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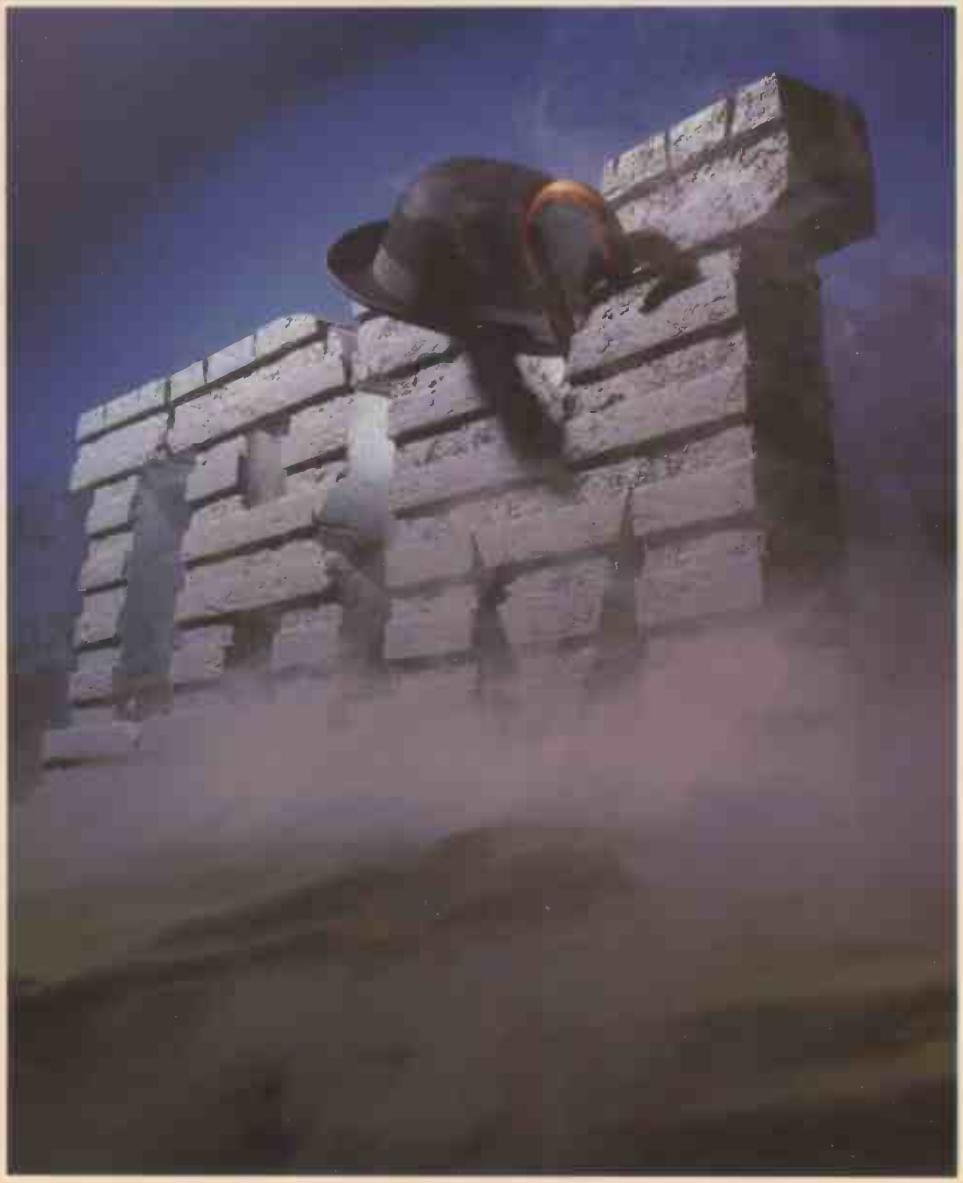

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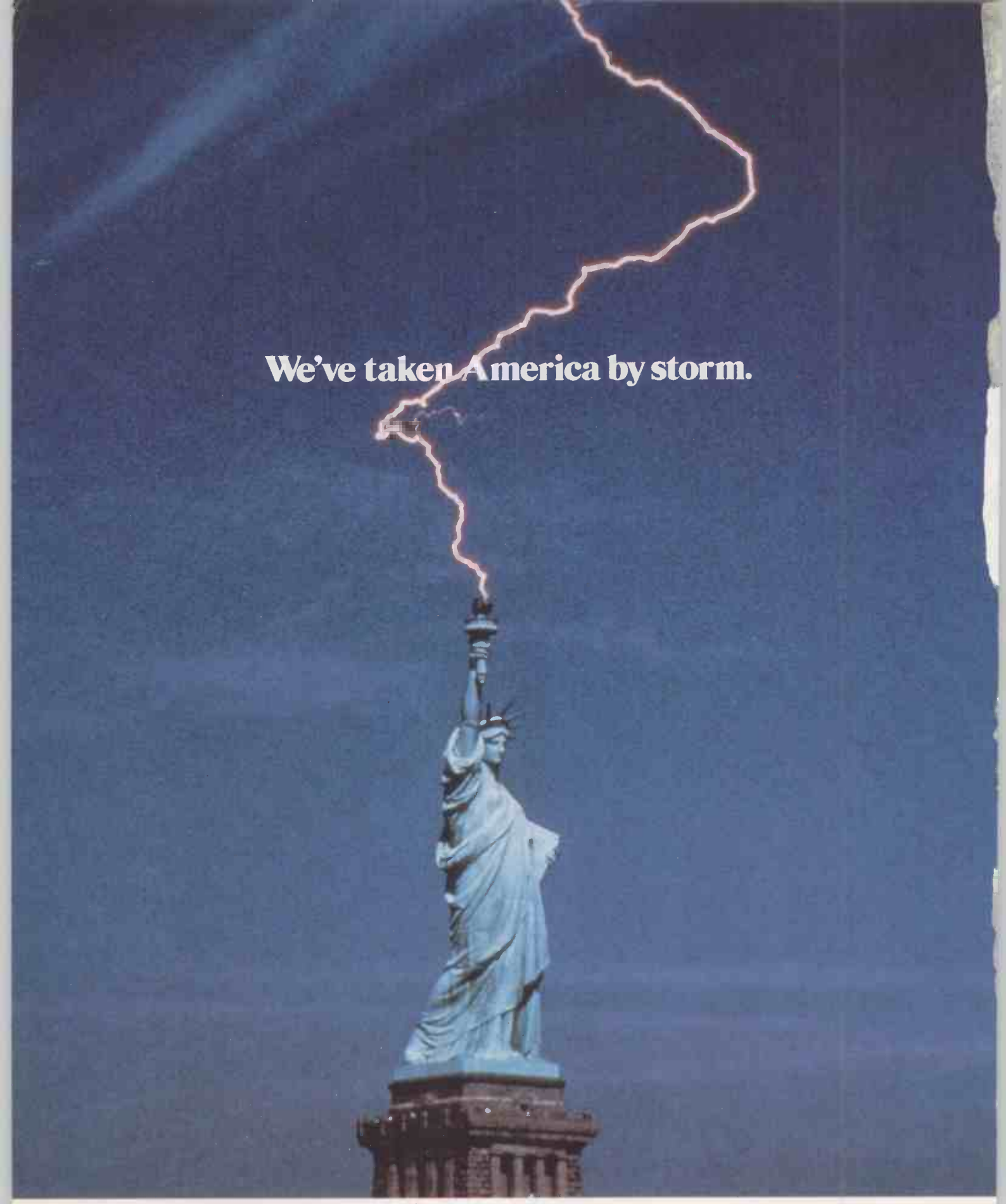

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COVER

IBM PC SPECIAL

PC clones for under £1,000, AT-alikes for less than £3,000: can the IBM PC survive? On page 87 *Jack Schofield* sets the scene and reflects on the future. Two of the ultra-cheap PC clones from Tandon and Centaur are reviewed on page 89 along with the new Tandy 3000 on page 92. Finally, there is a comparison of the 40-plus contenders in the PC and AT compatibles market 87

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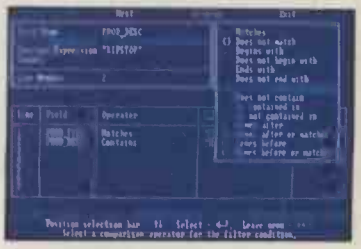

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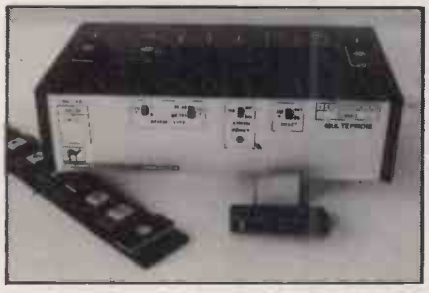

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STEPHEN GREENFIELD MODEL MAKERS. PHOTO BY TONY HUTCHINGS.

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OSBORNEMANIA

"I predict that if I come back a year from now there will not be a single mass-merchandise package selling in the U.K. for more than £100, and that includes Lotus 1-2-3 and Symphony." So Adam Osborne told *Practical Computing* last September. As this month's issue shows, recent events on both the hardware and software fronts could well prove him right.

Although Osborne has been conspicuous by his absence from the hardware scene following the traumas of his transportable computer, his influence lives on. Phil Clarke, one of the founders of Centaur, is a close associate; his IBMulator is reviewed in this issue. Both Clarke and his company share the Osborne philosophy that the margins on personal computers should be the same as those on any other merchandise: profitable but not profiteering. Nor is Centaur alone. Computopro, Walters and Tandon have all launched PC clones for around the £1,000 mark, in what looks like the beginning of the end of PC pricing as we knew it.

This is not a case of desperation in a fading market. Sales of the IBM PC/AT have barely got going, yet Tandon has also launched a complete AT-alike for around £3,000, and Tandy has just given credibility to this superficially impossible pricing by doing precisely the same thing.

There can be no doubt that a fundamental shift is taking place in the pricing of hardware. No longer can manufacturers and dealers slap a huge mark-up on scarce machines and sit back and enjoy the easy money. They are beginning to have to work for it.

The case of software is even more interesting. Osborne referred explicity to Lotus 1-2-3, and in this issue we review his own Paperback Software's VP-Planner, a Lotus look-alike for less than £100. Once again, this is no one-off quixotic gesture of a man driven crazy by the inequities of the micro manufacturing world: we also look at Twin, another 1-2-3 clone for around the same price, and there are more to come. There are dBase doubles and WordStar stand-ins; quite simply, a software revolution is under way.

That it is happening is hardly surprising; it is only strange that it has taken so long. Look at the facts of software publishing. According to a recent Infocorp report, a typical $495 package costs only $60 to research, develop and manufacture. Another $90 goes on sales, marketing and general administrative costs. This leaves a total profit of $345, which is split three ways: $75 to the publishing house, $30 to the distributor, and a massive $240 for the dealer. Of course, dealers will claim that much of this goes on training and support. But to quote Osborne again: "The truth is, if you get rid of the complexities that most people never use you come up with a product which is simple enough that it needs no training and no support."

Publishers like Paperback Software and Mosaic have shown the fatuity of the idea of "perceived value pricing" which has sustained these kind of figures. According to this, a package is priced on the nominal savings that will accrue from using it, rather than on its real production costs. The refusal of the leading software houses to countenance even a semblance of sanity in their pricing is a further sad reflection of the industry's immaturity.

The appearance of software clones could potentially have the same impact that IBMulators are having on the hardware scene, if the big software houses and the courts let them. Digital Research's out-of-court settlement with Apple over DR's alleged infringement of copyright was the first straw in the wind. There are increasing signs that large American computer companies are preparing for bloody legal battles in some hitherto obscure areas of copyright protection. The new clonemakers, are almost certain to be hardest hit by any new outburst of litigation. They are by definition working closely to an original, and are often small entrepreneurs with limited finances.

Nobody is denying software authors the right to enjoy the fruits of their labours and to protection from outright pirating. But the lawsuits now under preparation go beyond punishing infringements and verge on vindictive extermination. Such stifling of innovation and creative borrowing is contrary to the spirit of the micro industry. For the sake of that industry and of the users who support it, let us hope that Adam Osborne and his apostles are still around in September 1986.

5 YEARS AGO...

Apple Computers and ITT had seemed to be set for legal action over the copyright of several products Apple was supposed to have licensed to ITT — but they have reached an agreement without disclosing its terms.

Apple had alleged that ITT infringed its copyright for the Apple Disc II system, DOS 3.1 software and "circuit diagrams and circuit lay-out diagrams relating to the Apple Disc II system".

Observers had expected a protracted legal battle when the High Court in London resumed its sittings in October last, but in the event both parties agreed to settle and to keep the terms of that settlement confidential.

In a statement read to the High Court, ITT said it was "happy to undertake that, except as provided in the agreement, it will not manufacture or sell any article infringing the copyright of Apple".

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FEEDBACK

Our Feedback columns offer readers the opportunity of bringing their computing experience and problems to the attention of others, as well as to seek our advice or to make suggestions, which we are always happy to receive. Make sure you use Feedback — it is your chance to keep in touch.

Write to

Feedback, Practical Computing,
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Sutton, Surrey SM2 5AS

Bad habits

I DO appreciate that the Open File section in *Practical Computing* is very much what we readers make of it but two programs in the December issue lead me to question whether your monitors are earning their keep. Poor programming practices should either be corrected or, at least, highlighted as a contribution to our mutual learning process.

Line 310 of the Fractal Generator on page 114 has a Goto jump out of a For-Next loop. Although this works on the BBC Micro it is not permitted by BBC Basic and is, in any case, an unsound practice.

The WordStar Uploader on page 125 ignores good Pascal style by declaring items which are clearly constants as variables and then initialising them.

Agreed, many of these points are a matter of taste, but discussion of programming techniques and style are a valuable part of your journal.

PETER AMEY,
(via Telecom Gold).

Free IBM PC software

IN THE article on IBM Freeware in December's *Practical Computing*, I was surprised to find no mention of IBM PC User Group's Software Library.

The group, which now has nearly 4,000 members, pioneered the introduction into this country of Public Domain and User Supported software for the IBM PC and compatibles. Our first 15 discs of software were issued in November 1983. Since that time IBM PC User Group has built up a library of over 2,500 programs on some 130 discs, the contents of which are listed in two 72-page catalogues. Many of these programs were contributed by our own members.

IAN FRASER,
IBM PC User Group,
PO Box 593,
London SW1V 2PG.

Scots surnames

I HAVE been doing some work on the approximate representation of surnames by a method quite different from the one described by Mike Lewis in your December issue, using as my source the Highlands and Islands Telephone Directory. Some of his comments need modification for this area. In particular his figures for the lengths of British surnames are too low here because of the high incidence of names beginning with Mac. Unless, of course, he implies that Scots should be classed as another nationality, a notion which would command plenty of support up here.

For this work it would be very useful to have a count of the total of unique surnames in which Smith counts only once for all the Smiths, and so on. As a worst case I worked through the Macs in the directory and got a count. Since this meant going through about 19,000 names it was fairly tedious, and I thought that the information might well exist already. I therefore wrote to British Telecom to ask whether it has a figure for the total of unique surnames held in its directories, and a list of such surnames for this area. After a lapse of six weeks I got the answers No and No.

H J GAWLIK,
Muir of Ord,
Ross-shire.

DATABASE REALITIES

I USUALLY read computer magazine editorials to find them jawing away at some relatively obscure observation which I feel is designed as a sop to minorities among their readers, but not so in your December 1985 issue.

At last someone else has seen the truth! The vast majority of micros are sold with a database of some sort which is then adapted to do something which should be useful to the buyer. It's like a buying a car in a few big bits and putting them together later. If an expert puts them together all the cars look alike and perform alike. If the user puts them together he hasn't got the expertise to get the best results. Just like cars, every micro shop's machines and programs are the best and are always better than the Ford/Vauxhall/Austin/Volvo down the road. At least that is until the salesman changes his pitch and then he suddenly sees the error of his past ways.

The whole purpose of a computer is for it to do something that the potential user wants to do. But very, very often the potential user has absolutely no idea of what a computer can do. So what's the answer? Well, it's pretty simple, you just have to find people who have been involved in computers for some years and who also have many, many years of practical, day-to-day, business applications. They should be over 40 and be of at least middle-management experience.

This sort of person will be able to recognise situations which are crying out for a computer. They should be able to pinpoint the jobs which can be satisfied by a spreadsheet and also be able to offer specialised software for the rest at a sensible price.

Sadly, there are not a lot of computer salespeople who fall into this category at present and I reckon we have eight to 10 years to wait before they start arriving. When they do arrive we shall still have the paradox of the car salesperson — that is, the whizzcar is the best because it pays my wages.

So what we really need are computer companies who don't need to do it to make a living and whose executives are over 40 with proven records. I wonder if such animals exist.

Finally, wasn't Compec interesting. You could have pushed a wheelchair around without difficulty and the Software Section could have been used for a pedal-car derby without upsetting anyone. If you think about it, you will find it absolutely confirms your Editorial.

ROD BUTTERWORTH,
Microplan Business Systems,
Leek,
Staffordshire.

ESD — again

I READ the letter in Feedback from Brian Hamer in your October issue on electrostatic discharge (ESD). We cannot provide solutions but we can provide a definable discharge problem for our customers to solve. Schaffner has been in the business of ESD simulation for many years, so there has been an awareness of the potential problems for some time.

As micro-electronics become more commonplace in our lives we must protect sensitive components susceptible to ESD both during assembly or in use. ESD can be generated from many sources but perhaps the most common source is in the office environment being generated from synthetic materials used in clothing, footwear and carpets. How many of you have walked across your office to a filing cabinet and received a shock as you discharge your potential difference through the cabinet to earth? The shock you receive may be mildly unpleasant, yet can lead to catastrophic failure in sensitive electronic circuits.

In order to help the circuit designer and manufacturers of components and equipment, Schaffner has developed test equipment to simulate these environmental shocks.

TOM LEAHY,
Schaffner EMC Ltd,
One Ashville Way,
Molly Millar's Lane,
Wokingham,
Berkshire RG11 2PL.

MAY I clarify a point made by Mr Maguire in Feedback, December. Mr Maguire very rightly identifies the low level of static charge which can damage integrated circuits during handling — either during manufacture or the service of equipment. However, the voltage levels in our experience which affect micros during normal use will tend to be higher since some level of protection is provided by the outer case of the

(continued on next page)

(continued from previous page)

computer and the operator's physical distance from the PCB. The main objective of static control computer protection is to keep the operator's voltage down to below 500V, low enough to exclude malfunctions such as lost data, spurious signals, complete crash, etc.

T J BURTON,
3M U.K. plc,
Bracknell,
Berkshire.

BBC B+ problem

THE ARRIVAL of the Acorn BBC model B micro did much to encourage interest in the potential of the computer as an educational resource. Despite its limitations, it caught the imagination of teacher and pupil alike, and much good-quality software has been written for it.

Many teachers, in secondary and, notably, primary schools, have spent much time and effort on attending training courses where they have learned about computers and how they may be used to broaden the curriculum. Much scarce funding has been used to purchase peripherals and software for use with the machines.

There must be mixed feelings then, that Acorn should quietly axe production of the trusty B, and replace it by the uprated and much more expensive B+. While one welcomes certain features of the new machine, disturbing questions are raised about the development of educational computing in the short to medium term. Where a school wishes to acquire an additional machine to utilise its existing software more fully, it will now be supplied with a machine which, it seems, will simply not run much of the software base — including it would appear some of Acornsoft's own products. This can only be a blow to plans for further integration across the school, and to the confidence of those teacher-leaders whose attempts to persuade often unwilling colleagues are suddenly undermined.

At this college, we are attempting to compile lists of existing software where the Acorn B+ seems incompatible with its predecessor in order to deal with many enquiries from schools whose staff find that their newly acquired possession simply appears not to work. We should be grateful to any of your readers who would send details of their experiences in this matter.

G J FORSEY & D COUSINS,
Gwent College
of Higher Education,
Allt-yr-yn Avenue,
Newport,
Gwent.

BASIC BENCHMARKS

	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
Atari 520ST — 68000	0.9	2.8	5.8	6.5	7.2	13.7	20.4	9.2	8.1
Sinclair QL — 68008	1.9	5.4	9.3	9.1	11.8	24.0	42.4	20.7	15.6
IBM PC — 8088	1.3	4.8	11.8	12.2	13.4	23.6	37.6	36.6	17.7

520ST Benchmarks

I RECEIVED the Atari 520ST Basic on disc at the end of November, and ran the standard Benchmarks — see table above. The average speed of 8.1 seconds is quite respectable for a £750 system, especially considering the 520ST holds several windows on-screen while running the routines, and has to switch from the command window to the output window. This is a bigger overhead than using a line editor on a character-mapped screen as on, say, the IBM PC.

When both the operating system and Basic are finally committed to ROM, further optimisation should mean the final Benchmarks are slightly quicker.

Incidentally, the Basic disc also includes, free, the ST Writer word processor and manual. This is a 16-bit version of the excellent Atariwriter program familiar from the eight-bit range. Extra features allow toggling between black on white text and reversed out, and between screens of 78 characters by 25 lines and by 40 lines. In the latter, 37 lines are very legible, editable text.

JACK SCHOFIELD,
Sutton,
Surrey.

Hicups

THE HITACHI MBE-16002 PC is no longer supported by Hitachi with software. Any request for such support will be referred to a software company. Couple this with the fact that many of those that bought the Hitachi computer did so on the understanding that it was compatible with the IBM PC, which is not entirely true, and you will begin to see why it is that some of us users of the Hitachi PC feel that we have not been treated too well.

Hitachi seems to have washed its hands of its machine. Meaning no more development, confining all users to a limbo. One such user is currently endeavouring to return his machine to the supplier because it is not what they said it was. Another even wrote to Japan for information of a MPE-3700 light-pen as he got nowhere with the U.K. head office. He has had no response with that attempt either. I understand now that there is no light-pen.

The pity is that the machine itself is pretty good. What is needed is some support. Not a lot will happen if the users of this machine do not come together to make it happen. So there is Hicups. For want of a better expression, it is a user group for the Hitachi MBE-16002 PC.

Hicups is not a software company. We are a group of people trying to realise the potential of our systems. This ideal can be achieved by all users sharing experiences and helping one another.

Another way to get more from our computer, being a 16-bit MS-DOS machine, is to plunder the treasures of the PDL. Even here is a problem. Much of this rich source will not run on the Hitachi PC. But for a small covering charge, we can now make available programs from our library of some 30 discs.

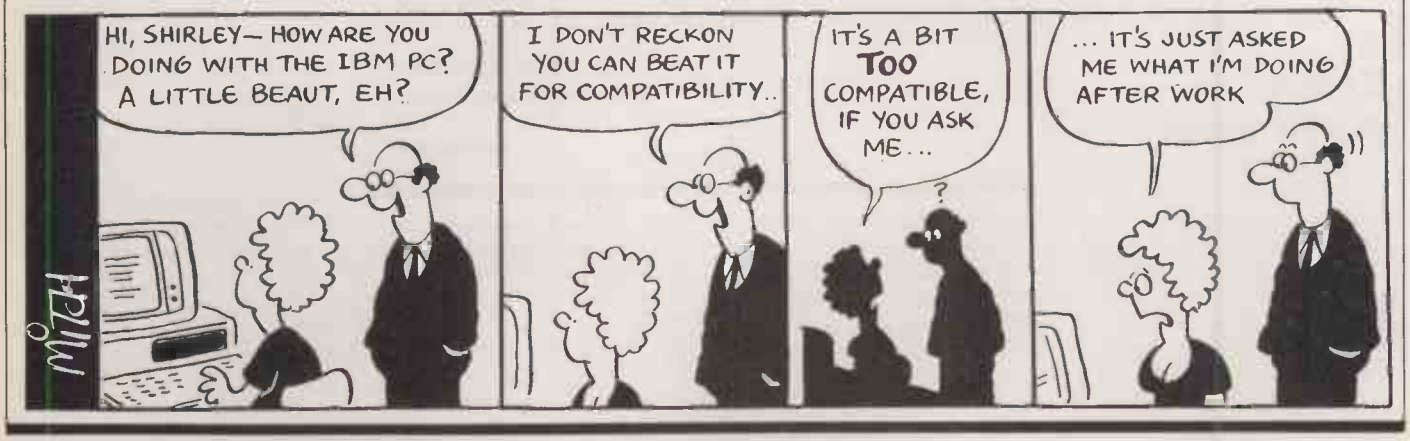
BRUCE AINGE,
Hicups,
Foxberry House,
16 Foxberry Road,
London SE4 2SP.

New BBS

WE HAVE just started the PD Software Library Fido system, a 24 hour free system, running at 300/300 baud. Situated in East Grinstead, Sussex, the number to call is (0342) 315636. The Sysop is Rod Smith.

The board is mainly intended for CP/M, MS-DOS and IBM PC users but also has an area for BBC and Amstrad, Several megabytes of public-domain software are available for download. As well as the normal message facilities, a special help wanted and help offered message area is provided for beginners and people with technical problems. Other baud rates may later be supported if demand is great enough.

ROD SMITH,
Public Domain Software Library,
East Grinstead,
Sussex.



This is the size of paper taken by Epson's new P-80 printer.

Which Computer Show
stand 435.

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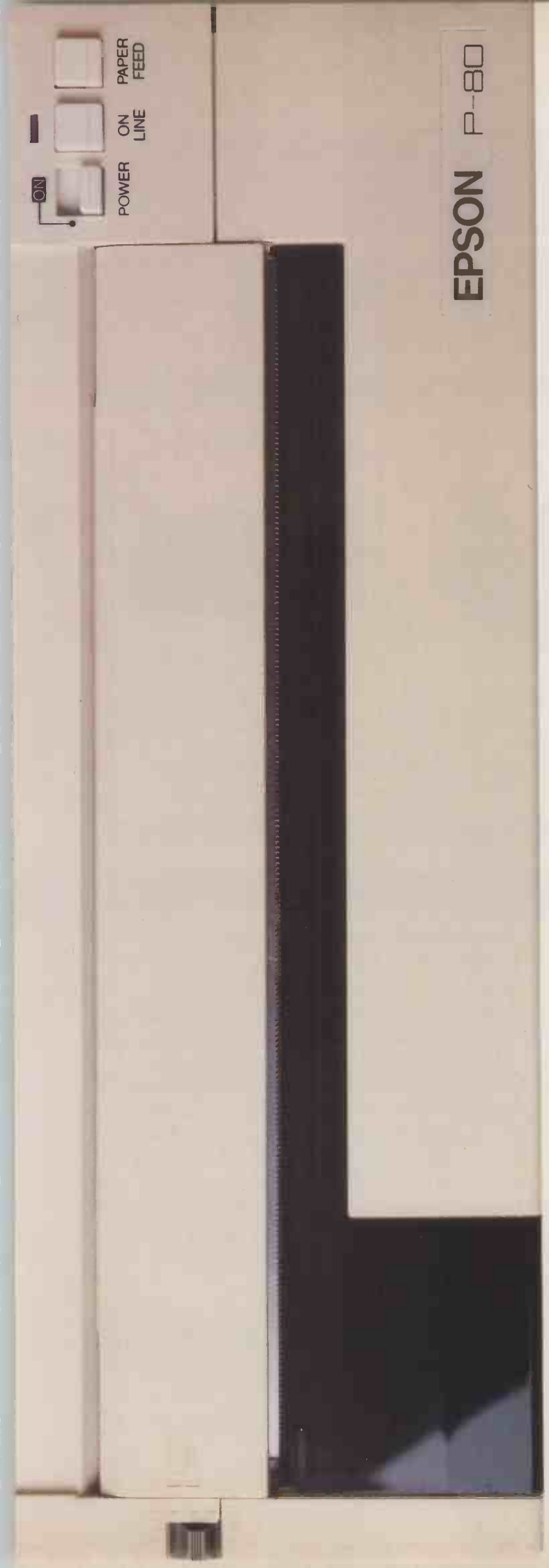

This is the size of the P-80.

Which Computer Show stand 435.

Your eyes do not deceive you. (And no, we haven't cheated with the picture.)

The P-80 really is that compact.

You can pop it in your briefcase and use it anywhere you like. (At only just over 1 kg, it certainly isn't a pain in the arm to carry.)

Yet the P-80 and its sister the P-80X boast all the important functions of much larger printers.

The print quality is actually superior to that of most dot matrix printers, with the P-80X in particular producing very clean, sharp print for reports and letters.

What's more, they are both far quieter than most other printers, since they gently apply the print by thermal transfer.

Of course, the big question is: how much are they? Fortunately, the answer is not so big. The P-80 costs £160 and the P-80X £250 (both excluding VAT).

Interested? Then here's a little space for you to fill.

Please send me the small print on these small printers (P-80 and P-80X).

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Company _____

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11

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Where possible, please indicate your system size and requirements. This will help us to give you more precise information about how SPRITE can help you.

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● Circle No. 139

Low-cost comms for the home

HOME MICRO users are in luck, as a wave of very low-cost modems, complete with the necessary communications software, has just hit the market.

Pace is selling a complete hardware/software comms package for the Amstrad 464, 664 and 6128 machines. For £150 you get a serial interface and ROM board, a Pace Nightingale multi-rate modem, and communications software based on the BBC Commstar package.

With this setup you should be able to access both 300 baud ASCII text services such as Telecom Gold, and 1,200/75 baud viewdata services such as Prestel. Contact Pace Micro Technology, Juniper View, Allerton Road, Bradford BD15 7AG. Telephone: (0274) 488211.

A similar all-inclusive hardware/software combination is also available for BBC users from Datastar. This time you get a multi-speed Magic modem and Commpanion software for £99,95 including VAT. This combination is again capable of both viewdata and ASCII comms, and the ROM-based software includes a CET telesoftware downloader. Contact Datastar Systems, Unicom House, 182 Royal College Street, London NW1 9NN. Telephone: 01-482 1711.

Commodore users are not left out. Miracle's 64 Multimodem works with the 128 as well as the 64, and connects to the cartridge port. Again, it comes complete with software for both viewdata and ASCII text, while the modem is a multi-rate one with auto-dialling. The price is £98.50. Contact Miracle Technology (U.K.) Ltd, St. Peters Street, Ipswich IP1 1XB. Telephone: (0473) 216141.

HALF-HEIGHT BERNOULLI

APSTOR'S new 20Mbyte disc-drive unit for the Apricot, IBM and other MS-DOS micros uses Bernoulli technology. The £3,450 unit has two half-height 10Mbyte drive units stacked either horizontally or vertically. Unlike a conventional hard disc, the Bernoulli data cartridges are removable, so that you can keep several backups.

Bernoulli technology offers an alternative to the ubiquitous Winchester hard disc, with comparable capacity and speed. Data is stored on a flexible recording surface inside a hard plastic cartridge. But a Bernoulli cartridge is not the same as an ordinary floppy disc since the recording medium floats on a cushion of air as it spins inside the cartridge. This reputedly endows Bernoulli drives with considerable shock resistance.

Details available from Apstor Ltd, Unit 5, Victoria Road Trading Estate, Portslade, Brighton, Sussex BN4 1XQ. Telephone: (0273) 422512.

Laser sheet feed

ONE DRAWBACK most of the popular laser printers is their slightly limited paper handling. Despite a top speed of eight pages a minute, most come with just a single 100-sheet input tray. Laser Feeder is a fix for the problem.

For £1,190 it gives you two 200-sheet input trays and a 50-envelope magazine. Another model has six input trays.

For further details contact Mekom Computer Products Ltd, Enfield Hall, Enfield Road, Edgbaston, Birmingham B15 1QA. Telephone: 021-454 2288.

Printer scheduler

THE FIRSTQUAD printer scheduler lets you share one, two or three printers between up to 16 users. Firstquad costs £1,300 and works with IBMs, Apricots, BBCs and most other common micros. It is designed to let you mix different brands of computer without difficulty. The unit has 16 serial ports to connect your computers, plus three serial and one parallel port, for the printers or plotters you want to share.

Contact Director Computer Products Ltd, 39 Clarence Square, Cheltenham Spa, Gloucestershire GL50 4JP. Telephone: (0242) 520297.

HARDWARE SHORTS

● Flexibuffer is a high-capacity printer buffer for Epson FX and LX series printers and 80-column IBM matrix printers. It fits inside the printer in place of the Epson serial board. Flexibuffer comes in several different sizes offering between 8K and 265K of buffer space, with prices ranging from £79.50 to £203. Contact Gram Business Systems Ltd on (0622) 679595.

● BBC users who have over-extended their systems might be interested in an additional power-supply unit from Pace. The £39 unit plugs independently into the mains and gives you four more BBC-type output sockets. contact Pace Micro Technology on (0274) 488211.

Cheap Unix for education

TORCH is dropping the price on its Unicorn Unix system for BBC educational users. The Unicorn is an add-on box for the BBC computer. Inside is one floppy drive and a 20Mbyte hard disc, together with 1Mbyte of RAM and a 68000 processor.

For £3,995 you now get the Unicorn box itself plus Unix System 3 software. The price also includes terminal software on ROM for five BBC work stations, as most users will probably want to use the system with either the Econet or Torchnet local area network.

Details from Torch Computers Ltd, Abberley House, Great Shelford, Cambridge CB2 5LQ. Telephone: (0223) 841000. PC

Epson PX-4 portable

THE EPSON PX-4 is a battery-powered CP/M machine similar in specification to Epson's popular PX-8. Although it has been on sale for some time through specialised dealers, is only now being made available more widely. Prices for the A4-sized machine with 64K of memory start at £575, not including software.

Compared to its better-known PX-8 sibling, the PX-4 has a smaller display, of eight lines by 40 columns. But it does have a quicker 3.7MHz processor. The space freed to the right of the narrower display can be filled with a variety of options: 40-column printer, digital multimeter, micro-cassette deck, built-in modem or an extra 64K of RAM or ROM. This flexibility makes the PX-4 ideal for specialised applications.

Contact Immediate Business Systems, 3 Clarendon Drive, Wymbush, Milton Keynes, Buckinghamshire MK8 8DA. Telephone: (0908) 568192.

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Dave Garland, Popular Computing: "Most Pascal compilers barely fit on a disk, but Turbo Pascal packs an editor, compiler, linker, and run-time library into just 29K bytes of random-access memory."

Jeremy Pournelle, BYTE: "What I think the computer industry is headed for: well documented standard, plenty of good features, and a reasonable price."

Portability. Turbo Pascal is available today for most computers running PC DOS, MS DOS, CP/M 80 or CP/M 86. A XENIX version of Turbo Pascal will soon be announced, and before the end of the year, Turbo Pascal will be running on most 68000 based microcomputers.

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Jerry Pournelle, BYTE: The tools include a B+tree search and sorting system. I've seen stuff like this, but not as well thought out, sell for hundreds of dollars".

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From Start to Finish in 300 pages. Turbo Tutor is for everyone, from novice to expert. Even if you've never programmed before, Turbo Tutor will get you started right away. If you already have some experience with Pascal or another programming language, Turbo Tutor will take you step by step through topics like data structures and pointers. If you're an expert you'll love the sections detailing subjects such as "how to use assembly language routines with your Turbo Pascal programs."

A must You'll find the source code for all the examples in the book on the accompanying disk ready to compile. Turbo Tutor might be the only reference on Pascal and programming you'll ever need.

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The games you can play and replay, revise and rewrite – but cannot resist. Chess. The ancient Japanese board game of Go-Moku. Bridge. And a manual to take you step by step through each, so that you can study programming techniques and analyse game, strategies (and even rig the games, you cunning devil!). Irresistible.

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We also supply other programmers tools, especially those for the language C. Write or call (0272) 279499 for more information.

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NOTE: Turbo Editor Toolbox and Turbo Gameworks are available for the IBM PC and true-compatibles using Turbo Pascal 3.0 ONLY.

Amstrad prices are £5 higher
These prices include shipping within the UK, but not VAT and local taxes.
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Send cheque/P.O. to **Bristol Micro Traders,** *Borland Sales Group, Maggs House, 78 Queens Road, Clifton, Bristol BS8 1QX*

● Circle No. 133

LOW-COST PERSONAL PUBLISHING PROGRAMS

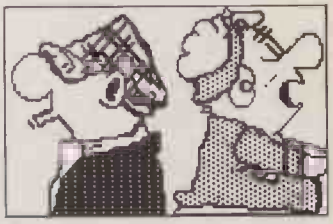
FLEET STREET EDITOR does for low-cost machines like the BBC Micro what Aldus Page Maker does for the Mac. It lets you create newspaper-style pages from your existing word-processor files. The program costs £39.95 including VAT for the BBC. Versions for all the Amstrad machines and the Commodore 128 are also being developed.

The BBC version lets you type new text straight in or use existing View or Wordwise files. You divide your page, which can be up to A4 in size, into a series of columns or boxes, and then flow the text into them. You can add headings and graphics, and change type styles on the page.

Fleet Street Editor comes with a built-in library of 600 pre-drawn graphic images, but you can also draw new ones or incorporate them from other popular BBC packages. You output finished pages to an ordinary dot-matrix printer; most of the common ones are supported by the program.

While Fleet Street Editor is not yet up to the standard of the more expensive existing Mac or IBM PC packages, the BBC version will probably appeal to many people who want to product things like posters, newsletters and presentation aids.

Clearly Mirrorsoft thinks there is a future in this type of personal-publishing package. It is already working on more ambitious software for the Apricot, IBM PC, Atari ST and Commodore Amiga. The packages for the MS-DOS machines are scheduled for completion this spring, and those for the 68000-based machines in the summer.



Fleet Street Editor includes 600 ready-made images.

These packages will be more up-market than the sort of software Mirrorsoft concentrates on at the moment. According to the company the personal-publishing packages will probably interface to proper phototypsetting equipment in addition to laser printers and standard matrix printers.

Contact Mirrorsoft Ltd, Freepost BS4382, Paulton, Bristol BS18 5BR. Telephone: 01-377 4644.

Amnesty for WordStar pirates

MICROPRO is offering an amnesty to all end-users who possess illegal copies of WordStar. For £40 a disc it will swap dodgy copies for the real thing with no questions asked. Paradoxically the move reflects increasing confidence that unauthorised users can now be successfully prosecuted under the new Copyright (Computer Software) Amendment Act.

According to Robin Oliver, Managing Director of the American-based Micropro's U.K. operation, much of the illicit copying has been taking place in medium and large companies. He says that many users have not realised that what they are doing is illegal: "We do not wish to get involved in prosecuting such people, and would like to offer them a chance to 'make it legal' ".

This offer applies to all versions of WordStar, irrespective of the system. Once users have a legitimate copy they can then get all the benefits of properly registered users, including the right to apply for software updates.

In a related move, Micropro has announced a network-licensing scheme for WordStar 2000, its top-of-the-range IBM word processor. Users will be able to buy additional copies of the £465 program for use on local area networks at less than half the price.

Contact Micropro International Ltd, Haygarth House, 28-31 High Street, London SW19 5BY. Telephone: 01-879 1122.

This is an example of FONT style 1
This is an example of FONT style 2
This is an example of FONT style 3
This is an example of FONT style 4
This is an example of FONT style 5
This is an example of FONT style 6
This is an example of FONT style 7
This is an example of FONT style 8
This is an example of FONT style 9
This is an example of FONT style 10

BBC printer utility

FONTWISE gives high-quality print and 10 extra print styles to BBC users with Epson-compatible printers. The print utility costs just £12 and works with the Wordwise and View word-processing programs and with straight ASCII text. For further details contact Clares Micro Supplies, 98 Middlewich Road, Rudheath, Northwich, Cheshire CW9 7DA. Telephone: (0606) 48511.

SPI dis-integrates Open Access quartet

SPI is about to launch a new version of Open Access, this time as a set of four separate modules. The announcement represents yet another sign of the shift away from giant do-everything packages. The original, integrated six-in-one product will still be available, but Software Products International recognises that many users now prefer to buy simpler stand-alone products as they need them, perhaps integrating them later.

The new modular family is called Access Four. It consists of spreadsheet, database, word-processor and network-manager modules, the last of which is designed to allow several users to access the system on a PC network.

When Open Access was originally launched in 1983, was one of the first of the big integrated packages, and has proved one of the most successful. Among its strong points is the ability to handle large amounts of data without becoming memory-bound.

Contact Software Products International, 13 Horseshoe Park Estate, Pangbourne, Berkshire RG8 7JN. Telephone: (0735) 74081.

Logo on the Mac

LOGO is now on the Mac. Microsoft's Mac version of the popular education language was developed by Logo Computer Systems Inc., and so has the approval of Logo guru Seymour Papert. The price is about £200, or £145 to educational users.

Contact Microsoft Ltd, Excel House, 49 De Montfort Road, Reading Berkshire RG1 8LP. Telephone: (0734) 500741.

AMSTRAD SHORTS

- Compsoft Delta is available to Amstrad PCW-8256 users for £99 including VAT. Delta is a powerful relational database which allows you to have up to eight files open at a time. Contact Newstar Software Ltd on (0277) 213218.
- Poly Print gives the printer which comes with the Amstrad PCW-8256 another 10 typefaces. It does not work with documents created with the current version of Locoscript, the WP which is bundled with the Amstrad, but comes with its own built-in text editor and will work on all normal ASCII files. Poly Print costs £29.90 including VAT from Newstar Software.
- The Cracker is the first spreadsheet with integrated graphics for the Amstrad PCW-8256. If you have data in DIF or dBase format it can read it too. The program costs £49 including VAT from Newstar Software. An IBM PC version is available for £98.
- Digital Research is supporting both the Amstrad PCW-8256 and 6128 machines with low-cost versions of CBasic, Pascal, DR Draw and DR Graph. The Pascal is Pascal MT+, a full version of the structured business and educational language. DR Graph is a business-orientated chart-making package. All four products cost £49.95 each, including VAT. Telephone: (0635) 35304.

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MULTI-USER dBASE III

ASHTON-TATE has shown a multi-user version of dBase III at the Comdex exhibition in Las Vegas. Called dBase III Plus, the new version of the top-selling database package will allow several users to access the same data simultaneously.

dBase III Plus is scheduled to go on sale in the U.K. early this year. The £595 program will replace the existing dBase III product for both single and multiple users. Ashton-Tate believes that stand-alone users may later want to transfer their dBase-written applications to a network, and dBase III Plus will allow them to do this.

The new version runs on a minimum stand-alone configuration of one 256K floppy-based IBM PC. To use it with a Novell or IBM PC local area network you also need to get the new dBase II LAN Pack. This costs £795 and allows up to three additional PCs to access the same data.

As well as multi-user capacity, dBase III Plus offers several major enhancements over the existing package. These include pull-down menus to assist new dBase users, quicker sorts and better debugging facilities. Some 50 new comands have been added to the dBase language, and there is a new query-by-example front end for browsing through data.

Existing dBase III users will be able to upgrade to the Plus version for £99; dBase II and Friday users can upgrade for £220.

This new product announcement follows on from Ashton-Tate's recent acquisition of Multimate. The U.S.-based company is now probably the second-largest micro software company after Lotus. Its product line-up for the IBM PC now consists of dBase II, dBase III Plus, Framework II, Friday and various versions of Multimate.

Details from Ashton-Tate (U.K.) Ltd, Oaklands, 1 Bath Road, Maidenhead, Berkshire SL6 4UH. Telephone: (0628) 33123

Sirius/IBM machine

FULL IBM compatibility and the ability to run Sirius software is offered by the Victor VI. This is more of an achievement than it sounds because the 5.25in. floppy discs on a Sirius or Victor 9000 series machine rotate at varying speeds depending on which track it is reading, whereas on the IBM PC the speed is constant. The Victor VI drives can do either; you just put a disc in and leave it up to machine to work out how to read it.

In other respects the Victor VI is a fairly conventional 8088-based PC clone. In twin-floppy configuration it costs £2,795, while 10Mbyte, 20Mbyte and 30Mbyte hard-disc versions are also available with prices starting at £3,995.

The twin-floppy Victor VI.

More details from Victor Technologies (U.K.) Ltd, Unit 1, Valley Centre, Gordon Road, High Wycombe, Buckinghamshire HP13 6EQ. Telephone: (0494) 450661.

DOS books

THREE GUIDES to DOS have been published, and two are British. *Introduction to PC-DOS* by Bob Eager is one of the IBM Personal Computer Series from Addison-Wesley, and it costs £11.95. Five British PC books are scheduled or published already, and there should be more. The ISBN is 0 201 14529 4. Telephone: (0734) 794000.

MS-DOS — An Introduction is by Mark Adams, published by Century Communications at £9.95. The ISBN is 0 7126 05541. Telephone: 01-240 3411.

The American book is *PC-DOS: Introduction to High-Performance Computing* by Peter Norton of Norton Utilities fame. It is also suitable for beginners. It is published by Prentice-Hall International at £16.95, ISBN 0 89303 752 4.

A M Stearns returns to PC roots

A M STEARNS' Great Communicator is a fast AT clone built around the Intel 80286. It is constructed in an unusual way for an IBM compatible: instead of adopting the usual motherboard/card-slot method, all the circuitry is on cards, including the CPU. This will sound familiar to devotees of the old S-100 bus systems.

A M Stearns claims this return to the backplane approach makes it easier for the user to keep the hardware up to date. Five slots on the system are free to take conventional IBM A" or XT-format cards.

A Great Communicator system with a 20Mbyte hard disc, one floppy, 512K of RAM and amber monitor costs £4,550, which is slightly cheaper than the equivalent AT. A M Stearns is also backing a rental scheme under which the same configuration would typically work out at around £189 a month. Among the more unusual options available are an A4-size monochrome monitor which shows a full 66 lines of text.

The Great Communicator adopts the backplane approach.

Contact A M Stearns Ltd, AM International, Maylands Avenue, Hemel Hempstead, Hertfordshire HP2 7ET. Tel: (0442) 42251.

(More news on page 19)

IBM SHORTS

● SB-Writer adds word-processing and mail-merging functions to Lotus 1-2-3. SB-Writer costs £72.50 from Systembuild of Cambridge. Telephone: (0778) 344388.

● Sign-Master is an easy-to-use presentation-graphics package designed specifically for producing text signs, slides and overhead-projection film. It has seven built-in character founts and a symbol library, and works with most printers and plotters. The price is £218 from P&P. Telephone: (0706) 217744.

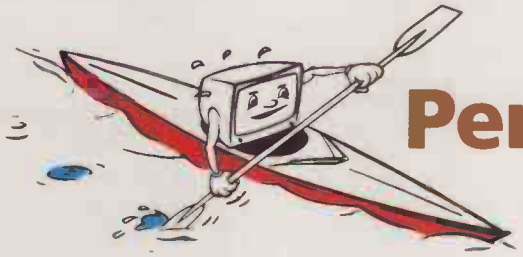
● Version 3.31 of the popular Multimate word processor supports the HP Laserjet printer and has a quicker built-in spelling checker. It costs £450. The Multimate On-File add-on gives Multimate improved mailing and recording-keeping abilities. It costs £110 and works with version 3.30 and above. Contact First Software on (0256) 463344.

● Release 2.1 of Supercalc 3 gives the well-known integrated spreadsheet the ability to handle more memory and make full use of the IBM Enhanced Graphics Adaptor card. Colour printers are now supported, allowing you to produce presentation graphics with the £360 package. Details from Sorcim/IUS. Telephone; (0753) 77733.

