REVIEWS

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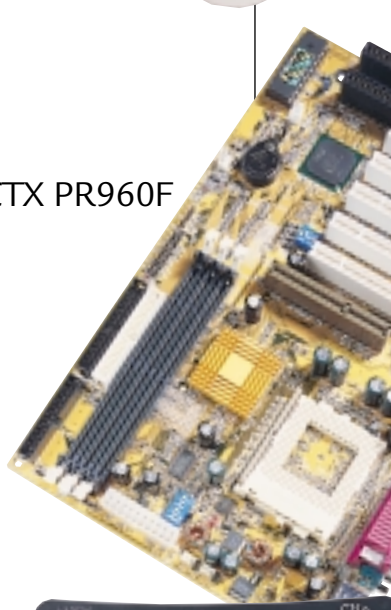


Nik Rawlinson
DEPUTY EDITOR

Freedom frighters

Some people never give encryption a second thought. To them it's just a technology the US government would rather never see cross their borders. To others, and to Vancouver resident Jim Bell in particular, it holds far more meaning. In the mid-1990s, Bell wrote a ground-breaking Internet essay entitled *Assassination Politics* in which he outlines how an organisation would be able to use digital cash to award prizes to anybody who correctly predicted the day on which a public figure died. Members of the public would also be able to make anonymous contributions to the fund.

Of course, as the prize fund increases so it becomes more likely that someone will eventually make a prediction and then ensure that they win by knocking off said subject themselves. It's worth reading the whole 16,500 words of Bell's article (http://jya.com/ap.htm) to get the gist of how it works, but the organisation administering the scheme would bind the digital cash prize fund to a key and post it on the Internet. Whoever correctly 'predicted' the death would then be able to separate the cash from the key and bank it. Moreover, by Bell's reckoning, there would be no way for the authorities to trace the cash.

The implications are far reaching. No public figure could feel sure that their next action would not make them the next target. A chancellor announcing a rise in income tax on television one minute could become the Internet's most wanted person (and most valuable property) the next. It would be the end of politics as we know it. If you think I'm exaggerating, read Bell's article.

For this and other reasons, Bell's house was raided in a pretty heavy-handed manner. Having found a printed copy of Assassination Politics in his car (it had been impounded by the IRS) the authorities came ready for trouble. He currently resides in an institution in Phoenix, Arizona. His case is well documented online, though, and you can see scans of government documents pertaining to the search of his house (www.parrhesia.com/jimbell/).

Now there's a saying that it's not the bullet that kills but the hand that pulls the trigger (Scaramanga to Bond, *The Man with the Golden Gun*) and I fear I'm going to make a similar assertion here: it's not the computer that does the wrong, but the user. I'm no longer talking about Bell or his writings, but about the world in general. It's a fact that the Internet was used to coordinate simultaneous rallies against world trade (last summer in London and autumn in Seattle both spring to mind). But while there is no denying the Internet facilitated the formation of these organised groups, there were more powerful forces at work.

Governments around the world are concerned at the freedom that encryption gives wired users

The print and broadcast media reported the fact that the Internet was being used in this way, effectively driving more people to the sites and promoting the activists' cause. Yet it was not they but the Internet that got the blame.

Governments worldwide are concerned at the freedom encryption gives wired users, and are eager to ensure they are able to decode and read any email they wish. Many are putting the pressure on ISPs, holding them liable for material that passes through their servers.

Jim Bell's article has been on the Internet for years and the technology is in place to realise his ideas but *Assassination Politics* has not come about. Perhaps this ought to indicate to the authorities that they should look at what makes people want to use the Internet in the way they would rather they didn't instead of reacting to, and fuelling, moral panic.

VNU European Labs

VNU Labs tests all kinds of hardware and software, from PCs and modems to databases. All our tests simulate real-world use and for the most part are based on industry-standard applications such as Word, Excel, PageMaker and Paradox. Our current PC tests for Windows 98, NT and 2000 are the SYSmark tests from BAPCo. In all our performance graphs, larger bars mean better scores.

ratings

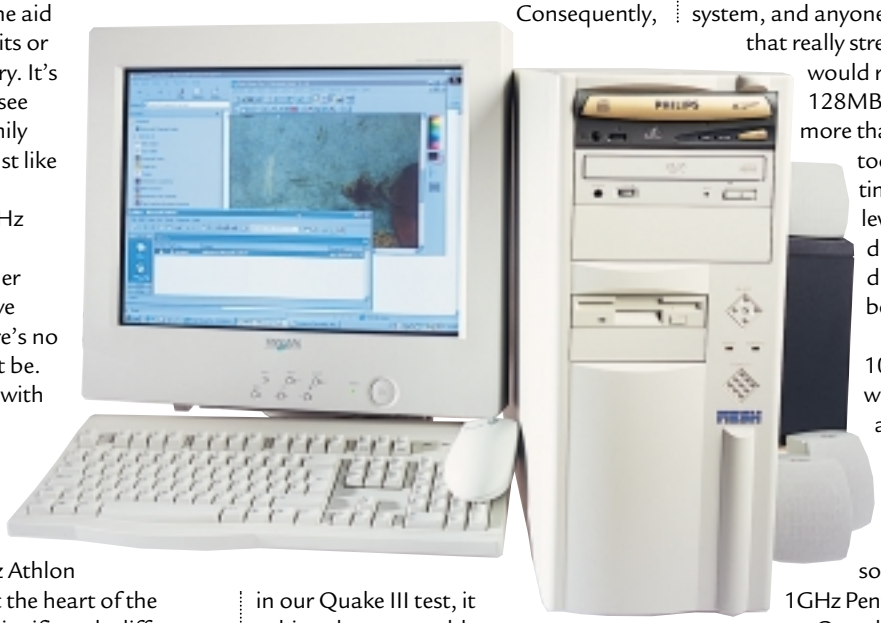
★★★★★	EXCELLENT
★★★★	VERY GOOD
★★★	AVERAGE
★★	BELOW AVERAGE
★	POOR

Mesh Matrix 1GHz Ultra

Owning the fastest chip on the block may meet the demands of your ego, but perhaps that's all.

So, here we are. The once dreamed-of home PC, with a processor running at one thousand million clock cycles every second, without the aid of refrigeration units or other jiggery-pokery. It's strange when you see one, because, funnily enough, it looks just like a normal system.

The Matrix 1GHz Ultra is similar in appearance to other Mesh systems we've reviewed, and there's no reason it shouldn't be. That's the trouble with dreams becoming reality: they're often more pedestrian than you'd like.



The 1,000MHz Athlon screaming away at the heart of the Matrix Ultra isn't significantly different to the slower-clocked parts we've seen in other machines in recent months. Incremental improvements in the 0.18micron fabbing process have simply meant higher yields, with enough dropping off the production line to make it feasible to sell them in quantity. The processor's 512KB Level 2 cache remains off-chip and running at one-third clock speed, in contrast to current Coppermine PIIIs with their more effective complement of 256KB running at full core speed.

We expected the first commercially-available, non-refrigerated 1GHz machines to be high-end, but by current standards the Ultra is mid-range. For a start, it's running Windows 98SE, rather than Windows 2000, and its storage subsystems are EIDE rather than SCSI. The processor is backed up by a single 100MHz, 128MB SDRAM DIMM, and a fast 34GB IBM 34GXP Deskstar EIDE hard drive – the highest specification Deskstar, with 7,200rpm spindle speed and a 2MB data buffer. Graphics are handled by the more-than-capable Guillemot 3D Prophet Pro DDR-DVI, which – as the name suggests – sports double data-rate memory and a digital flat panel interface. The latter feature is completely useless to 99.9 per cent of the population, but the card itself is one of the fastest of the current crop and the DVI interface may be of use in the future.

Consequently, in our Quake III test, it achieved a respectable result of 79.6fps. A Taxan Diamondtron-based 980TCO99 monitor looks excellent at 1,280 x 1,024.

With the massive capacity of hard drives these days, some form of large backup medium is essential, so the Philips CD-RW drive is a sensible inclusion with four-speed CD-R, four-speed CD-RW, and 24-speed CD-ROM performance. It comes with a blank CD-R and CD-RW, plus CeQuadrat recording software. It seems that to keep the total price of the Ultra below £2,000 ex VAT, Mesh has cut back on the sound card: with this system you get a SoundBlaster Live! Player 1024, rather than the Live Platinum supplied with the 850MHz Matrix we reviewed in the April issue. Not much of a drawback, unless you're seriously into PC-based music, and you get the capable set of Labtec LCS-2514 speakers.

The Ultra's components are plugged into an MSI K7 Pro motherboard, which sports AMD's own 750 chipset. With the PCI sound card and 56K PCI modem already present, there are three PCI slots and one shared slot free. Despite Intel's demands for 'legacy-free' systems, that extra ISA slot is still worthwhile, particularly for old network cards.

There's little denying that, at the moment, there are no good reasons for the majority of consumers to buy a 1GHz system. Given that the most demanding games run silky-smooth on a 600MHz system, and anyone running applications that really stretch this processor would require more than 128MB of RAM, it's little more than a showcase a bit too far ahead of its time. At the professional level, AMD is still at a disadvantage, as no dual Slot A motherboards are available.

There's also the 100MHz of SDRAM, which is fast becoming a millstone round the neck of current systems, and could be the factor that propels Intel's latest solutions to the fore (see 1GHz Pentium III review, p75).

Overall, the Matrix Ultra is a fine system and a definite milestone, but plumping for a 750 or 800MHz processor would provide near-identical performance in the real world, for a lower price.

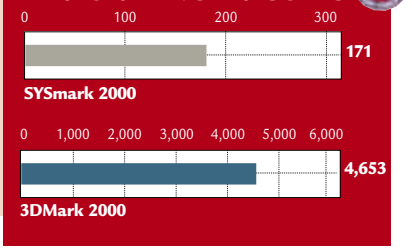
DAVID FEARON

DETAILS

★★★★

PRICE £2,349 (£1,999 ex VAT)
CONTACT Mesh 020 8208 4706
www.meshplc.co.uk
PROS Crikey, 1GHz!
CONS Only professional applications can make serious use of so much number-crunching power
OVERALL A 1GHz processor is far better suited to a Windows 2000 workstation: consumer-based applications just don't need it at the moment

PERFORMANCE RESULTS



Dell Dimension XPS B1000

A great PC using Intel's take on the 1GHz CPU.

With the constant cat-and-mouse game AMD and Intel have been playing, it's no surprise that the 1GHz Pentium III has arrived at the same time as the 1GHz Athlon (see previous page).

It's not just the processor that's special in Dell's new flagship, though. It's supported by an Intel VC820 motherboard, with its i820 chipset giving support for RAMBUS (DRDRAM) memory. The big advantage of Direct RDRAM is higher bandwidth – the single 128MB Samsung PC700 module in the B1000 gives a peak transfer rate of 1.3Gbytes/sec, as opposed to 763Mbytes/sec for a standard PC100 DIMM module. The much-publicised technical problems of the system limits the number of RIMM sockets in the system to two, however.

Unusually for a system vendor, Dell is now taking the lead on the component manufacturing front. The B1000 Special Edition sports Dell's GeForce 256-based graphics card, with DVI output, plus DDR (double data rate) SGRAM. Nothing too unusual there, except that there's 64MB of it, making it the first GeForce to sport more than 32MB, reducing the performance hit from pulling textures from main memory over the AGP bus.

The Pentium III is a Slot 1 device, and, as with the 1GHz Athlon, it's no different from the Coppermine PIIIs, except that it's clocked faster and runs with an increased 1.7v core voltage. Not surprisingly, the 1GHz PIII is an 'EB' chip, with a front-side bus speed of 133MHz, helping to take advantage of that increased memory bandwidth offered by the RDRAM.

To eliminate any potential heat problems, the CPU in the B1000 has a monstrous heatsink mounted on it, and is actively cooled by the company's standard arrangement of a cowling that directs air flow from the case fan. This does make things look a little cramped in the case, but the cowling is easily removed to get access to the processor.

The rest of the system is up to scratch, with the processor and graphics card supported by Quantum's latest 30GB Fireball Plus LM hard drive. Its specs equal the more popular IBM Deskstar GXPs, with a spindle speed of 7,200rpm and a 2MB data buffer.

Dell hasn't forgotten to pay attention to that all-important aspect of any high-end system, the monitor. It's thinly disguised with a Dell badge, but it's a Sony-made 19in FD Trinitron unit. It's not up to the standard of Sony's latest G500 19-incher, with an older variant tube that has variable centre-to-edge grille pitch, but it's still an excellent monitor that will manage 1,280 x 1,024 with no problem.

As far as expansion capability goes, the VC820 maintains Intel's goal of legacy-free systems by denying you any ISA slots, but you do get three free PCI slots, with the other two occupied by the 56K modem and SoundBlaster Live! Value sound card. With the presence of the NEC DVD drive and the Sony CD-RW drive with eight-speed CD-R, four-speed CD-RW and 32-speed CD-ROM performance, there are no more 5.25in bays, but there are two front panel 3.5in bays spare, plus an internal 3.5in drive cage. Just about the only state-of-the-art feature that the Dell lacks is an optical mouse, but the three-button Logitech Mouseman Wheel is pretty good. Microsoft Office 2000 Small Business Edition and Norton AntiVirus 2000 provide a solid software base.

With a SYSMark 2000 score of 184 and almost 5,000 3DMarks, the B1000 outclasses the Athlon-equipped Mesh Matrix 1GHz Ultra in the speed stakes. But a serious downside is that the graphics card, the 820 motherboard and RDRAM all add up to a considerable price premium over the Mesh, making the B1000 affordable only for seriously dedicated early adopters. And the provisos regarding the installation of Windows 98 and small quantity of RAM on such a powerful system apply as much to this machine as they do to the Ultra. Overall, though, it looks like AMD needs to release the Thunderbird Athlon and come up with DDR SDRAM-based systems to carry on competing effectively with Intel in pure performance terms.

Questions of price aside, there's no denying the Dimension B1000 SE is a top-notch system in every sense of the word, and if you must have the fastest machine around, it's the PC to go for.

DAVID FEARON

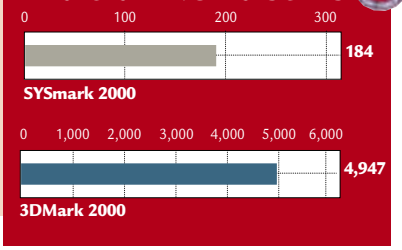
DETAILS

★★★★★

RECOMMENDED PERSONAL COMPUTER WORLD

PRICE £3,136 (£2,669 ex VAT)
CONTACT Dell 0870 907 5869
www.dell.co.uk
PROS Walks off with the honour of being the fastest PC we've ever tested
CONS Far more expensive than the Mesh Matrix 1GHz Ultra, making it strictly a system for well-to-do early adopters
OVERALL It performs well, but at a price

PERFORMANCE RESULTS



Sony Vaio PCG-Z600RE

Sony has always had lots of tricks up its sleeve, and it has put plenty in its new ultra-portable.

Even though Sony more or less invented the ultra-portable notebook with the Vaio 505 series, it hasn't sat back and rested on its laurels. Sony has managed to improve on its own designs while the competition is still trying to catch up.

The Z600 represents a variation on the 505 theme, coupling improved specification and performance with slightly increased size and weight. That said, the Z600 is still svelte and weighs in at an insubstantial 1.7Kg.

Beating at the heart of the Z600 is a 500MHz Pentium III processor, backed up by 128MB of RAM, which is pretty impressive for an ultra-portable. As with previous Sony models, the casing is constructed from a magnesium alloy and sports the now famous silver and lilac Vaio colour scheme.

