads and some VR headsets are supported for that extra interaction, but sadly we were unable to test this feature.

Packed with alien blasting action, with great graphics and sounds, Marathon is a treat that really satisfies

Packed with alien blasting action Marathon really satisfies, and finally delivers the kind of entertainment most Mac users want.

System Requirements: Mac, 68020 or faster, 13in monitor, System 6.0.5 or higher, hard drive, 3Mb RAM.
Price: £49.99
Con tact: Softline 0181 401 1234

Charts

HMV Games Level One

PC

1	Bio Forge (CD)	EA
2	First Encounters (PC/CD)	Gametek
3	Dark Forces (CD)	Virgin
4	DiscWorld (CD)	Psygnosis
5	Lost Eden (CD)	Virgin
6	Star Trek Final Unity Demo (CD)	Microprose
7	Super Karts (CD)	Virgin
8	NBA Live 95 (CD)	EA
9	X Com Terror From Deep (PC/CD)	Microprose
10	Temptation (CD)	Virgin

MAC

1	Marathon (CD)	EA
2	Myst (CD)	EA
3	SimCity 2000 (CD)	Maxis
4	Rebel Assault (CD)	US Gold
5	Stalingrad (CD)	US Gold
6	Links Pro Golf	Access
7	Peter Gabriel Xplora (CD)	Real World
8	Sim City Classics (BMG)	Mindscape
9	3D Atlas	EA
10	Another World	Kixx

Leisure Lines

Brainteasers courtesy of JJ Clessa

Quickie

What perfect square when turned upside down gives another perfect square?

(For example, 81 is a perfect square and when turned upside down gives 18, which unfortunately, is not a perfect square.)

The *PCW* Prize Puzzle

This month, we have a problem that is slightly out of the ordinary. It relates to permutations and combinations.

A certain High School for Boys was holding its annual sports day. There were seven field events: shot, discus, long jump, high jump, javelin, pole vault, and hop, step and jump.

For each event, the winner scored five points, the runner-up scored four, third place took three points, and fourth place was awarded two points. All the rest scored zero.

The winning boy scored 30 points altogether by being first in all four jumping events and the discus, then coming third and fourth respectively in the shot and javelin. In how many other ways could this score have been achieved?

Answers on a postcard or the back of a sealed envelope — no letters and no floppy disks, please. Send to: PCW Prize Puzzle July 1995, P.O. Box 99, Harrogate, N. Yorks HG2 0XJ, to arrive not later than 20th July 1995.

Winner of April 1995 Prize Puzzle

There were about 130 entries to our prime factor puzzle. You had to find the largest number which had all its digits and which had the greatest number of different prime factors. Several of you managed to solve it without computer help — smart Alecs!

The required answer is unique and is made up of 9 different primes:

`857, 146, 290`
`(=2,3,5,7,11,13,17,23,73)`

Our winner for this month comes from Ireland and is Mr Christian van der Bosch of Ballincollig. Congratulations, your prize is on its way.

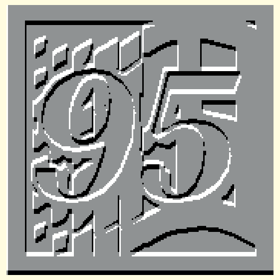
The ussual message goes to all the also-rans: keep trying — it could be your turn next.

Hands On Contents

New to Hands On this month is the Windows 95 column, making *Personal Computer World* the first UK computer title to include regular Windows 95 coverage. Tim Nott will be tracking the path of Win95 from final beta to shipping product in August or September or November.....

Hands On remains the place where readers can contribute to *PCW*, and as always we'll pay for anything we use. Macros, sections of code and hints and tips will be rewarded with a £20 book or record token (please say which you'd prefer) and we'll pay hard cash for longer, more involved pieces. Please include relevant screenshots in GIF format.

All submissions should be emailed to the author of the appropriate section or snailmailed to Hands On, Personal Computer World Editorial, VNU House, 32-34 Broadwick Street, London W1A 2HG. Questions and short hints and tips can be faxed on 0171 316 9313.



An early **dip**

As the final release of Windows 95 glimmers on the horizon, Tim Nott starts a new series by diving straight in to the preview version.

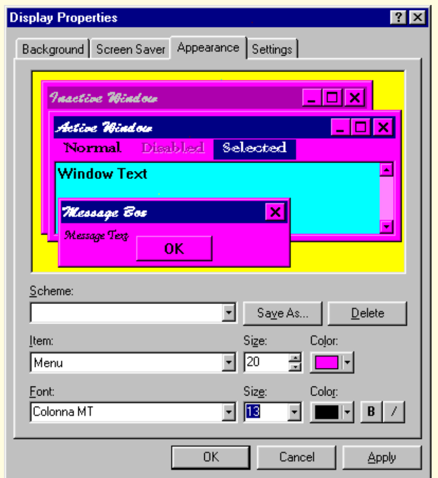
By the time you read this, the Windows 95 preview programme should be well under way, with the official beta sites being swelled by another 40,000 UK users who have paid their £35 to join the programme. They are using release M8, also known as build 347, which though generally stable, still needs some finishing touches.

Windows 95 is a huge jump from 3.x. It has been designed to make life easier for new users, but it's also going to cause a lot of confusion for more experienced DOS and Windows hands. This new column is, for the first few issues anyway, going to be rather a case of the visually impaired leading the visually impaired.

To begin at the beginning, what do you do when the CD-ROM or 24 disks arrive? The first step is to clear out enough disk space. Windows 95 is huge, and installing everything in sight from the CD-ROM took up 80Mb.

The second question is whether to install over your existing Windows 3.x or to a different directory. The installation routine tries very hard to persuade you to do the former; indeed at one point it seems that there is no other way. This is not the case: you can keep your existing Windows/DOS and "dual boot" between that and Windows 95.

If you upgrade your existing Windows, then your installed hardware, applications and relevant settings such as Program Manager groups (though not as we know them) will be inherited. And you will save on disk space. But you have to delete Windows 95 and reinstall DOS and 3.x to go back. Installing in a separate directory means you will have to reinstall most of your applications, but will be able to return



A dabbler's delight, changing fonts as well as colours

to the familiar world of 3.x by pressing the F4 key as soon as the "Starting Windows 95" message appears during boot-up. My opinion is that it would be not so much brave as simple-minded to overwrite an existing 3.x installation on which one earns one's living.

Make sure you read the Readme file (and any other text files) before you do anything else. There is a lot of system-specific information it would be impossible to cover here, but I will mention my favourite: "If your system is configured for Iceland, do not use DriveSpace to compress or uncompress your drive."

Another proviso, not in the Readme file I have, is that if you have a WINDIR environmental variable set in AUTOEXEC.BAT, you must REM it out before installing. The setup routine copies this to the new version with the consequence that Windows 95 tries to process the old SYSTEM.INI when it first loads, throwing up an extraordinary quantity of error messages stating that it's unable to find a file.

Having done this, and backed up whatever is dear to you, follow the instructions for preparing your disk and start installation. I found it coped well with my rather strange hard-disk setup. Drive C: is uncompressed, but a second hard disk, D:, has a DoubleSpaced partition on it as E:. It replaced DoubleSpace with the later DriveSpace, but apart from a brief moment of panic when this stopped loading "high", everything worked.

Dual booting, as mentioned earlier, means you have a short time in which to press F4 and revert to your previous installation. The relevant boot files are renamed to suit; the new ones get the .W40 extension, the old the .DOS extension. If, perchance, pressing F4 has no effect, then either you're not hitting the button quickly enough or dual booting is not enabled. In this case, don't panic. Let Windows 95 load, find Notepad and edit the MSDOS.SYS file in the root directory of the boot drive. You will need to remove the Read Only attribute by double clicking on the My Computer icon, then the icon for the drive. Right click on MSDOS.SYS, choose Properties from the pop-up menu and clear the Read Only box. Yes, this came as rather a shock to me too, having always considered this to be an inviolable binary part of DOS, but it's now a text file. The entry BootMulti=1 needs to be in the Options section. You can also add the line Bootwin=0. This reverses the behaviour, so you default back to your old ways or press F4 to load 95.

Once you have Windows 95 up and running, the only thing to do is to jump in and start splashing about. Click on anything and everything you see, with both mouse buttons. If it all gets too much, you can still dig out the comfort-blankets of Program Manager and Minesweeper.

Sooner or later, however, you're going to want to do some real work, using your existing applications. Some may work, just by clicking on them from Explorer or an open folder, but many won't, as they will be looking for components (such as .DLLs) that are still in the old Windows directory. You'll get a rather confusing error message about the path being invalid. You need to re-install the application from 95 into its existing directory — or folder, as we must all learn to say. Then all the relevant bits and pieces will be installed into the new system. Obviously, this means a lot of .DLLs will be duplicated, but at least you'll be able to run your application from either environment.

I was worried that re-installing my old apps might overwrite some of the new system files, but so far, so good. I didn't make it any easier for myself as I just stuck the disks in drive A: and ran A:\SETUP.EXE. Well, you don't do that. Go to Control Panel and click on Add/Remove programs and follow the Wizard's instructions. One very useful tip if you're reinstalling Microsoft Office is to first edit WIN.INI and insert the following:

```
[MSAPPS]
MSAPPS=Path to existing location
```

If you don't do this, Office will insist on duplicating all the shared stuff, such as Graph, WordArt, the spelling checkers and filters into a subdirectory of your Windows 95 directory — I mean, folder.

And now, here's the first unofficial Windows 95 secret. Earlier beta builds had a display option for full window dragging. M8 reverts to the old way — as you move or resize a window, you just see its outline. Apparently this was removed as a standard feature as it didn't work well on ordinary ISA display cards. My thanks to Guy Gascoigne for pointing out that you can re-enable this by adding ILOVEBUNNY32=1 to the Windows section of WIN.INI. The option will appear as a checkbox in the Display properties sheet.

Next month, when I've had a little time to get over the shock of the new, we'll take a more philosophical look at the interface and try and demystify it. Until then, get the feedback flowing in, by post to *PCW* or by email to timn@cix.compulink.co.uk. **PCW**

Top ten frequently asked questions

Q What's that cross where the Maximise/Restore button was?
A That's the kiss of death. It closes the window instantly with one click. You still get prompted to save any open files, though.

Q Where have the window borders gone?
A They're still there. You can grab them with the mouse as before, but they are now cosmetically integrated into the colour scheme.

Q OK. I want to change the colour scheme. Where the hell is Control Panel/Colours?
A It's in Control Panel/Display, or if you want to be flash, right-click on an empty bit of desktop and choose Properties. Click on the Appearance tab and just look what fun you can have.

Q How can I close a folder and all its ancestors at one go?
A Hold down the shift key as you close the folder.

Q Where has the system menu button gone?
A It's still there. Click the jolly little icon at the top left of the window, or right-click anywhere on the title bar.

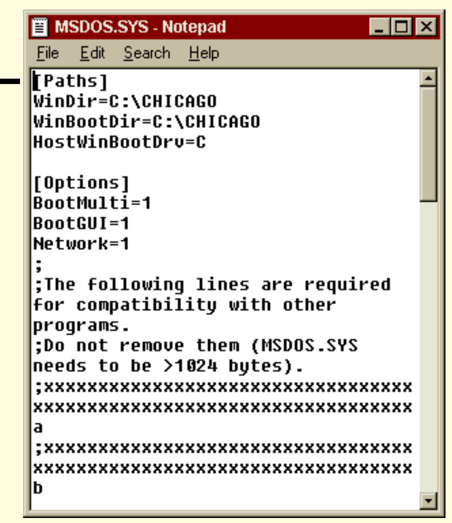
Q I've got a lot of windows open and the taskbar only shows me the first few letters of each title. How do I know which is which?
A Resize the taskbar by dragging one edge.

Q How do I remember which key to press when dragging a file to copy, move or create a short-cut?
A Don't bother. Right drag and you'll be presented with a choice.

Q How do I rename a file?
A Use the File/Rename menu command, or right click/Rename. To be really flash click once on the icon, then once on its title. In all three cases you type the new name right there, not in a dialogue box.

Q How do I really, really delete something, rather than sending it to the Recycle Bin?
A Shift + Delete

Q Whoops. How do I undelete it?
A Sorry, you can't.



Now a text file, MSDOS.SYS holds the key to dual booting

Now you see it, now you don't

Tim Nott thinks it's a real pane waiting for Windows 95, but shows you the most economical way to update your hardware in readiness for its arrival, how to increase your memory, and catch the PCI or VL bus.

To say that things are rather quiet at the moment would be an understatement. It has been a while since we saw an exciting new Windows application and even the shareware authors seem to have gone into temporary retirement. There are still one or two traditionalists sitting on their back porches whittling away with Visual Basic, though.

The reason for this quiet time, of course, is Windows 95 — or rather, the lack of it. Though applications such as Claris Works 3.0, which comes with Windows 32-bit extensions, give us a taste of what's to come, few developers are interested in teaching the old dog new tricks when there's a 32-bit, pre-emptive multitasking greyhound on its way. But the question is, when?

Both users and developers are getting twitchy, like children on the run-up to Christmas. But unlike this remarkably stable product which has shipped an annual update bang on schedule for nearly 2,000 years, Windows 95, formerly known as Chicago, is a more movable feast. Perhaps this can best be illustrated with a few historical quotations.

"Chicago is scheduled to ship in the second half of 1994" (Microsoft document, Chicago Q & A, December 1993).

"Windows 95 is scheduled to ship in the first half of 1995" (Microsoft document, Windows 95 Q & A, September 1994).

"...we have moved our date one time; from the end of 1994 to the first half of 1995..." (Microsoft document Dmyth.doc, October 1994).

"Microsoft said that shipping of the product may be delayed until August." (Financial Times, 21st December 1995).

"...Windows 95 is going to ship this August, I guarantee you that." (Microsoft spokeswoman quoted in the Independent, 5th March 1995).

"We are still on track to meet our quality goals and ship in August." (Yusuf Mehdi, product manager at Microsoft's personal systems division, quoted by Newsbytes, 28th March 1995).

It may be mere cynicism but I detect a slight difference in spin between these two latter announcements, with the hint of a potential "but" in the second. So how about: "What we meant is that it will be an august occasion when Windows 95 eventually ships," instead?

My personal view is that they're going to make it. There may be a hiccup or two with the Microsoft Network but my money is on shrink-wrapped Windows 95 on UK dealers' shelves by 31st August.

Hard-wearing hardware

Meanwhile, back in the real world of Windows 3.x, life goes on. One thing unlikely to be lessened by Windows 95 is the demand that Windows places on hardware. Microsoft has pledged that it will run as well, or better, as Windows 3.x on a 386DX with 4Mb of RAM.

This brings us to the question of what constitutes a sensible base from which to run the current and subsequent versions of Windows, and what is the most cost effective method of upgrading a Windows PC?

Referring to that fount of knowledge, the Microsoft 3.1 Resource Kit, we find that Windows will run in standard mode on a 286 computer with 1Mb of RAM, and in 386 enhanced mode on a 386SX with 1.6Mb. But "run" is perhaps something of an exaggeration, as the delays suffered while Windows pages memory passes in and out to disk can be extremely frustrating.

Windows loves memory. It devours the stuff. Adding more, at almost any level, will improve performance and this should be viewed as a first line of attack. No matter what the processor, if you have less than 4Mb of memory, then believe me, life doesn't have to be like that. An honourable exception should be made here for some notebooks that have Windows and applications stored in read-only memory.

For most desktop machines, adding memory is a straightforward matter of plugging in extra SIMMs (single in-line memory modules). Some manufacturers have proprietary memory expansion systems, in which case it remains a simple matter but becomes more expensive. If you are really unlucky, you might have an old motherboard that can only accept extra memory via an expansion card. In this case it would probably be more cost-effective to replace the motherboard (a subject to which we'll subsequently return).

Four megabytes should be considered the absolute minimum for running Windows with any degree of comfort. For general business or graphics use with current applications then an 8Mb memory is really the entry level, despite what the adverts say. For instance: Excel 5 has a 4Mb .EXE file; WordPerfect 6.1 needs 6Mb to run; and 8Mb is now the minimum for drawing packages such as Corel 5 and Micrografx Designer. Doubtless, in a year or two's time I would be able to update this paragraph by doubling those figures.

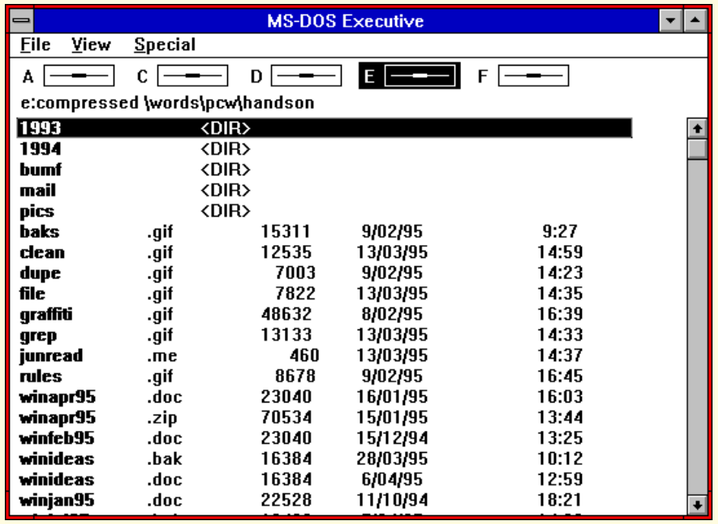
One over the eight

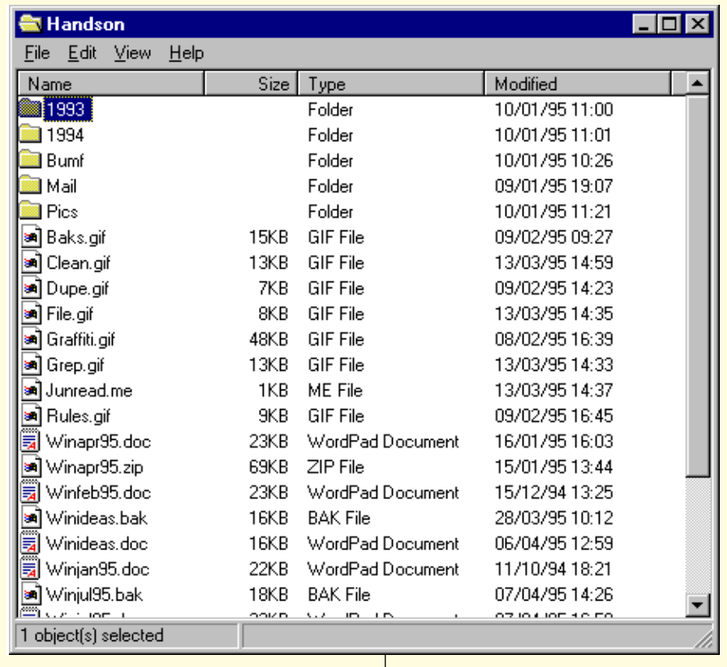
Unlike the cost of processors or hard disks, memory prices have failed to tumble during the past few years. But for any 386SX or better, upgrading to 8Mb is nevertheless the single, most cost-effective improvement you can make to a PC.

There are, however, a couple of caveats to watch out for, particularly if you intend going beyond 8Mb. On most middle-aged machines which use 30-pin SIMMs, there is room for a maximum of eight modules. These are arranged in four banks on a 386, and in two banks on a 486.

One entire bank at a time must be filled with the same type of SIMM. So if all eight slots on a 486 board are occupied by 1Mb SIMMs, then the next step up is to remove four of these and replace them with 4Mb SIMMs. This will give a total of 20Mb, plus four redundant 1Mb SIMMs. So if you were originally hoping to go to 12 or 16, it is going to be rather more expensive than anticipated. However, some dealers will let you trade in surplus SIMMs.

Another caveat is that the classic 30-pin SIMM is rapidly becoming unfashionable in favour of the 72-pin variety. And this brings us neatly back to the subject of motherboards. Whereas a memory injection will boost the performance of a PC, any further upgrading of an older machine will almost certainly mean replacing the





Top *The Windows 2 view of your computer...*
Bottom *...and the Windows 95 view*

processor. If you've got a 386, then it makes sense to upgrade to a 486. It is possible to do a straight chip swap (using Cyrix upgrade chips) to go from a 386SX 20 to a 486SX 40 for example. But although this is an extremely easy-to-fit solution, it's not terribly cost-effective when compared with fitting a new motherboard. If your existing board doesn't have a local bus, then you're still stuck in the upgrade cul-de-sac because you won't be able to take advantage of the latest variety of graphics accelerators and other goodies.

It is possible to find a motherboard, fitted with a 486DX 66 processor with both PCI and VESA local buses and standard ISA slots, for less than £200. Additionally, you should get onboard enhanced IDE hard disk control on the PCI bus, which will speed up disk performance. As well as this, you should have floppy drive control, COM ports — the latter with 16550 UARTS for fast external modem performance — and a printer port, so you don't need a separate I/O card. The catch, however, relates back to the last caveat.

Get on the bus, Gus

There are two popular local bus standards: VESA (*aka* VL) was the first on the scene; but the current favourite is the newcomer, PCI. Although it's possible to find a VESA local bus board that takes 30-pin SIMMs, (or a mixture of 30 and 72-pin), PCI boards seem to deal exclusively with the 72-pin variety. So it may once again be a matter of finding a friendly dealer who will trade in the older type. But the 72-pin variety does offer more flexibility — typically you'll have room for only four on the motherboard, but each of these can range between 4Mb to 32Mb.

Changing a motherboard is not actually as daunting a task as it may first appear. It means, for example, that you could transform an ancient 16MHz 386SX with 2Mb of RAM into a very hip 8Mb 66MHz 486 for around £400 (plus VAT). But having completed the task, you'll probably start to notice how infuriatingly slow the screen performance has become. And this is the problem with upgrading — it's hard to know when to stop.

Windows makes enormous demands on the graphics display but "accelerated" display cards, which sub-contract a lot of the work involved from the central processor, make a great deal of difference.

Additionally, if this is an old standard VGA-only device that's limited to 16 colours, you're missing out on a lot. Nearly all multimedia applications need a 256-colour display and for serious image-processing work even more is required. And if you're stuck in 640 x 480, you might want to work at a higher resolution to get more information on the screen at once. But it's vital to check first that your monitor will support this: ideally it should be capable of displaying the required resolution at a non-interlaced refresh rate of no less than 70Hz. The ISA bus is becoming an increasingly lonely vehicle for graphics cards — most now take advantage of the extra speed available from the PCI or VL buses.

Retro Windows

Older readers may remember MSDOS.EXE. This was the Windows 2.x shell which was rather like a simple File Manager. It didn't have a split tree/contents structure but merely listed all the files in the current directory, with optional details. You could copy, move, rename, or delete files, and create new directories as well as run programs. Navigation was accomplished either by clicking down into a subdirectory on different drive icons, or up along any part of the current path beside these. So, if you were in C:\DATA\WORDS\LETTERS\BUSINESS\INSURE, clicking on LETTERS would take you straight to that level.

Although it struggled through to version 3.0 for old time's sake (much as Program and File Manager are still lurking in Windows 95), it was finally pensioned off in version 3.1. It may just be sentimentality but I've still got a copy on one of my machines and although you can't do anything like drag and drop, it does work with the [extensions] settings in WIN.INI, so you can double click to launch an associated file. The beauty of it is that wherever you set the working directory in Program Manager properties, then that is the directory you're in when you start MSDOS.EXE. Thus, you can have one icon pointing to C:\...\BUSINESS\INSURE, another to C:\...\BUSINESS\TAX, and so on. Because you can run multiple instances of MSDOS.EXE, it's rather like having shortcuts to folders on your desktop. This, of course, is one of the salient features of Windows 95, and goes to show that what goes around, comes around.

Devious DLLs

Since previous months' mentions of duplicate .DLLs, the plot has thickened somewhat: some applications will update existing .DLLs when installed.

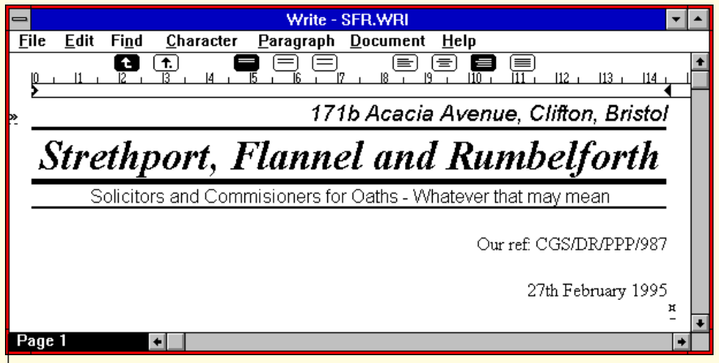
I'm not referring to the rogue installation routines that overwrite these with earlier versions (*Hands On,* June 1994), but to perfectly well-behaved applications that install genuine, latest model Microsoft-all-the-way-through files.

This is usually the stuff that isn't included in the standard Windows package, such as the Video for Windows player or the OLE 2 files. These have a development life of their own and get updated independently of the main thrust of Windows. Video for Windows, for example, is now at version 1.1 and strictly speaking we should be referring to OLE 2.01.

Great pains are taken to ensure backwards compatibility — if, say, a Pigs In Space CD-ROM, bought in 1993, came with run-time Video for Windows 1.0, which was later updated to 1.1 by the installation of a new Acme Multimedia Workshop bought last week, then the video clips in the former will still run.

It should be common sense really, but it doesn't always seem to work out that way. When CorelDraw 5 was released last year, it included a bundled copy of Ventura Publisher 5 — or rather, it contained a virtual copy of Ventura in the form of a voucher that could be exchanged for the real thing when the programmers had it ready.

When it eventually did arrive, patient punters started to find that Corel's reputation for bugginess, and Ventura's for bloody-mindedness, had conspired in an extra special way. It seems that Ventura 5 has a deep and abiding affection for the original OLE 2 files. If something updates these with later versions — for example, the latest versions of Word, WordPerfect or Microsoft and Claris Works — then Ventura gets a severe attack of the sulks and won't load from Program Manager. The hard disk will make all the right noises, but nothing will actually happen.



Write rules OK — with a little help from Paintbrush

Fortunately it's possible to get around this by loading CorelDraw, running Ventura from this, and then closing CorelDraw. But you'll be pleased to hear that the story has a happy ending: the latest build of Ventura 5 (known as F1) fixes the problem and should be available by the time you read this.

Paintbrush rules OK

The latest, tiny but perfectly formed, Paintbrush + Write trick revolves around the image attributes recently examined in this column.

Windows Write has no drawing tools, so apart from underlining it's impossible to put a ruled line into a document without some outside help. With a little cunning, though, and the help of Paintbrush, you can achieve the effect seen in the screenshot shown here, using only the standard Windows equipment.

Call up Write, turn on the ruler from the Document menu, and note the distance between the margins. Start Paintbrush and go to "Options/Image Attributes...". With the inches or centimetre option button selected, enter the Write margin distance as the width. Switch the measurement to "pels" and enter two as the height. Set the black and white option, OK the dialogue, then set the background colour to black and start a new file. You'll have a black rule, two pixels high — save this as rule2.bmp and then repeat the operation for other measures. The files will be tiny, and you can then load these into Paintbrush and copy and paste into Write. As the latter can't manage the feat of having graphics and text on the same line, you can only use this for horizontal rules but it's better than nothing.