● Microsoft has released Pascal, Fortran and Cobol compilers for its Xenix 286 operating system. Microsoft already offers Basic and C for the Unix-like operating system designed for Intel 80286-based machines. Details from Microsoft on (0734) 500741.

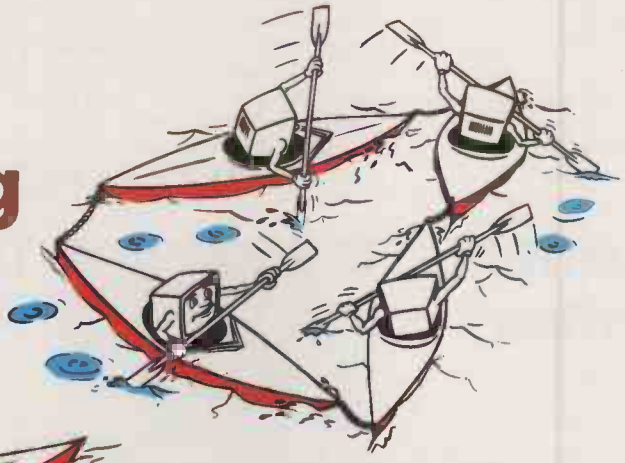
● Opus Supplies is selling a Qume daisywheel printer complete with twin-bin sheet feeder for £995. The 40cps printer comes already fitted with an IBM interface. Details from Opus Supplies Ltd on (0737) 65080.

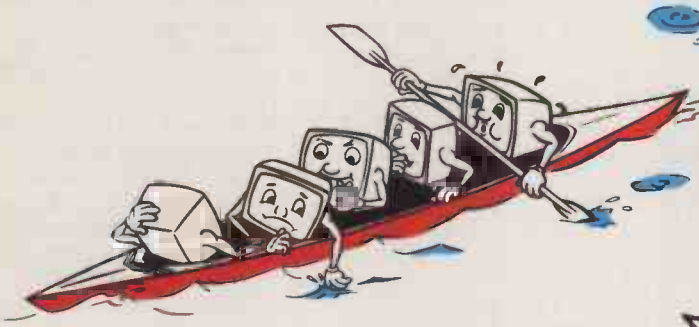
Which Boat Are You In?



Personal Computer

Networking





Super-Micro

HYPER-MICRO

Full Power for Each

A simple and fair analogy to the choice of multi-station computers, wouldn't you say?

Take a PC as equivalent to a single rowing boat. Just as a PC has one processor and one user, a single rowing boat has one passenger and one rowing power.

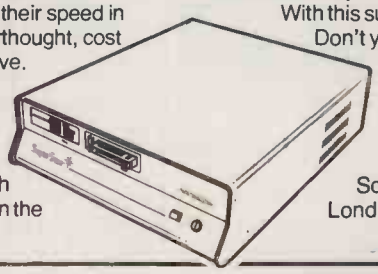
Then a network of PCs is a collection of such boats tied together trying to make a common journey; think of their speed in terms of a single boat, their co-ordination is an afterthought, cost per extra passenger is always the same — expensive.

The so-called Super-micro is just a longer boat with, typically four or so passengers, but essentially with still only one paddle to row with. Think of the speed again!

In the Hyper-micro, however, you can have as much 'processing power' as number of users. It is based on the 'one-to-one' relationship between the number of users and processors and on perfect co-ordination amongst the users; just as in our 'Special 16' boat. In addition and unique to the BROMCOM Hyper-micro; each user has four virtual screens running independently or related MS-DOS and CP/M programs simultaneously.

With this superiority, it was only fair to call it the Hyper-micro.

Don't you agree?



BROMCOM

Sales and Marketing, Bromcom Ltd
Southbank Technopark, 90 London Road,
London SE1 6LN Tel: 01-928 2900 Telex: 926012

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ADVERTISEMENT

IS YOUR COMPUTER AS CLEVER AS THE HYPER-MICRO?

Introducing the Hyper-micro — the first system to offer multi-processor based Concurrent DOS 4.1 with DR-Net. The power of more than sixteen 16-bit PCs in one with Concurrency for each user.

The limitations of the stand-alone PC are now widely known and no networking can disguise the shortcomings of such systems to meet multi-user computing requirements.

Today's successful business requires a fully integrated multi-user computer with easy expansibility as the needs grow.

The Hyper-micro offers multi-processor based Concurrent DOS 4.1, operating through DR-Net, to up to 16 simultaneous users from one central system. Multi-processing means allocating the equivalent power of one PC to each user so that no CPU degradation is experienced as more users added onto the system. This is a contrast to the "shared processor" principle most commonly used. Not only can all 16 users share the same data and communicate with each other but at the same time each user has, at his or her command, four virtual screens allowing up to four tasks to be conducted concurrently at each workstation.

Thus with such functionality and with more than the power of 16 PCs we think you will agree that the Hyper-micro adds a new dimension to multi-user computing.

How clever is your computer?

For more details see the opposite page.

IBM adopts Novell LAN in U.S.

NOVELL has stolen a march on its network rivals by getting IBM to market its LAN software. The deal applies only to the U.S. at the moment, but it gives a big boost to the Novell product's credibility.

Novell Netware is a multi-user, multi-tasking network operating system which actually replaces the software IBM provides for its PC network and cluster systems. You run Netware software on the LAN's file server, while each station runs a small Novell shell program on top of MS-DOS.

The advantage Novell claims for netware over the own-brand IBM software is improved performance and compatibility with more third-party application packages.

Theoretically you can connect up to 50 PC stations to each LAN file server, though in practice the hardware cannot handle more than four of five with reasonable performance. Another advantage of Novell Netware is that it lets you use several file servers on the same network, so providing a way around this hardware limitation.

Netware costs £2,100 per file server. For further details contact Novell Data Systems, 78-82 St. John's Road, Tunbridge Wells, Kent TN4 9PH. Telephone: (0892) 47833.

Bigger Winchesters

THE PROFESSIONAL is a high-volume 140Mbyte hard-disc subsystem for the IBM PC. It costs £6,995 and comes fitted with a built-in tape cartridge for making backups.

Discs of this capacity make most sense connected to a network, and the Professional claims to support all the leading brands. A 280Mbyte version of the disc system is also available, and an even higher-capacity model offering three-quarters of a gigabyte is promised for the end of 1986.

Contact Micro Technology Group, 51 The Pantiles, Tunbridge Wells, Kent TN2 5TE. Telephone: (0892) 45433.

Omnis 3 for IBM

OMNIS 3 is probably the most successful application generator for the Macintosh, and one of the few British software packages to make it into the U.S. sales charts. It is now available in a new version for the IBM PC and clones.

Compared to other IBM databases of the application-generator type, Omnis 3 is fairly easy to use, but it is quite expensive at £445. You define report and record layouts and end up with a tailored menu-driven application.

Omnis 3 comes complete with a set of example applications, including a sales ledger and time and cost recording. It can accept data from Lotus 1-2-3, Multiplan and other packages which uses the DIF format.

For more information contact Blyth Software Ltd, Mitford House, Benhall, Saxmundham, Suffolk IP17 1JS. Telephone: (0728) 3011.

Better APL

RELEASE 5 of the APL*Plus PC version of the popular APL numbers-orientated language has full IBM graphics and improved editing and performance. Full high-resolution graphics are now available from within APL.

Pre-written APL graphics functions are provided for drawing things like pie, bar and line charts, and the new release supports the IBM Enhanced Graphics Adaptor. The new full-screen program editor offers a spreadsheet-like facility for numeric arrays which can also be incorporated in your own applications. A set of fast assembler-written utilities for things like string search and replace and text justification is also provided to speed up program execution.

APL*Plus PC costs £695 from Cocking & Drury Ltd, 16 Berkeley Street, London W1X 5AE. Telephone: 01-493 6172.

Low-cost telex with a PC

TELEX 2000 gives an ordinary IBM PC or clone the full functions of a proper telex machine. What is more, you can have Telex 2000 running in the background, waiting for incoming messages, while you continue to use your spreadsheet or word processor.

This all assumes you generate enough telex traffic to make it worth your while leasing your own telex line from British Telecom. You then need a telex modem to fit between the telex line and your IBM PC; these are more complex than phone modems, and more expensive. Telex 2000 is designed to work with the Telexbox 3 unit — at £1,450 it is quite cheap as telex modems go. Telex 2000 itself is the software part of the system; it costs £125.

You also need a graphics card in the PC and a printer. The total cost works out below what you would pay for a dedicated telex machine, and you still have the normal PC functions available.

Contact Telex 2000, 34 Copelands, New Ash Green, Dartford, Kent DA3 8LG. Telephone: (0474) 872558.

Tandy AT-emulator

LATEST in Tandy's line of very good value IBM compatibles is the Tandy 3000, a full Intel 80286-based AT-clone system for just under £3,000. With a 20Mbyte hard disc, one 1.2Mbyte floppy, 512K of RAM and monochrome screen the price comes to £2,974. The 3000 is reviewed on page 92 of this issue.

Contact Tandy Corporation, Tameway Tower, Bridge Street, Walsall, West Midlands WS1 1LA. Telephone: (0922) 648181. PC

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AT2: Same as above but with 20MB Hard Disk £2,999

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RAM UPGRADES

64K RAM 150NS: Set of 9 chips (64K)/set of 36 chips (256K)/set of 54 chips (384K) ..... £20/£75/£100

128K RAM 150NS: Piggyback for "AT": Set of 9 chips £43

256K RAM 150NS: Set of 9 chips (256K)/Set of 18 chips (512K) £50/£90

512K RAM Board with Clock/Calendar and battery with 512K RAM £299

MONO/COLOUR GRAPHICS

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For PC/XT and Compatibles:

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360K half height drive for PC/XT £130

360K drive for "AT" - exactly same drive and colour as IBM "AT" £199

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MAC-400: External drive for MACINTOSH £249

OLIVETTI M24/M21

M24 with 640K RAM, Single Floppy, 10MB Hard Disk, Keyboard Screen and DOS £1,899

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20MB Streamer + Cables + Software (internal or external) £750/£850

40MB Hard Disk + Controller + Cables (internal) £1399

20MB half height hard disk for "AT" £450

20MB Hard Disk + 20MB Cassette Streamer + Controller + Cables + Software — External Subsystem £1,499

KEYBOARDS

83 key for PC/XT £99

108 key UK KB - PC/XT, separate cursor pad £160

Keyboard for "AT" £190

MONITORS

Zenith Amber Monitor £125

KAGA Amber Monitor - IBM Compatible £159

EAGLE 13" Colour - IBM Compatible 640 x 200 ..... £225

MITSU BISHI 14" Colour IBM compatible £249

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155W replacement PSU for PC/XT, DC Fan £140

200W replacement PSU for "AT", DC Fan £190

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Metal Case, flip-top-cover, 8 slots suitable for MICRONIX PC/XT Compatible Motherboard, PSU and Floppy/HD/Streamers £100

Metal Case for "AT" Compatible Motherboard, PSU, Floppy/HD ..£175

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FUJITSU DC1200 136 column, 180 CPS/36 CPS NLQ IBM TYPE .£399

FUJITSU SP320 48 CPS daisy wheel, Centronics £899

FUJITSU DPL 24 288CPS/96CPS letter quality £999

QUENDATA 20 CPS Daisy Wheel £199

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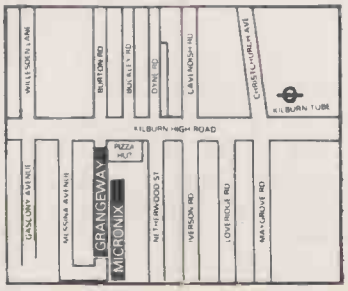

● Circle No. 132

DATA LAW LOOMS

WITH the 11 May 1986 deadline for the Data Protection Act getting closer, panic should soon be setting in as computer users begin to worry about whether they are meant to register. After 11 May many unregistered organisations will be breaking the law if they hold the sort of personal data covered by the Act.

In fact, if you hold any information on other living people for business or professional reasons you probably are required to register. And, although some users have not realised it, the educational sector is not exempt. On the other hand, if your people-related data is held for genuinely recreational purposes or the management of purely personal household affairs you probably can get away with ignoring the Act.

In the *Practical Computing* editorial office we are not going to register, because the data we hold is on products and companies, not people. But our subscription and marketing departments probably will regiser as they hold data on identifiable living people — possibly you.

A fuller guide to who is affected by the Act appeared in the September 1985 issue of *Practical Computing*. The Data Protection Registrar will send you free of charge a registration pack with an explanatory booklet and the necessary forms. Registration itself costs £22. The Data Protection Registrar is at Springfield House, Water Lane, Wilmslow, Cheshire SK9 5AX. Tel: (0625) 535777.

If you need more help, the training organisation ADM has produced a rather steeply priced kit, aimed mainly at small to medium-sized businesses. For £65 you get the Registrar's forms, a copy of the Act itself, ADM's guide to the act and a set of forms designed to help you decide whether you need to register. Details from ADM Ltd, ADM House, 5-9 Headstone Road, Harrow, Middlesex HA1 1PL. Tel: 01-863 0621.

Women's training pack

THE Women's Computer Course is a free 80-page source book designed for women who teach about computing. Arising from a series of evening classes run by the authors, it contains original and reprinted articles, press cuttings, pictures and cartoons. Topics covered include women's jobs, health and history in computing, word processing, and a long section on Basic programming. The book pulls apart easily, so sections can be photocopied.

Produced with help from the Equal Opportunities Commission, the teaching pack is free, but you have to send an A4 SAE and 90p postage. Contact Robyn Smits and Mary Jennings, 157 Maryland Road, London N22 5AS.

Mailpost delivers email to the door

OLD paper-and-envelope letters have many advantages, not the least of which is that you can send them to people who are not equipped to receive electronic mail. Mailpost is a brand-new facility on the Telecom Gold mail system which lets you exploit a combination of old and new technology in a useful way.

With Mailpost you email the text of your letter and the address of its intended recipient to Mailpost's mailbox on Gold. The Mailpost staff then type the letter out on real paper, stick it in a real envelope and post it off. A few days or weeks later it will, hopefully, arrive.

The service makes most sense if you are travelling around abroad or away from your office with a portable computer. A typical letter sent to someone in the U.K. works out at around £1 with Mailpost. To this you must add a once-off registration fee of £135, which also gets you a Telecom Gold mailbox if you do not already have one. Mailpost is run by New Technology Systems, which operates its own Telecom Gold user group.

New Technology Systems also offers a complementary service so that your email-less recipient can reply to you. Your correspondent rings up a Mailbox number on the ordinary voice telephone and dictates a message to Mailbox staff who then forward it electronically to your Telecom Gold mailbox.

Details from New Technology Systems, Pembroke House, The Crescent, Leatherhead, Surrey KT22 8HW. Telephone: (0372) 379873.

Zenith winner

WE HAD nearly 800 entries for our competition in the September issue to win a Zenith ZF-158-42 IBM-compatible computer. The main task we set was to list seven features of the system in order of importance. The tie-breaker asked you to come up with an improvement on the rather dull name.

Only one entrant came up with exactly the same sequence as the *Practical Computing* judges. R Gibson of Winchester agreed with us on CDGBAFE: the ability to run colour packages even with a monochrome monitor; speed switchable between 4.77MHz and 8MHz; full one-year guarantee; five free expansion slots; 768K maximum on-board RAM capacity; no motherboard for greater reliability; and uses large-scale gate array technology.

He therefore wins the competition, and all your suggestions for a better name for the Zenith system were not needed. This was just as well as the majority of them were pretty feeble. But R Gibson, who won anyway, did not do badly with his suggested name, "Apex". Many thanks to Zenith Data Systems for providing the attractive prize.

Database publishing on CD-ROM

THE PROMISE of having the world's knowledge, or at least large chunks of it, at your fingertips has been with us ever since the first on-line database publishing service saw the light of day.

But a promise is what this facility remains for most people. The complexities of accessing databases and of formulating effective search strategies are a barrier to general use of on-line databases, but an even greater barrier is the cost of mounting even simple searches.

Now compact-disc read only memory (CD-ROM) is poised to remedy some of the deficiencies of on-line database publishing. CD-ROM is a development of the familiar 12cm. CD audio disc, and shows great promise as a cheap and robust high-capacity storage medium.

Philips has introduced a unit called the CM-100, which can store 600Mbyte on a single-sided disc. This is the equivalent of 230,000 pages of A4 double-spaced text or more than 1,000 images.

The CM-100 adheres to the standard developed by Philips and Sony, which allows total interchangeability between discs and drives for compact audio discs. Progress is being made to extend this standard to include CD-ROM, and it will soon be implemented for the IBM PC/XT and PC/AT computers and compatibles. In the U.S. a company called Micro Trends has developed a CD-ROM interface card for the Apple II.

So far, the number of CD-ROM products is small, and what is potentially a large publishing market is caught up in a familiar bind: products are not developed until the customer base is sufficiently large, and the customer base grows slowly if only a limited number of products are available.

On the software front, Grolier is publishing its Academic American Encyclopaedia on CD-ROM for the IBM PC and Atari 520ST, and Sydney Library Products can now provide the entire Library of Congress Marc database of bibliographic records on CD-ROM. Sydney also provides the CD-ROM software and equipment, including the interface board for the user's PC, as part of a package deal for the Marc database.

In the U.K. a system developed at AERE Harwell combines the Status information-retrieval software with compact-disc technology. Users of the system can access information on CD-ROM, using either standard Status commands or tailored menus. They can then use the information from the CD-ROM, to create their own personal databases. PC

Pick a disk... any disk

Floppy disk incompatibility – an unpleasant fact of computer life. GEMINI M-F-B 2 SYSTEM – a pleasant computer solution.

When we introduced the original Gemini M-F-B system, we provided a lot of answers to the growing problem of disk size and format incompatibility. And now with the M-F-B 2, we can provide even more answers.

The new system continues to provide the ability to format and transfer data between any of the microcomputer formats currently available within its library of over 400 machine type and format combinations, but now goes even further.

The changes in hardware manifest themselves in a system that now provides either 10MB or 20MB of Winchester based storage and the adoption of half-height devices have allowed the inclusion of a 3.5" floppy drive as standard.

The software changes now provide the M-F-B 2 system with the capacity to not only hold up to 700 format combinations, but to also supply an MS-DOS suite of software enabling support of the entire IBM PC (PC, XT and AT) family, and IBM 'lookalikes'.

The Gemini M-F-B 2 now comes with a 12 month free format update service.

The 8" drive shown may be omitted from the system.

A 0.5MB RAM Disk is an additional option for the system.

MULTIBOARD COMPUTERS

Gemini
Computer Systems Limited

Springfield Road, Chesham, Bucks HP5 1PU.
Telephone: (0494) 791010. Telex: 837788

● Circle No. 140

BY MIKE LEWIS

KEEP YOUR DISTANCE

It is not only financial problems that lend themselves to solution on a spreadsheet.

If you were to conduct a survey into what people use their spreadsheet packages for, you would probably find that the vast majority stick to the same few applications, with budgets, cash-flow forecasts and sales analysis probably topping the list. This is fair enough; after all, these are presumably the very jobs for which the original purchase of the spreadsheet was made.

Yet how many more problems go unsolved, and how many decisions are made on the basis of inadequate information, just because people do not realise the help their spreadsheet could give them? There must be hundreds of everyday business problems which are eminently suitable for spreadsheet treatment, given only a little planning and imagination.

DISTANCES

One such group of applications are those that could loosely be termed geographical: problems involving places and distances rather than pounds and pence. For example, suppose your company has recently attracted new customers in a distant part of the country, and you have to decide the best site for a new warehouse to serve them. You have a short list of 10, and now you must work out which has the lowest costs.

You do not need a computer to add up the fixed costs like rent and rates, but when it comes to variable costs such as those that depend on the number of deliveries and distances travelled, things are much trickier. Suppose that each customer has a known number of deliveries per period, and that the transport costs, in pounds per vehicle-kilometre, are also known. For simplicity, you can assume that each delivery is a single vehicle load. The problem then boils down to identifying the warehouse site which involves the lowest total distance to all customers, weighted by the number of deliveries.

To find the distance for each trip you could use a mileage chart from one of the motoring organisations. You would then go through, multiplying each one by the number of drops, and obtain a total for each of the possible sites.

But with 10 sites and, say, 500 customers, you would be faced with the daunting prospect of 5,000 look-ups. Also, most published mileage charts are for main towns only, while customers are likely to be here, there and everywhere.

A better approach would be to find the distances between customers and warehouses by applying some elementary principles of Cartesian geometry, with a little help from Pythagoras. These tell us that if two points have co-ordinates of (x1,y1) and (x2, y2) respectively, the straight-line distance between them is

$$\sqrt{((x-x2)^2+(y1-y2)^2)}$$

If all the customer and warehouse locations are given co-ordinates relative to a common origin, you could build this formula into a spreadsheet and let the software do the calculating.

Fortunately, all the locations in question already have such co-ordinates, as has every town, village, large building and duck pond in Britain, thanks to that marvellous invention, the National Grid. In this system, the country is divided into 50 squares, each side of which is 100km. Each square has a unique two-letter identifier. Locations within the squares can be referenced by their co-ordinates along an east-to-west and north-to-south axis respectively, relative to the south-west corner of the square.

You can find grid references by looking at an Ordnance Survey map, or from the index of the Ordnance Survey Atlas of Great Britain. Before you enter them into the spreadsheet, you must convert the two-letter labels of the big squares to a numeric form. Unfortunately, there is no formula for this, so you will have to resort to a look-up table, an extract of which appears below. For example, the swing bridge across the harbour at Whitby has a full grid reference of NZ 899 115. The less precise reference for the entire town is NZ 89 11. Since the south-west corner of square NZ has co-ordinates 4,5 in units of 100km, the typed-in value for Whitby becomes 489 511.

GRID SQUARE CONVERSION

An extract from the table used to convert the two-letter identifiers of the 100km. squares to numeric x,y co-ordinates.

Square	x	y
SD	3	4
SE	4	4
TA	5	4
NY	3	5
NZ	4	5

DATA ENTRY

You can now set up the spreadsheet, entering customer locations in the rows and warehouses in the columns. Enter each half of a grid reference in a separate cell, since this is a separate term in the Cartesian formula mentioned earlier. After you enter and replicate the formula, the software will place the straight-line distances in the body of the sheet.

By now you have probably seen what appears to be a major objection to all this: lorries seldom travel in straight lines. Is there a predictable relationship between the distances travelled along the road and the straight-line distances obtained by the formula?

To answer this question, I took a large sample of British towns and villages, and plotted the actual mileages between them against the straight-line distances. I then used the least-squares method to find the line of best fit. The result was the following formula

$$r = 1.18s - 0.72$$

where r is the road distance and s is the straight-line distance. It is surprisingly accurate for most points in mainland Britain. In practice the constant term, 0.72, can be omitted because it lies within the margin of error of the six-character grid references.

Further columns may now be added to the spreadsheet for holding the road distances. You can then multiply each of these by the number of drops for each customer, giving the total number of vehicle-kilometres for each potential site. Of course, this example contains many assumptions that might make it inappropriate for your own use. But it does at least show that there is far more to spreadsheets than budgets and cash-flow forecasts. PC

WAREHOUSE-SITING SPREADSHEET

An extract from the warehouse-siting spreadsheet, showing three possible sites and 11 destinations.

	Grid ref	No. of drops	Stockton 444 519			Catterick 423 497			Dalton 443 476		
			Straight	Road	Total	Straight	Road	Total	Straight	Road	Total
Goole	474 423	5	100.6	118.0	589.8	89.9	105.3	526.6	61.4	71.7	358.7
Ilkley	411 447	7	79.2	92.7	649.2	51.4	60.0	419.7	43.2	50.2	351.7
Leyburn	411 490	12	43.9	51.1	613.4	13.9	15.7	188.1	34.9	40.5	485.9
Malton	478 471	5	58.8	68.7	343.4	60.8	71.1	355.3	35.4	41.0	205.0
Northallerton	437 493	2	26.9	31.1	62.1	14.6	16.5	32.9	18.0	20.6	41.1
Pately Bridge	415 465	15	61.3	71.6	1074.1	33.0	38.2	573.0	30.1	34.8	521.7
Ripon	431 471	8	49.7	58.0	463.7	27.2	31.4	251.0	13.0	14.6	117.0
Selby	461 432	1	88.6	103.9	103.9	75.3	88.1	88.1	47.5	55.4	55.4
Settle	382 463	4	83.5	97.9	391.5	53.3	62.1	248.5	62.4	72.9	291.5
Skipton	398 451	9	82.1	96.2	865.4	52.4	61.1	549.5	51.5	60.0	540.2
Thirsk	442 482	4	37.1	43.0	172.0	24.2	27.8	111.4	6.1	6.5	25.8
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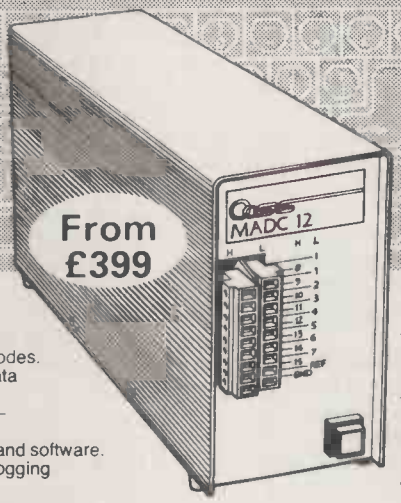

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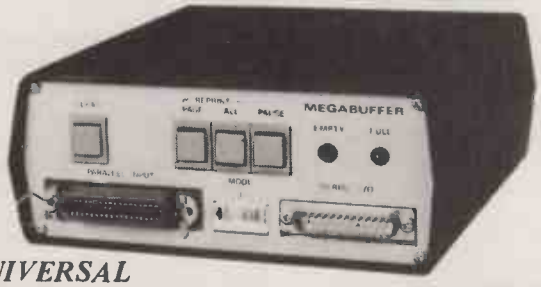

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SQUARING UP FOR THE 32-BIT BATTLE

As the chip manufacturers slug it out for the 32-bit crown, it remains an even bet whether compatibility or performance will win out.

It is always tempting to wonder whether the introduction of the latest microprocessor design will represent the ultimate limit of performance beyond which it will be unnecessary to go.

Some people once predicted that passengers on trains would suffocate at speeds of 30 miles per hour or more, and that high-speed transportation would remain for ever the preserve of a privileged minority. Likewise there are contemporary prophets who predict that the market for 32-bit microprocessors is so small that the cost of developing such devices cannot easily be recouped.

It is true that today's market for 32-bit computers is very small in comparison to the market for eight- and 16-bit systems. But cheap and available technology has a habit of creating its own market where none existed previously. Judging from the activities of the chip manufacturers, this is likely to be the case for 32-bit microprocessors.

RECESSION

Despite the worst recession in semiconductor sales for more than a decade, all the major microprocessor manufacturers are pushing ahead with extensive 32-bit programs. They are confident in the belief that there really will be a mass market for microcomputers and other systems based on this very powerful technology.

Although there is not much to be gained from porting most of today's software packages on to a 32-bit machine, the new software which will soon become available will be able to perform all the old tasks with increased user-friendliness and reliability. It will also make some tasks possible for the very first time.

One intriguing question concerning this giant leap in performance is which chip family will emerge as the industry standard, if indeed any one does? Until now Intel has had an unbroken string of successes. They started with its popular eight-bit 8080A, which was only ever eclipsed by the compatible Z-80 from Zilog, and progressed to the 8088 and 8086 of the IBM PC and its compatible cousins, and most recently the 80286 of the IBM PC/AT.

One of the major reasons for Intel's success has been the compatibility of its processors. This has provided a software upgrade path from one generation to the next, allowing users to preserve their software investment. Other chip manufacturers — notably Zilog, whose 16-bit Z-8000 failed to catch on for microcomputer applications despite the huge Z-80 following — ignored the need for software compatibility and have suffered badly as a result.

Although the market has decided that upwards compatibility is very high on its list of priorities, this attractive feature has only been available at a price. To retain compatibility Intel has had to pass many of the less than desirable features of its earlier processors on to their successors. Consequently it has been severely constrained in the architectural design of all its new devices.

Other manufacturers, particularly Motorola and National, decided that although software compatibility was a good thing, they need not go back as far as the eight-bit generation. In a bold attempt to oust Intel from the number one slot they designed 32-bit processor architectures before they could actually build a 32-bit processor, and then introduced a downwards compatible 16-bit variant as their first family product.

This strategy achieved moderate success, with sales of both the 68000 and the 32016 being adequate to ensure continuation of the species. But Intel has remained firmly in first place. The question now is whether the need for 32-bit processing power will stretch the Intel architecture beyond sensible limits. Will the Motorola and National families, which are still waiting in the wings with a steadily increasing software base, now be able to eject Intel from the number one position? Perhaps they may even be able to woo the mighty IBM away from its staunch position of using Intel only.

LOYALTY

The Intel 32-bit offering is the new 80386. On the face of it, it is a very powerful device which includes an on-chip memory-management unit, and offers a high degree of compatibility with all its earlier progenitors. But will it be good enough to retain the loyalties of big customers such as IBM in the face of intense competition from the architecturally more advanced offerings from Motorola and National?

I do not know the answer, and I am making no predictions as I got it wrong the first time around. I thought that the Motorola 68000 would have ousted the Intel 8086 and its cousins long before now. This time there are two main contenders for the 32-bit crown: the Motorola 68020 and the new National 32332, an improved version of the 32032 which was the first conventional 32-bit microprocessor to become available.

National Semiconductor is one of the world's largest chip producers with 29 plants in nine countries and with sales in the year to the 31 May 1985 of $1.79 billion. However, despite its size National has had a string of problems. Its early microprocessors, such as the eight-bit 8060 and NSC-800, failed to notch up sufficient sales to enable them to become true classics like the Z-80 and the 6502.

National's earlier microprocessor efforts were half-hearted, but with its relatively new 32000 family it has spent vast sums on product development and marketing. The results have been impressive. Already available is a comprehensive family which shares an identical internal 32-bit architecture and comprises the 32008 with an eight-bit data bus, the 32016 with a 16-bit data bus, and both the 32032 and the 32332 which share a full 32-bit data bus.

SUPPORT CHIPS

Within the 32000 family, software migration is guaranteed because internally all family members are virtually identical. A comprehensive array of peripheral circuits is available too. Also, it is difficult to fault the National family in performance terms, with the 32032 notching up 0.8 million instructions per second (mips) and the new 32332 about 2.5mips. Promised for the future is the 32C532 which should manage nearly 6mips. Also to become available this year is a floating-point arithmetic chip set which will crunch four million floating-point operations per second.

The 32332 contender offers a 4Gbyte address rage, dynamic bus sizing from eight to 32 bits to suit the application, and a burst mode memory-addressing capability which gives 60 percent time savings on the execution of certain data move operations. All this, added to the demand-paged virtual memory, Unix System V operating system, and C, Fortran Pascal and Ada language compilers, makes the National chip a potent competitor.

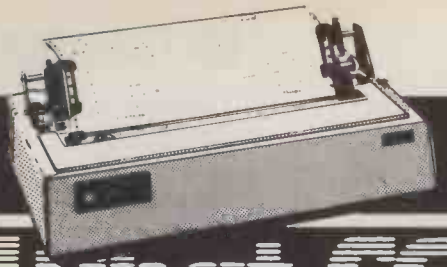
But sheer peformance may not carry the day. The ugly duckling 80386 is a fairly simple upgrade for existing 80286-based systems such as the IBM PC/AT, and there is a lot of inertia in the personal-computer business.

To help us make up our minds, National has produced a detailed comparison between its 32-bit family and the Intel 80386. It concludes that the jump to 32 bits is stretching the creaky old Intel architecture beyond sensible limits, and that it is now time for it to make way for a more advanced design. National cites a long list of deficiencies in the 80386 design which are not, of course, shared by its own device.

With the 80386 chip there are lots of rules to remember about which registers, data types, address modes and instructions can be used together. Newer families like those from Motorola and National provide greater programming simplicity. They keep things general-purpose and untrammelled by historical precedents which date right back to the 8080A of the early seventies.

The uniform architecture of the 68000 and 32000 families provides upwards and downwards software compatibility so that software developed for the 32008 can easily be converted for use on the 32332 and vice versa. While it is fairly easy to adapt 80286 software to run on the 80386, it is less easy to go the other way unless many of the new features of the 80386 are not used.

Finally, the traditional segmented-memory approach used by Intel is less flexible than the linear 4Gbyte space afforded by its competitors. Also the virtual-memory support in the Intel family is much less sophisticated. In performance terms the choice seems simple, but I will not be placing any bets on the outcome. PC



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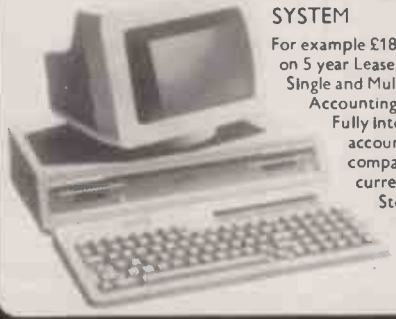

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GUIDES, INC., OAK BROOK, ILLINOIS 60521

: : : : : : : : : : : : : : : : : : : :
:      HOTEL/MOTEL INFORMATION NOW      :
:        AVAILABLE THROUGH THE          :
:       OAG  ELECTRONIC  EDITION        :
:                                       :
: SEE SUBSCRIBER BULLETIN FOR DETAILS :
: : : : : : : : : : : : : : : : : : : :

PRESS RETURN FOR SUBSCRIBER BULLETIN
OR ENTER /F, /S, /H, /I, /U
ENTER /M FOR A LIST OF OAG EE COMMANDS
OAG>/M

          ** OAG COMMAND MENU **
ENTER:/I FOR INFORMATION AND ASSISTANCE
      /F FOR FARES DISPLAYS
      /S FOR SCHEDULE DISPLAYS
      /H FOR HOTEL/MOTEL DISPLAYS
      /M TO RETURN TO THIS MENU
      /U FOR USER COMMENTS AND
         SUGGESTIONS BOX
      /Q TO EXIT FROM THE OAG EE

ENTER THE COMMAND OF YOUR CHOICE
OAG>/F

ENTER DEPARTURE CITY NAME OR CODE
OAG>LONDON

YOUR DEPARTURE CITY IS NOT UNIQUE.
USE LINE NUMBER TO SELECT CITY NAME
OR AIRPORT NAME FROM THE LIST BELOW.
1 LONDON,ONT,CANADA
2 LONDON,ENGLAND
3 LONDON,ENGLAND/GATWICK
4 LONDON,ENGLAND/HEATHROW
5 LONDON,ENGLAND/LUTON
6 LONDON,ENGLAND/STANSTED
7 LONDON,KY,USA
8 LONDON,OH,USA
9 LONDONDERRY,N.IRELAND,U.K.

ENTER +,-,LINE NUMBER OR CITY NAME.
OAG>4

ENTER DESTINATION CITY NAME OR CODE
OAG>SAN FRANSISCO

CANNOT IDENTIFY YOUR DESTINATION CITY.
IF YOUR CITY NAME IS NOT LISTED BELOW,
SCHEDULED FLIGHTS MAY NOT BE AVAILABLE.
1 SAN FRANCISCO,CA,USA/CHINA BASIN
2 SAN FRANCISCO;OAKLAND,CA,USA/OAK
3 SAN FRANCISCO,CA,USA/OAKLAND CONV
4 SAN FRANCISCO DEL ORO,MEXICO
5 SAN FRATELLO,SICILY IS,ITALY
6 SAN GABRIEL,CA,USA
7 SAN GAVINO MONREALE,SARDINIA IS
8 SANGENJO,SPAIN
9 SAN GENNARO VESUVIANO,ITALY

ENTER +,-,LINE NUMBER OR CITY NAME.
OAG>1

THERE IS NO AIR SERVICE
FOR-SAN FRANCISCO,CA,USA/CHINA BASIN

THE OAG EE CAN NOT ASSIST YOU IN
OFFERING ALTERNATE AIR SERVICE.

YOU MAY WISH TO REFER TO AN ATLAS FOR
ANOTHER LOCATION WHICH MAY HAVE AIR
SERVICE.

ENTER ANOTHER CITY NAME OR CODE OR
ANY SLASHED COMMAND.
```

At this point I had to go back to the first menu and work my way back to entering the destination name.

```
OAG>SAN FRANSISCO

CANNOT IDENTIFY YOUR DESTINATION CITY.
IF YOUR CITY NAME IS NOT LISTED BELOW,
SCHEDULED FLIGHTS MAY NOT BE AVAILABLE.
1 SAN FRANCISCO,CA,USA/CHINA BASIN
2 SAN FRANCISCO;OAKLAND,CA,USA/OAK
3 SAN FRANCISCO,CA,USA/OAKLAND CONV
4 SAN FRANCISCO DEL ORO,MEXICO
5 SAN FRATELLO,SICILY IS,ITALY
6 SAN GABRIEL,CA,USA
7 SAN GAVINO MONREALE,SARDINIA IS
8 SANGENJO,SPAIN
9 SAN GENNARO VESUVIANO,ITALY

ENTER +,-,LINE NUMBER OR CITY NAME.
OAG>2

ENTER DEPARTURE DATE
OR PRESS RETURN TO USE 01 DEC
OAG>20 JAN

                FARE MENU
FARES FOR                        FARES FOR
DIRECT FLIGHTS                DIRECT FLIGHTS
AND CONNECTIONS                       ONLY
---                                    ---
1  COACH AND BUSINESS CLASS FARES      6
2  FIRST CLASS AND EQUIVALENT FARES    7
3  COACH, BUSINESS AND FIRST CLASS     8
4  ADVANCE-PURCH AND EXCURSION FARES   9
5        ALL OF THE ABOVE FARES       10

PLEASE ENTER A NUMBER
OAG>3

FARES IN U. K. POUNDS          MON-20 JAN
SELECTED FOR LHR-OAK

£  ONE-WAY  RND-TRP ARLN/CLASS FARECODE
 NO LOWER FARES IN CATEGORY
1*  308.00              WD/Y      YLX2
2*  308.00              TW/M      MLX14
3*  308.00              PA/Y      YLX281
4*  308.00              BA/M      YLX2
5*  308.00              BA/M      YLX2
6*  308.00              NW/Y      YLX11
7*  323.00              TW/M      MLW14
8*  323.00              BA/M      YLW2
 * ENTER L£ TO VIEW LIMITATIONS
ENTER +,L£,X£,S£,M,RF    (£=LINE NUMBER)
```

Here I guessed that RF stands for Return Fare. Help menus are not obviously available.

```
OAG>RF

ENTER RETURN DATE
OAG>30 JAN

FARES IN U. S. DOLLARS         THU-30 JAN
SELECTED FOR OAK-LHR
   (TAX NOT INCLUDED)
£  ONE-WAY  RND-TRP ARLN/CLASS FARECODE
 NO LOWER FARES IN CATEGORY
1*  495.00              WD/Y      YLW2
2*  495.00              WD/Y      YOW2
3*  495.00              WD/Y      YOX2
4*  495.00              WD/Y      YLX2
5*  566.00              TW/M      MLX14
6*  566.00              PA/Y      YLX281
7*  566.00              BA/M      YLX2
8*  566.00              BA/M      YLX2
 * ENTER L£ TO VIEW LIMITATIONS
ENTER +,L£,X£,S£,M,RF    (£=LINE NUMBER)
OAG>
```

I had now found the information I required and so tried to get off the system.

```
OAG>QUIT

SORRY, CANNOT UNDERSTAND YOUR ENTRY;
PLEASE CHECK YOUR ENTRY AND TRY AGAIN.
OAG>OFF

SORRY, CANNOT UNDERSTAND YOUR ENTRY;
PLEASE CHECK YOUR ENTRY AND TRY AGAIN.
OAG>/OFF

SORRY, CANNOT UNDERSTAND YOUR ENTRY;
PLEASE CHECK YOUR ENTRY AND TRY AGAIN.
OAG>HELP

SORRY, NOT SURE WHY YOU NEED HELP AT
THIS POINT.  SUGGEST YOU RETURN TO THE
OAG COMMAND MENU AND BEGIN AGAIN,
OR REVIEW THE HOW TO USE DISPLAYS.
ENTER /M FOR OAG COMMAND MENU OR
/I FOR INFORMATION AND ASSISTANCE.
OAG>/M

          ** OAG COMMAND MENU **
ENTER:/I FOR INFORMATION AND ASSISTANCE
      /F FOR FARES DISPLAYS
      /S FOR SCHEDULE DISPLAYS
      /H FOR HOTEL/MOTEL DISPLAYS
      /M TO RETURN TO THIS MENU
      /U FOR USER COMMENTS AND
         SUGGESTIONS BOX
      /Q TO EXIT FROM THE OAG EE
ENTER THE COMMAND OF YOUR CHOICE
OAG>/Q


