The small **print**

Do your small print projects turn out just as you had hoped? Or are you about to make your first attempt? Either way, take a tip from Ken McMahon to achieve good-looking results.

So, you want to design and produce your own business stationery, marketing material, conference programme, product catalogue, no-smoking signs and suchlike. If the blurb on any of the DTP layout packages (from Quark XPress to the cheapest budget package) is to be taken at face value, then this can be done in a matter of minutes. While the results may not win you awards, your stuff will stand up to anything produced by the professionals.

Although it may take a little longer than "a matter of minutes", it's true that these days even the most budget-priced packages, running on the humblest desktop PC, can be used to produce astounding-looking artwork. What they neglect to tell you on the packaging is that the quality of your results depends more on how you approach the task than the size of your hard disk and the stature of your software.

As with most other projects, proper planning and adherence… well, a relaxed grip, anyway… to a few fundamental guidelines will go a long way towards ensuring that your print job looks and costs what you expected. This month, we'll take a look at how you can prepare the ground to ensure that everything goes smoothly and according to plan, and at what you can do, practically, to ensure that your print project isn't derailed by technical shortcomings.

Planning the cost

Even if your project is modest, say some headed stationery, you'll need to cost it and plan a schedule. If it's a 128-page colour catalogue and you omit this vital first stage you'll probably end up paying for it more than once (perhaps literally). Working out how much it is going to cost will not only save you money – you will be able to get comparative print quotes and take the cheapest option – but will also make you consider the design elements earlier. When you receive the invoice is not the best time to discover that your beautiful full-colour letterheads have cost 50p a sheet.

Often, the colour format of your project is dictated by the material it contains. If you want to include colour photos you'll have to print in four-colour process (CMYK); usually the most expensive option. If your company logo is blue and green you'll have to opt for two "spot" colours in addition to black for the text. But with a little imagination it is possible to cut the cost without compromising too much on the quality.

Colour pictures can be restricted to parts of the document. For example, if you want to make a good initial impression it might make sense to have the cover of your project printed in four-colour process and the rest in black. "Self-covered" documents, where the same material is used for the cover as for the inside pages, are cheaper to print than those with a heavier, card cover. If your budget is tight but you want to produce an upmarket publication, printing in a single colour (it doesn't have to be black) on better quality paper and opting for a matt laminate finish can be a less expensive but nonetheless classy-looking option.

The time to consider these things is now. Before a picture is chosen and before you get anywhere near your PC, you should have a clear idea of how your publication is going to look and what it is going to cost.

Consider the content

The next consideration is content. Your approach to this depends largely on the nature of the document you are producing, but generally speaking the trap into which most people fall is trying to squeeze too much in. Authors fill books on this subject as there's a lot to be said. What most of it boils down to, however, is that if you want people to read your stuff you have to make it easy for them and keep them interested.

Turn-off number one is column upon column of tightly packed text with nothing to break it up. Don't fall into the trap of assuming that you must fill every square inch of the page with type or pictures. An easy way to lighten up a layout is to leave the outer column empty; so on a four column grid you only use the inner three. You can then bleed your pictures and put captions in the outer column.

Pictures

There are plenty of things you can do with pictures to liven up a layout. The first thing is pick the right ones. If you've got no pics to begin with, consider yourself lucky. There's a growing list of sources for general illustrative pics, and CD collections of copyright-free images like those produced by Corel, are an excellent and relatively cheap source.

If you have a flatbed scanner, then you can use virtually anything, from your holiday snaps to old magazines. But here is a word of warning about copyright: you must make sure you don't infringe it. It's definitely not a good idea to go around scanning and reproducing pictures from books and magazines without permission.

You can only go so far with plagiarism and even though technically it's probably a bit suspect, I would argue that it is fair game to use *bits* of other people's pictures provided they are not recognisable as the original. So if you spot a particularly spectacular or appropriate piece of sky, for instance, or a small element of a picture which would work well as a background tile, then I would say "go for it".

More often than not you have to work with what you've got but even the dullest set of amateur snaps can be considerably improved by a little imaginative cropping. Get rid of dull or distracting background detail by removing it using a clipping path in an image editing package.

You can make a design feature of cut-outs by running type around them. Book publisher, Dorling Kindersley, has defined an entire publishing style based on cut-out images on a white background.