PCW Contacts

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All present and correct

Checking the state of files copied onto floppy leads Simon Collin into SmartDrv territory, an April Fool "joke" is the cause of some alarm, and he turns on to the /A switch.

I need to make sure that the files I copy onto a floppy disk are correct and uncorrupted. I have tried to use the verify switch with the DOS COPY command, but this always says the file has been correctly saved — even when the disk is faulty. Short of accessing each file from the floppy disk, how can I be sure that my data gets copied accurately?

Any DOS command that writes data to disk can be set to verify what it's just written. This doesn't mean that it will check the accuracy of what's in the file, but DOS will check that the disk sector has correctly stored the data. The simplest way to enable verify is to issue the command VERIFY ON either by adding it as a line in your AUTOEXEC.BAT file or just typing it in at the C:\ prompt. From now on, commands like COPY, XCOPY and MOVE will verify what's been written to disk. The verify process works very simply: the sector that has just been written to is read and the data compared to the original.

Where I suspect you are going wrong is that you have a disk cacheing program running. Most users have SMARTDRV installed and, if this caches disk writes as well as read operations, then the verify process will be carried out in RAM and won't test the disk. To solve the problem and ensure that verify is working correctly, disable the write cache operation of your cache software.

By default, SMARTDRV read-caches and write-caches hard drives, but only read-caches floppy drives. If you want to check how your copy of SMARTDRV is set up, enter the command SMARTDRV /S and you'll get a screen of statistics showing how efficient it has been, together with a list of the drives and how they are cached.

To set up SMARTDRV to read and write cache a hard drive, use the drive+ switch, to remove both types of cacheing use the drive- switch, and to enable only read cacheing use just the drive letter. For example, if you want to disable cacheing on your floppy drive A: and have only read caches on the hard drive C:, you would use the following statement:

```
SMARTDRV A- C
```

An alternative to setting each individual drive is to use the /X switch which disables write cacheing on all drives. Either way, if you enter one of these commands the VERIFY routines should now work correctly.

April Fool!

I've just had a rather unpleasant April Fool joke played on me, which I thought I would pass on to other readers. Not so that they can do this to unsuspecting colleagues, more as a useful tip! The DOS command used to carry out this act is SET DIRCMD = 0. This returns the very worrying message that there are no files found when the user types in the DIR command.

I covered the DIRCMD command several months ago, but I didn't go into details about its misuse! In fact, the poor user can still list files in a directory after this command's been entered, but only if he specifies the full directory path. For example, if you're in the root directory, typing DIR won't work but typing DIR C:\ will list all the files.

The purpose of the DIRCMD environment variable is to set the default switch configuration for the DIR command. For example, you could use it to set the DIR command to display the file listing one page at a time, equivalent to using the /p switch with the DIR command. By setting DIRCMD to zero, you are removing the default switch parameters from the DIR command and forcing it to respond only if a full path is included.

Three months ago, I had a letter from a user who wanted to secure his PC during coffee breaks. This DIRCMD statement that you've described would be one way to stop users snooping around. Of course, it's not as good as the CTTY > NUL command that I described then, since programs can still be run and files copied — if you know their names.

Paths to success

Over the past few months I have had many letters about the PATH environment variable. I've dealt with some questions in the column, but have never covered all the options to the PATH variable and how you can make it work more efficiently.

The PATH variable holds the names of subdirectories and drives where DOS can find an executable file once it's finished looking in the current directory. The PATH variable has a maximum length of 127 characters — in practice, this is actually 122 characters once you've used up the PATH= sequence — and this could pose a limit especially if you have several disk drives or volumes. If you want to set up a Path, you use the PATH= command; you can enter this from the command line or from within a batch file.

To set the path to include the root directory of drive C:, the \DOS directory and the \APPS directory, use the following command with each separate search path separated by a semicolon:

```
PATH = C:\; \DOS; \APPS
```


As you have probably already discovered, the PATH command overwrites any existing PATH each time you enter a new path. Although rather irritating, this offers the byproduct of being a useful way to clear the Path variable by simply entering PATH = ;. If you enter the PATH command by itself, you'll display the existing contents of the variable.

To switch between two PATH configurations, you can save the contents of the current PATH variable to a batch file which can then be run to initialise the PATH:

:

To save the Path, redirect it to a file:

```
C:\ > PATH > OLDPATH.BAT
```

You can now enter your new path and can restore DOS back to its original state by running OLDPATH.BAT.

If you need to temporarily add a new entry to the PATH, rather than edit the AUTOEXEC.BAT file line that defines the PATH variable, you can add to it from the DOS command line using the following trick. Create a batch file called ADDPATH.BAT that contains the following line:

```
@SET PATH = %PATH%; %1
```

It might seem rather peculiar, but this works, trust me! For example, to add the C:\APPS directory as a new entry to the PATH variable, just type in ADDPATH C:\APPS and it will be added to the end of the existing PATH statement — subject to the size constraints mentioned at the start.

If you do exceed the size limits of the variable, you can use the DOSKEY command as an alternative way of setting up a series of PATHs. DOSKEY lets you assign DOS commands to any short name; you can then run a whole list of commands with a simple command. For example, if you need to regularly check up on which files in a subdirectory have not been archived recently, you could assign the following:

```
DOSKEY CHK=DIR \FILES\SIMON\VITAL\*.* /A:a
```

One of the most efficient ways of using DOSKEY is to assign PATH statements with it. Instead of including the search path entry within the PATH variable, you could replace the whole lot with a simple DOSKEY command to start the application. This way, it's faster to run the program and you save space in the PATH variable. For example, if you've just installed a new application, called APP.EXE, stored in \APPS\UTILS\BIN, then your PATH statement might look similar to:

```
PATH=C:\;C:\WINDOWS;C:\DOS;C:\APPS\UTILS\BIN
```

The DOSKEY way would be to assign a short name APP the full path that points to the executable file, APP.EXE:

```
DOSKEY APP=C:\APPS\UTILS\BIN\APP
```

If the application needs command-line parameters, you can use DOSKEY to pick them up by adding the characters $* after the DOSKEY command. This will pass on any command-line characters: for example, if APP.EXE needs a filename entered on the command-line in order to work, you can modify the DOSKEY statement to read:

```
DOSKEY APP=C:\APPS\UTILS\BIN\APP $*
```

Switching on to attributes

In the previous section on PATHs, you'll see that I used an example that lists files that need to be backed up all through the DIR and DOSKEY commands. I covered the DIR command thoroughly over a year ago, but there are a couple of tricks that are worth remembering and the /A switch is one of neatest. This lets you list files according to their attribute bit. For example, if you want to view all the files that need to be backed up (those that have their archive bit set), use the command:

```
DIR /A:a
```

This can be used in reverse. If you want to check all those files that have been backed up (that do not have the archive bit set), use the following:

```
DIR /A:-a
```

The letter following the colon defines the attribute bit to be used: 'h' for hidden files, 's' for system files, 'd' for subdirectories, and 'r' for read-only files.

In MSDOS 6.2 you can do a similar trick with less effort. If you type just the plain vanilla DIR command you won't see any hidden or system files. If you type DIR, (that's a comma directly after the DIR) you'll see the system and hidden files. The comma works, but you'll find it more flexible to use the correct switches that I've described above.

PCW Contacts

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Vintage **Portage**

Portage, Unix's subsystem, aims to make Unix an integral part of Windows NT. Chris Bidmead guides you through it, and investigates Deskman/2, but begins with another look at the great Awk.

I have received some correspondence from a reader on the subject of AWK: he thought the language might be a useful way of cleaning up HTML stuff uploaded using NetScape. When you look at an HTML file as ASCII it's full of this kind of thing:

```
<TITLE>A Nice Title Like This</TITLE>
<H2>A Nice Subtitle Like This</H2>
<H3><AUTHOR>The Author</AUTHOR></H3>
<H3>Blurb</H3>
<PRE>

Article.

</PRE>
```

Just the job for Awk. My correspondent, Bill, came up with the following program for this:

```
{
gsub(/<[A-Z0-9]+>|<\/[A-Z0-9]+>/,"")
}
//
```

The gsub statement strips out the unwanted marking and the "//" pattern subsequently prints every line. But the program needs some refinement. The catch pattern isn't wide enough, because the WWW markup language, HTML, doesn't just use letters and numbers within its angle brackets. It can put a ton of different things in there including "=" and "!".

Bill continues:

"When I experimented with removing anything within "<>" regardless of internal pattern, by using /<.+>/, Awk behaves horribly and replaced the entire line with nulls. I can't really explain why."

Well, I'm glad to see other people make the same kind of mistakes in Awk that I make. The reason the wider catch pattern /<.+>/ produces blank lines is because it's doing exactly what Bill is telling it to. He has widened the catch pattern too far. Awk is always looking for the largest string that fits the pattern, so if you have an input line like <H3>Blurb</H3> the /<.+>/ pattern catcher will catch the whole line, because that's a pattern that begins with "<" and ends with ">".

So, we need to exclude the possibility that the pattern can also include other "<" characters. Here's my attempt at it. You'll notice I've also tried to improve the readability and make the pattern self-documenting.

```
#Removes HTML markup from WWW files
#CHB Jul 95

BEGIN {
html_on = "<[ -;=-~]+>"
html_off = "\/" html_on
}
{
gsub(html_on,"")
gsub(html_off,"")
print
}
```

This is better, and will do the job with a lot of HTML text. But it assumes, like Bill's original program, that the open angle bracket and the close angle bracket of a particular HTML annotation is going to be on the same line. Judging by HTML files I've inspected this isn't always the case. The program would have to be quite a bit more complex to deal with this possibility.

But I have a confession to make. Last week I was caught up in a lot of intensive work involving research culled from the Web, a few pages of which I wanted as ASCII. I should have knocked up a couple of lines of Awk, but I could see myself getting hooked on the delights of testing and refining it, and time was pressing. So what I did (don't laugh) was just print out the pages from Web Explorer (IBM's NetScape equivalent for Warp) and OCR them with Caere's Omnipage Pro. This is an extended mode Windows application that is supposedly tricky under OS/2, and running it full screen is to be recommended. I run it seamless and it works just as well as it does under Windows (which is to say, yes, it bombs out a couple of times, but not often enough to be more than an occasional irritant).

Warp's Web

Having used the WebExplorer, I lamented for weeks the fact that it "isn't re-entrant". Actually, I hadn't really sat down and thought about it properly, but I'd the vague impression that although it's multi-threaded, you can't run multiple copies. I'd been impressed with the way the Gopher client can visit several different sites, downloading files simultaneously. You can run the WebExplorer alongside the Gopher, but only one WebExplorer at a time was usable.

But hang on — why would you want to run multiple copies of the WebExplorer? The answer is that the PPP or Slip serial connection you have with your Information Provider isn't always the bottleneck. I often find myself sitting there waiting for a slow server at the other end of the line to deliver its information. While you're waiting, why not go off exploring other links? You can do that within Gopher, but not with a single copy of the WebExplorer.

Once I'd re-addressed the problem in this way, the obvious thing to do was to fix the WebExplorer object so that it could launch multiple copies of the program. By default, installed objects run a single instantiation of themselves — once you've double-clicked on an object to open it in a window, a second double-click on that object will return you to the same window. But if you open the Settings notebook for the object and turn to the Window tab you'll find you get two options under "Object Open Behaviour". As well as the default behaviour "Display Existing Window" you can alternatively "Create New Window". Click the radio button instead. Then, every time you click on the WebExplorer icon, you open a new instantiation of the program. You can usefully do this for most of the other TCP/IP objects like Archie and FTP-PM.

FTP-PM is the Presentation Manager version of two File Transfer Protocol applications that come with Warp. If you're puzzling about Archie, don't hunt around for it on your Warp CD-ROM because it isn't there. It's one of the options among the software updates that IBM offers when you first log in to your Internet connection. Click on the "Software Update" object that appears in your SuperHighway folder when you install the BonusPak and the update process will be automated for you.

Your Archie client works in conjunction with any one of a number of Archie servers out there on the Net. The servers collect archive information about the names of files and directories that can be accessed via FTP. "Archie" is the name for the complete system of co-operating Archie servers that share information about the file archives distributed across well over a thousand FTP sites worldwide.

The only Archie I'd used before yesterday was the one available from CIX. This does a good job, in a simple, text-based sort of way. You type "archie <pattern>", and this creates a text file of files and directories whose names contain <pattern> together with the full names of the respective sites.

Useful stuff, but the OS/2 Archie does much more. If you open the "IBM Internet Connection for OS/2" directory that the BonusPak installs you'll find an object called Retrieve Software Updates. Run this through your Internet connection and you'll then be connected to updates.gopher.ibm.com, which contains newer versions of the software you've already installed, and some new applications like this beta version of Archie.

The OS/2 Archie is a PM application that lets you do pretty well everything by point and click — including downloading the files once you've tracked down their whereabouts. If your search returns the name of a directory, double-click on the Associated Directory icon to re-connect to the Archie server to query the directory contents. Ironically, I found this sometimes makes it easier for me to root among the 200Gb or so of files out there than to hunt for a particular file on my own modest network — and certainly a lot easier than restoring individual files from backup.

Having previously mentioned FTP-PM, it's a nice "get you started" application which allows you to shift files by drag and drop from the remote directory onto your local disk. But like a lot of simple GUI applications it's strong on interaction and weak on automation. I haven't even figured out how to make it do an MGET (multiple file transfer) without stopping and asking for confirmation with each file. Normally you can switch this on and off with the Prompt command, but FTP-PM seems not to understand this. If I'm missing something, please do write in and set me straight.

You might want to forget FTP-PM and use the command line version that gets installed automatically from the BonusPak. Just open an OS/2 window, or full-screen session, and type "ftp <sitename>". Type "help" to get a list of commands, and "help <command>" for further details. It seems to me a much more flexible FTP environment than the PM version, but you can go one better if you get hold of NCFTP from any of the usual FTP sites.

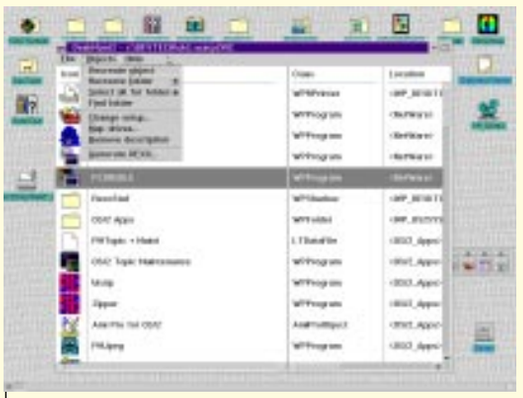
This is an OS/2 port by Steve Willer of Mike Gleason's generic freeware improvement on the vanilla FTP, and after using if for a couple of weeks I'm devoted to it. Like the standard FTP it allows you to keep your regular site names in a resource file called netrc, paired against the appropriate username and password. NCFTP recognises substrings within this file, so you only need to type "open lasermoon" to open the ftp.lasermoon.co.uk site.

Just typing "open" by itself is even more fun. This gives you a menu of all the sites in your netrc file with a number against each site. Just type the number to open the site. Better still, the menu also includes a list of recent sites you've visited, whether or not you bothered to include them in your netrc file. And, there's more — when you revisit a site, days or weeks later, NCFTP remembers which directory you were in last time and puts you back there.

No, it's not pretty, and it hasn't got a bunch of buttons and icons. But NCFTP has every hallmark of a program written by someone who really uses this kind of stuff, and knows a thing or two about design.

DeskMan/2

I'm in the process of moving my complicated WPS desktop from old Red Warp to new Blue Warp that comes with built-in WinOS/2. They're both installed on primary partitions on the same drive, so either becomes drive C: depending on my choice from the Boot Manager, and they can't communicate directly with one another. However, they do share the same set of network drives, so the trick is



DeskMan/2 builds a description file for any object you drop onto its icon, allowing you to reconstruct the object, even in a different version of the operating system. Optionally, DeskMan/2 can create a Rexx program for any object, so you don't need DeskMan/2 on the target system

somehow to write out the defining information about my Red Warp desktop to a network drive. Then I should be able to power up Blue Warp and reconstruct the desktop from that information.

The utility DeskMan/2 offers a few ways to do this. I'm experimenting with it at the moment and I'll let you know how I get on next month.

Portage

Last month I briefly mentioned Portage, the Unix subsystem for Windows NT sold by the Canadian company Consensys. Consensys is a repackager and reseller of Novell's UnixWare, and Portage is one of the fruits of this relationship. The product adds an almost complete version of S5R4 to the Microsoft operating system, allowing you to run Unix shells like the C Shell much as if you were in a standalone Unix environment.

But there's much more to it than that. Portage aims to make Unix an integral part of Windows NT rather than a sort of ghetto. The utilities that Portage brings to the party interoperate with Windows NT files and directories created by Windows NT programs, and vice versa. The two Unix shells Portage provides, ksh and csh, can be used to launch Windows NT applications or utilities, and the Unix tools can be run equally well from the Windows NT Command Prompt.

The same synergy applies to applications development. As an alternative to the standard Unix ar, cc, ld and make commands that come with the Portage SDK, Consensys claims that you can use Microsoft Windows NT compilers and debuggers to put Unix applications together. Using the Portage SDK you can even build hybrid Unix/Windows NT applications that play to both the Unix API with the Win32 API.

One example of this is the Portage Windows NT interface, a Windows application that operates as a glorified gateway to Unix for interactive use. Open it and up pops a shell window and a separate window full of buttons, each marked with the name of Unix utility. Click on the utility of your choice and you get a dialogue box tailored to that particular utility, with a list of tick boxes corresponding to the various arcane parameters. Each tick box carries the name of the parameter together with a textual memory jogger about what it does.

These memory joggers are great for the not-quite Unix guru who's still confused about the difference between the -1 and - l parameters to LS. For the more lowly of us, every dialogue box comes with a Help button. Click on this and you get the Unix manual pages for that utility, laid out in Windows Hypertext help format.

The combination of Unix and Win NT works well, with a few hairy exceptions that add much needed interest to the rather dull Win NT user interface. One obvious bone of contention between the two operating systems is the casing of filenames. Windows is case-insensitive, and Unix preserves case distinctions and won't delete ThisFile if you ask it to "rm thisfile". As I say, you can choose between a Portage shell window and the Win NTcommand line to run a mixture of NT and Unix commands, and in either environment "del thisfile" will delete the file. If this inconsistency worries you, though, there's an easy way to fix it. You can switch off the Unix case-sensitivity by setting the environmental parameter CASENAMES to n.

Unix users will probably want to work with CASENAMES=y, but there's at least one rather nasty surprise in store if you do this. I was investigating the case sensitivity by creating files with different names, and the easy way to do this is "COPY CON <filename>" (which creates a DOS-type filename) or "cp con <FileName>", the Unix equivalent which preserves the case. (Okay, just testing you Unix hackers: the real Unix equivalent is "cp /dev/tty <FileName>", but the Portage symbiosis lets you mix DOS devices with Unix utilities like this). I used cp to create a file called ElBid and another called elbid in the same directory. If you look at the directory with ls, the files show up as you might expect. But use the DIR command in a Win NT command line window and you see that the first file is called elbid~y. This is how Portage avoids the problem that Win NT can't live with a pair of files called ElBid and elbid in the same directory.

Now, here's the problem: if you want to get rid of the file you named in lower case only, you can either "del elbid~y" or "rm elbid". But if you get mixed up and try to "del elbid" you'll lose the wrong file.

There are one or two other inconsistencies to which you'll need to adapt. For example, Portage keeps all the Unix utilities in a single file, bin, off the directory it is using for its root. In ordinary Unix systems some of these utilities will be distributed among other directories like /etc, so if you're trying to run a shell script written for another Unix you'll need to check any path references it makes.

Portage (pronounce it the French way) offers a pushbutton interface to Unix utilities. As you select options, they get written into the Input window at the top of the dialogue box, so you can learn as you go along

The one serious problem I had (and I need to investigate this further) is that from inside Portage's Unix shell my NetWare directories seem to be inaccessible, confining the shell's operation to files and directories on local drives. The way around this, if you want to run fgrep, say, on a remote directory, is to do so from within the Win NT command line window.

PCW Contacts

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Caring and **sharing**

Translation filters have improved, but you may still have problems showing your Windows documents to someone with a different word processor. Tim Phillips has some answers, as well as consolation for DOS users and some nifty shareware.

It's one thing to put a whole bunch of fonts, styles and pictures into your word processor document. It is quite another to let someone else see the document if they don't own the same word processor.

While the standard of translation filters has risen dramatically over the last three years, as well as the number of filters which word processors have as standard, there are still a number of problems, to judge by your letters. Part of the problem is that when a new piece of software comes out, it can contain all the filters for all current editions of all its rivals. As soon as one of the rivals upgrades, the filters are out of date.

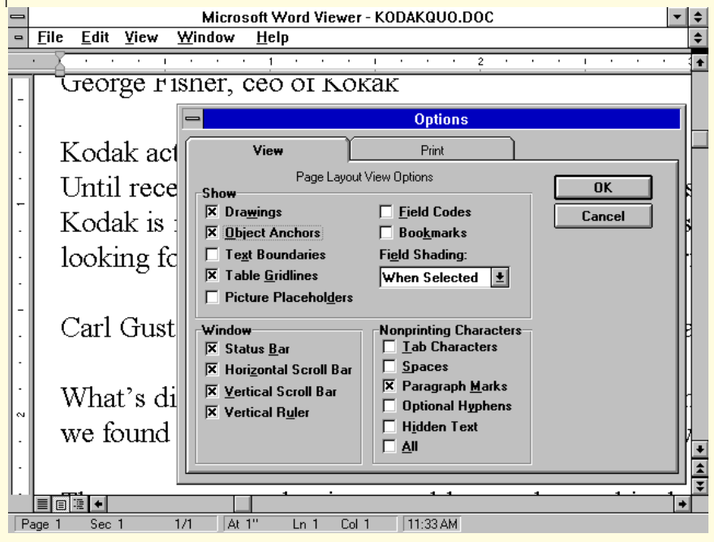
Statistically the biggest problem for Windows users has been in mixed Ami Pro and Word for Windows sites. This has not been remotely amusing for Ami Pro 3.0 users who are faced with WinWord 6.0 every day, and can't do anything with it. One solution is to upgrade: version 3.1 has the filter you need.

For you, and many others in the same predicament, here are a few pointers:

1. The slow way

Save your documents in an intermediate file format. If God had meant us to be proprietary, he wouldn't have invented Rich Text Format. I have had little trouble getting accurate visual replicas of documents in four or five word processors using RTF, but there is a downside of course: it is storing the look of the thing, rather than its structure.

The Word for Windows viewer. Download it, give it to your friends and be instantly popular



Interestingly, this is the Microsoft advice for users who want to translate between Microsoft Works and Word.

2. Previous versions

Save in WinWord 2.0 rather than WinWord 6.0, and the document is available in Ami Pro 3.0. Again, laborious, and you miss out on WinWord 6.0 features. But then, if you wanted those you'd have standardised on version 6.0 anyway.

3. Get on your supplier's nerves

Pestering technical support will occasionally produce a surprise. For example, Microsoft has a filter that will translate Ami Pro 3.1 documents.

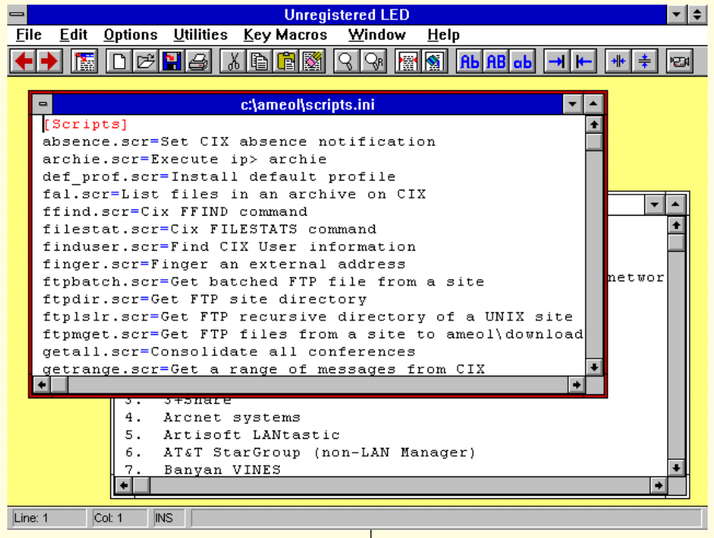
4. More interesting solutions

If you're a WinWord user and you want to lord it over your colleagues, consider giving them the Word viewer that Microsoft supplies as freeware. You can get this from CompuServe (GO MSWORD) or from Microsoft's FTP site (ftp.microsoft.com), or try contacting Microsoft direct.

The viewer fits on one floppy and allows you to view, print or copy, but not edit, the document. Depending on your point of view this is either a useful resource or Microsoft's dastardly attempt to infiltrate your PC. It's probably a bit of both.

5. Custom-built software

Anyone with a major file translation headache needs Word for Word, one of the best-kept secrets in file conversion. It's like a whole bunch of viewers in one package, and you can get it in Windows, Mac, Dos or Unix versions from the Software Compatibility Centre on 01344 885224. SCC claims more than three pages per second batch conversion speeds and 130 file formats.



LED, a handy little text editor that programmers might enjoy

6. Adobe Acrobat 2.0

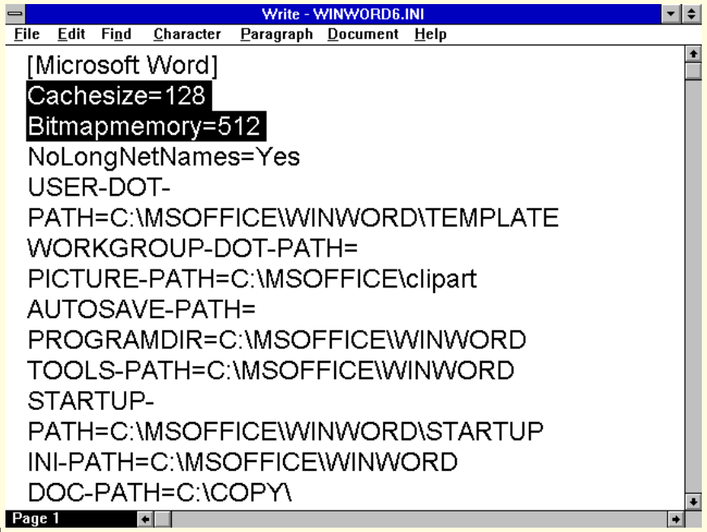
The real thing: write your files in Acrobat's Page Description Format, and anyone with a reader on any platform will be able to read them. They even look alike. The Acrobat reader is freeware, and following a tie-up with NetScape, PDF format looks like it will have the same effect on the Web as its ancestor PostScript had for printing. If you're publishing documents with a lot of formatting for distribution online or outside your company, then sending the document with an Acrobat reader is the answer.

DOS

For users looking for a new product, 'whatever happened to..?' is becoming a bit of a DOS user's lament. Like naming ten famous Canadians, it's a good game to play on long car journeys. I'll admit I was stumped recently, when someone asked me what the plans were for Locoscript.

Now I have the answer. There will be no new versions, but the company will continue to sell Locoscript Professional 2+ for DOS, which is beginning to look a little pricey at £99. If you are looking for cheap and cheerful, then the cut-down PC Easy is still available too, at £19.95.