END OF OAG SESSION

Your session with OAG has now
been closed. Thank you for using
the Telecom Gold Gateway Service.
```

BY BEN KNOX

HIGH-FLYING DATABASE

There is now an all-electronic edition of the Official Airline Guide.

If you are one of those people lucky enough to work for a company that believes in doing business face to face, which means you are flying around the world from time to time you will be interested in a service which has just become available on Telecom Gold. It is called the Official Airline Guide Electronic Edition (OAG EE).

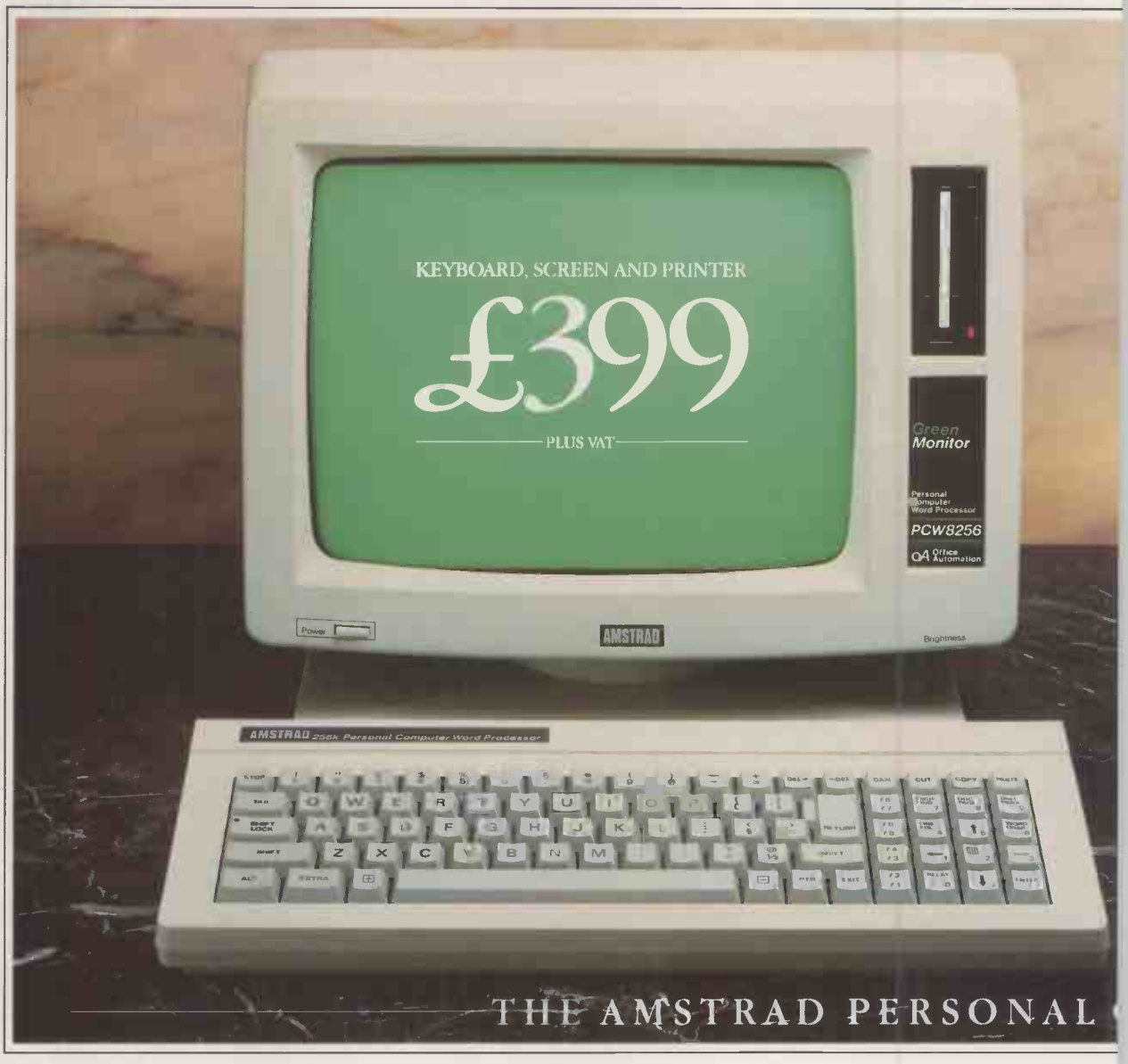
It claims to be a fare-based, unbiased airline flight-information system available 24 hours per day which contains the direct and connecting schedules of over 750 airlines worldwide. The database holds details of 350,000 North American fares updated daily, 60,000 international fares updated weekly, fare price comparisons, departure and arrival times, airline and flight number, aircraft type, meal service, number of stops, and the actual journey time.

Whether the actual journey time given will have that much relevance to the time on the day of travel, considering the number of aircraft delayed or cancelled due to bad weather, industrial action and so on is debatable. But given the limitations, the OAG EE does contain a great deal of information. Getting at it requires some patience: there are a distinct lack of menus, until you work out how to call them up.

Apart from the difficulty of using the system, my other criticism of the OAG EE is its cost: 56.5 pence per minute at peak time, and 38 pence per minute off-peak.

If you want to use the OAG, you need to be on Telecom Gold. Use the command OAG at the > prompt. PC

More than a w
for less than



Don't look at the price of the Amstrad PCW 8256 or you won't believe what is to follow.

Because the PCW 8256 is a complete wordprocessing system and a complete personal computer at a completely unbelievable price.

It's a powerful wordprocessor.

The PCW 8256 is totally equipped for wordprocessing. It has a high resolution screen with 90 columns and 32 lines of text. That's 40% more usable display area than most PC's.

There's a high speed RAM disc that allows you to store and retrieve information instantaneously, as you're creating a document.

The 82 key keyboard is specifically designed for wordprocessing. Its special function keys allow you to refer to "pull down" menus as you work, so you don't have to memorise complicated codes. This simply means it's easy to use.

And the PCW 8256 has an integrated printer, with compatible software that gives you a choice of letter quality and high speed drafting capabilities.

Finally there's an automatic paper load system, as well as tractor feed for continuous stationery. All for the price of an electric typewriter.

It's a powerful computer.

The PCW 8256 is more than a wordprocessor. It's also a purpose built computer with an enormous 256k memory.

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MPUTER WORDPROCESSOR

not enough, for the real computer buff, a combination of the powerful Mallard basic, Dr Logo and GSX Graphics system extentions will mean you can write your own programs. There's also an optional combined serial and parallel interface, that gives you access to modem, additional printers and other peripherals. And you can even add an extra 1 M byte drive.

So even if you started off just wanting a wordprocessor it won't be long before you'll be hooked on the compelling possibilities of micro-computing.

Now you can look at the price. The Amstrad PCW 8256 costs just £399 + VAT. It's a lot less than you'd expect to pay for a lot more than a wordprocessor.

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Q Word processors are being used increasingly by students for writing up dissertations and projects, because they allow you to change what you have written repeatedly, and right up to the last moment. While I like the right-justified edge they can produce, I do not like the large number of blank spaces that get left on a line. Is there any way WordStar can be made to reduce the amount of blank space produced?

A DUNCAN

A Most word processors that justify text to give a straight right-hand margin produce a lot of empty spaces on a line of text. This is because each line must be padded out with extra spaces to make it finish in the right place. We too prefer text to be fairly dense on a line, and using a printer capable of proportional spacing this is how we do it.

If you are using a 10-pitch daisywheel the default spacing is .CW12, which gives a character spacing of 120/12 or 10 characters per inch. Extra spaces added by WordStar to adjust the right margin are divided into the appropriate number of microspaces, each 1/120in., and extra microspaces are added first between words, and then between letters. Thus unless a line contains exactly the right number of letters to fill it, the actual spacing between letters is increased, so that though you intended to print 10 characters per inch, you will almost certainly print less than this.

When we are using a 10-pitch daisywheel we issue a .CW11 command, giving a spacing of 120/11 or 10.9 characters per inch. If a line is filled with exactly the right number of letters, it will print 10.9 characters per inch, but if WordStar adds any extra spaces to justify the right margin the number of characters per inch is reduced — hopefully to about 10. We find that this works well in practice. Similarly, if you are using a daisywheel designed to give 12 characters per inch, you could issued a .CW9, which gives 120/9 or 13.3 characters per inch.

A different solution for WordStar users is to alter the microjustify algorithm so that it puts more emphasis on adding microspaces to the gaps between words, rather than inserting microspaces between the letters in a word. This can be achieved by running the patcher subroutine in the Install or WInstall program and changing the hexadecimal value at location DMJWB from 00 to FF.

POWER SUPPLIES

Q Please can you explain the difference between a normal power supply for a computer, and a switching power supply. Why is the switching power supply considered best?

M HUGHES

A The first power supplies for computers comprised a transformer to step the 240V a.c. mains down to a low voltage — say 5V — for the computer boards, disc drives, etc., and a rectifier to convert the low-voltage alternating current to direct current. There are two problems with this arrangement.

First, if you draw a lot of current the voltage is likely to drop; adding extra boards or extra disc drives may cause this. If the voltage falls, the chips behave erratically and the computer may crash or give wrong answers. The probem can be overcome by having a very large transformer with a lot of soft iron in the core, and thick wires for the windings, so that it can deliver much more current than you are likely to need. But big transformers are both expensive and heavy.

A second problem is that the voltage provided by the mains itself may vary. If the mains voltage varies by 10 percent the output voltage will also vary by the same margin, and instead of getting 5V d.c. you would only get 4.5V. A remedy for this is to produce, say, 8V d.c. from the power supply, and use a voltage stabiliser to drop it to the required 5V. The snags are that this adds extra components and so increases the cost, and that in dropping the voltage the voltage stabiliser produces heat — and chips do not like too much heat.

This is where the switching power supply comes in. At its simplest, it converts the a.c. mains into d.c., which is fed through the primary coil of a transformer to produce the required low voltage in the secondary coil. Since transformers do not work with d.c., an electronic switch that goes on and off repeatedly is placed in the primary circuit, giving intermittent d.c. that will work a transformer.

The voltage induced in the secondary coil depends on two factors: the ratio of the number of turns of wire in the primary and secondary coils of the transformer, and the frequency with which the switch in the primary circuit goes on and off. A suitable electronic circuit can vary the switching frequency to compensate for variations in the mains voltage, and in this way the voltage from the secondary coil of the transformer can be kept constant. Of course, the secondary voltage is still a.c. and requires a rectifier to provide d.c. to drive the chips.

All modern microcomputers have switching power supplies. The advantages are that they can use smaller, lighter and cheaper transformers, and give a stable voltage without producing a lot of unwanted heat.

? · ! · ? · ! · ? · ! · ? · ! · ? · ! · ? · ! · ? · ! · ? · !

Q I am considering buying a micro for use in solving mathematical problems, so I am interested in how to judge the speed with which it will perform arithmetical operations. Is there any significant difference between the available micros in this respect, and if so which has the greatest calculation speed?

T LOCK

A Practically all micros are sold with some version of Basic interpreter, either built in as a PROM inside the computer, or loaded into memory from a disc. You are therefore probably concerned with the relative speed of doing arithmetic calculations in Basic on different machines.

When magazines such as *Practical Computing* review new computers, they include a series of Benchmark timings. These are the times taken by a standard series of Basic programs to perform various arithmetic tasks. The programs are listed on page 104 of the January 1984 edition of *Practical Computing*. The average of these eight tests gives a measure of the computer's speed. This varies depending on several features:

- The clock speed of the CPU — 2MHz, 4MHz, 4.77MHz, 8MHz and so on. The faster the clock speed, the faster it can do calculations.
- Whether the memory chips can run fast enough to keep up with the CPU, or whether wait states must be introduced to slow the CPU down so that the memory can keep up.
- The type of CPU chip used. Z-80, 8088 and 6502 processors handle eight bits at a time, whereas 8088, 8086, 80186 and 80286 chips handle 16 bits at a time. The 16-bit processors should do arithmetic faster than eight-bit processors running at the same clock speed. The 68000 processors are potentially the best around, but the 68008 used in the Sinclair QL only accesses eight bits of data, and so is slow.
- The particular version of Basic used. Some are much less efficiently coded than others.
- The number of figures accuracy used in calculations; the more figures carried, the slower the calculations.

If your arithmetic calculations involve reading data from files, or writing it to files, then these may involve a significant amount of time, and the speed of these operations depends on how well the operating system has been written, and on the speed of the devices used to store files. Cassettes are very slow, floppy discs are a lot better, and hard discs are pretty fast.

If you are really concerned with speed, using a Basic compiler rather than an interpreter makes an enormous difference in running speed. We recently speeded up a program by between 15 and 20 times using a compiler. Similarly, other languages such as Fortran or Pascal run much faster than Basic interpreters.

The IBM PC and its many clones have the facility to add an 8087 arithmetic co-processor chip, which speeds arithmetic by three to 10 times, provided your software can use the chip. Interpreters certainly cannot, and not all compilers can either.

If you are concerned with getting accurate answers, beware! Most computers carry six or seven decimal figures, and this is not enough. For accurate scientific work we use Micro Mike's Bazic on an eight-bit CP/M computer, and Xitan's XBasic on a 16-bit MS-DOS computer. Both allow you to choose how many figures accuracy you wish to use.

The fastest micro is probably the TDI Pinnacle or the Tadpole. Both use a 68000 CPU, and both are excellent machines but are outside the price range of most small users. We had one of the first Sinclair QLs and found it slow — a seven-year-old Z-80 CP/M machine ran faster — and Microdrives are not my choice, but there are a lot of satisfied Sinclair users. If you can go up-market a bit, you should look at the Ferranti PC, which has impressed us as good value, or the RM Nimbus.

Q I have been told that there is no limit on the size of file handled by WordStar other than the maximum size of file you can store on a disc. The large document capability of WordStar is supposed to come from its ability to read the appropriate part of a file from disc into memory, storing parts of the document in temporary disc files if necessary, and putting the whole lot back together at the end without the user ever being aware of this. I was therefore surprised that every time I tried to handle a file of 260K my WordStar program crashed, and the crash is reproducable.

Is there a bug in WordStar, or is my copy corrupt? Have you any suggestions how I can get round the problem?

M STOKES

A It used to be true that the maximum size of document that WordStar can handle is the maximum size of file that you can store on a disc. But discs have been getting bigger. With versions of WordStar up to and including version 2.6 the maximum document size was restricted to 250K, but this was increased to 500K at version 3.0, and this limit will be raised to 8Mbyte in later releases.

If your copy of WordStar is working properly on more normal, smaller files it is not likely to be corrupt. First check that you have disc space for this 260K file, a backup and some temporary file space; if you have not, lack of space on the disc could be the cause of the crash. Otherwise, we suspect that your problem is that you are using WordStar version 2.6 or earlier.

If you are using an early version of WordStar, the best remedy is to ask your dealer to upgrade your master copy to the latest version. Provided you have the master copy of the disc, good dealers will usually do this for no more than a nominal sum.

As regular users and enthusiastic supporters of WordStar, we would like to query your reasons for handling such large files. It will make reading, writing and editing of files slow, and will greatly increase the risk of running out of file space. We write books, but store each chapter as a separate file, and either print the chapters separately, or use Mailmerge to print several files together as one document. Subdividing a large document into several smaller files makes it much quicker to find a given place to make a correction. Working with smaller files also makes it quicker to write the updated version on to disc at the end of the edit. Reading and writing disc files is slow on systems with floppy discs.

The optimum size of a file is one just small enough to reside in memory, since this saves the time taken to write and read temporary files. Remember, too, that you need disc space for both the new version and the backup version of the file. Usually these will be on the same disc, but you can arrange to have one file on one disc drive and the other file on another disc drive. These comments are less valid if you use a hard disc, or if you use a large silicon disc but we still prefer several small files to one very large one.

Q I was disappointed to learn that the Advance 86B is unable to run Concurrent CP/M or use the 8087 mathematical co-processor chip. Will an upgrade be available from Ferranti and, if not, will the lack of vectored interrupts on the Advance prevent the use of the future multi-tasking Microsoft Windows? Do you know whether Supercalc release 3.2 and Turbo Pascal release 3 will work with the 256K Advance 86B with an Epson FX-80 printer?

TROND MYKLEBUST

A The original design of the Advance 86 has a flaw, and vectored interrupts 21 and 22 are not handled correctly. We believe it was something to do with buffers for these interrupts. Though Advance designed the machine, it was actually made by Ferranti, which spent a lot of time improving the Advance, correcting the vectored-interrupt problem, and providing better heat dissipation, new versions of ULAs and new ROM sets. These improvements are carried forward into the Ferranti 860 PC and XT models.

The failure of the vectored interrupts to work properly has no effect on most applications, but with two important exceptions: if you want to run Concurrent CP/M, and if you want to use an 8087 arithmetic co-processor. Towards the end of the production run of the Advance, Ferranti designed a small piggyback board to cure the problem. The board plugs into the socket on the motherboard which normally holds the 8088 CPU chip, and the 8088 plugs into the extra board. This board costs about £160, but both Concurrent CP/M and the 8087 chip work with it. Unless you bought the machine last summer, and you specially asked for it, I doubt if you will have the modification. If it is there, it will be quite obvious if you look at the motherboard.

If you want to add the board to upgrade your machine, we suggest you contact a Ferranti dealer. Two we have found very helpful are: Consort Data Ltd, 126 New Walk, Leicester LE1 7JA; and Advanced Microcomputer Applications, 8 Glebe Street, Beeston, Nottingham NG9 1BZ.

Remember that an 8087 chip can improve the speed of arithmetic calculations by an average of three times, sometimes even more. However, the software must be able to use the chip, or it will have no effect. Basic interpreters do not use an 8087, nor do any of the word processors. Compilers may use the chip, but before you buy one you should check that it can.

We have no personal experience of multi-tasking using Microsoft Windows, Supercalc version 3.2 or Turbo Pascal release 3, but the only program we know that will run on an IBM but will definitely not run on a Ferranti — or an Advance with the interrupt modification — is Anagram. The Epson printer may require a special ROM set to use the IBM graphics characters: you should check with a dealer.

Q I own a Sharp MZ-80K computer with a Sharp MX-80FD twin disc drive and a MZ-80 I/O interface. I also have a Sharp MZ-80P3 dot-matrix printer, plus a Brother EM1 typewriter. I wish to purchase a new 128K or 256K computer, and want one if possible which will work with my present peripherals, to save me buying new ones. I particularly wish to continue using the twin discs and the Brother typewriter, which are very expensive. Is there a computer on the market which would allow this?

J R MOORE

A Before trying to answer your question it is worth posing another one. Why do you want a new computer? Is your present one too slow, does it have too little memory to run programs you really want to use, are the discs too slow, or do they not store enough data? If you change machines, you will have considerable expense both on the machine and on software, and you will spend a lot of time learning about the new machine. You must be sure that it is a necessity, not just a fad.

Unless you possess considerable expertise and patience as an electrical engineer and machine-code programmer, I can see little chance of you using your existing floppy-disc unit with a new 16-bit machine. Almost all the 16-bit machines are sold with at least one, and usually two disc drives already built-in.

I do not have any technical information on the Sharp MZ-80P3 dot-matrix printer. If it is connected through a serial port, there is a very good chance that it will work with another computer; if it is connected through a parallel port you will almost certainly need a new ribbon cable with different plugs on it, or get the old one changed. Even then it may or may not work. Printers need not be all that expensive. We have recently seen several good, cheap printers which will work with the IBM PC and look-alikes.

The Brother typewriter has an RS-232 serial connection, and this should be easy to connect to a new machine. However, you must make sure that the new computer has a serial port, since some only have parallel as standard. The 16-bit machines have their own keyboard, so you do not require the typewriter as an input device; if you do any amount of printing you will find a proper printer faster and much more robust.

As to which machine to choose, it depends what you want it for and how much you can afford. Remember that you only get what you pay for. The Sanyo is one of the cheapest 16-bit machines around, and includes a lot of software. The Ferranti PC-860 is British and extremely good value: it has a lot of bundled software, and a better performance than the cheaper Sanyo or the much more expensive IBM PC. The Research Machines Nimbus is also British, has an advanced specification and is very attractive; Research Machines has built up an excellent reputation with schools and other educational establishments through the 380Z and 480Z machines. PC

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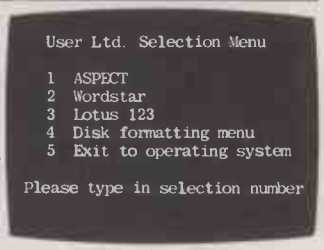

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HARDWARE

Panasonic has returned to the fray with a range of transportables: we try out one of them. After One Per Desk and the Acorn Communicator we look at the latest in office work stations, this one from Tandata.

SOFTWARE

Practibase, the first of the cheap dBase doubles, will be on the test bench. We also investigate Sperry's best-selling Mapper, a mainframe package that has arrived on the micro, and we look at the world of fourth-generation languages.

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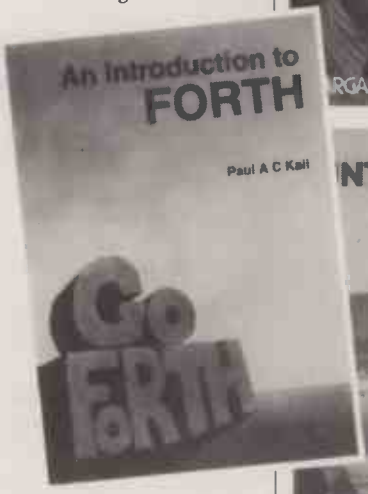
Martin Eccles examines the wide range of books available on how to learn and improve your knowledge of this versatile programming language.

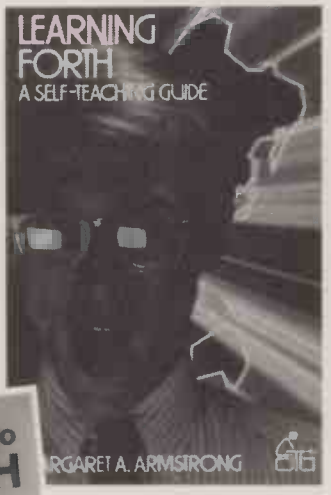
GOING FOR FORTH

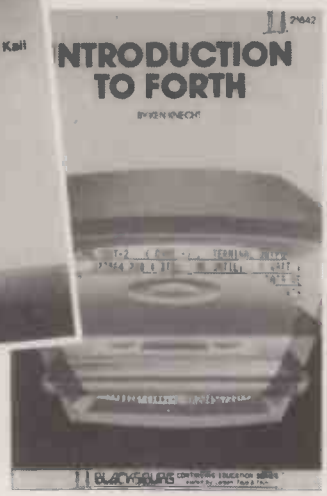
FORTH promotes the writing of well-structured programs but it is friendlier to the computer than it is to the programmer. Since, loosely speaking, Forth is a compiled language, Forth programs can be as fast and efficient as machine code. But compared with a language such as Basic, Forth is more difficult to learn. However, unlike Basic the language itself can easily be extended to suit your applications, which makes it a lot more versatile.

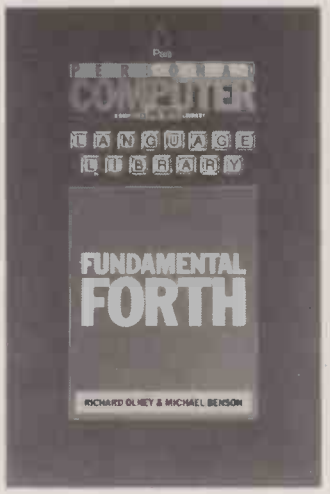
Availability is one of Forth's strongest points. It is public-domain software and language documentation for Fig-Forth (Forth Interest Group Forth) is readily available. There is also an excellent version of Forth-83 available free to CP/M user group members. There is at least one commercial version of Forth for most microcomputers. The four main systems in use are Poly-Forth, Forth-79, Fig-Forth and MMSForth; Forth-79 is often referred to as standard Forth and Forth-83 is an updated version of Forth-79.

Forth was designed for controlling telescopes and its forte remains in real-time control applications. As such, Forth is used by many engineers, but it can be used to write any type of program; most of Forth is written in Forth. Its other advantages are that it is interactive, largely processor-independent and uses virtual memory. On the other hand, Forth lacks a file structure, it uses unfamiliar notation and it has poor data structures, which is why it is less suitable for writing data-processing software.









California University research assistant Margaret Armstrong in her self-teaching guide *Learning Forth* demonstrates that learning Forth need not be boring. Her question and answer method and clearly written text will not suit everyone's mentality but *Learning Forth* is certainly a book that anyone interested in computers can understand. For example, number manipulation using postfix notation is discussed as an aspect of Forth's stacking mechanism rather than as a mathematical hurdle. This makes a surprising psychological different. Had the Jupiter Ace been accompanied by this work, it would probably have survived a lot longer.

Most of the book concentrates on number manipulation and data processing, and there is very little on graphics. But the book contains plenty of software examples, including a simple payroll program, and origins and differences of the various Forth interpretations are discussed briefly.

Of the introductory books, *Learning Forth* contains the most useful Forth glossary. A list of Forth words with brief explanations is an invaluable programming aid. Such a list is usually found in the language manual but it might not be as useful as this one. Sadly though, *Learning Forth* is very exensive.

Exploring Forth is densely packed and, in the words of the author, is "not a book for armchair reading." This is a practical introduction to Forth programming which takes you far enough to be able to continue on your own. It does this by concentrating more on intricacies of the languages rather than on constructing programs.

A section on simple graphics and animation is included. It is more of a reference book than *Learning Forth* and better for readers with experience in another language. The list of words at the back of the book has no explanations and is less useful than the list obtained by a command in the language itself. No further reading list is provided.

Paul Kail's *An Introduction to Forth* is a lively little introduction written with Spectrum and Jupiter Ace users in mind. The many diagrams help you understand the language, and teaching how to write programs is combined reasonably well with descriptions of how the language works.

This is the most concise of the introductory-type books. Despite the book's small size, it has brief sections discussing graphics, sound generation, and tape and disc interfacing. Apart from many short programming examples in the text, there are seven slightly longer light-hearted programs at the end of the book. The book's Forth word glossary is quite good, but use of the book for reference is impaired by the lack of a good index.

The only introductory book written for a specific version of Forth is *Introduction to Forth* for TRS-80 users running MMS-Forth, which is also available for the IBM PC. It consists of useful detailed descriptions of Forth words and how they work together, which makes it a good reference book for programmers. However, specific information on how the language works is not included, and in this respect the book is not a complete introduction, rather more an excellent supplement to the language manual.

Fundamental Forth begins by talking about computers, then programming, then Forth, which is a good start. Each chapter after that is well defined and clearly written, providing a good

(continued on next page)

BOOK REVIEWS

(continued from previous page)

grounding on how Forth works within the computer and how to write programs. What is more, *Fundamental Forth* is one of the cheapest of the books reviewed here.

Glossaries are included for Fig-Forth, Forth-79 and Forth-83 to help the reader to adapt program examples, and there is a chapter on disc use. This book is recommended to anyone interested in Forth.

I would argue that Forth's requirement for rigidly structured program writing makes it more difficult to learn properly if you already know Basic. The authors of *Forth for Micros, The Student's Forth* and *The Complete Forth* disagree, suggesting that familiarity with Basic will help you follow their works. It would have been more practical to assume that the reader had read a good introductory book on Forth.

With *Forth Techniques* the authors claim you can "learn how to handle advanced arithmetic operations, explore the realms of turtle graphics and even create your own compiler." The compiler is for turtle graphics and is included to illustrate how Forth can be moulded to suit the user's application.

Forth Techniques does not profess to turn you into an expert programmer but it succeeds in its goal of taking its readers to a point where they can produce their own practical solutions to everyday problems. It does this with the aid of numerous working examples.

Chapters deal with extending the Forth system, extended number manipulation, and fixed record-length disc files. This is the only book reviewed with a chapter on hardware control — a task that Forth is particularly suited to. Program examples are to Forth-79 specifications but sufficient information is given to allow them to be modified for other versions of Forth.

Forth Techniques is intended to follow on from *Fundamental Forth* and together, these two books cost about the same as *Forth Programming* for twice the number of pages. They are both practical and well written.

Forth for Micros is intended to teach programming in Forth and demonstrate its use and power. Described as useful for micro enthusiasts and students of computer science, it is not as practical as *Forth Techniques* but it goes deeper into the intricacies of program structures.

Written for people who can already program in Basic or Pascal, *Forth for Micros* is intended as a conversion course. It teaches Forth by example and comparison, and includes useful subroutines for manipulating strings, provision of character literals and implementation of multi-dimensional arrays. There are one or two exercises at the end of each chapter.

Again, this book is written for Forth-79 and supplementary information is given where needed to allow the examples to be modified. However, Forth 83 is not mentioned.

Forth is written by engineers in general terms for standard Forth and will appeal most to engineers, students, scientists and anyone needing a deep understanding of the language. Emphasis is on encouraging the reader to write efficient, economical programs.

It concentrates mainly on serious programming and how the language works, providing a brief introduction and history followed by details of how the interpreter works, mechanics of the language, recursion and multi-tasking. Special properties of the language are discussed later on in the book. A chapter of problems with suggested solutions and an excellent bibliography are provided.

A building-block approach is used in the American offering *Forth Programming*, aided by over 50 program examples. Impatient people love this approach. It allows them to start putting big programs together in a short time. But if you want to be able to write programs without the aid of the book, you will still have to study how all the building blocks work and how to break them down. For that reason it is probably best to consider it as a programmer's reference.

Each of the book's 13 chapters explains an aspect of the language such as arithmetic, stack manipulation, adding words, Do loops, string processing and disc operations. The text is clear, as is typical of American books, the structure is logical and the examples are useful. The only drawback is its price. It includes a Forth glossary but there is no bibliography.

The author of *The Complete Forth* has written a Forth compiler and his understanding of how the language functions is reflected in the text. It is divided into aspects of the language but the explanations go deep, with frequent descriptions of what is happening in the computer memory. The first half of the book uses frequent comparisons with Basic and the latter half describes the more unusual features of Forth, many of which have no equivalent in other languages.

The Complete Forth is written for standard Forth-79 but common departures are detailed as footnotes. It is densely packed and often a little too busy, but it gives a full description of how the language works, using many examples and diagrams. The Forth glossary is on a pull-out reference card and a brief bibliography is included.

In *The Students' Forth* the first thing that readers are told is that they will not be able to use normal conventions when writing algebraic expressions. Admittedly this is a textbook for formally

teaching the inner workings of the language, but do books for students have to make learning appear so difficult? In fairness though, the book works through the language systematically.

The main intention of *The Students' Forth* is to show the reader how to use the language. But the author also claims that by the time intelligent readers have read it they should be able to implement their own version of Forth. This book is essential for anyone thinking of implementing Forth. Forth-83 is used for examples, with references to Forth-79, MMS-Forth and Poly-Forth.

GOING FOR FORTH

Learning Forth by Margaret A Armstrong. Published by Wiley Press, 223 pages, £17.80. ISBN 0 471 88245 3

Exploring Forth by Owen Bishop. Published by Granada, 176 pages, £6.95. ISBN 0 246 12188 2

An Introduction to Forth by Paul A C Kail. Published by Micro Books, 120 pages, £8.95. ISBN 0 946705 01 1

Introduction to Forth by Ken Knecht. Published by Howard W Sams, 142 pages, £8.95. ISBN 0 672 21842 9

Fundamental Forth by Richard Olney and Micheal Benson. Published by Pan, 239 pages, £6.95. ISBN 0 330 28960 8

Forth Techniques by Richard Olney and Michael Benson. Published by Pan, 253 pages, £6.95. ISBN 0 330 28961 6

Forth for Micros by Steve Oakey. Published by Newnes Technical Books, 148 pages, £6.50. ISBN 0 408 01366 4

Forth by W P Salman, O Tisserand and B Toulout. Published by Macmillan, 159 pages, £7.95. ISBN 0 333 36798 7

Forth Programming by Leo J Scanlon. Published by Howard W Sams, 246 pages, £13.55. ISBN 0 672 22007 5

The Complete Forth by Alan Winfield. Published by Sigma Technical Press, 131 pages, £6.95. ISBN 0 905104 22 6

The Student's Forth by Glyn Emery. Published by Blackwell Scientific Publications, 101 pages, £6.50. ISBN 0 632 01436 9

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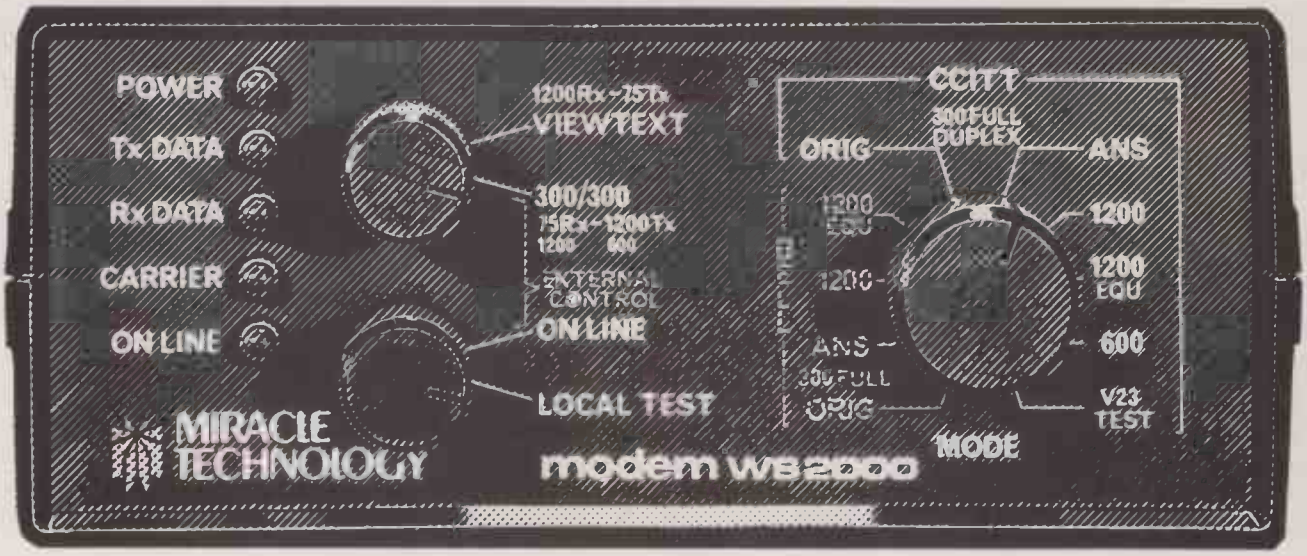

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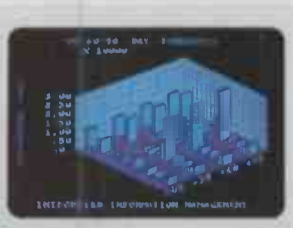

3-D GRAPHICS—NOT JUST PRETTY PICTURES. These graphics distill raw data into trends that can be instantly visualized, helping you discern the important facts from a wealth of information.

does Arithmetic. Your Appointments the World.

Because they do not have a dedicated relational data-base manager that can quickly direct massive amounts of data, other programs simply can't do what OPEN ACCESS can. Some don't have a communications program, others no dedicated word processor. None have a time management program.

There's just one conclusion: OPEN ACCESS can do more for you than any other comparable business program on the market. Bar none. But the only way for you to be convinced is for you to see OPEN ACCESS work its magic on your work load. So call your local software dealer today, or call us at SPI,

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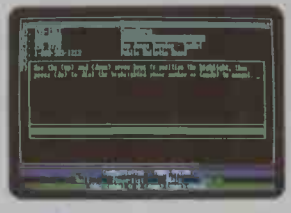
4

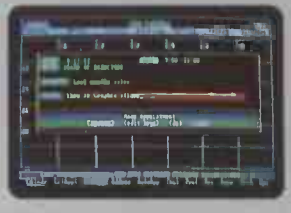
WORD PROCESSING—EDITOR EXTRAORDINAIRE! Superior word processors make it easy to correct typos, change words, shuffle paragraphs and format documents. This is one of that breed. Use it to write efficient memos, letters, proposals and reports.

5



TELECOMMUNICATIONS—YOUR LINK WITH THE WORLD. This program gives you access to virtually any other computer system in the world. Not only can you transmit and receive reports from your colleagues, you can also subscribe to special data banks that know everything from GM's stock price to the relative humidity in Genoa. Now that's power!

6



TIME MANAGEMENT—CONSERVING YOUR MOST PRECIOUS RESOURCE. This module helps you keep track of all your appointments, hour by hour, day in and day out. It alerts you to standing obligations, automatically coordinates meeting times with other busy professionals, and lists all your associates on a Rolodex™-like file.

● Circle No. 108

The new Epson SQ2000.

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Unlike squealing dot-matrix and daisy-wheel printers which whack the characters onto the paper, the new SQ2000 quietly shoots on astonishingly accurate microdots of ink.

So you can use it in your office and you won't notice it's there.

What you will notice is its speed (at 105 c.p.s. in letter-quality mode and 176 c.p.s. in draft, it's far quicker than a daisy-wheel), its near-photographic standard of graphic reproduction and its print quality (as high as that of an impact matrix printer).

As you'd expect of an Epson printer, the SQ2000 is extremely reliable.

It's also very flexible, taking a range of paper widths and offering an enormous variety of print styles and paper feed options.

The price? £1825 + VAT. It may be more than current printers cost, but for a near-silent one, it's a snip.

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● Circle No. 111

ATARI ST

520ST

POWER WITHOUT THE PRICE

THE NEW ATARI 520ST

Under the new leadership of Jack Tramiel (former boss and founder of Commodore Business Machines), Atari Corporation have marked their entry into the world of business/personal computers with a machine which leaves the competition standing. Tramiel's slogan 'Power Without the Price' has been implemented in the manufacture of the new 512K Atari 520ST colour computer which offers the user amazingly high performance at an incredibly low price. Launched as a work-station, this new system incorporates seven software packages as well as the 520ST computer with 512K RAM, mouse controller, high resolution monochrome monitor (640x400), 95 key keyboard (with 18 key numeric keypad), MIDI interface, GEM and a 500K 3½ inch disk drive, all for the package price of only £651.30 (+VAT = £749). Dubbed the 'Mac beater' and the 'Jackintosh' (after Atari's Chief, Jack Tramiel), Atari's new machine has been directly compared with the Apple Macintosh RRP £2595 (+VAT = £2985) which offers similar features and capabilities but at a much higher price. Favourably reviewed by the UK's highly critical specialist computer press, the 520ST is likely to make a great impact in this country as a sophisticated alternative to an IBM PC, APRICOT or APPLE MACINTOSH. Unlike its overpriced competitors, the Atari 520ST can be linked up to a colour monitor to unleash a choice of up to 512 colours. The addition of colour brings out the full potential of graphics packages such as GEM.

USER FRIENDLY GEM OPERATING SYSTEM

The power of the ST is harnessed and made user friendly by the new operating system 'GEM' from Digital Research. GEM stands for Graphics Environment Manager and allows a user friendly colour or B/W graphics interface which closely resembles that of the Macintosh. This similarity extends to the use of moveable resizeable windows, icons to represent objects such as disks and disk drives, and the use of pull down menus and a mouse. The advantage of all this is that the computer becomes extremely easy to use. GEM has now been implemented for the Acorn, ACT, Atari, IBM, ICL, and Olivetti. Software written for GEM on one computer should also run under GEM on another computer. This will enable the market to quickly produce a large library of standard interchangeable software.

FREE SOFTWARE AND FUTURE EXPANSION

The Atari 520ST comes supplied with seven free software packages as listed below. 1) TOS -Tramiel Operating System based on CPM 68K. 2) GEM Graphics Environment Manager by Digital Research (DR) giving a WIMP (Window, Icon, Mouse, Pull down menu) environment. 3) DR GEM Paint for creating graphics masterpieces. 4) DR GEM Write for word processing. 5) Logo learning language to enable you to write your own programs easily using turtle graphics. 6) DR Personal Basic a powerful user friendly version of the Basic programming language. 7) BOS operating system giving you access to dozens of business applications packages already available on the market. Designed with future expansion in mind, the ST also features a host of different interfaces to the outside world and an impressive list of accessories is planned. Atari will soon be releasing a 1000K (1MB) 3½ inch disk drive, and a 15MB hard disk storage system as well as a mass storage compact disk (CD) player capable of storing an entire 20 volume encyclopedia on one disk. A full range of inexpensive printers are planned including dot matrix, daisywheel and thermal colour printers. With its unbeatable graphics, speed and software at a price which is far below that of any comparable personal computer currently on the market, the ST is all set to do battle with the competition. To receive further details of the ST from Silica Shop, just fill in the coupon below with your name and address details and post it to us.

Silica Shop Price: £651.30 + £97.70 VAT = £749.00 This price includes:

- ★512K RAM
- ★B/W MONITOR
- ★MOUSE
- ★500K 3.5" DISK DRIVE
- ★GEM
- ★KEYBOARD (95 KEYS)

£749

ATARI 520ST SPECIFICATION

MEMORY
512K RAM (524,288 bytes)
16K ROM expandable to 320K
Port for addn'l 128K plug-in ROM cartridges
200K TOS operating system

GRAPHICS
Individually addressable 32K bit-mapped screen with 3 screen graphics modes:
320x200 pixels in 16 colours (low resolution)
640x200 pixels in 4 colours (med resolution)
640x400 pixels in monochrome (high res)
16 shades of grey in low res mode
512 colours available in low/medium res
8 levels of each in red, green and blue

ARCHITECTURE
4 custom designed chips:
GLUE Chip - MMU Memory Mngmnt Unit
DMA Controller - Graphics Processing Unit
16/32 bit Motorola 68000 processor at 8MHz
eight 32 bit data registers
eight 32 bit address registers
16 bit data bus/24 bit address bus
7 levels of interrupts/56 instructions
14 addressing modes/5 data types

DATA STORAGE
High speed hard disk interface
Direct memory access 1.33 Mbytes per second
CD (Compact Disc) interface
Built in cartridge access
Dedicated floppy disk controller

DISK DRIVE
500K (unformatted) s/sided 3½" floppy d/drive
349K (formatted) storage capacity

SOUND AND MUSIC
Sound Generator
Frequency control from 30Hz to above audible
3 voices (channels) in wave shaping sound in addition to a noise generator
Separate frequency and volume controls
Dynamic envelope controls
ADSR (Attack, Decay, Sustain, Release)
Noise generator
MIDI interface for external music synthesizers

KEYBOARD
Separate keyboard microprocessor
Standard QWERTY typewriter styling
Ergonomic angle and height
95 keys including 10 function keys
Numeric keypad — 18 keys including ENTER
One touch cursor control keypad

MONITOR
12" screen - high res monochrome monitor
640x400 monochrome resolution

VIDEO PORTS
Display - Low Resolution - 40 columns
Med/High Res - 40/80 plus cols
Medium res RGB (Red/Green/Blue) output
High resolution monochrome (Black & White)

COMMUNICATIONS
Bidirectional centronics parallel interface for printers, or modems capable of input/output
RS232C serial modem/printer interface
VT52 Terminal Emulation Software
Maximum Baud Rate up to 19,200
High speed hard disk interface
Floppy disk controller (Western Digital)
2 joystick ports (one for 2 button mouse)
MIDI interface for external music synthesizers

GEM WIMP ENVIRONMENT
WIMP - Window Icon Mouse Pop-down menus
Two button mouse controller
Icons/Pull down menus/Windows
GEM VDI - Virtual Device Interface
GEM AES - Application Environment Services
GEM BBT - Bit Block Transfer
Real time clock & calendar

SOFTWARE
GEM environment
with user friendly Macintosh style operation
'TOS' - Tramiel Operating System
Atari's own system based on CP/M 68K with hierarchical directory & file structure plus a host of MS DOS & UNIX command structures
'BOS' - Business Operating System
to run any standard BOS business programs
GEM desktop
with GEM PAINT graphics mgmt system and GEM WRITE word processor
Personal BASIC and DR Logo
originally written by Digital Research (DR)
Very much like those on other machines except for the extensive use of pull down menus, mouse control and windows

VARIOUS
Dimensions: 470mmx240mmx60mm
Replaceable external power supplies
Expansion: 3½" floppy disk drives 500K/1,000K (two drives can be connected)
3½" 15Mb hard disk
CD (compact laser disc)
Dot matrix & d/wheel prntrs (black)
Thermal dot matrix (colour)
RGB & monochrome monitors

LANGUAGES
BASIC & LOGO supplied
Many others will soon be available, including: Assembler, BCPL, C, Cobol, Compiled Basic, Lisp, Modular-2 and Pascal

Note: Some of the above specifications are pre-release and may therefore be subject to change

MACINTOSH v F1e v 520ST

"Imagine a Fat Mac - the 512K Apple Macintosh - but with a bigger screen, a far bigger keyboard with numeric keypad, cursor and function keys, and colour. That gives you some idea of what the Atari 520ST is like, except for two important things. First the Atari seems faster. Second the Atari system is about one third of the price."
June 1985 - Jack Schofield - PRACTICAL COMPUTING

	APPLE	APRICOT	ATARI
FEATURES OF BASIC SYSTEM	MACINTOSH	F1e	520ST
Price includes B/W Monitor	YES	NO - extra £200	YES
Keyboard size mm (LxDxH)	330x147x50	450x167x28	470x240x60
Keyboard size ins (LxDxH)	13x5¾x2	17½x6½x1	18½x9½x2½
3½" D/Drive (Unformatted)	500K	500K	500K
3½" D/Drive (Formatted)	399K	315K	349K
WIMP (Window, Icon, Mouse ...)	Apple	ACT - Activity	GEM
Real-time Clock	YES	YES	YES
Polyphonic Sound Generator	YES	NO	YES
RS232 Serial Port	YES	YES	YES
Centronics Parallel Printer Port	NO	YES	YES
Dedicated Floppy Disk Controller	NO	YES	YES
Hard Disk DMA Interface	NO	YES	YES
Full stroke keyboard	YES	YES	YES
Number of keys on keyboard	59	92	95
Numeric Keypad	NO	YES (16 Keys)	YES (18 keys)
Cursor Control Keypad	NO	YES	YES
Function keys	NO	10	10
16-bit processor	68000	Intel 8086	68000
Processor running speed	8MHz	4.77MHz	8MHz
RAM size	512K	256K	512K
Number of graphics modes	1	4	3
Number of colours	Monochrome	16	512
Max Screen Resolution (pixels)	512 x 342	640 x 256	640 x 400
Mouse included	Single Button	NO - extra £95	Two Button
Replaceable External Power Pack	NO	NO	YES
Cartridge Socket	NO	NO	YES
Joystick Ports	NO	NO	YES (two)
MIDI Synthesiser Interface	NO	NO	YES
Monitor Size	9"	9" - extra £200	12"
RGB Video Output	NO	YES	YES

System Cost with: Mouse - Monochrome Monitor - 512K RAM - 500K Disk Drive

Price of basic system (exc VAT)	£2595+VAT	£595+VAT	£652-VAT
+ Mouse	Included	£95+VAT	Included
+ Monochrome Monitor	Included	£200+VAT	Included
+ Expansion to 512K RAM	Included	£295+VAT	Included
Price of complete system (exc VAT)	£2595+VAT	£1185+VAT	£652-VAT
PRICE rounded down including VAT	**£2,984**	**£1,382**	**£749**

PRESS COMMENT

"Atari's new corporate image as an aggressive low cost computer maker is likely to mirror that of Commodore where Mr. Tramiel established the maxim that 'Business is war'."
August 21st 1984 FINANCIAL TIMES

"This is the only personal computer I know of that comes with a Midi interface as standard."
Peter Bright March 1985 PERSONAL COMPUTER WORLD

"The (GEM) version running on the Atari 68000 machines will have the additional advantage of leaving the PC version standing."
April 6th 1985 PERSONAL COMPUTER NEWS

"It would seem that GEM offers the ideal operating system."
March 7th 1985 POPULAR COMPUTING WEEKLY

"I found it (GEM) extremely easy to use and was very impressed with the way in which it disguises the unfriendly hardware and operating systems lurking under the surface."
Peter Bright Feb 1985 PERSONAL COMPUTER WORLD

"The electronics in the machine are a work of art ... The heart of the 520ST is a Motorola 68000, one of the most powerful 16-bit processors around and in many respects it is close to being a 32-bit chip ... when the machine appears in the shops, I'll be at the front end of the queue to buy one."
Peter Bright June 1985 PERSONAL COMPUTER WORLD

"This machine is significantly more powerful than an IBM PC ... If it's possible to design a sure-fire winning machine, this is it."
May 11th 1985 PERSONAL COMPUTER NEWS

"... the use of GEM makes the new range of Atari computers so similar to the Macintosh (with the added attraction of colour), that they are already being called 'Jackintoshes'."
May 2nd 1985 COMPUTING

"The new Atari ST computers truly represent to the consumer what Jack Tramiel is saying — easy-to-use computing power without the price."
March 1985 ANALOG COMPUTING

"It (the ST) uses the most modern technology that is affordable, in a package that gives a professional impression."
May 23rd 1985 POPULAR COMPUTING WEEKLY

"The Atari ST is one of the most elegant designs I have seen ... Atari has used an original and elegant method of memory management which should make the ST faster than any other PC on the market - in any price bracket ... The 64K dollar question is would I go out and spend money for one? To which the only answer is 'Try and stop me!'"
John Lambert July 1985 ELECTRONICS & COMPUTING

"The 520ST is technically excellent ... The 520ST hardware is the new standard by which others will be judged."
July 1985 YOUR COMPUTER

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ON THE NEW ATARI 520ST COMPUTER

Mr/Mrs/Ms: Initials: Surname:

Address:

Postcode:

Do you already own a computer
If so, which one do you own?

● Circle No. 112

THE 520ST. OVER QUAL

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BELFAST
Computer All Ltd.
BELFAST
Education Company Ltd.
BELFAST
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BELFAST
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Laskys.
BERKS SLOUGH
Laskys.
BERKS SLOUGH
Silicon Chip.
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CAMBS CAMBRIDGE
Laskys.
CAMBS PETERBOROUGH
Laskys.
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Microplus.
CHESHIRE CHESTER
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THE ATARI 520ST Personal Computer has a list of qualifications as long as your arm. With a powerful 16 bit processor and 512k of memory linked to high resolution graphics and 512 colours its work is fast, clear and sharp on your screen, no matter how demanding the task.

Controlling the 520ST is easy through its mouse and unique operating system incorporating GEM desk top manager, whilst its eleven peripheral connectors including MIDI interface enables it to mix and communicate easily with other computer products.

The ST which presents itself in smart modern styling comes with powerful BASIC

IFIED AND UNDERPAID.

plus Logo programming languages, a word processor and drawing programme, yet costs only £652* including disc drive and black and white monitor.

Why? Because at Atari we bring up our products to work hard for their living.

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*This price is exclusive of VAT.

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The print on the left is certainly legible, which is quite good enough for most purposes.

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That's why Epson have brought out the new LX-80.

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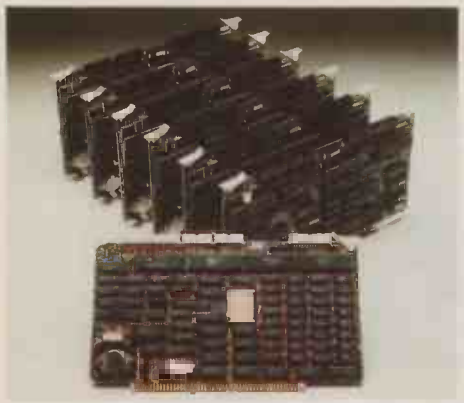


Minstrel power – 80186 master and HTS 186 dual processor slaves.

They passed the latter test with flying colours. But looks aren't everything. Inside this beautifully engineered chassis, you'll find a close coupled Turbo DOS† network that holds the key to all your multi-user computer projects.

Now, and for the future.

Minstrel 4 is a multiprocessor machine – every user of the system gets a DEDICATED CPU and 512 Kb RAM. This virtually eliminates the response time degradation you often find on timeshare minicomputers and so-called supermicros.

Minstrel design – fast tape back-up for safety and convenience.

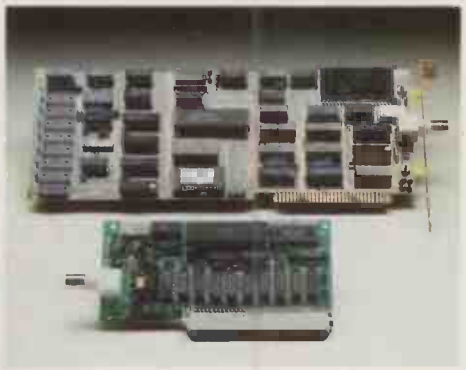
Minstrel 4 is more powerful than most minis, even in its most basic state. You can start with two users, but a full blown 16 user system will give you 9 MBytes dynamic RAM and 17 CPUs with 80186 instruction sets, running concurrently at 8 MHz. With that sort of power, we're confident that you won't run out of steam.

Minstrel workstations – come complete with function keys and business graphics potential.

Minstrel 4 has unprecedented networking capability. The Winchester controller has built in ARCnet. You can network IBM PCs, ATs, Apricots, Olivettis and all lookalikes if required. Gateways to IBM and ICL mainframes are available. Most important, you can network Minstrel 4s together – 256 of them to be precise.

Minstrel 4 supports CP/M, MP/M, MS DOS (including version 3.1 with file and record locking) and has PC DOS emulation, so you can run nearly all the popular business packages.

Storage capacity is only limited by your budget. A single Minstrel 4 holds up to 160 MBytes formatted disk capacity, with onboard streaming back-up of up to 60 MBytes. Direct memory access means you can download 20 MBytes onto tape in less than 4 minutes. Higher capacity drives can be supplied.



You can even network stand-alones into the Minstrel System, using Minstrel ARC net cards.

A two user Minstrel 4 system, complete with tape back-up and terminals will cost you less than £7,000. Additional workstations, just over £1,000 per user, a price/performance package you'll find unbeatable.

At last there is a serious alternative to the minicomputer, with the sort of costs and flexibility you'd associate with a micro. It's called Minstrel 4, and you should find out more about it. Write or call us for details.

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So

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51

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That's right, it instantly gives you near letter quality print when you'd expected rough draft only.

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Both FX's print all the IBM graphic characters too. Just flick a DIP switch and you've selected either those or the industry standard. Although that's something to shout about, the next feature isn't: they're three decibels quieter than their predecessors.

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To finish off, we've uprated the new FX's buffer size to a whopping great 8K, meaning your computer can move onto other tasks even more quickly than before.

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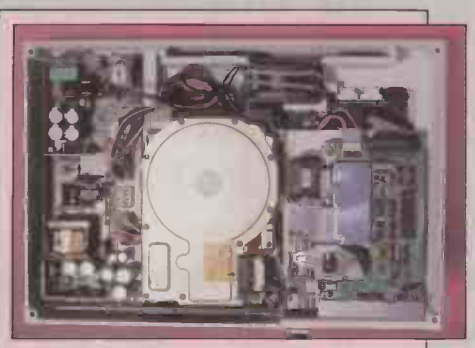
REVIEW

TORCH TRIPLE X
WIMPS MEET UNIX

By Glyn Moody



Could this be the machine which at last brings Unix software within the grasp of the ordinary micro user?

Unix and micros have not been a very successful mix so far. Partly this is a result of the juggernaut-like progress of PC-DOS, but in many respects Unix has been its own worst enemy. It is a large, complex system, and though the ever-increasing memory and processor power available on micros has made the size of Unix less of a problem, its complexity and blatant lack of user-friendliness remain.

All this may change with the launch of the Triple X from Cambridge-based Torch Computers, best known for its BBC Micro add-ons. The Triple X is a Unix machine, but with the important difference that it uses a Macintosh-like Wimp interface to handle the command sequences. Not content with that, Torch has also come up with a 1Mbyte RAM 20Mbyte Winchester machine, with colour, for only £4,700.

As befits a machine which is trying to look more like a conventional desk-top micro than a forbidding Unix engine, the Triple-X has a neat and compact system box in white moulded plastic. Thought has evidently been given to fairly minor elements of the design.

The on/off switch is a touch-sensitive contact switch on the front of the machine. It can be controlled from within the operating system for a controlled self-shut-down process, complete with safe parking of the hard-disc head. At the back, the Power In and Power Out sockets are positioned underneath an overhanging lip which uses the weight of the main box to hold the plugs in place.

Inside there is a tidy layout, with the Winchester in the centre and the 720K floppy drive to the right. The motherboard lies underneath. A quiet fan is placed at the back; on the review model it was held in with rubber bands. In operation, the machine throws out warm air, mostly through vents at the front.

SPONGY SPACE BAR

The keyboard has a reassuringly PC look about it, even down to the 10 function keys down the left-hand side. Unfortunately, what is otherwise a perfectly acceptable professional keyboard is marred by a spongy space bar which would be a disgrace on a Sinclair Spectrum Plus, let alone a £4,000 business machine. The mouse, which comes as standard, plugs into the keyboard at the back.

A major feature of the machine is its comms facilities, and an on-board Ethernet chip set is incorporated as standard, allowing immediate LAN comms. As well as one serial port for use with printers, modems or

SPECIFICATION

CPU: 68010 running at 8MHz
RAM: 1Mbyte standard plus 64K for bit-mapped colour graphics; expandable to 7Mbyte internally
ROM: 16K self-test, diagnostic and start-up routines
Display: 10in. standard; optional 13in; normal resolution 720 by 256; high resolution up to 800 by 512 pixels, and up to 16 different colours selected from a total of 256
Keyboard: full QWERTY, numeric keypad, cursor keys, 10 function keys
Mass storage: 720K floppy and 20Mbyte Winchester as standard; 40Mbyte option
Interfaces: three serial ports, Ethernet, BBC-compatible 1MHz bus, VME bus
Software in price: System V Unix; Unisoft Uniplus+ implementation with shared libraries; Wimp front end
Hardware options: high-resolution graphics board, 68028 board, Winchesters up to 500Mbyte
Dimensions: main system box 450mm. (17.7in.) x 310mm. (12.2in.) x 130mm. (5.1in.)
Price: £3,995 for 1Mbyte RAM, 20Mbyte Winchester system; £700 for 10in. colour monitor, £799 for 13in. colour monitor
Manufacturer: Torch Computers Ltd, Abberley House, Great Shelford, Cambridge CB2 5LQ. Telephone: (0223) 840238

UNIX

For what has now become the serious operating system *par excellence*, Unix's origins were decidedly frivolous. It grew out of an abortive time-sharing project called Multics, which involved MIT, Bell Labs and General Electric. When Bell Labs pulled out, one man there was rather miffed: Ken Thompson had developed a nice little space-travel game on the system, and rather than lose his valuable work, he wrote his own operating system for a DEC PDP-7 mini, and ran it on that. Recognising that his system was not quite so grand as Multics, Thompson called it Unix.

Through a combination of benign accidents and some useful features, Unix grew into the favoured operating system for the later PDP-11s. Eventually it was rewritten in C, by which time it had grown to a staggering 300,000 lines of code.

Until recently Unix has been found mainly in educational establishments. But with the introduction of Microsoft's Xenix, along with more and more interest in micro-based multi-user systems, Unix in its various forms has been gaining ground in the business micro community.

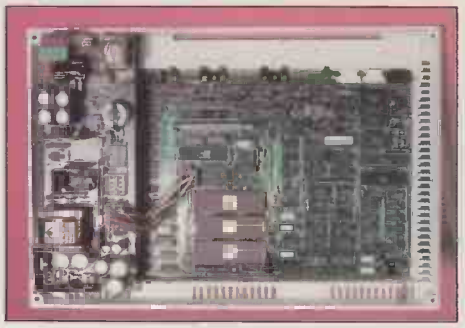
Unfortunately Unix still shows its ad hoc and academic heritage in many respects. It is a large and powerful system, but it does not go out of its way to help users. The nearest thing to a concession in this direction is the Shell. As its name suggests, the Shell forms the outermost layer of the operating system and acts as a kind of buffer between the user and the nitty-gritty of the main code. From it, the main commands like listing directories and controlling disc allocation are handled.

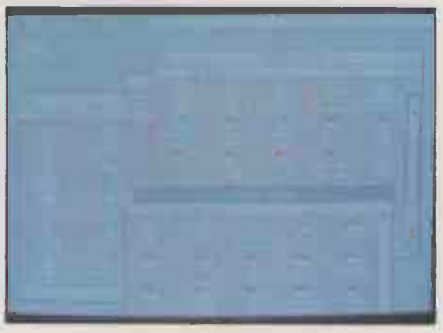
Although Unix has become something of a bogeyman with which to frighten micro tyros, a subtle process of infiltration has begun which could lead to most of us using more Unix than we ever imagined possible. MS-DOS 2.0 incorporates various ideas taken directly from Unix: for example, treed directories and the use of special files. The latter are not files at all, but allow you to treat things like the keyboard as if they were. So the command in MS-DOS