Proofing

Now is a good time to think about proofing. For mono publications you can get an excellent idea of how things are going to look just by placing the film on a sheet of white paper, or by photocopying it. Colour proofing is more complicated and, of course, far more expensive.

You have three options, in increasing order of cost: digital proofing is the cheapest but the least reliable because the

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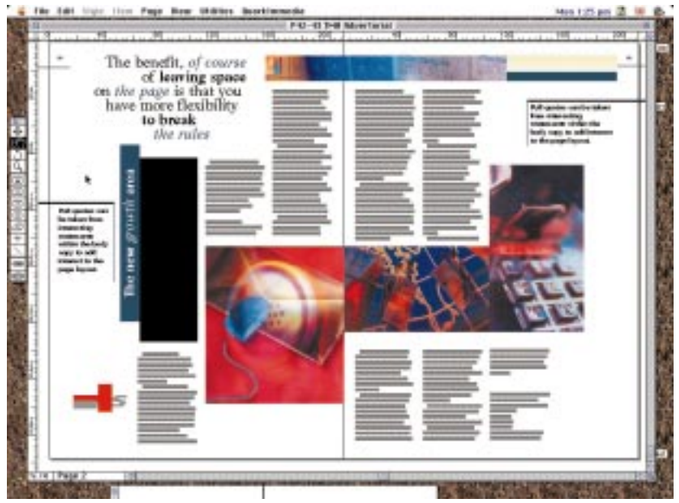
Tips for good-looking design

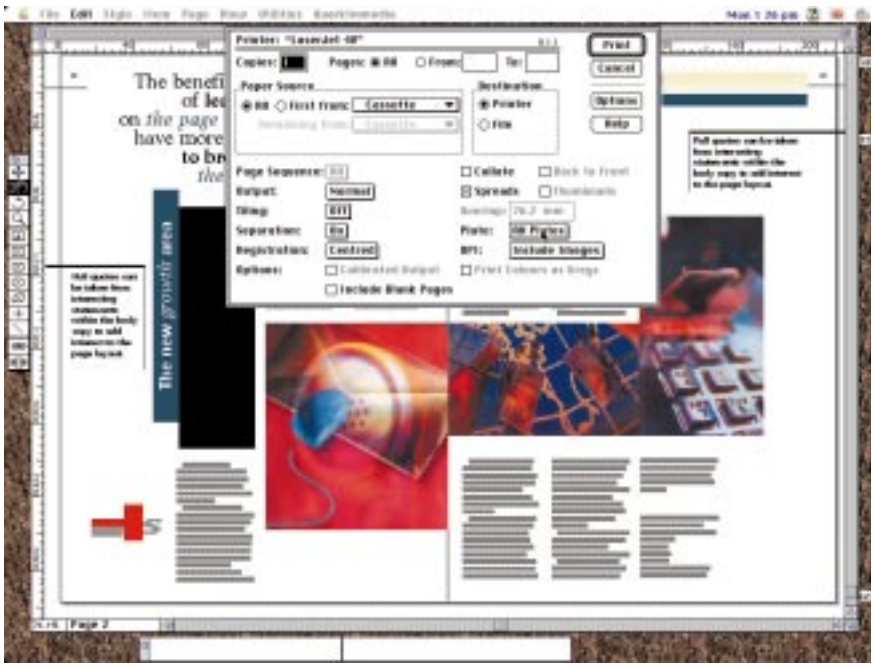


Leaving plenty of space on the page not only makes it easier on the eye, it gives you more flexibility to accommodate things like logos, pictures and captions. You can use pull-quotes to break the text up or, as here, to add visual interest and grab the reader's eye

- Steal: why make up your own design (a difficult and time-consuming process) when there's so much excellent design knocking around which you can appropriate for your own? Try to pick something suitable: using something like Hello! magazine as a template for your annual report is probably not good; try and look out some other annual reports.
- Try to establish a consistent theme throughout your publication. Use one font for the headlines and another for the body copy and stick with them. Don't change type sizes or leading to try and squeeze too much copy onto the page; either cut the copy or make more pages. Place page titles and running heads in the same position and use the same colours on reverse-out straps.
- Avoid script fonts unless it's a wedding invitation or menu.
- Leave some (perhaps lots) of space on the page and leave one column blank — not the middle one.
- Avoid the temptation to make everything too big. Type has a tendency to look smaller on the screen than it does on the page. Ten-point type is plenty big enough for body copy and if you don't have enough copy to fill, increase the leading rather than the type size.
- Pay attention to detail. Sloppiness in this area will let you down badly. Make sure columns of type align (use baseline grids if your layout package has them). Make sure that repeating items are in the same place and in the same colour on every page and that captions, crossheads etc, are in the correct style. Set style sheets are a big help here.
- Break up long tracts of type with crossheads, pictures and pull-quotes.