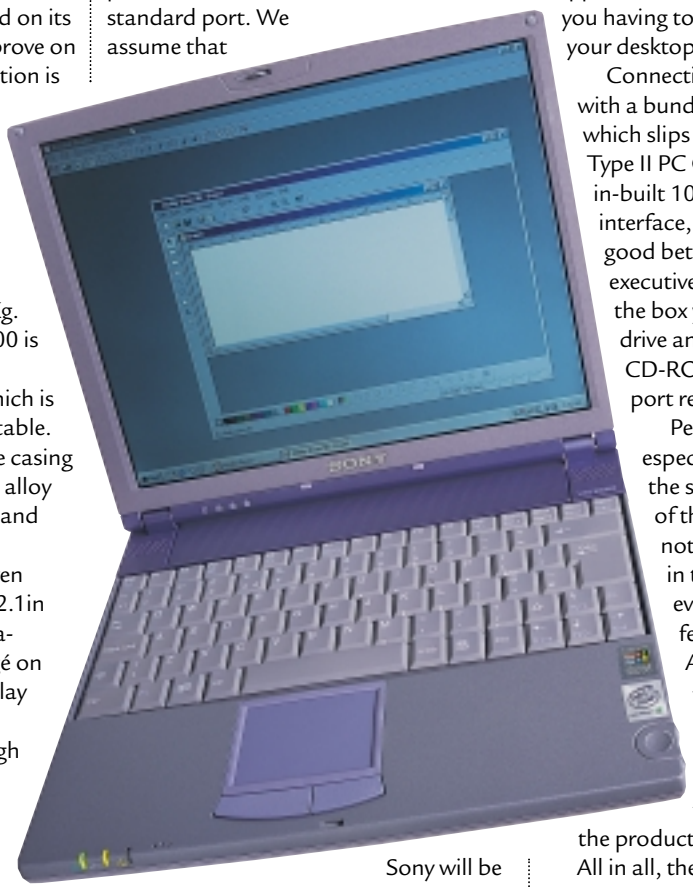
The screen is excellent, with even lighting and vibrant colours. At 12.1in it's larger than previous Sony ultra-portables and the Toshiba Portégé on page 77. That said, the Z600 display sports the same 1,024 x 768 resolution as the Toshiba, although some users may find the larger screen easier on the eyes.

The keyboard is equally good, especially given the shallow dimensions of the casing. The keys are full size and there's a decent amount of travel, plus the Enter and Backspace keys are larger to ensure an accurate and fast typing rate. A high-quality touch pad sits beneath the space bar making pointer manipulation a breeze. It's also recessed deep enough to avoid any accidental activation when typing.

Now that we've covered the basics, let's take a look at what makes Sony notebooks special.

First up is Sony's trademarked i.LINK connector, which is basically an IEEE1394 (FireWire) interface. The reason that Sony has always included this interface in its notebooks is that the company also produces digital video camcorders. If you happen to have a DV camcorder you can connect it to the Z600 via the i.LINK port and transfer your movies, edit them and transfer them back without any loss of quality. Thankfully, at 12GB, the Z600 has a decent size hard disk.

There are also two USB connectors. One of them is a full-size, standard USB port, while the other is a small non-standard port. We assume that Sony will be producing products to connect to this non-standard port in the future, possibly the Music Clip MP3 player that debuted at Comdex last year. That said, if you need to connect a standard USB device there's a handy convertor in the box.



Next to the small USB port is the most unique feature that the Z600 has to offer: a Memory Stick slot. Memory Stick is Sony's solid-state, removable memory which is already used in its digital cameras, music devices and robot dogs. The Memory Stick slot acts like a removable storage device: files can be dragged to and from the memory stick just like a hard disk. This makes the Z600 an ideal companion for a Sony digital camera, so you can take pictures and transfer them simply – without the need for cables.

On the opposite side of the chassis from the Memory Stick slot is a jog dial. This allows you to scroll through various applications and launch them by pressing the wheel. You can also add any application to the jog dial menu to save you having too many shortcuts on your desktop.

Connectivity is well catered for with a bundled 56K PC Card modem, which slips handily into the single Type II PC Card slot. There's also an in-built 10/100 Base-T network interface, making the Z600 a pretty good bet for the jet-setting executive. In addition to this, in the box you get an external floppy drive and an external 16-speed CD-ROM drive, as well as a port replicator.

Performance is impressive, especially when you consider the size of the Z600. It beat all of the ultra-portable notebooks which appeared in the April group test, and even a number of the fully-featured models.

Additionally, the price of £1,959 ex VAT is very reasonable, considering the high quality of the package as a whole and the outright desirability of the product.

All in all, the Z600 sets a new standard for the ultra-portable notebook. If you're looking for a well-specified and incredibly stylish, super-slim mobile computer, this is it.

RIYAD EMERAN

DETAILS

★★★★★

PRICE £2,301.82 (£1,959 ex VAT)
CONTACT Sony 08705 424 424
www.sony.co.uk
PROS Slim, sexy and feature packed
CONS Absolutely none
OVERALL A truly stunning piece of design and technology. If you want to be the envy of your peers in the executive departure lounge get a Sony Vaio PCG-Z600RE

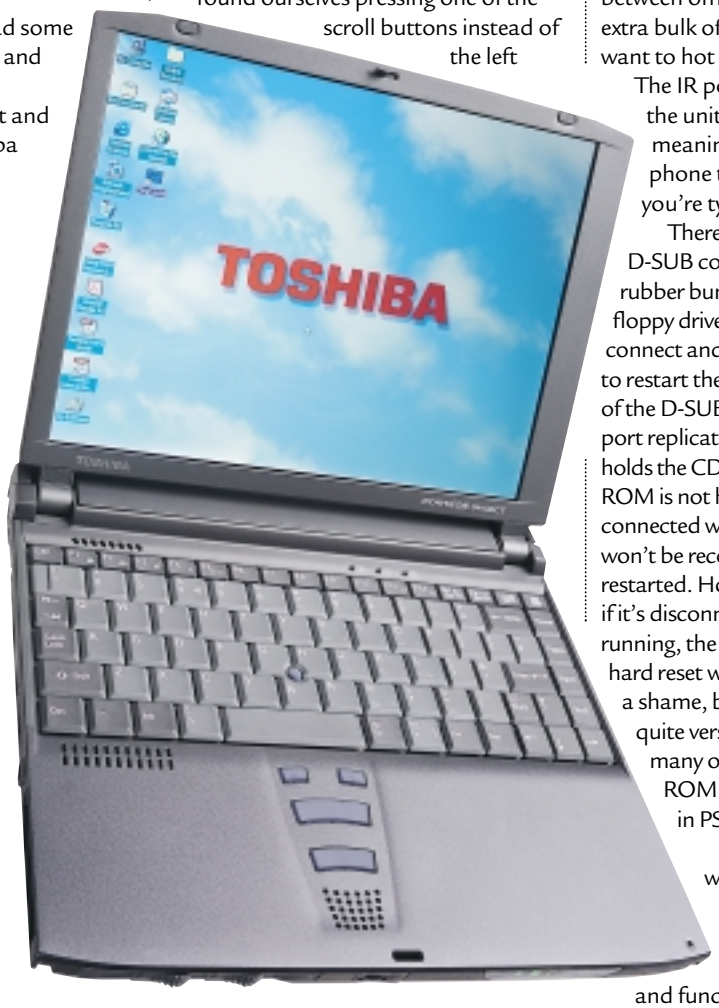
PERFORMANCE RESULTS

Toshiba Portégé 3440CT

A beautifully realised ultra-portable that has addressed the faults of its predecessor, with ports galore.

The Portégé 3440CT is the successor to the 3110CT that we reviewed in the April notebook group test. We had some issues with the specification and the screen resolution of the 3110CT when we reviewed it and we're glad to say that Toshiba has addressed both these points.

Driving the Portégé is a 500MHz Intel Pentium III processor backed up by 64MB of RAM. This is a pretty impressive specification for an ultra-portable notebook and it helped the Toshiba to produce a respectable SYSmark score of 92.



The 11.4in TFT screen is a fine example of the technology and sports a resolution of 1,024 x 768. This is a major improvement on the 3110CT that could only manage 800 x 600. It is, however, somewhat disappointing that the screen wasn't made larger, since there is a fair amount of space surrounding the display that could have been utilised. Strangely, the screen can't be tilted back very far: the battery, which clips to the rear of the chassis, prevents free movement. This shouldn't be too much of a problem, but on the odd occasion when you want to show others what's on your screen it could be an issue.

Like the 3110CT, the 3440CT keyboard doesn't exhibit too much travel in the keys, but you can get used to that. The main issue is the size of the Enter and Backspace keys. The Enter key is tiny and easily missed, but the Backspace key is not only small but also has the Home key positioned next to it. This means that you can accidentally press Home when you're trying to delete a character and end up with your cursor in the wrong place.

Toshiba uses trackpoints rather than touchpads for pointer manipulation, and the example on the Portégé is first rate. However, the array of selector buttons includes two scroll buttons, which in practice work well, but we too often found ourselves pressing one of the scroll buttons instead of the left selector button. Positioning the scroll buttons underneath or to one side would have resolved this issue.

Considering the slimline chassis of this machine, there's quite a lot stuffed inside. Surprisingly, for an ultra-portable, there are two stacked Type II PC card slots that will also accept a Type III card. Also welcome is a D-SUB monitor connector. This means that you don't need to carry around the port replicator if you have a presentation to give. That said, the port replicator is fairly well designed, although the cable that connects it to the notebook is a little bulky.

There's a built-in V.90 modem to keep you connected on the move, but if you want network access you'll have to connect it up to the port replicator, which is a little disappointing, especially since the Portégé is aimed at the corporate user. So if you need to travel between offices you'll have to carry the extra bulk of the port replicator if you want to hot desk.

The IR port is located at the front of the unit rather than at the side, meaning that positioning a mobile phone to communicate with it while you're typing could be difficult.

There's a USB port next to the D-SUB connector, covered by a sturdy rubber bung. The supplied external floppy drive connects via USB, so you can connect and disconnect it without having to restart the machine. On the other side of the D-SUB port is the connector for the port replicator and the external bay that holds the CD-ROM drive. Sadly, the CD-ROM is not hot-swappable. If it's connected while the machine is running, it won't be recognised until the system is restarted. However, more alarming is that if it's disconnected while the machine is running, the notebook will hang and a hard reset will be necessary. This is a bit of a shame, because the external bay is quite versatile and can accommodate many other devices such as a DVD-ROM or Zip drive. It also has built-in PS/2, serial and parallel ports.

Ultimately, the Portégé is a well built ultra-portable notebook, but it's playing catch up to the Sony Vaio Z600 in both the design and functionality stakes.

RIYAD EMERAN

DETAILS

★★★★

PRICE £2,297 (£1,955 ex VAT) including CD-ROM

CONTACT Toshiba 01932 828 828

www.toshiba.co.uk

PROS Slim and light with a decent spec

CONS Keyboard could be better, no internal network interface, IR port position

OVERALL A decent ultra-portable notebook, let down by a few design problems

PERFORMANCE RESULTS

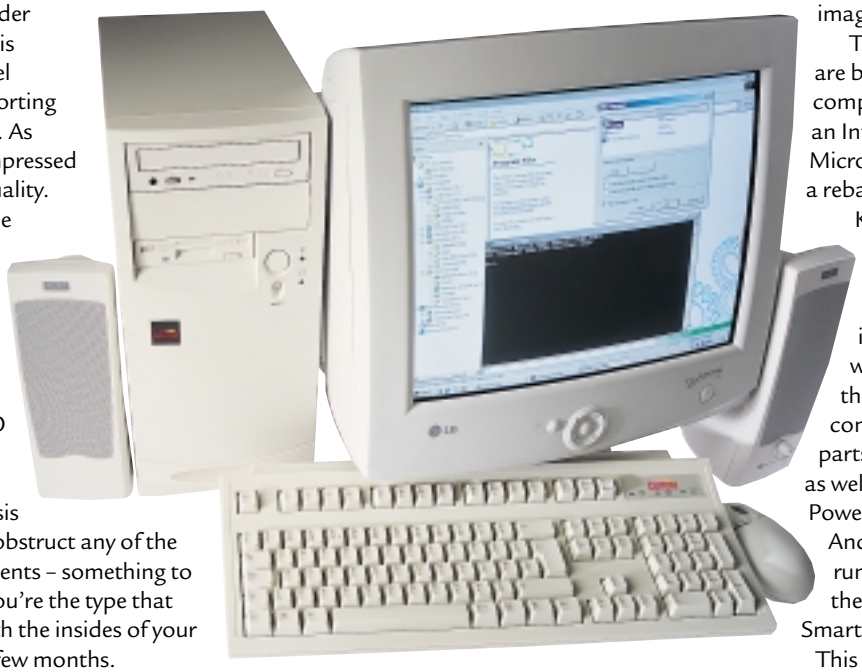
SYSmark 2000

Carrera Lynx W600

The first of the new 600MHz Celerons has arrived in a system of surprisingly high specs and low price.

Once again Carrera has proved how it can turn around new technology quicker than anyone else, supplying us with this 600MHz-based Celeron PC one day after the chip was made available to manufacturers.

It comes in a compact case that should have no trouble finding a home on or under most desks, and is housed in an Intel motherboard sporting the 810e chipset. As usual we were impressed with the build quality. The interior of the machine was among the tidiest we have seen, with all cables neatly tied back in place and the CD audio cable traced neatly around the chassis so that it didn't obstruct any of the internal components – something to bear in mind if you're the type that likes to tinker with the insides of your machine after a few months.



If you are a serial upgrader, you'll find three empty PCI slots, thanks to the fact that most of the components are mounted directly onto the motherboard. Carrera has incorporated a second nine-pin serial port into the Lynx W600 by tracing a lead from the internal connector on the motherboard to an output on a blanking plate. This obstructs the lower PCI slot, but is easily removed should you decide you need to use that slot in the future. External connectivity has been considered, too, and you'll find a 56K modem in the motherboard's AMR slot. To save you investing in a socket doubler to dangle from the wall, this also has a telephone pass-through point.

There's 128MB of RAM, which is currently more than enough for all but the most demanding user, who would be less likely to buy a Celeron anyhow. A 13GB Western Digital Caviar hard drive, meanwhile, handles storage. This 7,200rpm UltraDMA66-compliant device is mounted in such a way as to give you room to fit a secondary device beside it should you choose. Optical storage comes in the form of an eight-speed Panasonic DVD-ROM drive and this was very slow to eject discs.

Graphics are handled by the 810e graphics chipset, so it's not going to be the best games-playing device around, but there are plenty of competent PCI graphics cards on the market should you feel the need to upgrade. The poor handling of graphics is not a criticism of Carrera – it is an integral part of Intel's processor strategy. Sound is also handled by onboard processors and arrives at your ears courtesy of a set of 10W Altec Lansing ACS-22 tower speakers.

The monitor is an LG StudioWorks 775N model incorporating LG's usual excellent OSD. This has two preset colour temperatures, which are supplemented by a user-defined option and five shape and orientation-adjustment settings, including rotation, in addition to the usual positional controls. Unfortunately, cost-cutting on LG's part means it has a captive video cable, so if you have any problems with this relatively inexpensive component you'll end up having to replace the whole monitor. On the positive side, though, screen uniformity is good, with even colours across the whole surface. The focus is sharp, right into the difficult to control corners, and there is absolutely no evidence of undesirable streaking where dark and light areas meet. Colour registration is spot on, proving that all electron guns line up on both the horizontal and vertical planes. Regulation is also fair, so that applying a flashing white block to an otherwise blank screen results in only minimal image expansion.

The keyboard and mouse are both top-notch components, the former is an Intellimouse from Microsoft and the latter is a rebadged Key Tronic. Keyboards are a very personal thing, but the Key Tronic brand has always gone down well in the *PCW* office. As with all Carrera machines, this system comes complete with a two-year parts and labour warranty, as well as 12 months of PowerGen Internet Access. And, to get you up and running from day one, there's a copy of Lotus SmartSuite Millennium, too.