The company is not making any secret of the fact that no new word processor



The two caches that you can change which might speed up WinWord 6 in a 4Mb PC

software is being developed. Instead it has set sail for the Internet, where in the next few weeks you will see Locomotive Software subsidiary, Turnpike, launch software with the same name. It's an offline reader for Internet mail, targeted at dial-up users, and it will contain a text editor (they have the code knocking around after all). "It's a whole new venture for the company," said a spokeswoman, adding that it wouldn't be a DOS program. It's Windows from now on.

Don't worry, though, you will not be left high and dry when you want to move to a PC and take your files with you. In sympathy with this month's theme of document conversion, the lack of a Windows version of your favourite software needn't be a disaster if you buy Locomotive's transfer utility called LocaLink for Windows. For £99, you get the software, the cables, and the chance to convert your documents to standard Windows word processor formats.

Hints

If you're looking for a cheap and cheerful word processor which can handle multiple files under Windows, record and play keystroke macros with a natty find and replace, then I have a little gem for you that I turned up during a snuffle round on CIX. It's called LED, it's shareware (£34.95 if you decide to keep it), and the current version is 1.3.

LED is copyrighted by systems integrators Logica UK, and you can find out more about it by mailing Woolly@cix.compulink.co.uk, or 100315,665 at CompuServe.

Although I doubted the idea of shareware text editors under Windows last month, I am now eating my words, because this is an excellent and professional implementation. I'd recommend it for programmers who need the find and replace function as well as the ability to cut and paste large text buffers. That's the best use for LED, although its font handling could stand some improvement.

Of course, you can also use it to edit .INI files, so useful for tuning up Word for Windows (see below).

Quick Word

Following my general recommendation of Word 6.0. I have been asked by several Word 6.0 users to come up with some ideas to make it work faster if you have less than 8Mb of RAM.

I can do no better than to repeat Microsoft's advice:

1. Disable the expanded memory use by EMM386.EXE, unless you are running software that needs it. Run MemMaker under DOS to do this.
2. Set the upper and lower cache sizes for SMARTDRV.EXE to 2048 and 320, unless you are running Windows for WorkGroups, in which case the small figure will be 128 already. Leave it at that. Your DOS manual tells you how to configure SmartDrive.
3. Create a permanant Swapfile.
4. Here's the tricky bit. If you don't use many graphics, you can reduce the size of WinWord's graphics buffer. In Program Manager, pull down the File menu and click on Run.

Type: `WINWORD6.INI`

Click OK. This opens Notepad and the WinWord initialisation file. Immediately below the line which says [Microsoft Word], insert a line:

`Bitmapmemory=512`

Save the file and restart WinWord.

5. Another tricky one: you can increase the size of WinWord's 64K text cache, reducing the number of disk reads it requires. Open WINWORD6.INI again, and immediately below the [Microsoft Word] line, add a line:

`Cachesize=128`

Save the file, restart Word. Either of these lines can be edited out of the .INI file if there's no improvement.

Useful lesson

Any teachers out there? I was intrigued, while mining CompuServe for the answer to a technical question, to find a group of Ami Pro users whose problem was that they couldn't print some of the text in a document, while making other parts of the text 'invisible' to the printer. All the available solutions involved marking the text, printing only a 'form', and then finding that your printer wouldn't print the graphics on the page either.

The solution was suggested by a teacher, who writes her test papers with the answers included. She used one paragraph style, let's call it 'Para_1', for the questions, and another, 'Para_2', for the answers. Both styles are the same. All you do to print is set the text colour for 'Para_2' to white. If you want to do it more elegantly, record a changing-colour-printing-and-changing-colour-back-again macro.

Problems

While we are on the subject of filters, Eric Young of Newbury laments: "Every time I try to save my Ami Pro 3.1 documents in WordPerfect format, I get a GPF." A quick follow-up call to Eric helped me to established the crucial fact: he has been trying to convert documents with numbered pages.

There's no special reason why putting page numbering into your document should cause a crash; it just does, and very messy it is too. As always, there are two ways around this: either remove your page numbers, which is at best half a solution because numbered WordPerfect document will still crash the system if you try and import them; or call Lotus technical support and request a bug fix. Funnily enough, just before we went to press a new version of the filter became available. It's also on CompuServe.

Impossible equations

Nigel Watson at the Heriot-Watt University Physics Department has a problem with Word for Windows 6.0:

"We are constantly producing scientific documents which rely heavily on equations. After a while we noticed that every time you edit an equation your resources go down by about five per cent, so after a short time you have to reboot Windows and reload your document." Not surprisingly Nigel calls this "A PAIN" and has some advice for Bill Gates which I won't repeat, but in this case agree with.

It isn't just a word processing problem, but a Windows problem that WordArt or the Equation editor, or quite a few other word processor applets, can cause. Windows has four 64K resource heaps which fill up according to Windows usage. One is full of menus, another is full of dimensions, and so on. The one with the least free resources is used as the 'free resources' figure.

Unfortunately the GDI heap stores all the graphical objects you use: icons, buttons, fonts, cursors and so on. There are a lot of these in the Equation editor, but when you close it, the GDI heap doesn't empty them out. Instead it fills up a bit more when you re-use the editor, and so on until it is full and you have to restart Windows. There's no fix for this, except to wait for Windows 95. The way to conserve GDI resource is to minimise the number of fonts you use, make sure you are not using a screen saver that leaks resources (some do), don't use wallpaper and leave program groups iconised when Windows starts up. And that's about it.

Meanwhile, another Lotus Ami Pro query — it has been a big month for them. Having now seen the new release of Ami Pro, I can honestly say that it's worth sticking with. The new version's a cracker.

Janet Russell of Northfields wants to use find and replace to find multiple carriage returns, but leave single ones alone.

This has me stumped. Ami Pro doesn't find more than one special character per search, so it will find every example of a carriage return and strip it out if you search for two together. (You enter a paragraph mark in the dialogue box by typing <ctrl+enter>). Finding exactly two carriage returns? Not possible. I'm sure there must be a way to achieve this, but it defeats me.

PCW Contacts

And that's that for this month. Surface or airmail to *PCW*, otherwise I'm on email at **wong@cix.compulink.co.uk** and **CompuServe 100436,3616**

What's in a Name?

Quite a lot, where spreadsheets are concerned. They make for surprising flexibility when you're working with your software, and have a variety of uses. Stephen Wells whets your appetite.

Traditionally, a businessman would say that the Assets of his company equalled its Capital plus its Liabilities. It's the classic Balance Sheet equation: what the company owns always equals what it owes, either to creditors or to its owners.

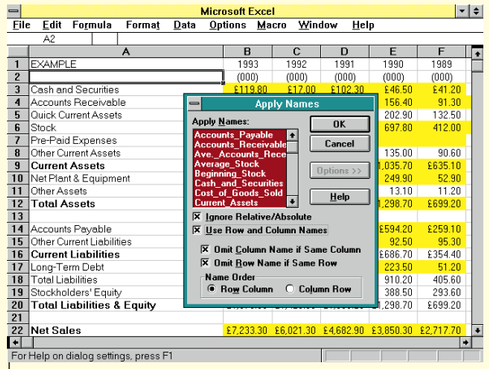
Then for a decade or so you'd hear people muttering, A64=A45+A30. But with the introduction of the Name (the spreadsheet one, not the Lloyd's one) we have gone full circle and once more people can call a spade a spade.

In Excel, a Name can be up to 255 characters including spaces, so you could write a paragraph describing the item if you wanted to. What you're identifying can be a single cell, a group of cells, a value or a formula.

Some people just use Names for frequently used items, like a discount rate. That's fine. Wherever it applies on a worksheet, you can just insert the Name, say, Professional_Discount, in formulas. If later you want to change the discount, you just edit the Name's definition. Excel will go through the worksheet and update every use of the name. Other people use Names simply for navigation, like bookmarks in a word processor document.

Names can be used as utilities. When you set the print area under Options, it is saved under the Name, Print_Area. In fact, all similar built-in Names such as Print_Titles, Sheet_Title and Crosstab_Range are recognised in any national version of Excel. Even better, if you enter one of these names in the English version of Excel, not only will it work in, say, the French version, but Excel will translate it into French!

As I say, a Name can refer to a value or formula which is not actually entered in a cell. You simply press Ctrl+F3, enter the new Name in the Define Name box, and a number or formula in the Refers To box. Discount could be the Name and =15% the entered value.



It's the work of a moment to make and apply Names in Excel

To use this Name you might enter the amount to be discounted in cell B5. In C5 you'd enter =B5-B5* then press F3, select the Name, Discount and bang, it's pasted in. Very useful: like having a multi-paged Clipboard. The number of Names available to you is limited only by the available memory.

The key shortcuts to remember with Names are based on the F3 function key. F3 offers a pick list of Names available to paste in when you need them. It also has a Paste List button so you can paste a list of your available Names and their definitions in a corner of your worksheet.

Ctrl+F3 offers a list of the Names in the worksheet and lets you edit their definitions. It also allows you to add new Names with their definitions entered manually.

Shift+Ctrl+F3 is used to create names automatically. You just highlight a range which includes labels in the top or bottom rows, or the left or right columns of the block.

The F5 function key is even more useful with the inclusion of Names on your worksheet. The Go To box offers a pick list of all the Names in alphabetical order. You can just zip down to the Name of your choice.

Just to show how easy it is in Excel to convert a traditionally entered worksheet to one which uses Names, I'll use as an example the template for financial analysis of companies which carry stock that many readers now have.

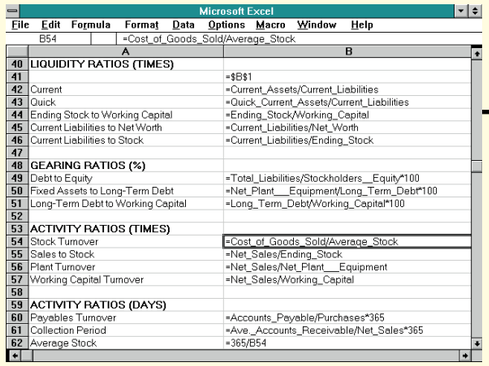
Select the range A3:G38. Press Shift+Ctrl+F3. Accept the default of Create Names in Left Column. Go to cell A2. Choose Formula, Apply Names. All the names are listed in alphabetical order in a box and marked ready to apply, Fig 1. Accept the defaults of Ignore Relative/Absolute and Use Row and Column Names. Also accept the default options of Omit Column Name if Same Column and Omit Row Name if Same Row. Also leave the Name Order option as Row Column.

In the Reference area of the formula bar, you'll see the cell addresses tick over as Excel works its way through the template.

Once the job's done, it is in this area where you can also see any Name if you select the appropriate block. If you select B35:G35, the Name, Working_Capital will appear up there.

Mini-worksheet for options

A	B	C	D
1	Year 1	Year 2	Year 3
2 Hardware	15,125,000	13,750,000	12,500,000
3 Returns	11,343,750	10,312,500	9,375,000
4 Carry forward	=B2-B3	=B4+C2-C3	=C4+D2-D3



The first financial analysis template automatically converted to use Names

Now, if you choose Options, Display Formulas, you'll see that Stock Turnover, for instance, is given as Cost_of_goods_Sold/Average_Stock, Fig 2.

Where a row was excluded from the Name-making process, then the cell address is given. That's why =$B$1 appears in cell B41 and B54 in cell B62. Excel is smart enough to figure out which cell addresses should be absolute and which not.

Where a value was shown, like 100 (to form percentages) or 365 (to divide a year into days), then it stays that way.

Now you may take such things for granted, but what tickles me is that without reference to column headings, Excel assumes that, say, the Stock Turnover for any year is based on the Cost of Goods Sold and Average Stock for that year, even though the replacement formula using Names is identical across the columns.

But what about those options, you ask? Don't worry about them. Oh, well, if you insist. All they do is control what is shown when you display or print out formulas. Your results, numbers-wise, are unaffected.

Here's an example. Enter the mini-worksheet at the bottom of the opposite page. Highlight the whole thing and Create Names with the options Names in Top Row and Left Column checked.

If you now highlight the range B2:D2, you'll see that the Name, Hardware appears in the Reference area of the formula bar. Highlight D2:D4 and you'll see the Name Year_3.

Now click in an empty cell and choose Formula, Apply Names and select every option available. The displayed formula in D4 becomes =Year_2+Hardware-Returns.

But if you had unchecked the options to Omit Column Name if Same Column, and Omit Row Name if Same Row, then the displayed formula in D4 becomes Carry_forward Year_2+Hardware Year_3-Returns Year_3.

In other words, every cell gets its own cross-referenced name and you can spell it all out if you want to.

Lotus 1-2-3 for Windows confines its use of Names to ranges only. Appropriately it calls them Range Names. But you can still have them automatically named by including labels in your highlighted selection, above, below, to the left or to the right of the block of chosen cells.

You can also press F3, choose from a drop-down list of available names, and paste them into a formula instead of a range address.

To go to the first use of a Name, you can take advantage of 1-2-3's Navigator button at the left of the edit line. It displays a list of Range Names in the worksheet.

Where 1-2-3 primarily differs from Excel is that it doesn't offer all the optional variations for displaying Names in formulas: a negative perhaps for the whiz at debugging spreadsheets, but a blessing for the tiro as it's one less thing to worry about.

Financial analysis

When I started this series on financial analysis last September, I mentioned that there would be two templates to build up. We now come to the second one, for the analysis of companies which do not carry stock.

In the last few years, it is the service segment of the UK economy which has shown the most growth, particularly among small businesses. So we leave behind the manufacturers, wholesalers and retailers and move on to businesses like architects, radio stations, chiropodists, estate agents, solicitors, security guards... all selling something which you can't store on a shelf.

Again there is an example set of figures, Fig 3. These are provided so that if you enter the template from the listings, you can check that you get the same results and your formulas are correct.

The example this time is an advertising agency. It is traditional in agencies to carry the costs of production of advertisements and commercials until these are billed to

the client, and this is sometimes referred to as an inventory. But it's a minor part of the business, typically only 10 to 15% of bills, and therefore it isn't measured as an inventory here. (Media buys — broadcast time, publication space and billboards are pre-billed as a security measure and to safeguard cash flow.)

Many service companies carry equipment and supplies (information technology, medical, stationery) which can be quite valuable. They may appear on the Balance Sheet as an asset and be expensed (written off) at intervals. This stock, however, is not viewed as inventory for the purposes of financial analysis. It is not the stock in trade of the business.

I must also prepare you for some terms which will appear in the Income Statement portion next month. Because many service companies are also agents, the Service template format refers to sales as Billings. (An agent is a firm which is authorised to handle and spend the funds of another.) In advertising, Billings means the total of all the client's media and production budgets. To an insurance agent it would mean the value of all the policies sold.

Commissions which are traditionally 15% in advertising are some fraction of these billings. Fees are other income earned apart from the commissions.

For some purposes (Accounts Receivable for instance) it's the Billings figure which is relevant. For others (Profit, for example) it's the Commissions and Fees — the real Gross Income of the company — which is significant.

In advertising agencies, Compensation is the major category of expense: staff salaries and benefits. And this is usually true of most service businesses as it's the skill of its employees which the company is selling.

Overhead here is synonymous with Operating Expenses less labour costs.

Beyond these terms, the definitions I have provided in preceding columns will help you decide how to divide up any service company's Balance Sheet into the 16 items shown this month.

As before, row 2 has no effect on the calculations. It is simply a reminder to you, as you enter figures, whether you're entering in hundreds, thousands, or millions.

The Industry figures are not current but at one time were the median for large advertising agencies.

The Service template is a little shorter than the previous one because there are no entries referring to inventories, and because there is no price sensitivity section. You can send for this template (see below) but for those who wish to enter it for themselves, there are two short adjacent listings. The one alongside defines the Names used; the one above gives the simple additions and subtractions. Apart from the ampersands (&), Excel has automatically created the Names from the labels in column A. The first 20 rows are primarily for data entry although half the figures are calculated. This block gives a précis of the company's Balance Sheets for five years.

The blocks marked in yellow are the data entry cells. As with the template for companies which carry stock, it's not the totals which are calculated in some instances. As the bigger numbers on the financial statements are the critical ones, they're the ones entered. The smaller numbers can be calculated to make up the slack and ensure that everything balances where it should.

The Balance Sheet happens to be laid out with the most liquid assets first. It also uses the terms Accounts Receivable and Accounts Payable rather than Debtors and Creditors. But as the American terms have come over with accounting software, they will be familiar. The financial ratios themselves are used internationally.

Next month, we'll add the Income Statement section of the template and then we can start creating the tabular and charted results.

I must mention that I'm most gratified by the interest that has been shown in this series. Not only have I received numerous requests for the first template on disk but with them many kind notes making favourable comment. These have come from an extraordinary spectrum of readers, geographically and demographically. These spreadsheeters recognise the usefulness of financial analysis for management, investment, education and — a surprise to me — local government.

Listing of initial formulas in the Service template

```
Quick Current Assets      =Cash_and_Securities+Accounts_Receivable
Other Current Assets      =Current_Assets-SUM(B5:B6)
Other Assets              =Total_Assets-Net_Plant_Equipment-Current_Assets
Current Liabilities       =Accounts_Payable+Other_Current_Liabilities
Total Liabilities         =Current_Liabilities+Long_Term_Debt
Stockholders' Equity      =Total_Liabilities_Equity-Total_Liabilities
Total Liabilities & Equity =Total_Assets
```

The Balance Sheet portion of the Service template showing example results

Microsoft Excel

File Edit Formula Format Data Options Macro Window Help

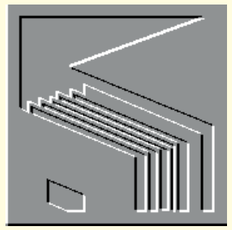
	A	B	C	D	E	F	G
1	SERVICE	1994	1993	1992	1991	1990	1989
2		(000,000)	(000,000)	(000,000)	(000,000)	(000,000)	(000,000)
3	Cash and Securities	£16.00	£15.00	£11.00	£10.00	£7.00	
4	Accounts Receivable	54.00	43.00	33.00	35.30	38.00	28.00
5	Quick Current Assets	70.00	58.00	44.00	45.30	45.00	
6	Pre-Paid Expenses		0.40			0.30	
7	Other Current Assets	0.00	2.60	2.50	0.00	4.10	
8	**Current Assets**	£70.00	£61.00	£46.50	£45.30	£49.40	
9	Net Plant & Equipment	4.40	4.20	4.00	3.50	3.90	
10	Other Assets	5.00	6.80	7.10	7.00	7.90	
11	**Total Assets**	£79.40	£72.00	£57.60	£55.80	£61.20	
12							
13	Accounts Payable	£49.50	£39.00	£27.50	£29.50	£30.00	
14	Other Current Liabilities	12.00	12.70	8.00	7.00	11.20	
15	**Current Liabilities**	£61.50	£51.70	£35.50	£36.50	£41.20	
16	Long-Term Debt	0.60	0.80	1.50	1.30	1.20	
17	Total Liabilities	62.10	52.50	37.00	37.80	42.40	
18	Stockholders' Equity	17.30	19.50	20.60	18.00	18.80	
19	**Total Liabilities & Equity**	£79.40	£72.00	£57.60	£55.80	£61.20	
20							

Listing of initial Names in the Service template

```
Accounts_Payable           =$B$13:$G$13
Accounts_Receivable        =$B$4:$G$4
Cash_and_Securities        =$B$3:$G$3
Current_Assets             =$B$8:$G$8
Current_Liabilities        =$B$15:$G$15
Long_Term_Debt             =$B$16:$G$16
Net_Plant Equipment        =$B$9:$G$9
Other_Assets               =$B$10:$G$10
Other_Current_Assets       =$B$7:$G$7
Other_Current_Liabilities =$B$14:$G$14
Pre_Paid_Expenses           =$B$6:$G$6
Quick_Current_Assets        =$B$5:$G$5
Stockholders Equity        =$B$18:$G$18
Total_Assets               =$B$11:$G$11
Total_Liabilities           =$B$17:$G$17
Total_Liabilities Equity   =$B$19:$G$19
```

PCW Contacts

Stephen Wells welcomes feedback on spreadsheets via *PCW* Editorial at the usual address or at **stephen_wells @pcw.ccmail.compuserve.com**. For the financial analysis template for service companies, in Excel 4 format, send a formatted 3.5in disk and a stamped, self-addressed envelope.



Internal affairs

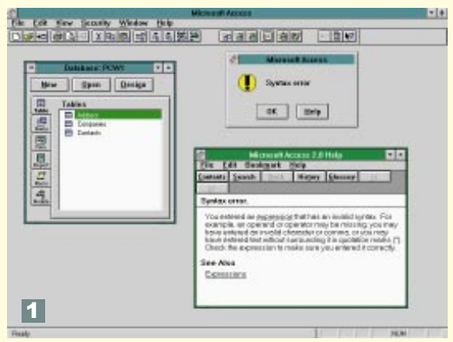
Mangled or corrupt data files can be hell to restore, but most modern RDBMSs come with some sort of recovery procedure. Get to know yours, says Mark Whitehorn, who also puts more of Ted Codd's rules to rights.

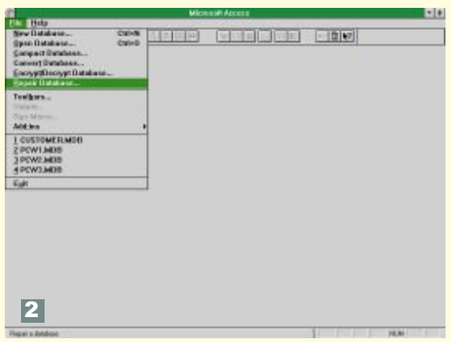
The internal structure of modern database files is complex. It would be conceptually much easier if the data within them was stored in a simple, easy-to-read way, like a fixed length ASCII file. Then if the file ever became corrupt, you could at least recover most of the data with a simple text editor. Some early PC DBMSs stored their data in just this way; the problem is that it makes data retrieval painfully slow, so in practice the internal structure of most data files is horribly complex. Try "typing" an Access .MDB file for example.

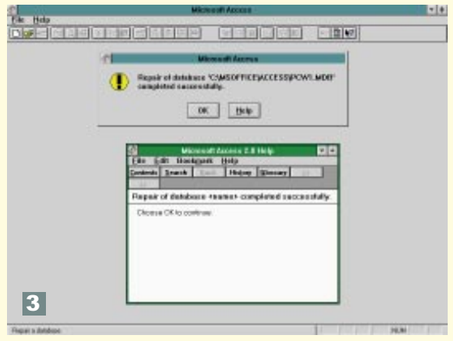
So, what do you do if anything goes wrong and the data file does become corrupt? Well, it shouldn't be a problem: you just go to the last backup. If the backup is unavailable or out of date, many RDBMSs provide utilities to help you recover, or repair, their data tables. Paradox for DOS was an early package which came quite well prepared for trouble, and the newer versions are even better. Access, with its even more complex file structure, has the repair facility right up front in the File menu. I had cause to use it recently, when I started to get an error message upon opening a table. It is simplicity itself to use: the only problem I find is that it fails to tell you what the problem was in any detail. It will also give the smug "Repair of database xxx completed successfully" even if you run it on a perfectly sound database that has no errors. otherwise, it works fine, however. I have only encountered one database it was unable to fix.

It is a good idea to acquaint yourself with your own brand of recovery procedure now, before tragedy strikes, so that you know what to expect in time of trouble.

Making repairs in Access







1 *Error message received upon trying to open a table in Access. The help system doesn't provide much enlightenment*
2 *Choosing Repair Database from the menu system*
3 *Access reports that the table has successfully been repaired (which is quite true). Once again, the help system is uninformative, although this time the meaning of the message is self-evident*
4 *The table after repair*

Codding around

Continuing our search for perfection in all things relational, here are some more of Ted Codd's rules.

High-level insert, update and delete

Rule 7: *The capability of handling a base relation or a derived relation as a single operand applies not only to the retrieval of data but also to the insertion, update and deletion of data.*

Remembering that Codd uses the term "relation" to mean a table, we can interpret this rule as follows.

You expect the RDBMS to allow you to retrieve records with a single command — that is, it should let you query the database in the normal way. This rule says that not only querying, but also inserting, updating and deleting multiple records should also be possible with a single command. In other words, if you want to delete all the invoices which are older than five years, you don't have to locate each one and delete it individually. You should be able to eliminate them all with a single command.

The same applies to inserting and updating, so you should be able to issue one command which, for example, alters the discount rate from 5 to 10 percent on all items the stock level of which exceeds the weekly usage by a factor of ten.

This rule is important, not just because it makes your life easier, but also because it has far-reaching implications as soon as you start to use a system where the database engine is divorced from the front-end. The ability to perform multi-record changes to a table with a single command reduces the communication between the front and back ends. When the link is over a WAN, this can speed up the whole process dramatically.

Physical Data Independence

Rule 8: *Application programs and terminal activities remain logically unimpaired whenever any changes are made in either storage representations or access methods.*

I have a great reprint from Date (another database wizard who often co-publishes with Codd) which lists the 12 rules. His explanation of this rule, and rule 9, is short and sweet: "Self-explanatory". This seems a little hard, particularly as he doesn't include the rule itself, just the heading "Physical Data Independence". I'm not sure it's self-explanatory, and neither is Codd who expands it by saying: *To handle this, the DBMS must support a clear, sharp boundary between the logical and semantic aspects on the one hand, and the physical and performance aspects of the base tables on the other; application programs must deal with the logical aspects only.*

In practice, this means that the logical interaction the user has with the database ("I want to find all the orders which are overdue for payment") should be divorced from the physical structure of the tables of data. Suppose that as a database expands the database manager decides that an index is required on a particular table for performance reasons. This rule says that it should be possible for the manager to add that index without the users being aware of any change. They and any application programs should be able to work as before. The only difference users should see is a faster response time.

Logical Data Independence

Rule 9: *Application programs and terminal activities remain logically unimpaired whenever information-preserving changes of any kind that theoretically permit unimpairment are made to the base tables.*

If this one sounds rather like Rule 8, that's because it is; the two are often considered as a pair. As an example of what this rule means, suppose that you have a table of CUSTOMERS that for performance reasons you want to split into two, CUST_ENGLAND and CUST_REST. This allows you to search more rapidly through the customers in England, but what happens to all your existing programs and users? They are used to interacting with an all-embracing table called CUSTOMERS. This rule says that if a DBMS is to be considered a Relational DBMS, it has to allow both applications and users to go on dealing with CUSTOMERS as if there hadn't been a split. In practice this can be done by creating a view (or query) which combines the two new tables into a single entity with the original name.

Note that complete conformity with this rule depends on compliance with Rule 6, the view updating rule, which says that all views which are theoretically updatable are also updatable by the system. If rule 6 isn't obeyed, then although we can manufacture a view called CUSTOMER from CUST_ENGLAND and CUST_REST, the users will be unable to interact with the data it contains in the same way as before.

Rules 8 and 9 are included in the rule set to provide a high degree of flexibility. Codd describes them in order to split the logical interaction with the database away from the physical and base structuring as much as possible. In turn, this allows the database manager to make changes to the underlying structure without upsetting the way the user works, and without requiring application programs to be re-written. As Codd says:

The physical and logical independence rules permit database designers for relational DBMSs to make mistakes in their designs without the heavy penalties levied by non-relational DBMSs. This, in turn, means that it is much easier to get started with a relational DBMS because not nearly as much performance-oriented planning is needed prior to "blast-off".'