Ten ways to avoid disaster

1. Make sure your work has been properly read for errors. First, read it yourself and then get someone else to read it.
2. Ensure that any scanned pictures, logos and so on are all in CMYK format and not RGB. If there are RGB images in your document they will print as a composite image on the black plate and your film will be useless.
3. Do not unintentionally mix spot and process colours. If you intend your job to print in four colours, make sure you don't have any specified as spot colours. In addition to the CMYK plates you will get one film for each spot colour you have defined. Your bureau will throw a party on the additional profits generated by your expensive mistake and you will have to return the following day to have the whole job run out again.
4. Any scanned pictures, illustrations and other associated files must be sent to the bureau along with your layout document: if they are missing, the screen resolution preview (low resolution and horrible) will be used and it's "double-cost film" time again. A good bureau should spot this kind of problem, though, and let you know about the missing files before it runs the film.
5. Find a good bureau. It will save you time and money as well as a nervous breakdown.
6. Make a dummy using laser prints. This will help you avoid things like folds that don't work and reply forms that end up on the back of important information that needs to be kept. You can also send the dummy to the printers so they know exactly what the finished article should look like. Tell them, too, in writing. You can't be too careful about this sort of thing.
7. Print colour separations on your laser printer. This will highlight potential problem areas 2 and 3 (*above*) while you've still got time to do something about it and before it costs you anything.
8. Send laser proofs to the bureau so that it will realise straight away if there is a problem; this could be running out the wrong file, for instance. It is also a good idea not to send your single-page flyer to the bureau on the same disk as the 48-page colour brochure you did last year!
9. Keep backups and save your work at regular intervals. Some applications have an autosave function which is worth switching on. It's easy to get carried away and work for a couple of hours without saving and that's when disaster will surely strike.
10. Get proofs! Proofing isn't an expensive luxury – it's essential. Build the cost of proofing into your budget and allow time (and money) to make changes if the proofs highlight a problem: otherwise, there's no point in having them.



An easy way to check that you are not about to mess up, big-time, with your colour separations is to output them to your laser printer (for this to work you will need a PostScript printer). If, in addition to the CMYK plates you have half a dozen spot colours, you're in trouble

proof is not made from the film itself but by imaging the file to a dye-sublimation colour printer. Cromalins or Matchprints are made from the final film using a photographic process and give very accurate results. Wet proofs are produced on a special proofing press and have the big advantage over the previous two methods in that they are produced in exactly the same way (offset litho) as will be the finished job.

How to work out the cost

Assuming you are not charging for your time, the main cost components of any printed job is the cost of the printing itself and the cost of producing the artwork or film. Once you have finished your bit (design and production) you will need to run the job out to film, from which the printer makes the printing plates which go onto the press.

When you obtain quotes for printing, ensure that the printer is aware that you are supplying colour-separated film rather than camera ready artwork.

It is cheaper to run out film as spreads (two adjacent pages) rather than as single pages. So assuming your publication is A4-size, get your bureau to run out A3 spreads. As a rough guide, an A3 film costs around £11, so if you output spreads your film costs will be around £5.50 per colour, per page. You can save even more money on film and print by using imposition software which will "impose" your pages into sections (or groups) in the correct position for printing.

Stationery

For a small business, it's hardly worth getting business stationery printed by a commercial offset litho printer. Short-run stationery, especially colour, can be extremely costly. We print all our business stationery on a colour inkjet printer and it looks great. We can print it as we require it and it works just fine in a mono laser printer. But beware of doing this with some colour lasers because the colour image has a tendency to deposit itself on the rollers and thence to subsequent sheets in your mono laser printer when you output letters.

■ Ken McMahon is our new Hands On Graphics & DTP columnist. His predecessor, *PCW*'s features editor, Gordon Laing, can be emailed as Gordon_Laing@vnu.co.uk.