```
copy con: example
```

will allow a file called Example to be created directly from keyboard input, called the console here. It seems likely that as micro operating systems move more in the direction of multi-user configurations, further features will be borrowed from Unix. It is also significant that Microsoft produces not only the leading PC operating system in MS-DOS, but also a version of Xenix. Ultimately, some kind of convergence can be expected, though in what form is unclear.

(continued on page 56)





Far left: The neatly packed motherboard.

Left: Triple X's Gem-like display.

Below: The Triple X's deceptively conventional appearance conceals a formidable Unix engine.

(continued from previous page)

additional terminals, there are a further two fast serial ports. These can handle terminals or hook directly into X-25 or SNA applications. The X-25 protocol is used widely in telecommunications such as PABXs or even the PSS network. Torch sees the Triple X as being particularly well suited to such comms applications.

After you have turned the machine on, you are greeted with a surprisingly forthright beep, possibly followed by a request to key in a password. This is the first but not last occasion that the Triple X shows its origins. Unix was designed with a multi-user capability from start, and so is well endowed with many levels of password protection throughout its operation.

The main opening menu looks refreshingly familiar. Apart from a window giving the total free memory, the rest of the screen bears more than a passing resemblance to the Macintosh's. Around the edge there are a number of icons: some are in the form of labelled folders, while others are representations of filing cabinets, floppy discs and so on. Operation of this desk top is also closely similar to that followed by Apple's machine. Placing the cursor over an icon and holding down the left-hand button allows you to drag the icon across the screen. Clicking once selects it, and double clicking causes the icon to be activated.

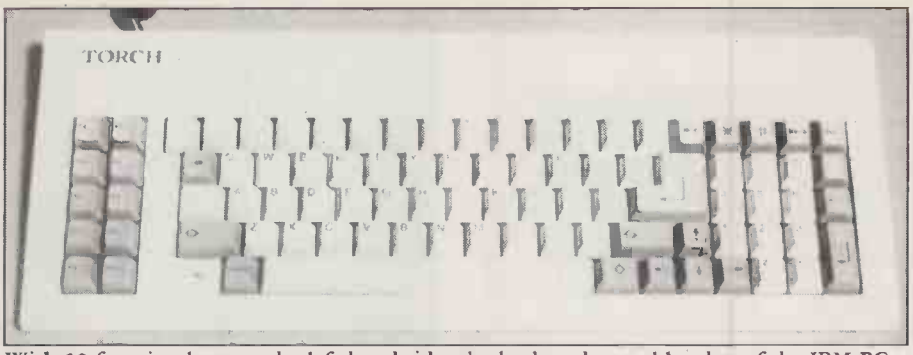
Activating a folder calls up the files held within it. They may be picture icons, other folders or files. They appear in a newly opened window which has scroll bars and a corner pull which allows you to alter its size. The whole window can also be moved by dragging the main bar at the top. In the top left-hand corner there is a Close box. When you open up a window, various options appear across the top command line of the screen. One of the options allows you to replace icons by listings of the full file names

PICTURE ICON

The process of calling up folders can be continued for as long as the nesting of files continues. The picture icons generally correspond to commands: for example, the filing cabinet corresponds to viewing the top level or root directory. The window size is 80 by 24, so successive windows overlap. A big plus is the ease with which concurrent tasks can be set up by opening further windows.

As well as invoking commands, icons can be used to select operations like disc formatting and file transfers. There is a Format Floppy Disc icon, and a Palette icon which lets you alter the on-screen colours. The system is designed to allow file transfers to be performed by opening both the folder from which the file is to be transferred and the destination folder, and then simply dragging the icon across. However, on the review machine doing this produced an error message with the note that the procedure had not yet been implemented.

The desk-top collection of icons can be altered by clearing the screen of all but the most essential icons, such as the filing cabinet and the waste folder, and then dragging out those that you wish to be present on start-up. This set is then saved at close-down.



With 10 function keys on the left-hand side, the keyboard resembles that of the IBM PC.

Utilities like a calculator and real-time clock are represented by icons. There is also an icon for the Unix Shell, which takes you out of the icon-driven desk top into the naked Unix environment itself.

This is necessary if you intend using any of the deeper levels of Unix — for setting up a multi-user system, for example. Such multi-user operation is one of the key advantages of running Unix, which incorporates all the necessary elements from the start. Other micro multi-user operating systems are all too often attempts to bolster what are essentially single-user products, with often dubious results.

The tried and tested Unix multi-user environment is a strong selling point of the Triple X. The unmodified system can support up to three additional terminals connected via the Triple X's serial ports; more can be added, though there is then danger of degradation of response.

TRIPLE X

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	■	☐
Ease of use	☐	☐	■	☐
Documentation	☐	☐	■	☐
Value for money	☐	☐	☐	■

☐ The Triple X offers full but user-friendly Unix at a bargain price.

Even with one user the Triple X did not seem blindingly fast. Windows were opened and files pulled in at a rate which looked roughly comparable with the Mac, which is hardly the fastest machine on earth. But loss of speed seems a small price to pay for taming Unix. In practice, speed is only likely to be a problem with processor-intensive operations. Any loss caused by the overhead of handling multiple windows with icons can easily be wiped out by returning to the Shell. Effectively the Triple X wins on both fronts.

Even though the unfriendliness of Unix seems to have been overcome with this system, there remains a serious obstacle to the machine's success: the lack of cheap business software. There is certainly business software around, and it will run on the Triple X without difficulty, but much of it is unsuitable and the rest is ludicrously overpriced. For example, two packages which came with the review machine were Uniplex word processing and Ultracalc. Neither was earth-shattering in performance, though the prices were, at £1,000 and £1,300 respectively. The micro professional is simply not used to paying this sort of price, which in any case flies in the face of industry trends.

LIMITED APPEAL

With luck, the Triple X may itself help to bring about the introduction of reasonably priced Unix software. But until it does, the appeal of the machine is likely to be limited to academic establishments, where Unix is relatively popular already, and those businesses which already have substantial, mini-based Unix installations. For the latter, the Triple X is a real bargain. It might also prove popular for departments who wish to investigate the world of Unix but who have hitherto been put off by the high entry-level price and the language's fearsome reputation.

The Triple X comes with full documentation which ranges from an introductory handbook to two thick spiral-bound tomes which dot the i's and cross the t's for every aspect of Unix.

Future developments include a 19in. monitor with 1,836- by 1,836-pixel resolution for CAD/CAM work, and boards with a 68020 and a floating-point processor. The Triple X seems likely to do very well in specialist markets where such add-ons are particularly relevant. Whether it succeeds in the wider business micro world will depend on a number of factors quite independent of the machine's undoubted virtues.

CONCLUSIONS

- The Triple X is a Unix V machine which uses icons and windows to circumvent user-hostile aspects of the operating system.
- The Wimp techniques work very well, though it is still possible to get lost among extended trees.
- Even for those who prefer the old-fashioned virtues of Shell operations, the Triple X offers exceptional value for money.
- Unfortunately the generally high standard of the system's construction is spoilt by a flawed keyboard.
- The lack of reasonably priced business software remains a major problem for Unix users. PC

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DEPARTMENTAL/SALES/ PURCHASE ANALYSIS	✓	✓	✓
AGED DEBTORS/ CREDITORS ANALYSIS	✓	✓	✓
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*Comparisons relate to versions for Apricot PC, IBM PC and compatibles. Sage programs are available for a wide range of MS-DOS.

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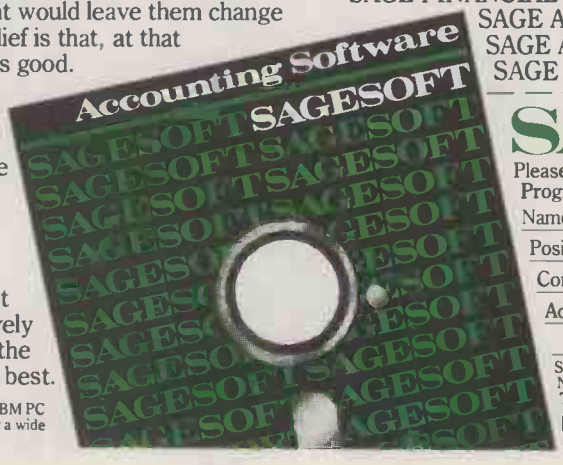

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ASPECT costs £400 + VAT for a single user version and £950 + VAT for the network version*. A limited record version is available for £40 + VAT and this amount will be deducted from the price of the full version if one is purchased later.

ASPECT is available from Microft Technology Limited, The Old Powerhouse, Kew Gardens Station, Kew, Surrey TW9 3PS, or from many dealers. For further information telephone 01-948 8255.

* This allows up to 5 terminals on the network. A further £100 + VAT is payable for each additional terminal.

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METATEXT
PRINT ENHANCER

By Ian Stobie

This RAM-resident utility for IBM PCs induces an ordinary dot-matrix printer to produce NLQ output.

Many people are happy with their existing matrix printer for producing quick drafts of documents for their own use, but would like to produce better-quality output to send to other people. They face the choice between buying a new printer or finding a cheap way to enhance the old one.

Metatext represents the enhancement route. It is a £95 software utility which runs on the IBM PC and close compatibles. With it you can produce very readable near letter quality (NLQ) print on the IBM Graphics Printer and most Epson and Epson-compatible machines.

The penalty you pay for this quality is loss of speed. Metatext produces its NLQ output by getting the printer to make several passes over the same piece of text. However, it does also let you switch back to your printer's normal printing method, so you can still print quickly when quality does not matter.

Metatext comes on disc in a box with a manual. There is also a small, flat rectangular piece of plastic called a puck, which is for switching between your printer's normal printing mode and Metatext's enhanced-quality printing. The puck has Draft marked on one side of it, Quality on the other. Inside is a gravity-sensitive switch. You turn whichever side you want face-up, and the Metatext software knows from the switch position what quality to print.

The first thing you do when setting up Metatext is connect the puck. It has a thin cable leading from it which fits between the printer port on your computer and your existing printer cable. You plug the puck adaptor into the port and then piggyback the printer cable into the back of it.

To install Metatext you boot MS-DOS, insert the disc and type MT80 or MT132, depending on the width of your printer. This sets Metatext running in a small area of memory, and then returns you after a few seconds to the MS-DOS prompt. You can then run existing software packages as normal.

Metatext takes up 29K of memory if you are using an 80-column printer, or 34K with 132 columns. It ran without any trouble with all the software we tried, which included Multiplan, Lotus 1-2-3 and various 1-2-3 clones, Basic, and different word processors. Memory-resident programs like Metatext can run into problems if you try and use them at the same time as another memory-resident program, but we tried Metatext with Sidekick and it worked fine.

The advantage of Metatext compared to many other printing utilities is that once you have installed it you can forget about it. You do not have to send special Escape sequences or any other commands. In each of the Metatext founts Metatext will print the full IBM PC character set, so there is no need to alter any software. You just print from inside your application package in the normal way, or use the IBM Print Screen key, and Metatext prints in quality or draft mode depending on which way up the puck is.

METATEXT

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	☐	■
Ease of use	☐	☐	☐	■
Documentation	☐	☐	☐	■
Value for money	☐	☐	■	☐

☐ Simple to install and very easy to use.
Gives NLQ print of excellent standard.