Integrity Independence Rule

Rule 10: *Integrity constraints specific to a particular relational database must be*

definable in a relational data sublanguage and storable in the catalog, not in the application programs.

Ah, a serious rule this one . It contains an important expansion:

In addition to the two integrity rules (entity integrity and referential integrity) that apply to every relational database, there is a clear need to be able to specify additional integrity constraints reflecting either business policies or government policies.

After this rather oblique reference to referential and entity integrity as an integal part of relational databases, Codd goes on to say:

To be more specific, the following two integrity rules apply to every relational database:

Entity integrity. No component of a primary key is allowed to have a null value.

Referential Integrity. For each distinct nonull foreign key value in a relational database, there must exist a matching primary key value from the same domain.

The definition of entity integrity given here is relatively spartan. It is sometimes expanded (for example, Vang 1991) to include the concept of the match between a record's content and the real-world object that it represents. Which definition you consider to be the most important, or most useful, is up to you. Codd's has the advantage of being more exact and therefore easier to quote.

Both referential and entity integrity are important, not to say essential, parts of a relational database; I've discussed them in earlier issues of *PCW*. Why Codd sees fit to introduce them as a mere addition to another rule is not clear. But we have seen before that he has a tendency to include essential information as an expansion of a rule; as another example, no rule explicitly says that an RDBMS needs a data dictionary, yet that is implicit in Rule 4.

Implicit in this expansion of rule 10, though never stated, is that referential and entity integrity rules have to be stored in the catalogue (data dictionary) rather than in the application programs. This is clearly essential, since if they are only stored in the applications, it becomes easier for a user to accidentally or maliciously subvert that integrity. Almost all PC-based RDBMSs seem to ignore this rule. Some only allow you to impose referential and entity integrity through the application language, others store the information in the fact; the only one I know of which maintains an effective data dictionary is Access.

However, this rule says more: it says that in addition, an RDBMS needs to be able to store other integrity constraints, and that we have to be able to store these in the catalogue (data dictionary) and also to define them in the data sub-language. What might these "other" constraints be? If you are storing someone's date of birth (DOB) and the date of their entry into school (DOE), it is clearly reasonable to set up a rule stating that the DOE must be greater than DOB. In fact, you might decide that DOE has to be greater than DOB + 4 years. In either case, you want this rule to be applied in all cases, without argument. Rule 10 says that you must be able to define such rules in the control language that you use, and also be able to store the rule in the data dictionary.

Problem solving: Paradox for DOS 4.5

Q. I know that Paradox 4.0x had a problem with secondary indices not working properly when the table it was based on was larger than 128Mb; problems like queries taking forever to run. I still seem to be getting the same problem in 4.5. Wasn't it fixed?
A. As far as I know it was, so this probably isn't the cause of your problems. Try RESTRUCTURING the tables.

Q. The application:
— Paradox DOS 4.02 app/db on Novell server
— Diskless workstations, so each user's privdir is also on the server
— Main table 12,000 records, 12.8Mb
— Single field primary key, three maintained single field secondary indexes
— Database usage is heavy, some updates, no deletes, heavy reporting
— No Mb file
— Application has been running okay for about eight months

The problem:
Three times in the past two months we've suddenly had one of two different reports go wacko and come out with almost double the money amounts they should (not exactly double, we haven't been able to come up with the bad numbers ourselves). The reports scripts present a form for selection criteria, run a query, and copy a report layout from an empty report-holder table. Typical selection criteria would pull 10-30 percent of the records from the main table.

As soon as the users tell us about the doubling problem, we re-run the query/report script with the same selection criteria, and everything's just fine. So, we can't recreate the problem on demand. It just pops up every once in a while.

Today, the users ran what's called the billing preview report, which looked fine. So they ran the billing (*exactly* the same query/report script, but destination is file instead of printer). The billing file data added up to almost double what it should have been. We did nothing but re-run the script and the billing file output was correct.

I've just put in tracing code to capture the Answer tables and Savevars every time these reporting scripts run. I'm trying to decide if a Restructure/Rebuild all indexes is worth a try. TUTILITY says all is fine with the table.

A. There are two obvious causes. One is that the tables are damaged, the other that there is a problem in your PAL program. The former seems unlikely because damaged tables usually give consistently incorrect answers.

The latter seems more likely. Perhaps there is a path through your program which is only rarely taken by the users. However, when it is followed, the result is that one or more tables and/or sets of variables aren't cleared. Also, if you use any temp/holding tables, make sure they are declared private, and also that they are all being emptied under all circumstances. If you don't do this, another possibility is that someone else on the net might be overwriting your data.

Those are a couple of theoretical answers to your problem. On a more pragmatic note, if the "output" end of your report processes was converted to a single processing loop that allowed the user to select Screen/Print/File until they finally quit, you won't have to run the process twice to do your preview and print. That way, if it looks alright on the screen, the user can print it immediately.

Finally, you may want to use rebuild rather than Tutility Verify. Rebuild can fix things that Verify doesn't realise are wrong. Always make sure you have good backups first.

PCW Contacts

Mark Whitehorn welcomes readers' correspondence and ideas for the Databases column. He's on **penguin@cix.compulink.co.uk**

Picture perfect

Fresh from his scanners group test, Gordon Laing looks at the next stage: how to make all those scans you made look at least something like the original picture. An easy business? Far from it...

I got so carried away with this month's scanners group test that too much was written for the space allocated. Always one to champion the truth, I decided that some of the most interesting and revealing discoveries shouldn't be filed away until the next suitable feature, but aired here, in *Graphics & DTP*, in the same issue.

The subject of digitising, manipulating and finally reproducing continuous tone images — colour photographs to you and me — is absolutely enormous and fabulously tortuous. It may be dead easy to plonk a snap on your flatbed, hit the scan button, and place as desired in your final document, but to have the reproduction bear any resemblance to the original is a very different matter.

The problem is colour. We all perceive it differently and if you think we can be awkward, electronic publishing equipment take the biscuit. When you think about it, the goal is simple: here's an original picture, here's my final publication, and all I want is the reproduction to look the same — oh, and it would be good if the scan bore some resemblance to the original on my monitor, and a colour proofing device, too, would be nice.

At worst it's absolutely impossible and at best, pretty damned close to impossible. The troubles are not just perception, but the consequent description of colour. What's scanned in RGB colour space must be converted somewhere down the line into CMYK for printing, and that's when you learn there are some colours that cannot exist in both colour spaces. What do you do? Panic, approximate, or hope that the inaccuracies are within the printing margins of error?

And then there's the problem of manipulations. Every time you try to correct an imperfection in, say Photoshop, you lose quality. But wait — are you observing the reproduction under the same lighting conditions as you did the original? And who's to say what's correct anyway.

Well, not me, for starters, but what I will do is present, in the most independent way possible, some results of colour calibration, and correction within the digital domain — in short, how to make your scans look really good.

Unless there's something severely wrong with your scanner, it should at least be consistent — consistently wrong perhaps, but at least if it always captures deep red as watery pink, you can compensate.

Standard colour test targets are available with reference scans on disk. The calibration software compares a scan made of the target with the reference scan and creates a correction profile from the differences. Simply apply this profile to any subsequent scans and the output on a known printer should, in theory, be perfect.

In practice it actually works rather well, so long as there's nothing fundamentally wrong with your scanner. If it's only capturing four of five colours, or just highlights, no amount of correction will save your day. Similarly, the units capable of capturing a higher density, or those with a good signal to noise ratio, will have the most to gain.

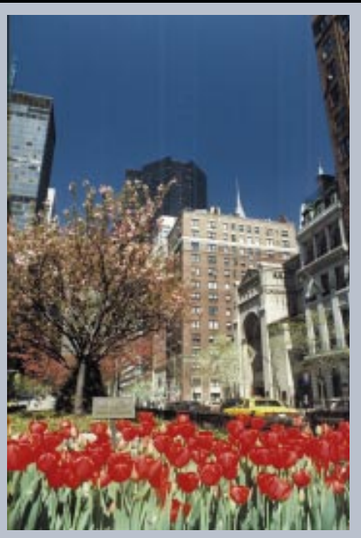
Before going any further, the ultimate rule of scanning and manipulation applies: the less mucking around you do with the image, the more chance it has of looking good. In other words, you should try to make your corrections in as few steps as possible. Ideally, these should be made at the time of scanning, from the TWAIN module or Photoshop plug-in. Adjust those brightness, contrast or colour sliders *before* the scanning.

In the case of the high-bit scanners, this is where you can work with the full 30 or 36 bits of information, losing a couple here and there, but still having 24 good ones to save. Many superior scanning systems send a correction tone curve to the scanner via the TWAIN module at the time of scanning, again ensuring the least possible loss of detail.

But here we're going to look at what you can do after the event. When we

Reflective scan results

Just how good is a £3,250 scanner? If a cheap scanner captures all the colours, is it possible to correct them and match the output of the expensive unit?
We scanned the same 5" x 7" colour print on a £3,250 Agfa Arcus II and a £650 Microtek ScanMaker II. The Arcus II raw scan is far right, the ScanMaker II raw scan is on the right.
Both scanners were calibrated using Agfa FotoTune, costing around £500, and colour corrected and separated for output on a Chromalin proof. The corrected ScanMaker II image is directly below, while the Arcus II corrected image is below right.
The vertical stripes on the Arcus II scans are due to dust on the optics.
A drum scan is shown for reference (below left). The Arcus II clearly beats the ScanMaker II on detail and sharpness, but FotoTune has done an admirable job on colour correction



tested the colour flatbeds in the group test earlier this issue, we compared raw, uncorrected scans of a colour photograph and an Agfa IT-8 test target. The former scans have been printed in all their glory, or lack of it, to see how they all compare to each other. The IT-8 scans had their histograms analysed — not to see how accurate they were, but rather what range of information was present and ready to be corrected.

Here, we're presenting the results from two further tests. The first is with our reflective target, a typical A5 colour printed photograph. We scanned it on the cheapest and most expensive scanners in the group test and placed the resulting images side by side — the two scanners differ in price by nearly £3,000. Both scanners had a profile made using Agfa's superb FotoTune application, which was then used to correct the raw scans. Next to the original raw scans are the corrected images and the output of the drum scanner we normally use for our pictures. Can colour correction make a cheap scanner look as good as an expensive one? And can it make a good scanner look like a drum scanner costing typically over £10,000, requiring a skilled operator, and a charge of over £25 a shot?

Next up is the problem of scanning 35mm film. In publishing, larger-format film is normally used for better quality, but is 35mm good enough for quarter-page reproduction? Are flatbed transparency adapters any good for 35mm? What about Photo CD?

This time the raw scans of the same 35mm slide are provided by the built-in transparency adaptor of the Agfa Arcus II, and the film scanner as part of every Photo CD bureau. Correction of the former is once again courtesy of Agfa FotoTune, while we can thank the equally remarkable Binuscan Color Pro for attempting the brave task of making Photo CD look good on paper. Binuscan is distributed by IMC. Again, our trusty drum scanner was called in to provide a so-called reference result.

The really fun part is that I'll see the proper results of these tests at the same time as everyone else, when the magazine hits the shelves in early June. Since this was written two months earlier, I'll have to wait until September's column to comment and make any conclusions. Which do you think look best?

Transmittive scan results

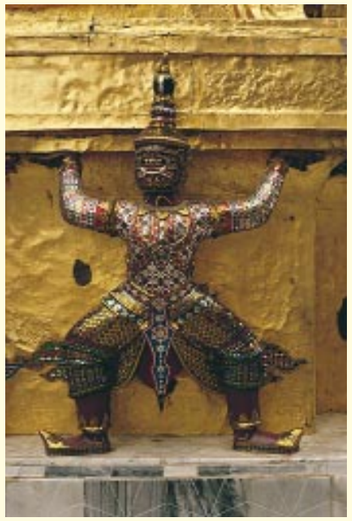
Is it possible to use cheap scans of 35mm trannies in a professional publishing environment? We took a highly detailed 35mm transparency as a test image — the yellow cast was bound to cause trouble. We first scanned the trannie using the built-in transparency adaptor of the £3,250 Agfa Arcus II flatbed, reviewed in this month's scanner group test, then took it to a local Photo CD bureau which charged less than a quid for its scan.
Far left is the raw scan of the Photo CD, while the Arcus II raw scan is seen left. We used Binuscan, distributed by IMC, to correct, sharpen and separate the Photo CD image, seen below left. Directly below is the result of Agfa's FotoTune, used to correct the Arcus scan, having been suitably calibrated. Below right on the next page is the original trannie, scanned by our regular drum scanner, providing a reference result

FONT OF THE MONTH

Just my type

Step forward Mekanik, Font of the Month! When it was designed in 1988 by David Quay, Mekanik was a highly original font. It spawned many imitators including Neville Brody's considered classic, Industria, two years later.

PCW's art editor Darrell Kingsley chose Mekanik as one of our new headline fonts during our redesign late last year. Like Runic, another of the new headline fonts, it's highly compressed, allowing long or several words to be fitted on a single line. A cutting-edge font, indeed used extensively in our Cutting Edge pages.



PCW Contacts

Gordon Laing is tired and emotional, suffering from scanner overload. He still wants to hear from you, though, so write to the usual *PCW* address, or those suitably equipped can email him as **gordon_laing@pcw.ccmail.compuserve.com**

Faces **01276 38888**
FontWorks **0171 490 5390**
Agfa UK **0181 231 4200**
IMC **01753 830999**

Animated **discussion**

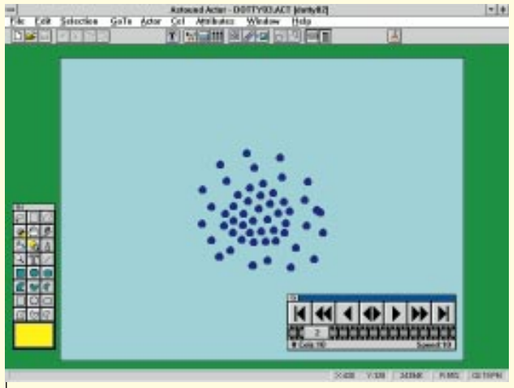
Off to pastures new, Karl Dunkerley signs off with a demonstration of Astound 2.0 screen effects and whips up a dream home sales promo thanks to MediaStudio's easy DTV editing facilities.

Thanks to the excellent multimedia packages now available, technology has come to the rescue of many a would-be artist. Animation is a subject that fascinates many, and I for one thought it unlikely that I would ever be able to actually do any. But Gold Disk's newly launched Astound 2.0 enables anyone to put together simple animations without having to draw anything.

Astound's Actor and Animator modules show just how simple and effective animation can be. For instance, imagine you're creating a rolling demonstration for an exhibition and wish to draw prospective customers' eyes to the screen. You could, for example, use a star flashing up in different parts of the screen, or you may prefer to flash up a shower of coloured dots.

To do this, you would use Actor to record each cell, or frame, of the animation, while Animator allows you to create a path for each cell on the page. Launching the Actor module, you can begin to produce the first cell by clicking the Attributes menu option, followed by Pen. In the Tools box, click on Brush icon and choose a wide brush — the effect should stand out. To change the paint colour, double-click on the colour swatch at the bottom of the toolbox and then select the one you want with the right mouse button. Position the brush in the centre of the page and then click. Move the mouse slightly and click again. Repeat a couple of dozen times but keep a tight, circular shape.

Create more cells and then click a double arrow icon in the Player window to move to the second cell. Change the brush colour and go dotty once again.



Starting to go completely dotty in Astound Actor

Adding a handful of dots further out enhances the flashing effect. To see the effect, click the middle icon in the Player window. Click it again to stop it before you become hypnotised.

Red, green and blue tend to be the most striking colours but you can add others for variety. Click the Play icon again and watch all ten cells flash away merrily, if a little jerkily. Use File and Save to save your masterpiece and call it "DOTTY01.ACT".

To add the path you need to jump to the Animator module by clicking on the icon furthest to the right on the main toolbar. First add in a background image using Event, Background and Picture. I chose to "Open CANVAS.GIF" but you must remember to click Select before Done to state that this is the background you want.

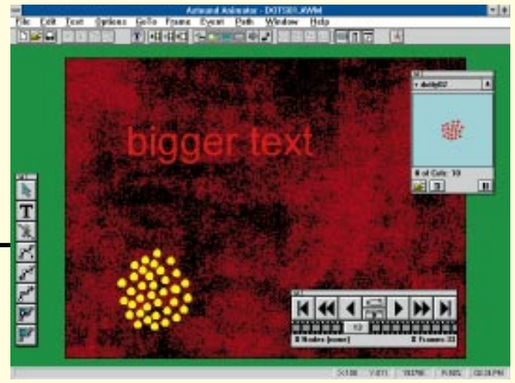
You then need to Select Palette and it is as well to "Keep the original palette of this Background". Canvas is a dark red and black background which gives an excellent contrast to the brightly coloured dots of the Actor.

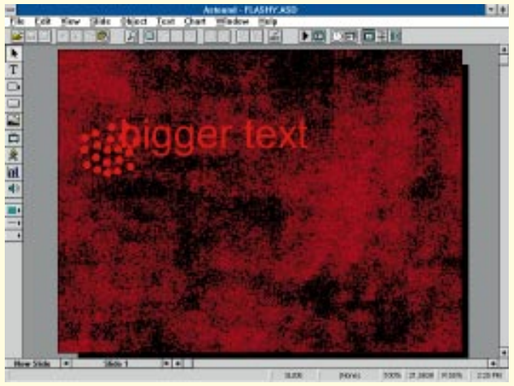
As we want the dots to highlight the text it is better to add this to the background first. Changing the text attributes is the first step. Click the "T" icon on the main toolbar and the dialogue box allows you to change the settings to Arial, 72-point, centred, and the colour to a full red. Use the"T" icon on the other toolbar to type the actual text in the style chosen. I used the phrase "This is the new stuff" (a Peter Gabriel line) as this kind of display is likely to be used for promoting new products and services. Hit Esc to exit and the text will appear in the Actor window.

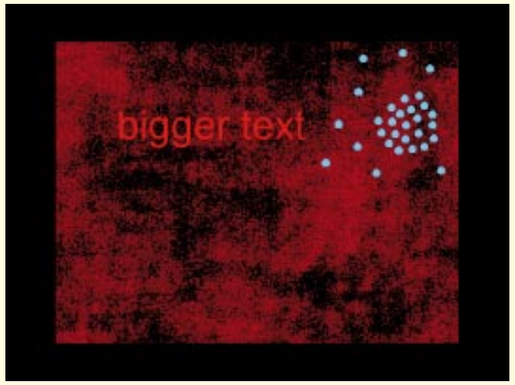
You can make the text follow a path and jump around the screen but I decided to leave it in the top left corner. However, you do need to create a path to make the text appear on the screen, and to keep the text still, a trick is needed. Simply click the Registered Motion Path Tool icon in the toolbar (the third down). When you move the pointer back onto the canvas you will see the text appear. Find the position you want and click. Then keep clicking until you've done 30 frames. You've created a path with 30 points one on top of the other.

Now we need to add the dots but we must first reset the animation to Frame 1 by clicking the icon furthest to the left in the Player window. You need the dots in Actor next so go to the Actor window where you will find DOTTY01.ACT listed. Click on that, followed by the Registered Motion Path Tool icon again. Move the pointer around the screen. You will see the cells change each time you click to indicate the position of the new cell. As there are only ten cells you will end up with the whole animation repeated three times. Do File and Save, calling the file "DOTS01.AWM". Make sure the Compressed box is checked.

The animation is finished so close down Animator and Actor, making sure to save any objects and resources needed. From Program Manager launch Astound 2.0 and click Create with No Template.







1 *Adding a background, text and paths in Astound Animator*
2 *The presentation with imported animation in Astound*
3 *The final results with the screen going dotty potty*

Click File, Import and Movie. The animation will be placed on the slide but don't worry if it looks horribly blocky at first. Usually the animation is not properly centred so you need to click Object, Centre on Slide and Both to line it up correctly. If you click on the Play icon you will see the Animation run. It is now a normal slide in an Astound presentation.

The result is distinctly eye-catching compared to the run-of-the-mill material you end up with from normal presentation graphics slide shows like PowerPoint and Freelance. This example was a simple one but you can use the same principles to demonstrate actions. For instance, a molecular biologist could use the dots to represent cells fighting each other in the human immune system. Often the representation does not have to be accurate. If you wanted to demonstrate chaos in the road systems, several lines growing and running around the screen resulting in a spaghetti-style mess would convey the idea adequately.

The great thing about these kinds of animations is how easy they are for even complete art-failures to do something effective.

DTV dreams

As a confirmed desktop video fan I waited with bated breath for the latest Windows version of Adobe's Premiere editing suite. Version 4.0 is undoubtedly a huge improvement over 1.1 (it has now caught up with the Mac package) but my enthusiasm for it was overshadowed when U-Lead's MediaStudio 2.0 turned up. Despite being a late beta, this has proved to be both stable and impressive.

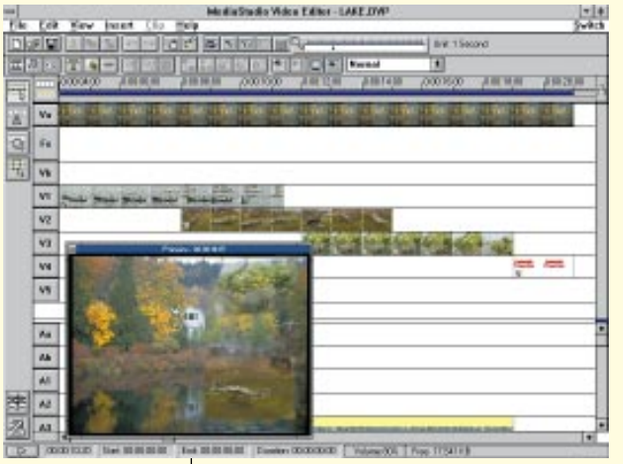
The feature that has impressed me most is the video overlay facility. Up to 99 channels are possible and each can have separately timed and designated paths. These can also have a degree of transparency which is ideal for giving an impression of dreaminess. MediaStudio's transitions list is also pretty impressive but I'll concentrate on the overlay feature

using the clips already supplied on the CD-ROM. It enables anyone producing promotion materials and corporate videos to produce some excellent results easily.

Imagine I'm an estate agent trying sell an expensive lakeside property and would like to make a short promo video expounding the beauty of the area as well as of the house itself. Fortunately, there is a bitmap of a house by a lake so, after launching MediaStudio, I need to bring this onto video channel A. To do this, I click on Insert and choose the LAKEHOME.JPG file from the sample\images directory on the CD-ROM and drop it onto channel Va. The still is obviously too short to be used for the background so its duration needs to be increased by dragging its handles out to 20 seconds.

I'm not putting anything on channel Vb but will use the overlay tracks instead. Again I click Insert and choose Video File and motorbot.avi from samples\video. I put this on channel V1 starting two seconds into the video sequence. To view the clip I double-click on the thumbnail images. Clicking on these with the right mouse button brings up a small menu including the Moving Path and 2D Basic option. Clicking this brings up a dialogue box where I can change all manner of features. The image is too large as I want the motorboat to appear to be moving across the lake in front of the house and it needs to be in proportion. I click on the Start point denoted on the path diagram and change the width and height to 60 and 40 pixels respectively. The same has to be done for the end position or the image will seem to grow as it moves. The path also runs left to right yet the boat goes right to left in the clip, so I click the Reverse Path icon. I move the start and end points to just off the image area. There is an Actual Image icon and you can run the effect in a tiny thumbnail window. To give a dream-like effect I change the Soft Edge to Large, then using the Overlay Options I change the Transparency to 65 percent which strengthens the effect.

I then do the same thing with a clip of an otter swimming (called OTTERS.AVI). For effect, I want this clip to appear in the wake of the boat on the bottom righthand corner of the image. First I put the image on channel V2 starting after seven seconds, but the sequence is too long so I shorten it using the clip's drag handles to make it seven seconds long. Again I choose the 2D Basic option and shrink the image, but move the end point onto the corner of the screen and then change the Soft Edge to Medium.



Multiple overlays with paths and transparency in U-Lead's MediaStudio 2.0

To finish the sequence off, I bring in the clip of a squirrel at 11 seconds and cut it down to seven seconds in length. Using the Overlay Options I set the opening transparency to 0 percent and the end to 60 percent. The effect will be to fade the overlay up as the clip progresses. Using 2D Advanced I can change the shape of the image to cut out the corners which have unwanted detail. I can also rotate the image slightly.

For the last two of the 20 seconds I use the Title Clip facility to add text to the image. This can be treated in the same way as any other clip and a path, rotation and distortion added. When I've done what I set out to do, I can run the Preview to see all the effects before clicking File, Create, Video File and then changing the options to achieve a reasonable image quality. Creation of the final video sequence is relatively quick, as it should be on a Pentium-90. One of the best features of this program is being able to see each frame as it is created.

PCW Contacts

From next month, the Multimedia column will be edited by **Panicos Georghiades** and **Gabriel Jacobs.** They can be contacted on **g.c.jacobs@swansea.ac.uk**

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Better late than never...

... was how Steven Helstrip felt when he finally got hold of the Windows 95 beta, though in some ways, he thinks it was worth the wait. Also, if you're in need of some serious samples, read on.

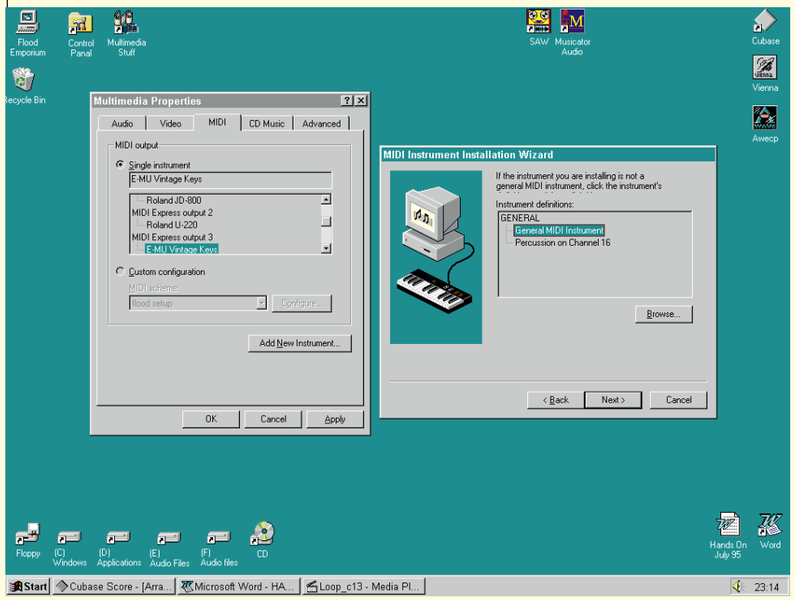
I recently installed the Windows 95 final beta to see what all the fuss has been about. It took an entire weekend to get it working properly, but when I did I found some pretty interesting changes in the MIDI department. Although I expected it to be much the same as 3.1, several nice touches have been added, including the ability to re-name MIDI output ports and build lists of instruments in your setup.