This machine is very similar to the Lynx W533 that won a recommended award in our April issue, and obviously heeding the adage 'if it ain't broke, it don't need fixing' Carrera has come up trumps again.

NIK RAWLINSON

DETAILS

★★★★★

RECOMMENDED Personal COMPUTER WORLD

PRICE £821.33 (£699 ex VAT)
CONTACT Carrera 020 8307 2800
www.carrera.co.uk
PROS Rapid integration of the latest technology, compact case, quality peripheral components, affordable
CONS None
OVERALL A well built and sturdy machine, perfect for the home user who is not mad about games

PERFORMANCE RESULTS

Dan Dantum 866PC

A machine with lots of room for expansion.

While the recent arrival of 1GHz CPUs may have stolen the thunder of perfectly good systems running a fraction slower, please give respect where it's due to the first PC we've tested which houses an Intel 866MHz Pentium III.

There's 256MB of PC100 SDRAM, installed as a pair of 128MB DIMMs – the four memory slots can house up to 4GB of SDRAM in total. Of course, you'll have to wait for 1GB DIMM modules to appear if you want to take advantage of this. Storage is courtesy of an 18GB Western Digital Ultra160 SCSI hard disk, and the combined DVD-ROM/CD-R/CD-RW talents of Ricoh's MP9060A EIDE drive. Graphics are provided by the supremely quick Creative Labs GeForce 256 AGP card, with 32MB of super-fast DDR memory, but sadly no DVI interface for digital connectivity with future displays. It did, however, deliver an impressive 75.8fps in Quake III Arena at 1,024 x 768 in 16bit. Finally, it would be rude not to throw in a 56K PCI internal modem, so Dan has fitted one of these, too.

An excellent Iiyama VisionMaster Pro 450 19in monitor is supplied, capable of supporting flicker-free high resolutions of 1,600 x 1,200 at 90Hz or 1,280 x 1,024 at 110Hz, using its perfectly flat Mitsubishi Diamondtron NF tube. Dan also supplied Creative's CSW100 stereo speakers and subwoofer. We must finally mention the tall case with neat interior and absolutely loads of room for growth – no fewer than four 5.25in and three 3.5in drive bays are available, and only one out of the six PCI slots is occupied.

The interesting part of the system, however, is the Supermicro PIIIDM3 motherboard, based on Intel's top-of-the-range 840 chipset. Supermicro offers three versions of this motherboard and these are identical apart from their onboard SCSI configurations.

The PIIIDM3 is the middle of the range, and features Adaptec's fastest Ultra160 SCSI with three onboard SCSI connectors: 68-pin Ultra160 LVD/SE, 68-pin UltraWide and 50-pin Ultra. Unfortunately, the SYSmark 2000 and 3DMark 2000 benchmarks did not like the SCSI chipset, and hence we were unable to obtain any scores for the system, although this should neither be blamed on Dan or taken as an indication of an unreliable system.

All three motherboards feature UltraDMA66 interfaces, onboard 10/100 Ethernet, onboard audio, an AGP Pro slot (compatible with AGP 2X and 4X), and a pair of 64bit PCI slots; you'll be pleased to hear that the onboard SCSI is housed on the 64bit PCI bus. Most importantly, all three boards support dual Slot 1 CPUs, and although Dan has fitted just the one 866MHz PIII, a second could be added as a great upgrade in the future. However, you would also need to upgrade the operating system, as Dan has installed Windows 98 SE, which can only recognise a single CPU.

The 800 series chipsets were originally designed for RAMBUS memory, but issues with supply and cost resulted in Intel creating its Memory Repeater Hub (MRH-S) that allows you to use standard PC100 SDRAM DIMMs. Note that even if the front-side bus is running at 133MHz, as it is in this system, the MRH-S only drives SDRAM at 100MHz.

Disappointingly, SDRAM suffers from lower performance under an 800/MRH-S chipset than on the aging Intel BX chipset. On the plus side, the 840 chipset uniquely boasts dual-memory channels. While originally designed to double the RAMBUS bandwidth, Supermicro has fitted a pair of MRH-S chips on its 840 boards, theoretically doubling its SDRAM performance.

You must install two DIMMs at a time, but overall SDRAM performance on the PIIIDM3 certainly appears to be above that of BX. Note that, as we went to press, Intel admitted there was a problem with the MRH-S used on 840 motherboards, which has problems with high-end ECC memory often used in servers. If you're considering using ECC memory, try and avoid the 840 until this is resolved.

Even with its problems, the 840 chipset isn't all bad and, housed in Supermicro's motherboard, it provides this workstation with excellent performance today and plenty of room for expansion in the future. After all, Ultra160 SCSI has sufficient bandwidth for anyone, the maximum 4GB memory is very comfortable, while the ability to pop in a second CPU offers a neat boost in performance. There are also more spare drive bays than you can shake a stick at.

GORDON LAING

DETAILS

★★★★

PRICE £2,635.53 (£2,243 ex VAT)
CONTACT Dan 0870 444 7020
www.dan.co.uk
PROS Great components – including Ultra160 SCSI and dual SDRAM channels
CONS 840 chipset is expensive and unreliable with ECC memory
OVERALL A solid workstation with lots of expansion possibilities

PREVIEW

Carrera Music PC

A system built specifically for the needs of the PC musician and which slots neatly into your effects rack.

Musicians have a lot to put up with when it comes to PCs. Not only do they have to use an operating system that wasn't designed for real-time applications, such as audio mixing, but they also have to live with the fact that PCs come in desktop boxes. Really what musicians want is for their PC to fit neatly in a 19in rack with all their other audio gear.

While there's not much you can do about the first problem, Carrera has finally sorted out the second one. To our knowledge, the company is the first PC manufacturer in the UK to offer musicians a PC stuffed solely into a dedicated 19in rack case. Once you've used this case you'll start to see why this is such a good idea. All your audio connections are located at the back of the rack, just like on your other audio equipment, so it's easy to patch your sound card outputs into a rack-mounted mixer or patch bay.

The machine we've looked at here is a prototype model that Carrera is developing, so the final case configuration will change for its release. We'll be reviewing the production model as soon as we can get our hands on it. Currently, though, the PC has a 600MHz Pentium III with 128MB of SDRAM. You also get a 56K modem, a DVD drive and a Yamaha CD-RW, with eight-speed CD-R, four-speed CD-RW and 24-speed CD-ROM performance, which is ideal for backing up audio files. Carrera has split the 20GB hard drive into two equal partitions: one for your applications, and the other for audio files.

The graphics card is a dual-head Matrox G400 Max, which means if you've got an old monitor lying around you can use this in conjunction with the bundled Hansol 710A 17in model to give you extra screen space – something that can become a scarce commodity when running lots of audio applications at the same time.

What's really cool about this machine is the inclusion of Yamaha's SW1000XG sound card and Cakewalk Pro Audio 9. The SW1000XG is a very versatile card. Not only do you get a 64-voice synth using 20MB of wavetable sounds, but also five independent effects, ranging from great sounding reverbs to a licensed Aphex aural exciter.

As you'll know, if you read our review in the April 2000 issue (p114), Cakewalk is a fine audio and midi sequencer. It's easy to use and studio panels are available to control the SW1000XG from within the program.

You also get a pair of VideoLogic Sirocco self-powered speakers which, while being no replacement for pro studio monitors, are ideal for day-to-day listening. On the downside, the MIDI keyboard Carrera has also included is less than ideal. It's the Evolution Dance station – a short, single-octave keyboard that is hardly suitable for serious work.

As this is an early prototype machine, there are still a number of issues with the PC. For a start, the power supply is currently mounted at the front of the unit, meaning that both the fan and the voltage switch are facing you when you drop the hinge door at the front.

There are currently also too many fans inside the case. Two of these blow cool air across the motherboard, while another located at the rear of the case expels air out the back of the machine. When you also take into account the power supply fan and the CPU fan, this all adds up to quite a lot of noise, which might be OK in a live situation, but is hardly ideal for a studio environment.

However, Carrera is sourcing new rack-mount cases and promised that this wouldn't be a problem with the production model – the company is also planning to fit whisper fans to reduce the noise level further. Another problem we noticed is that the edge of the SW1000XG card is currently flush with the top cover of the rack case. This obscures the connectors at the top of the SW1000XG used for adding Yamaha's plug-in synth add-on cards. Hopefully this won't be a problem with the new cases.

Overall, Carrera has made a major step in the right direction when it comes to delivering what serious PC musicians need. We'll be looking at the finished version of this PC in an upcoming issue to deliver our final verdict. Carrera is also selling a standard desktop model for around £100 less.

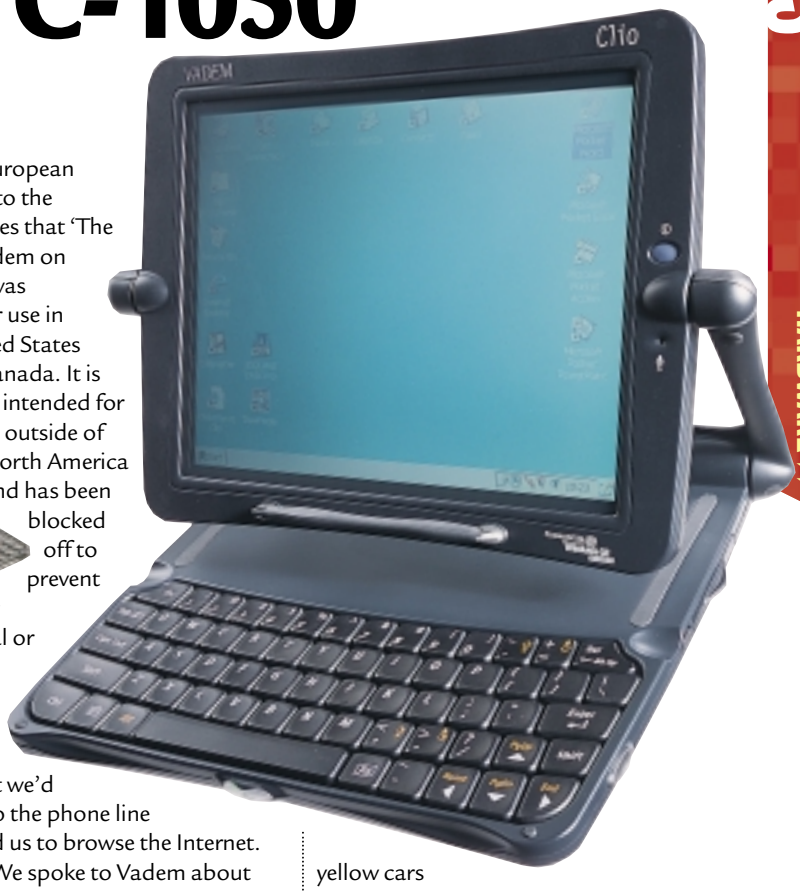
NIALL MAGENNIS

DETAILS

PRICE £2,172.58 (£1,849 ex VAT) estimated
CONTACT Carrera 020 8307 2800
www.carrera.co.uk
PROS Great rack-mount case idea, excellent sound card, good speakers, CD-RW included
CONS Fans are noisy in this prototype and there is no room to add the connectors for the plug-in modules available from Yamaha, poor midi keyboard
OVERALL Carrera has put together a solid bundle for serious musicians. The SW1000XG offers a huge palette of sound effects and the rest of the system's specs are equally impressive. We have high hopes for the production model – stand by for a full review

Vadem Clio C-1050

A stylish, versatile and portable notebook.



The Vadem Clio is one of those products that is hard to pigeonhole. When you first open it up it looks pretty much like a notebook replacement with unusual styling. Rather than opting for the more common clamshell design, the 9.4in DSTN touch-sensitive screen is mounted in the middle between two side supports, to allow it to be positioned comfortably.

Further investigation reveals that the screen can be rotated 180 degrees in the vertical plane, to allow the unit to fold completely flat and be used as an A4 tablet. In between these two extremes, it can also be positioned in an upside down 'V' configuration and be used as a freestanding display. It is this flexibility of design that sets the Clio apart from the competition.

The Clio shows that if there is one place that Windows CE works, it is on a full-size display. The 640 x 480 resolution, supporting a colour depth of up to 16bits, makes the constant task bar and permanent menu strip bearable. When running Windows CE Professional version 3.01, you'll find pocket versions of Word, Excel, PowerPoint and Access, along with the Contacts, Tasks, Calendar and Inbox components of Outlook.

Also in the bundle you'll find a copy of Pocket Internet Explorer and ParaGraph's CalliGrapher handwriting-recognition software. While other recognition packages require that you learn a new character set or spend time teaching it to recognise your handwriting, CalliGrapher offers full cursive recognition, so you can simply pick it up and use it.

The unit itself is small, measuring just 11.25 x 8.75in at its extremes. The keyboard is fair, but rather annoyingly curved, which can make typing a little difficult at times. The keys are also overly rounded on all edges, making it easy to catch the adjacent key by accident.

On our review unit there was a 56K modem included that connects through the RJ-11 socket on the left-hand side, next to the power connector and serial port. The European addendum to the manual states that 'The built-in modem on this device was designed for use in the United States and Canada. It is not intended for use outside of North America and has been blocked off to prevent any accidental or improper use', which left us wondering exactly what we'd plugged into the phone line that allowed us to browse the Internet.

We spoke to Vadem about this and were told that the modem was not BABT approved, and so could not be used in the UK, but had been left in for the mobile user travelling elsewhere in the world.

The battery compartment at the rear of the unit holds the lithium ion battery pack with a stated life of 10 hours. The battery compartment also provides access to the Type II Compact Flash slot. The closed access to this slot means that you'll be unable to use devices such as network adaptors or modems, which is a shame. On the right-hand side of the case is a single Type II PC Card slot.

To get the most out of your Clio while sat at your desk, you'll find a copy of ActiveSync 3.0, Outlook 2000, a mains adaptor, serial cable and a travel dock connector (to connect the low-profile serial port to a full nine-pin connector). The travel dock connector also neatly takes the mains power connector, so there's one less cable to be unplugged to get on the road.

On the whole, the Clio, despite the name that conjures up images of petite yellow cars in the south of France, is a very stylish device. The flexibility of the design means that it can function as a notebook, a replacement for laptop use or an A4 tablet if you have less space. Add to this the ability to do, albeit limited, presentations on the move and you have one very functional unit. The lack of a UK-approved modem is a shame, and the keyboard can be a bit awkward at times. The CalliGrapher handwriting recognition software really is second to none, however, and you could easily get away with only using the keyboard occasionally.