```
Normal IBM Graphics Printer output
Metatext draft print is the same
Metatext printing in Courier fount
Metatext printing in Typewriter fount
Metatext printing in Italic fount
Metatext printing in Orator fount
```

Draft and NLQ type from Metatext.

SPECIFICATION

Description: memory-resident print utility to produce higher-quality print on standard dot-matrix printer
Founts: offers Courier, Cubic, Elite, Italic, Orator and Typewriter founts in addition to normal quality
Supported printers: Epson FX, RX, JX and LX series and compatibles, IBM Graphics Printer and compatibles
Runs on: IBM PC and clones
Copy protection: none
Price: £95
Publisher: Image Computer Systems Ltd, 27 Cobham Road, Ferndown Industrial Estate, Wimborne, Dorset BH21 7PE. Telephone: (0202) 876064
Available: now

Metatext also produces very good quality output. Usually it gets the printer to make three passes when printing text in quality mode, as against only one normally or in draft mode. On each pass Metatext fires a different set of pins in the print head, so the characters are built up on a different pattern to the normal fount. This gives better results and allows for the use of several alternative founts.

Metatext comes with six different founts on disc, but you can only have one going at a time. Courier is the default fount. If you want to use Elite, for instance, you have to go back to the operating-system level and retype MT80 with the appropriate parameter. Fortunately, the Metatext manual is excellent: all the information you need to do this is there and it is very well presented.

As with other memory-resident utilities you need to reinstall Metatext each time you turn on your machine. Since the Metatext disc is not copy protected you can simplify things for yourself by copying the relevant files on to your boot disc and setting up the Autoexec.Bat file to install Metatext automatically at power-on. This makes installation into a once-and-for-all task.

CONCLUSIONS

■ Metatext is not cheap but it does produce very good printed NLQ output from standard matrix printers. Where it really succeeds is in ease of use.

■ An alternative to Metatext for some printers such as the Epson FX series is to add a hardware NLQ card inside the printer. This gives good results but Metatext is slightly cheaper, and offers a broader choice of fount as a bonus.

■ Metatext is best suited for people who do most of their work at draft speed but want good quality on special occasions. PC

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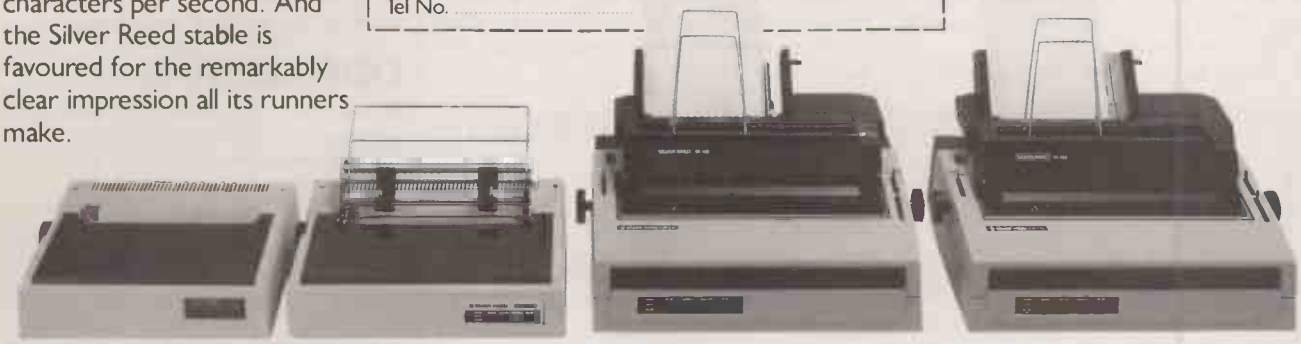


EXP400 EXP500 EXP550 EXP770

● Circle No. 119

MIRACLE WS-3000
HAYES-COMPATIBLE MODEMS

By Steve Gold

The first BT-approved range of modems which can use both the U.S. Bell and European CCITT transmission frequencies.

If you pick up literature or even a manual for a U.S.-originated personal-computer communications program, you will see the phrase "Hayes protocol compatible" throughout. Hayes is a modem manufacturer whose units — for better or worse — have had their control codes adopted as the de facto standard. U.S.-built modems adhere to them almost as rigidly as business micros seem to default to IBM PC standards.

Because of the plethora of communications software available for personal computers, it is inevitable that the U.K.'s fledgling modem industry should bring out modems compatible with prevailing software standards. The WS-3000 series of modems are among the first offerings from a mainstream U.K. company.

SPEED BUFFERING

Principal to the WS-3000 modem's concept is the adoption of the Hayes protocols, which permit control of the modem via the computer keyboard. Such commands must adhere to a special format and are prefixed by the AT or similar command prefix. They also allow speed buffering of data, so that a computer whose RS-232 will only support same-speed full-duplex data transfer can be connected with a split-speed service such as Prestel.

The WS-3000 modems sport the grey, black and red livery that Miracle Technology now regards as its standard colours. The front panel of the V-2123 unit has LED indicators for: Power On, On-line, Terminal Ready, Request to Send, Clear to Send, Carrier Detect, Send Data, Receive Data, and Autoanswer Mode.

The modem worked faultlessly with several micros and comms software packages. Connection is simply a matter of hooking up a 25-way RS-232 plug on to the rear of the sparsely populated back board of the WS-3000. Booting in a terminal software package established direct communication with the modem, and onwards to the phone line. Ideally, the RS-232 should be set at 300 baud for 300 baud operation, or 1,200 baud full-duplex for 1,200 baud combinations such as 1,200/75, etc.

All units feature an on-board Nicad-backed, memory unit that retains up to 63 telephone numbers plus descriptions for autodialling. This can be useful where such facilities were not available via the computer's software.

The WS-3000 V-2123 version does not use full-duplex 1,200 baud, but offers host-controlled half-duplex switching. This means that only one 1,200 baud channel with associated tone generation is in operation at any given time. There is no back channel sent, as is the case with 1,200/75 baud working. In practice, there are very few host systems in the U.K. which allow working at such half-duplex speeds. The only public option which uses this rate is Prestel, and even then only for bulk updating by information providers to its system. The only other possible use for such a half-duplex rate is for transmissions between basic WS-3000 units, which brings to mind software exchange and its inherent overtones of software piracy, etc.

MIRACLE WS-3000

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	☐	■
Ease of use	☐	☐	☐	■
Documentation	☐	■	☐	☐
Value for money	☐	■	☐	☐

☐ Costly, but worth considering if you want a full-featured modem with minimal hookup problems.

As well as offering CCITT tones in various configurations, the WS-3000 also has the distinction of being one of the first modems to legally use 300 baud Bell frequency tones in the U.K. It does this by generating a special guard-band frequency while the 300 baud Bell tone is in operation. This prevents the local telephone exchange from interpreting the Bell tones as multi-frequency spectrum. For this reason, modems which do not generate the guard-band frequency cannot legally connect to the U.K.'s phone system, which rules out almost every modem yet produced in the U.S.

All Hayes commands are prefixed with AT, which indicates to the modem that a command is coming. The commands acceptable to the modem use a mnemonic which allows the user to grasp the meaning of the abbreviations without constantly referring to the manual. This is a reflection of the superb simplicity of the Hayes protocols rather than the modem itself. However, it made installing and using the modem a straightforward process, especially when linking up to an unfamiliar machine with communications software that was difficult to understand.

The manual available for review with the machine was a draft one, without photos or glossy paper, in a basic photocopied A4 format. It was obvious that it had been compiled from the technical notes of the modem's designer. I found it a little difficult to have to wade through several chapters before going on-line. In the end I gave up reading at the third chapter, and hooked the modem up to my well-used BBC Micro. The fact that I got on-line almost immediately is a tribute to the originators of the Hayes protocols, not to the manual's writers. A revised manual is said to be in preparation.

SPECIFICATION

Description: series of three autodial/auto-answer modems using Hayes protocol; they handle U.S.-style Bell and European-style CCITT transmission frequencies; BT-approved
Hardware required: can be used with any micro equipped with an RS-232 port and running Hayes-compatible comms software such as Enable, Fido, Framework, Symphony, Crosstalk, Smartcom, ASCII Express, Vicom and Chit-Chat
Protocols: Bell 103, CCITT V-21, V-23, V-22 (V-22 and V-22 bis models only), V-22 bis (V-22 bis model only)
Prices: V-2123, £295; V-22 £495; V-22 bis £650; data-security option, £98
Manufacturer: Miracle Technology (U.K.) Ltd, St. Peters Street, Ipswich IP1 1XB. Telephone: (0473) 216141
Availability: now

CONCLUSIONS

- The relatively high price of these units buys flexibility and ease of use.
- A wide range of communications software is available to drive them, since they accept Hayes-standard codes.
- For anyone wishing to operate within the U.S. phone system from the U.K., no other BT-approved unit is yet available.
- The appearance of standard, serviceable units of this kind is a reflection of the growing maturity of micro comms in the U.K. PC

VP-PLANNER & TWIN
LOTUS CLONES

By Glyn Moody

Lotus 1-2-3, the world's top-selling package for over two years, is about to be undercut by a flock of programs which offer all its functions and more — at a fraction of the price.

It had to happen. After the IBMulators — clones of the top-selling IBM PC, often for half the price — we now have Lotus look-alikes which offer the full functionality of 1-2-3. Two of the first past the mark, in what is almost certain to develop into a fast and furious contest, are VP-Planner and Twin.

As befits a product from Adam Osborne's Paperback Software. VP-Planner does indeed arrive in the form of a paperback, albeit a rather thick one. The Osborne philosophy is that software should be sold through traditional outlets such as bookshops, and packaged and priced accordingly. VP-Planner weighs in at a very attractive £99.95.

COPY-PROTECTED

As with all Paperback Software, the discs are held in a reinforced pouch at the back of the book. The act of unsealing this is held to commit you to all the usual dubious rigmarole about accepting the terms and conditions of the licensing agreement. As a man dedicated to injecting some sanity into the selling of software Osborne seems to be backsliding. Another surprise is that the main system disc is copy-protected, but it is possible to buy an unprotected disc — for using with a Winchester, say — for a small extra charge.

These gripes apart, the package emerges as little short of extraordinary in terms of performance and, especially, value for money. For all that it is no more than a paperback, the manual is a paragon of its kind.

Installation is easy: you just put the disc in your machine and run it. The opening screen presents you with seven options, including Quit. Two options let you list the current directory and set up the path name for files to establish the working directory. The two main commands let you work with the spreadsheet or with the multi-dimensional database.

As you might expect, the spreadsheet looks and handles almost identically to Lotus 1-2-3. The software authors have, however, been unable to resist the temptation to make improvements. For example, 1-2-3 lets you enter commands from the / menu either by selecting them with the cursor keys or using their initial letters. VP-Planner displays commands at the foot of the screen rather than above the spreadsheet.

Extra features include the ability to hide portions of the spreadsheet. This is achieved by setting the column width to zero: the data remains and can be displayed in the status line by moving the cursor into the appropriate part of the invisible region. You can set up six windows rather than two. Range names which have been defined can be called up with a simple command, and there is a relative Goto command; instead of giving the Goto address directly, you specify two cells where the required row and column are stored.

VP-PLANNER

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	☐	■
Ease of use	☐	☐	■	☐
Documentation	☐	☐	☐	■
Value for money	☐	☐	☐	■

☐ Matches Lotus 1-2-3 as a spreadsheet, and goes way beyond it as a database.

There are a couple of interesting additions to the family of @ functions, notably @poly and @root. The first evaluates a polynomial whose coefficients are stored in a range of cells, and the latter solves a similar polynomial using iterative approximations.

The ability to create macros — that is, complex strings of commands — and assign them to single keys is one of Lotus's most powerful features, but also one of its most opaque ones. VP-Planner supports all the usual Lotus features and uses the same codes, but adds several of its own which go some way to alleviating the complexities of the process.

Foremost among these is the Autokey macro. Like Microsoft's Excel, reviewed in the November issue of *Practical Computing*, VP-Planner will record a macro as you type it in. You simply invoke the Autokey Define command, and then proceed through the macro step by step. Until this mode is terminated, every keystroke will be recorded and assigned to a predetermined key. The macro is than called up in the usual way by pressing that key simultaneously with the Alt key.

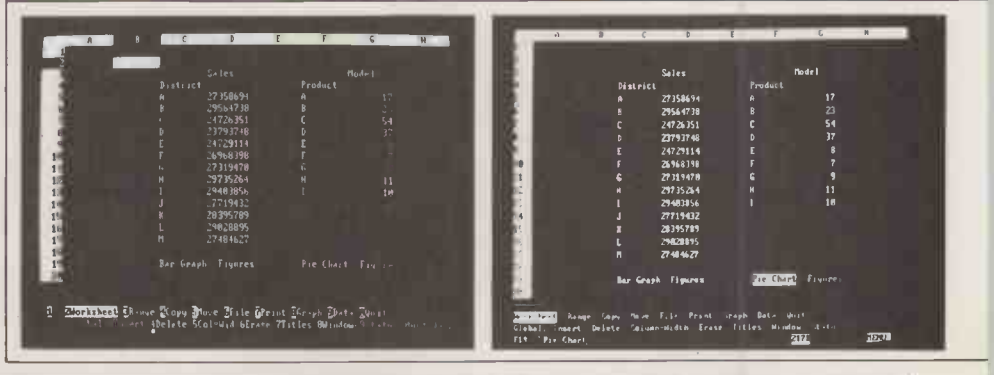
Where VP-Planner goes furthest beyond 1-2-3 is in its provision of a multi-dimensional database facility. This is in addition to the primitive database functions also available on the spreadsheet, as with the Lotus product.

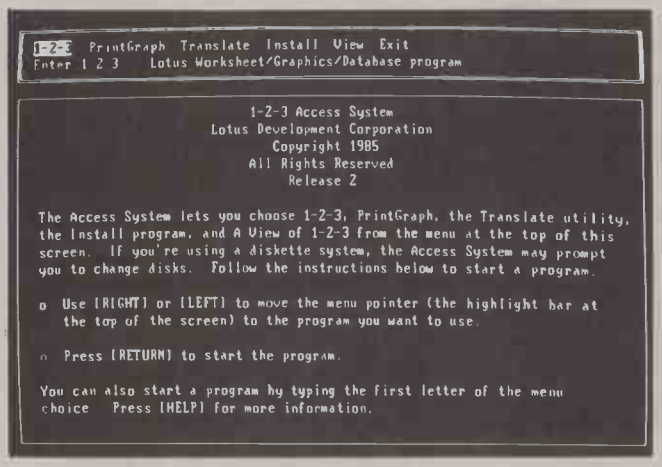
Conceptually, the multi-dimensional database can be seen as an extension of these database facilities. Data is still entered on a two-dimensional spreadsheet-like grid, with column labels providing the fields, but in addition the row labels act as further fields. This is a true two-dimensional database.

Higher dimensions are obtained by adding further spreadsheet grids. For example, on a database holding information about a range of product sales, the row labels might be a breakdown of gross and net sales, together with profits. The columns could be months, so the figures on each sheet would show the variation of the gross and net sales for each month.

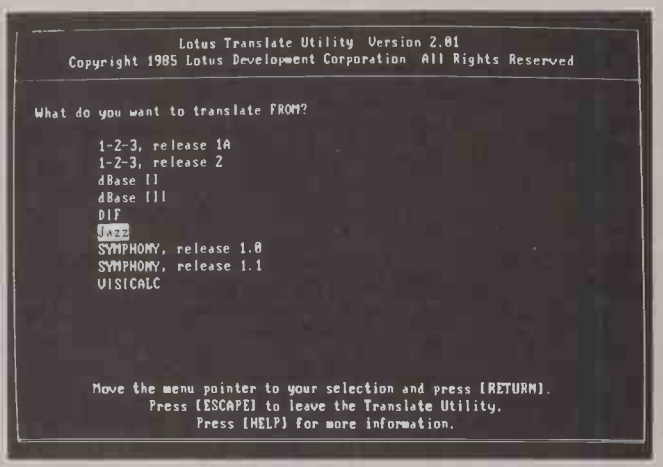
If there were a whole range of products, each with sales and profit figures, a separate spreadsheet grid would be needed for each. This would produce a three-dimensional database. A fourth dimension would be

(continued on page 64)





Release 2's menus are like those of Lotus Report Writer.



The Translate menu allows you to swap files between programs.

LOTUS 1-2-3 RELEASE 2

It is three years since Lotus launched 1-2-3 on an unsuspecting world. All the more surprising then, that there are not more changes in its new release 2 of this top selling product. Partly this reflects the fact that, like IBM, Lotus is effectively locked into its own standard. To stray too far from it would be to court unpopularity and worse from a large and loyal user base — as Micropro found out to its cost with the radically different WordStar 2000. Though 1-2-3 was a well-judged product from the start, there remains plenty of room for improvement, especially in terms of added facilities, as VP-Planner and Twin both show. Lotus no doubt avoided this approach for fear of harming sales of its other major product, Symphony.

The most radical changes have occurred in the packaging rather than the product. Gone is the dowdy cloth-bound case; instead we have a gleaming grey laminated case, with the new clean-cut logo.

Best of all, the manual has been split into three and completely rewritten. Getting Started and Tutorial both convert what were mind-numbingly pedantic chapters in the original version to light prose spiced with plenty of screen dumps and even a few illustrations. In many respects this new airy image reflects the distance Lotus 1-2-3 and its users have travelled: the difference between Getting There and Being There. The reference manual, perhaps the most important member of the set, also represents an improvement. The command tree is now drawn quite explicitly, though the format of the explanation is still not as clear as that provided by the exemplary VP-Planner.

Changes to the program itself are relatively few and minor. For example, you can now set up spreadsheets with 8,192 rather than 2,048 rows; the 8087 and 80287 maths co-processors are supported; and the upper memory limit has been boosted to 4Mbyte. However, the minimum RAM has also increased from 192K to 256K. You can also copy the system files to hard disc, but only once; they have to be copied off before reinstalling them.

Release 2 has the same user-friendly menus found in Lotus Report Writer, reviewed last month. Installation is controlled from an approachable front end, called Access. From this initial menu you can also invoke the Print Graph program as well as control the translation of files between different formats — say, from Jazz to 1-2-3. A welcome improvement is the ability to enter the path directory as you call up a file for retrieval.

On the main command menu there is a newcomer. Called System it lets you hop back into DOS without losing all your files. Typing Exit takes you back to where you left off. This means that you can load another program while running 1-2-3, given sufficient memory.

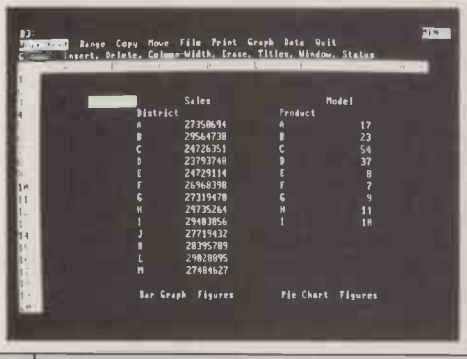
The Worksheet-Global-Format-Hidden sequence makes the contents of a specified range disappear on-screen, even though they still exist. A new Range command, Transpose, switches a row into a column and vice versa. Data has two interesting additions: matrix inversion and matrix multiplication. The matrix inversion is particularly neat and convenient; it also looked pretty fast. Data has also acquired some regression capabilities and a more exotic one called Parse. This allows you to split up a long entry occupying just one cell — possibly imported from a database — into separate cell entries.

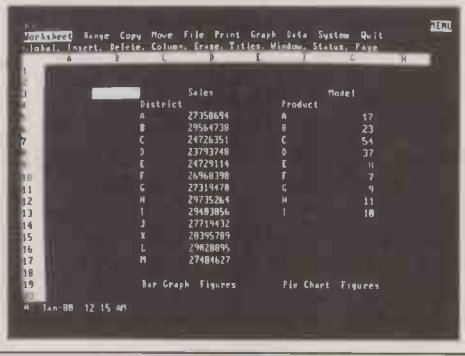
There are a number of new functions, still signalled by the initial @. Several of these beef up the string-handling capabilities, while others offer more obscure financial functions like double-declining depreciation.

The Print Graph section has undergone rather more radical changes in its command structure, the net effect of them being that more choices are available as far as output hardware is concerned.

Clearly release 2 is no radical revision of 1-2-3, just a tasteful face-lift. The biggest gains are for the tyro, who is less likely to be intimidated by the manual. The old hands will have to console themselves with the fine-tuning which has been done here and there.

Lotus 1-2-3 release 2 is free for those who purchased the earlier version on or after 24 April 1985, though there is a £25 postage, packing and handling charge. For those who bought it earlier the inclusive cost is £140. Otherwise the full price is £395. Contact Lotus Development U.K. Ltd, Consort House, Windsor, Berkshire SL4 1EX. Tel: (0753) 840281.





From the left:

VP-Planner highlights function keys in inverse video.

Twin's command menu appears at the bottom of the screen.

The original Lotus 1-2-3 spreadsheet.

Lotus Release 2 shows the date and time at the bottom left-hand corner of the screen.

(continued from previous page)

added if a different set of stacked sheets were needed for different sales regions.

Typical manipulations of such data would be consolidating — that is, adding together — all the sales for the different regions for each product, each month and each category like net sales. Alternatively the four dimensions could be reduced down to three by adding up all the months to give the year's figures for each region, each product and each category.

If this sounds complicated, it is. Thinking in four dimensions is not easy, and in fact VP-Planner can handle five-dimensional databases. In the example quoted this might correspond to having all the information already described, but for several countries. VP-Planner does its best, allowing you to cut through the multi-dimensional sheets in any pair of the dimensions, and so input or edit data from any viewpoint. It also allows you to set up logical relations between elements. For example, you can specifiy that the Totals figure in the time dimension is obtained by adding up each of the months. Such relationships need to be specified, since the database itself possesses none of the arithmetic abilities of a spreadsheet.

Multi-dimensional databases can be linked in with spreadsheets, allowing data to be manipulated using the full range of functions. Once modified, it can then be stored back in the database. This feature can be used to link together the multi-dimensional database with dBase files. This is possible since the spreadsheet has a facility to store and retrieve dBase files, and can act as an intermediary in the process.

CLEAR THINKING

The ability to set up and manipulate multi-dimensional databases is a very powerful feature and a complicated one. Good use of function keys and on-screen help is provided, but a clear head is still needed.

Taken together with the other refinements, the inclusion of this powerful database facility in a package costing less than one-third the price of 1-2-3 is astonishing. Even for current owners of the Lotus product, VP-Planner could well be worth buying just for the additional features or as a backup system. It has no difficulty in handling files created by 1-2-3, and works with the new Lotus Report Writer, reviewed last month. In fact, the otherwise excellent manual almost assumes that you are familiar with 1-2-3 anyway: it deals slightly perfunctorily with the basics, partly because VP-Planner offers so much more in the way of advanced features. However, this lack is compensated for by the full reference sections, which are clearer than their Lotus counterparts.

Like VP-Planner, Mosaic Software's Twin combines added value with a price well under that of 1-2-3, in this case £145. The extended graphics facilities it offers are partly a product of Twin's place in a wider range of programs called Integrated 7, published by the same company. One bonus it offers is the possibility of importing graphs created from the spreadsheet — or even 1-2-3 — into word-processing documents. As a result of its enlarged graphics facility, Twin requires a minimum of 260K to run, which is just too big for a 256K machine.

Once again, Twin's manual is rather less grand than the full Lotus set, taking the form of a thick spiral-bound booklet. A conventional pouch at the back holds the three discs: two system discs and a library disc. They are not copy protected.

The installation process simply consists of copying across the system files from DOS to the Twin disc so that you can boot straight up from that. The hardware configuration can be altered from a very full menu of options contained within the program.

The on-screen appearance is very similar to 1-2-3, except that the command menu once again appears along the bottom of the screen. Twin lets you change the background colours of the program display.

Practically all the commands are set out and work in the same way as in the Lotus product, and data for 1-2-3 can be handled without problem. One slight variation, apparent when you are retrieving a file, is that the disc directory obscures the display of the spreadsheet itself. This has the advantage of clarity and can also cope with extended directories. Once a file is selected, the spreadsheet display is reinstated.

TWIN

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	■	☐
Ease of use	☐	■	☐	☐
Documentation	☐	■	☐	☐
Value for money	☐	☐	☐	■

☐ Gives you everything Lotus does, plus a wider range of graphics.

Choosing Graph from the main command menu causes the substantial subsidiary graphics program to be pulled in from the main system disc. This can be rather slow, particularly if you are jumping backwards and forwards between the spreadsheet itself and graphs produced from it. As well as the normal 1-2-3 options, Twin allows you to produce three-dimensional bar graphs, which use blocks rather than strips, a similar three-dimensional pie chart, and a pie/bar chart in which one of the pie slices is further exploded into a bar chart.

Most of the extra features are controlled from the Options three-page sub-menu. As in the directory listing, the command menus spill over a substantial part of the spreadsheet itself. The first page handles the size, colour and fount of the legends which appear on the graph. There are eight sizes, two palettes of three colours, and you can use three out of 11 possible founts.

SPECIFICATIONS

VP-PLANNER

Description: Lotus 1-2-3 clone with added multi-dimensional database facilities
Hardware required: IBM PC or compatible with at least 256K RAM
Copy protection: yes; unprotected disc available for around £8
Publisher: Paperback Software, California
U.K. distribution: Unique Solutions Ltd, 17-21 Castle Street, Cardiff CF1 2BT. Telephone: (0222) 390714. Computer Frontier (U.K.), Business and Technology Centre, Bessemer Drive, Stevenage, Hertfordshire, SG1 2DX. Telephone: (0438) 310163
Price: £99.95
Availability: now

TWIN

Description: Lotus 1-2-3 clone with extended graphics facilities; part of Integrated 7 family of products
Hardware required: IBM PC or compatible with at least 260K RAM
Copy protection: none
Publisher: Mosaic Software, Cambridge, Ma 02140, U.S.A.
U.K. distributor: Future Management Corporation Ltd, 38 Tanners Drive, Blakelands North, Milton Keynes MK14 5LL. Telephone: (0908) 615274
Price: £145
Availability: now

The second page of the sub-menu allows detailed control of the axes. For example, you can specify linear or logarithmic scales, and whether a grid is to be displayed. The final page handles the details of shading and the legends to be appended.

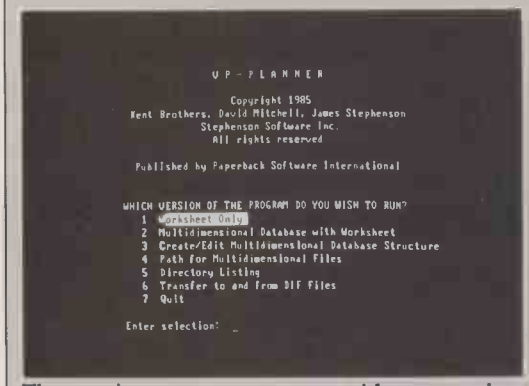
The other graphics feature of note is the ability to create so-called slide files rather than printed outputs. These can be imported later into a text document created with the companion word processor in the Integrated 7 family.

MANUAL ADEQUATE

The accompanying manual is adequate, but bears no comparison with that for VP-Planner. If that skimped slightly on the basics, Twin's ignores them almost completely. Macros in particular suffer from a lack of detailed explanation. The only area to receive its due is graphics where the extra facilities are explained at length. The command list follows Lotus's listings format, which looks very confused compared to VP-Planner's well thought-out and well-presented nested commands. Against the densely packed eight pages of index of the Paperback Software package, Twin has a rather more meagre four. Even more than VP-Planner, Twin seems to assume that you either know how to use 1-2-3 or are prepared to go out and buy a book on the subject.

Twin's main strength is undoubtedly its extended graphics. For anyone who is considering 1-2-3 but requires particularly strong graphing facilities, Twin is a sensible buy. In fact, even current 1-2-3 owners may

VP-PLANNER

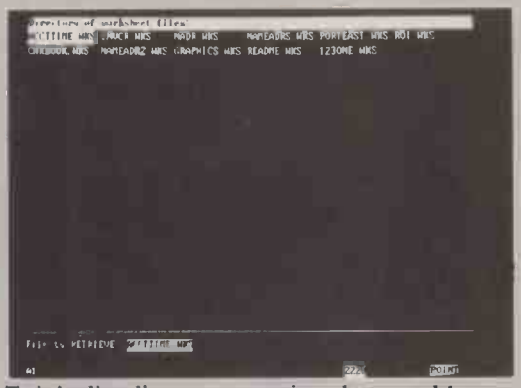


The opening menu presents you with seven options.

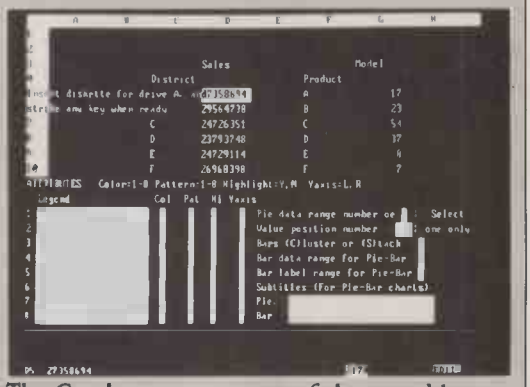
You can set up a four-dimensional database.

Setting up details within each dimension.

TWIN



Twin's disc directory overwrites the spreadsheet.



The Graph menu over part of the spreadsheet.

You can label the x and y axes.

find it worth the price, especially if they find the possibility of importing graphs into word-processing documents attractive. The fact that Twin is part of a complete integrated family may also be a point in its favour for those who are looking for a complete system with 1-2-3 compatibility.

When people started copying the PC, IBM took it surprisingly well, judging rightly that more clones meant a bigger market penetration, and so more software and more reason to buy IBM. Lotus may not prove so benevolent. VP-Planner and Twin may be among the first clones to appear, but they will certainly not be the last, Another Lotus look-alike on the horizon is Practicalc, part of an entire clone family.

Clones of 1-2-3 will add to the effective installed base of the product, but the increased production of Lotus add-ons would be nowhere near so important to Lotus as more IBM software has been to IBM. The bottom line is that Lotus stands to lose out.

End-users can only benefit from this kind of competition, but American courts may start coming down hard on anything even vaguely resembling a product clone. The Gem settlement between Apple and Digital Research may not be representative, but there are other cases which indicate that visual appearances alone may be enough to convince the courts that an infringement has taken place.

It would be sad if the big boys were allowed to stifle any suggestion of creative borrowing, though obviously they have a right to protect their investment in a successful product. But if they do obtain a ruling from the courts which maintains their effective monopolies, to what extent is is reasonable that they should charge artificially high prices? For the moment end-users would do well to get in there while they can, and benefit from the coming spate of high-quality software clones.

CONCLUSIONS

- VP-Planner is a Lotus 1-2-3 clone with a very powerful multi-dimensional database built in as an extension.
- Twin is also fully Lotus 1-2-3 compatible, and has extended graphics facilities.
- Both packages are good value.
- The manual of VP-Planner is excellent, both in terms of content and appearance.
- Partly as a result of its power, but also because of the need to keep within 1-2-3 conventions, VP-Planner's database is rather difficult to use.
- Twin falls down slightly on its somewhat inadequate manual, which tends to assume, even more than that for VP-Planner, basic expertise in 1-2-3. PC

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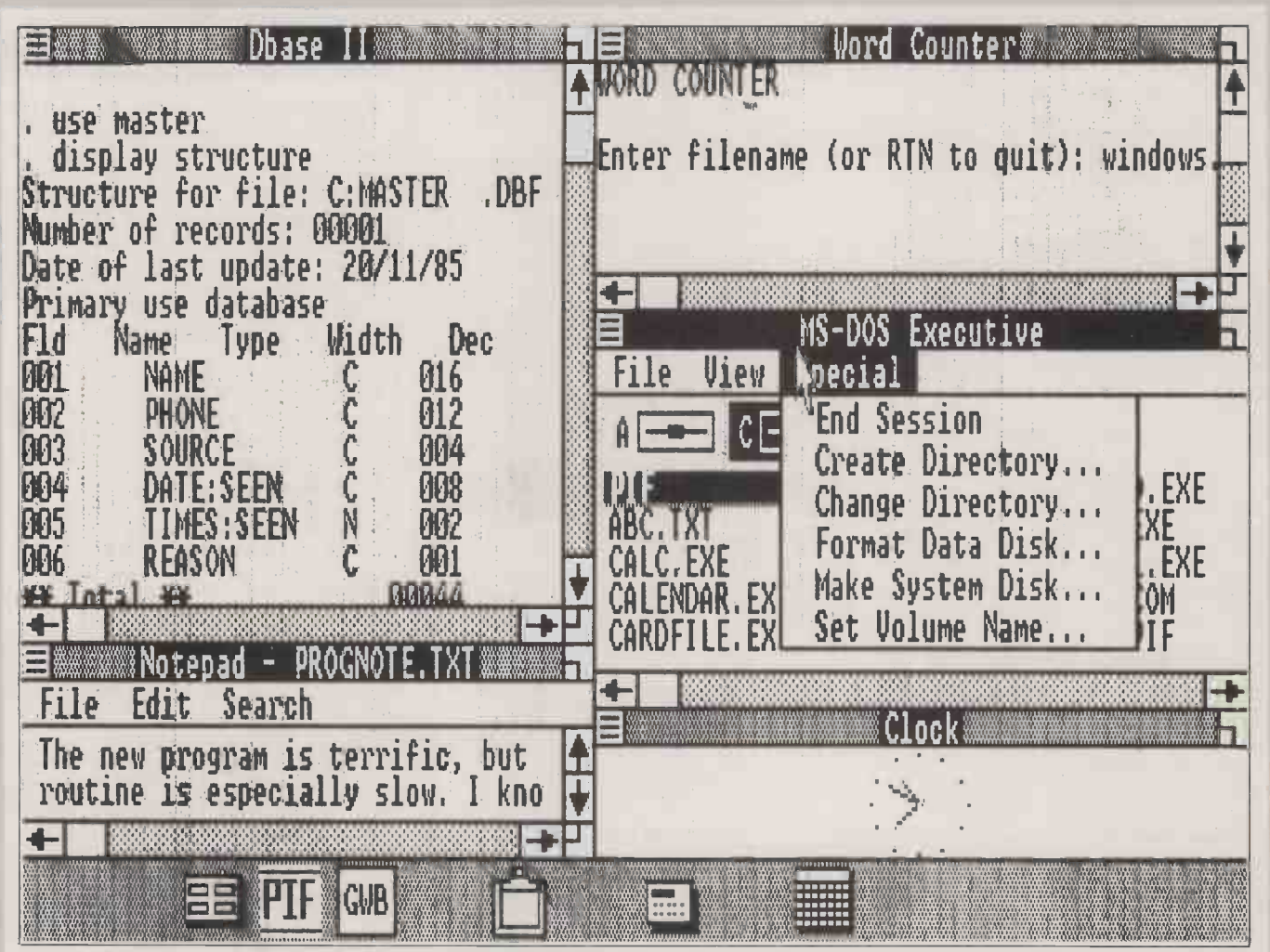
MICROSOFT WINDOWS
THE MULTI-TASKING WIMP

By Mike Lewis

Not just another window, icon and mouse program, but a vehicle that will allow existing MS-DOS applications to be run and displayed simultaneously.



When I first saw a review copy of Windows, I jumped to the conclusion, as many others seem to have done, that here was another Macintosh-like Wimp manager, bringing icons, overlapping windows and multiple founts to the world of MS-DOS. So I started preparing this review as a point-by-point comparison against that other exponent of the graphical interface, Digital Research's Gem.

On this somewhat simplistic basis, the Microsoft product scored badly. Its windows did not overlap, its use of graphics was very limited, and only one of its subsidiary applications could handle the fancy founts.

No fewer than 11 separate programs are active here, five of them visible on the screen. We noticed considerable degradation, but at least the clock still kept the correct time.

A definite win for Digital Research, or so I thought.

But after using Windows regularly for several weeks, I am now convinced not only that it is the superior product, but that it leaves the competition standing. Forget about Wimps; that is not what Windows is all about. It is as a vehicle for multi-tasking that this program really shines.

With Windows, you can run several tasks at the same time, you can quickly and easily switch between them, and you can transfer both text and graphics from one to another. Best of all, Windows works with existing applications; you do not need a special version of your favourite database or spreadsheet to take advantage of its power.

The whole thing is controlled by a command-line substitute called the MS-DOS Executive, which is invoked automatically when you start Windows. This shows, in a window, a list of the files in the current directory, and also sports a set of pull-down menus for copying files, changing directories, and suchlike tasks.

Running a program is simply a matter of pointing to the appropriate file name with

(continued on next page)

(continued from previous page)

the mouse and double-clicking the button. Windows then relegates the Executive to the grey icon bar at the foot of the screen, and opens a fresh window for the selected application. This can be moved around and resized like any other window, and has a single pull-down menu for such operations as cut and paste.

The multi-tasking aspects of this process are not always obvious. The point is that after you have started the application running, you can close its window while you go on to something else. Meanwhile, the original job is still executing in the background. The only indication of what is going on in memory is the icon bar, since this shows an icon for each program that is either running or waiting for attention from the user.

When you want to take a look at any of the background tasks, you drag its icon from the grey bar towards the centre of the screen. This causes the application's window to reopen. It is possible to split the screen between several applications by dragging one icon to the border of another's window.

Of course, the application program is unaware that it is running in a window, and will happily display its output as if it had the whole screen to itself. Only a portion of the screen is visible at any one time, so you have to use the scroll bars at the window's edge to pan the window around the virtual screen. This raises a small problem when the cursor is outside the window area, since it is possible to enter data through the keyboard, and for the program to accept what you have typed, without your input being visible. No data will be lost, but it could be disconcerting if you are not aware of what is happening.

REDISPLAYS OUTPUT

Unfortunately, not all programs can run in a window. The system works by intercepting the program's screen output, and either redisplaying it in a window or inhibiting it completely if the program is running in background. This is fine if the program uses MS-DOS system calls to display its output, but many software packages bypass MS-DOS and write directly to the video-mapped memory instead.

To make matters worse, Windows cannot intercept graphics output, so many popular applications — including Lotus 1-2-3 and Microsoft Word — are unable to run in a window. Microsoft has provided special graphics routines to make such software Windows-compatible, but so far very few vendors have taken it up.

Where an application is unable to run in a window, the system hands the entire screen over to it. But you can still switch to and fro between the application and Windows simply by pressing Alt and Tab at the same time. However, only one such full-screen task can be active at a time. While it is switched out, it does not continue execution, although you can return to it at exactly the point at which you left it.

Switching out in this way needs lots of RAM, so the Alt-Tab technique does not work with memory-hungry programs. Here you need to quit the application before returning to Windows. The same is true of programs that read the keyboard directly rather than through MS-DOS, since there would be no way of trapping Alt-Tab.

By now it should be clear that Windows needs to know a lot about a program before it can start it running. It needs to know how the program writes to the screen and reads the keyboard, whether or not it outputs graphics, how much RAM it uses, and also what other resources it needs.

PIFS

It gets these parameters from a set of program information files — Pifs for short. There is one file for each application. Windows comes with Pifs pre-installed for several mass-market packages like Lotus 1-2-3 and WordStar, but for other programs you need to set them up yourself.

Creating a Pif is easy enough, thanks to the Pif Editor, which reduces the task to a form-filling exercise. The trouble is that the average user has no way of knowing what to fill in. How many of us know whether our favourite word processor writes directly to the screen, or reads the keyboard buffer, or even how much RAM it needs? But this is just the sort of information that you must have if the program is to run in a window, which is the whole point after all.

The only advice that the Windows manual gives on this issue is to experiment, and that is exactly what I did. I found that all my Microsoft Basic and Turbo Pascal programs ran in their own windows, as did dBase II and III, Rbase, Sagesoft's Chit-Chat package, the IBM Assistant series and Multiplan. On the other hand, WordStar, Reflex, Supercalc 3 and Microsoft Word all needed the full screen, and the first two of these failed to respond to Alt-Tab.

With Basic, I could not use any of the graphics commands, which seemed reasonable, nor would the Screen statement work, which was surprising. Windows quite properly stopped me from using Chit-Chat while its own terminal-emulator was active, since both require the communications port. I was delighted to see that Sidekick worked normally. The biggest failure occurred when I tried to run a program that itself uses the Microsoft mouse: this caused the system to crash completely.

All this experimentation was very time-consuming. Perhaps the day will come when software publishers automatically include their products' Pif parameters in the manuals, or even supply the file itself.

CUT AND PASTE

No multi-tasking operating system or extension is complete nowadays without some form of cut and paste between applications. Windows resembles the Macintosh in this respect, with its built-in clipboard. With both window-based applications and those that take over the entire display, you can copy whole screens to the clipboard by pressing Alt-PrtSc. This works for graphics just as well as for text. Alternatively, you can use the mouse to select any rectangular portion of a window, then execute the Copy command from a pull-down menu to transfer this to the clipboard.

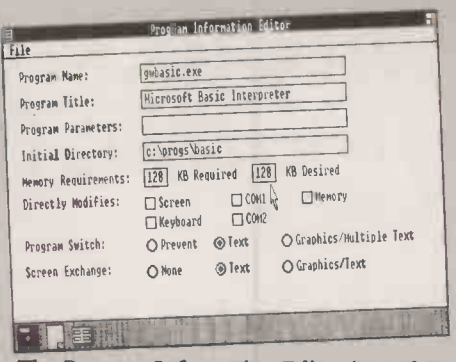
Similarly, there is a paste command which copies from the clipboard into a window. With text, the effect is the same as if you had typed the data at the keyboard. You cannot paste to full-screen applications, although

WINDOWS

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	■	☐
Ease of use	☐	☐	■	☐
Documentation	☐	☐	■	☐
Value for money	☐	☐	☐	■

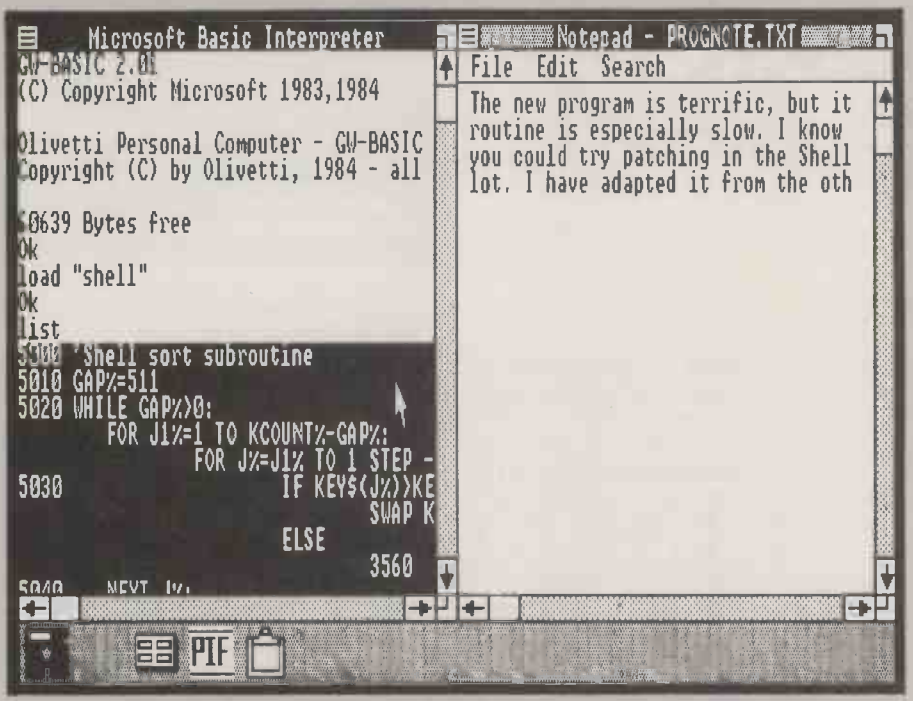
☐ If you really want multi-tasking, this could be your best bet.

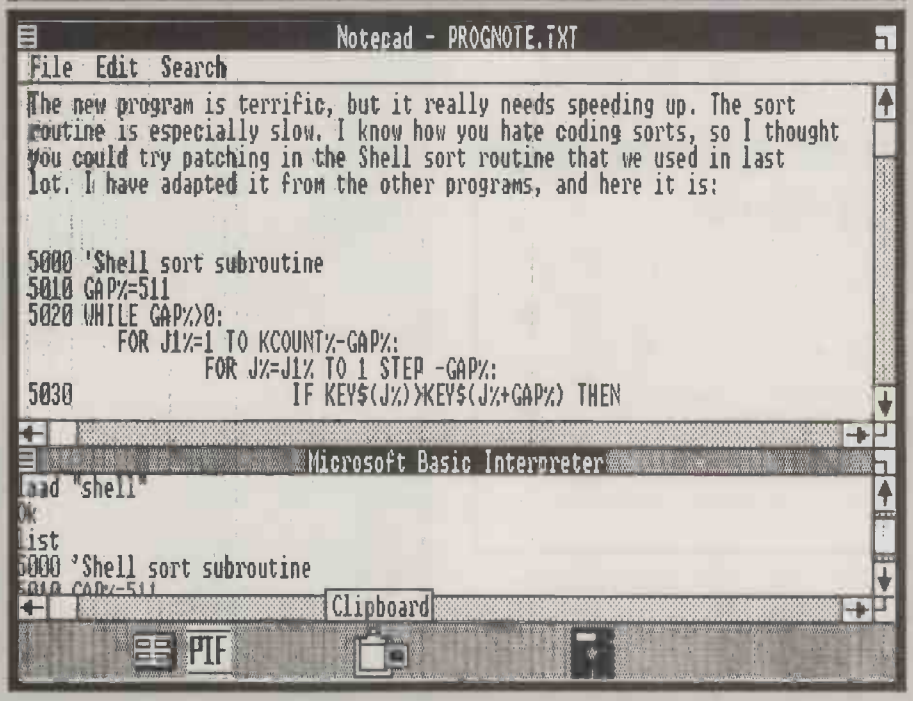


The Program Information Editor is used to tell Windows how to run an application program. Filling in the form is easy enough; knowing what to enter is sometimes more difficult.

SPECIFICATION

Description: multi-tasking extension to MS-DOS, providing fast switching between tasks; includes a word processor and painting program and a large set of desk accessories
Hardware required: IBM PC, XT, AT or close compatible, RM Nimbus, Apricot; needs at least 256K RAM, twin floppies or hard disc, MS-DOS 2 or later, graphics card or equivalent; a hard disc, mouse and 640K RAM are strongly recommended
Copy protection: none
Price: £95 for Windows and desk accessories; Windows Write and Windows Paint are also included in price for the initial release
Publisher: Microsoft Corporation of Bellevue, Washington, U.S.A.
U.K. distributor: Microsoft Ltd, Excel House, 49 De Montfort Road, Reading, Berkshire RG1 8LP. Telephone: (0734) 500741
Available: early 1986





Top: The highlighted portion of the Basic window can be copied to the clipboard by selecting the appropriate command from a pull-down menu. Above: The clipboard's contents have now been copied to another application. This is a good deal faster than merging files, and can also be used with graphics.

you can copy graphics from such programs into the Paint program.

Perhaps the most important issue which arises when looking at multi-tasking is the question of degradation. To what extent does one program slow down the execution of another? With Windows, degradation certainly exists, but not always to the extent of reducing overall throughput. A lot depends on the type of programs that are running.

For example, I have a particularly large spreadsheet which normally takes a full 20 seconds to recalculate. When running under Windows, with no other task active, the time increased to 32 seconds. However, I then tried running the spreadsheet at the same time as typing furiously into a word processor. The recalculation time increased to 36 seconds, but during that time I was able to type a fairly lengthy paragraph, with no noticeable loss of response from the keyboard.

WORD COUNTER SLOW

In another test, I set my word-counting program going while the spreadsheet was at work. It normally takes 62 seconds to count a 4,000-word file, but in this case the time was 92 seconds. During this time, the recalculation was virtually suspended, although it resumed at normal speed once the word counting was finished. I put this poor performance down to the continual disc accessing that is required by the word counter.

Even switching between windows can take several seconds while disc-intensive tasks are in progress, although at other times it is instantaneous. Perhaps the worst result I obtained was on loading dBase II. This needed a staggering 33 seconds just to write its sign-on message, compared to just three seconds taken to do the same task outside Windows.

I carried out these tests on an Olivetti M-24, a very speedy machine when measured against an IBM PC/XT. But the results would be a good deal better on an AT or one of its look-alikes. I have seen Windows running on the 80286-based Apricot Xen, and while I was not able to carry out detailed timings, I certainly did not notice the slightest degradation in performance.

DESK ACCESSORIES

You would probably see much better performance from programs written especially for Windows. So far, the only ones to appear are Microsoft's own Windows Write and Windows Paint, and a CAD package called In-a-Vision from Micrografix. There is also a collection of desk accessories which are supplied with Windows itself; these include a card file, notebook, calendar, calculator, clock and terminal emulator.

If you want to write your own Windows-compatible applications, you will need to buy a programmer's toolkit from Microsoft. This allows you to construct your own pull-down menus, dialogue boxes, mouse support, application icons, and much more, all in standard Windows format. It also supplies the system calls you need to output graphics to a window.

I have not yet had a chance to get to grips with the toolkit, but at first sight it looks many times easier to use than the Gem equivalent. But the best thing about Windows is that none of the goodies in the toolkit are really important, since most programs can run under Windows without them knowing anything about the interface. This fact alone puts the product streets ahead of Gem.

CONCLUSIONS

- It is a mistake to regard Windows as another Macintosh-like graphical interface. Its Wimp features are incidental to its main role as a vehicle for multi-tasking.
- Its greatest strength is the fact that it can be used with existing applications, although some applications are more amenable to running under Windows than others. The effort needed to find out if, and how, a given program interacts with the system could be considerable.
- Transferring graphics and text between programs is very simple.
- Although switching between tasks is usually very rapid, you can expect a noticeable slowing down of some programs in certain circumstances, especially when running Windows on 8088/86-based machines. PC

FRAMEWORK II
INTEGRATED GIANT

By Glyn Moody

Ashton-Tate has produced an exceptionally elegant and powerful multi-function program, but how many people will have the time or patience to learn to use it?

Practical Computing voted Framework the commercial software package of 1985. Now Ashton-Tate has come out with Framework II, and for once gilding the lily has produced a product which is not only bigger but also substantially better.

The original Framework was by no means perfect. As is often the case with integrated packages, the word-processing features were limited and the comms were manifestly bolted on as an afterthought. It is in these two areas that the main changes have occurred.

The first thing you notice about Framework II is the size of the box: it is gross. There seems to be another law of second releases, that however minor the changes to the program are, the manuals are given a thorough revamp. In all, there are five manuals, eight discs and a host of paraphernalia such as quick-reference cards and keyboard templates.

TRY IT AND SEE

The manuals are arranged a bit like the recent *Encyclopaedia Britannica* with its Propaedia, Micropaedia and Macropaedia. Ashton-Tate's efforts consist of an introductory *Getting Started*, a basic *Learning Framework*, a *Using Framework* for reference and a final *Advanced Framework*. Apart from the obvious shifts in level, there are also differences in approach, notably in *Learning Framework* where the emphasis is on try it and see.

Generally the manuals are an improvement over the earlier versions. They are well written and well produced with full indexes, but to my mind they are badly let down by the peculiarly opaque instructions on setting up the system. It turns out that all the information is on the Set Up disc itself, though since this point is mentioned only in passing it is all too easy to miss. For the inexperienced user this could be very off-putting.

There are no fundamental changes in the way in which Framework operates. As the review of the original Framework in February 1985 issue of *Practical Computing* explained, everything is based around the idea of frames, which are like windows, except that they are much more active. For example, frames can hold not only text, spreadsheets, databases and graphs, but also other frames, which may in turn hold any of those as well as formulae. The formulae are built up in Fred, the frame-editing language. This too is an extension of familiar ideas: all Fred commands and functions begin with @, just as in VisiCalc or Lotus 1-2-3. One final element, taken from the Macintosh way of doing things, is pull-down menus.

Where Framework scores over its rivals and is so innovative is in the thoroughness with which these basic concepts can be applied at every level, and in every application. So, for example, the pull-down menus have the same effect in whatever application. You can also copy frames holding frames holding frames just as easily as single words. The command structure remains constant, wherever you happen to be in the program.

FRAMEWORK II

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	☐	■
Ease of use	☐	■	☐	☐
Documentation	☐	☐	■	☐
Value for money	☐	☐	☐	■

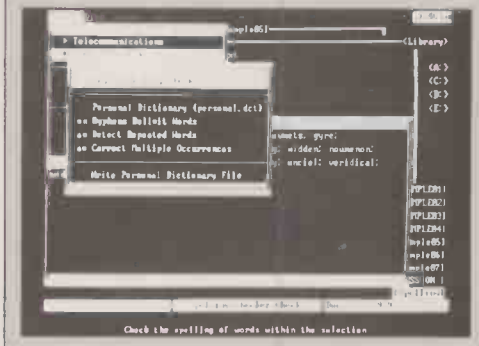
☐ Currently the ultimate integrated package, though for many people it may not be the most practical solution.

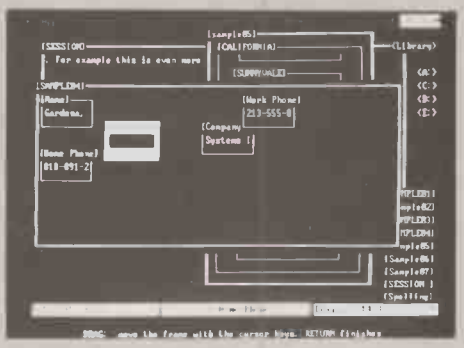
Framework II's biggest advance is in the area of comms. Where before there was a separate program called Mite, with its own command structure, telecommunications have now been fully integrated into the frame approach. The comms are called up from a new pull-down menu, called Apps, placed at the extreme left of the menu bar. Calling up the next level down from the telecommunications option brings up a menu of services which for the U.S. release reviewed here included Lexis, Compuserve and seven others, all of which can be dialled direct by the machine without further intervention from the user.

The parameters such as dial-up number, baud rate, parity and the rest can be preset using the Setup menu, also available from the main telecomms menu. The version released in the U.K. will come set up for services such as Telecom Gold, Prestel and One to One.

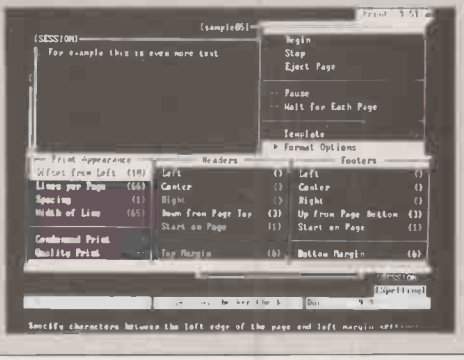
After you have been connected via your modem to one of these services, a comms frame opens to display the incoming data. This frame can then be handled like any other: information may be copied across to other frames, and so on. It is possible to keep a comms frame active in the background while you carry out other tasks such as spreadsheet calculations. A small on-screen note reminds you that you are still running up a phone bill even if the telecomms screen

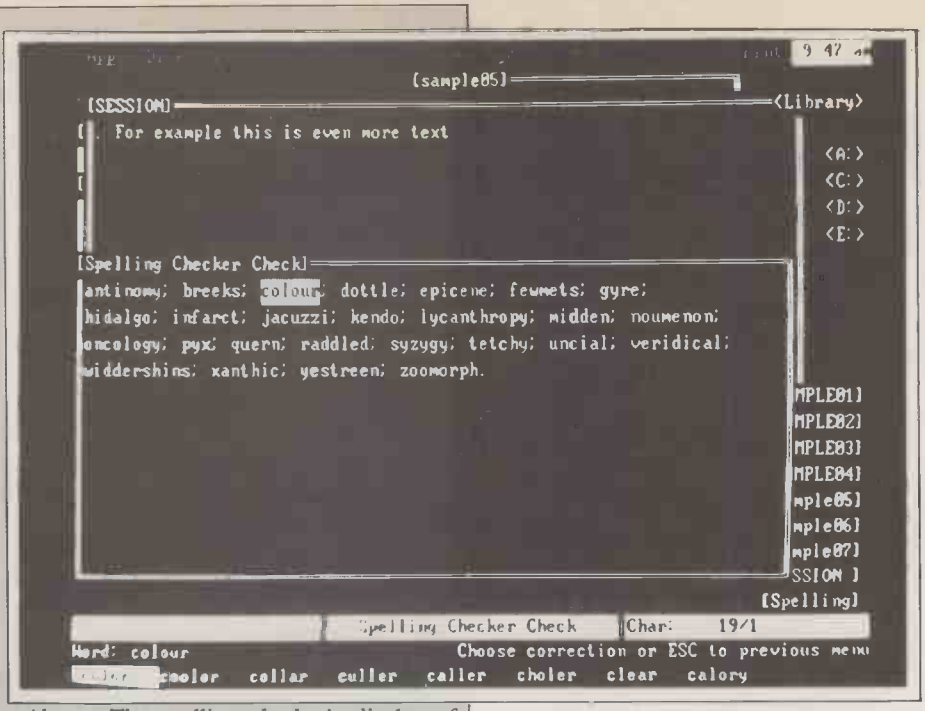
The new Apps menu with the Telecommunications sub-menu (above) and Spelling Check (below).



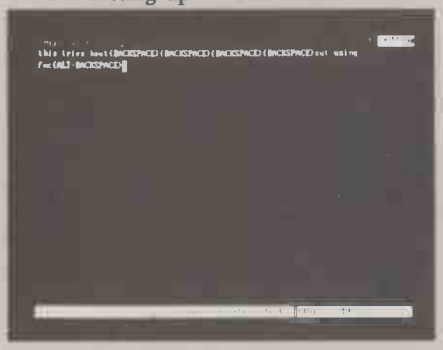


Above: Fields are dragged around the screen to set up a report format.
Below: New Print Format menu.





Above: The spelling checker's display of unfamiliar words and alternatives.
Below: Setting up a macro.



SPECIFICATION

Description: integrated package with word processor, mail-merging, spelling checker, spreadsheet, database, graphics and comms
Systems requirements: 384K IBM PC or PC/AT; 512K RAM with hard disc is desirable
Price: £550; earlier version bought after 1 September 1985 may be upgraded free; for those bought earlier upgrade costs £85
Copy protection: yes; can be copied once only to hard disc
Publisher: Ashton-Tate, Oaklands, 1 Bath Road, Maidenhead, Berkshire SL6 4UH. Telephone: (0628) 33123
Availability: now

has been folded away. The buffer for this background capture can be set to up to 64K.

There are two types of transmission: text transfer and file transfer. The latter incorporates error checking, and is always a foreground process. If the on-board modem has autodial facilities, you can also use an option from the same comms menu to dial a number by pointing to it in a frame, and then conduct a normal voice conversation.

The Apps menu also allows you to access the other new feature of Framework II: an 80,000-word spelling checker. Once again, this is fully integrated into the frame-based operating environment. To use it you simply select your document, spreadsheet, or database, or even a set of frames with sub-frames, go to the Apps menu, select the spelling checker, and then run it.

When the check encounters an unknown word, it will offer you what it judges near alternatives which you can then select, or will add the new word, or just go on. The screen photograph above shows some of the words it did not recognise, as well as its suggestions for the strange English word "colour". The version shipped in the U.K. will have fully anglicised dictionaries, and will use £ signs and so on. Running off a hard disc on a fast AT-alike, the check was carried out very quickly. Additonal refinements include the ability to detect consecutively repeated words and to install personal, as well as business and computer sub-directories.

A number of other word-processing features have been added or tightened up. For example, page breaks can be set and are visible, there are soft hyphens and non-breaking spaces, and there is now a useful word count.

MAIL MERGE

Mail-merging has also been fully integrated into the working of the program. By making the relevant database co-resident on the desk top, it is very easy to insert the appropriate field names in the document to be merged. The field names, which are held as column headings in the database, are placed between < and > markers. Provided the database file is on the desk top, invoking Mailmerge from the Apps menu carries out the insertions automatically. The new Mailmerge works with dBase II and III files too. A feature lets you print labels, using frame dragging techniques which are very similar to those employed in the Lotus Report Writer reviewed last month.

The other main improvement to the word processor is the gathering together of all the commands which handle the printed appearance, including headers, footers, and condensed and NLQ print, in a new sub-menu of the Print menu. Originally these commands formed part of the Fred language: their new position should ensure their wider use.

Other small changes in Framework II include the addition of 13 Fred commands, and an extra menu option here and there to round things out. You can also set up larger frames of all kinds, using boards like Rampage and Above Board. This is controlled from the Set Up program which also lets you allocate portions of hard discs as virtual memory. This allows frames and files which are too big for RAM to be shunted off to the Winchester, which acts as a kind of make-believe RAM extension. Files can be imported and exported from a number of programs such as Lotus, WordStar and Multimate. More important is the ability to set up keyboard macros by recording them from the keyboard as you go through the relevant sequence. This method is a great improvement over having to type them in explicitly.

MACROS ON-SCREEN

Macros are held in a new on-screen feature, the library cabinet. This replaces the older Maclib program. Also stored here are printing templates and abbreviations, which are set up in the same way as macros and let you shorten commonly used phrases to a couple of letters which are then automatically replaced.

The most important difference between the two versions is that Framework is now truly integrated. You can treat all the applications in exactly the same way, and shift data effortlessly between them. The five functions are now, at last, equals. Ashton-Tate has ironed out the bumps and produced full-function applications which, together with the powerful if slightly daunting Fred programming language, should meet all professional needs. The result is probably the first totally integrated package which does not skimp on any of its component parts.

But the question remains: does anyone really need such monster programs? In its present form, Framework is a monumental piece of coding and a veritable software colossus. Because of its conceptual purity and rigour — the way everything comes back to nested frames — getting to grips with its many functions is also a formidable task. Perhaps it is best regarded as the ultimate turbo-charged power program, and left to those who feel equal to its challenge.

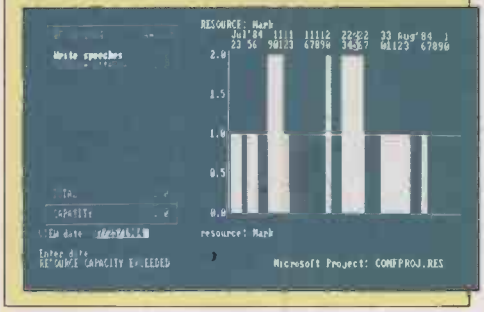
CONCLUSIONS

- Framework II improves on an already impressive earlier version by fully integrating comms into its system of pull-down menus and frames.
- It is still relatively complicated, and requires a clear and logical mind to navigate its many-layered complexities.
- The word-processor element now holds its own against most stand-alone packages, and has many other features besides, such as a spelling checker and mail-merging.
- Such is the size and power of the program that you could not sensibly contemplate running it on anything less than an AT or compatible. PC

PROJECT PLANNERS
ORGANISING YOUR RESOURCES

By Richard Sarson

This month we take a closer look at the Tabloid programs written with the everyday micro user in mind, but not forgetting the more sophisticated Heavyweight packages.



Microsoft Project's activity screen (above) and resource-allocation histogram (below).

Last month we looked at how project-management software can be useful in handling the costing and scheduling of large and complex jobs. A new breed of program that has sprung up over the last two or three years allows anyone with an ordinary business micro to do the kind of analysis previously available only to large companies and project-management specialists. These Tabloid packages join the Heavyweight programs derived from specialised mainframe software. How far and in what ways these packages reflect what goes on in a project varies from program to program.

One of the main differences is the way in which systems represent the time, resources and costs of a project. For instance, the simpler systems assume that one activity starts immediately the last one has finished. In real life, you can start pouring concrete before your mate has finished digging the trench. Apart from the Heavyweights, only Timeline can handle these leads and lags accurately.

SMALL UNITS

Most of the packages allow time to be expressed in units, which range from minutes to months. Having the right time unit matters where, for instance, a firm works a half-day on Saturday. For this, time units of days and weeks alone are not good enough.

The cheaper systems have one calendar, but the Heavyweights have more — up to 256 on Cresta. This could be useful, say, on a project in the Gulf, where the Muslim weekend is Friday and Saturday, and also where subcontractors may work different hours.

Most systems relate the calendar to the activity but some, notably Superproject, give a calendar to every resource. This will take into account where an art director and a cameraperson may be working on the same clip, but may work different hours with different holidays. Some of the Heavyweights allow the user to state the day of the week on which an activity should start — useful if you know that Charlie will always have a hangover on Monday. Another thing to watch out for is that some packages do not recognise that different countries use different formats for dates. Expressing 2 June 1985 as 6.2.85 can be very confusing for a British user.

There are differences in the size of network which can be handled. On the cheaper systems this can vary from 200 activities on the Harvard Project Manager up to 2,500 activities on Pertmaster. Heavyweights Hornet and Plantrac quote up to 64,000 activities. However, this is a theoretical figure which could not be controlled by one person or fitted on to a 10Mbyte disc. The realistic maximum for a single system is 3,000 to 4,000 activities. Cresta quotes 32,000 activities for its multi-user system.

There are two different ways of building up a network. The first is by defining an activity as a duration between two numbered nodes, which are connected to other activities. This is called an arrow network. The second is by precedence, where the activity is defined merely by the duration of the activity and the identification of the activity which precedes it. Both methods have their adherents among project managers. The cheaper U.S. packages are precedence only, but some of the Heavyweight British systems have mixed sub-projects, with some on arrow and some on precedence.

A year or two ago, a major issue in the selection of project-management systems was whether they catered for sub-projects, and whether resources could be spread over multi-projects. Now, almost every package offers sub-projects in one form or another.

A final difficulty some of the cheaper packages have when dealing with time is that once an activity is under way there is no provision for changing the remaining duration or the percentage completed, even if it has become obvious that your original estimate was wrong. You are stuck with the original estimate of time.

As well as calculating the length of time a project will take, the programs work out whether resources allocated to the activities in a network get overloaded. The cheaper programs beep or flash when they find an overload, and wait for the user to move the activities around to remove it.

The Heavyweights try to overcome the problem by performing automatic resource smoothing. At its simplest this means levelling out the resources to reduce the peaks by shifting the activities around, moving the overloads as far as possible into trough periods when the resource is underutilised. Others go further and delay the completion date of the whole project to remove the overloads.

Hornet and Kernel are even more sophisticated. They have two overload limits on a resource. One is the normal level, which indicates, say, that the normal number of bricklayers is five, but with an absolute limit

THE HEAVYWEIGHTS

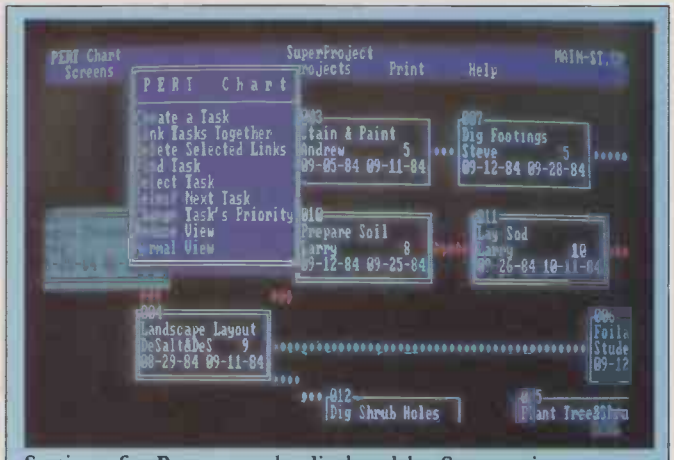
The Heavyweight packages surpass the Tabloids in features, size and power. They are likely to be used by professional production managers as their basic tool and are less user-friendly than the Tabloids. Prices start at around £1,500 and rise to over £10,000.

Artemis: Metier Ltd, 23 Clayton Road, Hayes, Middlesex UB3 1AN. Telephone: 01-848 3400. **Cresta:** K&H Ltd, 9 Villiers Road, Kensington upon Thames, Surrey KT1 3AP. Telephone: 01-549 0056. **Hornet:** Claremont Controls Ltd, Albert House, Rothbury, Morpeth, Northumberland NE65 7SR. Telephone: (0669) 21081. **Kernel:** Harvey Baker & Partners, 1 Mansell Street, Stratford-upon-Avon, Warwickshire CV37 6NR. Telephone: (0789) 295880. **Plantrac:** Computerline Ltd, 118 Church Road, Addlestone, Weybridge, Surrey KT15 1SG. Telephone: (0932) 40298.

The Hornet data-entry screen.

Screen bar chart from Hornet, showing critical activities.

Hornet resource histogram, indicating where an overload occurs.



Section of a Pert network, displayed by Superproject.

Superproject resource details.

Calendar screen display from Superproject.

of seven if contract labour is taken on. Hornet goes a stage further by making it possible to specify a maximum and minimum duration to an activity as well as the ordinary estimated duration, so as to optimise the use of resources.

The packages offer a varying number of resources available to a project. Only 35 are available on Microplanner, but many offer unlimited numbers, even among the cheaper systems. Most packages define a resource as Labour, Material, Plant or Overheads, but project Manager's Workbench defines a resource as Labour only.

When allocating a resource to an activity, some packages allow the resource to be applied to only part of the activity. For instance, a crane may only need to be available for part of the time for erecting the first floor of a building. Cresta, Kernel, Microplanner and Plantrac offer this facility.

Cresta allows you to offer an alternative resource, such as a drawing-office manager, if there is an overload on the normal resource of drawing-office staff.

Most packages allow for both fixed and variable rates to be charged against a resource. Some, such as Microsoft Project, allow a fixed cost against the activity. Most of the Tabloids give good cost reports. Where the project-management packages cannot provide flexibility of reporting, they transfer data to a spreadsheet, and do it that way.

Hornet can delay costs until after the activity has happened. This reflects real life, where the bill for materials is often presented and paid after the relevant activity has been completed.

For a project lasting several years, you may want to increase the costing rates for the resources, to keep up with inflation. The

(continued on next page)

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Tabloids cannot do this, but the Heavyweights would have no problem, particularly Hornet, which has its own built-in resource spreadsheet.

The traditional way of entering and amending dates, durations and resources in the networks is to draw out the network with pencil and paper, and then fill in a form on the screen. You then set a calculation routine going, and look at the results presented to you as a bar chart or resource histogram which scrolls across and down the screen.

Microsoft Project and Project Manager's Workbench present you with a split screen so that you can fill in the input form at the bottom, and see the effect on a bar chart at the top. Superproject and Macproject go a stage further. Instead of drawing the network on paper, you draw it directly on the screen, by filling in boxes for each activity.

PRETTY MEANS SLOW

This is all very user-friendly, but there are snags if you have a network of any size. The screen is small, and despite zooming and scrolling you cannot get enough data into the boxes and you can get lost in your own network. Of course, a large network takes time to recalculate, so what should be immediate visual feedback becomes sluggish. The more sober input methods of the Heavyweights, with their full-screen entry forms, are therefore better for complex jobs.

To make life easier for people used to spreadsheets, Microsoft Project has designed its input forms to look and operate like a spreadsheet. Similarly, Timeline has mimicked Lotus 1-2-3. For mouse-orientated users, Harvard, Macproject and Microsoft are the ones to use. Among the Heavyweights, Artemis, Cresta and Kernel require users to design their own input forms. This is great for project managers who know what they want, but a pain for the casual user.

Most programs have good help screens or prompts. They are necessary for such big programs where the manuals are cumbersome. Timeline and Macproject provide an audio-cassette introduction to project management along with the basic functions, which gives a pain-free entry. Timeline's was the best of the Tabloids, and Hornet the best of the Heavyweights. Most of the Heavyweights provide a Beginner's mode and an Expert mode. Among the Tabloids, PMW, Superproject, Timeline and Pertmaster provide this.

The systems provide different kinds of reports. The Tabloids print out bar charts, network diagrams, tabular summaries of resources and costs, and detailed lists of activities. Among them, only Microsoft Project and Timeline print resource histograms. If you do want to do your own thing, all the systems provide DIF or ASCII formats for links to database programs, and most have direct import/export links to Lotus, Multiplan, Supercalc or WordStar.

Among the Heavyweights, Microplanner and Plantrac give a very wide range of standard reports in tabular and graphical form. Artemis, Cresta and Kernel are database systems with powerful report generators, so they leave it up to users to design their own reports. Kernel even provides a programmer's toolkit, so that users can bolt complex modelling systems on to their planning system.

Hornet takes a half-way position. The company provides a set of standard reports which can be customised, but also provides a report generator and a library of more complex reports with guides on how they were designed. Also, some other software houses are bolting systems on to Hornet.

One important point about reporting the progress of a plan is whether the reports can compare the actual position with the original plan on one sheet of paper. Better still, if you can see three stages — say, today's position compared with last week's and with the original baseline plan. Microplanner and PMW show this well on their standard reports. Even if the standard reports do not show it, it is important for the system to make it easy to archive one or two levels of history, to build up a planned versus actual user-generated report. Timeline saves eight levels automatically.

Currently, there is no clear market leader in the U.K., either among the Tabloids or the Heavyweights. The Heavyweights in particular have been rather a craft industry, like CAD on micros. Whether this will remain the case depends on whether the present heavy sales of the Tabloids to casual users keep up, and bring project management to the masses, or whether the fashion passes, and the planning packages gather dust on the shelves.

SPECIFICATIONS

HARVARD TOTAL PROJECT MANAGER

Special features: uses windows to show bar charts, histograms; reports on selected parts of network
Hardware required: IBM PC, XT, AT, and compatibles, 320K RAM
Publisher: Harvard Soft, Inc., 521 Great Road, Littleton, Ma 60, U.S.A.
U.K. distributor: Softsel Ltd, Syon Gateway, Great West Road, Brentford, Middlesex TW8 9DD. Telephone: 01-568 8866
Price: £495

MACPROJECT

Special features: supports 2,000 activities; reports cash flow
Hardware required: Mac, 128K or 512K RAM
Publisher: Apple Computer (U.K.) Ltd, Eastman Way, Hemel Hempstead, Hertfordshire HP2 7HQ. Telephone: (0442) 60244
Price: £99

MICROPLANNER

Special features: offers six calendars; comprehensive time and resource reports
Hardware required: IBM PC or XT, 256K RAM; Apricot, Sirius, Sage, Corvus Concept, 128K RAM; Macintosh, Apple II, Apple III, TDI Pinnacle
Publisher: Microplanning Software Ltd, 34 High Street, Westbury on Trym, Bristol BS9 3DZ. Telephone: (0272) 509417
Price: Macintosh £395; Apricot £750; IBM £1,250

MICROSOFT PROJECT

Special features: supports only 128 activities, but links to Multiplan, dBase, Lotus and Microsoft Chart
Hardware required: IBM PC or XT, 128K RAM
Publisher: Microsoft Ltd, Excel House, 49 De Montfort Road, Reading, Berkshire RG1 8LP. Telephone: (0734) 500741
Price: £245

PERTMASTER

Special features: supports 2,500 activities; cash-flow curve reports
Hardware required: IBM PC or XT, 128K RAM; MS-DOS and CP/M
Publisher: Abtex Software Ltd, 8 Campus Road, Listerhills, Science Park, Bradford BD7 1HR. Telephone: (0274) 734838.
Price: £650; Pertprinter £295

PROJECT MANAGER'S WORKBENCH

Special features: input by drawing bar chart on screen; reports can be edited manually; links to Lotus
Hardware required: IBM PC or XT, 320K RAM; DEC Rainbow, HP 150, Wang PC
Publisher: Hoskyns Group Ltd, 91-93 Farringdon Road, London EC1M 3LB. Telephone: 01-831 6811
Price: £1,250

SUPERPROJECT

Special features: input by drawing network on screen; calendars for each resource; links to Supercalc and Superdata
Hardware required: IBM PC, XT or AT, 256K RAM
Publisher: Sorcim/IUS, 43-51 Windsor Road, Slough, Berkshire SL1 2EQ. Telephone: (0753) 77733
Price: £395

TIMELINE

Special features: stores up to eight levels of networks; links to dBase, Lotus, Multiplan and Supercalc; comprehensive time and cost reports
Hardware required: IBM PC, XT or AT, 256K RAM
Publisher: Breakthrough Software Corporation, 505 San Marin Drive, Novata, Ca 94947, U.S.A.
U.K. distributor: Softsel Ltd, Syon Gateway, Great West Road, Brentford, Middlesex TW8 9DD. Telephone: 01-568 8866
Price: £450

CONCLUSIONS

- If you have a Macintosh, small projects and little money, Macproject is the most suitable package.
- If your projects are not bigger than 500 activities, but in other respects you want quite a sophisticated planning system, the Mac version of Microplanner is the most appropriate package.
- Harvard, Timeline and Superproject are best if you want to draw small networks straight on the screen, but Pertmaster is best if you have slightly larger networks and want more reports.
- If you are used to spreadsheets, you may find Microsoft Project convenient to use.
- If you are planning office projects and, say, writing complex sales proposals, and would like a good consultant at your elbow, Project Manager's Workbench will suit your needs best. PC

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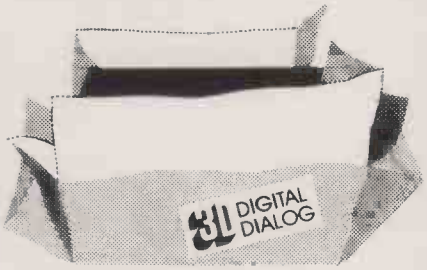

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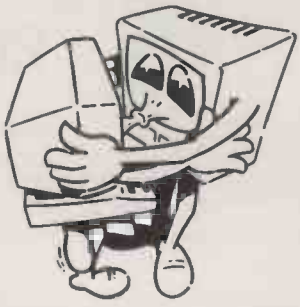

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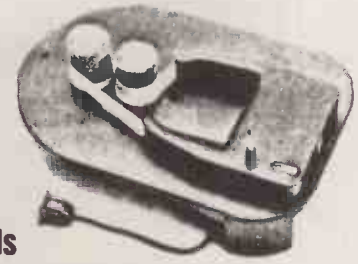

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QUICKBASIC
THE BEST OF BOTH WORLDS

By Mike Lewis

Now IBM users have at their disposal a Basic compiler that includes all the virtues of Basica and GWBasic, and will run existing code almost unchanged.

SPECIFICATION

Description: compiler for Microsoft Basic
Hardware required: IBM PC or compatible, one floppy, 256K RAM, MS-DOS 2 or later
Copy protection: none
Price: £99
Publisher: Microsoft Corporation of Bellevue, Washington, U.S.A.
U.K. supplier: Microsoft Ltd, Excel House, 49 De Montfort Road, Reading, Berkshire RG1 8LP. Telephone: (0734) 500741
Available: now

Microsoft's latest Basic compiler, QuickBasic, offers little that is completely new, but it does bring together some of the best features of its predecessors. At £99, it is also something of a bargain.

Until now, Microsoft Basic has been developing in two different directions. The compiled language, in the shape of Business Basic, offers lots of goodies for the professional programmer: separately compiled modules, dynamic arrays, alphanumeric labels and the like. The interpreters, like Basica on the IBM PC and GWBasic on IBM compatibles, derive their strength from advanced hardware-dependent features, especially sound and graphics.

What QuickBasic does is to combine the two. Programs originally written for Basica or for Business Basic can be compiled with QuickBasic with little or no change, giving you the benefits of structured programming along with the bells and whistles. The main disadvantage of QuickBasic is that it is only available for IBMs and compatibles rather than MS-DOS machines in general.

For most programmers, the compiler's greatest attraction will be the ability to maintain a subroutine library. With interpreters, the only way of reusing standard routines is to duplicate the source code. QuickBasic lets you compile a subroutine to Microsoft's standard object format, which can be combined with the main program or other subroutines during linking.

Compiled subroutines are invoked with the Call command. You can pass parameters either by reference — which means that the called module can alter the value within the caller — or by name where the subroutine has a private copy of the parameter. The familiar Run and Chain commands are still available, but Call is altogether neater and more efficient.

An important side effect of separate compilation is that you can now break the 64K limit on program size. In fact, the code segment is still subject to this figure but since the limit is 64K per module it is easy to get round it. The data segment must also be within 64K, but again this is no real problem thanks to the fact that arrays can now be allocated and released dynamically.

The compiler does have a few rough edges, one of which is its claimed networking feature. There are commands for locking or unlocking individual records, ranges of records or entire files. However, there appears to be no way of seeing if the record that you are about to access has already been locked, and the manual is silent about the results of trying such an access. On several occasions, our attempts at record locking caused some otherwise bug-free programs to crash.

But in most respects, the language is highly compatible with interpreted Basic. Most of the differences are new features, so programs that run correctly under the interpreter should compile first time. Apart from record locking, the only difficulties that we found were in the macro-language processes, Draw and Play, where the Execute Substring functions needed slight adjustment.

The mechanics of compilation are similar to earlier Microsoft compilers. Two alternative libraries are available for linking. Brun10.Lib is used with large systems of programs and needs a RAM-resident run-time module. Bcom10.Lib is more suitable for small free-standing programs, where the library routines are linked directly to the executable file.

Although compiling a program is straightforward, QuickBasic is not a complete programming environment along the lines of Turbo Pascal. There is no built-in editor, and nothing approaching Turbo's super run-time error trapping. Nevertheless, the Microsoft product could present a serious challenge to Turbo Pascal in the sub-£100 compiler market. It is at least as fast, and it has the enormous advantage of separate compilation of subroutines.

The people at Bellevue see QuickBasic as the first in a line of budget-priced compilers. If it succeeds — and it certainly deserves to — you can expect to see more Quick products emerging. QuickPascal and QuickFortran will probably be next.

QUICKBASIC

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	☐	■
Ease of use	☐	☐	■	☐
Documentation	☐	☐	■	☐
Value for money	☐	☐	☐	■

☐ A powerful argument for staying with Basic.

HOW QUICK?

	QuickBasic	Basica	Turbo Pascal
Sieve of Eratosthenes	0.5	71.0	1.6
160,000 empty For Loops	1.2	32.1	2.0
750 prints to screen	58.4	58.9	45.0
40,000 Psets	9.5	31.5	6.5
Drawing 5,500 horizontal lines	3.7	38.5	34.0
Word counting	7.0	80.0	14.0

The first of these benchmarks performs a single iteration of the Sieve of Eratosthenes prime number benchmarks; like the four following benchmarks it was carried out by Microsoft. The last was our own test, using an 800-word file with the word-counting program published last year on page 31 of our August 1985 issue. All times are in seconds.

The average compile-plus-link time for five QuickBasic programs, all between 60 and 100 lines, was five seconds. We obtained exactly the same average time for five similar Turbo Pascal programs, including writing the Com files.

CONCLUSIONS

■ QuickBasic is excellent value for money. If you have an IBM or compatible, it is hard to think of a reason for buying any other Basic compiler.

■ The language is powerful, and highly compatible with earlier compilers and interpreters. It should go a long way to helping Basic programmers write structured, modular code. PC

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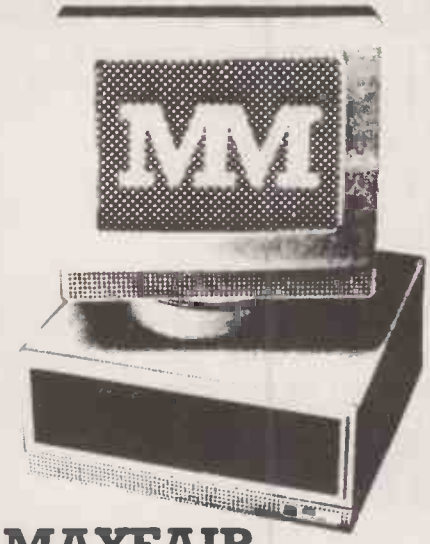

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Professional Cobol	1995	2295	Quill	165	189
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POSITIVE LIFESTYLING
HEALTHWARE FOR YUPPIES

By Glyn Moody

Aid or gimmick, this program is one of a new breed to help you use your micro as a mentor for self-improvement.

It is interesting that the rise of the personal computer should coincide with the baby-boom generation's passage through middle management in the professions. Matching that generation's desire for self-improvement there has arisen a whole class of programs which can be classed as wealthware and healthware.

The first group is well represented by the Thoughtware management-training programs reviewed in the June 1985 issue of *Practical Computing*. They were notable not so much for the originality of their ideas, which are largely based on established findings in the field, but on their use of the micro to replace class-bound tuiton.

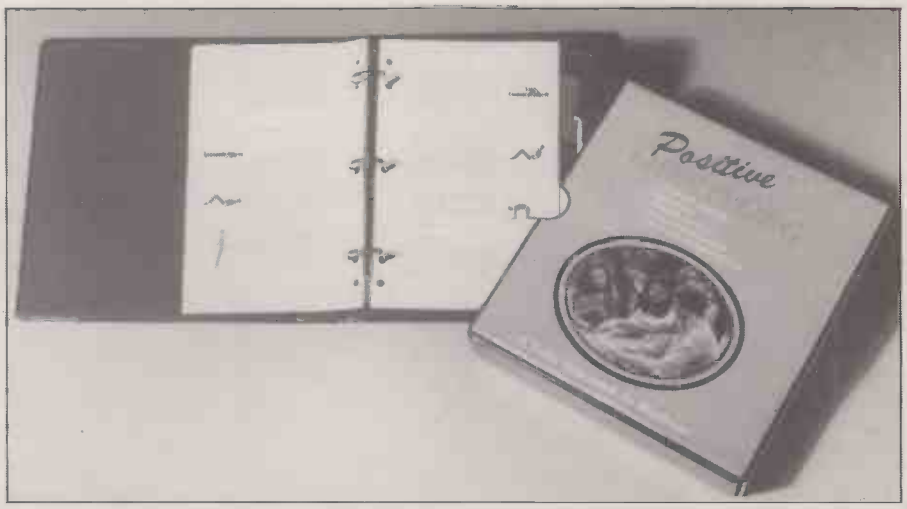
Much the same can be said of Positive Lifestyling from Softworld Inc. It is designed to monitor and advise on aspects of nutrition, exercise, stress management, weight control and what it calls "chemical dependence", meaning addictions to alcohol, drugs, tobacco and so on.

Installation is simple, and consists of copying across the system files and Basica to the main program disc. Although the binder claims that the package will run with an IBM PC/XT as well as an IBM PC, my attempt to transfer files to the hard disc ended in failure. This difficulty partly reflects the thin nature of the notes on installation.

Thereafter, operation consists of pressing Return, the A, B or C keys, or entering numbers. As the program is written in Basic, it is not fast. Also it is highly modular so there is frequent accessing of both the program disc and the data disc.

SPECIFICATION

Description: a self-improvement program designed to monitor and regulate aspects of your life style, such as exercise and nutrition
Hardware required: 128K IBM PC or compatible, colour or graphics board
Copy protection: yes
Price: $69.95
Publisher: Softworld Inc., 9550 Black Mountain Road, Suite G, San Diego, Ca 92196. Telephone: (U.S. area code 619) 578-4878
U.K. distributor: none at present



POSITIVE LIFESTYLING

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	■	☐	☐
Ease of use	☐	☐	■	☐
Documentation	■	☐	☐	☐
Value for money	☐	■	☐	☐

☐ Mainly of interest as a harbinger of self-improvement programs to come.

On booting up, you are presented with a short introduction to Positive Lifestyling's overall aims. They are partly in the form of crude animations, and it appears that you must suffer this each time you load the program.

There is a main menu, from which you can choose to set up an inventory of your life-style characteristics. Having set that up, you then seek advice on improving aspects of it. You are presented with a number of questions on a variety of related topics and offered a choice of possible responses. As you go through the sections on nutrition, exercise and so on, your answers are logged. A complete record of these aspects may be kept for each day, allowing a picture to be built up over many months, or even years. Consequently, you can view your ascent into wellness or your slouch into slobdom.

The questions of the life-style inventory are almost trivial, but do possess some value. For example, they spell out what areas you should be aware of. The nutrition section highlights elements such as fibre, fat and carbohydrate quite well. A simple bar chart then indicates your relative state of wellness.

The manual includes a series of exercises. There are also more details on the content of various foodstuffs and the metabolic rates of sporting activities. This side of the product seems rather underdeveloped, and there are plenty of books which handle such things in greater detail.

However, Positive Lifestyling does offer privacy, which can be very important in an area that people may be embarrassed about. All entries are password protected to ensure their confidentiality.

Positive Lifestyling is interesting as an example of a trend rather than as a product which you would use constantly. Its price of $69.95 may seem extortionate in Britain, but probably not in relation to the costs of U.S. software. Similarly, its restriction to the IBM PC is partly explained by that machine's penetration of the serious home market in the U.S.

Equally, Positive Lifestyling is intended as a corporate product, and aimed at busy executives who may neglect to look after their health. Positive Lifestyles is a method of nudging executives into getting fit, to the benefit of the employer as well as the individual. As such, its aims are laudable.

CONCLUSIONS

■ Although it works on a rather simplistic basis, Positive Lifestyles does serve to remind the user of the basics of healthy living.
■ The dollar price is likely to be converted into a comparable sterling figure if a distributor is found in the U.K. This will make it rather expensive for personal use, but less so for a corporate environment. PC

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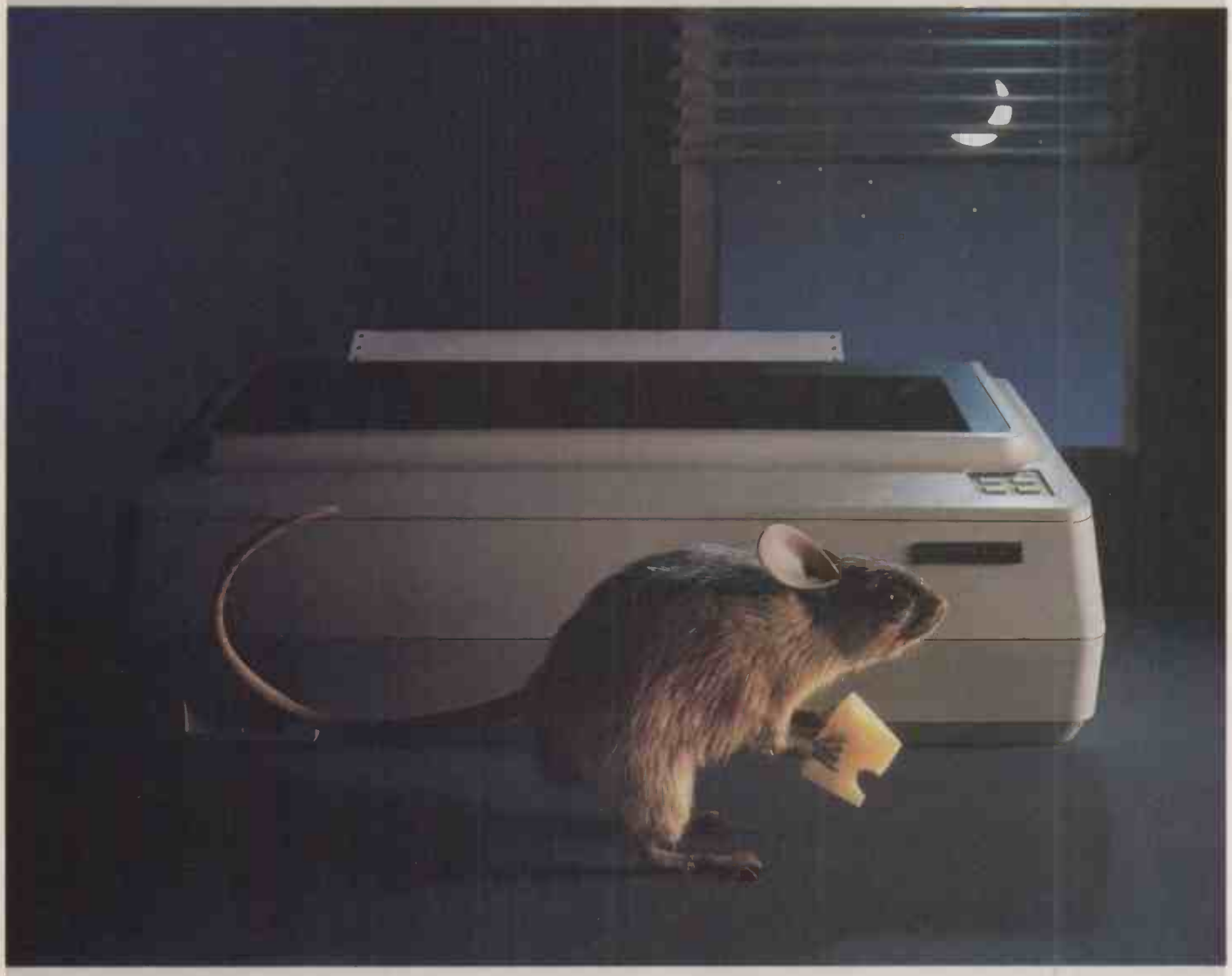

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TOP 10

The market for on-line services is expanding as more micro users acquire modems. **Ian Stobie** picks out 10 database hosts likely to be of use to business and professional users.

For years, on-line databases have been of limited use to the average business micro user. They have been too expensive and have usually offered only specialised information, so to most people they have been irrelevant.

This is beginning to change. Large numbers of micro users are acquiring modems, mainly for electronic mail. This creates a large number of appropriately equipped potential customers for on-line services. The more enlightened database publishers are beginning to think of lowering their prices and improving the usability of their software to tap this huge new potential market.

But it is early days yet. Even with the most populist services you are still talking about spending maybe £50 an hour to access the data, and to this you have to add the phone bill for ringing through to the database host system.

HOST OPERATOR

The terminology used in discussing on-line databases can be confusing. The host is the computer system on which the database is held or the company which operates the host. As a user, your dealings are generally with the host: you ring up the host computer and you pay the host operator.

The database publisher or owner is usually someone different. They create the database and keep it up to date, but do not deal with users directly. The distinction is similar to that between book publishers and booksellers. Any one host will usually offer several databases, for example Datastar offers 87, and Dialog over 230. Conversely, some databases are available from more than one host, such as Derwent's patents index which can be found on several systems including Dialog and Questel.

Many of the most interesting databases in our survey are hosted in the U.S. In fact it is only in the U.S. that the opportunity presented by the arrival of a mass market of business micro users has really been grasped. Most of the European databases are still very specialised and they are often harder to use.

We have tried to give a general idea of costs, although these vary depending on the data you are looking at. Normally the host charges a joining fee or an annual subscription. Generally this entitles you to several hours free use of the system. After this you are billed by the host on a regular basis, usually monthly.

Charging structures are often complicated because several different companies are involved. The host probably makes a flat-rate hourly charge but the database publishers' charges must be added to that. They may be worked out differently in each database: say, on a simple hourly basis or on a sliding scale depending on the number of searches you make.

BETTER WAYS

Because of both the cost and the greater complexity of getting at data distributed on-line, database publishers are seriously exploring alternative methods of distribution. Data is usually made available on-line either because it needs frequent updating, or because the volume of data you need to work with is too great to distribute on disc.

There is really no alternative to offering highly volatile data on-line. But optical-disc technology is opening up new possibilities for bulky, static data. CD-ROM, the computer equivalent of the hi-fi compact disc, looks like being the cheapest and most promising of the competing optical products. One disc can hold the equivalent of more than 1,000 floppy discs. CD-ROM's big disadvantage as a general floppy replacement is that it does not allow you to alter data on the disc, but that is not a problem when it comes to distributing this sort of database.

WHERE TO LOOK

In this survey we have concentrated on those databases which are most likely to be of interest to ordinary business and professional users. Of course, many databases are highly specialised and you should be able to find out about these through the relevant professional body or a good technical librarian. An on-line source of information is available from Cuadra's directory of databases, one of the services on Datastar.

Two other general sources of information are *Information World Review*, a monthly newspaper published by Learned Information Systems, subscription £18 per year, and Aslib, an organisation which publishes various useful reports and surveys.

PSS AND QUICK MODEMS

Apart from the charges made for accessing the data, you can easily run up large phone bills using any on-line service, either electronic mail or database.

For all but the lightest on-line user it is worth considering joining British Telecom's Packet Switch Stream network. PSS is only available for sending data, not voice calls. It lets you ring any distance at the local rate plus a small PSS charge. So at off-peak times you can ring the U.S. for about £1.50 per hour instead of the normal £36.

Joining PSS costs £25. You are given a Network User Identity (NUI) which is your PSS passport. To ring someone on PSS they must also subscribe to PSS or the local national equivalent, and you need to know their Network User Address, which is like another phone number. Fortunately, most database hosts have NUA numbers, so you can call them at cheap PSS rates.

Another way to reduce running costs is to get a faster modem. Most hosts will let you access at 1,200 bits per second. Even though some of them charge slightly more at this speed, it generally works out much cheaper to use the faster rate. If you are using a 300 baud modem at the moment a quicker one could pay for itself in both reduced phone bills and lower connect time.

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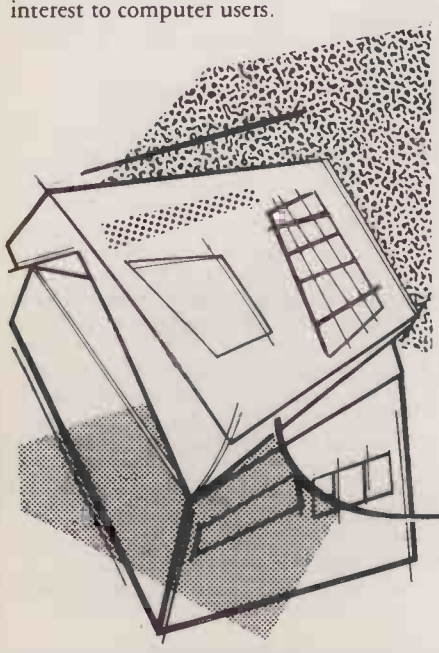
TOP 10

COMPUSERVE

Price guide: starter pack $40; hourly rate $6 off-peak, $13 peak time
Example databases: Commodities News, up-to-date price and news service; Standards and Poors, financial reports and forecasts; U.S. Today Update, American news magazine
Other services: email, conferencing, SIGS, CB

In the U.S there is not the same distinction between business and home user. Compuserve serves both, which gives it a much larger user base than any conventional database — it claims to have 250,000 registered users. This creates its own pull for the business community, and Compuserve is used for selling both professional services and straightforward consumer goods. Traditional databases are there, but in among more consumer-orientated offerings. Popular services are Associated Press news and U.S.A. Today Update, a news magazine. Investors are well served with a range of current and historic price data, forecasts and reports, but much of it is U.S.-orientated. In fact, much of Compuserve has an American rather than an international feel to it. Subscribing to Compuserve from the U.K. is quite complicated, but worthwhile since there is much on the system that is of interest to computer users.



DATASTAR

Price guide: no subscription; charge of £40 to £87 per hour
Example databases: Business Opportunities, international tenders, etc; Martindale, drug information; BMA Press Cuttings, medical articles
Other services: email

Datastar is particularly strong in the business and biomedical area. Although based in Switzerland, Datastar hosts a wide range of English-language databases — the BMA's press-cuttings database is held on the system, for example. Most databases hold abstracts or summaries, but a few are full-text, such as the Harvard Business Review and Martindale's drug pharmacopoeia. Other business services include the magazine-clippings database Prompt, also available on Dialog, and Celltech's abstracts on biotechnology and commerce. Many of Datastar's 87 databases are rather specialised, such as East European Chemical Monitor. There is no joining fee, but Datastar charges up to £20 an hour in addition to the database owners' royalties, which average from £20 to £70 an hour — the pricing is in Swiss francs.

DATASOLVE

Price guide: £60 per hour
Example databases: World Reporter, news and current affairs; Magic, advertising and marketing; World Exporter, sales leads, tenders, risk analysis
Other services: hosts private databases

World Reporter provides the full text of current and back issues of several major journals for a flat fee of £60 per hour. The journals include the *Economist*, *Financial Times*, *Guardian*, *New Scientist* and *Washington Post*. It also holds transcripts of the BBC World Service news, summaries in English of foreign broadcasts picked up by the BBC Monitoring Service, and Associated Press wire-service reports. Magic is a new service for the advertising and marketing world. It offers media data from Mintel, Meal and Brad, consumer forecasts of consumer behaviour and the full text of *Campaign* and other relevant journals. The annual subscription fee of £200 also gives access to World Reporter. The hourly charge is again £60 for most data, but Mintel costs more.

DIALOG

Price guide: no joining fee; hourly rate $50 to $100
Example databases: Prompt, articles from world business magazines; ICC, U.K. company data and performance comparisons; Medicine, medical abstracts
Other services: email

Dialog is the largest traditional on-line service, hosting over 230 different databases. Most of these give abstracts or references to printed material, although some such as *Playboy* or *Scientific American* are full-text. The Dialog approach is to offer databases in most areas, but it is particularly strong in medicine, technology, biology, patents and music. Hourly charges vary depending on the database. They average $80 to $100 in the business areas, with scientific databases generally cheaper at $50 to $80 an hour. Dialog gives a PSS number automatically to all its U.K. users, and has its own leased-line across the Atlantic which costs a flat $10 an hour. Although Dialog is based in the U.S., the databases are international. For example, in the medical field it hosts both the U.S. Medline and the Dutch Embase.

I P SHARP

Price guide: no joining fee; £52 per hour and 0.9 pence per price
Example databases: Ex-Share, share prices from all world stock markets; OECD, economic data and forecasts for OECD countries; Official Airline Guide, flight times and prices worldwide
Other services: email

I P Sharp is a Canadian-based host specialising in financial and economic data. Extel's share price service Ex-share covers all the world's major exchanges: Hong Kong, Singapore, Sydney, New York, London and Tokyo. Users are charged at 0.9 pence a price plus connect time. I P Sharp also holds a large volume of historical data on share price movements. The OECD produces numerous trade and economic statistics, including annual national accounts for all its 24 member countries, plus twice-yearly Economic Outlook forecasts. It also issues reports on Eastern European and Third World countries. For many of these you just pay the connect time to I P Sharp — the data itself is free. The Official Airline Guide covers all major airlines' scheduled services, giving times and prices. It is available on Telecom Gold too, as you can read in the Comms Link column on page 29 of this issue.

MEAD DATA CENTRAL

Price guide: $200 joining fee; about $50 per hour
Example databases: Nexis, full-text magazines and newspapers; Lexis, British and U.S. case law and statutes; Exchange, company and industry research reports; Medis, full-text medical reports
Other services: on-line document ordering

Mead Data Central is U.S.-based but acts as a host for both its own Nexis service and the British legal database Lexis. Lexis has almost cornered the market in legal databases, at least as far as the U.K. is concerned. It is expensive, costing £4,800 a year or more depending on use. But it is a full-text database containing all British statutes, general case law back to 1945 and tax law back to 1885. Although hosted in the U.S. Lexis is marketed in the U.K. directly by its publisher, Butterworth Telepublishing. Nexis is a very large full-text database of international periodicals. It covers over 175 journals, including the *Financial Times*, *Business Week*, the *Economist* and the *Washington Post*. Nexis is marketed by Mead, so prices are in U.S. dollars. There is a $200 joining fee, and a minimum hourly charge of $20 with additional charges based on the data you are looking at and the number of searches you make. You would be wise to allow at least $50 an hour for using it.

PERGAMON INFOLINE

Price guide: no joining fee; £50 per hour
Example databases: Jordan Watch, U.K. company profiles; Key British Enterprises, on-line business directory; British Standards; BSI abstracts
Other services: document ordering

Pergamon Infoline hosts 40 databases, many of them with a strong British bias and in the business area. Jordan Watch holds financial data on 52,000 British companies, and the basic details on all companies registered at Companies House. Key British Enterprises is a full-text on-line version of Dun and Bradstreet's business directory, covering 20,000 companies. Pergamon also hosts the British Standards Institute's on-line database; you can order up paper copies of the relevant standards after locating them in abstract form. Pergamon offers several databases of U.S. and British health and safety information, plus a patents database called Impadoc. There is no joining fee for Infoline, and Pergamon quotes an average hourly charge of £50 on the business databases.

PRESTEL

Price guide: £6.50 quarterly rental; page charges, plus £3.60 an hour at peak times
Example databases: Citiservice, shares, commodities and futures prices, and news; Bizznet, business news and software for computer users
Other services: email, telex, shopping, home banking

Prestel could claim with some truth to be the largest on-line database host in the U.K., but it is not really a database in the same sense as the other services described in this survey. Prestel comes in the form of pre-formatted patges designed for display; the other database services provide it in the form of an ASCII stream, which means that as well as putting the information up on your screen you can do all sorts of things with it such as search for specific words, compare numbers, and transfer data into your spreadsheet or word processor. Prestel is more limited and is more of an electronic magazine than a database, but it is a very large one, with nearly a third of a million pages. Prestel is quite cheap, but you pay for some of the pages, especially the more business-orientated ones. Much of the most serious use of Prestel happens inside closed user groups.

TELECOM GOLD

Price guide: £40 joining fee; £3.50 per hour cheap rate, £10.50 peak
Example databases: IDB, daily newspaper for computing industry; Official Airline Guide, flight times and prices worldwide
Other services: email, radiopaging, telex

Telecom Gold is best known as an electronic mail service, but it also beginning to serve as a host for databases. *Infomatics Daily Bulletin*, a newsletter for the computer industry, has been available for some time. The real value of having it on-line is that you can search through back issues to locate references to a particular story. IDB costs 56 pence a minute to access on top of the normal Telecom Gold charges. The Official Airline Guide is just going on to Telecom Gold now — see page 29. Telecom Gold is the largest electronic-mail service in the U.K., with around 30,000 users. This gives it a head start as a database host. Individuals pay £40 to join, and companies pay £300, which gives them an unlimited number of mailboxes. Both Ashton-Tate and Lotus are setting up private bulletin boards on Telecom Gold for users of their software packages. These will provide answers to technical queries and will probably download software

THE SOURCE

Price guide: £49.95 joining fee; $30 per year, plus $14 to $18 per hour off-peak
Example databases: AP, UPI, Washington Post, news, Newsbytes, computer newspaper; Investor, stock prices, news and purchasing
Other services: email, electronic conferencing, SIGS

Although much smaller than Compuserve, The Source is probably its main competitor in the populist, personal-computer orientated on-line field. Both these systems are American, and unlike the services run by the traditional host operators they are very easy to use, especially The Source. Unlike a traditional on-line system The Source does not contain a few massive databases, but a large number of quite small ones. Many of the 800 or so on offer are frivolous, but many are not. In the U.S., home and business users are not so distinct as in the U.K. For instance, The Source offers stock and commodity pricing services aimed at both the fund manager and the home investor. Home and business computing is very well supported, with specialist user groups organised by machine and interest. In many ways The Source is more an electronic forum than a database. The on-line conferencing facilities in particular are very powerful and you can participate almost simultaneously in dialogues with a large number of users worldwide.

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The Alternative Options

Optional extras for the ALTERNATIVE PC include 8087 numeric processor, 10MB or 20MB internal Winchester, or any of the multitude of options available for the IBM PC.

ALTERNATIVE PC

The Alternative Network

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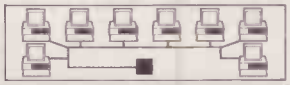

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INTERVIEW

PHIL CLARKE of Centaur Systems

INTERVIEWED BY GLYN MOODY

Phil Clarke is marketing director of Cardiff-based Centaur Systems. This newly formed company has recently launched a range of IBM PC compatibles for prices starting around £1,000, one of which is reviewed on page 89 of this issue. Centaur has already clocked up a series of multi-million pound OEM deals with its new machines. Before joining with four other shareholders in this venture, Clarke lived for a number of years in the U.S. where he has his own software companies. He also worked with Adam Osborne, who introduced the first cheap transportable, along with the idea of bundled software. Clarke also worked for IBM in systems support.

How do you see the IBM PC world developing over the next year or so?

WHAT you are seeing and what you will see is a complete change. Up to six months ago, you had the end-user coming into the dealer and paying £2,000-plus for a system, under the impression that there was some magic in there that would make it work. For the small businessman that is maybe 10 percent of his annual turnover paid out on this one piece of kit.

What's happened over the last six months, and what will happen over the next 12 months, is that the prices of both hardware and software are really going to drop through the floor. To the point where you're going to get a hard-disc system — monitor, printer, software — for under £1,000. It will keep on dropping. As to where the marketplace will bottom out, I don't know. I have this suspicion that you may see a PC for under £300 within the next two years. And that will make life very interesting. What you have is raw component cost as your guiding factor. The current product can be put together — and I'm talking about anybody's product, not just ours — for under $150.

And then you come to monitors. You can go out to the Far East and buy monitors for under £20. And I'm talking about IBM-style monitors which will retail for over £200. You may find that the old idea of having eight machines in a dealership and people come in and spend an hour there — that disappears, and what you have is almost like a cash-and-carry PC business. If that happens, I think we're starting to approach where a PC should be in terms of the marketplace.

How are these prices, in particular your prices, being achieved?

BY SHEER volume. By turning the PC into what it really is, which is a commodity product. It's not a high-level computer, it is very, very simple. If you open the case and have a look inside, what you have is a motherboard, two disc drives, a power supply, a disc controller, a video controller, a speaker, and that's it. The components that go on there you can probably buy for 30 to 40 dollars and put it together yourself. So you're just seeing volume component costs, as ours are, and we put them out at what we think is a realistic price.

This is very much the Osborne philosophy; what are your connections with him?

WE'VE worked pretty closely. We both have the same philosophy. Adam's made the statement to me about the software industry itself, which has been profiteering over the last five years, where you have a production unit cost of pennies. Certain manufacturers in particular, where they have a 15- to 16-dollar total production cost are retailing at the 400- to 500-dollar mark. And that level of profiteering could not go on. Adam's particular strategy is with software, with his Paperback Software. If you look at his products, they are not the best in the world, but neither are they the worst. They are good-quality products at a ridiculously cheap price, and they are presented in a form which is acceptable to the current marketplace.

The packaging is a clue to this. Previously, you would have the plain binders — it's the industry's way of trying to give a mystical air to what's inside. They don't say a damn thing on the outside. You look at a two-, three-, four-inch manual: it frightens the life out of the end-user. And nine times out of 10 they never learn to use the product properly. That's almost criminal in this industry where people are paying the amount that they are.

Do you think any big names are going to be in trouble?

THERE ARE a few big names already in trouble. You've seen in this country alone what has happened to ICL because they didn't change with the marketplace. Apricot are a good company, but they are a good company in the U.K. and nowhere else, and in this day and age you just can't do that. Particularly for British companies you have to go overseas, and not just Europe: you have to attack the American market.

What impact do you think your activities will have on American companies?

IT'S a difficult thing to estimate. We've just signed a major contract where we're selling machines into the heart of the Valley — coals to Newcastle.

Why do you think you have managed to bring about this kind of price reduction when no one else, American or Japanese, has?

WILLPOWER. It's really that simple: because we wanted to do it. We looked at our particular strategy for our company and took a supermarket approach to it, which is producing a good-quality product at a good price. Now at this point in time we are lower than anybody else in the marketplace, and we will attempt to keep it there. Now IBM could sell that machine at a loss for two years and put us out of business. Well, that's just a fact of life. But the company will be there in five year's time, and we will turn over in excess of 30 million dollars this year.

And next year?

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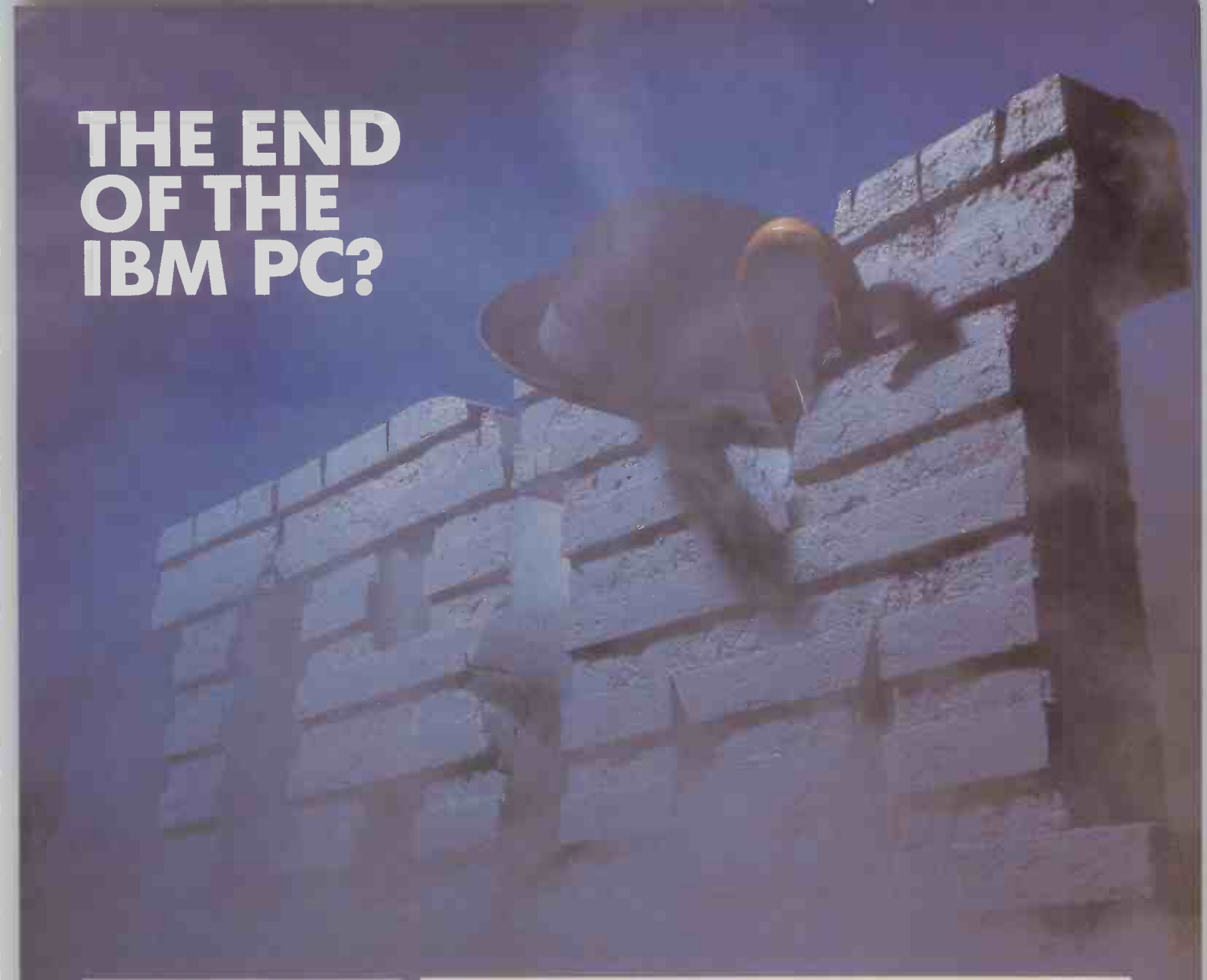
THE END OF THE IBM PC?



Old-fashioned and slow, the IBM PC is coming under attack from more advanced systems on the one hand and cheap clones on the other. **Jack Schofield** assesses the future of the micro standard of the mid-eighties.

A year ago I wrote in this magazine: "The question facing everyone who buys a micro today is not 'Why buy an IBM PC?' but 'Why buy anything else?' When it comes to single-user business micros, IBM has the field under its thumb." The continuing increase in the IBM PC's share of the market shows that most micro buyers have taken the same point of view.

But nothing lasts forever, and it may now be time to consider two further questions. First, how long will the IBM PC standard survive? Second, will IBM be able to stay in the micro market?

The first question is really about whether IBM simply joined the micro market when it launched the PC, or whether it changed it irrevocably. The second question is whether IBM can compete with the clones for other companies in the U.S., Korea, Taiwan and Japan.

The chief value of the IBM PC today is not that it offers technical excellence, but that it offers a standard. Technically, the IBM PC was an advance when it was first launched in August 1981, almost six months before the ACT Sirius 1 appeared in the U.K. But by today's standards it is primitive, old-fashioned technology. Half a dozen companies can offer much higher performance for down to one sixth of the price.

The advantage of having a hardware standard is that it sets up a benign circle for software houses and end-users. Software writers are encouraged to write for the PC standard because it provides them with a large potential market; end-users are encouraged to buy the standard PC because it makes a wide range of software available. This benefits everyone. However, no standard lasts for ever, and it may be that the IBM PC is coming to the end of the road.

The 1977-80 business standard was the Apple II with VisiCalc. It lost out because it limited software writers and users to Apple DOS, and the limitations of the Apple hardware of the time — limited disc space and an upper-case 40-column screen display being the major drawbacks.

The 1980-82 standard became 64K CP/M, because this solved the Apple problems. First, programs could run on a wide range of hardware, as long as it had an Intel 8080 or Zilog Z-80 chip and 64K of RAM. Second, it could provide an 80-column screen with upper and lower case. Third, it offered the chance to put

(continued on next page)

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more data on a disc. Once Supercalc came out, CP/M killed the Apple II as a business micro.

The 1983-85 standard has been the IBM PC with Lotus 1-2-3, because it solved the problems that arose with CP/M micros. First, PC-DOS swept away the confusion of disc formats that had arisen under CP/M. Now any 5.25in. PC disc should run on virtually any PC-compatible micro. Second, the Intel 8088 cracked the 64K memory limit which enforced the use of slow overlays which big programs like WordStar had to use on CP/M micros. PC-DOS provided a huge 640K of addressable memory space.

OUT OF DATE

Today, however, the PC standard is due to be replaced, because it fails to meet today's needs for speed, multi-tasking, the ability to handle a lot of data, and for good-quality bit-mapped graphics. The 4.77MHz Intel 8088 is a painfully slow, out-of-date processor compared to current offerings such as the Motorola 68000 or later Intel chips. It makes the IBM PC slower than home micros that cost only a couple of hundred pounds.

PC-DOS's 640K of address space comprises 10 64K segments, which is fine for a single-tasking, single-user micro, but hopeless for the micros of the future. PC-DOS's 32Mbyte limit in disc-addressing capability is too small, as the availability of low-cost, high-capacity hard discs will soon demonstrate. The 5.25in. 360K disc drive is too small and too slow by today's standards.

Finally, the IBM PC's display is a mess. You can have a green screen which is excellent but does not do bit-mapped graphics, or a colour screen which offers almost illegible text and cannot scroll

The IBM PC: old-fashioned, but still the one the others have to follow.

without flickering, or an enhanced colour graphics adaptor which is expensive and so slow as to be virtually unusable.

The IBM PC was designed as a 16K home micro with Basic in ROM and a cassette port. But anyone sitting down to design a proper computer would now use something like a 16MHz Motorola 68000 offering 16Mbyte of unsegmented address space — 25 times more than the PC and sufficient to run several programs at once. The 5.25in. discs would be replaced by 720K 3.5in. drives. The display would provide both readable text and high-resolution, bit-mapped colour graphics, and so on.

The IBM PC has been upgraded since its launch. PC-DOS gave way to DOS 2, then DOS 3 and 3.1, with DOS 4 due early this year. The 160K single-sided drives were changed to 320K double-sided with an increase from eight to nine sectors per track providing 360K. The original 16K RAMs were changed for 64K RAMs and one day IBM may even move to 256K chips.

Also, there is a huge industry which produces add-ons to patch up the defects of the original. Hercules display cards, accelerator cards which have faster chips, the Above Board RAM card which busts the 640K DOS limit, plug-in hard discs, mouse drivers and thousands of others products are on offer.

Unfortunately all these add-ons are working to destroy the IBM PC standard. It is no longer enough to say "This program runs on an IBM PC". You have to say "This program requires DOS 3.1, two 360K drives, 384K of RAM, a Colour Graphics Adaptor or Hercules card, a Hayes Smartmodem . . ." and whatever else is required.

There is nothing new about the process by which micros go out of date and are replaced. It has happened before, and it will certainly happen again, because not even the IBM PC standard is going to last a thousand years. The fact that it is IBM's standard, rather than someone else's, only means that it may last longer than it would otherwise. The question is whether it will last another five years, or two years, or less. I would bet on two.

OVERNIGHT DISASTER

This is not to suggest that the IBM PC is going to lose its appeal overnight. There is no reason to suppose it will prove less long-lived than the Apple II, an old-fashioned eight-bit micro which was launched eight years ago but which has every appearance of continuing as a best-seller. Nor need sales of IBM PCs and PC clones drop. For example, no one raves about eight-bit CP/M the way we did five years ago, but Amstrad will probably sell more CP/M machines this year than were ever sold during the years when CP/M was dominant. The IBM PC standard could, in its turn, take over the home market, once business users have moved on to something better.

The IBM PC standard could also be replaced by another IBM PC standard, perhaps based on the Intel 80286 or 80386 chips. Machines built around these should have the advantage that they can run the old IBM PC software. However, the new software will not be capable of running on the old IBM PC, so IBM would effectively be starting again, just like anyone else. Considering IBM's recent track record — the Portable PC, the PCjr, the AT, Topview, the EGA — success is far from guaranteed.

The second question I posed was whether

IBM could stay in the PC market in competition with the U.S. companies making superior clones, the Koreans, the Taiwanese and the Japanese. So far IBM has done very well out of its horse-and-buggy standard, but the PC's primitive design makes it very expensive to manufacture.

A comparison of a PC board with that of a clone like the Olivetti M-24 is instructive. The Olivetti packs almost everything you need on to the motherboard, with fewer chips, which makes it far cheaper to manufacture. Olivetti can thus offer a machine that runs more than twice as fast, sell it cheaper than IBM, and yet — I would guess — still make more profit on each one sold.

When it comes to cost cutting, the Koreans and Taiwanese do even better. There are dozens of clones coming on to the market at prices of around £800, compared to the £2,000 cost of an IBM PC with a similar specification. Not everyone wants a Korean or Taiwanese copy, but when highly regarded Japanese companies like Epson get into the act later this year, IBM could start finding its products a lot harder to shift.

POACH TECHNOLOGY

And there is worse — or better — to come, as several companies reduce the PC and PC/AT to a few custom chips. One company, Zymos, is launching what it calls Poach technology. The somewhat provocative name derives from "PC on a chip", and Zymos has reduced 87 discrete components from the IBM PC/AT to only two custom chips. The company claims it will be possible to add an Intel 80286, some RAM and a couple of controllers, and build an IBM PC/AT-alike on a 4in. square printed-circuit board.

Initially the cost will be sufficient to enable to a PC clone to be built as a lap-top micro for about £600. Once production is ramped up, the cost will be negligible. The equivalent of an IBM PC/AT could be produced small and cheap enough to go into every science student's school satchel.

Can IBM compete with this? When IBM came into the micro market, its president committed it to becoming "the low-cost supplier". Note the definite article. In spite of continuously increasing production, and repeatedly cutting the cost of its PCs, it has not managed this. It has lost the battle for the transportable market, where it was beaten by Compaq. It may not win the battle for the high-end PC market, where Compaq and Olivetti/AT&T are competing hard. It has failed in the home-computer market, where the PCjr was an unexpected disaster. When it launches into the lap-top market next year, it will find other suppliers already becoming entrenched. We could end up with an IBM PC standard, but with IBM not selling a significant number of machines.

However, one thing is certain: the battle is not over yet. The establishment of the IBM PC standard was not the beginning of the end of the micro market, merely the end of the begining.

Things are hotting up at the bread-and-butter end of the PC market with a rash of cheap, serviceable clones. **David Barlow** looks at two bargain machines.

PRICE-BUSTERS

There have been some dramatic developments on the PC-compatible price front. Whereas last year at this time it was hard to buy a decent dual-floppy machine for less than £1,500, this year the starting price is around half that figure.

These bargain-basement machines fall into two distinct groups. The first, as you might expect, is made up of machines manufactured by unidentified plants in Taiwan or Thailand and imported into the U.K. by enterprising distributors. The second group comes as something of a surprise as it contains some big names like Tandon, of disc-drive fame, and Epson, best known for its large range of printers. These machines are not quite as cheap as the faceless imports, but they are better made and have the reputations of established manufacturers to back them up.

This review looks at one example from each group. The Centaur PC is distributed in the U.K. by Centaur Systems of Cardiff and retails for around £850. From Tandon, we tested a hard-disc machine comparable to the IBM PC/XT, costing £1,595.

PERFORMANCE ADEQUATE

Both suppliers cover most of the PC range. For example, a Tandon machine configured to match the Centaur PC sells for around £1,295, while its top-of-the range AT-alike costs £2,740. Both firms' review machines performed perfectly adequately, and will probably make life very hard for many of the manufacturers of higher-priced machines.

In the best traditions of Far Eastern products, the Centaur PC appears almost indistinguishable from the IBM PC, at least when viewed from a distance. Its footprint is almost identical. At close quarters the machine does look cheap, especially when compared with the Tandon, but internally the finish is good, and the space inside the box is used effectively.

The Centaur is based on the Intel 8088 CPU running at 4.77MHz. This is exactly the same configuration as the IBM PC and does not provide much in the way of performance when compared to sophisticated PC-compatibles like the Olivetti M-24. Although the basic Centaur is only provided with 128K of memory, the MS-DOS maximum of 640K can be mounted on the motherboard by fitting two banks of 256K chips. There is also a socket alongside the Intel 8088 for the 8087 arithmetic co-processor.

The review machine was supplied with two Matsushita 360K floppy discs. Hard-disc upgrades of 10Mbyte, 20Mbyte and 40Mbyte are also available. There is room for a further two half-height storage units in the case, and the disc controller is capable of handling a total of four floppies.

The Centaur also scores well when it comes to other areas of expansion. The motherboard has six full-length expansion slots and two half-length. The floppy-disc controller sits in one of the short slots and the display driver board in one of the long slots, leaving a useful six still vacant.

CENTAUR PC

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	■	☐	☐
Ease of use	☐	■	☐	☐
Documentation	☐	☐	☐	☐
Value for money	☐	☐	☐	■

☐ Amazing value but let down by slow floppy discs and poor overall finish.

Accompanying these machines from the Far East there are a wide variety of multi-function cards covering serial and parallel ports, clock calendar, graphics and RAM functions, all at suitably low prices.

The major problem area with the basic Centaur proves to be its display card. To keep the cost down a compromise unit is installed, and while the distributors claim it has graphics capabilities, we could not find any. The machine refused to run even the most basic test of compatibility, the Flight Simulator, because the display card is not graphics compatible with the IBM.

Every other program that called for a graphics card also failed. Compatibility on text-only software proved to be excellent,

BASIC BENCHMARKS

Both machines run the Benchmark routines slightly faster than the IBM itself, but the difference is unlikely to be of any significance in practice. The routines were published on page 104 of the January 1984 issue of *Practical Computing*.

	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
Centaur PC — 8088	1.3	4.7	10.2	10.6	11.6	21.0	32.3	34.5	15.8
Tandon PCX — 8088	1.4	5.1	11.1	11.4	12.4	22.2	34.7	36.9	16.9
Olivetti M-24 — 8086	0.5	2.0	4.7	4.7	5.2	9.4	14.8	16.1	7.2
IBM PC — 8088	1.3	4.8	12.2	12.2	13.4	23.6	37.6	36.6	17.7

(continued on next page)

BAGSHAW BENCHMARKS

The disc Benchmarks show where corners have been cut or pains taken with the look-alike machines. The performance of the Centaur's floppy drive is sluggish by current standards, and is likely to make the machine tedious to use for many applications. By contrast, Tandon has really gone to town with the PCX — its 10Mbyte Winchester is among the fastest we have tested. The disc Benchmarks are explained on page 99 of the July 1985 issue of *Practical Computing*.

	BM0	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	BM9	BM10	BM11	BM12	BM13	Total
Centaur PC — 360K floppy	24	15	11	93	23	80	9	111	18	9	41	817	414	114	1779
IBM PC — 360K floppy	21	10	21	21	20	30	8	65	17	7	15	311	145	51	742
Tandon PCX — 10Mbyte hard	21	7	10	12	5	9	4	10	4	4	5	44	32	5	172
IBM PC/XT — 10Mbyte hard	19	5	19	15	3	22	8	27	8	3	3	76	31	15	254

(continued from previous page)

but you would be well-advised to budget for a decent graphics card when comparing the Centaur machine to more established equipment. Centaur is offering a Hercules-compatible card, but it was not supplied for review and as yet no price has been fixed.

The 12in. monitor supplied with the Centaur has a very similar performance to the IBM unit. Its text display is stable and clear, but the marked ghosting when scrolling can be tiresome. Of all aspects of the Centaur, the least likeable is the keyboard, which looks and feels very cheap. Key action feels rather vague, though on the plus side it does include LED status indicators on the Num Lock and Caps Lock keys. Most cheap compatibles use a Keytronics-style keyboard; even this has its shortcomings, but it is vastly superior to the Centaur unit.

The Centaur was supplied without an operating system or any documentation. The distributors say that these items will be supplied with production machines, but this kind of presentation does little to inspire confidence. The machine will be supplied with MS-DOS 2.11; we used a spare copy to carry out the review.

SACRIFICE SUPPORT

Lavish after-sales support is one thing that those who buy cheap micros must expect to sacrifice. Nevertheless, the Centaur PC is supplied with a three-month guarantee. Centaur is also looking into including a 12-month on-site warranty at no extra charge.

The Tandon PCX, though not identical to the IBM PC/XT, is certainly reminiscent of it. The unit is actually more attractive, finished in lighter colour shades and is slightly smaller in size. The all-round finish of the machine is superb. The system is based around the Intel 8088 running, as with the Centaur and the IBM, at 4.77MHz. The basic Tandon is fitted with 256K of RAM which can be expanded to 640K, either by adding chips to the motherboard or by fitting extra RAM boards.

There are seven slots on the expansion bus of the Tandon: five full-length and two half-length. On the hard-disc review machine one of these was occupied with the disc controller and another with the display driver. This leaves four full-length slots and one half-length slot free for user boards. The basic Tandon machine is supplied with a parallel port mounted on the display board. Tandon is quite honest about the capabilities of the display board fitted to its machine: in line with IBM's policy, the basic PCX is configured for text-only applications. However, there is a colour version of the machine available for an extra £325 which includes the colour monitor and graphics card.

It comes as no surprise to find both the floppy disc and the hard disc are manufactured by Tandon. The company has, after all, been supplying similar units to major manufacturers for many years. The larger-than-average 14in. green-screen monitor, included in the basic price of the Tandon, is a very attractive unit. Once again, performance is very much on a par with the IBM unit.

TANDON PCX

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	■	☐	☐
Ease of use	☐	☐	■	☐
Documentation	☐	☐	☐	■
Value for money	☐	☐	■	☐

☐ Impeccably presented IBM PC compatible with good hard-disc performance.

Tandon's keyboard is a beautifully finished unit which appears to have been specially made for this machine, unlike the cheaper compatibles which seem to source their keyboards from the same few manufacturers. Key action is good, and the unit features a tilt device and status LEDs.

The Tandon PC is supplied with a standard implementation of Microsoft MS-DOS 2.11. Once again, compatibility was hard to assess without a full graphics card, but the machine ran all the text-based IBM software without no difficulty. It is reasonably safe to assume that a company like Tandon with a reputation to preserve will ensure that the compatibility of its first business PC will be acceptable at the very least. Distributors of a foreign import are less likely to have the necessary resources or technical support to rectify deficiencies in this area.

The Tandon is supplied with three well-presented A5 manuals: a user guide, a DOS guide and a GWBasic reference manual. Although brief, they should be sufficient for most users' needs. The standard warranty is six months.

Above: Space is well used inside the Centaur PC.
Below left: The Centaur PC, almost indistinguishable from an IBM PC.
Below right: The Tandon PCX is superbly finished and does not reveal its budget pretensions.
Right: Inside the Tandon PCX.

SPECIFICATION

CENTAUR PC

CPU: Intel 8088 running at 4.77MHz
RAM: 128K, expandable to 640K
Dimensions: 500mm. (19.7in.) × 140mm. (5.5in.) × 400mm. (15.7in.)
Display: 12in. monochrome monitor displaying 80 columns by 25 lines; various graphics options available
Keyboard: 83-key IBM layout with 10 function keys
Mass storage: two 5.25in. 360K half-height floppies
Interfaces: parallel only; others optional
Software in price: MS-DOS 2.11
Price: £860; colour system £1,220
U.K. distributor: Centaur Systems, 17-21 Castle Street, Cardiff CF1 2BT. Telephone: (0222) 390714

TANDON PCX

CPU: Intel 8088 running at 4.77MHz
RAM: 256K, expandable to 640K
Dimensions: 500mm. (19.7in). × 140mm. (5.5in.) × 350mm. (13.8in.)
Display: 14in. monochrome monitor displaying 80 columns by 25 lines; various options available
Keyboard: 84-key IBM PC layout with 10 function keys
Mass storage: one 5.25in. half-height floppy; one half-height 10Mbyte Winchester
Interfaces: parallel only; others optional
Software in price: MS-DOS 2.11
Price: £1,595; 20Mbyte model £1,795
Manufacturer: Tandon Computer U.K. Ltd, 5 Suttons Industrial Park, London Road, Reading, Berkshire RG6 1AZ. Telephone: (0734) 664676

CONCLUSIONS

■Despite some rough edges, the Centaur PC has all the necessary basics to make a competent if unexciting PC compatible.
■The Tandon PCX is a well-finished PC/XT compatible supported by a major manufacturer; the performance of the Tandon-built 10Mbyte hard disc is substantially better than IBM's.
■Users of both machines should budget for a serial port and a decent graphics board when comparing them with better-established compatibles; the basic Centaur PC has only 128K of memory, which may need to be upgraded.
■The Centaur PC has good expansion potential, but its disc performance is poor by current standards.

The upper end of the PC market looks set for a shake-up judging by this cheap, fast AT clone, tested by **Glyn Moody**.

TANDY 3000

Tandy presents a heartening case of learning to get it right. The TRS-80 series of machines — known affectionately or otherwise as "Trash-80" — were the first generation of serious machines from the company, and many of them are still doing sterling service. But they are dinosaurs from an era when everybody and his or her dog had their own operating systems.

For its subsequent micro, Tandy recognised that you have to be brave or Apple to go it alone in a world dominated by the IBM PC. Even so, the company was still reluctant to go the whole hog: the Tandy 2000, reviewed in September 1984's issue of *Practical Computing*, was a fast and powerful MS-DOS micro.

Following the unspectacular sales of the 2000 model Tandy came up with the 1000. As we reported in our April 1985 review, this excellent machine offered full functional IBM compatibility with good price performance. Unfortunately, Tandy remained a touch idiosyncratic: the expansion slots were not full length, thus precluding total operational compatibility; the keyboard was different; and there was no provision for emulation of the high-resolution monochrome mode.

FULL COMPATIBILITY

With the Tandy 3000, Tandy has taken the plunge, and offers full AT functional compatibility and full-length expansion slots. The 3000 weighs in with a price which knocks the bottom out of the market: around £3,100 for a 20Mbyte system, 1.2Mbyte floppy, 512K RAM, serial and parallel ports, keyboard and monochrome monitor. The equivalent IBM price is nearly £4,900.

Even the casing of the main system box mimics Big Blue. Gone are the curiously dated, rounded curves of the Tandy 1000 and 2000. Instead there are strong lines and square corners, though the unit is smaller overall than the PC/AT. At the front of the machine there is a recessed Reset button.

Standardisation at last — the Tandy 3000 even looks like an IBM.

TANDY 3000

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	☐	■
Ease of use	☐	☐	☐	■
Documentation	☐	☐	☐	☐
Value for money	☐	☐	☐	■

[ ] Offers more performance than the IBM PC/AT for a significantly lower price.

One noticeable omission is the locking key found on the IBM. Tandy says that it prefers to use software rather than hardware to keep the system secure.

Opening up the machine reveals plenty of room for expansion cards. There are a generous 10 slots in total: seven 16-bit, and two full-length and one half-length eight-bit. On the review machine, three slots were occupied by cards for monitor, printers and disc controllers.

A hefty power-supply unit sits at the back of the box and a fan is placed at the front. There are various permutations of disc drives. For example, you can have two floppies — either 1.2Mbyte or 360K — plus one 20Mbyte Winchester, or one floppy and two Winchesters. The flexibility of allowing two hard discs and up to 40Mbyte of storage is attractive. The drives and power-supply unit are protected by clear plastic covers which lie above them. Beneath it all is the motherboard, which is neat, spacious and seems to manage without any last-minute fudges.

For the keyboard, Tandy has abandoned its quixotic version used with the Model 1000, and produced a more spacious design with a normal AT layout. The overall size has been kept smaller than IBM's, largely through the incorporation of Number, Scroll and Caps Lock indicators in the keys themselves. The feel of the keyboard is good: it is very light but not shallow. There are small ridges on the home keys to help touch-typists, though they may find it a long stretch to the Backspace Delete key.

BAGSHAW BENCHMARKS

	BM0	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	BM9	BM10	BM11	BM12	BM13	Total
Tandy 3000 — flappy	11.4	3.5	4.5	14.6	14.9	24.3	4.3	23.6	12.3	7.6	14	82.1	48.2	23.1	288.4
Tandy 3000 — 20Mbyte hard	6	1.9	2.3	2.9	1.7	9.5	2.8	14.9	4.7	1.7	3.1	15.8	9.1	12.2	88.6
Compaq Deskpro 286 — flappy	10.5	4	4	12.5	15	16.4	5	17.5	5.3	8	13.4	75	45.5	18.2	250.3
Compaq Deskpro 286 — 30Mbyte hard	6.2	1.8	2.5	2.3	2.8	3.6	1.2	3.8	1.1	0.8	1.6	11	5.9	3.2	47.8
HP Vectra — flappy	10.3	3.5	3.7	11.8	12.1	23.2	4.1	23.6	12	7.7	15.1	83.2	48.1	22.1	280.5

As more manufacturers aim for greater IBM compatibility, we compare current PC- and AT-alikes.

TURNING THE TABLES ON IBM

There have been two ways of following IBM. One is to offer compatibility without sacrificing the refinements which can be added quite easily. The other is to go all the way, warts and all. Surprisingly enough, the first method was the most popular to begin with, and is only now being superseded by the second.

In the first class there are machines like the Olivetti M-24, which has long provided a benchmark against which subsequent IBMulators have had to be measured. In particular the 8MHz clock rate instead of the original 4.77MHz has resulted in some fairly spectacular gains in performance. Compaq and Sperry, other early contenders in this market, also offer faster clock rates.

But the tide has now turned. If you produce a PC clone today, the chances are that it is an identical copy, as far as is legally possible. Since there are no incentives to purchase in the specification, all the attention is concentrated on one area: price.

As the tables on the following pages show, the latest round of machines hovering around the £1,000 mark make the more senior members of the club look ridiculously costly, and that includes the IBM PC itself. This is partly a reflection of the maturing marketplace. Now people are prepared to buy on price alone, and to hell with the three letters on the front or the weeks of handholding sometimes offered. It also reflects that the cutting edge of technology has moved on to the world of the AT.

Until recently it would have been safe to make the distinction that while the PC market was coming to the end of its life and would be subject to increasingly savage price-cutting, the AT was safe for a while at least. After all, the machine is barely a year old. Then along came Tandon, and more recently Tandy. Both offer a full IBM PC/AT-alike for not much more than the price of the IBM PC itself.

It is not clear to what extent these represent flashes in the pan. Both Tandon and Tandy are major players in their respective fields, and it seems unlikely that either would adopt this kind of pricing lightly. It would therefore appear that a fundamental shift is taking place in the IBM PC and AT market, with even the undisputed king of that world likely to feel the repercussions.

(continued on page 96)

SPECIFICATION

Processor: 80286 running at 8MHz
RAM: 512K standard, expandable to 640K on-board, and to 12Mbyte under Xenix
ROM: power-up diagnostics
Keyboard: full IBM PC/AT QWERTY layout
Display: 12in. green or 14in. colour monitor; 80 or 40 characters per line, 25 or 50 lines; optional 640-by-400 monochrome graphics, or 320-by-200 in 16 colours, or 640-by-400 in four colours
Discs: 5.25in. drive can read 360K or 1.2Mbyte formats; optional 20Mbyte Winchester
Interfaces: serial and parallel ports standard; internal IBM eight- and 16-bit bus expansion slots
Software in price: none
Hardware expansion: RAM upgrades, maths co-processor
Dimensions: 165mm. (6.5in.) x 483mm. (19in.) x 457mm. (18.in.)
Weight: 21.3kg. (47lb.)
Prices: basic machine with 20Mbyte Winchester, one 5.25in. floppy, serial and parallel port, but no graphics board £2,795; single-floppy version £1,995; 14in. colour monitor £499; 12in. monochrome monitor £179; graphics card £399, text display card £199; maths co-processor £249; hard-disc controller £399; MS-DOS 3.1, Basic, Deskmate £78
Availability: now
U.K. distributor: Tandy Corporation, Tameway Tower, Bridge Street, Walsall, West Midlands WS1 1LA. Telephone: (0922) 648181

In operation the Tandy 3000 proved to have another virtue over and above its price: it is very fast. It is aided in this respect by running its 80286 at 8MHz rather than IBM's more sedate 6MHz. As the Benchmarks show, it is comfortably close behind the swift Deskpro 286 in its Basic and floppy-disc performance.

Increasing performance does have its drawbacks, though. For example, the cursor now blinks at a manic rate. More seriously, there are suggestions that IBM might one day use timing routines to check that software is running on a bona fide 6MHz PC rather than a souped-up clone.

The Tandy 3000 is scrupulously faithful to its mentor in the degree of software compatibility it offers; it goes as far as the AT but not further. For example, it runs such packages as 1-2-3 and Sidekick, but like the IBM machine it will not run the ordinary Flight Simulator. No software comes bundled with the machine but Basic, MS-DOS and Deskmate are available for £78. Tandy has also announced that Xenix will be available this year.

On the review machine there was a nasty hardware fault with the power supply, which cut out several times. Tandy says that the models to be released to the public will have undergone modifications to avoid this problem. Set against this, the machine had undergone far more to-ing and fro-ing as a result of demos up and down the country than any normal business micro is likely to have to put up with. The fact that the hard disc accepted both this constant moving around and power cuts with such equanimity augurs well for reliability in that department.

DOWNWARD SHIFT

The Tandy 3000 emerges as an excellent machine with a truly tempting price tag. Anyone contemplating buying an ordinary PC/XT can now stretch to a full AT-alike without serious financial strain. What is particularly significant about the launch of the Model 3000 is that it joins Tandon's similarly priced AT clone in establishing a new level of pricing for ATs. Given the performance of the 3000 it seems inevitable that most other compatibles will be forced to move at least some way towards this level.

The PC-clone market has been opening up for some time, and it is getting more cut-throat by the minute. With the launch of the Tandy and Tandon machines the first shots have been fired in what could be a similarly bloody battle at the upper end of the PC market.

CONCLUSIONS

- The Tandy 3000 is a full IBM PC/AT clone for about two-thirds of the price. It is also much faster.
- The possibility of incorporating up to 40Mbyte of Winchester storage is a useful feature.
- The review unit experienced some problems with the power supply; otherwise, the unit seemed well made and reliable.

BASIC BENCHMARKS

The figures below show the time in seconds taken to run a run a series of standard benchmarks. Details and listings were given in the January 1984 issue of *Practical Computing*.

	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
Tandy 3000 — 80286	0.3	1.3	2.9	3.0	3.4	6.2	9.7	9.5	4.5
Compaq Deskpro 286 — 80286	0.3	1.2	2.8	2.9	3.2	5.7	9.1	9.2	4.3
HP Vectra — 80286	0.3	1.4	3.0	3.1	3.4	6.6	10.2	9.6	4.7
IBM PC/AT — 80286	0.5	1.9	4.6	4.7	5.2	9.1	14.6	13.5	6.8

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USING THE TABLES

The tables are split up into two sections: PC clones and AT-alikes. Some factors common to all have been omitted. For example, all PCs have 5.25in. floppies with 360K capacity, can take hard discs, and have a maximum memory of 640K. The quoted price is for a 256K, dual-floppy system.

All AT-alikes come with parallel and serial ports as standard, apart from the Hewlett-Packard Vectra, and all use MS-DOS 3.1 as their operating systems. The price quoted is for a 512K 20Mbyte Winchester, single-floppy system. Throughout, "yes" indicates that a feature is standard, and "no" that it is not.

PC-EMULATORS

Manufacturer and model	Processor	Speed (MHz)	Standard memory	Keyboard style	Parallel port	Serial port	Clock calendar	Expansion potential	Mono graphics	Colour graphics	Operating system	Bundled software	Warranty (months)	Price guide	Contact
IBM PC	8088	4.77	128K	83-key IBM	no	no	no	average	no	no	PC-DOS	no		£1,988	IBM 01-995 1441
A M Stearns PC	8086	8	128K	94-key non-IBM	yes	2	no	good	yes	yes	MS-DOS,BOS, CCP/M-86	Desktop, database	12	£2,195	AM International (0442) 42251
Canon A-200	8086	5	256K	83-key IBM	yes	yes	no	average	yes	yes	MS-DOS	no	3	£1,875	Canon 01-773 2156
Ceedata PC-401	8086	6	256K	83-key IBM	yes	yes	yes	good	yes	yes	MS-DOS	no	12	£2,180	Ceedata 01-783 0502
Centaur PC	8088	4.77	128K	84-key IBM	yes	no	no	good	no	no	MS-DOS	no	3	£720	Centaur (0222) 390714
Columbia PC	8088	4.77	128K	83-key IBM	yes	2	no	good	yes	no	MS-DOS,CP/M-86	Perfect Plus	3	£2,155	Icarus 01-267 6732
Commodore PC	8088	4.77	256K	85-key IBM	yes	yes	no	good	yes	no	MS-DOS	no	12	£1,675	Commodore (0536) 205252
Compaq Deskpro	8086	8	128K	83-key IBM	yes	no	yes	good	yes	yes	MS-DOS	no	6	£2,395	Compaq 01-940 8860
Computopro Compro 88	8088	4.77	640K	83-key IBM	yes	no	no	good	no	no	MS-DOS	Disc cache	12	£995	Computopro 01-439 1819
Epson Taxi	80C88	4.77	256K	85-key IBM/AT	yes	yes	no	poor	yes	yes	MS-DOS	Taxi	12	£898	Epson 01-902 8892
Ericsson PC	8088	4.77	128K	84-key IBM	yes	yes	no	good	yes	no	MS-DOS	no	12	£1,934	Ericsson (0634) 401721
Ferranti Advance	8086	4.77	256K	84-key IBM	yes	yes	no	good	yes	yes	MS-DOS	Perfect	12	£1,156	Ferranti 061-624 9552
Ferranti PC-860	8086	4.77	256K	84-key IBM	yes	yes	no	average	yes	yes	MS-DOS	Perfect II	12	£1,375	Ferranti 061-624 9552
Icarus PC	8088	4.77	256K	84-key IBM	no	no	no	good	no	no	MS-DOS	no	3	£1,299	Icarus 01-267 6732
ITT Xtra	8088	4.77	128K	84-key IBM	yes	yes	no	good	no	no	MS-DOS	no	6	£1,837	STC 01-300 3033
NCR PC-4i	8088	4.77	256K	95-key non-IBM	yes	yes	no	excellent	yes	no	NCR-DOS	Tutorial	12	£2,249	NCR 01-725 8337
Olivetti M-24	8086	8	128K	IBM or Olivetti	yes	yes	yes	excellent	yes	yes	MS-DOS	no	3	£2,165	Olivetti 01-785 6666
Osborne PC	8088	4.77	256K	83-key IBM	yes	yes	no	good	yes	yes	MS-DOS	no	12	£1,040	Future Management (0908) 615274
Sam 2001	8088	4.77	128K	83-key IBM	yes	yes	no	good	yes	yes	MS-DOS	no	12	£1,599	Conguin 01-646 3493
Sanyo MBC-885	8088	4.77	256K	84-key IBM	yes	no	no	good	yes	yes	MS-DOS	WordStar 2000	12	£1,390	Sanyo (0923) 57231

Sperry PC	8088-2	4.77/7.16	128K	84-key IBM	yes	yes	yes	good	yes	no	MS-DOS	no	12	£2,195	Sperry 01-965 3616
Tandon PC	8088	4.77	256K	84-key IBM	yes	yes	no	good	yes	yes	MS-DOS	no	6	£1,295	Tandon (0734) 664676
Tandy 1000	8088	4.77	128K	90-key non-IBM	yes	no	no	poor	yes	yes	MS-DOS	Deskmate	12	£1,358	Tandy (0922) 648181
Tashkl PC-16	8088	4.77	128K	84-key IBM	yes	yes	yes	good	yes	yes	MS-DOS	various	12	£1,650	Tashkl 01-904 4467
Televideo Tele PC	8088	5	256K	84-key IBM	yes	yes	no	poor	yes	yes	TeleDOS	Tele Solutions	12	£1,995	Computeraid (0734) 794664
Walters PC	8088	4.77	640K	83-key IBM	yes	no	no	good	no	no	MS-DOS	no	12	£945	Walters (0494) 32751-9
Wyse PC	8088	4.77	256K	83-key IBM	yes	2	no	poor	yes	no	MS-DOS	no	3	£1,925	RTS Ltd 01-267 7541
Victor VPC	8088		256K	83-key	yes	yes	no	good	no	no	MS-DOS	no	12	£1,399	Victor (06284) 4606
Zenith Z-158	8088	4.77/8	256K	84-key IBM	yes	2	no	good	yes	yes	MS-DOS	no	12	£1,995	Zenith (0452) 29451

AT-EMULATORS

Manufacturer and model	Processor	Speed (MHz)	Standard memory	Floppy disc	Hard disc	Keyboard style	Clock calendar	Expansion potential	Mono graphics	Colour graphics	Maximum memory	Operating system	Bundled software	Warranty (months)	Price guide	Contact
IBM PC/AT	80286	6	512K	1.2M	20M	PC/AT	yes	good	yes	yes	3M	PC-DOS 3	no		£5,103	IBM 01-995 1441
A M Stearns Communicator	80286	6/8	512K	1.2M	20M	non-IBM	yes	good	yes	yes	2.6M	MS-DOS 3.1	no	12	£4,550	AM International (0442) 42251
Compaq Deskpro 286	80286	6/8	512K	1.2M	30M	PC/AT	yes	good	yes	yes	8.32M	MS-DOS 3.1	no	6	£5,195	Compaq 01-940 8860
Goupil G-4	80186	8	512K	360K	10M/20M	PC	yes	poor	yes	yes	640K	MS-DOS 3.1	Windows	12	£4,420	SMT 01-785 2411
Hewlett-Packard Vectra	80286	8	256K	1.2M	20M	non-IBM	no	good	yes	no	3.64M	MS-DOS 3.1	PAM	12	£5,262	HP (0734) 696622
ITT Xtra XP	80286	4.77/6	512K	360K	20M	PC	no	eight-bit	yes	yes	640K	ITT DOS 2.11	no	6	£4,045	STC 01-440 4141
Kaypro 286i	80286	6	512K	1.2M	20M	PC/AT	no	good	no	no	1,024K	MS-DOS 3.1	Micropro	12	£3,869	Kaypro (06286) 67547
Sperry PC/IT	80286	4.77/7.16	512K	360K/1.2M	40M	PC/AT	yes	excellent	yes	yes	5M	MS-DOS 3.1	no	12	£5,066	Sperry 01-965 0511
Tandon PCA	80286	6	512K	1.2M	20M	PC/AT	no	good	no	no	16M	MS-DOS 3.1	no	6	£2,795	Tandon (0734) 664676
Tandy 3000	80286	8	512K	1.2M	20M	PC/AT	no	excellent	yes	yes		MS-DOS 2.11	no	12	£2,795	Tandy (0922) 648181
Televideo Performance AT	80286	6/8	512K	1.2M	20M	PC/AT	no	good	no	no	640K	MS-DOS 3.1	no	12	£4,295	Computeraid (0252) 521444
Triumph Adler P-50/60	80186	6	256K	800K	12.5M	non-IBM	yes	eight-bit	yes	yes	512K	MS-DOS 2.11	no	3	£3,950	TA 01-250 1717
Walters PC/AT	80286	6	512K	1.2M	20M	PC	no	good	yes	yes	3M	MS-DOS 3.1	no	12	£3,492	Walters (0494) 32751
Zenith Advanced PC	80286		512K	1.2M	20M	PC/AT	no	good	yes	yes		MS-DOS 3.1	no	12	£4,450	Zenith (0452) 29451

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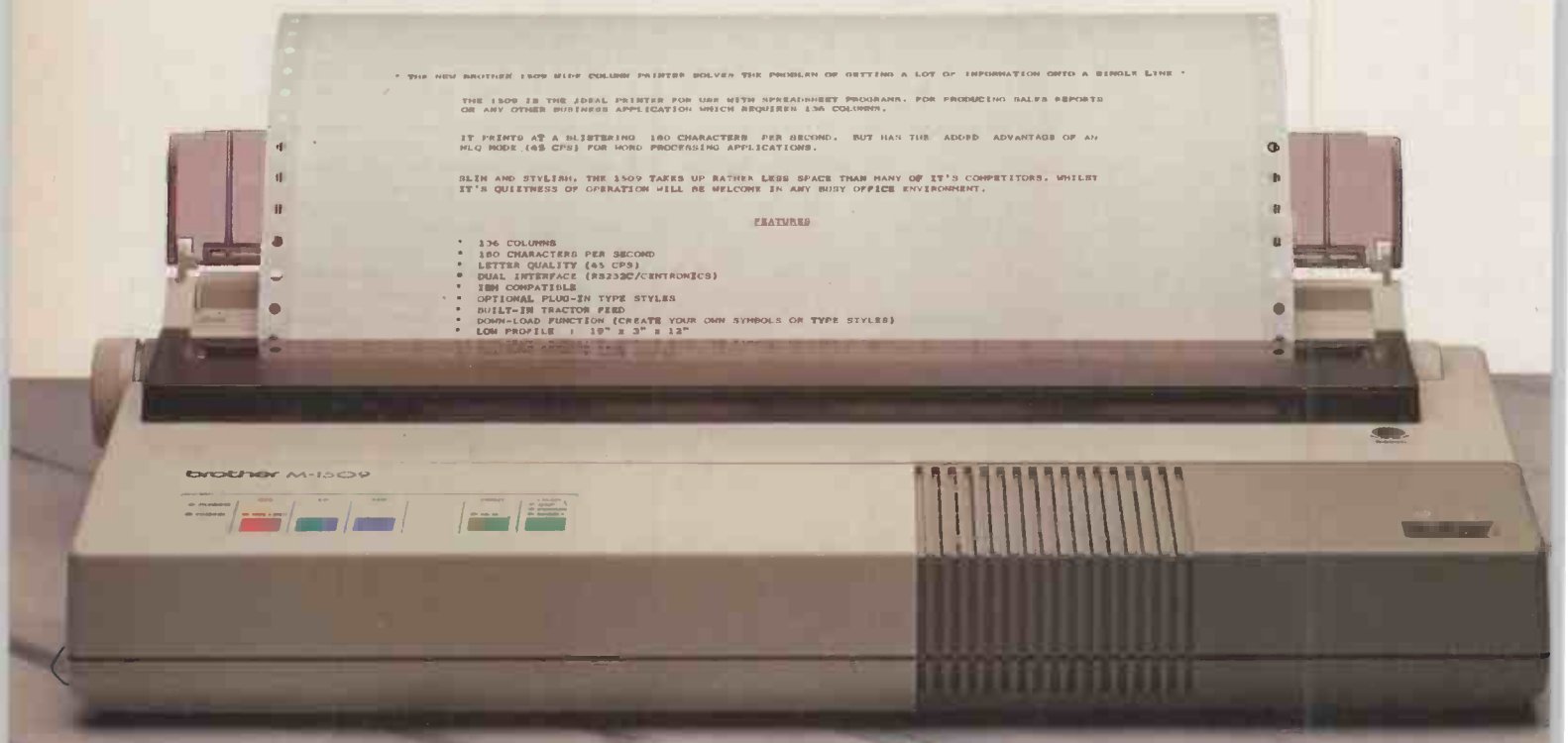

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● Circle No. 182

RESCUING WORDSTAR

All may not be lost, even when a system crash leaves several pages of a newly entered document still lodged precariously in memory. **John Lee** and **Timothy Lee** explain how you can retrieve your precious text.

WITH MOST word processors, WordStar included, the text typed in is stored in RAM. If the computer is switched off, the power fluctuates or fails, or if any other computer disaster occurs before you have saved the text on to disc, then the data you have carefully typed in will be lost. Because of this, it is good practice to save the file you are working on at regular intervals of, say, 15 or 20 minutes; WordStar has the simple command Control-KS to save and re-edit the same file, to make this easy to do. Should you then have a system crash of any kind, you at least have a fairly recent copy of the document on disc to fall back on.

In spite of this, most people who use word processors regularly will at some time have forgotten to save the document for several hours, and find that when they eventually try to do so they get a crash of some kind.

There are a number of possible reasons for a crash. First, it may be because the disc is so full that there is insufficient space to store the file. With WordStar, this gives the message

Fatal Error — Disk Full

If you are lucky, you will remain in WordStar, still editing your file.

In this case, the remedy is fairly easy. Type Control-KF from within the document to display the directory of files on the disc. Delete one or more files to make space on the disc with

Control-KJ <filename>

Then remove the directory from the screen with Control-KF, and try to save the file again with Control-KD.

BACK TO CP/M

If you are unlucky, and following the Disk Full message you crash out of WordStar back to the CP/M operating system, then a more elaborate method using CP/M's DDT is needed to save your file, and this is described later.

Another similar disaster occurs when there is still space on the file, but the directory is full. In this case you get the message

Fatal Error — Directory Full

Again, if you remain in WordStar you can display the directory, delete a file, hide the directory and save the file as previously outlined. If you have left WordStar and are now under CP/M, then the more elaborate method using DDT must be used to save your file.

The disc directory holds the names of the files stored on the disc, and also where on the disc they are located. Many versions of CP/M have a maximum of 64 directory entries, and for example if a lot of short letters of 1K or 2K have been stored on a typical double-sided double-density 5.25in. disc, the directory will become full long before the disc itself.

Another disaster can occur if you accidentally press the Reset button. This causes the computer to terminate the WordStar run abruptly and without any warning, and reloads CP/M from the floppy disc.

If for any of these reasons you have unexpectedly left WordStar and find you are under CP/M with the prompt A> or B>, remember that if your document was small enough to store in memory, it will still be there. But you must not switch off the computer or it will vanish for ever. You cannot load and rerun WordStar, since WordStar does not have a re-entry point that will preserve the data.

What you can do is to use DDT to move the data from its present position to 100 hex, which is the place that programs normally load under CP/M, and then save the contents of memory to a disc file. The following description of how to do this assumes that the computer has two disc drives, one for the system disc and the other for your data files.

First type Dir to see if the program DDT is stored on the system disc. If so, then all is well; if not, replace the disc by one that has DDT and press Control-C to tell the system you have changed discs.

If the current data disc has sufficient space for a file of around 30K, then all is well and this disc can be used to store the data. If you are not sure if there is enough space on the disc, you can run the program Stat to find out. This will not corrupt your data in memory, since the program loads low down in memory at 100 hex and is too small to overwrite the text in the high part of memory.

If there is not enough space on the disc, replace it by one with plenty of space and press Control-C to tell the system you have changed discs. This also ensures that it will not be treated as a write-protected disc. If you need another disc but do not have a formatted disc available, you can run the program Format; once again, this will not corrupt your data since the program loads low down at 100 hex and is too small to overwrite the text in high memory.

Assuming that you have a 64K CP/M system, that you are logged in to drive A, and that DDT is present on that drive, type

DDT

and press Return. The banner heading from DDT will be displayed, followed by the DDT prompt, which is a minus sign.

If you are using WordStar version 2.0 or 2.2 type

M7320,DFFF,100

to move the contents of memory — hopefully your text — down to 100 hex, ready to be saved. Alternatively, if you are using WordStar version 3.0 or 3.3, type

M7849,C2FF,100

to move the contents of memory down to 100 hex, ready to be saved. In either case type Control-C to leave DDT and return to the operating system.

Next type:

SAVE 109 B:NEWFILE

for WordStar versions 2.0 and 2.2; for WordStar versions 3.0 and 3.3 type

SAVE 75 B:NEWFILE

In each case this will save the contents of memory in a file called Newfile on drive B. You may, of course, specify another file name or another disc drive.

Finally use WordStar to edit Newfile. You will probably find that there is some rubbish at the beginning of the file, and this can be removed quite easily. To do this, put Control-KB, the beginning of block marker, at the beginning of the rubbish and put Control-KK, the end of block marker, at the end of the rubbish. Then delete the block with Control-KY. There may also be some rubbish at the end of the file, which should be marked as a block and deleted in a similar way. Then save the edited file in the usual way with Control-KD. This editing will probably reduce the size of the file considerably, and with luck the file now contains your work exactly as it was before the trouble occurred.

If you were working with a file that was too large to fit into the available memory when the crash occurred, then the file you recover will only contain part of the original document. If this is the case, then examination of the directory will reveal the presence of one or two temporary files. If your text file was called Book.TXT, then there may be a file called Book.$$$ and possibly also Edbackup.$$$. Such temporary files are normally deleted by WordStar once the main file has been saved safely. If it exists and is not empty, Book.$$$ will contain the start of the file Book.TXT up to the place where the remainder was resident in memory. Edbackup.$$$ will only exist if you have moved a long way backwards through the file. These files must be renamed before they can be handled by WordStar, and the renamed Book.$$$ can be inserted at the beginning of the rescued file using the WordStar command Control-KR.

SMALLER SYSTEMS

The procedure just described works for a 64K version of CP/M. It is worth examining the figures, since once they are understood a similar process can be applied to CP/M for any other size of memory. For example, the North Star Horizon normally has a 56K CP/M, since the disc board occupies an address at 58K.

The command

M7320,DFFF,100

for 64K CP/M and WordStar versions 2.X moves the block of memory beginning at location 7320 hex (29472 decimal) and ending at DFFF hex (57343 decimal) so that it starts at 100 hex. The size of the block is therefore 27,871 bytes. Data is written to disc in blocks of 256 bytes, so the number of blocks to be written is 27,871/256 or 109 blocks, and this is specified in the Save command.

Similarly, the command

M7849,C2FF,100

moves the block of data between the hex locations 7849 (30793 decimal), and C2FF (49823 decimal) down to start at location 100 hex. The size of this block is therefore 19030, which requires 75 blocks to be specified in the Save command.

For a 56K CP/M and WordStar versions 2.0 and 2.2 the commands are

M7320,BFFF,100
SAVE 77 B:NEWFILE

For a 56K CP/M and WordStar versions 3.0 and 3.3 the commands are

M7849,A2FF,100
SAVE 43 B:NEWFILE

PC

DATA MAKER

In the first article of their series on statistical tests, **Owen Bishop** and **Daniel Bishop** present a pair of programs which organise your data into a form ready for processing.

LIES, damned lies or just plain confusing, statistical data should always be approached with sceptical respect. Numerous tests are available to discover the truth behind the raw data, and this series will be explaining what the main ones are, and when and how to use them.

Though the examples presented are designed for business use, the tests are equally applicable in science, medicine, education, or any other field in which numerical data is processed. To use the programs in the form they are written you will need a BBC Micro with at least one disc drive.

The first statistical program, which generates histogram charts, appears next month. But first you need programs for putting the data on to disc. The Data Maker program stores tables of data and recalls them for display or printing out on any future occasion, or for analysis by the statistical programs. The following step-by-step description explains how it is used.

1. If you are loading an existing file — that is, one previously prepared by Data Maker — proceed to step 10. For a new file, continue with step 2.
2. Enter the data. You can use any format; a convenient one is

DDMMYY

so that you enter 190786 for 19 July 1986.
3. Enter the number of columns you need. The table can have from one to 12 columns.
4. Enter the number of rows you need. The maximum number of rows allowed depends on how many columns you decide to have.
5. Enter the column width — that is, the number of characters required in the widest column. Count one character for the decimal point, if there is one, one for each digit before and after the decimal point, and add one for the space between columns. There is no need to allow for minus signs, as they are displayed in the space between columns.
6. Enter column labels. Labels are not essential, but if you choose to use them you are asked to type in headings for each column.
7. Enter row labels — again, not essential.
8. State whether you wish to enter data by columns or by rows. With many kinds of data it is more convenient to work down column 1, then go to column 2 and so on. This is called "by columns"; choose which you prefer.
9. Enter the number of decimal places you require. All values in a column must have the same number of digits after the decimal point, but you may specify different numbers of decimal places in different columns. Key in the numbers of places when requested. Key 0 for any column which is to contain integers.
10. The data table is displayed, or the top-left corner of it if the table is too big for the screen. The top of the screen displays a status line showing the file name, date, number of columns and rows, and the number of decimal places for each column. For example, if the DP display shows 203, the first column has two decimal places, the second column has none and the third has three.
11. Data entry begins here. The cursor starts at column 1, row 1, so type in the value for this position first. The computer does not let you type in more digits before the decimal point than there will be room for in the chosen column width. If it refuses to accept any more numeric digits, it is waiting for a decimal point. Similarly, it requires the correct number of digits after the decimal point. Key Return when a value has been fully entered. If it does not already fill the column width, it moves to the right within the column.
12. The cursor then moves to the next row or column, depending on the option you selected in step 8, and waits for you to enter the next value. At the end of one row or column the cursor moves automatically to the start of the next. With some types of data, columns or rows may not all be filled with values. If you have finished entering all the values for a given column or row, key * and the cursor moves to the start of the next column or row. You can use the cursor-control keys to move the cursor manually to any position in the table, either to enter a value or to replace the existing value with a new one.
13. When you have finished entering data, the contents of the table, including its headings and other information, may be saved by keying S or printed out by keying P. After either of these operations, you are returned to the table display with all data present and can save a backup copy or take another printout if you wish. Typing R clears all data and returns you to step 1.

You can use the cursor-control keys to roam over the entire table, to enter or change a value or simply to review the table. The display scrolls to bring the required area on-screen. There is an important difference between a position which contains a zero and one which is merely left blank. A zero is treated as a value which is used in calculations, while a blank square is treated as a missing value and is ignored.

The Data Disc Initialiser program prepares a special data disc by setting up 14 files, each large enough to hold the largest table of data that Data Maker allows. It is not essential to use this program but it is a wise precaution, as it ensures that you will never find yourself without enough space to save a file that you have just edited.

All the programs in this series, along with five others, are available on a single-sided 40-track 5.25in. disc. The price is £20 including postage and 15 percent VAT. Please send your order to Owen Bishop, c/o Practical Computing; cheques should be made payable to Owen Bishop.

DATA MAKER