Sadly, though, there's no integration with current Windows applications. For example, although Windows 95 knows about the Vintage Keys sound module dangling from port three on my MIDI interface, Cubase doesn't. When native applications arrive this will change. Instead of selecting a port and MIDI channel you'll be able to select a synth you want to talk to and Windows 95 will remember where it is.

I mentioned two months back that Opcode is developing a plug-in module for Windows 95 called OMS (Open Music System). Any application that's OMS-aware will link to a document containing lists of all the sounds and patches in your setup. It also has multi-client drivers allowing several applications to share MIDI ports. This will allow, for example, a patch editor to communicate with your synth at the same time as a sequencer. It also lets you send MIDI data from one application to another for synchronising and sharing system exclusive data.

Before installing Win95 it's advisable to make sure everything is set up correctly for Windows 3.1, otherwise it's a nightmare to configure drivers, as I soon discovered. After about a week using Win95, a curious thing happened. I turned my PC on and Windows told me that it had detected a new piece of hardware — an OPL3 FM synth. It was talking about the FM synth on my AWE-32 sound card, but it certainly wasn't new. Having agreed that it might be useful to have access to it, Windows went off and installed the drivers.

Windows 95's Wizards for adding new kit to your setup. Unfortunately, there's no integration with current 3.1 apps



The latest news

There was lots happening at April's MIDI and Electronic Music Show, including the UK launch of a new D2D system for the PC. Called tripleDAT, the package includes a two-input digital I/O card (SPDIF and AES/EBU) with additional analogue output for monitoring, a MIDI interface, infra-red transmitter and some excellent software.

When used with a 90MHz Pentium with 16Mb RAM it will record and mix up to eight stereo tracks, or 12 mono. The software has all the usual editing facilities you would expect from a high-end package. Editing is non-destructive, since all the mixing, looping and effects are calculated in realtime at playback.

The package has DSP-based effects, including a four-band parametric EQ, reverb, compressor and pitch shifting. Further effects will be available as plug-in modules. A really interesting feature is the infra-red transmitter which provides an on-screen remote control for DAT machines. It also lets you use a DAT for backing up your hard drive when connected to the digital I/O card.

tripleDAT is distributed in the UK by Koch Media and costs £999 including all software, MIDI kit and two TOSLink cables. There will be a *PCW* review in next month's First Impressions.

PC Services has just announced a new MIDI adaptor kit for SoundBlaster-compatible cards. As well as providing two MIDI outputs it has a two-into-one

Left *tripleDAT is a seriously low-cost 16-track D2D.* **Below** *MIDI kit and line mixer for just £20*

line mixer and headphone socket. It plugs into the joystick/MIDI port and takes its power from the PC. The adaptor is a genuine bargain at just £20. Also planned for release this summer is a two in/out MPU401-compatible MIDI interface. It's expected to cost around £99.

Sequencing tips: using templates

When Cubase loads it opens a default song (def.all) that's used as a template for your MIDI setup. Unless you've made any changes to it, it will just show 16 empty tracks. There are several things you can do to customise the default settings which can save you time and make Cubase, or any other application, a better place to work.

First of all, if you have more than one MIDI instrument in your setup it's important to allocate each with a separate MIDI channel. For multi-timbral modules this may mean setting aside several channels or even a unique MIDI port. If you make this setup permanent you'll soon become familiar with the whereabouts of each instrument, and when songs are played back in future they'll play the original sounds. In addition, it allows you to create an instrument list to label the MIDI

Analogue To Digital II

Unless you've been hiding 400 feet beneath the North Sea for the best part of the nineties, you won't have missed the revival of analogue synths. If, like me, you don't own enough of them, the next best thing is to have the samples. Analog To Digital II is one way to get hold of them, with over 700 samples from some of the best including the Roland Juno 6, Sequential Prophet5 and miniMoog to mention just some. The CD also features the more recent Roland JD800, E-MU Vintage Keys and Korg M1.

The sounds are categorised into seven sections: atmospheres, loops and tunes, drums and percussion, keyboards and synths, pads and moods, special effects, and waveforms. To go through all the sounds we'd need a 40-page supplement so I'll just mention some.

Track 3, Planets, has nine seriously tense atmospheres that wouldn't sound out of place in any of the Terminator films. All have been recorded in stereo without any additional mixing, and where possible the pitch is listed. The CD is dubbed as an essential tool for dance production. It's also a great library of sounds for film soundtracks and effects.

Among the keyboards and synths is a diverse range of highly usable samples and effects. These aren't just boring presets that have been played to death for the past decade or so. For string and organ patches, samples are taken from intervals of fifths (some cases in octaves) to create a multi-sampled keyboard. All in all, a great selection.

The most disappointing section of the CD is the drum and percussion samples, which I didn't find at all inspiring. You may have a different opinion, though. There will be ten samples from A2D2 on next month's cover CD.

Price *£59.95 (inc VAT and postage)*
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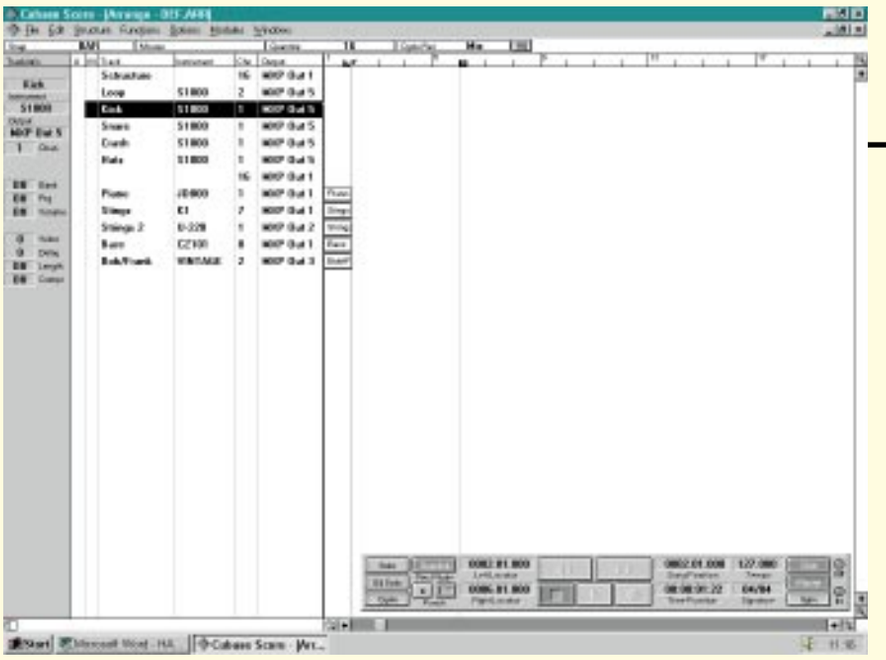


Default songs, or templates, can save you time when starting a new sequence

channels on each port. To do this, select channel 1 on port 1 and double-click in the instrument box within the Track Info column. Once you've given it a name, in my case JD800, it will display the instrument each time you select that channel.

You should do this for all the channels on each port. After you have done that, you can save the song as def.all and instrument names will be applied to all future songs.

The default song remembers just about every setting there is in Cubase including quantisation values, grid settings in the edit pages, left/right locator positions, drum maps and even what tool you last used in grid edit. So, spend some time to set up the most common values you use — it will save you time in the long run.

Starting your arrangements from bar two will let you use the first bar to send setup information to your keyboards such as program change, system exclusive messages, etc. If you do this, you don't have to worry about setting up patches on your synthesisers the next time you return to the song. If you start your song on bar one with program change information, glitches usually occur. Some MIDI instruments also take a few moments to respond to the information.

It's useful to label all the tracks you use and set them out in a uniform way. This will tell you exactly what each track is doing when you come back to work on the song again. By using track one as a marker, you can create parts for each section of your arrangement and give them names: intro, verse 1 and chorus, etc.

Below the marker track I group together all the percussion tracks, so I always know the kick drum is on track three, for example. To make the screen easier to read I also insert an empty track between percussion and instruments.

The def.all isn't the only template you can set up. You can create your own and save them in a template folder. If you regularly write for a string ensemble, you could create a template that sets up all the tracks you will need with program change messages to select the patches you use. If you have Cubase Score, you can set up the staves for each part.

PCW Contacts

If you have any tips related to MIDI or digital audio, send them in to the usual *PCW* address, or to **steve_helstrip@pcw.ccmail.compuserve.com**. We will also try to solve any problems you may have with MIDI.

PC Services **0181 658 7251**
Koch Media **01252 714340**

Recycling the oracle

Tim Anderson **looks at techniques for reusing objects in Delphi, unearths some unexpected problems, and ponders the value of sitting a newly introduced Visual Basic exam.**

"Object orientation", the programming buzzword of the nineties, promises many benefits. But putting objects to work is not always straightforward, partly because every development language seems to implement them in a different way.

Visual Basic, for example, is only superficially object-oriented: you cannot create new classes or sub-class existing objects like forms or controls. By contrast, Borland's Delphi is deeply object-oriented, supporting all the key features of the genre. There are still some surprising shortcomings. I received this letter from Mike Lockyer:

"I have imported one of our applications, that was developed using Borland Pascal for Windows (BPW), into Delphi with little difficulty (50k lines in less than a day). The environment is better and the integrated debugger is far superior to BPW.

"The conversion uses a set of old libraries supplied with Delphi to support BPW. My task was then to make use of the new TForm class instead of the old BPW type of TDialog.

"I have one query (the same one I asked Borland, without success): I want to create two similar forms — Form A and Form B. The latter contains everything that A contains plus a few new things, for instance another edit box.

"In Delphi, I can create Form A using TForm and create the dialogue components very easily (much better than using BPW), but when I create Form B to inherit from Form A, I cannot inherit anything. I have tried using a template but that makes a copy of the code, which I think is silly and certainly not object-oriented. If Delphi is properly object-oriented then it should be possible to create a new form and then inherit from that."

Creating a template in Delphi may be easy, but object-oriented it is not

Mike has a fair point, which I have discussed with Borland. What he wants to do is to design a custom form — easily done in the visual environment — and then to use inheritance to create slightly adapted forms from his newly customised base.

Delphi is able to offer several ways of doing this. First, there are templates. These are laughably easy to create: simply choose Options/Gallery when your project is open, select Add, and save one of your project's forms as a template. Next time you choose New Form, your customised form will be offered as one of the options. It is easy, but crude, since Delphi is only pasting code into your project — exactly the bad old habit we are meant to be losing. An object-oriented solution would inherit from the customised form, so that no code would have to be copied, and so that a future change to the base component would be automatically carried over into those projects which use it. Templates may be useful but, as Mike observes, they are not object-oriented.

Solution two is to create a component, and this works best with controls. For instance, you can create a customised button to use on all your company's forms (see panel). Another example would be an edit control with additional validation methods. This is a truly object-oriented technique for making code reusable, and not hard to implement in Delphi. But it doesn't meet Mike's need, which concerns forms rather than controls. You cannot place form components directly onto the component palette.

The workaround is to create components like Delphi's common dialogue controls; non-visual objects that display a form via an Execute method. The form can be designed in the normal way in Delphi. Then use File/New Component, and base the new object on TComponent. Next, create an Execute method that instantiates an object of TMyForm (or whatever your custom form was called).

This process is described in Delphi's *Component Writer's Guide* (chapter 13). You can add properties and methods that further customise the form. Delphi makes it easy to create controls at runtime, so there are many possibilities.

Although it's a highly effective technique, it is still not what Mike is looking for. Why can't you do with forms what you can do with other controls, declare new object types and merrily sub-class further types from your own custom classes?

Here we hit a Delphi limitation: Delphi's visual environment only allows new forms derived from TForm (the base form class). When you create a new form, Delphi declares a new class default name (TForm1) derived from TForm. Simultaneously, Delphi writes a standard Windows resource file default name TFORM1.DFM, which is an external file. The problem comes when you try to base a class on TFORM1. Deep in Delphi's VCL (the Pascal source code for Delphi's built-in objects), is a Create method for TForm which includes the following line:

```
if ClassType <> TForm then ReadComponentRes(ClassName, Self)
```

This means that when you try to derive a class TForm2 from TForm1, the compiler looks for a resource file called TFORM2.DFM. But it will not exist unless you create it separately. Of course there's nothing to stop you doing that or even adapting Delphi's VCL. The problem is not a fundamental limitation of Object Pascal but a side effect of the way in which Delphi's TForm type is designed.

But beware: hacking the VCL is rather like cracking open your laptop and soldering in some new components — it might work, but you're on your own with no guarantees.

Borland does promise that 32-bit Delphi, due out "soon after Windows 95" will fix this, so you may be better off waiting. For a contrast next month, I'll look at how Visual FoxPro handles exactly this issue.

Delphi defence

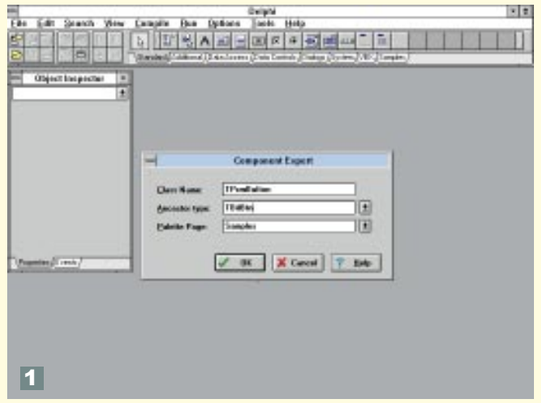
Judging from our mailbox, the newly broadened scope of this column is well appreciated. The following came from John O'Connell:

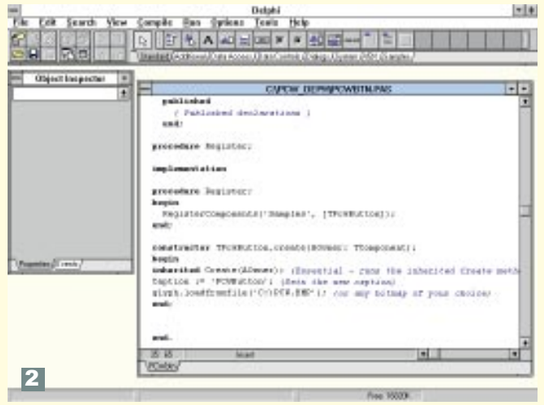
"I welcomed your review of Delphi in April's *PCW* and am pleased to hear that you'll include Delphi as well as VB in your *Visual Programming* column.

"Regarding this review, how do you justify your conclusion that 'VB's database controls and language features are better then Delphi's for local databases'?

"I presume that you have compared Delphi's database controls with the data-

Creating a custom component in Delphi





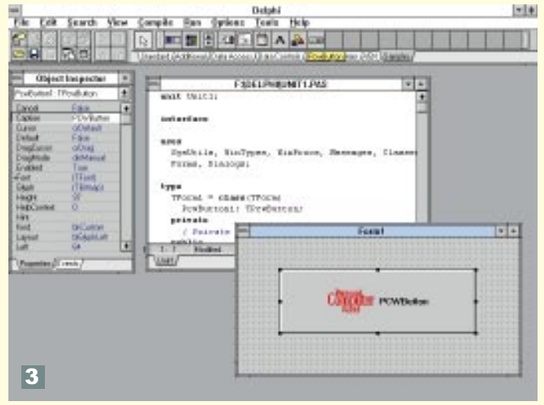
1 *This example creates a customised button which displays the PCW logo. It involves declaring a new class which inherits from one of the built-in classes: TBitBtn. The starting point is to choose File/New Component and to specify the name of the new class and of the ancestor class*

2 *The component is customised by overriding the constructor of the ancestor class. In the public part of the class definition, add the following line:*

```
constructor Create(AOwner: TComponent); override;
```

Then, in the implementation, write the new constructor:

```
constructor TPcwButton.create(AOwner: TComponent);
begin
inherited Create(AOwner); {Essential - runs the inherited Create method}
Caption := 'PCWButton'; {Sets the new caption}
glyph.loadfromfile('C:\PCW.BMP'); {or any bitmap of your choice}
end;
```



3 *Name the unit PcwBtn (by amending the first line of the code) and save as PCWBTN.PAS. Then choose Options/Install Components and select this file using the Add button. Choose OK, and the component will be added to the samples tab in the component palette. It is used in exactly the same way as the standard Delphi button. When you add it to a form, the code for that form will declare an object of type TPcwButton, thus picking up the customised code*

base VBX's that come as standard with VB 3.0 Professional? Incidentally, it doesn't even include a database grid control as Delphi does. And, there are numerous other database control features that Delphi has, but VB lacks. Did you review a very early beta version of Delphi? If so, then how about a review of the shipping product — then you could draw more accurate conclusions.

"As for your other conclusion that 'Microsoft is likely to keep VB one step ahead of Borland in implementing the latest Windows features', well of course they are. After all, for ages Microsoft refused to give Borland access to the implementation details for OCX's but it gave those details to all its favourite VBX developers. Microsoft's excuse for this? 'Borland aren't VBX developers'. No, they're the competition. Need I say more?

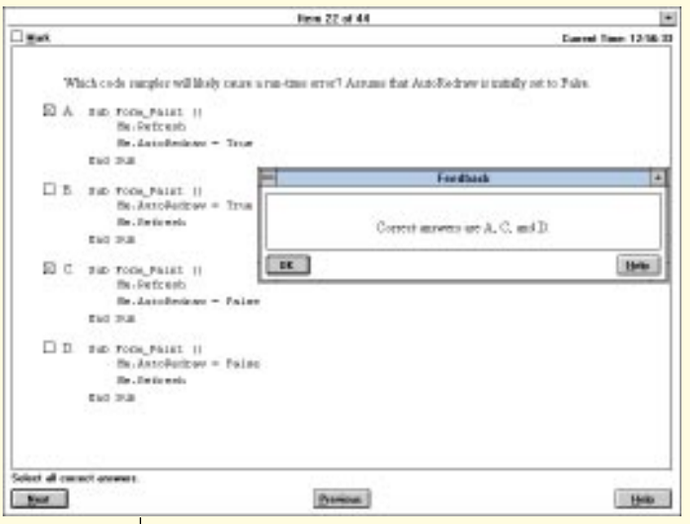
"Aside from these gripes, I did enjoy your article, so keep up the good work."

I agree that Delphi's data-aware components, particularly DBGrid, improve on the rather skimpy set supplied with VB Pro. But there are many superb data-aware controls for VB which do everything that Delphi's do, and more — things like Aware/VBX, Data Widgets, data-aware rich text controls like AllText and Visual Writer, and endless others.

Incidentally, one Delphi and VB supplier asked me to emphasise that these VBX's are not data-aware in Delphi — Delphi only supports level one VBX controls, and its native database engine is quite different. Is this unfair? Maybe, but developers are in the business of applications development, not of being fair to Borland, Microsoft or any other company. And if Delphi succeeds (which I believe it will), an equally strong third-party market will develop.

Even leaving aside the third-party components, I prefer VB/JET to Delphi for working with local tables. Although disguised by its poor documentation, VB's database language is great to work with: it offers dynasets, snapshots, querydefs, table objects, seek and findfirst methods, as well as methods for creating tables and indexes. And VB works much better with ODBC than does Delphi — sorry, but I'm not yet convinced by Delphi as a database language and I would expect this to improve in future versions.

Staying with letters, my thanks to David Boulding and Gary Wood of VisualTools (Europe) who thoughtfully wrote to tell me which of their VBXs work with which product — or more to the point, which do not work.



Wrong answers are politely corrected in the Visual Basic personal assessment exam

VisualTools sells Formula One, First Impression, ImageStream, VisualWriter and VisualSpeller, and here is an extract from their letter:

"Delphi. We understand that Delphi works extremely well with our products although ImageStream does not work with Delphi and VisualWriter has some problems. No wrappers.

"Powerbuilder. Powersoft is about to release a wrapper that works with Formula One and VisualSpeller, otherwise you need to use VBX and DLLs to connect. VBX support is weak.

"Visual Objects/CA. This product does not have VBX support built in but a third party, SuccessWare, has produced CLASS:VBX, an add-on which enables VO to work. To date we have heard of no problems with this.

"Gupta SQL for Windows. VBXs work quite well.

"TopSpeed/Clarion. Clarion is working hard at getting our product to interface with its product and has told us it is 'committed' to getting the two together.

"Visual C++ (Borland & MS). Both work with the DLLs & VBXs quite well although there are problems with ImageStream and Borland VC++.

"dBase for Windows. Works well but occasional problems with VisualWriter."

An interesting letter, but forgive me if I say it is not reassuring for developers wanting to slot VBX controls into environments other than Visual Basic itself. This is not a criticism of VisualTools: other VBX vendors suffer exactly the same problems and it is most considerate of VisualTools to pass on this information. But you need to specifically check compatibility before buying any VBX to be used outside VB. And that raises the question: will the new OCX standard be any better? The dream of visual components that work seamlessly across different applications is still far from reality.

Assess your VB skills

Visual Basic know-alls can now have a piece of paper to certify their expertise — it's part of Microsoft's Certified Professional programme, and the VB exam is one of the elective papers in the set required to become a Certified Solution Developer.

The exams are being run by Drake Prometric and cost £65 per paper; but if you're wondering whether you would make the grade, a personal assessment CD is yours for the asking.

The Visual Basic part contains 44 sections and is by no means a trivial pursuit: you would need to have an intimate knowledge of VB and Windows to score 100 percent. Because the questions are in sections such as Database, and DDE/OLE, the assessment (and the exams themselves) exposes any areas of weakness in your knowledge. Surprisingly, this assessment won't advise you whether or not you would be likely to pass or fail the real thing, although the rumoured pass mark is 60 percent.

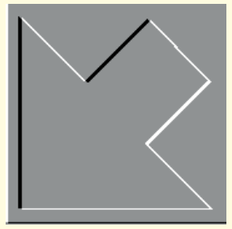
Certification gives some limited reassurance to companies employing consultants or commissioning applications. According to Drake, the concept was pioneered by Novell and was then enthusiastically adopted by the likes of Microsoft, Lotus and IBM.

But rather than all these proprietary qualifications, wouldn't it be nice to see some certified hype-busters, or FUD (fear, uncertainty and doubt) detectors? Oh well, there's always *PCW*.

PCW Contacts

Microsoft personal assessment CD and certified developer programme **01345 001000**; or to book an exam, call **0800 592873.**

Tim Anderson can be contacted via *PCW* at the usual address, or **freer@cix.compulink.co.uk** or **100023.3154@compuserve.com**



Piece work

Having set up a game of Go-Moku in Visual Basic last month, Mike Liardet strengthens play and shows how you can use the same code to play other games such as noughts and crosses

Last month I introduced the game of Go-Moku, discussed some of the game's strategies and tactics and presented the core code used to score moves. This month's article will tie everything up by presenting the user interface to the game and describing how the program's capabilities can be extended for stronger play. I shall develop the program in such a way that other related games can be implemented by re-using much of the code, using as an example a modification to the main program that can play noughts and crosses. With similar modifications it is also quite easy to implement related games like Fours or Connect-4.

Fig 1 shows the Go-Moku program in action. Play proceeds by clicking the mouse at an intersection point on the board to indicate where a counter is to be played. The small embellishment shown on one of the black counters near the top highlights the last move made by Black (the computer) and the large white arrow mouse pointer indicates that it is White (the person) to move. When it is Black's move the mouse pointer becomes a black rectangle. White is about to lose as there is an open-ended diagonal line of four Black counters and White can only block one end of this line, for example at the point underneath the mouse pointer.

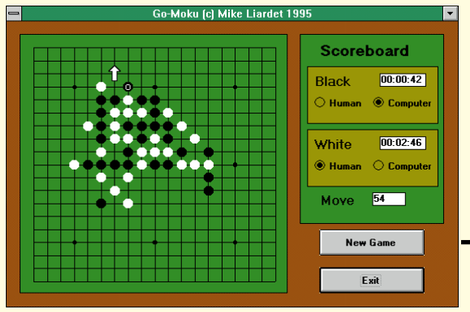


Fig 1 The Go-Moku program in action

The scoreboard gives the time taken by each side, and also indicates which side is a person and which is the computer. The game is implemented for person v. person play, person v. computer, computer v. person or computer v. computer. It also allows the user to change the playing arrangements at any time, even in the middle of a game. There are only two command buttons, one to start a new game and the other to Exit from the program.

Instead of placing all the implementation code in one form module, the code has been broken up into three modules: game.frm, game.bas and gomoku.bas. The reason for this will become clear as we proceed.

Fig 2 shows the Visual Basic form design for the game and Fig 3 lists all the controls used in the form, along with a description of their function.The properties of the form itself are set to be a "fixed single" border with no "maximise" option in its control menu. This is a slightly cowardly programming approach as it makes it impossible to resize the form (apart from minimising it which makes its interior invisible), so there is no need to implement any code to cope with resizing actions by the user. It would be better to allow the form to be resized, but then we have the painful task of changing its internal layout (in the form_resize event) every time this is done. Try it if you like — and don't forget to validate the minimum feasible sizes, below which nothing can be drawn

Fig 2 Form design for the game

The form is dominated by a large rectangular picture box used to display the main play area. To one side is another picture box containing the scoreboard. The picture boxes are not strictly essential. For example the board could be drawn straight onto the form and the various scoreboard controls could also be placed there as well, but it is easier to organise the form, with related elements grouped together, if picture boxes are used in this way.

The scoreboard picture box contains two picture boxes, one for each player, and these each contain two option buttons along with labels containing the colour of the players' counters and the time taken to make their moves. Although the time display looks like a text box it is actually a label made to look like a text box. Labels cannot receive user input, and as the time display is output-only it is better to use labels in this type of situation.

Most of the controls relating to the scoring for the two users are implemented as "control arrays". The scoreboard controls for each player have the same underlying name, but are differentiated by an index value; thus labTime(0) gives player 1's time and labTime(1) applies to player 2. Control arrays simplify the processing of the user interface. It is essential to contain the two pairs of option buttons in their own picture boxes as this is how Visual Basic interprets option grouping. Clearly it is not possible for player 1 to be both human and computer simultaneously, but as the two

***Fig 3** The controls used in the VB form and their function*

```
cmdExit          - the Exit command button
cmdNewGame       - the 'New Game' command button
Form1            - the form (window) used for the game
Label1           - the 'Scoreboard' textual label
Label6           - the 'Move' textual label
labMove          - the Move Number box
labPlayer(0)     - shows Player 1's colour
labPlayer(1)     - shows Player 2's colour
labTime(0)       - shows the time taken by Player 1
labTime(1)       - shows the time taken by Player 2
optComputer(0)   - is set if Player 1's moves made by the computer
optComputer(1)    - is set if Player 2's moves made by the computer
optHuman(0)      - is set if Player 1's moves made by the user
optHuman(1)      - is set if Player 2's moves made by the user
picGame  - picture box for the game board display
picScore         - picture box for the scoreboard display
Picture1         - picture box containing Player 1's details
Picture2         - picture box containing Player 2's details
Timer1           - Timer
```

option buttons for player 1 are held in the same picture box, VB does not allow them both to be on simultaneously.

The code used to process the form is shown in Fig 4, and is remarkable on two counts. Firstly, it is short. There is no code at all to service events where the user clicks one of the option buttons. This is quite surprising as, for example, there is a big difference between two people playing each other and the computer playing itself.

Even more surprisingly, there is nothing in the code that relates to the game of Go-Moku. It contains none of the playing rules, knows nothing about the board display or even the name of the game or the colour of its pieces. In short the form is a general purpose game-playing form which can be used to support many two-player games.