PCW Contacts

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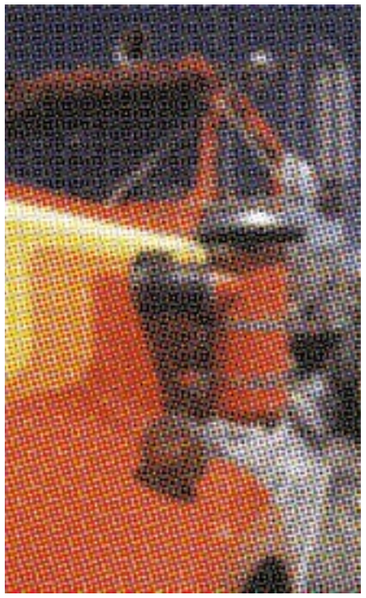
For auld **Laing** syne

Although there'll be many a wet pillow among readers, Gordon Laing this month ends his tenure of the column but leaves you with his ten golden rules for top graphics and DTP doings.

This month marks the end of an era in the world of Hands On Graphics and DTP. December 1993 saw the début of this column, where I promised to gossip about all things graphicky. No less than 44 fun-packed episodes later and it's time for me to hang up my graphics tablet and move on to pastures new. The Graphics and DTP column will continue, so if you've got a burning question about how to make the sky in your photos blue, retouch junior's red-eye or create your own fonts, please continue to contact us at the usual address [*see page 276*]. In the meantime, as a parting gesture, here are my top ten golden rules for getting the most out of graphics and desktop publishing.



Using dots of only four colours, it is possible for printers to simulate full-colour output

Font frenzy

It's safe to admit that the first time you designed a page layout you tried to fit every single one of your fonts onto it — I know I did. And why not – I paid for them, didn't I?

While it's true that you have, hopefully, paid for your fonts, that doesn't make it a good idea to use them all at once. Why? Because it looks a mess. Explore any good-looking poster, advertisement, magazine or newspaper page and you'll probably see only one or two different fonts in use.

These fonts have been carefully chosen to get across the same tone and message as the words. Should they look serious, official, frivolous or trendy? There's a suitable typeface for every occasion and you'll only confuse the matter if you try to use too many simultaneously.

Instead, stick to one or two different fonts and try using bold or light variations. Also bear in mind that some fonts work better than others when printed small as body copy or large in headline style.

Mac or PC? That is the question

The Apple Macintosh was there at the birth of desktop graphics and publishing, and during these early days almost all designers, printers and repro services invested and standardised on Macs. These people are not going to swap over to PCs in a hurry and this has resulted in a bit of a split between professional and consumer graphics work.

The trouble is compatibility. While the same applications are now available on both platforms, you've got to make sure everything else is exactly the same to prevent costly errors and reprints.

One Times font may not be quite the same as another. What may be only fractionally different on a single character could add up to a whole letter or word over the entire page, causing potentially disastrous reflow.

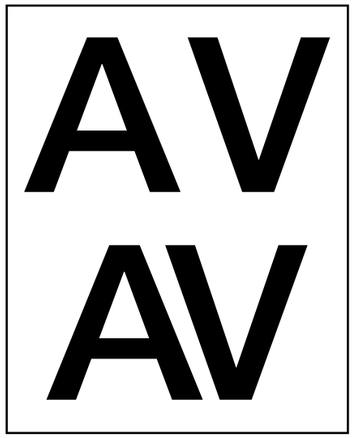
This can be avoided by making sure you buy the same fonts from the same source, but most professionals won't take the risk and prefer to just stick to Macs from beginning to end.

When working across platforms, stick with PC-formatted media since the Mac can read these without problems. Bear in mind that Windows will see only the first eight characters of a Mac filename and won't know what it is without a dot and a three-letter file extension. Macs will also see only the first eight characters of a Windows 95 long filename.

Scanner settings

It would be fair to think you'd need a 600dpi printer to do justice to a 600dpi scanner, but this is rarely the case. The problem is that each of the scanner's dots can be any colour, whereas a printer dot is usually one of only four colours, or even just black in the case of a mono printer.