```
   10 REM- DATA MAKER
   20 REM- A Statistical Utility Program
   30 REM- ------------------------------
   40 REM- by Owen and Daniel Bishop
   50 REM- ------------------------
   60 REM- Version 1.0 - 3/10/85
   70 REM- For the BBC Micro Model B
   80 REM- ------------------------
   90 *TV 255,1
  100 *FX4,1
  110 MODE7
  120 DIM DP(12)
  130 CR=0:KEY$=CHR$136+CHR$137+CHR$138+
CHR$139
  140 L$=STRING$(10," ")
  150 CLS:PROCcol:PRINTSPC(3);"DATA MAKE
R";SPC(66)
  160 PROCbtm:PROCcol:PRINT "Do you want
 to make a NEW data file":PROCcol:PRINT
"or LOAD an existing file?":PROCalpha("(
N/L) ",1)
  170 IF QR$="N" THEN PROCnewfile:GOTO 3
90
  180 IF QR$<>"L" THEN VDU7:GOTO 160
  190 CLS:PROCcol:PRINT SPC(3);"EDIT:";S
PC(71)
  200 PROCbtm:PROCcol:PRINT "Enter name
of file to be loaded":PROCalpha("(max 7
letters): ",7)
  210 ON ERROR PROCfserror:VDU31,10,0:PR
OCcls:GOTO200
  220 FILE$=QR$:A=OPENIN FILE$
  230 VDU31,10,0:PRINT FILE$
  240 INPUT#A,DF$:VDU31,24,0:PRINT"DATE:
 ";DF$
  250 INPUT#A,NC,NR:VDU31,0,1:PROCcol:PR
INTSPC(3);"COLS: ";NC;SPC(2);"ROWS: ";NR
;SPC(22-LEN(STR$(NC))-LEN(STR$(NR)))
  260 DIM SC(NC,NR),CL$(NC),RL$(NR)
  270 INPUT#A,CW,LC
  280 IF LC=0 THEN 300
  290 FOR J=1 TO NC:INPUT#A,CL$(J):NEXT
  300 INPUT#A,LR
  310 IF LR=0 THEN 330
  320 FOR J=1 TO NR:INPUT#A,RL$(J):NEXT
  330 FOR J=1 TO NR:FOR K=1 TO NC:INPUT#
A,SC(K,J):NEXT:NEXT
  340 FOR J=1 TO NC:INPUT#A,DP(J):NEXT:I
NPUT#A,DP$
  350 CLOSE#0
```

DATA MAKER