Of course the form does not cover all games. It is limited to forms of play where moves are made alternately by clicking with the mouse in the play area. Left exactly as implemented here, the form and its code could not be used directly for games like chess or draughts. These require a drag-and-drop facility: when the user is moving a piece it can be picked up with the mouse and dropped at its destination. A minor modification could extend the form to cope with this more complex form of move mechanism, but it has been omitted as in Go-Moku and related games you only need to click on a destination point.

Most of the hard work is done by the timer1_timer routine. Timer1 was set up in the form design to be called every second. Most of the time the service routine simply updates the time display for the player with the move, but if it detects that the option button is set to "computer" for the current move then it calls the routine that generates and displays that move.

The code that implements Go-Moku lies in four routines which are called from the main form (Fig 5). GameInit performs all necessary initialisation for the game. This sizes the picture box, which is supplied as one of its arguments, and returns the name of the game and the name of the the two sides so that these can be slotted into the relevant parts of the form display. GameStart is called every time a new game is to be started, in particular when the user presses the New Game command button, and also from Form_Load. Its main function is to redraw an empty board and set up the underlying data structures ready for a new game.

Apart from these two routines, only two others are needed: one to generate the computer's move and the other to supply the person's move, in the form of the (X,Y) co-ordinates of the mouse-hit in the game's picture box. Both routines return the outcome of the move: a win, loss or draw for the mover, or an indication that the move was an ordinary routine legal move or that it was illegal. These results are defined as global constants in Game.bas: ILLEGAL, LEGAL , DRAW, WIN0 and WIN1

Most of the time the two routines quietly accept the latest move and increment the move number, which is represented on the scoreboard. Indirectly this determines the player with the move: when the move number is odd player 1 has the move, and when it is even it's player 2. The timer routine uses this move number value to determine the correct player for updating the time display.

Obviously the GameMoveComputer routine is unlikely to return that it has made an illegal move, but it is quite possible that the human move was incorrect. For example, in the case of Go-Moku the player may have clicked over a point that was already occupied or nowhere near any point at all. These two routines are both written so that they can be called at any stage during a game. Neither is preset with the side it represents at the start of a game and so can freely be called upon to handle moves for either side. This gives players complete flexibility: they can change sides at any time, or get the computer to finish the game automatically, and so on.

The DisplayOutcome routine (contained in the form code) is used to handle the returned value from these routines. When the game is over it displays a win, loss or draw message box as appropriate, or beeps in response to an illegal move. Once a game is over there is no requirement to start a new game immediately, but no further moves are accepted by either side. The timer is stopped so that neither clock changes. No computer move can be

***Fig 4** Visual Basic code for the game form shown in Fig 2*

```
Option Explicit
'Name of the game
Dim msTitle As String
'Who we are timing player 0 or player 1
Dim TimeWho As Integer
'When we started timing the player
Dim TimeStart As Double
Sub cmdExit_Click ()
    End
End Sub
Sub cmdNewGame_Click ()
'User chose new game/called from form_load
Dim ignore As Integer
  'Prevent user input
    InputAllowed False

  'Always human v human to start with
    optHuman(0) = True
    optHuman(1) = True
  'Start new game
    GameStart
  'Reset scoreboard
    labMove = 1       '= stackTop+1
    labTime(0) = "00:00:00"
    labTime(1) = "00:00:00"
    TimeWho = 0       'Time Player0..
    TimeStart = Now   '..from Now
    timer1.Enabled = True        (contd.)
```

```
  'Now allow user input
    InputAllowed True
End Sub
Sub DisplayOutcome (ByVal viOutcome As Integer)
'Move just made - display result
    Select Case viOutcome
    Case ILLEGAL
        Beep
    Case WINO
        MsgBox labPlayer(0) & " wins!", 0, msTitle
        timer1.Enabled = False
    Case WIN1
        MsgBox labPlayer(1) & " wins!", 0, msTitle
        timer1.Enabled = False
    Case DRAW
        MsgBox "Honourable Draw!", 0, msTitle
        timer1.Enabled = False
    Case LEGAL
        labMove = labMove + 1 'on to next move..
    End Select
End Sub
Sub Form_Load ()
Dim sPlayer0 As String
Dim sPlayer1 As String
  'Bar any move from user until we are ready
    InputAllowed False
  'Centralise form
    form1.Move (screen.Width - form1.Width) / 2,
(screen.Height - form1.Height) / 2
   'form1.Borderstyle= 1 'fixed single (which is non-
resizable) already set
    'form1.MaxButton = False
    form1.Show
  'One-time initialisation
    GameInit picGame, msTitle, sPlayer0, sPlayer1
    form1.Caption = msTitle & " (c) Mike Liardet 1995"
    labPlayer(0) = sPlayer0
    labPlayer(1) = sPlayer1
  'start a new game - human v human
    cmdNewGame_Click

End Sub
Sub InputAllowed (ByVal allowed As Integer)
    'optHuman(0).Enabled = allowed
    'optComputer(0).Enabled = allowed
    'optHuman(1).Enabled = allowed
    'optComputer(1).Enabled = allowed
    picGame.Enabled = allowed
    cmdNewGame.Enabled = allowed
    If allowed Then
        If labMove Mod 2 = 1 Then
            picGame.MousePointer = 4  'Black square
        Else
            picGame.MousePointer = 10 'White arrow
        End If
    Else
        picGame.MousePointer = 11 'Hourglass
    End If
End Sub
Sub picGame_MouseUp (Button As Integer, Shift As
Integer, X As Single, Y As Single)

    InputAllowed False
    DisplayOutcome GameMoveHuman(X, Y)
    InputAllowed True
End Sub
Sub Timer1_Timer ()
  'Adjust time for player we are waiting for
    labTime(TimeWho) = Format$(Now - TimeStart,
"hh:mm:ss")
  'Check if someone has just moved
    If (labMove - 1) Mod 2 <> TimeWho Then
      'yes, so change who we are timing..
        If TimeWho = 0 Then
          'it was player0, so start timing player 1
            TimeWho = 1
            TimeStart = Now - CVDate(labTime(0))
        Else
          'vice versa
            TimeWho = 0
            TimeStart = Now - CVDate(labTime(0))
        End If
    End If

  'Check if its the computer to move
    If optComputer(TimeWho) Then
        InputAllowed False
        DisplayOutcome GameMoveComputer()
        InputAllowed True
    End If

End Sub
```

generated, and if the player attempts another move by clicking in the play area, the GameMoveHuman function just returns the game result again, causing the message box to be redisplayed.

Most of the code to support the four routines called from the game form was included in last month's listing. Even this code can support any similar game. The only section of the program that is really specific to Go-Moku is the Gomoku.bas code, shown in Fig 6. This contains board dimensions (19 x 19), length of a winning line (5) and the routines to draw a board and display pieces.

To prove the generality of the game playing form and the other modules, we have adapted it to play noughts and crosses. Fig 7 shows the implementation in action. Notice the black rectangle in the top right square. This is the mouse pointer which is displayed when player 1 is to move. Unfortunately Visual Basic offers only a limited choice of mouse pointers and this rectangle and the white arrow (see Fig 1) are the only remotely appropriate ones. There are Dynamic Link Library (DLL) calls that can be made to create custom mouse pointers, but unfortunately they do not work very well with VB.

The Game.frm and Game.bas modules remain unchanged for the noughts and crosses implementation. Only one new module is needed. The code for this is given in Fig 8. Principally this has some different drawing routines to display a different sized board (3 x 3) and different pieces, the familiar "X"' and "O"'. Of course, for you may think that noughts and crosses is not a particularly interesting game, but this implementation shows the flexibility of the generic game implementation that we have developed.

Also this implementation appears to be unbeatable (I have not exhaustively tested this). Notice that GameMoveComputer function in Game.bas does not contain a mini-max method for move generation: it

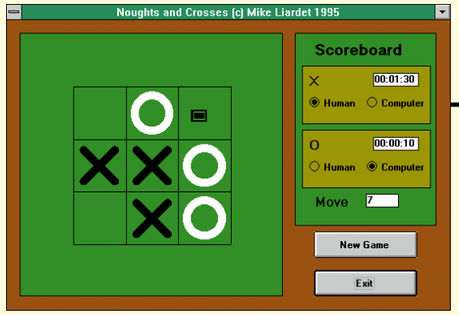


***Fig 7** With a minor adaption the Go-Moku program can play noughts and crosses*

simply looks at the available moves and picks what looks like the best move on the basis of a static scoring system. This seems to be good enough for optimum play at noughts and crosses. It would seem that, given any position it will always find the one winning move if there is one, or the one defensive move to stave off defeat if that is what is needed.

This programming example gives a good example of the strengths and weaknesses of VB, when compared with a compiled object-oriented language like C++. In VB's favour, it is very simple to implement the user interface: the form design is simple and user actions are easily trapped by the various controls' event procedures. The development environment is excellent with the capability to switch at any time between coding, running and debugging.

On the other hand the VB compiler does not generate real executable code; instead it produces an intermediate interpreted "p-code", which is not as fast as native code generated by a true compiler. This does not matter much when the program is I/O bound, for example when it is servicing user actions and so on, but the cracks start to show when it is given a meaty computation. The mini-max method (which we have not implemented here) is one good example and VB simply can't get through anything like the number of iterations that could be achieved with compiled language. This means that it is not practicable to get it to analyse to the same playing depth and so ultimately, given the same algorithm as a fully compiled language, it will not play as strongly.

VB has a more subtle disadvantage which is also shown up here. That is its inability to support "sub-classing". The interface between the various modules is crude when compared with C++'s capabilities with objects. We are left with global or module declarations and that's it. It is very difficult to impose the right structure on a VB program so that different modules can be slotted in and handled correctly. But as we have shown, it can be made to work after a fashion.

The most obvious enhancement to the code given here would be to add the mini-max method to the GameMoveComputer routine. Surprisingly, the very basic move selector which we have implemented works quite well at Go-Moku and seems to be unbeatable at noughts and crosses. It never makes any out-and-out blunders. For example it will always complete a line of five if possible and block a line of four if possible. Several previous Low Levels have described the mini-max implementation so it should not be too difficult to slot it in here.

The game form is more a framework than the last word in game playing. It could be improved in many ways, still without becoming specific to any one game. As already mentioned, a drag-and-drop facility would enable it to be used for more complicated games like chess and draughts. In order to do this the required move mechanism for a specific game should be returned by an extra argument in GameInit (ie a value indicating either "point-and-shoot" or "drag-and-drop").

The scoreboard display could also be enhanced in such a way that it records the results of previous games in a series, possibly interfacing it to an INI file to remember the results of previous sessions. An Undo button would also be quite useful. This could undo the last move made, whether by the computer or human player, and some commentary on the move

***Fig 5** The four routines which are called from the Game form in order to implement the particular game being played.The two GameMove functions each return a result, indicating the consequences of the move*

```
sub GameInit (pic as control, sTitle as string, sPlayer0 as string,
sPlayer1 as string)
sub GameStart
function GameMoveHuman (X as single,Y as single) as integer
function GameMoveComputer () as integer
```

***Fig 6** Gomoku.bas code contains the essential parameters for playing Go-Moku, and the routines to draw the pieces and so on*

```
Option Explicit
Const GAME_NAME = “Go-Moku”
Const GAME_PLAYER1 = “Black”
Const GAME_PLAYER2 = “White”

‘Values for directions used in scoring
Global Const NUM_DIRNS = 4
Global Const NORTH = 0
Global Const NORTH_EAST = 1
Global Const EAST = 2
Global Const SOUTH_EAST = 3
Global Const LAST_DIRN = NUM_DIRNS - 1
‘Classic Go Board has 19 by 19 points
Global Const N_SIDE = 19
Global Const NN = N_SIDE * N_SIDE
Global Const MOVE1 = NN \ 2     ‘First move always in the
middle
Global Const WIN_LENGTH = 5     ‘length of a winning line

Dim gridsize As Single
Sub BoardDraw ()
‘Draw an empty Go-board in picture box
Dim i As Integer

  ‘Clear old game
    picGame.Cls
    picGame.FillColor = QBColor(0)’Black
    picGame.FillStyle = 0’Solid
    gridsize = picGame.Width / (N_SIDE + 1)
  ‘Draw all lines
    For i = 1 To N_SIDE
       picGame.Line (gridsize, gridsize * i)-(gridsize *
N_SIDE, gridsize * i)
       picGame.Line (gridsize * i, gridsize)-(gridsize *
i, gridsize * N_SIDE)
    Next i

    If N_SIDE = 19 Then
      ‘Classic Go Board - plot nine marker points
       picGame.FillStyle = 0 ‘Gives solid circle
       picGame.Circle (gridsize * 4, gridsize * 4), grid-
size / 8
       picGame.Circle (gridsize * 10, gridsize * 4),
gridsize / 8
       picGame.Circle (gridsize * 16, gridsize * 4),
gridsize / 8
       picGame.Circle (gridsize * 4, gridsize * 10),
gridsize / 8
       picGame.Circle (gridsize * 10, gridsize * 10),
gridsize / 8
       picGame.Circle (gridsize * 16, gridsize * 10),
gridsize / 8
       picGame.Circle (gridsize * 4, gridsize * 16),
gridsize / 8
       picGame.Circle (gridsize * 10, gridsize * 16),
gridsize / 8
       picGame.Circle (gridsize * 16, gridsize * 16),
gridsize / 8
    End If
    DoEvents ‘ to see the results
End Sub
```

```
Sub BoardInit (sTitle As String, sPlayer1 As String,
sPlayer2 As String)
‘one time display initialisation
  ‘Make sure picture box is square, in ###largest way
    If picGame.Height < picGame.Width Then
       picGame.Height = picGame.Width
    Else
       picGame.Width = picGame.Height
    End If
  ‘Must have autoredraw
    picGame.AutoRedraw = True
  ‘Return game title, etc
    sTitle = GAME_NAME
    sPlayer1 = GAME_PLAYER1
    sPlayer2 = GAME_PLAYER2

End Sub
Sub BoardPieceDraw (col As Integer, row As Integer,
colour As Integer, highlight As Integer)
‘Draw a piece of required colour in (Col, Row),
highlighted if necessary
    picGame.FillStyle = 0 ‘Gives solid circle
    If colour = BLACK Then
       picGame.FillColor = QBColor(0)
       picGame.Circle (gridsize * (col + 1), gridsize *
(row + 1)), gridsize / 3, QBColor(0)
       If highlight Then
          picGame.FillStyle = 1 ‘Outline
          picGame.Circle (gridsize * (col + 1), gridsize
* (row + 1)), gridsize / 6, QBColor(15)
       End If
    Else
       picGame.FillColor = QBColor(15)
       picGame.Circle (gridsize * (col + 1), gridsize *
(row + 1)), gridsize / 3, QBColor(15)
       If highlight Then
          picGame.FillStyle = 1 ‘Outline
          picGame.Circle (gridsize * (col + 1), gridsize
* (row + 1)), gridsize / 6, QBColor(0)
       End If
    End If
    DoEvents ‘to see the results
End Sub
Function BoardXYValidate (ByVal X As Single, ByVal Y As
Single) As Integer
‘Validate X,Y mouse hit by user
Dim i As Integer
Dim j As Integer
    X = X - gridsize ‘compensate for offset of board in
picGame
    Y = Y - gridsize
    i = (X + gridsize / 2) \ gridsize
    j = (Y + gridsize / 2) \ gridsize
    If Abs(i * gridsize - X) > .2 * gridsize Or Abs(j *
gridsize - Y) > .2 * gridsize Then
       BoardXYValidate = -1
    ElseIf i < 0 Or i >= N_SIDE Or j < 0 Or j >= N_SIDE
Then
       BoardXYValidate = -1
    Else
       BoardXYValidate = i + j * N_SIDE
    End If
End Function
```


PCW Cover Disk
The full code for this month’s Low Level is on the cover disk given with this issue of *PCW*.

sequence would be a nice touch.

With computer-generated moves it is often a good idea to enable the user to specify a level of play, and possibly include a Play Now interrupt button. The “level” facility not only enables the players to set the standard of play in line with their own level of expertise, but it also determines the length of time the computer takes when choosing its move. Generally speaking, higher levels take considerably longer than lower levels and with a slower processor the advanced play response time may become unacceptably slow. The interrupt button can force the best available move for an impatient user, before the analysis is complete.

PCW Contacts

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***Fig 8** OXO.bas code. This is used in place of Gomoku.bas; then along with Game.frm and Game.bas it implements noughts and crosses*

```
Option Explicit
Const GAME_NAME = “noughts and crosses”
Const GAME_PLAYER1 = “X”
Const GAME_PLAYER2 = “O”

‘Values for directions used in scoring
Global Const NUM_DIRNS = 4
Global Const NORTH = 0
Global Const NORTH_EAST = 1
Global Const EAST = 2
Global Const SOUTH_EAST = 3
Global Const LAST_DIRN = NUM_DIRNS - 1
‘Classic Go Board has 19 by 19 points
Global Const N_SIDE = 3
Global Const NN = N_SIDE * N_SIDE
Global Const MOVE1 = -1     ‘No forced first move
Global Const WIN_LENGTH = 3 ‘length of a winning line

Dim gridsize As Single
Sub BoardDraw ()
‘Draw an empty Go-board in picture box
Dim i As Integer

  ‘Clear old game
    picGame.Cls
    picGame.FillColor = QBColor(0)’Black
    picGame.FillStyle = 0 ‘Solid
    picGame.DrawWidth = 1
    gridsize = picGame.Width / (N_SIDE + 2)
  ‘Draw all lines
    For i = 1 To N_SIDE + 1
       picGame.Line (gridsize, gridsize * i)-(gridsize
* (N_SIDE + 1), gridsize * i)
       picGame.Line (gridsize * i, gridsize)-(gridsize
* i, gridsize * (N_SIDE + 1))
    Next i

    DoEvents ‘ to see the results
End Sub
Sub BoardInit (sTitle As String, sPlayer1 As String,
sPlayer2 As String)
‘one time display initialisation
  ‘Make sure picture box is square, in ###largest way
    If picGame.Height < picGame.Width Then
       picGame.Height = picGame.Width
    Else
       picGame.Width = picGame.Height
    End If
  ‘Must have autoredraw
    picGame.AutoRedraw = True
  ‘Return game title, etc
    sTitle = GAME_NAME
    sPlayer1 = GAME_PLAYER1
    sPlayer2 = GAME_PLAYER2

End Sub
Sub BoardPieceDraw (col As Integer, row As Integer,
colour As Integer, highlight As Integer)
‘Draw a piece of required colour in (Col, Row)
    picGame.FillStyle = 1 ‘Gives outline
    picGame.DrawWidth = gridsize / 100
    If colour = BLACK Then
      ‘draw an X
       picGame.FillColor = QBColor(0)
       If highlight Then picGame.FillColor =
QBColor(8)
       picGame.Line (gridsize * (col + 1.2), gridsize *
(row + 1.2))-(gridsize * (col + 1.8), gridsize * (row +
1.8))
       picGame.Line (gridsize * (col + 1.2), gridsize *
(row + 1.8))-(gridsize * (col + 1.8), gridsize * (row +
1.2))
    Else
      ‘Draw an O
       picGame.FillColor = QBColor(15)
       If highlight Then picGame.FillColor =
QBColor(8)
       picGame.Circle (gridsize * (col + 1.5),
gridsize * (row + 1.5)), gridsize / 3, QBColor(15)
    End If
    DoEvents ‘to see the results
End Sub
Function BoardXYValidate (ByVal X As Single, ByVal Y As
Single) As Integer
‘Validate X,Y mouse hit by user
Dim i As Integer
Dim j As Integer
    X = X - gridsize ‘compensate for offset of board in
picGame
    Y = Y - gridsize
    i = X \ gridsize
    j = Y \ gridsize
    If Abs(i * gridsize - (X - gridsize * .5)) > .2 *
gridsize Or Abs(j * gridsize - (Y - gridsize * .5)) >
.2 * gridsize Then
       BoardXYValidate = -1
    ElseIf i < 0 Or i >= N_SIDE Or j < 0 Or j >= N_SIDE
Then
       BoardXYValidate = -1
    Else
       BoardXYValidate = i + j * N_SIDE
    End If
End Function
```

The luck of the Irish

Some Gaelic mathematics and other interesting stories, including a review of January's postage stamp problem, presented by Mike Mudge.

An Irish pattern-makers problem!
From Letterkenny, Co. Donegal, a letter which concludes, "Is mise le meas, Cólm O Cinnéide." poses the following:

"Imagine a string of numbers chosen from (1,2 or 3). For example,
1232123132331132331323231323313232l3 132313231331

In the string above, 3 occurs beside 3 which is really a bit boring. From this, suppose you apply the rule 'if a substring x is beside substring y' then x does not equal y. That is in a valid "superstring" (IRISH PATTERN!). 1 would not occur beside 1, 1213 would not occur beside 1213, 12131321 would not occur beside 1, 1213 would not occur beside 1213, 12131321 would not occur beside 12131321... etc.

The most formal terms I [Colm] can think of putting this in is:

(#x = #y) and (x~y) implies (x<>y) i.e. IF the length of a substring x equals the length of a substring y AND x is contiguous to y THEN x does not equal y.

Some example strings are:

```
(a) 121323121312321
(b) 232131232123132
(c) 313212313231213
```

If only two digits are allowed, the following strings are all that happen:
`0; 1; 01; 10; 010; 101; "`

PROBLEM Colm. Enumerate all the valid "superstrings" for the set of three characters (1, 2 or 3). Extend this algorithm to the set of n-characters (x1, x2, x3,....xn) commenting, if possible, on its efficiency.
Possible Hint: Is this related to the Wang Tiling of the infinite plane discussed in *Numbers Count*, *PCW* March 1995?

The Mull Factoring Group
The Cunningham Project using digital computers to find the factors of certain large numbers is organised by Professor Sam Wagstaff in the Department of Computer Sciences, Purdue University, West Lafayette, IN 47907, USA, tel 317 494 6010, fax 317 494 0739.

Tables of factorisations are published in the book: Factorizations of $b^n \pm 1$ for b = 2,3,5,6,7,10,11,12 upto high powers Ed. Brillhart et al and published by the American Mathematical Society in various editions as vol. 22 of their contemporary mathematics series.

Now, the Scottish arm of this project is led by George Sassoon of Ben Buie Lodge, Lochbuie, Isle of Mull, Argyll PA62 6AA, and it also has a Wiltshire subgroup. It has factorised about a dozen numbers greater than 10^{80} using several computers, and Professor Yuji Kida's suite of PPMPQS programs is about 10^{101}. The biggest number factorised to date (19/4/95) by the group had 98 digits and took several months of spare computer time on IBM-compatible computers. George asserts that now with 486s and a Pentium it would be a lot quicker and cites his own factorisation of an 80-digit number in about three days using a single 90MHz Pentium Dell.

Some Notation. 5,213+ denotes $5^{213}+1$, 3,419- denotes $3^{419}-1$. The suffixes L and M denote the algebraic factors of bn±1. Thus 12,321+ has algebraic factors 12,327L and 12,327M when n+3 mod 6, k = (n+3)/6, $L=12^{2k-1} - 2^{2k}-13^k + 1$ and $M = 12^{2k-1} + 2^{2k-1}3^k + 1$. Similarly for some other b & n. Duplication of work is posing a problem, e.g. the German group factored 12,327M just before MullFac but Wagstaff is trying to co-ordinate efforts to prevent this happening.

PROBLEM GS-MullFac. Attempt to rediscover the wheel by finding the 37-digit prime factor of 5,575L and also the 44-digit prime factor of 11,219+.

If possible, complete the factorisation of these 92 and 94-digit numbers respectively... THEN CONTACT GEORGE SASSOON for instructions and advice as to how best extend your experience of this 'very infinite'! area of exploration.

Incidental information: George Sassoon has recently ordered a 28.8 kbaud modem and is about to venture onto the Internet — comments welcome.

An Update on Multi-Perfect Numbers
Jason Moxham of Southampton, email JLM194@SOTON.AC.UK has found a total of 1067 multi-perfects. Recall that a number is multi-perfect of degree n if it is equal to n times the sum of its factors. (Including the improper factors of unity and the number itself.)

```
120 = 2³ x 3 x 5 with factors
1,2,3,4,5,6,8,10,12,15,20,24,30,40,60
& 120.
```

These sum to 360 i.e. 3x120 which is therefore triperfect or multiperfect of degree 3.

David Wells; Penguin Dictionary of Curious and Interesting Numbers, suggests that over 500 multi-perfects are known with degrees upto 8. Even with his extensive calculations, Jason has yet to find a multi-perfect of degree 9. The counts of degree n are C_n, Fig 1.

PROBLEM JM. Reproduce and extend if possible the results in Fig 1; are there any theoretical results relating to the existence of multi-perfect numbers of degree greater than 8?

Fig 1 How the counts of degree n are C_n

n	3	4	5	6	7	8	
C_n	6	36	63	228	413	321	giving a total of 1067.

NOTE: Jason is about to (31/3/95) experiment with 'PARI', a number theory package supposedly better (in some sense?) than UBASIC. Has any reader experience of this software which they would be willing to share either with Jason or, indeed, with all *Numbers Count* readers?

An Investigation of Legendre's Conjecture, CJ1, May 1995
Here readers were asked to investigate solutions of the Diophantine Equation: $x^3 + y^3 = Az^3$ in the special case A = 1. Much response has been received and Nigel Hodges of Cheltenham has given much food for thought. The fundamental reference for much *Numbers Count* material is "The History of the Theory of Numbers", a fascinating trilogy; in vol. 2 from page 572 onwards, the above equation is discussed. Dickson stated that there are no rational solutions for A = 3, 5 or 6. (In fact, for A = 6 there is the solution (x,y,z) = (37,17,21).)

J. Prestet provided the following wonderful result:

```
if (x,y,z) is a solution, then so is
(X,Y,Z) where X = x(2y³ + x3), Y = -
y(2x3 + y³), Z = z(x³ - y³).
```

Starting with A = 6 and (37,17,21) Nigel generates an all positive solution with X & Z having 26454 digits and Y having 26453 digits. Pepin has shown that there are no solutions for A = 14,21,38,39,57,76 & 196; whilst Lucas shows that there are only solutions when A is of the form $ab(a+b)/c^3$ for integer a,b & c.

PROBLEM CJ/NH. Investigate the obvious generalisations of this equation, i.e. with additional terms on the lefthand side and/or higher equal/unequal powers.

NOTE: Summaries of results for 'small' integers may provide an insight into some underlying theory... MULTIPRECISION INTEGER ARITHMETIC is NOT NEEDED to contribute to this problem.

A problem of random numbers
In the *Daily Telegraph* for Saturday 22nd April, Adrian Berry (science correspondent) reports on a letter in *Nature* by Robert Matthews, science correspondent of the *Sunday Telegraph*. This letter refers to "a mathematical theorem which says that if any group of numbers if chosen at random, there is approximately a 61% chance that it will not have any factors in common". Now, in Mathematical Recreations and Essays by W.W. Rouse Ball and H.S.M. Coxeter, 1947 reprint page 349, it is stated that if two positive integers are chosen at random, the probability that they will have no common factor is $6/\pi^2$. Mr. Matthews applied the above principle to "the numbers created by the positions of the one hundred brightest stars which are placed at random in the sky". The results showed that 61.3% of such numbers had no common factor and if the above theory is applicable this led to an estimate for π of 3.13, correct to within less than 0.4%. This agreement appears to be better than would be expected on a simple intuitive argument, for a sample of one hundred taken from an infinite population.