To simulate shades and colours, printers group dots together: the denser the group, the darker the appearance and vice-versa. The trouble is that each scanner dot may require many printer dots to do it justice. However, you'll be surprised at how low a scanning resolution you can get away with. The smaller the file, the less space it will require for storage and the quicker the printing time. Experiment by scanning the same photo at, say, 50, 100, 150 and 200dpi and look for the difference in the quality of your printed output.



Kerning brings adjacent characters closer, particularly useful in pairs such as A V

High scanning resolutions should be used when you want to print something bigger than the original. If it looks okay printed actual size when scanned at 50dpi but you want it twice the size, rescan it at 100dpi. This above applies for greyscale or colour photographic images. Black-and-white line art should be scanned at your printer's resolution since each scanned dot can be perfectly represented by a single black printer dot.

Colour spaces

Ever had one of those conversations with someone where you're describing something as rusty orange, when they stop you and point out that it is clearly pillar-box red, or worse still, lime green? We all have very different ideas about colour, and computers are no different. There's the added problem that different computer devices describe colours in different ways, and worse, some may not produce the same range as others.

Agreeing on colours is easy. Companies such as Pantone offer books packed with standard colours with specific numbers, just like paint charts from a DIY store. It doesn't matter whether you think it's sky blue and the other person is convinced it's navy, so long as you agree that Pantone X is the right one for the job.

Getting computer devices to agree can be a bit trickier. The trouble is that monitors, scanners and printers create colours differently and often don't offer the same range. The solution is to employ a colour management system and to calibrate each component so that what you scan looks the same on the screen as it does on the printed page. These systems will also warn you if you're trying to reproduce a colour that's beyond the printer's capabilities.

Clone zone

Regular readers know I love retouching photographs: sensibly eliminating dust and scratches, or stupidly adding moustaches and extra noses to my nearest and dearest. Whatever retouching you're doing, there's one big tip that will make your work considerably more convincing.

More often than not you'll want to paint with the same colour as found in the region of your work. The obvious thing would be to use the eyedropper tool to pick up a nearby colour and just carefully paint with it. The trouble with this is that you are painting with a solid colour over a subtle but clear pattern of natural texture photographic grain. Imagine wanting to repair a scratch over some sand, grass or a face and trying to literally reproduce complex blades, grains or skin by hand.

Fortunately, most paint and retouching applications offer a clone tool which literally copies a small area and allows you to paint with it. The idea is that you grab a bit of skin near the scratch, say, and paint over the scratch with it: you retain all the texture and photographic grain. It's quick, easy, and utterly convincing with a bit of practice.

Try regularly to pick up new areas with which to paint, since pattern repetition becomes obvious. And besides, the area you're painting over is often changing colour and brightness.

Making selections

Selecting areas in photographs can be a little tricky. It's done either by grabbing similar colours or by manually drawing around the desired portion. Charmingly-named Magic Wands are used to select areas of similar colours to a user-defined tolerance, while those with a steady hand may want to draw a shape manually or use editable vector paths.

Learn the lingo

Every specialised subject area attracts equally specialist jargon to describe it. Typography alone has numerous terms such as leading (pronounced "ledding"), kerning and point sizes.

Points (pts) are the standard units of size in graphics and 72 points make up one inch. While it's correct to describe a one-

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inch thick line as being 72 points thick, a 72-point character falls short of one inch in height. This is because the measurement of type takes into account a small amount of space above and below the character itself.

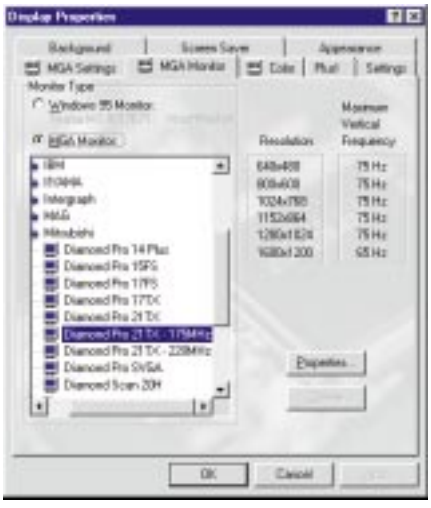
Leading refers to the amount of space in-between lines of text. It gets its name from the days of hot metal printing when strips of lead were inserted between lines of type to separate them.

Kerning is the adjustment of space between individual characters, while tracking is applied to an entire block of text. Adjacent capital A and V characters usually need a little kerning to bring them closer together (*see page 275*), while applying even a tiny amount of tracking across a page of text can often squeeze in many more words.