```
  360 ON ERROR OFF
  370 NT=FNnt
  380 PROCbtm
  390 VDU31,26,1:PRINT"DP=";DP$
  400 SW=36-7*LR:CC=INT(SW/CW):IF NC<CC
THEN CC=NC
  410 RD=16:IF NR<RD THEN RD=NR
  420 CD=CC:CS=0:RS=0:HB=4+7*LR:CX=HB:CY
=5:X=1:Y=1
  430 IF LR=0 AND NR>=100 THEN HB=5
  440 PROCcolumns:PROCrows
  450 PROCdata
  460 *FX15,0
  470 VDU31,CX-1,CY-1:K$=GET$
  480 IF K$="R" THEN CLEAR:GOTO 110
  490 IF K$="S" AND NT>0 THEN PROCsave:G
OTO 460
  500 IF K$<>"D" OR NT=0 OR SC(X,Y)=1E-2
9 THEN 520
  510 SC(X,Y)=1E-29:NT=NT-1:VDU31,CX-2,C
Y-1:PRINTLEFT$(L$,CW):IF NT=0 THEN 440 E
LSE 460
  520 IF K$="P" THEN PROCprint:GOTO 460
  530 IF INSTR(KEY$,K$)>0 OR K$="*" THEN
 PROCmove:GOTO 460
  540 IF ASC(K$)>47 AND ASC(K$)<58 OR IN
STR(".-",K$)>0 THEN PROCnumber:GOTO 460
  550 VDU7:GOTO460