Matthews concludes: "This shows that the language of the universe is that of higher mathematics" and further "this supports the belief of the ancient Greeks that numbers are at the root of everything in the universe".

Problem PI*ES. Sample integers from a variety of distributions whch appear to be random/pseudo-random/quasi-random.
Test for the existence of common factors and use the fraction, F, of these numbers with no common factor to construct estimates of π called π_e using π_e = SQRT(6/F). Address the question, are these estimates within the 'expected' range, given the sample sizes used?

Does this approach provide an additional test for randomness? If so, how can it be efficiently carried out?

Complete, or partial, responses to the above problems may be sent to Mike Mudge, 22 Gors Fach, Pwll-Trap, St. Clears, Carmarthen, Dyfed SA33 4AQ, tel 01994 231121, to arrive by 1st September 1995. Any complete or partial solutions received wil be judged using suitable subjective criteria, and a prize in the form of a £25 book token, or the equivalent overseas voucher, will be awarded by Mike Mudge to the 'best' solution arriving by the closing date. Such contributions should contain a brief description of the hardware used, details of coding, run times and a summary of the results obtained; all in a form suitable for publication in *PCW*. Additionally, readers' comments upon the general or specific nature of this month's column would be most welcome: in particular, the balance between research projects requiring multi-precision integer arithmetic and those which do not. THIS COLUMN BELONGS TO YOU, the READERS. Those with multi-precision facilities like to show them off. However, those who do not have them can still make a very valuable contribution to empirical number theory by using their programming skills and conducting an orderly and structured investigation to problems such as CJ/NH above.

Review of Numbers Count -141- January 1995: "Stamp of Approval", accompanied by the restricted INT FUNCTION
Was the poor response, numerically, NOT in quality!, associated with the season of this particular article (Christmas)? Previous experience with *PCW* readers suggests the latter. Those readers interested in the postage stamp problem may either refer to 'Algorithms for Computing the h-Range of the Postage Stamp Problem' by Svein Mossige, Mathematics of Computation, Vol. 36, No. 154 April 1981, or contact the University of Bergen, Bergen, Norway, in particular Christoph Kirfel of The Mathematics Institute, SVD. B, 5014 Bergen, Norway, for the latest results.

Suffice it to say that one of our regular readers, Gareth Suggett, extended his results to n(6,4) = 114 with solution set 0 1 4 19 33. Any advance on this, please? Ernst S. Selmer produced a two-volume document at Bergen in 1986... available on loan from Mike Mudge.

The RESTRICTED INT FUNCTION produced some interest, however. After much soul-searching (using an efficient search algorithm!) the prize must be awarded to its originator, Roy Dixon, of 119 Bullbrook Drive, Bracknell, Berkshire RG12 2QR. Thank you, Roy, for providing this sort of stimulus with such foresight.

Further results obtainable on request to M.M. or R.D.

Cry for help!
What are Dimitrov Wheels or, indeed, Serotic Wheels, and how do they adjust one's chances of winning the National Lottery? Replies to M.M. or to David Brake at *PCW*.
Mike Mudge

PCW Contributions Welcome
Mike Mudge welcomes readers' correspondence on any subject within the areas of number theory and computational mathematics, together with suggested subject areas and/or specific problems for future *Numbers Count* articles.

Below desk environment

In search of the networking advantages of Windows 95, Stephen Rodda found that a little practice and under-desk exploration made the installation of a final beta version easy.

The final beta of Windows 95 fell onto my doormat a couple of days ago. You're probably fed up with hearing about Windows 95, but there are a couple of aspects which don't seem to have been much vaunted. Take the NetWare volume-sharing in Windows NT as an example. I've written about this in a previous column, so I'll only mention that as long as you have Microsoft clients, an NT server will open a NetWare volume and share it among Windows clients.

The particular hidden advantage in Windows 95 is that as well as allowing sharing of the local resources over a Windows network, you can also (not at the same time) share local resources with Novell clients. The Windows 95 machine appears as a Novell server on the network, allowing all attached drives to be shared out on the network as though it were a Windows for Workgroups share.

This affects us (and Novell) in a variety of ways: firstly, you have an easy way of setting up a CD-ROM share — which Novell was never good at; secondly, if there's a large disk on a machine which is under-used, it allows extra disk space to be available to your NetWare users with not much more overhead in either hardware or labour.

How is this done? Windows 95 creates the name of a new server based on the name of the computer. My own machine (which is currently sharing both hard disks and CD) is called Berwick and the volumes are WIN95 and VOL_D; the CD, from which a client machine is currently installing Windows 95, is also shared, unoriginally, as CD.

The drives appear as BERWICK/WIN95, BERWICK/VOL_D and BERWICK/CD. Thus all we have to do is to ATTACH BERWICK and the new NetWare server is online (Windows 95 apparently uses its own password authorisation so, like a NetWare server, you can assign other passwords for users — if not other user names. User names and group names are read from the NetWare server). All you have to do then is to use the MAP command as usual to add the new drives to the available drives in the list. Windows 95 also allows printer sharing along the same lines.

My main machine crashed during the installation of the secondary copy of Windows 95 — I think Word for Windows was doing a backup and the remote machine was trying to access the CD at the same time; so much for re-entrant code. I rebooted it and although the second machine stopped installation, it allowed me to reconnect to the shared CD and to continue the installation as though nothing had happened.

It is not possible to judge the stability of a beta version accurately, since the whole point of a beta is to see what bugs still exist, but Windows 95 seemed a very stable operating system.

It's only a pity that my partner Jeff's machine, which runs SoftWindows, cannot run Windows 95 because the 80x86 emulator on the Macintosh will only support the 80286 chip. I hear, though, that there is an 80386 version coming soon. This should please DEC Alpha and MIPS users no end, as this same SoftPC emulator is loaded within their copies of Windows NT so they should be able to run native PC code which requires an 80386 or better.

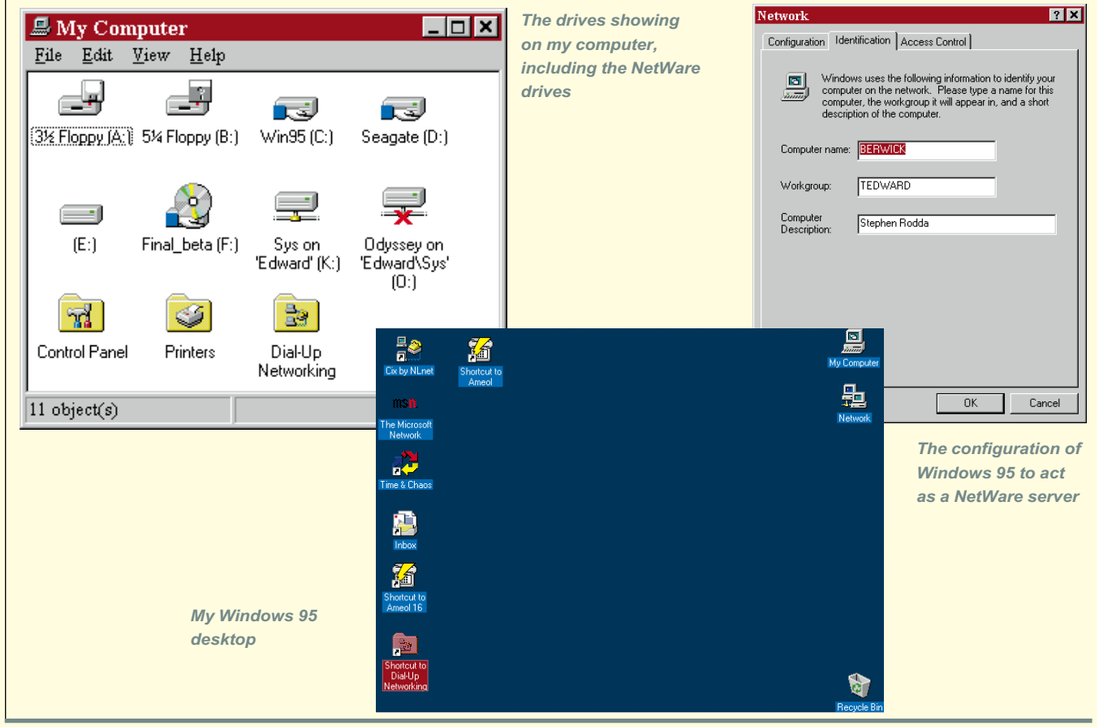
Although on my main machine Windows 95 took me about a day to set up, what with being absolutely crammed to the gills with cards and hardware, the second machine (possibly because I had learned something by then) was set up in double-quick time. I spent the second day reconfiguring the networking to access CIX. (Although the Microsoft Network, which is actually an online bulletin board affair, apparently allows Internet email, it doesn't yet allow TCP/IP file transfer.)

The first time around, the Windows 95 installation program's automatic hardware detection left a little to be desired. It seemed not to be very good at distinguishing IRQ9 from IRQ2, so it looked as if my ancient Mitsumi CD was lurking at IRQ2 for a while until I crawled on the floor and discovered that it really was on IRQ9.

It's amazing what you can learn about the hardware of a machine while crawling on the floor. I was looking at all the cards installed in my tower case, and after a rather illuminating time entering setup mode for the Adaptec SCSI disk controller, I had created a list of all the interrupts and so on, in use on my machine. The one thing I remembered was that I'd popped the NE2000 right up at IRQ 15, but I couldn't remember the reason. I decided it would have to stay there, as I wasn't going to re-install NT just for a wretched Windows 95 beta.

All this noted down, I decided to try re-installing. It worked beautifully. After a little judicious reassignment of the interrupts, port addresses and DMA addresses from Windows Control Panel so that no two things at any one time were taking up the same address space (it reminded me of those puzzles with one missing square) I managed to get everything to be — according to Windows 95 — where it *really* was.

Windows 95 and NetWare



The drives showing on my computer, including the NetWare drives

The configuration of Windows 95 to act as a NetWare server

My Windows 95 desktop

Questions & Answers

Stuck in a queue

I have a Kyocera FS1500 Ecosys laser printer on a Novell 3.12 (50-user) Ethernet network. The printer has its own Ethernet card, 5Mb of memory and is a print server in its own right.

Nearly every other day, now, any one of about a dozen users will send a print job which just gets stuck at the top of the queue. Pconsole shows it as either *active* or *adding*. The only solution is for me to delete the offending file. Doing this sometimes lets the other through although now and then I have to delete the whole queue and reset the printer. Exactly the same thing was happening when the printer was just servicing a print queue from the network server's print server.

I spoke to Kyocera's technical support line and they didn't know what was causing the problem.

Jim@CIX

There's a firmware upgrade kit for the NetWare print server service for that printer. Kyocera should have told you on the first call, but if you call again and mention that you know about the upgrade, they'll probably upgrade you.

Forgotten IDE

My NetWare server has started to lose its CMOS settings. Today I booted it and it had forgotten all about its IDE drives. What should I do?

Stephen Rodda

Yes, it's another one of my own problems which I've had on our network. Obviously, the battery in the server is dying. First I'll see whether there's an attachment for a battery on the motherboard. You can get battery holders for just this problem. They will hold three or four pen cells and should keep the problem at bay for another couple of years. If not, I'll have to either replace the Nicad battery or change the motherboard. Since I've got 16Mb of older, slow RAM invested in the motherboard, I'll be looking at the cheapest way round this. My server is a 386-20 and finding another 386 motherboard is probably well-nigh impossible nowadays. That would mean getting a 486, and I'd have to spend about £400 in replacing the motherboard and the RAM just to get back to the same situation as I'm in at the moment.

As a temporary measure, I've copied the drive settings (the number of cylinders, heads and sectors per track) from the sticky label which should have been on the back of the computer, but was inside the case, to another sticky label which I've fixed to the front of the case. Then, in an emergency I can always run setup and seconds later the machine will reboot and run DOS and NetWare. If your server hasn't got these settings on the outside of the case, make sure you put them somewhere obvious.

Absolute beginners

I need a beginner's book on networking? The network I will be setting up will have about 15 users and I'm considering NetWare or Windows for Workgroups.

"Beatnik"

You can't practically use Windows for Workgroups for 15 users. I'd suggest a real networking product for this number of clients (such as Novell or NT), since otherwise the users will either degrade the server machine's performance or they will get no performance out of the network at all, depending on how heavy the usage is and on the network performance settings. Another possibility is Windows 95, if it's available in the release version; it's a real 32-bit operating system and could cope with demands of this sort.

If you're going to be sharing out a vast amount of disk space, NT is cheaper. A good book on basic networking is Introduction to Networking *by Barry Nance, published by Que, ISBN 1-56529-824-1.*

Local difficulty

I have two PCs, a 386 and a 486, and one dedicated modem phone line, connected to a internal 14.4k faxmodem. I want to use the 386 as a modem server, left on 24 hours a day running as follows:

```
Time     Task
0800     Run the WINFAX DOS TSR
1900     Run a simple BBS program (not
         public access – just
         somewhere to dump files from
         work etc).
and loop
```

The two PCs will be networked in some way. Watford Electronics has two Ethernet cards plus cables and Personal NetWare in my price range. I thought of using a serial network but there is a radio mast half a mile away with microwave/FM/police/gas/cellular transmitters on and these interfere with my serial links, even when using high-grade shielded cables. The maximum reliable throughput I got was 9,600 baud; not enough to drive the 14.4k modem efficiently.

The 486 will not be on all the time but I want to be able to use Winfax for Windows and the Demon package on the 486, connecting to the modem via a network to the 386, dialling out as if it's a local modem. Can this be done, with Windows/Demon not noticing that the modem isn't local, or do I have to think of some other way to do this.

In a nutshell, I need a network package that seamlessly emulates the modem as a local device. Will Personal NetWare do this? I thought of Windows for Workgroups but the 386 doesn't have enough memory and upgrades are not really worth it.

Darren@demon.co.uk

There's no real solution to your problem other than to use a package such as Procomm Plus for Windows with a Class 2 faxmodem which will differentiate between fax and data calls. You could then use something like Winport to network the modem through a Personal NetWare network. As far as the radio interference problem is concerned, you could always try using an internal modem; this should remove the problem of interference through the serial lines.

PCW Contacts

Stephen Rodda is an independent computer consultant specialising in DTP and networking. He may be contacted as **the_bear@cix.compulink.co.uk**

The **quick** and the **cred**

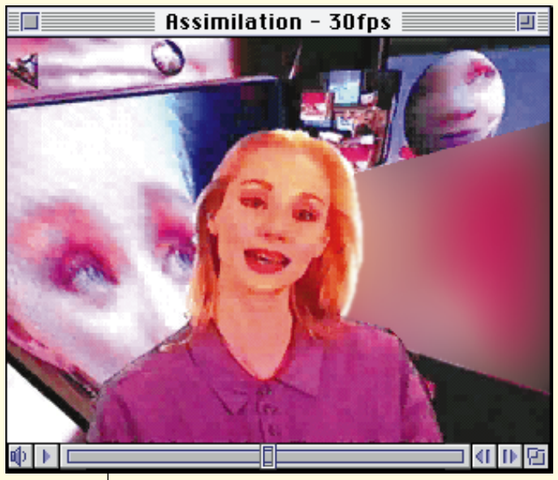
QuickTime version 2.0 is multimedia heaven for Mac users. Chris Cain provides an overview and explains how it controls and integrates video, animation, music and text into applications.

During the past few months, I've dealt with the subjects of Apple AV technologies and how to use a digitiser to capture small video clips. This month the spotlight turns to QuickTime, the multimedia software extension that makes all this possible.

But first, as they say, here is the news: rumour has it that Apple is beginning to gear itself up for the forthcoming launch of Windows 95. Reports are coming in of an internal memo at Apple headquarters in the US, advising sales staff of ways in which to compare Microsoft's latest OS with System 7.5. Along with a reminder that the only hardware currently guaranteed to run Windows 95 is a slide projector, the memo suggests that the sales force uses the PECO (Power, Ease of use, Compatibility and Overall value) format when comparing systems.

Apparently, the Mac sales force should concentrate on pointing out the PowerMac's higher number of native applications, superior multimedia facilities, and compatibility with DOS and Windows, via the excellent DOS card and SoftWindows. The memo also echoes a common Apple marketing cry that Macintosh users are more satisfied and more productive than PC users.

As expected, Apple UK declined to comment, but I hope that the company is taking Windows 95 very seriously. From what I've seen, it's a big improvement over the current version (but then again, what isn't?), and in most respects it's very close to System 7's ease of use.



QuickTime 2.0 is a complete multimedia architecture. It can run video at up to 30 frames per second

Perhaps even more important in the battle to increase Mac market share, and far more interesting to the average user, is the announcement that Doom II is to be released in June. The sequel, which took the PC industry by storm last year, will be available in both 68K and PowerMac versions. The conversion has been handled by Lion Entertainment and, as with the original version, a cut-down shareware edition will, hopefully, be travelling around the Internet by the time you read this.

Features of Mac Doom II include: higher resolution graphics than its PC cousin — up to 640 x 400 pixels in 256 colours; single and multi-player modes for Mac-to-Mac and Mac-to-PC sessions; spine-chilling stereo sound; and the ability to kill the Finder for increased speed.

Doom II for the Mac requires a 68LC040 Mac or better, 8Mb of RAM, System 7.1 or higher and 17.2Mb of hard disk space.

Step in QuickTime

When it comes to doing anything even remotely impressive on the Mac, you're unlikely to get very far unless you have a copy of QuickTime. There can't be many people out there now who don't know what this is, but in case there are, here's a quick overview.

Contrary to popular belief, QuickTime is not Apple's version of Video for Windows — it's a complete system software architecture for handling multimedia.

Designed in 1991 and launched just after the first version of System 7, QuickTime defines a standard for controlling and integrating dynamic media such as video, music, animation and text, into Mac applications.

The QuickTime system software extension is currently in version 2.0 and ships as standard with all Macs. An additional plug-in, written in RISC code, is available for PowerMacs to improve performance, and another extension, called QuickTime Musical Instruments, adds advanced MIDI capabilities.

Although QuickTime does much more than enable the playback of software video, this is the use to which most people will put it. Apple has an advanced video system with provision for multiple CODECs, full-screen images, and displays of up to 30 frames per second on PowerMacs. It supports professional quality video editing at 60 fields per second, with high data throughput as well as SMPTE time code, and can handle MPEG1 data playback with an additional decoder card.

QuickTime data files are called "movies", and information in them is broken up into a series of separate tracks. Usually, there's one track for video, one or two for audio, another for text and so on, and the QuickTime engine synchronises all of these on playback. This method works in a different way from the popular AVI (Audio Video Interleave) format as used by Video for Windows, where everything is stored in a single interleaved lump. See Fig 1 for more information on the data structures.

One advantage that the track system has over an interleaved format is its ability to intelligently drop video frames without losing audio quality on slow machines, thereby maintaining relatively smooth performance overall. Of course, there are limitations to this but in many cases it can work quite well. Another advantage is that it's far easier to edit and replace information when it's arranged in separate data streams.

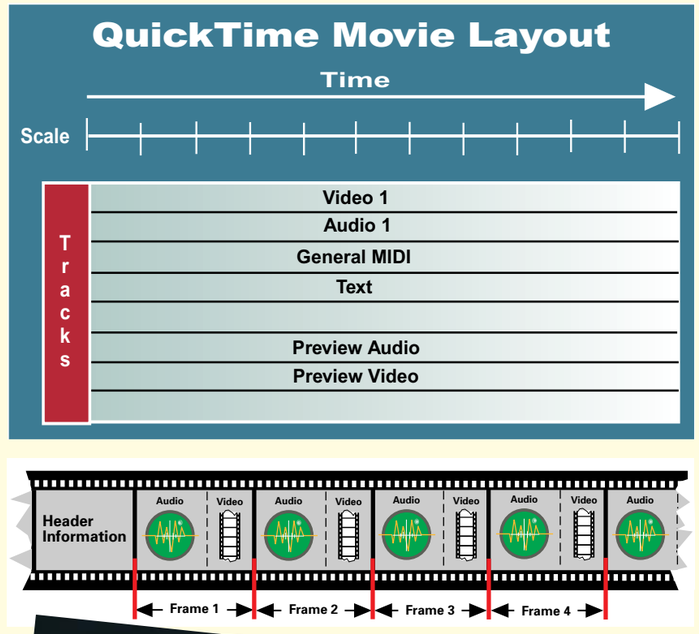
The audio aspect of QuickTime 2.0 is just as impressive. It has support for both digitised audio and a MIDI control data track that works in conjunction with either the QuickTime Musical Instruments extension, or an external synthesiser.

The QuickTime Musical Instruments extension is a real breakthrough, providing every QuickTime-capable Mac with an upgrade to General Midi (GM) sound without the expense of extra hardware. The extension contains a highly compressed set of instrument samples, licensed from Roland, which can actually be "played" like a synthesiser, using MIDI commands. These commands take up far less memory than conventionally recorded sound. Using them, you could fit several minutes of music on to a single floppy disk. If you are lucky enough to have real GM synth, you can get QuickTime to automatically divert the commands to this, to achieve maximum audio quality.

Other recent improvements to QuickTime include QuickTime VR, a virtual reality software solution to create movies that users can look around as if they were actually part of them. The development tools for this are currently in the final stages and hopefully will ship to programmers soon. But you only need the QuickTime extension itself to play movies back.

Another recent announcement is QuickTime Conferencing, a development to improve video conferencing.

Fig 1 Keeping track of time



Top *Fig 1 QuickTime uses tracks whereas AVI files* **(above)** *are interleaved*

Left *The IIcx is not 32-bit clean*

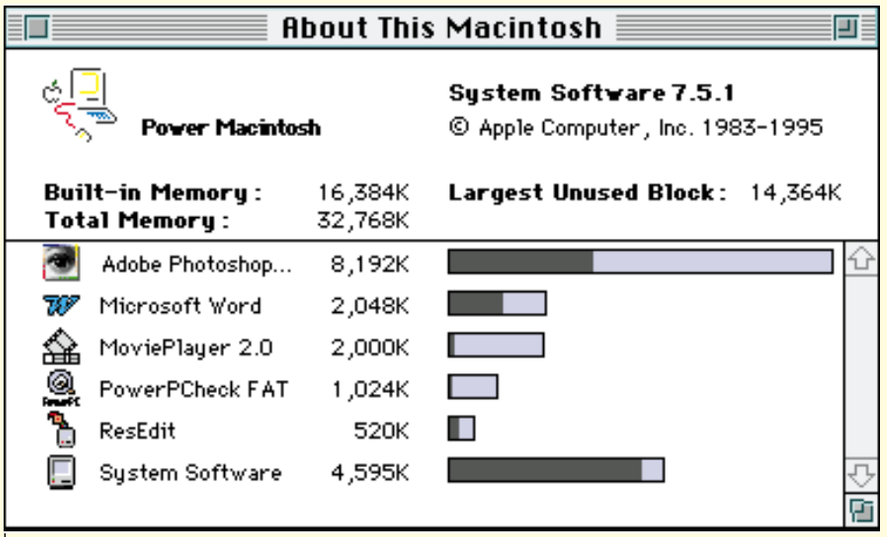
Thanks for the memory

The other day I got a phone call out of the blue from a friend: he's running his business on an old Mac IIfx, a tried and tested machine with a 40MHz 68030 processor. In the late eighties, this was one of the fastest Apple's you could get — I remember being quite jealous when it first arrived.

To cut a long story short, my friend had just been told that the IIfx only supports a maximum of 8Mb of RAM. Because large Photoshop images play an important part in his life, he wanted to move to 16Mb and was in a bit of a panic: was it true that the entire system must be upgraded just to be able to use more RAM?

Fortunately, although there is some truth in the 8Mb limit, the situation isn't half as bad as it seems and doesn't affect the IIfx. It's a little confusing, but I'll try to explain.

Some old Macs, namely the II, IIx, IIcx and SE/30, have ROMs that are limited to 24-bit memory addressing: that is, addresses in memory can be no more than 24 bits in length. Although this works out at around 16.7m individual memory addresses, the Mac hardware steals a lot of this for tracking information in ROM and on expansion cards. The result is an 8Mb limit on usable memory. System 6, the previous operating system, was also limited to this memory size. More modern Macs, and



Double the number of apps you can open with RAM Doubler

System 7, are "32-bit clean": they support 32-bit addressing, and raise the address space to a whopping 4Gb and usable memory to 1Gb.

To cure the problem with older machines, utility maker Connectix produced a system patch called Mode 32. Thanks to user pressure, Apple consequently acquired the rights to this software and distributed it free across services like AppleLink and CompuServe. The company now produces its own version called 32-bit Enabler.

While we're on the subject of patches, a useful utility that resurfaced this month, and one which is well worth getting hold of, is SoftFPU. It's a shareware program that emulates a 68881 maths co-processor. It allows machines without a floating point maths chip (such as the popular LC 475) to use applications that would otherwise require one. Although the applications run slowly, they do run.

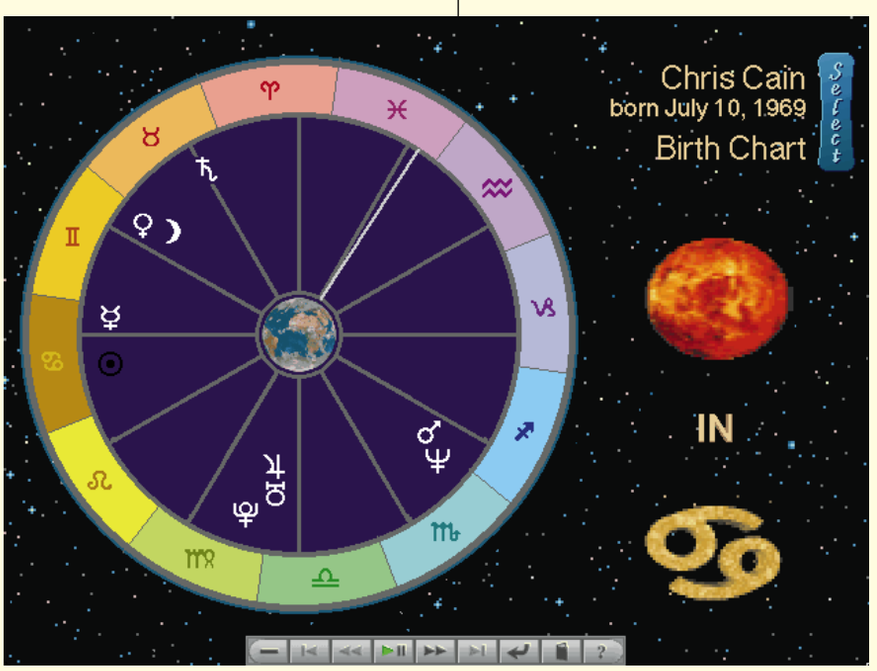
Utility of the Month

What with all this talk of patches and utilities, I've decided to introduce a regular Utility of the Month award. This will be awarded to the individual program that has proven itself to be indispensable, or at least incredibly useful. Mode 32 came very close to being the first winner, but it's a bit long in the tooth and only relevant to those using old Macs.