WILL HEAD

DETAILS

★★★★

PRICE £954.10 (£812 ex VAT)
CONTACT A2000 01483 852000
www.vadem.com www.pocketpc.uk.com
PROS Notebook, tablet and presentation facility, wonderful design, incredible handwriting recognition
CONS Awkward keyboard, no UK-approved modem
OVERALL In spite of its name, the Clio is a wonderfully designed device – the flexibility it offers far outweighs its disadvantages

Umax ActionBook S 246T

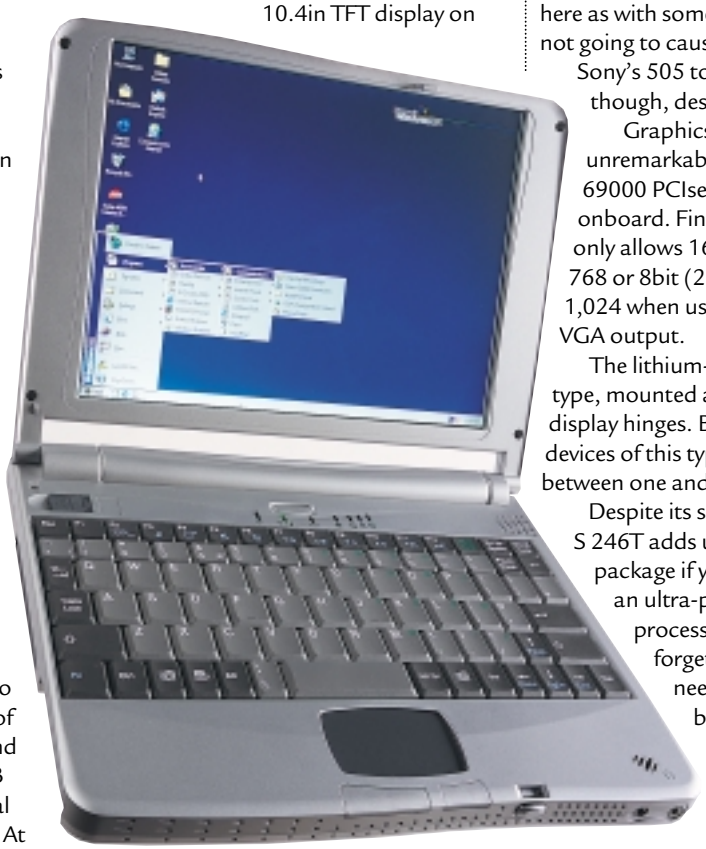
Another silver beauty that is perfect for email and word processing, but where's the CD-ROM drive?

There's nothing like giving your product a silver finish to make people want to buy it; a fact not lost on Umax with its latest sub-notebook. The 'S' in the S 246T's model name indicates its original manufacturer, Soyo, best known for its motherboards. However, there's no great shame in rebadging a notebook made by someone else, as most of the big companies do it, although they'd rather you didn't know.

The unit certainly deserves its sub-notebook label: at just 263 x 202 x 27mm and weighing in at 1.4kg it's about as small as a decently-specified notebook gets. Specification itself is certainly adequate for this class of machine. Inside there's a 466MHz mobile Celeron processor, allied to 64MB of SDRAM and a 6GB Fujitsu hard drive. Despite its size, the standard ports are built into the unit, rather than being relegated to a port replicator as with the likes of Sony's 505 range. At the right-hand side there are single PS/2 and USB connectors, plus parallel and serial ports, and a fast IrDA transceiver. At the rear there's just a D-SUB connector, and at the left a single Type I/II PC Card connector and external IDE connector. Unused ports are protected by press-on rubber covers that, while they may get lost, at least won't be prone to snapping off the way plastic covers tend to.

The external IDE is needed because there are no internal device bays, so floppy and CD-ROM drives need to be external. The supplied floppy drive connects to the parallel port, while the IDE connector can be used for a CD-ROM, DVD-ROM or LS-120 drive. Annoyingly, only a floppy drive is supplied as standard, so you'll need to shell out a further £99 plus VAT for a CD-ROM drive if you actually want to use the S 246T as anything other than a paperweight. As some recompense for the lack of a CD-ROM drive, the Umax does have an integrated 56K modem, with a flip-up connector mounted at the top left of the keyboard.

If you're a resolution junkie, the S 246T's TFT screen will appeal. Traditionally, notebooks of this size have 800 x 600 resolution screens, but the 10.4in TFT display on this unit has a native resolution of 1,024 x 768. It's not quite as good as most standard-sized TFTs, as the viewing angle is a little restricted, but it's great to have such a high resolution in so small a device.



A constant problem with sub-notebooks is that with the electronics so densely packed, they get hot. The S 246T certainly suffers from this and gets uncomfortably warm on your lap after a few minutes. The need to dissipate the heat also leads to the system fan being constantly switched on, and there's no option in the BIOS setup to switch between silence and performance modes, as with some other notebooks.

In use, the S 246T's keyboard provides acceptably responsive typing. The tops of the main letter keys are fairly large to help with accuracy, at the expense of the lesser-used keys. The touchpad is responsive, but being necessarily close to the keyboard, it makes accidental clicking from the heel of the hand a problem.

The S 246T's build quality is adequate, and its small physical size means that case flexing isn't as much of a problem here as with some larger machines. It's not going to cause the designers of Sony's 505 too many sleepless nights though, despite the silvery sheen.

Graphics are handled by an unremarkable Chips and Tech 69000 PCIset, with just 2MB onboard. Fine for most uses, but it only allows 16bit colour at 1,024 x 768 or 8bit (256 colours) at 1,280 x 1,024 when using the external VGA output.

The lithium-ion battery is the bar type, mounted at the rear between the display hinges. Battery life, as usual with devices of this type, is estimated at between one and two hours.

Despite its shortcomings, the S 246T adds up to a fairly attractive package if you're on the lookout for an ultra-portable email and word processing machine. Don't forget, however, that you'll need to add £99 to the basic price to be able to install any software on the thing: Windows 98SE is all that's supplied pre-installed.

Performance won't set the world alight either, but for the kind of uses this machine is aimed at, there's more than enough power.

DAVID FEARON

DETAILS

★★★★

PRICE £1,174 (£999 ex VAT)
CONTACT IMC 01344 871 329
www.umax.co.uk
PROS Attractive design, integrated modem, high-res screen
CONS Gets rather warm and it's a bit noisy, no CD-ROM drive as standard
OVERALL A capable machine for truly mobile use, at a good price, but nothing earth-shattering

PERFORMANCE RESULTS

SYSmark 2000

Mitsubishi Diamond Plus 91 vs CTX PR960F

Two 19in monitors square up to each other, but expect quality and value for money to win through.

Mitsubishi just failed to make the grade against Sony's latest offering in last month's 21in monitor group test. This time the Diamond Plus 91 isn't going directly up against a Sony, but against the arch-rival's tube technology: CTX's PR960F is equipped with an FD Trinitron tube. Both this and the Diamondtron NF in the Mitsubishi are the flat-screen, aperture-grille variety that are coming down in price and will replace shadow-mask tubes soon.

On paper, the Mitsubishi appears to be at a disadvantage. The tube has a variable aperture-grille pitch going from 0.25mm in the centre to 0.27mm at the edges, whereas the CTX has a constant 0.24mm pitch across the screen.

Attaching the pair to Matrox Millennium G400 MAX graphics cards and probing their limits, the Mitsubishi managed a maximum 77Hz refresh rate at 1,600 x 1,200 and 69Hz at 1,792 x 1,344, compared to the CTX's 89Hz at 1,600 x 1,200 or 78Hz at 1,792 x 1,344. The higher resolution is academic since neither can comfortably cope with it, but it does show the CTX's increased headroom.

Looking round the outsides, CTX wins again. The Mitsubishi provides a single D-SUB video input and there's no sign of a USB hub, or a bay in which to fit one. The CTX provides an additional BNC input, and USB is standard. There's a single upstream port plus two downstream ports at the back, with a further pair of downstream ports on the right-hand side behind the bezel.

On the OSD front, CTX has done away with the dedicated OSD Exit/Signal Select front-panel button found on most of its range – a retrograde step. The four remaining buttons control the OSD in standard fashion. The Mitsubishi also lacks an Exit button, it being replaced by the dubious FPM (fine picture mode) button that boosts brightness for better-looking video reproduction.

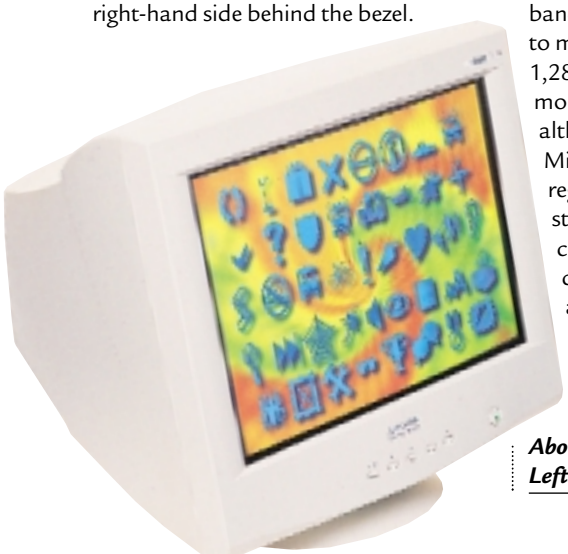
The new breed of flat-screen tubes seem more susceptible to signal noise, and neither monitor is entirely free of this: at the edges of text you can see dancing static, but it's imperceptible at normal viewing distances.

We often say a monitor needs to warm up thoroughly before use, but we've never seen it more clearly demonstrated than by the CTX. Straight after power up the picture is awful – fuzzy and inconsistent across the screen. But leave it to settle down for an hour and the difference is amazing.

Using our DisplayMate tests to assess image quality, both monitors give a fine performance. The first thing you notice when placing them side by side, however, is the difference in screen tint. The Trinitron screen is far darker, and the Mitsubishi looks more grey than black, making the CTX easily the winner in the contrast stakes. In other quality categories it's a fairly close run thing, but there's a definite winner. The higher bandwidth of the CTX's electronics leads to marginally sharper images at both 1,280 x 1,024 and 1,600 x 1,200, with more consistent focus across the screen, although the difference is very fine. The Mitsubishi wins on the power regulation front, giving slightly more stable images, and horizontal colour convergence is also better. When it comes to colour, fading linearity is almost perfect in the CTX across the whole spectrum, with the Mitsubishi close but a definite second.

In the end the better contrast and superior corner performance of the CTX means it wins in a straight quality fight. Take into account the features that Mitsubishi lacks, and the lower cost of the CTX, and you have a clear winner. The Diamond Plus 91 is a good monitor, but it's come up against the best CRT bargain we've seen in a long while. If you're on the lookout for a new 19-incher, look no further than the PR960F.

DAVID FEARON



Above: The CTX leads in contrast terms
Left: Power regulation is Mitsubishi's forté

DETAILS

★★★★

MITSUBISHI DIAMOND PLUS 91
PRICE £405 (£345 ex VAT)
CONTACT Mitsubishi 01707 278 684
www.mitsubishi-monitors.co.uk
PROS Generally very good quality
CONS No USB, single video input, noticeably poorer contrast than CTX
OVERALL A good monitor that's overshadowed by the CTX

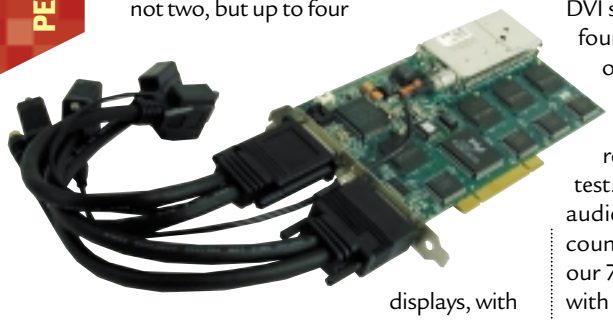
★★★★★

CTX PR960F
PRICE £363 (£309 ex VAT)
CONTACT CTX 01923 810 800
www.ctxmonitors.com
PROS All the features you could want, superb quality, brilliant price
CONS Must be thoroughly warmed up to give of its best
OVERALL This has to be the CRT bargain of the year

Matrox G200 MMS

Matrox's new card for its multi-monitor series will make you see double, triple or even quadruple.

There are some applications that demand more than one display for effective use. If you're working in a financial institution and need to keep your eye on real-time stock quotes, up-to-date websites and Bloomberg TV while writing a couple of reports, then having more than one screen could enhance your productivity. For uses such as these Matrox has produced a card that supports not two, but up to four displays, with an optional TV tuner on board.



We reviewed the top-of-the-range unit packed with four outputs, either analog or DVI (Digital Video Interface) for digital flat panels, and a TV tuner. The card utilises four G200 chips, each coupled with 8MB of RAM, adding up to a total of 32MB, attached to a single 8in PCI card. On the back are two custom connectors, plus a mini phono plug for the TV tuner aerial. Each custom connector takes a cable that splits into either two analog D-SUB ports or two DVI sockets. This means you can have four analog displays, four DVI, or two of each for maximum flexibility.

This card is not designed for games performance, and as a result did not fare well in our graphics test. Given its intended business audience, the lack of games ability may count to its advantage. Dropping it into our 733MHz 128MB RAMBUS machine with four monitors hooked up yielded a SYSmark 2000 score of 127, as opposed to 143 for the Creative 32MB AGP GeForce card that was in there previously. Given that it is a PCI card designed for multiple displays the result is impressive.

For those who need multiple displays, it's a good solution. At nearly £600, it may seem expensive, but if you can afford four digital flat panels, you can afford a decent card to drive them.

WILL HEAD

DETAILS

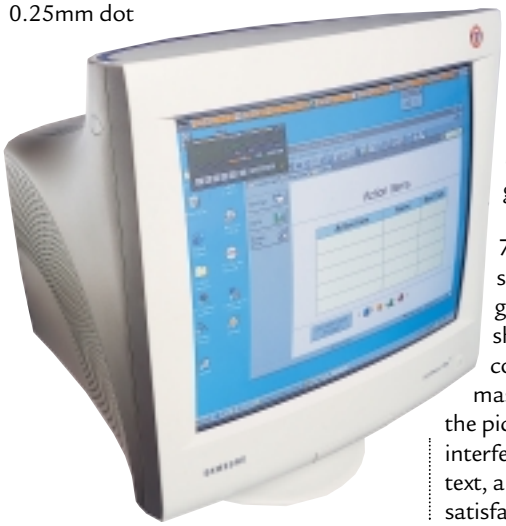
★★★★

PRICE £668.58 (£569 ex VAT)
CONTACT Matrox 01753 665 500
www.matrox.com
PROS Four displays, support for DVI, TV tuner on board
CONS You have to need four displays to make it worth while
OVERALL If you need four displays then the G200 MMS will suit you. The support for DVI plus the ability to mix and match with analog displays should ensure the longevity of the card

Samsung SM 1100p Plus

Samsung's latest SyncMaster offering only meets the needs of a dwindling shadow-mask market.

As 19in monitors become *de rigeur* for mid-range systems, the price and quality war is moving to the 21in battlefield. Samsung's response is this new 21in unit. The 1100p Plus differs from the standard 1100p in its tighter 0.25mm dot pitch and higher video bandwidths, allowing a maximum resolution of 1,800 x 1,440 at 76Hz.



The 1100p Plus has two video inputs, with both D-SUB and BNC connectors. There's no dedicated button to switch between them, but it only takes a second to do so via the OSD. The OSD itself is excellent: the seven buttons are mounted on an angled, slide-out tray. There's a dedicated information button to give confirmation of refresh rates.

Testing at 1,280 x 1,024 with a 75Hz vertical refresh, the 1100p's shadow-mask tube delivers the goods competently. The image is sharp across the screen, with vibrant colour reproduction for a shadow mask. Switching up to 1,600 x 1,200, the picture isn't as rosy, as graininess interferes with reproduction of small text, and focus and sharpness are less satisfactory. Compared to the aperture-grille tubes of Sony and Mitsubishi, the 1100p comes off worse – there's just no contest between the Samsung and the pin-sharp definition of any FD Trinitron or Diamondtron NF-equipped display. And Mitsubishi's Diamond Plus 200 with Diamondtron NF tube is cheaper, so we fail to see why manufacturers bother to produce new, high-end shadow-masks.

DAVID FEARON

DETAILS

★★★

PRICE £746 (£635 ex VAT)
CONTACT Samsung 020 8391 0168
www.samsungelectronics.co.uk
PROS Good quality for a shadow mask, very good OSD controls
CONS Why buy one of these when you can have a flat-screen, aperture-grille for less?
OVERALL For the few shadow-mask die-hards still out there, the Samsung is a good display

Sony Contact PCS-1500

Quality videoconferencing products have long been out of reach, until Sony brought them closer.