  560 DEF PROCsave
  570 PROCbtm:PROCcol:PRINT "Enter file
name to save under":PROCalpha("(max 7 le
tters): ",7)
  580 IF LEN(QR$)=0 OR LEFT$(QR$,1)=CHR$
32 THEN VDU7:GOTO 570
  590 ON ERROR PROCfserror:GOTO570
  600  A=OPENOUT QR$
  610 PRINT#A,DF$,NC,NR,CW,LC:IF LC=0 TH
EN 630
  620 FOR J=1 TO NC:PRINT#A,CL$(J):NEXT
  630 PRINT#A,LR:IF LR=0 THEN 650
  640 FOR J=1 TO NR:PRINT#A,RL$(J):NEXT
  650 FOR J=1 TO NR:FOR K=1 TO NC:PRINT#
A,SC(K,J):NEXT:NEXT
  660 FOR J=1 TO NC:PRINT#A,DP(J):NEXT
  670 PRINT#A,DP$:CLOSE#0:ON ERROR OFF
  680 PROCbtm
  690 ENDPROC

  700 DEF PROCprint
  710 PROCbtm:PROCnum("Width of printout
 (40-132) ? ",1,40,1,132)
  720 ON ERROR PROCpterror
  730 VDU2,21:PW=QN:PC=INT((PW-12)/CW)
  740 PRINT
  750 SC=0:PP=PC
  760 IF PP>NC THEN PP=NC
  770 PRINT"FILE: "FILE$'"DATE: "DF$
  780 FOR J=1 TO PP-SC
  790 PRINTTAB(6+LR*6+(J-1)*CW);J+SC;
  800 NEXT:PRINT:IF LC=0 THEN 820
  810 FOR J=1 TO PP-SC:PRINTTAB(6+LR*6+(
J-1)*CW);CL$(J+SC);:NEXT:PRINT
  820 FOR K=1 TO NR
  830 PRINT;K;TAB(4)RL$(K);
  840 FOR J=1 TO PP-SC
  850 IF SC(J+SC,K)=1E-29 THEN A$="" ELS
E @%=&102000A+(DP(J+SC)*&100):A$=STR$(SC
(J+SC,K)):IF RIGHT$(A$,1)="."THEN A$=LEF
T$(A$,LEN(A$)-1)

  860 @%=&90A:PRINTTAB(5+LR*6+(J-1)*CW)R
IGHT$(L$+A$,CW);
  870 NEXT:PRINT
  880 NEXT

  890 IF PP<NC THEN SC=SC+PC:PP=PP+PC:PR
INT:GOTO 760
  900 FOR L=0 TO 4000:NEXT
  910 VDU 6,3
  920 ON ERROR OFF
  930 PROCbtm
  940 ENDPROC

  950 DEF PROCmove
  960 IF K$="*" AND CR=0 AND X<NC THEN X
=X+1:Y=1
  970 IF K$="*" AND CR=1 AND Y<NR THEN Y
=Y+1:X=1
  980 X2=X:Y2=Y:IF K$=CHR$(139) AND Y>1
THEN Y=Y-1
  990 IF K$=CHR$(136) AND X>1 THEN X=X-1
 1000 IF K$=CHR$(137) AND X<NC THEN X=X+
1
 1010 IF K$=CHR$(138) AND Y<NR THEN Y=Y+
1
 1020 IF INSTR(KEY$,K$)>0 AND X2=X AND Y
2=Y THEN VDU7
 1030 DF=0
 1040 CX=HB+CW*(X-CS-1)
 1050 IF CX<HB THEN CS=CS-CC:DF=1:GOTO 1
040
 1060 IF CX>40-CW THEN CS=CS+CC:DF=1:GOT
O1040
 1070 CY=4+Y-RS
 1080 IF CY<5 THEN RS=RS-16:DF=1:GOTO107
0
 1090 IF CY>20 THEN RS=RS+16:DF=1:GOTO10
70
 1100 RD=16:IF NR-RS<RD THEN RD=NR-RS
 1110 CD=CC:IF NC-CS<CD THEN CD=NC-CS
 1120 IF DF=1 THEN PROCcolumns:PROCrows:
PROCdata
 1130 ENDPROC

 1140 DEF PROCnumber
 1150 SG=1:IF K$="-" THEN VDU31,CX-2,CY-
1:PRINTK$:SG=-1
 1160 S$=" ":IF SG=-1 THEN S$="-"
 1170 XN=CX:NK=0:ND=CW-2-DP(X):AM$=""
 1180 IF DP(X)=0 THEN ND=ND+1
 1190 GOTO 1220
 1200 *FX21,0
 1210 VDU31,XN-1,CY-1:K$=GET$
 1220 IF VAL(K$)=0 AND K$<>"0" AND K$<>"
." AND K$<>CHR$13 OR K$="." AND DP(X)=0
OR K$=CHR$13 AND DP(X)<>0 THEN 1200
 1230 IF K$=CHR$13 THEN 1340
 1240 IF NK=ND AND K$<>"." THEN 1200
 1250 XN=XN+1:PRINT K$:IF K$="." THEN 12
70
 1260 AM$=AM$+K$:NK=NK+1:IF NK<ND+1 THEN
 1200
 1270 IF DP(X)=0 THEN 1340

 1280 AM$=AM$+".":NK=0
 1290 VDU31,XN-1,CY-1:K$=GET$:IF VAL(K$)
=0 AND K$<>"0" AND K$<>CHR$13 OR NK=DP(X
) AND K$<>CHR$13 THEN 1290
 1300 IF K$=CHR$13 AND NK=DP(X) THEN 134
0
 1310 IF K$=CHR$13 AND NK<DP(X) THEN 129
0
 1320 PRINT K$:XN=XN+1
 1330 AM$=AM$+K$:NK=NK+1:IF NK<DP(X)+1 T
HEN 1290
 1340 SC(X,Y)=VAL(RIGHT$(L$+S$+AM$,CW)):
NT=NT+1
 1350 VDU31,CX-2,CY-1:PRINT SPC(CW)
```

(listing continued on page 109)

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DATA MAKER

(listing continued from page 107)

```
 1360 VDU31,CX-2,CY-1:PRINT RIGHT$(L$+S$
+AM$,CW)
 1370 IF CR=1 THEN 1400
 1380 IF Y=NR THEN K$="*":PROCmove:ENDPR
OC
 1390 K$=CHR$138:PROCmove:ENDPROC
 1400 IF X=NC THEN K$="*":PROCmove:ENDPR
OC
 1410 K$=CHR$137:PROCmove:ENDPROC
 1420 DEF FNnt:LOCAL NT%,J%,K%:FOR J%=1
TO NC:FOR K%=1 TO NR:IF SC(J%,K%)<>1E-29
 THEN NT%=NT%+1
 1430 NEXT:NEXT:=NT%

 1440 DEF PROCdata:LOCAL J,K:VDU23,1,0;0
;0;0;:FOR J=5 TO 20:VDU31,HB-1,J-1:PROCc
ll:NEXT
 1450 FOR J=1+CS TO CD+CS:HH=HB-1+(J-CS-
1)*CW
 1460 FOR K=1+RS TO RD+RS
 1470 IF SC(J,K)=1E-29 THEN 1490 ELSE @%
=&0102000A+(DP(J)*&100):A$=STR$(SC(J,K))
:IF RIGHT$(A$,1)="."THEN A$=LEFT$(A$,LEN
(A$)-1)
 1480 VDU31,HH-1,3+K-RS:PRINT RIGHT$(L$+
A$,CW):@%=&90A
 1490 NEXT:NEXT
 1500 VDU23,1,1;0;0;0;
 1510 ENDPROC

 1520 DEF PROCcolumns:LOCAL J:VDU23,1,0;
0;0;0;:VDU31,0,2:PROCcll:VDU31,0,3:PROCc
ll
 1530 VDU31,0,2:FOR J=1 TO CD
 1540 VDU31,(HB-1+(J-1)*CW),2:PRINT;J+CS
;
 1550 NEXT
 1560 IF LC=0 THEN VDU23,1,1;0;0;0;:ENDP
ROC
 1570 VDU31,0,3:FOR J=1 TO CD
 1580 VDU31,(HB-1+(J-1)*CW),3:PRINTCL$(J
+CS);
 1590 NEXT:VDU23,1,1;0;0;0;:ENDPROC

 1600 DEF PROCrows:LOCAL K:VDU23,1,0;0;0
;0;:FOR K=5 TO 20:VDU31,0,K-1:PROCcll:NE
XT
 1610 FOR K=1 TO RD:VDU31,0,K+3:PRINT;K+
RS:NEXT
 1620 IF LR=0 THEN VDU23,1,1;0;0;0;:ENDP
ROC
 1630 FOR K=1 TO RD:VDU31,3,3+K:PRINT RL
$(K+RS)
 1640 NEXT:VDU23,1,1;0;0;0;:ENDPROC
 1650 DEF PROCnum(Q$,Q1,Q2,Q3,Q4)
 1660 *FX21,0
 1670 PROCcol:PRINT Q$;:INPUT""QN$
 1680 QN=VAL(QN$)
 1690 IF QN=0 AND QN$<>"0" THEN 1720
 1700 IF QN<>INT(QN) THEN 1720
 1710 IF (Q3=0 OR QN<=Q4) AND (Q1=0 OR Q
N>=Q2) THEN ENDPROC
 1720 PROCline
 1730 GOTO 1660
 1740 ENDPROC

 1750 DEF PROCalpha(Q$,Q1)
 1760 *FX21,0
 1770 PROCcol:PRINT Q$;:INPUT""QR$
 1780 IF LEN(QR$)<=Q1 OR Q1=0 THEN ENDPR
OC
 1790 PROCline:GOTO 1760

 1800 DEF PROCline:VDU11:PROCcll:VDU7:EN
DPROC
 1810 DEF PROCbtm:VDU31,0,20:PROCcls:VDU
31,0,20:ENDPROC

 1820 DEF PROCfserror
 1830 ON ERROR OFF
 1840 CLOSE#0
 1850 VDU7
 1860 IF ERR>44 OR ERR=6 THEN 1900
 1870 CLS:VDU11:REPORT:PRINT " at line "
;ERL
 1880 *FX4,0
 1890 END
 1900 PROCbtm:IF ERR=222 THEN PRINT"No s
uch file";:PROCcol ELSE VDU11:REPORT:PRO
Ccol
 1910 PRINT" error. ":PROCcol:PRINT"Pres
s SPACEBAR, when you are ready "
 1920 *FX21,0
 1930 REPEAT:A=GET:UNTIL A=32
 1940 VDU11,11:PROCcls
 1950 ENDPROC

 1960 DEF PROCcol
 1970 PRINT CHR$130;
 1980 ENDPROC

 1990 DEF PROCcls
 2000 LOCAL CRS%,V,H
 2010 V=VPOS:H=POS
 2020 CRS%=999-H-(40*V)
 2030 VDU23,1,0;0;0;0;
 2040 REPEAT:IF CRS%<255 THEN 2060
 2050 CRS%=CRS%-255:PRINTSTRING$(255," "
);
 2060 UNTIL CRS%<255
 2070 PRINTSTRING$(CRS%," ");
 2080 VDU31,H,V
 2090 VDU23,1,1;0;0;0;
 2100 ENDPROC

 2110 DEF PROCcll
 2120 LOCAL V,H
 2130 V=VPOS:H=POS
 2140 PRINT STRING$(40-H," ");
 2150 VDU31,H,V
 2160 ENDPROC

 2170 DEF PROCnewfile
 2180 CLS:PROCcol:PRINT"NEW FILE:"'
 2190 PROCbtm:PROCalpha("Enter file name
 (max 7 chars): ",7)
 2200 IF VAL(QR$)>0 THEN VDU7:GOTO2190
 2210 VDU30:PRINTTAB(0,5)"FILE NAME: ";Q
R$
 2220 FILE$=QR$
 2230 PROCbtm:PROCalpha("Enter file date
 (max 6 chars): ",6)
 2240 DF$=QR$:VDU30:PRINTTAB(0,7)"DATE :
 ";DF$
 2250 PROCbtm:PROCnum("How many columns
(1-12)? ",1,1,1,12):NC=QN
 2260 VDU30:PRINTTAB(0,9)"COLUMNS = ";NC
 2270 DATA 140,110,90,75,65,55,50,45,40,
35,35,30
 2280 FOR J=1 TO QN:READ NR:NEXT
 2290 PROCbtm:PROCnum("How many rows (1-
"+STR$(NR)+")? ",1,1,1,NR):NR=QN
 2300 VDU30:PRINTTAB(0,11)"ROWS = ";NR
```

(listing continued on page 111)

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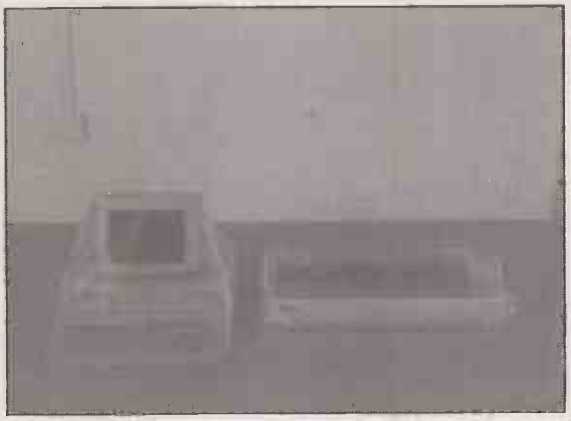

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DATA MAKER

(continued from poge 109)

```
 2310 PROCbtm:PROCnum("Column width (5-1
0)? ",1,5,1,10):CW=QN
 2320 VDU30:PRINTTAB(0,13)"COLUMN WIDTH
= ";CW
 2330 PROCbtm:PROCalpha("All OK (Y/N)? "
,1)
 2340 IF QR$<>"Y" AND QR$<>"N" THEN VDU7
,30:GOTO 2330
 2350 IF QR$="N" THEN N=N-1:RESTORE 2270
:GOTO2180
 2360 DIM SC(NC,NR),CL$(NC),RL$(NR)
 2370 FOR J%=1 TO NR:FOR K%=1 TO NC:SC(K
%,J%)=1E-29:NEXT:NEXT
 2380 NT=0:VDU31,0,4:PROCcls
 2390 PROCalpha("Do you want to label co
lumns (Y/N)?",1)
 2400 IF QR$<>"Y" AND QR$<>"N" THEN PROC
line:GOTO2390
 2410 IF QR$="N" THEN LC=0:GOTO 2500
 2420 LC=1
 2430 VDU31,0,2:PROCcls:PROCcol:PRINT"Ke
y in column labels (max ";CW-1;" chars):
"
 2440 FOR J=1 TO NC:PROCalpha(STR$(J)+"
",CW-1):CL$(J)=QR$:NEXT
 2450 PRINT
 2460 PROCalpha("All OK (Y/N)?",1)
 2470 IF QR$<>"N" AND QR$<>"Y" THEN PROC
line:GOTO 2460
 2480 IF QR$="N" THEN 2430
 2490 VDU31,0,2:PROCcls
 2500 PROCalpha("Do you want to label ro
ws (Y/N)?",1)
 2510 IF QR$<>"Y" AND QR$<>"N" THEN PROC
line:GOTO 2500
 2520 IF QR$="N" THEN LR=0:GOTO 2630
 2530 LR=1
 2540 VDU31,0,2:PROCcls:PROCcol:PRINT"Ke
y in row labels (max 6 chars):"
 2550 RR=0:RD=18
 2560 IF RR+RD>NR THEN RD=NR-RR
 2570 FOR J=1 TO RD:PROCalpha(STR$(J+RR)
+" ",6):RL$(J+RR)=QR$:NEXT
 2580 PRINT
 2590 PROCalpha("All OK (Y/N)?",1)
 2600 IF QR$<>"Y" AND QR$<>"N" THEN PROC
line:GOTO 2590
 2610 IF QR$="N" THEN VDU31,0,3:PROCcls:
GOTO2570
 2620 RR=RR+18:IF RR<NR THEN VDU31,0,3:P
ROCcls:GOTO2560
 2630 VDU31,0,2:PROCcls:VDU31,0,4:PROCal
pha("By columns or by rows (C/R)?",1)
 2640 IF QR$<>"C" AND QR$<>"R" THEN VDU7
:GOTO 2630
 2650 IF QR$="R" THEN CR=1 ELSE CR=0
 2660 DP$="":PRINT':PROCcol:PRINT"How ma
ny decimal places (0-";CW-3;")?":FOR J=1
 TO NC:PROCnum("COL "+STR$(J)+"  ",1,0,1
,CW-3):DP$=DP$+QN$:DP(J)=QN:NEXT
 2670 PRINT
 2680 PROCalpha("All OK (Y/N)?",1)
 2690 IF QR$<>"N" AND QR$<>"Y" THEN PROC
line:GOTO 2680
 2700 IF QR$="N" THEN VDU31,0,2:PROCcls:
GOTO2660
 2710 VDU31,0,1:PROCcls
 2720 VDU31,10,0:PRINT FILE$
 2730 VDU31,24,0:PRINT "DATE: "DF$
 2740 VDU31,0,1:PROCcol:PRINT SPC(3);"CO
LS: ";NC;SPC(2);"ROWS: ";NR;SPC(22-LEN(S
TR$(NC))-LEN(STR$(NR)))
 2750 ENDPROC


 2760 DEF PROCpterror
 2770 ON ERROR OFF
 2780 VDU 6,3,7
 2790 CLS:VDU11:REPORT:PRINT " at line "
;ERL
 2800 *FX4,0
 2810 END
```

DATA DISC INITIALISER

```
   10 REM- DATA DISK INITIALISER
   20 REM- by Owen and Daniel Bishop
   30 REM- ------------------------
   40 REM- Version 1.0 - 3/10/85
   50 REM- For the BBC Micro Model B
   60 REM- ------------------------
   70 *TV255,1
   80 MODE 7
   90 PRINT TAB(7,1)CHR$130"INITIALISING
 A DATA DISK"
  100 PRINT''"Place your data disk in dr
ive 0."''"The disk must have already been
"'"formatted with a program like *FORM40
."
  110 PRINT'"Initialising will destroy a
ny data whichis on the disk.":INPUT'"Are
 you sure that this is a blank disk"'"or
 one that you no longer need? (Y/N) "A$
  120 IF A$<>"Y" THEN END
  130 INPUT'"Press 'Y', then 'RETURN', w
hen the"'"disk is ready in drive 0 "A$
  140 IF A$<>"Y" THEN 130
  150 PRINT
  160 CLOSE#0
  170 ON ERROR IF ERR=214 THEN 260 ELSE
REPORT:PRINT;" at line ";ERL:PROCkeys:EN
D
  180 *ACCESS 0.#.*
  190 *FX11,1
  200 *FX12,1
  210 *ENABLE
  220 *DESTROY 0.#.*
  230 A$=GET$
  240 PROCkeys
  250 IF A$<>"Y" THEN END
  260 ON ERROR OFF
  270 PRINT'"Initialising data disk - pl
ease wait"
  280 *TITLE "STAT DATA"
  290 *OPT 4 0
  300 PRINT
  310 FOR J=1 TO 14
  320 E$="FILE"+STR$(J)
  330 PRINT;J;" ";
  340 X=OPENOUT E$
  350 FOR K=1 TO 30
  360 PRINT#X,STRING$(196," ")
  370 NEXT
  380 CLOSE#0
  390 NEXT
  400 PRINT''"Data disk ready"
  410 END
  420 DEF PROCkeys
  430 *FX12,0
  440 TIME=0:REPEAT UNTILTIME>50
  450 *FX15,0
  460 ENDPROC
```

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SEPARATE CASES

You can improve the appearance of your Basic and assembler listings with this routine, devised by **David Dawe.**

PRINTED program listings are hardly the most convenient way of transmitting software, but sometimes they are the only method available. It is therefore worth putting some effort into making listings as easy as possible on the eye, to ensure that worthwhile programs are not ignored just because they are difficult to read.

My MBasic Indent program, published in the October 1985 issue of *Practical Computing*, does this for Basic programs. The routine presented in this article is designed to process assembler source code, but it may also be used to tidy up an MBasic source-code listing if it is saved in ASCII format. Assembly code is usually written in four-column format under the headings Label, Operator, Operand and Comment. The comments are separated from the code using the semicolon separator.

When I am developing a new program over several editing sessions, I find that I end up with code and comments as a mixed bag of upper- and lower-case characters. I prefer to see the code in upper case and the comments in lower case, though there does seem to be a growing trend towards using lower case for the code. But with this program I can convert my source listings back and forward whenever I like.

The program splits each line of program at the separator and allows selection of upper or lower case for both parts of the line. Thus the source listing shown above can be tidied up so that the code is in upper case and the comments are in lower case. Lines which begin with a comment separator are deliberately left alone. In the case of assembler listings nothing is altered beyond a single quote so that lines such as:

```
CPI 'z'
```

or

```
DB 'Thats all FOLKS$'
```

are left intact.

The program could have isolated and altered each character using Basic's Mids$ function, but this proved incredibly slow, so the machine-code subroutine technique was adopted. The subroutine used is written in Z-80 code, and was listed as discussed in my article on machine-code subroutines in the August 1985 issue. The subroutine Call takes the form:

```
CALL MLOC(A%,B$)
```

where B$ is a string to be processed. The variable A% controls what is done with the string. Only alphabetic characters are affected. If A% is set to 0 then all translation is to lower case. If A% is set to 2 then only the first character is translated to upper case, the rest will be lower case. If A% is set to 3 then the first letter of each word is translated to upper case, the rest will be lower case.

The program will also work on MBasic ASCII source code. The code must use the single-quote separator. Lines beginning with this separator are left unaltered. This utility, used together with MBasic Indent, should make any program look good. PC

BEFORE . . .

```
;This is a Demonstration of BEAUTY

        org     100h
PRSTR:  equ     9               ;CP/M funtion to print string
bdos:   EQU     5               ;FDOS call aDDress
Start:  mvi     c,PRSTR         ;Use fn 9
        lxi     h,messg         ;Point to start of MESSAGE
        CALL    bdos            ;go do it
        JMP     0               ;back to cp/m
messg:  DB      'What a super Program$'
```

. . . AFTER

```
;This is a Demonstration of BEAUTY

        ORG     100H
PRSTR:  EQU     9               ;cp/m funtion to print string
BDOS:   EQU     5               ;fdos call address
START:  MVI     C,PRSTR         ;use fn 9
        LXI     H,MESSG         ;point to start of message
        CALL    BDOS            ;go do it
        JMP     0               ;back to cp/m
MESSG:  DB      'What a super Program$'
```

SEPARATE CASES

```
100 '************************************************************
110 '*************            BEAUTY             ***************
120 '************************************************************
130 '
140 PRINT "This program 'beautifies' a Source Code ASCII file"
150 PRINT "which has trailing comments separated by ' or ;"
160 PRINT
170 PRINT "It converts the code & comments to lower or UPPER"
180 PRINT "case as required. It  works for  all lines except"
190 PRINT "those  beginning  with  the  separator. These are"
200 PRINT "deliberately left unaltered."
210 PRINT
220 PRINT "Program by D F Dawe (C)"
230 PRINT "Cornwall Microelectronics and Computing Centre"
240 PRINT "Cornwall College of Further & Higher Education"
250 PRINT
260 'The machine code below is assembled for &HB000
270 'It changes the case of the letters as required
280 'much faster than using BASIC !
290 CLEAR,&HB000
300 MLOC=&HB000
310       FOR J=0 TO 128
320       READ N
330       POKE MLOC+J,N
340       NEXT J
350 PRINT "Please state name of file to be beautified"
360 PRINT "I require the extension BAS,ASM,MAC or PRN"
370 PRINT
380 INPUT "FILENAME.EXT....";FILE$
390 P=INSTR(FILE$,".")
400 IF P=0 OR P<>LEN(FILE$)-3 THEN 350
410 E$=RIGHT$(FILE$,3)
420 IF E$="BAS" THEN S$="'":GOTO 470
430 IF E$="ASM" THEN S$=";":GOTO 470
440 IF E$="MAC" THEN S$=";":GOTO 470
450 IF E$="PRN" THEN S$=";":GOTO 470
460 GOTO 350
470 OPEN "I",#1,FILE$
480 INPUT #1,A$
490 CLOSE
500 IF ASC(A$)>127 THEN 980
510 INPUT "State format for the code,      select U or L";CO$
520 IF CO$="L" OR CO$="U" THEN 530 ELSE 510
530 INPUT "State format for the comments, select U or L";CM$
540 PRINT:PRINT:PRINT:PRINT
550 IF CM$="L" OR CM$="U" THEN 560 ELSE 530
560 PRINT "The file list will now be as follows"
570 PRINT:PRINT:PRINT
580 NFILE$=FILE$
590 MID$(NFILE$,P+1,3)="TMP"
600 OPEN "O",#2,NFILE$
610 OPEN "I",#1,FILE$
620       WHILE NOT EOF(1)
630       LINE INPUT #1,N$
640       L$="":R$=""
650       IF N$="" THEN 810
660       P=INSTR(N$,S$)
670       IF P<6 AND E$="BAS" THEN L$=N$:GOTO 810
680       IF P=0 THEN L$=N$:GOTO 740
690       IF P=1 THEN L$=N$:GOTO 810
700       L$=LEFT$(N$,P)
710       R$=RIGHT$(N$,LEN(N$)-P)
720       IF CM$="U" THEN A%=1 ELSE A%=0
730       CALL MLOC(A%,R$)
740       IF CO$="U" THEN A%=1 ELSE A%=0
750       IF E$="BAS" THEN LL$=L$:GOTO 790
760       Q=INSTR(L$,"'")
770       IF Q=0 THEN Q=LEN(L$)
780       LL$=LEFT$(L$,Q)
790       CALL MLOC(A%,LL$)
800       MID$(L$,1,LEN(LL$))=LL$
810       PRINT L$;R$
820       PRINT #2,L$;R$
830       WEND
840 CLOSE
850 PRINT:PRINT:PRINT
860 INPUT "Are you happy with this format (Y/N)";R$
870 IF R$="Y" THEN 930
880 IF R$<>"N" THEN 860
890 KILL NFILE$
900 PRINT:PRINT
910 PRINT "Your source file remains unchanged"
920 END
930 KILL FILE$
940 NAME NFILE$ AS FILE$
950 PRINT:PRINT
960 PRINT "Your file has been beautified as requested"
970 END
980 PRINT "Your source file must be saved in ASCII !!"
990 END
1000 'Z80 MACHINE CODE as my UCLC program
1010 DATA 229,213,126,254,4,48,9,135,79,6
1020 DATA 0,33,19,176,9,233,209,225,201,24
1030 DATA 6,24,28,24,50,24,69,209,225,205
1040 DATA 121,176,126,205,41,176,35,5,32,248
1050 DATA 201,254,91,208,254,65,216,198,32,119
1060 DATA 201,209,225,205,121,176,126,205,65,176
1070 DATA 35,5,32,248,201,254,123,208,254,97
1080 DATA 216,214,32,119,201,209,225,205,121,176
1090 DATA 126,205,65,176,35,5,200,126,205,41
1100 DATA 176,35,5,32,248,201,209,225,205,121
1110 DATA 176,126,205,65,176,35,5,200,126,205
1120 DATA 41,176,35,5,200,254,32,40,238,24
1130 DATA 243,235,70,35,94,35,86,235,201,0
```

OPEN FILE

SIERPINSKI'S CURVE

Logo is well suited to plotting certain types of mathematical function. **Obhijit Chatterjee** presents a program which implements the Sierpinksi curve and plots it out on an Amstrad PCW-8256 system.

THE Italian mathematician and logician Giuseppe Peano showed how a single point, tracing out a monster curve — that is, a curve with no unique tangent at any point — moving continuously over a square, could pass at least once through every point in the square and on its boundary. David Hilbert proposed a simple way of generating a Peano curve with two end-points. In the limit, the curve begins and ends at the square's top corners.

However, Waclaw Sierpinski generated a closed Peano curve — with no end-points — which bounded an area 5/12ths that of the square. The procedures listed illustrate how the Sierpinski curve is constructed. The structure of Hilbert's curve can be illustrated by similar procedures and the first four generations of the sequence of drawings leading to it are shown opposite.

DR Logo is particularly suited to producing this curve because its graphics depend on the concept of moving a turtle around the screen by specifying its direction and the distance it has to travel in that direction. This technique dispenses with the need for the messy calculations which would otherwise have been used to generate the curve had the graphics been dependent on a co-ordinate system.

The procedures illustrate the fourth generation of the polygonal drawings whose limit is the Sierpinski Curve. The primary procedure, called Sierpinski, initialises the screen and sets up the basic design for the plot. It calls two procedures, a and b.

The two procedures draw the basic components of the diagrams. The procedure called Side draws the element shown in figure 1B, and the procedure called Omega draws the element shown in figure 1A. Procedure a calls Side, Omega and Side in turn. Procedure b calls Side, followed by three Omegas, followed by Side.

The following commands replace

[a b a a b b b a a b a]

in the second line of Sierpinski

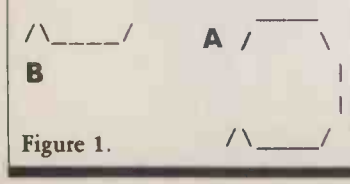


Figure 1.

SIERPINSKI PROGRAM

```
?po "Sierpinski

to Sierpinski

make "long 20

make "half :long / 2

ct clean fs ht pu setpos [-280 256] pd

  seth 315

repeat 4 [a b a a b b b a a b a]

end

?po "a

to a

side Omega side

end

?po "b

to b

side repeat 3 [Omega] side

end

?po "side

to side

rt 90 fd :half rt 90 fd :half lt 45 fd

  :long lt 45 fd :half

end

?po "Omega

to Omega

rt 90 fd :half rt 90 fd :half repeat 3 [lt

  45 fd :long lt 45 fd :half]

end

?copyoff
```

after Repeat 4 for the various generations. The first generation needs only

side

The second generation needs

a

The third generation needs

a b a

The fourth generation, as listed, needs

[a b a a b b b a a b a]

The fifth generation will be

single triple single single triple triple triple single single triple single

where Single is defined to be

a b a

and Triple is defined to be

a b b b a

Clearly, a pattern begins to emerge so that, for the sixth generation, if Single is redefined to be

single triple single

and Triple is redefined to be

single triple triple triple single

the design for the fifth generation may be applied. If successive generations are defined in this way, the scale of the drawing being reduced at each stage to keep the overall size constant, the whole square will eventually be filled.

To produce different generations, three changes need to be made to the procedure Sierpinski. First, the global variable :long should hold the distance for the longer forward movement. Second, the Setpos command should be adjusted so that the diagram does not fall off the screen. Third, the Repeat 4 loop in the fourth line should be amended as previously indicated.

It is quite possible to adapt the procedures to produce successive generations with a pause after each one, although this has not been attempted to avoid further complication of the issue.

The command to print the graphics produced on the screen is

<EXTRA> <PTR>

pressed simultaneously.

Peano curves are discussed by Martin Gardner on pages 124 to 133 of the December 1976 issue of *Scientific American*, along with descriptions of other curves, such as snowflake curves. PC

SIERPINSKI PROGRAM

The first two lines of Sierpinski initialise the global variables :long and :half, the two distances required by the fd commands in Side and Omega. Between successive generations, the variable :long should be halved. For example, the third generation will have :long set to 40.

The third line sets up the screen ready for plotting to begin. It clears the screen of both graphics and text, puts the hidden turtle near the top left-hand corner of the screen and points it 45° to the left from the vertical.

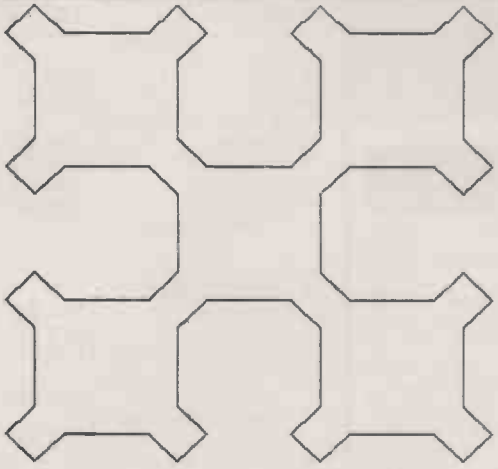
The fourth line defines the curve. Since the curve has rotational symmetry of order 4, only one quarter of it need be specified, and this is repeated four times.

The a procedure defines a single unit for Sierpinski. A single unit consists of a Side, an Omega followed by a Side.

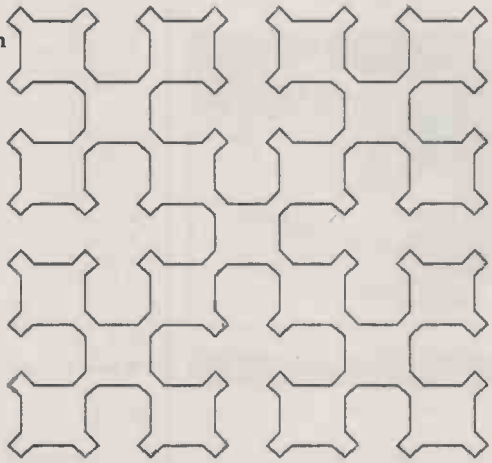
The b procedure defines a triple unit for Sierpinski. A triple unit consists of a Side, three Omegas, followed by a Side.

SIERPINSKI CURVES

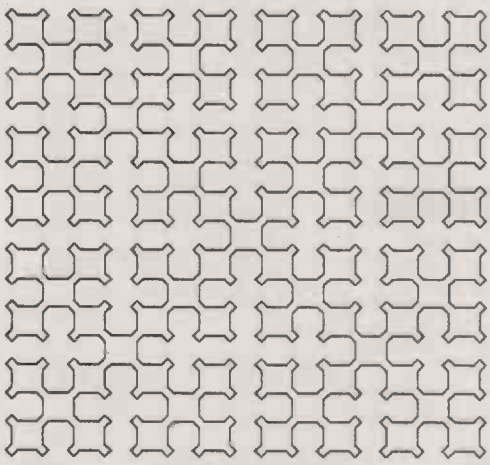
First generation



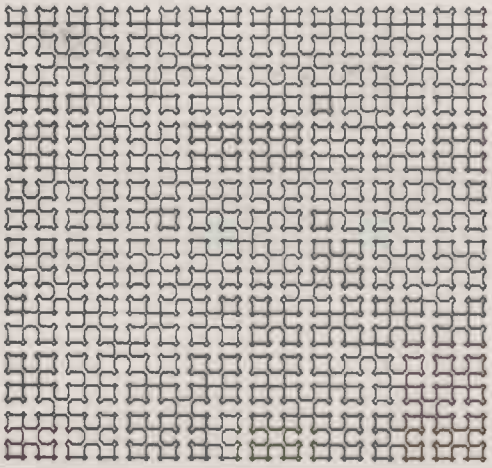
Second generation



Third generation



Fourth generation



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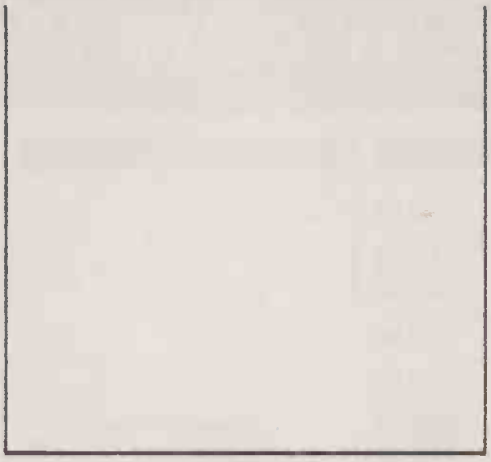

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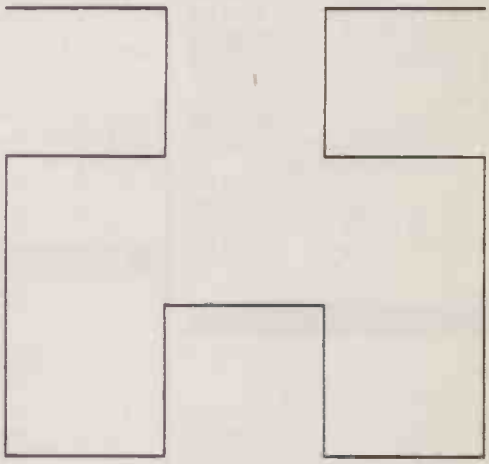

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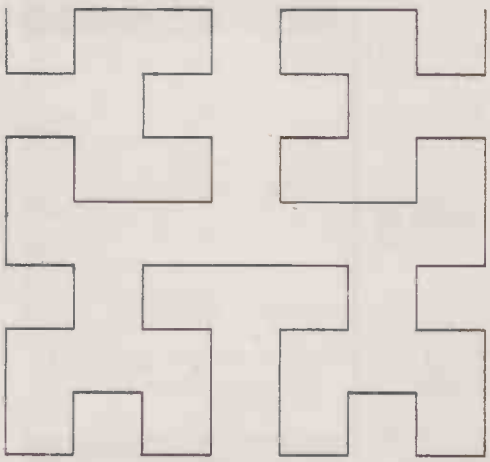

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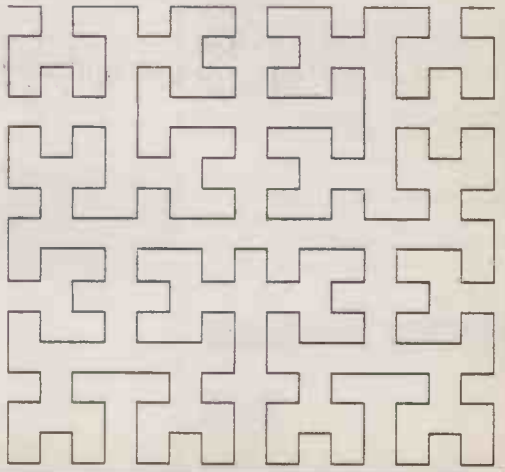

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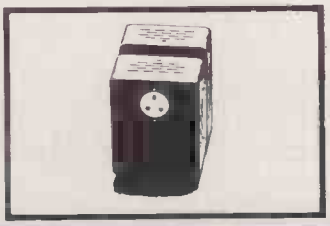

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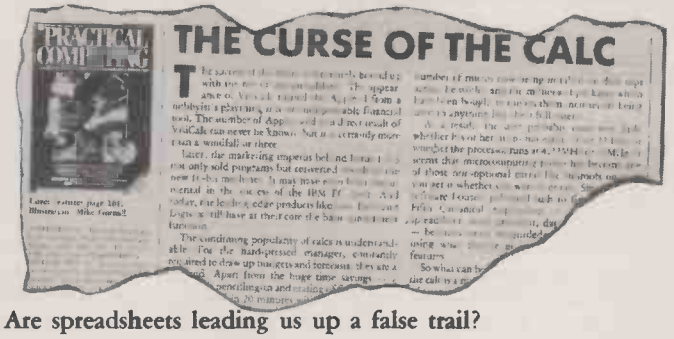
LAST WORD

Ralph Cornes suggests that it is time for the spreadsheet to change into a tool capable of more specific use.

PERSONAL COMPUTING: THE WAY FORWARD



Are spreadsheets leading us up a false trail?

THE important argument in the December editorial, about the likely impasse in personal computing, can be developed to produce some interesting ideas on possible solutions.

The editorial hypothesised that spreadsheets have been too successful in personal computing, and that users tend to twist everything, from filing to text editing, into a spreadsheet application. Consequently, executives do not use personal computers properly. More importantly, this misuse shows that executives are less hooked on computers than the industry had imagined, which is undoubtedly true.

It is an important argument because conceptually personal computers have gone about as far as they can go, unless we change the rules of the game in the same way that they were changed when VisiCalc first appeared. There are some excellent tools for all the basic information-handling functions in office work. You cannot invent extra functions; all that can be done is to combine them in different ways, and you soon exhaust the viable combinations.

ONE IN FIVE

It is a truism to say that personal computing is concerned with everything except traditional computing, which processes structured data in large volumes in order to provide administrative support systems. The people concerned with traditional corporate computing are generally accountants, accounting and administrative assistants, and clerks. They amount to less than 20 percent of the white-collar work force, so personal computing has a target user market which is at least four times the size of traditional computing and more than four times as variegated.

The members of this pool of potential users are diverse in nature. Between the manager and the secretary in the corporate hierarchy, there are other staff members who are generally known as professionals. They fall into two main classes: those who deal with people, such as the executive, the rep and the personnel officer, and those who deal with things or objects, such as the researcher, the engineer and the scientist. All these people have widely differing profiles and requirements.

The object-orientated professionals usually want lots of computing power and the tools to use it. If you give them this, they will make all sorts of adjustments in their work, but will never learn anything which they consider to be logically surplus to their specific requirements.

The people professionals, too, tend to have a short fuse when asked to conform to a rigid and formal application protocol. But in other ways their requirements and profile can be very different. They want speed not power, user-friendliness and a lot of little systems, while the objects professionals want one big omnibus system. The required tools and the ways in which they need to be presented to diferent users vary in nearly every possible way: in power, scope, ease of use, user-friendliness, complexity, speed, capacity and cost.

Whether you agree with the categorisation of information handlers is irrelevant to the argument, which merely echoes Shakespeare's phrase: "custom cannot stale their infinite variety". It is a variety which is not satisfied by existing personal computer products; there is no word processor cum graphics package designed expressly for a civil engineer, nor a spreadsheet designed for a metallurgist.

A further truism is that the traditional disciplines of computing, office automation, personal computing and telecommunications are all converging. The use of each one on its own increases productivity in an application area, but the results can be revolutionary when they touch. This can be seen in the use of videotex for holiday travel, electronic funds transfer, the changing economics of automobile manufacture, the use of an order book to drive flying shears in a metal mill, and so on.

Pressure is beginning to grow from user management and user professionals to develop these total information-processing systems, where the information is practically untouched by human hand from start to finish. It is a pressure sparked off initially by the advent of personal computing. The design engineer who finds it very difficult to become enthused about net requirements planning is pushing hard to have his or her CAD application generate automatically the master files for subsequent product planning.

To underline the obvious, this convergence is on an application basis. The salesperson with a portable terminal and cellular radio wants to co-ordinate his or her activities with the order-handling office on the one hand and with the marketing strategist on the other. The personal computer probably has to be hooked directly into the mainframe applications to expedite the convergence which gives the big bang payoff, and which will give new dimensions to the use of personal computers in business.

The professionals and support staff who are on the periphery of administration, are sucked into a vertical application. But the whole thrust of personal computing, both from suppliers and from users, is that it shall be introduced and managed on a functional basis, and the products, including spreadsheets, reflect this. They are general where they should be specialised and they communicate sideways but not vertically. There are no general-purpose logical hooks. We want a logical RS-232, which is impossible but gives the general idea.

A final statement of the obvious is that the end-user is not going to stay happy with personal computing as now defined. As the power on his or her desk grows, he or she will want to construct personal, sectional and even departmental systems which are independent of the corporate centre. And that means developing languages for open-shop systems development. The user increasingly will insist on talking to the mainframe direct. Just as in the Reformation, when good Christians and true believers wanted to talk directly to God, the user now wants to talk directly to the corporate computer priesthood.

TAILOR-MADE

A summary of all these obvious points shows a market demand for vertically integrated applications which can be constructed largely by screwing together specialised personal-computer products.

The answer to what is needed to enable the personal computer to fulfil its potential now defines itself. First via a spreadsheet-type of program, we want to be able to communicate directly with the corporate computer. We would like to be able to define the contents of a spreadsheet cell so that it arrives automatically into the spreadsheet from a mainframe database. This involves making the

(continued on next page)

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spreadsheet communicate with data dictionaries for all the main databases, Adabas, Total, IMS, IDMS, etc.

This is not as easy as it sounds. If the lines between personal computer and mainframe are not going to be swamped by the sheer volume of data, a lot of processing is required on the mainframe. For example, select a subset of records, select information from a subset of records, accumulate all entries of a particular type, and do all this while sorting into complicated sequences.

Communication also needs to go in the other direction. The personal-computer user will need to update corporate data which today is verboten; the Pope would as soon rent St. Peter's to the Moonies as would DP managers let you modify their central data. Therefore the user needs a sort of interim scratch pad within the central database that he or she can work on and with, and which the DP manager can use to update the corporate data when satisfied with its legality and correctness. Both of these communications flows imply the solution of major software problems.

The next requirement to get personal computers out of the corner that the spreadsheet has pinned them into, is to make the tools modular and specific for specific users. The current armory of spreadsheet, text-editor, database, and communications manager are very good general-purpose tools. But none of them can be ideal for all users, because some users have requirements and profiles which are the exact opposite of others, and this is regardless of whether the packages are integrated with other packages into vertical systems.

THE LAST THING YOU WANT TO DO IS TO SCRAP THE SPREADSHEET OR TO INHIBIT ITS USE . . .

An engineer has different filing, text-editing, graphics and calculation requirements to an economist, accountant, planner or market researcher. The planner might be satisfied with an input/output table that works on straight-line equations; the heating engineer might have all sorts of oddly shaped curves to put into a model. Similarly, a research metallurgist, who seems to spend most of the time bending and stretching and banging and cooking and freezing pieces of metal, feels happier doing all this with double-precision arithmetic. The decision-support theorists all seem to want floating-point as their algorithms go round in ever-decreasing circles. But all of them love using a spreadsheet.

The last thing you want to do is to scrap the spreadsheet or to inhibit its use; you want to develop it into something different. The answer is to make the spreadsheet a central piece of software to which all sorts of different professional requirements can be appended. We want a sort of Meccano kit which we can screw on to the spreadsheet skeleton to meet specialised demand.

Finally, there are couple of other items which should ensure that you swim with the tide. The use of an application generator would be welcome to most professionals. Application generators give users the chance to develop personal systems and sectional systems without having to wait for the computer professional. For them you can wait a couple of years, by which time your initial problem has been replaced by yet another one.

It is a personal-computer business to modularise software to meet end-user requirements, and to match user profiles. The initiative for making the mainframe-to-micro link, probably via an addition to the modularised spreadsheet, must come from the mainframe specialists. Fortunately, there are proprietary databases in fairly common use and I anticipate that spreadsheet interfaces with, say, Total and Adabas will arrive once the need for them is evident.

So this is how to move out of the corner personal computers are pinned into. The message is that software must be market-led and not technolgy-pushed. Very probably most designers think it already is, but they have not understood their potential market, nor where it is taking them. The twin answers are modularity to reflect the different kinds of users and a two-way link-up with mainframes. You will then see business providing the rather frightening sums of money necessary if, as all the forecasts say, four out of five staff are to be using personal computer work stations by the end of the decade. PC

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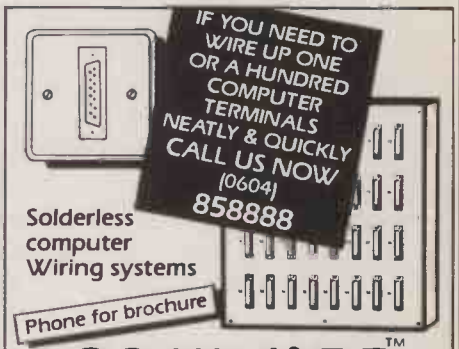

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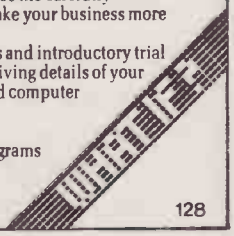

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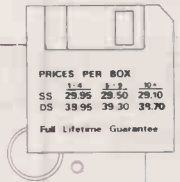

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