After much debate, Connectix RAM Doubler is this month's worthy recipient. Absolutely invaluable at around £60, it effectively doubles the amount of available memory in your machine and lets you have more applications open simultaneously. It does this by using advanced data handling techniques and compressing and decompressing information on the fly. Best of all, there's no noticeable decrease in speed.

Another benefit for PowerMac users is that the RAM doubler reduces the amount of memory needed to run native mode applications. It does this in the same way as turning on Apple's virtual memory but without the performance drop. Good stuff.

The Time Life Guide to Astrology. It's Mystic-Meg Mungus, Mate!



Sign of the times

You can happily lose several hours playing with the Time Life Guide to Astrology. It's a CD-ROM comprising everything you need to take on Mystic Meg. The guide takes you through the history of this ancient art, from its birth in Mesopotamia to its use in modern Europe. There is a section on understanding the mystic symbols of the Zodiac, and a look at how to read an astrology chart.

The program can also be used to cast your own personal horoscope, and will tell you what kind of a person you are in several American accents. Apparently I'm a highly creative Cancerian with good communication skills and an emphasis in Earth and Wind. You can also cast compatibility with friends and lovers, and the disc includes the profiles of over 500 famous people. I'm destined to hit it off with the gorgeous, pouting actress Drew Barrymore, and my mother would have been good mates with Groucho Marx, if they had ever met.

Even though I don't take any of this seriously, I can thoroughly recommend the disc to anyone even remotely interested in the subject. It's great fun.

PCW Contacts

RAM Doubler costs **£69.95**. Available from **Computers Unlimited**, **0181 200 8282.**
SoftFPU and **Mode 32.** Available from up-to-date Apple dealers, shareware libraries and all good Mac online services.
QuickTime 2.0 and **QuickTime VR**. Available from **Apple, 0181 569 1199.**
The Time Life Guide to Astrology costs **£21.27**. Available from **Softline, 0181 4011234.**
Chris Cain loves to hear from Mac users and can be contacted via email as **chris_cain@pcw.ccmail.compu-serve.com**, on **eWorld** as **Cain** or by writing to *PCW*. He especially wants to hear from anyone who knows **Drew Barrymore's** phone number.

Any questions?

If you've got a PC problem or think you could help other readers out, contact Frank Leonhardt.

Light relief

I have an old CBM PC40 III, fitted with a Quantum 40Mb drive. On starting up the hard drive, a light comes on and stays on, and after the "checking extended memory" message up comes "1782 controller failure". After booting from floppy, the screen says "Invalid drive specification" when C: is typed. I've run the Setup program and confirmed that the setting is correct for the Quantum 40Mb drive.

The CBM manual states: "The PC40 III motherboard incorporates the controller logic necessary to allow the AT drive to be attached directly, using a standard 40-pin flat ribbon cable." It also says: "The drive is a specially designed integrated/intelligent drive known as an INTEGRATED AT DRIVE." I've taken the drive out, checked connections etc. but to no avail.

I'd welcome any ideas on whether the fault will be in the drive itself, or something on the motherboard.

Keith Mercer
100046.3472@compuserve.com

The Commodore manual was being a little inaccurate when it claimed there was a drive controller built in to the motherboard. In the dim and distant past — five years ago — you needed a drive controller card to operate a hard disk unit. The CPU communicated with its drives through the controller, requesting data and receiving it back.

One weak link in this design was the connection between the drives and the controller — the ST506 interface. This wasn't able to deal with the possibility of communications errors. The longer the cable, or the faster the attempted transfer, the greater the chance of data being corrupted en route. The arrangement also limited development because controller and drive manufacturers dare not deviate from the standard to avoid incompatibilities.

Enter Integrated Drive Electronics, or IDE. In order to get the shortest possible cable between the drive and the controller, and thus the fastest and most reliable transfers, why not put the controller electronics on the drive itself, and then run a cable back to the motherboard and plug it straight into the normal AT expansion bus? The software on the PC wouldn't know whether it was talking to a separate controller card or to the drive itself, so everything would "just work".

And it did. Some manufacturers added a 40-way connector on the motherboard for attaching an IDE drive cable, while others simply used an adaptor card to plug it into a standard expansion slot.

When your machine complains of a controller failure, the faulty controller it sees must be on the IDE drive simply because there isn't one on the motherboard. It is possible that you have a problem with the cable or there could be a genuine fault near the IDE socket, but I doubt this; there is very little there actually to actually go wrong. That just leaves the drive.

The drive really isn't worth repairing: with hard disk space costing 25p per megabyte it's only worth £10. I'd suggest you take the machine to a reputable computer shop and get them to fit a new drive, rather than buying one and hoping for the best. You may find that not all modern IDE drives work with the Commodore, but the shop should be able to try a few until a compatible one is found.

Miffed about MIPS

I have a small program called MIPS.COM, which is supposed to tell you the number of MIPS your CPU can perform.

These are some sample results:

```
Intel 486DX2-66 13 MIPS
Intel 486SX-25  6.9 MIPS
AMD 386SX-33    2.8 MIPS
Intel 286-16    1.5 MIPS
UMC486SX-33     11.5 MIPS
```

Why is my UMC machine's MIPS so high? Is it actually that much faster, or is it a mistake?

Also, I've just upgraded from 4Mb RAM to 8Mb. Why is it, then, that I keep getting a "Low memory, close some windows..." message when trying to Print Preview in Word for Windows 2.0? My system resources (as displayed in Program Manager help) have also decreased from around 79% to 59% when just Program Manager is running. I find this very strange.

j.f.hayhurst@uclan.ac.uk

If MIPS only attempts to measure CPU speed and nothing else, then as you say, it is probably a mistake. If it takes the speed of the graphics and disk subsystems into account, then an SX/33 could be made to go a lot faster than some poorly configured high-clockspeed machines.

My guess, however, is that the 486SX/33 is actually being clocked at 40MHz. Bear in mind that a DX2/66 is actually a 33MHz processor running some internal instructions at 66MHz. The overall performance increase is certainly not 100% over the 33MHz part — 30-40% is more realistic. This results in a standard SX or DX running at 40MHz being close to the same speed as a DX2/66.

You can quite often find PCs with their processor clock circuits set incorrectly. Many believe this is done by some less-than-professional clone makers in order to get their machines perform better in benchmarks — and this probably does happen. However, I'm inclined to believe it's down to straightforward incompetence because it doesn't just turn up on review machines.

Getting to your second question, it is very rare to genuinely run out of memory with Windows 3.1. If you have 16Mb configured, including Virtual Memory, then you have to try quite hard to use it all. Painting programs are about the best way, but word processors use relatively little.

Like many other Windows applications, Word claims to have run out of memory when, in fact, it has simply run out of those mysterious "System Resources" you see displayed in the Program Manager About.. dialogue. This percentage figure is calculated based on the amount of free "system" memory left which belongs to the GDI and USER system modules. I'll spare you an explanation of what the GDI is all about because, unfortunately, there is nothing you can do about it anyway.

I think the loss of system resources you apparently suffered coincidentally with your RAM upgrade is actually a red herring; however, getting the figure back up is the key to keeping Word happy.

Hurdla hurdles the overdrive

Could you tell me if my Ambra Hurdla 486DX 33MHz is suitable for upgrading to the DX/4 100MHz overdrive chip. Since my PC predates the DX/4 chip, it is not mentioned in the technical manual. The reason for my concern is the change in voltage in some PCs from 5v to 3.3v.

Toby Smith
SMITHTE@rmcs.cranfield.ac.uk

According to Intel's latest compatibility lists, the Hurdla mt (DX/33) is certified upgradable with the DX2ODPR66 only. However, most machines which can be upgraded in this way will also work with the DX4ODPR100 and I suspect that your Ambra will be no exception.

If you want the latest information on certified overdrive compatibility you can call Intel's FaxBACK service on 01793 431155 using a touch-tone telephone. Even if you don't, it is an interesting experience, but make sure your fax machine is loaded with a fresh roll of paper first.

All about BIOS

I would like to know how to tell if the system BIOS on a computer is stored in normal ROM or the upgradable Flash ROM, without actually going to the expense of buying an upgrade disk.

Secondly, if the BIOS is in Flash ROM, is it necessary to remain with the same manufacturer, or can you chop and change; say, from Award to AMI?

Thirdly, the BIOS chip on my motherboard is not soldered on, it is in a socket. Does this present the possibility of changing the chip itself to Flash ROM, or might there be compatibility problems?

Chris Liddell
cjl100@tmphost.york.ac.uk

The idea of being able to upgrade your BIOS easily does sound attractive. At one time it was also necessary to cure bugs and accommodate new upgrade technology. However, the situation has moved on since then.

The system BIOS (Basic Input/Output Subroutines) can either be stored in a ROM or EPROM chip or, in some newer machines, Flash EPROM. An EPROM chip can be re-programmed using some special equipment, whereas a ROM cannot. However, this is only of academic interest to end-users wishing to upgrade. In either case, the chips must be removed from their sockets and replaced with new ones.

Flash EPROM has several advantages over traditional EPROM. It can be re-programmed while still inside the computer, allowing updated software to be distributed on disk. The old contents can be erased "in a flash" and new data written in its place. It is also a lot faster for the processor to access than traditional EPROM.

You cannot replace a normal BIOS ROM with a Flash EPROM as the design of the board is completely different.

Although it is possible to upgrade a BIOS ROM, it is not that simple. A modern PC BIOS will contain special code, specific to the motherboard, to configure the PC chipset used. This means that you cannot swap BIOS ROMs between machines: they simply won't work. In fact, the only advantage comes if a bug is discovered and the motherboard manufacturer wishes to release a fix.

Because the BIOS is so tightly bound to the motherboard, you will probably save yourself a lot of time and trouble by changing the entire motherboard to fix a BIOS problem. This does seem a bit drastic but the expensive bits are the processor and the RAM, which you would transfer across. Bare motherboards themselves are relatively inexpensive.

NetScape's new address

I'm new to World Wide Web browsers. Currently, I'm using NetScape for browsing the WWW. Just a few days ago, when I first tried to run NetScape, it said that it couldn't locate the NetScape home page. My NetScape home page address is:

```
http://home.netscape.com://netscape/home/welcome.html
```

Every time I use NetScape it says that the address is not a valid URL address.

Ainuddin Hj.Khamis
ainudin@sel.itm.my

A simple answer: NetScape's home page has been moved. Edit your NETSCAPE.INI file and in the [Main] section replace the Home Page line with the following:

```
Home
Page=http://mosaic.mcom.com/home/welcome.html
```

Mysterious disappearance of WfWG fonts

I have installed Windows for Workgroups and I am having trouble with its fonts. I installed Excel 5.0 and have no problem; all fonts present and correct. I then installed Word 6.0 and, lo and behold — no fonts! Have you any suggestions beyond starting everything from scratch and re-installing the lot?

B.G.Joyce-iy1i9198@lmu.ac.uk

I find the disappearance of your fonts rather puzzling. Perhaps someone out there can offer an explanation?

If you want to get them back, you can install fonts without installing everything using the Control Panel. First, however, you will have to find your fonts.

*The easy way to do this is using File Manager to search for any files matching the specification *.TTF. Make a note of their location (it will probably be C:\WINDOWS\SYSTEM) and run Control Panel.*

Select the Fonts icon and click on the Add button. Select the directory containing the fonts you wish to add and their names will appear in a box. Just click on Add All and they should be restored to you.

VSHARE.386 update

A couple of people have written to me pointing out that VSHARE.386, the SHARE.EXE replacement shipped with Windows 3.11, will work with version 3.1 of Windows too. Simon Child even sent me the ftp location for it so users for 3.1 can upgrade if they wish. It is at ftp.microsoft.com with a filename of WW1000.EXE.

PCW Contacts

Frank Leonhardt is an independent computer boffin who can sometimes be contacted on **0181 429 3047** or via email as **frank@dircon.co.uk** or **leo2@cix.clink.co.uk**. Letters may be sent to *PCW* at 32-34 Broadwick Street, London W1A 2HG, but individual replies are not normally possible. Please do not ask about cover disks or CD-ROMs!

Intel product information:
01793 431144 (voice)
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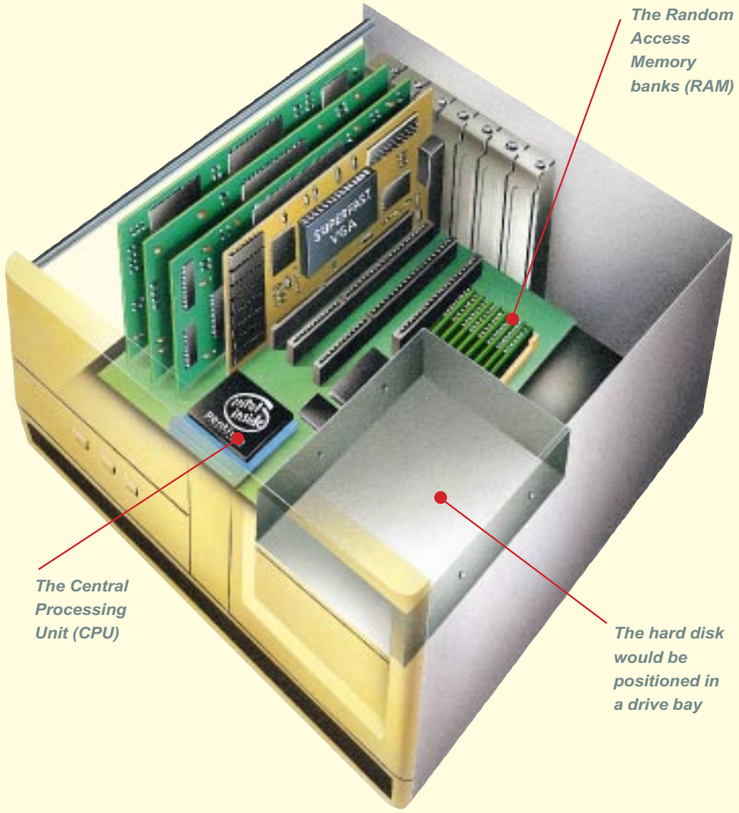
Just like **starting** over

Eleanor Turton-Hill guides you through the morass of jargon and misinformation you're guaranteed to encounter when buying a PC, and tells you exactly what you should *really* look out for.

If you're new to computers, buying a PC can become something of a nightmare. Like most other specialist commodities, PCs are buried in a confused pit of jargon and acronyms which serve as a barrier between computer people and the rest of the world. You don't have to be a computer propeller-head to break through this jargon barrier, but you do need to do a certain amount of homework before stranding yourself completely clueless in the middle of Dixons on a Saturday afternoon.

One of the major problems with buying a computer is that the market is continually changing, so you'll always need up-to-date advice on exactly what you can get for your money. This continual state of flux gives rise to a never-ending debate among computer specialists concerning what constitutes "the minimum system". Don't worry, I won't rehearse any of those arguments here. What I will do, however, is go through some of the essential terms you'll need to digest before you part with any money, as well as suggesting a basic system necessary to run the current generation of computer software.



PCW ILLUSTRATION by Russell *Harvey*

The processor

One of the first things you'll hear people talking about is the type of processor in the machine. This is the central processing unit (CPU), or chip, and is probably the single most important component to consider when you're buying a PC. At the moment it's generally agreed that the entry-level system should have a 486DX2/66 processor. The "486" refers to the type of chip (generally made by Intel, but there are clone chips made by AMD and Cyrix), and the "66" refers to the speed of the chip in megahertz (MHz).

The "DX" refers to the maths co-processor which is built in to the chip to speed up mathematical calculations. This helps if you do a lot of number-crunching type operations but it's also a necessary part of the system if you use any complex graphics programs, and many CAD packages will not install if your system lacks a co-processor.

There are many other types of processors around, some of which have very similar names to the one described above. But don't let anyone try to persuade you that a 486SX/66 or a 486DX2/50 is almost the same thing. The 486SX is missing the crucial co-processor, and the DX2/50 is just slower and would gain you a negligible saving.

RAM

RAM stands for Random Access Memory. It's the working memory used by your computer to store instructions and data before they can be committed to the hard disk. Because RAM works much faster than the hard disk, it's used for handling all the data which is in constant use while programs are running. The hard disk is used for dumping any data which the system does not currently need.

So, how much RAM do you need in your computer? Well, ultimately it all depends on what software you're going to want to run. In the old days of DOS-based applications, most spreadsheets, word processors and simple databases could run quite happily on 1 or 2Mb. These days, most people run Windows programs which are graphical by definition (even simple spreadsheets and word processors). There's a great deal of infuriating debate among computer people about the minimum amount of RAM required to run Microsoft Windows. In my view you'll need at least 8Mb to run the average system satisfactorily.

Most DX2/66 systems should come with at least 8Mb RAM. Any less is a sign of shameless skimping. A system with 4Mb RAM will just about run but will soon drive you round the bend with its painful crunching noises and flashing lights as it struggles to shovel data from memory to disk.

Another important thing to check about the RAM provided in your system is whether it uses standard or proprietary memory, and what the upgrade alternatives are. Some PC manufacturers force you to buy their own proprietary memory chips, usually insisting that their own special memory is faster and more reliable. Generally this is just a way of getting you to spend an extortionate amount of money. Proprietary RAM is generally priced at three to four times the price of industry-standard SIMMs.

The hard disk

The hard disk is the part of your system which holds all the programs, documents and data when your PC is switched off. The longer you have your computer, and the more documents you create, and the more data you store, the more valuable your hard disk becomes. In fact, hard disks which crack up can put small companies out of business in a flash. Your hard disk is the storage place for all your valuable work.

The programs you run (i.e. your word processor, graphics package or spreadsheet) are replaceable. When you buy your PC, you'll often get some of this software pre-installed on the hard disk, but you'll also get a set of floppy disks which you can use to re-install if anything goes wrong. Anything else you create should be instantly backed up onto a spare floppy disk.

Most DX2/66 PCs these days come with at least 500Mb (half a gigabye) of hard disk. The price of hard disk drives (unlike RAM) has shrunk considerably in the past year or so, and it's well worth shopping around for a good deal.

The monitor and videocard

When it comes to working happily with your system, the monitor is probably the most important and overlooked element. Most people end up with the monitor which comes included in the overall system deal and nine times out of ten, this is a bad move. Poor quality monitors are often thrown into a package deal to keep the overall system price down. Typically they are small, have horribly curved screens and give you a headache. You don't have to buy the monitor which comes included with the PC. Spend some time in the shop playing with different monitors. Test the screen controls, and compare the clarity of the display on a variety of models.

People often get confused about the relationship between the video card and the monitor. The video card sits inside the PC and controls the features that the software can display on the monitor. There are several features to look out for. Firstly, check the amount of memory on the card. Two megabytes is about standard these days, 1Mb is skimpy and 512kb is barely usable. Also, check out the performance capability of the card. Video cards come as 16-bit, 32-bit, 64-bit and even 128-bit. All you need to know about this is that high numbers of bits means faster performance and more colours.

The most important aspect of your video card, and the most frequently quoted feature, relates to the resolution which the card supports in Windows. This is measured in terms of the number of pixels the card displays on the screen. The absolute minumim these days is 1024 x 768 with a refresh rate of 70Hz. The refresh rate is an important figure to look out for as it relates to the flicker which you will perceive from your monitor.

Finally, find out whether your video card is "local-bus" or not. Local bus is a type of interface which connects your video card to the motherboard. It's a recent development which allows the memory in the card to be addressed directly by the CPU, which makes it a lot faster than the standard ISA (Industry Standard Architecture) interface. PCW

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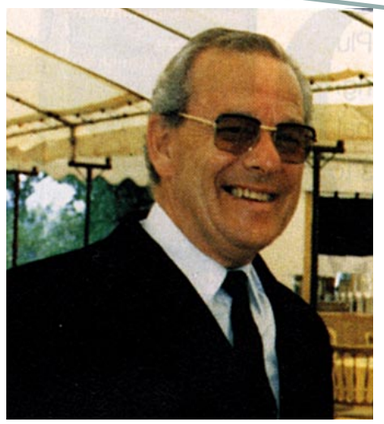

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ChipChat

● While Microsoft was holding its recent World Wide Developer's Conference in San José, California, we went surfing on the Internet to track down news about the party that always follows.

So, here are the top ten rumours about Microsoft's WWDC party:

1. The barman will be called Bob, and he won't let anybody drink alcohol without their parents' permission.
2. There'll have to be another party on Tuesday to correct the problems people had at the first one.
3. The waitresses will be twice as big as they were last year, but only half as fast.
4. The first 640 people sit downstairs, but everyone else has to perch on the roof.
5. The room will be crammed with so many bars, there's no room for people.
6. You can't hear the music at the party unless you bring a SoundBlaster card.
7. No one will be able to work out how to order food, because the menus will be so non-standard.
8. You have to order drinks from the "Drinks Wizard" who asks you 17 questions and then always gives you warm root beer.
9. All the doors in the bar will look like push doors, but you have to pull them.
10. The party has been postponed until next year (but Bill Gates will make a speech telling us how good it's going to be).

● Intel press conferences can sometimes get very technical. Take this exchange between Michael Bond of Intel and Richard Barry of PC Week:

RB: "So what you are saying is that the Triton chipset is like a conditioner — you can use any shampoo and conditioner, but if you use two from the same maker you will get better results. Pentium will work better if you have a Triton."

MB: "Well, of course we think that Triton is Head and Shoulders above the other chipsets..."

Apparently, hair care people don't talk about computers in their meetings, and it doesn't really matter which conditioner you use with a shampoo...

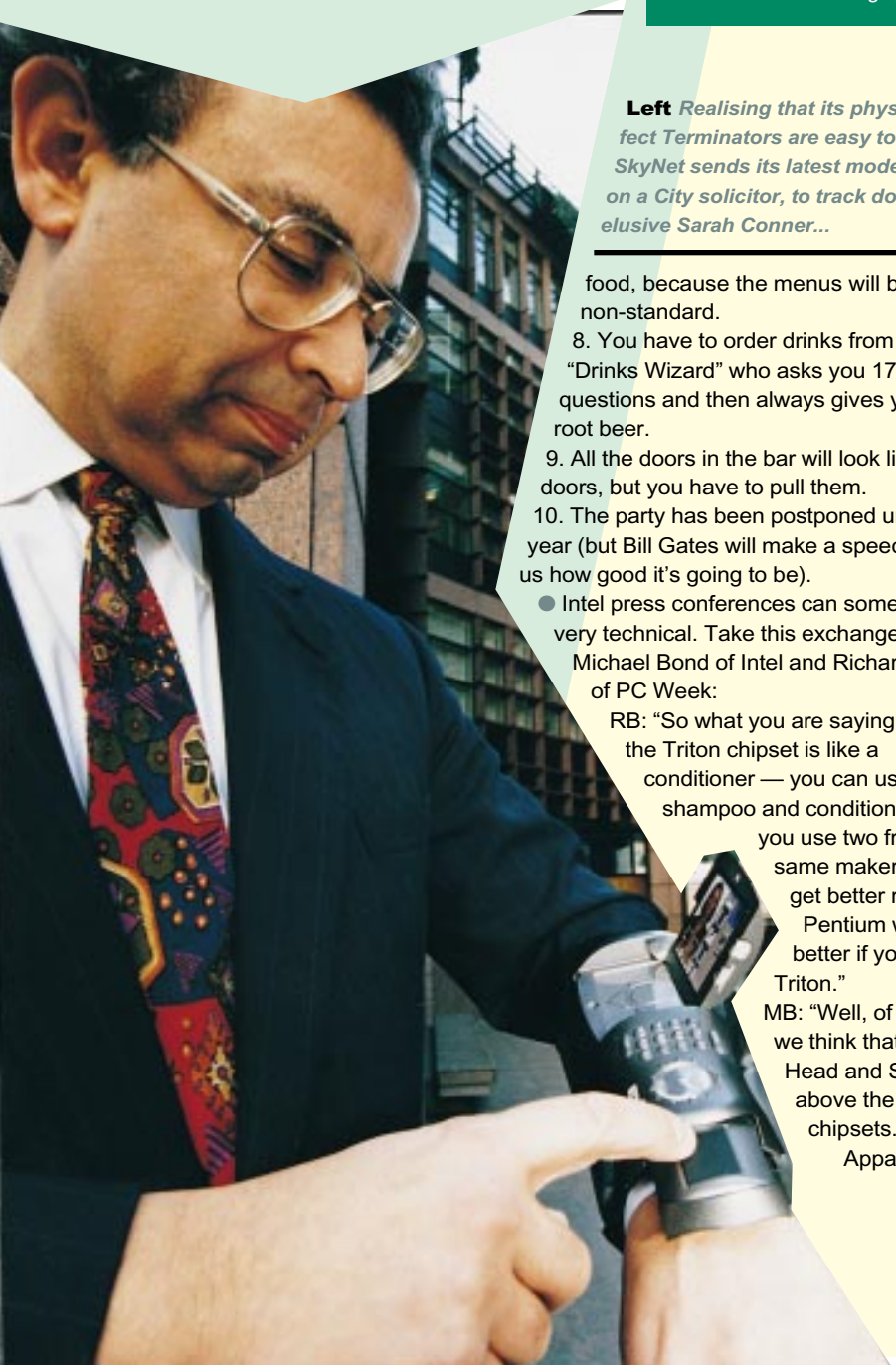
● Ever wondered what the special Windows key does on Microsoft's Ergonomic keyboard? Wonder no more. Top sources report that pressing this will automatically cause a General Protection Fault with the new improved Windows 95. Previously you needed to run an application to do this...

Beware!

With a top notch anti-virus software group test scheduled for a forthcoming issue, the *PCW* team set out to find the nastiest strains around.

If you're constantly swapping data with others, you'd do best to look out for the following:

John Major Virus: Restricts your monitor to 16 levels of grey.
Heseltine Virus: Deletes 31 files but claims 11 can be recovered.
British Gas Virus: It won't do anything now but it will send two viruses around next week.
AA Virus: It doesn't do any harm itself but it knows a virus that can.
Traffic Cone Virus: Slows down the bus and all other traffic and has a tendency to occur on bank holidays.
ASCII Virus: Draws a small comedian on the screen, singing silly songs.
Dyslexia Virus: Messes about with your flies.
John Smith Virus: The best virus we never had.
Winona Ryder Virus: Turns floppy disks into hard ones.
Kylie Minogue Virus: Infects your files for a period of time, then disappears without a trace.
Mussolini Virus: Hangs your system — from a lamp-post.



Left *Realising that its physically perfect Terminators are easy to identify, SkyNet sends its latest model, based on a City solicitor, to track down the elusive Sarah Conner...*

Sorry, our mistakes

On last month's cover disk we credited a picture, entitled "Talisman of Death", to Walter A Kuhn. In fact it is the creation of Peter Andrew Jones, to whom we apologise for the mistake.

• We'd like to point out that Nick Beard does know that PCI stands for Peripheral Component Interconnect, and not Pre-connection Inspection as reported in last month's Business Matters. At least, he says he does.

• There are also corrections to the Performa PowerMacs review. We mistakenly referred to the Crusader as the 5100 — it is in fact the 6200 and, due to last-minute changes at Apple, said machine is now the same price as the all-in-one 5200. The SoundBlaster support offered by these machines is also now 16-bit 1.6 and not 1.5 as stated.

• The ResourceBank CD, reviewed in last month's CD-ROM section, is now free of charge and not £19.95 as reported.