Remote videoconferencing is getting a much-needed second wind thanks to the falling price of ISDN, DSL and cable modems. This, along with the shift towards 100MB and Gigabit Ethernet in the workplace, is also making reasonable-quality desktop videoconferencing possible.

The choices available for anyone looking to seriously videoconference have always been limited. In most cases, to do it with any sort of quality, you have had to convert a spare office into a videoconferencing suite, complete with broadcast-quality lighting, microphones, soundproofing and cameras – an operation that at best would cost tens of thousands of pounds, but most often would end up costing much more.

The other option has been to take the opposite approach – the webcam. For as little as £30 you can use a low-resolution 'golfball' shaped camera (often with a built-in microphone) to perform low-quality videoconferencing over Ethernet, ISDN and dial-up connections, either directly or over the Internet. The picture quality is crude, the audio disastrous, but to be fair, it is seldom ever hyped as being any better on the box.

The middle ground has remained under-exploited for the best part of a decade, with only the likes of PictureTel offering usable big-box kit that does not need to be built into a room. Even this, though, is very pricey.

Sony, a long-time manufacturer of videoconferencing hardware, is trying to exploit this market with the Contact PCS-1500, a high-quality, set-top camera and microphone unit that does not require specialist installation or environmental conditions.

The camera is based on a 1/3in CCD with a 12x zoom lens. This is mounted on a 25-degree, motorised, tilting base that can be controlled locally by the remote control at source or at the remote end of the connection. The Contact can also auto-track a subject using colour-tone comparison, and while this is useful, it struggles to cope with fast body movements and low light conditions.

The Contact can produce a maximum output resolution of 352 pixels x 288 scan lines, output to a conventional PAL display. Connection to a display is by composite or S-Video connection. Sadly, the Contact has no onboard Scart connector, the format favoured by the majority of modern television sets and PAL monitors. The Contact also includes phono and S-Video input sockets for an external audio and video source.

Built into the front of the Contact is an infra-red receiver. This is for use with the optional Document Station, a wireless overhead viewer (used much like an overhead slide projector) that can also be used as a manually controlled extension camera. Built into the base of the camera is an SVGA scan convertor, allowing you to feed the video output from a PC into the videoconference broadcast. In testing we achieved both a good infra-red transmission range of 11m (against the documented range of 5m) and a stable data transfer. Even occasional breaks in the line of sight caused by people walking in front of the transmitter on the Document Station caused only split-second dropouts in signal. Recovery from a complete loss of signal took only around two seconds.

We performed point-to-point connection testing by dialling from one Contact to another over a single ISDN line. On a single 64Kbits/sec ISDN connection, picture and sound quality was good (if a little quiet even at full volume) and we had no problems in cross-controlling the remote camera using the remote control or using the picture-in-picture facility, allowing each end to display both the outgoing and incoming image. In a basic point-to-point connection you can use up to three lines between the two points, which offers near-broadcast quality transmission, allowing for a higher audio and video-encoding and decoding level. Encoding takes place at 16Kbits/sec, 48/56Kbits/sec and 56/64Kbits/sec, depending on whether there are one, two or three lines available. Multiple lines are bonded together by

the Compact and are treated as a single high-bandwidth connection.

The Compact supports the H.320 multipoint standard. For the multipoint test, we undertook a three-way conference with groups in Holland and Italy. All sites were using the same equipment connecting over multiple lines into a central ISDN dial-up hub. All the same facilities were available for remote control but in addition we were able to make full use of other features such as windowed display (showing all three images on screen at once), SVGA feed broadcasting (using the SVGA scan converter in the Document Station).

Again, picture quality was excellent, taking full advantage of the multiple lines available. Sound was still poor, but the added bandwidth helped to compensate slightly for the low volume through added clarity. Feeding a presentation from a PC into the conference was straightforward, involving connecting the PC output to the document station, establishing line of sight with the Compact and switching to remote feed.

However, the sliding PowerPoint slides in our test presentation exposed the failings of ISDN transmission, as the frame rate (a maximum of 30fps) was not sufficient to provide a smooth transition from slide to slide, instead jerking in two large jumps.

For cross-platform testing, we performed a two-line connection between one Compact unit and a PictureTel installation within our office. Despite the differences in hardware, the unit connected first time when dialling from the Compact to the PictureTel location, although we did experience a connection failure on one of the two lines. Across a single-line connection the quality was blocky, but the people in each location were still recognisable. Sound quality was clear but quiet, and showed how underpowered the Contact's audio output is. Connected to the PictureTel installation there was a one-second audio delay in both directions, although this problem can be corrected with some fine tuning of the audio and video settings on both devices.

Overall, the Contact PCS-1500 represents a competent attempt at a mid-range videoconferencing device. Despite its failings in the audio department, the lack of domestic connection sockets and extremely cumbersome system software, it still remains easier to use than many of the more professional systems available. Combined with the wireless Document Station it becomes a very powerful centrepiece for a videoconferencing system, capable of rivalling room installations costing 10 times as much.

CHRIS GREEN

DETAILS

★★★

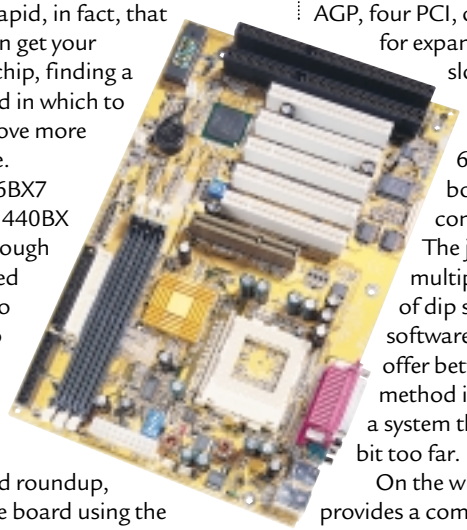
PRICE £4,107 (£3,495 ex VAT)
CONTACT Sony 01932 816340
www.sel.sony.com/
PROS Small, excellent quality lens, good infra-red networking range
CONS Fiddly menu system, clumsy remote control, no Scart output socket, sound output is often too quiet
OVERALL Sony has managed to strike a good balance between price, size and image quality. This is let down by a poor menu system that makes operation cumbersome at best

Gigabyte GA-6BX7

A great motherboard that's happy to team up with the Flip Chip and your old SDRAM memory.

Pentium IIIs are making a rapid transition from Slot 1 to the FC-PGA (Flip Chip Pin Grid Array) format. So rapid, in fact, that while you can get your hands on a chip, finding a motherboard in which to run it will prove more troublesome.

The GA-6BX7 employs the 440BX chipset, although an i820-based system is also available. To allow cross-comparison with March's motherboard roundup, we tested the board using the same components and a 600MHz Flip Chip running on a 100MHz front-side bus (FSB). The board scored a SYSmark 98 score of 249, beating all the other 100MHz FSB boards in the group test.



On the board itself you'll find one AGP, four PCI, one ISA and a shared slot for expansion, with three DIMM slots for memory. The two EIDE channels only support UDMA33, not 66, and the layout of the board is tidy, with all components sensibly placed. The job of setting the FSB and multiplier is left to two banks of dip switches. While a software-based solution may offer better ease of use, this method is a simple way to recover a system that has been pushed that bit too far.

On the whole the GA-6BX7 provides a competent feature set and its use of cheaper SDRAM provides a simple upgrade path to faster processors.

WILL HEAD

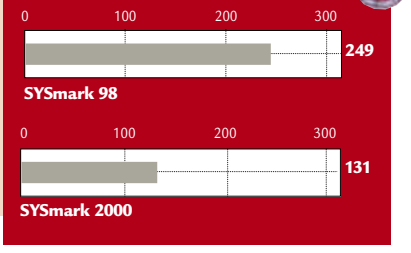
DETAILS

★★★★★

RECOMMENDED Personal Computer World

PRICE £99 (£84.26 ex VAT)
CONTACT Gigabyte 01908 362 700
www.gbt-tech.co.uk
PROS Supports FC-PGA Pentiums and SDRAM while still delivering good performance
CONS No support for UDMA66, if you want it
OVERALL If you want to upgrade your system but take your SDRAM with you, then the GA-6BX7 is a compelling solution. Support for the latest processors, without the performance drop of running SDRAM in an i820-based system

PERFORMANCE RESULTS



Fujifilm FinePix 4700 Zoom

There has been much talk about Fujifilm's Super CCD, so finally here's the 4.3 megapixel proof.

New 3.3 megapixel digital cameras may feature 2,048 x 1,536 pixels compared to 1,800 x 1,200 of earlier 2.1 megapixel models, but with its new Super CCD technology, Fujifilm's FinePix 4700Zoom boasts a massive 4.3 megapixel resolution with 2,400 x 1,800 pixels to play with.

Super CCD uses octagonal photo-diodes, closely packed in a honey-combed pattern. The active area is thereby increased, boosting sensitivity and signal to noise ratio. Fujifilm also claims that the closer pixels of Super CCDs deliver an effective resolution of 1.6 to two times that of conventional CCDs. Since Fujifilm then describes a 1.9 megapixel Super CCD as equivalent to a conventional three megapixel CCD, we looked forward to seeing what quality lay behind the 4.3 megapixel badge.

In terms of memory, 2.1, 3.3 and 4.3 megapixel cameras produce raw, uncompressed file sizes of around six, 10 and 13MB respectively. Using its best JPEG-quality mode and highest resolution, the 4700 produced 1.6MB files. Compare this to Canon's 3.3 megapixel S20 (see p104), which at its best-quality settings produced files just over 2MB. Since the 4700 started with 30 per cent more pixels and still produced a smaller file, its best-quality compression is more severe than Canon's.

Fujifilm supplies the 4700 with a 16MB SmartMedia card that can squeeze in nine, 19 or 47 images at the highest resolution; 1,280 x 960 and 640 x 480 pixel modes are also available. The maximum card size is 64MB.

Physically speaking, the 4700 measures 78 x 98 x 33mm and weighs 255g without batteries – very compact and comparable to Canon's S20. The 4700 takes just two AA batteries, and Fujifilm supplies a pair of NiMHs (nickel metal hydrides) that recharge in 12 hours and are good for around 80 shots with the decent 2in TFT display or 230 with the optical viewfinder – you can also use alkalines in an emergency, but they run down alarmingly quickly.

Despite its compact dimensions, the 4700 houses a 3x optical zoom, equivalent in coverage to 38-114mm on a 35mm camera. There's a manual focus option, with around 15-20 steps, depending on how quickly you can press the buttons. Shutter speeds range from three seconds to 1/2000 second, and there are two aperture settings: 2.8/4.5 or f7/10.8. You can't manually adjust shutter speed or aperture, but you can change flash brightness, white balance, sensitivity, metering mode and exposure compensation from +/- 1.5 EV (Exposure Value) 1/3 steps.

Most impressive of all is the video-capture mode that produces great looking 320 x 240 pixel AVI movies at 10fps, which play back on the screen or your PC using QuickTime 4. Clips of up to 80 seconds with sound can be captured, and the 16MB card will store a total of 90 seconds.

Control and camera status are handled by a circular backlit LCD panel on the rear, surrounded by four buttons – it's dead easy to operate, with the panel changing icons to indicate which button does what. Optimised modes are available for night scenes, portraits and landscapes, while guidelines can be overlayed to aid composition.

Surprisingly, this is Fujifilm's first camera to feature a USB interface. The supplied software mounts the card as a drive in My Computer and images are transferred in seconds; Adobe PhotoDeluxe Home Edition 3.0 is included. Composite video and audio outputs are provided for TVs.

The higher sensitivity of the Super CCD was apparent in our tests, with good, bright images captured without flash indoors. But to accommodate large 4.3 megapixel images, Fujifilm has been forced to turn even the best-quality compression up a bit too far. Pixelated JPEG artefacts were visible when closely examining images compared to results from other cameras. In our optical test, any benefit of higher CCD resolving power was lost as compression blurred the finest details into each other, with no TIFF mode to avoid it.

That said, the 4700 still captured slightly more detail than 2.1 megapixel models, but not as much as Canon's S20. We'll have to wait for Fujifilm's high-end 6.1 megapixel FinePix S1Pro SLR, with uncompressed TIFFs and support for IBM's CF MicroDrive to see what Super CCD can really deliver. In the meantime, the 4700 is still a fine camera that out-gadgets Canon's S20, and outperforms just about every other digital compact.

GORDON LAING

DETAILS

★★★★

PRICE £699 (£594.89 ex VAT)
CONTACT Fujifilm 020 7586 1477
www.fujifilm.co.uk/di
PROS 3x zoom, great video capture, 2in TFT
CONS Over-compression lets down quality
OVERALL Ultimate image quality aside, a superb compact

Canon PowerShot S20

Another shot from the Canon stable that is sure to be a hit with its 3.3 megapixel CCD.

Anyone familiar with Canon's 2.1 megapixel PowerShot S10 (and in this month's *PCW* competition you have a chance to win one on page 466) will immediately feel at home with the new S20 – it's essentially the same camera, apart from a champagne gold finish and the small matter of it being the first 3.3 megapixel model we've tested.

While 2.1 megapixel cameras produce 1,600 x 1,200 pixels, a 3.3 megapixel model gives you 2,048 x 1,536 to play with; in real terms, this lets you make inkjet prints about two inches bigger and you'll certainly get a great-looking 10 x 8in photo.

Higher-resolution images, however, take up more room. Like its predecessor, the S20 employs a mild compression ratio at its best 'Superfine' quality, producing files measuring just over 2MB each. Fortunately, Canon supplies the S20 with a 16MB CompactFlash card, good for around six images in Superfine, 16 in Fine and 31 in Normal. Lower-resolution 1,024 x 768 and 640 x 480 pixel modes are also available. The S20's card slot is CF-II compliant and happy to swallow an IBM MicroDrive hard disk.

Measuring 105 x 69 x 34mm and weighing 270g excluding card and battery, the S20 may be bigger than, say, Canon's tiny IXUS APS cameras, but in digital camera terms, it's tiny. Canon supplies a lithium ion battery that charges in 90 minutes and squeezes out around 55 shots using the bright 1.8in TFT screen or 230 with the optical viewfinder; you can also use a disposable 2CR5 lithium battery.

In a body this size, you're only getting a 2x optical zoom lens, equivalent in coverage to a 32-64mm f2.9/4.0 35mm lens. It will focus as close as 12cm in macro mode, and while you can lock the focus, there's no manual focus mode. Exposures range from two seconds to 1/1000 second, but again, there's no manual control over shutter speed, or aperture either. In fact, apart from adjusting white balance and exposure compensation from +/- 2EV (Exposure Value) in 1/3 stops, it's pretty much an automatic affair. You can lock the exposure and choose from centre-weighted or spot metering, though.

Various shooting modes are selected using the top dial, and can be adjusted using the small LCD panel also on the top. Image mode offers optimised settings for landscape, fast shutter, slow shutter, night scene and black and white. Fast shutter and landscape modes imply the use of wide-open and closed apertures respectively, but in our tests we sadly measured little difference in the depth of field. Slow shutter and night scene set the camera to longer exposures, the latter with a flash to illuminate foreground subjects; we managed to capture trailing car headlights at night, which is quite an achievement for a mostly automatic digital camera. There's also a neat stitch mode that guides you through taking multiple pictures that are automatically joined together later in software – great for panoramic shots.

Images are replayed on the screen and can be zoomed in by two times for closer inspection – there's also a slide show option and composite video output to a TV or VCR. Connection to your PC is through a serial or USB cable, and unsurprisingly the latter is infinitely preferable, transferring images in less than six seconds. Canon's image transfer software is a doddle to use, and a copy of Adobe PhotoDeluxe 3.0 is also bundled.

In our tests, the S20 without a doubt resolved more detail than the S10 and other 2.1 megapixel models; it's not a massive difference, but a noticeable one. Images taken with the S20 under a variety of conditions also look great, but even with the mildest compression there are still slight JPEG artefacts if you look closely, and sadly no uncompressed TIFF mode to completely avoid them. At £699, there are cheaper digital cameras around, but none at the time of writing that offer true 3.3 megapixel resolution. Nikon, Epson and Sony are on the verge of launching their 3.3 megapixel models, and while all offer greater manual control, none will be as small or cute as the S20. Fujifilm's FinePix 4700 Zoom, reviewed on p101, however, shares the same dimensions and price, and boasts 3x optical zoom, video recording and a 2in screen, but its over-compression didn't quite match the S20 in our quality tests. If you're happy with the minimum of gadgets and manual control, but demand a small, top-quality body, then the S20 is the way to go.

DETAILS

★★★★★

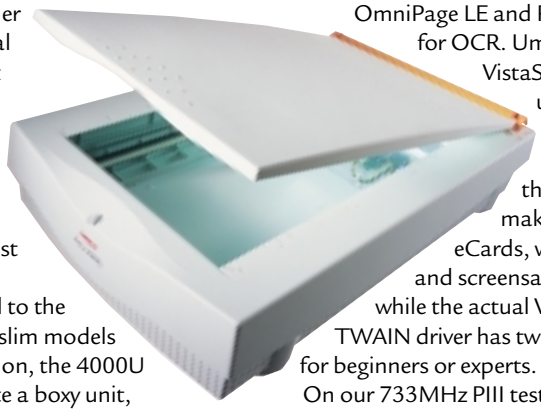
RECOMMENDED Personal COMPUTER WORLD

PRICE £699 (£594.89 ex VAT)
CONTACT Canon 0121 666 6262
www.cannon.co.uk
PROS Compact and great quality, can take IBM MicroDrive
CONS No video recording, little manual control
OVERALL Unbeatable quality from a tiny automatic package

Umax Astra 4000U

A sizeable, mid-range scanner that puts in a good performance with plenty of detail for enlargements.

Positioned between the Astra 2000 and PowerLook ranges, Umax's Astra 4000U is targeted at mid-range users. For £219 ex VAT, you get a solid scanner offering a true optical resolution of 1,200 x 2,400dpi, available in up to 42bit colour.



Physically speaking, the Astra 4000U is not the most compact of flatbed scanners. Compared to the latest breed of ultra-slim models from the likes of Canon, the 4000U comes across as quite a boxy unit, measuring 120 x 322 x 535mm. So saying, the specification is higher and the maximum scanning area is larger too: legal-sized at 216 x 356mm.

Connecting to your PC with a USB cable, the 4000U requests the driver disc and gets on with a painless installation – at only 1m, the cable is quite short, though. The software package consists of Adobe Photoshop 5 LE, Presto PageManager and the choice of OmniPage LE and Recognita for OCR. Umax's own VistaShuttle utility guides you through making eCards, wallpaper and screensavers, while the actual VistaScan TWAIN driver has two modes for beginners or experts.

On our 733MHz PIII test machine with 128MB of RDRAM, the 4000U came up with previews in 25 seconds and performed A5 colour scans at up to 300dpi in just over half a minute. A 2.5 x 1.5in mono scan at 1,200dpi arrived in 30 seconds. Time-wise, it's not a really quick scanner, but we've seen slower.

Image quality on automatic settings was good, and in 42bit mode, captured slightly more detail in bright highlight or dark shadow areas than in 24bit. However, don't be fooled into thinking it'll get anywhere near the dynamic range of more expensive scanners such as Umax's own PowerLook.

Overall, the Astra 4000U is a fair scanner for the price and a contender for anyone demanding 1,200dpi optical resolution for enlargements of originals.

GORDON LAING

DETAILS

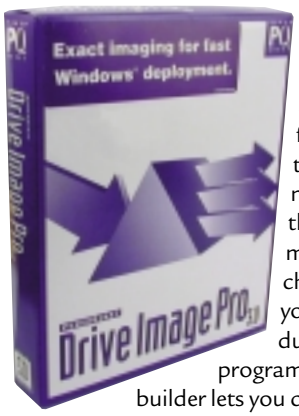
★★★

PRICE £257.33 (£219 ex VAT)
CONTACT IMC 01344 871 329
www.umax.co.uk
PROS Lots of detail at1,200dpi true resolution
CONS Hefty compared to many home flatbeds
OVERALL Good if you need 1,200dpi for bigger enlargements

Drive Image Pro 3.01

Unbeatable disk imaging utility combining a wide range of functions with an easy-to-use interface.

There's been nothing to touch PowerQuest's Drive Image and PartitionMagic programs recently, and this latest release does little to dent the company's reputation. The big change for Drive Image Pro 3.01 is that it supports Windows 2000 It is a hard-disk cloning utility that combines a wide range of functions with an easy-to-use interface.



The package runs under DOS, using a windows-based interface that makes it easy to navigate. It is aimed at those who need to deploy multiple copies of a hard drive, such as system integrators and managers. With just a few clicks you can create a single image of your hard drive, and two levels of compression are available. Once you've done that, you can use the Powercasting feature to deploy a copy of the image file onto computers across your network. There's also DataDeploy – a feature that enables the deployment of new programs onto the network. After monitoring the changes made to your hard drive during the installation program, DataDeploy builder lets you customise the installation program to suit your environment's needs. You can then use the manager program to roll out the application.

PartitionMagic Pro 5.0 is included in the package – this excellent utility allows you to re-size hard disk partitions on the fly. Be aware, however, that 5.0 does not include Windows 2000 support, although a version that does should be available for download around the time you read this. If you're a home user, this is way beyond what you need – Drive Image standard will be enough. For large IT specialists, however, Drive Image Pro 3.01 is an excellent product, useful for system integrators and power users alike.

JASON JENKINS

DETAILS

★★★★★

PRICE 10 CD pack £176.25 (£150 ex VAT)
CONTACT PowerQuest UK 01189 755955
www.powerquest.com
PROS Everything you could want in one box
CONS PartitionMagic did not support Windows 2000 at the time of review
OVERALL A great product for corporate users

Windows CE 3.0

With this latest incarnation of WinCE, Microsoft may win back its place in the palm-size market.

Microsoft entered the palm-sized market in 1998 with a universally panned version of the Windows CE operating system. Just as now, Palm OS was then the dominant force in the market, as it was simply much better suited to the task. Microsoft has, therefore, gone back to the drawing board and come up with a new version of its Palm operating system, Windows CE 3.0, optimised for the Pocket PC.

One of the most criticised aspects of the old CE was the GUI, and so this has been completely redesigned for CE 3.0. It is a lot better: gone are the distracting shadows in favour of a totally flat, single tap interface. The new wave of Pocket PCs will have colour screens, and the operating system makes good use of colour to flag up things such as urgent appointments. The company has not been able to resist keeping the Start button, but this has moved to a more convenient place at the top left of the screen, and has been combined with the title bar. This displays either Start or the name of the program you are using as appropriate. Context menus have also been introduced – pressing and holding the touch screen brings up a context menu similar to a right mouse click. At the top of the Start menu are six small icons representing the most recent applications used, for ease of access. Generally speaking, all of the programs have greatly simplified views – instead of tying to cram everything from the desktop version of Outlook onto a palm-sized screen, for example, there's now only the information you're likely to need. Memory management is improved, and you can shut down applications by pressing the OK button, if it appears, at the top right of the screen.

There's a lot included in terms of software. Pocket versions of Word, Excel, Outlook, Internet Explorer and Media Player are present as standard. One of the most important programs, as far as Microsoft is concerned, is Outlook – it sees contact management as the primary use of the Pocket PCs. You can easily access your calendar, contacts, inbox, notes and tasks using the Start menu. Using the latest software, Microsoft Activesync 3.1, you can synchronise all this information with your desktop machine easily, and a copy of Outlook 2000 is included on the CD, if you don't already have it. As always, there is no built-in compatibility with non-Microsoft applications, but it is open to third parties to provide this if they wish.

Microsoft Reader (above) and Windows Media Player are what Microsoft hopes will be the killer applications for its new OS

Pocket Word and Excel can read desktop files and can be used to make changes to them. Although they both support most of the features of the originals, they use different file formats and there are some more advanced aspects that they can't support. There are three ways to write – a keyboard where you simply stab at appropriate letters on the screen, a transcriber and a character recogniser. All three work well and which one you choose will come down to a matter of personal taste.

Pocket Internet Explorer is a full web browser with support for HTML 3.2, framesets, Jscript 1.1, SSL, ActiveX and XML. You can browse the Internet in exactly the same way you do with desktop IE. It has a handy 'fit to page' feature that attempts to fit each web page onto the screen to stop you from having to constantly scroll the page. This is more successful on some web pages than others and, although you can indeed browse the web, it does much better on services that have been specifically optimised for it, such as AvantGo.

Microsoft is very proud of its Windows Media Player. This plays both MP3 files and Windows Media files. The idea is that the music you download to your PC can be transferred to your CE device using Microsoft's Media Manager software and it can then be used as a portable media player. There's also Microsoft Reader – a program for reading electronic books. You can buy them over the Internet, transfer them to your Pocket PC and read on the move.

Unfortunately, people who use Palm OS and like it are likely to be prejudiced against anything Microsoft comes up with. Windows CE 3.0 is a great improvement on what went before, however, and it puts the company in a position to compete in the palm-sized market. Ultimately, though, it will all come down to the standard of the new hardware. Casio, HP and Compaq will all have units out at launch time and the quality of these will make or break the new operating system.

JASON JENKINS

DETAILS

★★★★

Price Bundled with a hardware device
Contact Microsoft 0345 002 000
www.microsoft.com
Pros New GUI, lots of software, easy to use
Cons Control bars at top and bottom will still annoy some
Overall Microsoft has had a serious re-think and it shows. Windows CE 3.0 puts it in a stronger position, but the new hardware will swing it one way or the other

BETA

Adobe LiveMotion

Macromedia's supremacy with Flash is now in contention from Adobe's incredibly easy-to-use release.

Macromedia will tell you that more people can view Flash content in their browsers than can use Java applets, and up until now it has had the monopoly on Flash-authoring software. The release of Adobe's LiveMotion, though, doubles the number of providers to two and – if the beta is anything to go by – gives Macromedia serious competition for the less demanding user.

One thing you'll be doing in LiveMotion is expanding and collapsing the timeline. This is made up of a heading for each object in your animation, beneath which is another line for every attribute applied to that element. Pressing on the arrow beside each object heading expands and contracts this list, letting you maximise your workspace when you don't need to refer to its attributes.

The magic word in that last sentence, was 'object' because, rather than being layer-based, LiveMotion works on the concept of objects. In this way, everything in your animation always remains editable. This dramatically shortens the time needed to manipulate elements within your animation. Want to change the colour of a button over time? Simply create an initial keyframe within the 'colour' section of your timeline and then a second one later on, at which point you just switch to the colour you want on the colour palette. It's difficult to visualise this without actually using the package, but believe us, it's fast.

The whole interface retains the familiar Adobe look and feel, which makes it easy to use for those familiar with Illustrator, PageMaker or Photoshop.

When you move objects within your animation, LiveMotion generates the first and last keyframes using bezier curves to define the path of motion, ensuring smooth passage. If you'd rather use straight lines and corners you can switch. Want your object to move in the opposite direction? Swap the positions of the first and last keyframes. This will work with any alteration, such as swapping from a blue-red colour change to a red-blue change. Likewise, if you have made your colour change too rapid, putting it right is a matter of simply dragging the closing keyframe further into the animation.

To help you control their actions more fully, text strings can be broken apart into their constituent characters. Because LiveMotion is object-based, this is all that you need to do to start working on them individually – they don't have to be distributed across separate layers. Once text has been broken in this way, each character is given its own entry on the timeline. These can be group selected if necessary, so that any attribute applied to one is applied to them all.

The collapsible timeline gives you a general overview and makes accessing the different parts of your animation easy

Your work can be saved into a library so that it can be dragged into future animations, saving valuable time in the future. Individual objects can be grouped together before being put into the library, so that when they are used the next time they will all be inserted into the animation together – there'll be no need to insert multiple objects one by one.

Being the latest addition to the Adobe stable, it is unsurprising that LiveMotion understands Photoshop files. These can be dragged and dropped straight into an animation with all layers intact and can be broken apart so only an individual element on one layer can be animated and all other layers discarded if necessary. An Edit Original command will load the file back into Photoshop for editing. LiveMotion even understands clipping paths, so any effects you apply, say, to the edge of an object, will apply only to the object and not the bounding back.

LiveMotion objects can have Photoshop filters applied to them and these will appear on their own palette. These can then be turned on and off at the click of a mouse without damaging the original object.

Creating roll-overs is also easy. Once you've drawn and selected your initial rollover state, open the rollover palette and LiveMotion will define this as the Default Up/Mouseoff state. This can be changed by selecting from a dropdown menu. Clicking New several times creates the remaining three necessary states and each can be redefined by selecting the appropriate condition from a dropdown menu. Any state can also be linked to a separate action within your animation. Say you wanted your button to indent when you passed over it and a penguin to jump. Once you have drawn your jumping penguin animation and defined how the rollover will indent, you drag a focus point out of the Over line of the button's rollover palette and point it at the penguin, much like defining a hyperlink in Dreamweaver or GoLive.

It will be interesting to see what Macromedia comes up with to combat LiveMotion. This is currently the easiest option for generating Flash animations, and Macromedia will have to work hard to ensure it retains ownership of the market it created, where lower-end users are concerned.

NIK RAWLINSON

DETAILS

★★★★

PRICE £282 (£240 ex VAT)
CONTACT Adobe 020 8606 4001
www.adobe.co.uk/products/livemotion
PROS Object based, quick and easy to use, collapsable timeline
CONS Macromedia retains unique rights to parts of the Flash format that Adobe is currently unable to leverage. LiveMotion suffers from being pixel, rather than vector based
OVERALL If the finished product is as good as this public beta, Adobe should be on to a winner

BETA

Adobe InDesign 1.5

The world of DTP may get upset with Adobe's challenger to rival and unseat the venerable Quark.

It's less than a year since Adobe launched what half the world expected to be a QuarkXPress killer – InDesign. In that time, it has done well to establish itself in the page-layout market, becoming one of Adobe's fastest-selling products to date. In part, this is no doubt thanks to the level of customisation that can be achieved. The structure of InDesign is a small core onto which a number of plugs-ins can be bolted. These plug-ins can be rewritten and, in this latest version, easily switched on and off as needed for efficient memory management. InDesign uses Microsoft VBA or AppleScript depending on your OS of choice, allowing you to produce scripts that interact with the program core and hence execute faster and more efficiently than macros that interact only with the user interface. This means that third-party developers are able to produce cross-platform add-ons and you no longer see a lag between the release of modules for Mac and Windows systems.

InDesign incorporates Adobe's familiar user interface, but some subtle changes, such as the fact that the document window automatically opens to fill all available workspace, make it even simpler to use. New tools have been added, too, such as an Illustrator-esque pencil tool and the ability to place text on a path. Colours can now be dragged out of the swatch palette and dropped onto page elements that will then adopt them. Moreover, InDesign will automatically name colours for you.

The text on a path feature is just one of the new tools that makes InDesign such a pleasure to work with

These names are based on the CMYK values of the colour, but you can rename them in a more friendly manner should you choose. The default colour names will update if you subsequently adjust the CMYK balance.

Nobody likes being held up when they're facing a short deadline, and even the slightest delay can become tedious, so InDesign now includes the option to down-sample images for screen display. This shows lo-res versions of the pictures onscreen while you are working on a document, without affecting the output resolution. Likewise, you can now avoid setting printer and PDF export styles each time you output in either way. When set to meet your requirements they can be saved and used every subsequent time. PDF settings include adjustment to image-compression levels, independently linked to image types and font subsetting, while print-setting options take care of how colour separations should be handled, how documents are to be scaled, font subsetting and whether crop and bleed marks are necessary. The built-in trapping engine automatically traps colours throughout your document unless otherwise specified.

InDesign now includes the option to down-sample images for screen display

An innovative Smooth tool supplements the new Pencil tool. It's never easy to draw smooth curves with a mouse, but this new tool lets you smooth out kinks in your work. An Erase tool does what you'd expect and, if you use it in the middle of a line or curve, it will cut it in two. Multiple points on any number of lines can be manipulated simultaneously. Selecting by dragging across them and you can then manipulate one and have the other selected points follow it.

The eyedropper tool does more than merely sample colour – you can also use it on text to copy font, size and style attributes. The adopted attributes aren't related, so changing the original won't ripple down through all inherited styles.

Many tools have been merged into the new Free-Transform tool. Rocking this from side to side or up and down outside of a selected element will spin it around on the page, while using it to resize the bounding box will resize the contents. If it contains text, the characters will resize to fit, while using it to drag one edge of the bounding box past the opposite side will mirror the contents, saving you from having to dig into a menu. Right clicking on an image lets you define how it interacts with the bounding box. A new object-distribution function lets you specify how much space appears between selected page objects. This allows for even distribution horizontally or vertically to create tidy layouts.

We were disappointed that Adobe still has not adopted a click-and-go policy as far as text input is concerned – it is still necessary to first draw a text box and then type within it. This mirrors Quark's way of working, but it is a shame that Adobe didn't draw on the PageMaker model in which you also have the option of typing directly onto the page and relying on the software to define the text box itself, cutting down on tool swaps.

Page jump lines can now be generated automatically and updated on the fly. Simply type 'Continued on', insert a special page reference character and

overlap the frame containing this line with the frame containing your story. InDesign will then keep track of where the remainder of the story is placed and update the page reference character to point at this secondary page. Likewise, include 'Continued from' on the next part of the story and it will fill in the character defining the origin of the text and point readers back to the copy origin.

InDesign offers auto-generation of placeholder text. Define your frames and any follow-on frames and select Fill With Placeholder Text from the right-click popup menu to have it filled with classic Latin text. This will fill the initial frame and any associated follow-on text boxes.

Use the Fill With Placeholder Text command to quickly fill frames

One annoying quirk of the original InDesign was that, if a font was missing from your document, it would warn you, but not give you the option to find it on your hard drive or network. This is rectified in this version and the error message popup now includes a Find Font button. Likewise, a new Find Fonts command within the application will generate a list of fonts used within the document, and this can be sent to the print house along with your files. This list includes all fonts used in any embedded PDF or EPS files.

When introduced last year, InDesign marked a significant step forward in page layout. Competitively priced and easy to customise, it appealed to a wide range of users. It's good to see Adobe has built on its strengths and incorporated new features which complement a well thought out piece of software.

NIK RAWLINSON

DETAILS

★★★★★

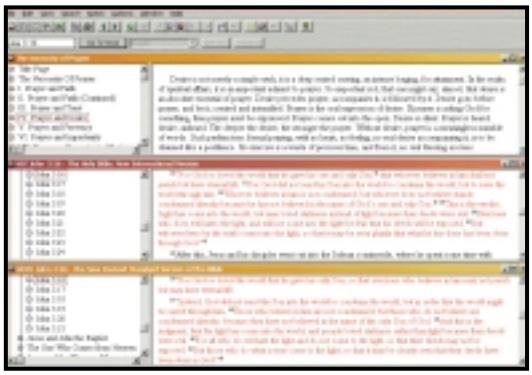
PRICE £515.83 (£439 ex VAT) or upgrade for £69.33 (£59 ex VAT)
CONTACT Adobe 020 8606 4001
www.adobe.co.uk
PROS Customisation, text on a path function, downsampling of screen images for fast redraw, simultaneous path editing of multiple points in drawn objects, flexible eyedropper tool
CONS Unable to click and go with the Type tool
OVERALL A worthy successor to an already impressive package

Quick Verse 6

Bible lovers everywhere will enjoy being able to view different translations at once with this software.

QuickVerse 6 is a Bible reference library on three CD-ROMs. It consists of seven translations of *The Bible* (*New International Version, King James Version, New Revised Standard Version, Darby's New Translation, American Standard Version* and *Young's Literal Translation*), along with 38 other books, mainly *Bible* commentaries and classic Christian texts, such as *Pilgrim's Progress*. At £79, this represents excellent value for money compared with buying the paper editions.

In use, each book is displayed in a separate window. As such, it is easy to have a couple of different translations or reference books on the screen at the same time and refer between them. Particularly impressive is the way each book integrates with the others. QuickVerse can search for all occurrences of a word or phrase, not just in one book, but in as many as chosen. This makes studying dramatically faster and more comprehensive than using paper editions. The search facilities are comprehensive, allowing wildcards and Boolean logic, but can come across as very complicated at first. Having said that, there is a QuickSearch, which lets you search for a word simply by right-clicking over it in one book; the program will find all other occurrences both in that book and the others.



It's easy to find specific verses in different translations to compare them, saving you lots of time

As you move verse with one *Bible* translation, the other translations can be told to automatically follow. Three of the books provided are *Bible* dictionaries, which can be viewed as separate books in their own right, or accessed by right clicking over a word in any other book and selecting Lookup. An interactive *Bible* atlas is also supplied, giving both background information (as text) on places in *The Bible* and appropriate maps. QuickVerse comes with a map editor, allowing the user to customise maps and then print them.

Two further editions of QuickVerse are available – Expanded and Deluxe – which come with a greater number of books. Alternatively, extra books may be purchased individually over the Internet.

ALEX SINGLETON

DETAILS

★★★★

PRICE £79.00 (£67.23 ex VAT), Expanded edition £159 (£135.32 ex VAT), Deluxe edition £235 (£200 ex VAT)
CONTACT Sunrise Software 0845 0579 579
www.sunrise-software.com
SYSTEM REQUIREMENTS Pentium processor, Win95, 98 or NT, 16MB of RAM, 45MB of hard disk space
PROS Excellent value for money, a large number of books
CONS QuickVerse is not as simple to operate as it could be
OVERALL It makes *Bible* study a lot faster, and as such can be recommended

MGI VideoWave III

This package can help novices achieve professional looking results and enter the video-editing world.

Having cut their teeth on still picture-editing suites, developers seem to have drastically shortened the learning curve with video editing and each new software release makes quantum leaps in terms of interface design and features. VideoWave III is a real stunner in terms of its editing and special effects features.

With the right hardware you can use video studio to capture analog footage from your regular analog camcorder, but this is one of the new wave of video editors aimed at digital video (DV) camcorder owners. The capture functions are integrated within VideoWave III, rather than in a separate application as in some other packages. VideoWave recognised our Panasonic DV camcorder straight away and we had no problems using the device control buttons to both control the camcorder and capture clips to the library.

You use a mode selector button-bar to the left of the view screen to switch between editing tasks. Starting in the cutting room, this is where you trim captured clips, setting 'in' and 'out' points before transferring them to the storyline.

The next button down takes you to the darkroom – a familiar place for still digital picture editors, but not one you often find in video-editing packages. Here you can make colour balance and brightness/contrast adjustments.

Another thing you don't get as standard with other packages is special effects – VideoWave III has an excellent selection of warp and wipe type effects. Swirl gives your clips the tumble drier effect, ripple pulses concentric waves through them to give a stone in pond effect, mosaic produces the sort of clunky pixelation good for concealing identity, and flip horizontal and vertical need no explanation. For each of these effects you can set sliders to adjust the degree and set start, hold and finish points in the clip duration.

Used in conjunction with transitions the special effects can produce jaw-dropping results, but there's a separate mode selector button for these with all the dissolves, wipes, reveals, slides and cuts you'd expect. You don't get the kind of control you would with a timeline-based editor like Adobe Premier, or Ulead Media Studio, but it's quick and simple. To add a transition just click on the area between clips in the storyline and select one from the library. You can then adjust the length of the transition and preview it.

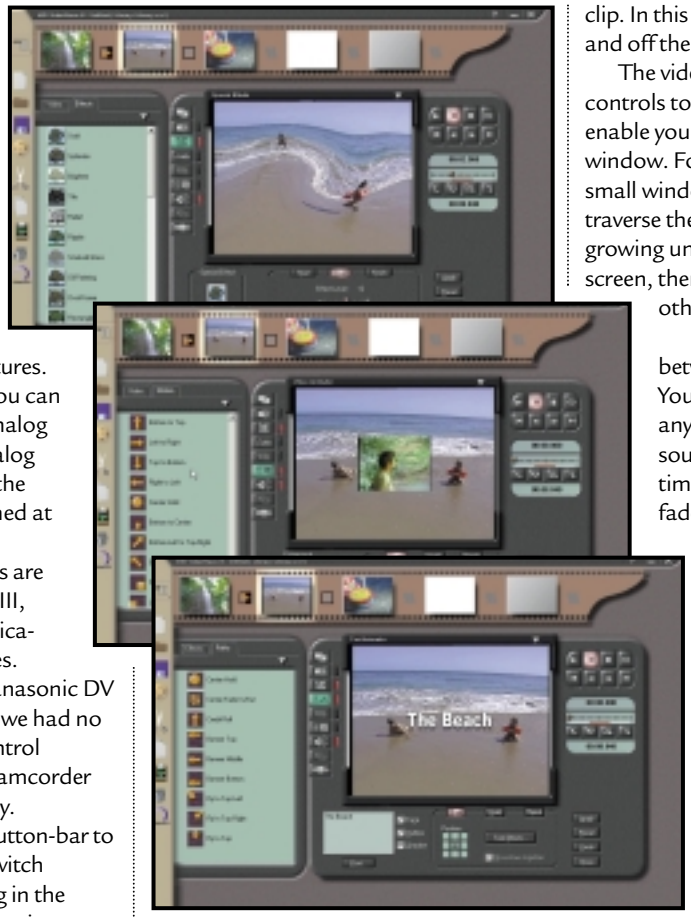
In titling mode you can add title text, specify its style and control its movement. There are a number of preset options for text style as well as the path the text takes in and out of the frame. So, for example 'fly in top left' does just that – text appears at the top left of the screen, moves to the middle and stays there. A three by three grid below the preview window lets you control text movement in the same way as for special effects, by specifying a start position plus hold and finish phases of a clip. In this way you can make text fly on and off the screen in any direction.

The video animator uses similar controls to those for the title path to enable you to control a picture-in-picture window. For example you can have a small window running a separate clip traverse the screen from left to right, growing until it reaches the centre of the screen, then shrinking as it moves off the other side.

Audio strikes a good balance between ease of use and features. You can capture from audio CD or any device connected to your sound card. In the absence of a timeline you're not able to cross-fade channels or adjust output levels at specific points in the track, but you can control the overall level and the point in the video track at which an associated audio track begins and ends as well as its fading in and out.

VideoWave III won't suit everyone, the lack of a timeline editor and the frame-by-frame control it offers could be considered a drawback, and some custom presets for video animation and titling styles and paths would be a good addition. That said, for those with little or no video-editing experience, and those who have, but lack the time or inclination to build effects from the ground up, VideoWave III provides the means to clean-cut, painless professional looking results.

KEN MCMAHON



Top:Special effects to make your head spin. Centre:Video animator mode lets you inset and animate video clips. Above:Titling at its simplest

DETAILS

★★★★

PRICE £81.70 (£69.53 ex VAT)
CONTACT MGI 0800 973 830
www.videowave.com
SYSTEM REQUIREMENTS Windows 98 SE (for DV use), PII 266MHz, 64MB of RAM, 45MB of free disk space for application, 1GB of free disk workspace
PROS Ease of use, interface, special effects
CONS No timeline, no customisable presets
OVERALL Provides hassle-free results

Mandrake Linux Deluxe

A commercial version of the open-source OS, whose ease of installation makes it worth every penny.

Earlier releases of Mandrake's variant of the open-source Linux operating system have received acclaim right across the board. Perhaps its greatest asset is that it is based on Red Hat, reckoned by many to be the best Linux available, but rather than simply rebadging an existing product, Macmillan Software has taken things a step further and effectively out-Red Hatted Red Hat. This latest version is based on the 2.2.14 kernel, which is currently the most recent stable kernel, although 2.3.99 is now in alpha.

In the best tradition of Linux benching, we decided to test it on a fairly low-specced system – a two-year-old Cyrix-based PC with a 233MHz processor, 32MB of RAM and a weeny hard drive of not much over 500MB. This had previously been running Corel Linux and so we were keen to see whether Mandrake would be lazy and install into the existing partitions or show a little initiative and define its own. As it turned out, it opted for the latter, although it still gave us the chance to maintain the disk state as it was. In the end, we hit the button to clear what was already in place and then asked Mandrake to define its own partitions. For easy identification, these were colour coded in the on-screen diagram.

This was just one of 15 steps, each of which sits beside a traffic light that turns from red to green to indicate your progress. While 15 steps might sound a lot, it really isn't when you consider that things like adding a user name and password takes up a step, as does installing a printer or telling the system in which time zone it is to be used. Of course, this is still more involved than the default process for Corel Linux, but this method gives you far more flexibility.

We liked the way Mandrake handled package installation. We were using a small drive, so had no chance of installing everything we might have wanted. We were therefore able to select broad package categories along the lines of 'communications' or 'office' and then, after a warning that we would not be able to fit everything onto our hard drive, used a sliding bar to select the size of installation with which we would be happy to proceed. What we ended up with was a working installation that, although a little sluggish on account of the fact we had put it to the test on a machine that did not quite meet the required spec, would make a competent office or home platform.

Linux Mandrake Deluxe comes on a mammoth collection of no fewer than six CDs. The first of these is bootable, but if your BIOS doesn't allow you to install in this way you can revert to the more common boot floppy. If you're new to Linux it's worth paying for a retail package like this for the bundled support. In this instance that support comes from Linuxcare, which guarantees to respond to any enquiry within 24 hours – provided certain system information is sent with every problem.

When you consider what you would have to pay for an equivalent 'Windows' installation, Mandrake comes out as extraordinary value for money. Three of the additional CDs include more than 900 applications including Star Office 5.1a, Corel WordPerfect 8 Lite (one step down from that found in Corel Linux), everything you need to get on the Internet, the IBM ViaVoice SDK and a whole host of applications for running a web server.

The documentation is extensive. As well as the usual disc-based manuals, you get a chunky user guide and reference manual. At times we did wonder in which language it had originally been written, especially with paragraphs such as 'What is Samba? You must tell, an implementation of an exotic dance for Linux. What does this mean, indeed? No, it has nothing to see with the Brazilian dance, it is a server for SMB clients...' Such nuggets of pure nonsense are few and far between, though, and the documentation is, on the whole, comprehensive and easy to follow.

If the only thing that has been stopping you installing a Linux distribution to date has been the fear that it'll be beyond your technical ability, perhaps this is the time to give it a go. You no longer have to worry about manually mounting drives and an automated update utility ensures you are always running the most up-to-date system.

NIK RAWLINSON

DETAILS

★★★★

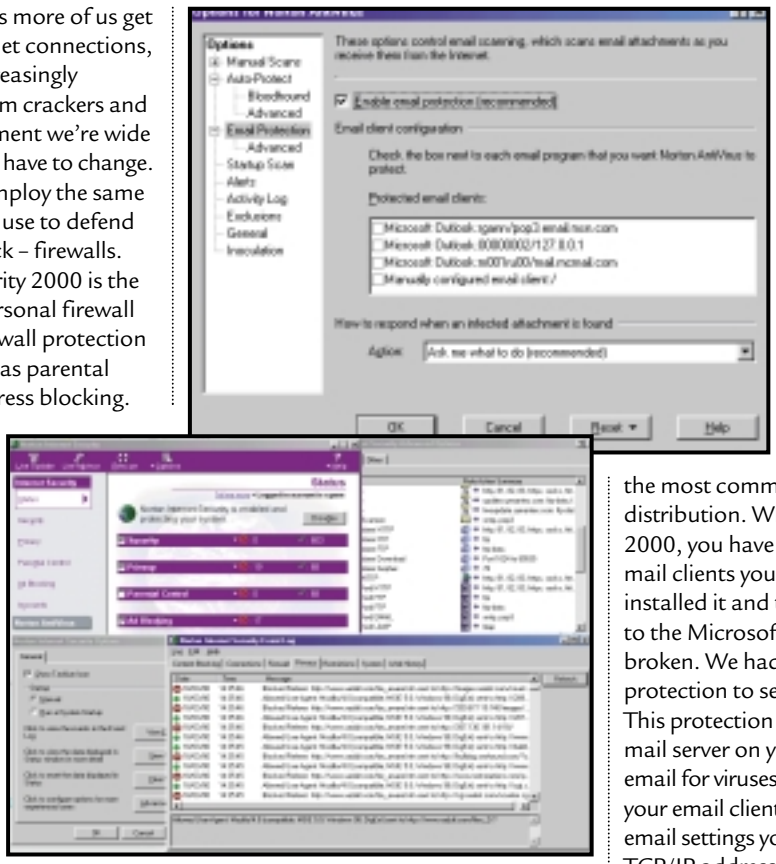
PRICE £49 (£41.70 ex VAT)
CONTACT MediaGold 020 7221 4600
www.macmillansoftware.com
SYSTEM REQUIREMENTS Pentium-compatible processor, 16MB of RAM (64MB recommended), 600MB hard drive space (1.5GB-plus recommended), CD-ROM drive
PROS Good installation routine, well supported version
CONS Manual translated a little too literally in parts
OVERALL A good distribution for all users – beginners or experienced

Norton IS 2000

Personal firewall protection that puts guards at the open door of an always-on Internet connection.

Pretty soon now, as more of us get permanent Internet connections, we'll become increasingly susceptible to attacks from crackers and script kiddies. At the moment we're wide open to attack, but that'll have to change. We're going to have to employ the same defences that companies use to defend their networks from attack – firewalls.

Norton Internet Security 2000 is the first of a new breed of personal firewall products, combining firewall protection with other features, such as parental monitoring and web address blocking. Its name may include the word 2000, but this product is for Windows 9x only – it doesn't run under Windows 2000. In common with many of the packages that make up Symantec's utility software, this is another 'bought-in' product, based on AtGuard, a personal firewall product that Symantec licensed from WRQ.



Configuring the NIS 2000 firewall is easier than most, but it's still a mightily complex task

The problem with firewalls, whether they are software or hardware-based, is that they can be fearsomely complex to configure, which puts them at odds with the target market for these products – domestic end users. So, Symantec has hidden the twiddly bits and simplified the main interface (which matches the new Norton Utilities 'house style'), giving the user a choice of just three levels of protection: low, medium, or high. You can block ActiveX controls and Java applets, as well as more primitive TCP/IP attacks and it has special built-in rules designed to block hack attacks from notorious programs such as BackOrifice. When an attack is detected you're not given any other info apart from that fact.

The firewall engine in NIS 2000 seems to be the same as that found in WRQ's well-regarded AtGuard product. It's a competent rule-based interactive learning firewall, supporting both inbound and outbound filtering, but if you want to get the most out of it, you're going to have to get your hands dirty and develop a thorough understanding of TCP/IP first.

The ad blocker monitors web-page loading, determines which graphics are adverts and stops them downloading. By and large this works well, but it can block essential elements of web pages, rendering them unusable. This was configurable, but it wasn't a straightforward task. NIS 2000 also prevents personal information, such as credit card numbers, from being sent over the Internet or to a website without your permission, plus it can control how websites place and use cookies on your PC.

The Parental Control feature isn't the most effective on the market, but it's adequate for most family needs. You can decide which categories to block, choosing from a database. Or you can block everything and then specify which sites can be visited. Free updates to the database are available for the first year, after which you have to fork out for subsequent updates. Individual users can have their own profiles, which is useful in a family environment.

The package also comes with a full copy of Norton AntiVirus 2000, a competent antivirus product. This has one or two new features, one of which is designed to trap viruses being transmitted as email attachments, perhaps the most common vehicle for their distribution. When you install NAV 2000, you have to specify which of your mail clients you want to protect. We installed it and then found our email link to the Microsoft Network had been broken. We had to turn off email protection to send and receive emails! This protection works by installing a mini mail server on your PC that checks your email for viruses, before passing it on to your email client – when you check your email settings you'll find a mysterious TCP/IP address, 127.0.0.1 in lieu of your regular mail server settings. MSN uses a Microsoft security oddity called Secure Password Authentication, and it was this which thwarted the protection system. More annoying was that it didn't advise us what it had done to our settings.

Overall, the product simplifies what is an extremely complicated procedure. However, you'll still need to put in the effort to get the most out of it.

ROGER GANN

DETAILS

★★★★

PRICE £50 (£42.55 ex VAT)
CONTACT Symantec UK 01628 592 222
www.symantec.co.uk
PROS Works well, good value, Norton AntiVirus is an added bonus
CONS Still complex under the hood
OVERALL NIS 2000 is a good stab at putting a friendly face on what is, after all, a frighteningly complex product. It does the job, but the learning curve is steep if you want to fine-tune its configuration

Rhinoceros 1.1

If you have a hankering for 3D NURBS, this cunning 3D design software has everything you need.

We reviewed the first version of this curiously named package in the March 1999 issue, where it earned a recommended award, and the latest version – 1.1 – is now available. Rhino is a 3D NURBS-based modeller, intended as a fast design prototyping system for production engineers, and as a general 3D modeller.

NURBS, for those not in the know, are non-uniform rational B-splines. A NURBS object is fully described by control curves so it can be rendered at any resolution. This is in contrast to a polygon, mesh-based object, the detail level of which is fixed. The difference between the two is essentially the same as that between vector and bitmap graphics formats.

Rhinoceros is stunningly easy to use. Any decent modeller makes it fairly easy to create arbitrary geometry, but Rhinoceros' power lies in the ease of creating controlled, accurate and precise models that are completely watertight with no signs of gaps, polygon tears or any of the other artefacts that normally creep into complex solids. Every surface and solid creation tool is here, plus blending, filleting, chamfering and Boolean operators for combining and smoothing the results into complex objects. The interface is superbly designed. While modelling precise geometry, the range of cursor snap functions is invaluable for easy alignment. You can snap to the mid or end point of the nearest curve, and to the perpendicular axes, at tangents and intersections. This all helps keep models mathematically precise with little effort. Rhino simply does the job quickly and efficiently. Booleans never seem to fail, and the filleting and chamfering commands work spectacularly.

A great feature of Rhino is the CLI (command line interface): all functions have equivalent command line keywords. The CLI is always active, so you can freely mix it with mouse-driven modelling; for instance, while entering a free-form curve, you can place a point precisely with respect to the last by typing the relative coordinates, and then go back to the mouse. The CLI seems daunting at first, but after a while it becomes invaluable. Initiating the function you want by typing its name is usually quicker than navigating through the menus or learning which toolbar icon performs which function.

As the number suggests, version 1.1 is an incremental improvement, but does add significant new features. There's a shaded working mode to allow objects to be continuously shaded while editing, although it can't take advantage of OpenGL acceleration. The old-style shade function that deactivates while editing can use OpenGL, however.

There are powerful new visual analysis tools, including surface curvature analysis with false colour (see above) and zebra stripes to check for surface discontinuity.

Rhino's basic inbuilt rendering engine remains unchanged: you can place lights and do simple texture and bump mapping, but it's no replacement for a proper rendering package. However, you can experiment with Pixar's complex RenderMan standard, using the Blue Moon Rendering Tools on the CD. Usually, you're better off exporting to 3D Studio MAX for serious rendering.

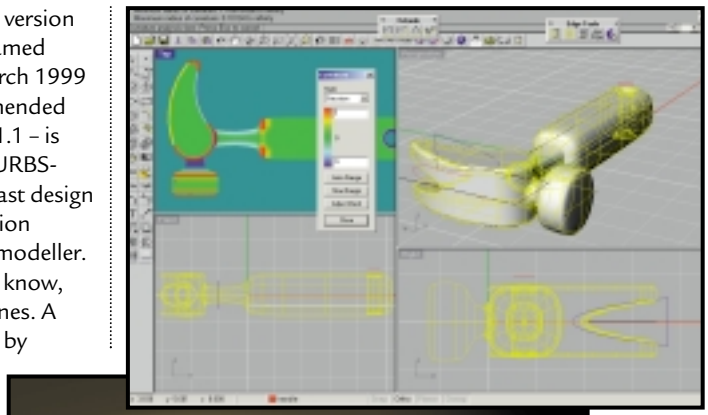
There are interface enhancements: the middle mouse button pops up a favourite toolbar, the recently-used command list, or runs a macro. The primary modelling addition is the surface creation tool, which can create surfaces from a curve network.

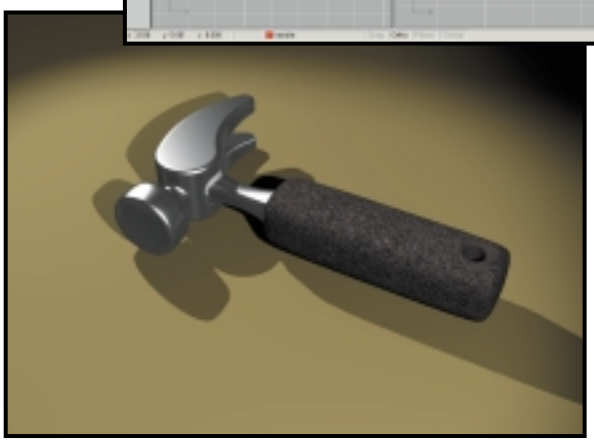
To aid documentation and prototype production, Rhino will now create 2D projection drawings from an object, plus you can manually annotate the results with dimensions and text. Dimensions aren't linked to the underlying geometry of an object though: they're just annotations.

The only criticism is that there isn't a new manual – just the old one with an extra booklet documenting the additions.

While its main aim is in serious production-oriented design, we can't see any modeller who needs to produce original geometry not being over the moon once they've tried Rhino.

DAVID FEARON





Top:Version 1.1 includes visual surface curvature analysis and a shaded working mode. The hammer model was created from a tutorial in under an hour
Above: Exported into 3D Studio, the results speak for themselves

DETAILS

★★★★★

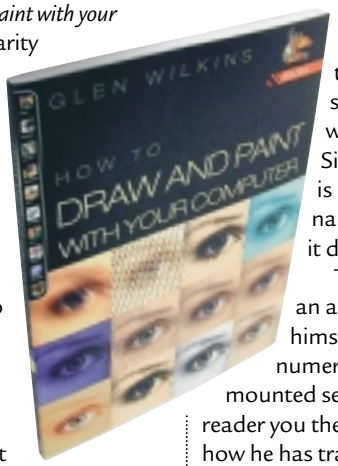
RECOMMENDED Personal COMPUTER WORLD

PRICE £586 (£499 ex VAT)
CONTACT Softcover International 020 7259 2100
www.softcover.com, www.rhino3d.com
PROS Every modelling function under the sun, implemented superbly. Fast, fuss-free and efficient, completely stable
CONS Supplying a V1.1 addendum booklet with the V1 manual is a bit of a cop-out
OVERALL Truly industrial-strength solids modelling. Rhino excels at producing accurate and flawless geometry with amazing ease

How to Draw and Paint

For those who feel a bit daunted by the thought of digital art, this could be the boost you need.

The rather old-fashioned title of this A4 book brings to mind old classics such as *Computer Graphics on Your Commodore 64*, but when you get inside *How to Draw and Paint with your Computer*, the only similarity is that they are both printed on paper and bound between two covers. It is also then that you realise why the title is so general, focusing on hardware rather than software: it does not restrict itself to the use of any single package, instead discussing Photoshop, Illustrator and Photo-Deluxe just as much as it talks of CorelDraw, Painter and LivePIX.



If you think this will all quickly become confusing, fear not – icons on the edge of each page let you quickly identify the packages being used and the general weight of the book is more towards general theory than package specifics, so although something might be demonstrated in Photoshop there is nothing to say you could not apply similar principles to your work within CorelPaint. Similarly, each time a plug-in is used an icon in the margin names it so that you can hunt it down yourself.

The author Glen Wilkins is an accomplished digital artist himself, having worked for numerous magazines and mounted several exhibitions. As a reader you therefore find it useful to see how he has transformed common images using digital tools. The book is definitely picture heavy rather than text-based, allowing you to work along through the steps and compare what you have achieved to the examples given.

This is undoubtedly a well produced book that is beautiful to look at, but you have to ask yourself whether there really is any need for this sort of a publication. Digital art is so often a matter of tweaking and the user can benefit from the sort of trial and error approach which is forbidden fruit as far as an oil and canvas merchant is concerned. Perhaps this is one of those situations where it's better to just get on and play with the software than read about it.

NIK RAWLINSON

DETAILS

★★★★

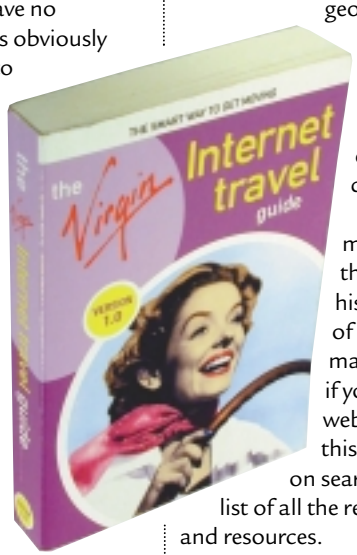
AUTHOR Glen Wilkins
PUBLISHER Collins
ISBN 0-00-413406-0
PRICE £14.99

Virgin Internet Travel Guide

With cyber cafés sprouting up in every continent, this travel guide will soon make itself indispensable.

There's no shortage of Internet guides, but the majority of them are generic and have no particular focus. Virgin has obviously realised this and decided to release a product that concentrates on one specific area: travelling.

Before even opening the book it's plain to see that one of its major advantages is its size. With an A6 footprint it won't take up too much space in your backpack. You might think it's a bit odd carrying an Internet travel guide with you when you're travelling, but considering that almost anywhere you go in the world these days has an Internet café, it could be a useful addition to your luggage.



Of course the most obvious entries in the book are sites dedicated to specific geographic locations. These links can range from an individual's opinion of somewhere they've visited to an in-depth listing of what to do and where to go.

This book has a lot more to it though. At the front you'll find a history and explanation of the Internet that makes interesting reading if you're not aware of the web's roots. Following this is a section with advice on searching, along with a list of all the relevant search engines and resources.

The traveller's advisory section is one of the best in the book and contains some very useful information. Here you'll find a list of all the major embassies, currency convertors, weather report sites and first aid resources.

There are also sections for activity holidays, flight booking and luxury packages, with each one having an extensive list of useful links.

It's truly incredible how much information has been squeezed into such a diminutive tome. What's even more impressive, though, is that this little wonder will set you back only £4.99. If you enjoy travelling, buy one of these now.

RIYAD EMERAN

DETAILS

★★★★★

RECOMMENDED BY PCW COMPUTER WORLD

AUTHOR Davey Winder
PUBLISHER Virgin Publishing
ISBN 0-7535-0441-3
PRICE £4.99