Which bitmap format?

A bitmap image is basically a grid full of coloured dots, and a bitmap file is just a header describing the size, shape and colour depth of the grid. A footer confirms the end of a file, with a wad of noughts and ones sandwiched in-between describing the colours of the dots. Since many dots are of similar or even identical colour, it's possible to describe several in one go, thereby saving memory.

Compression of this kind can save loads of space and can be employed with varying degrees of ruthlessness. LZW, or run length encoding, will only describe bunches of dots if the colours are the same, offering moderate but full-quality, lossless compression. Most bitmapped file formats offer LZW or RLE compression as an option, while the GIF format employs it as standard.



Manually choosing a monitor may be the only way to get rid of your flickery display

A final blatant excuse for a personal photo: Gordon Laing considers life after Graphics & DTP

JPEGs support 24-bit colour and variable levels of lossy compression. This means information is lost forever, so save images as a JPEG at your own risk or keep an uncompressed TIFF version for backup.

As far as compatibility is concerned the classic TIFF format rules, supported by virtually every application across almost every platform.

Sort your system

Flickering displays, or those set to run at unnecessarily low resolutions in few colours, really wind me up. The real pain is there's rarely any need to spend extra money: it's just a case of a system being supplied without having been properly set up.

For a flicker-free, steady display you want a refresh rate of at least 70Hz and a non-interlaced mode. Many computers, capable of much higher specs, are supplied running at a flickery 60Hz. So what can you do about it?

First, check your Display properties and see whether your specific graphics driver has left a convenient refresh rate control. If there's no sign, have a look for a suitable monitor or display utility that may have been installed with your graphics drivers, usually hanging around in the Programs sub-menu of the Start menu.

Infuriatingly, plug-and-play monitors rarely help. To prevent them defaulting to 60Hz, you may have to specify a different monitor model than the plug-and-play version selected in your display properties. Check your monitor specs and choose something similar: most new 15in or 17in monitors can display a resolution of 1,024 x 768 non-interlaced at 70Hz or higher, so you could choose something like an NEC 4FG monitor which has the same specs. This somewhat backhanded method can sometimes be the only way to trick your system into selecting a higher refresh rate. If your monitor has any difficulty in displaying the settings you've selected it will go blank for a few seconds, but hopefully return with your old settings. If it doesn't, restart your machine in safe mode, change the settings back and restart.

You have to laugh

Rule number ten is simple, and one which I hope has become obvious during the years I've been writing this column: make sure you have a laugh! While designing serious fax headers or page layouts, remember to take time out to create greetings cards, calendars or just muck around with someone's photo.

What you can achieve with a modest PC these days is utterly remarkable in terms of professional quality and, more to the point, great fun.

I hope I've answered your questions, dispelled a few myths and perhaps put you on to a few ideas. Most of all, I hope you've enjoyed reading the columns as much as I've enjoyed writing them, and thanks for putting up with the blatant excuses I've made for slipping my photo in at every opportunity.

So, ladies and gentlemen, "Gordon Laing has now left the building…", but he'll hang around as Features Editor for a while.

PCW Contacts

Any questions, tips or suggestions? Write to the usual *PCW* address, or email graphics@pcw.co.uk.

Putting on the style

Gordon Laing goes typetastic and puts fonts on the presentation catwalk with a style to suit any occasion without being over-dressed. But beware of font overload on your resources.

This month I'm returning to our old friends, fonts. Yes, I've been away from the subject for a while so it's time to have another look. Rather than delve into formats and character maps, I thought it would be worthwhile to go back to design basics and consider which typefaces are best suited to which tasks. But first a little graphics news.

The big story this month is the unbelievable release of Adobe Illustrator 7 for Windows! Yes, the high-end drawing product we all thought had been abandoned for good on the Windows platform has made a surprise reappearance in a brand new version. It has been brought up to date with the Mac, too.

As if that weren't enough, Adobe has also announced new versions of its Streamline tracing utility, and Dimensions, its wonderful 3D modelling tool. And equally surprising, they're both available for Windows as well as Mac. I'm particularly excited about Dimensions as it is one of my favourite graphics apps, and this is its début on the Windows platform.

At the time of writing, Adobe wasn't entirely certain how it was going to package, bundle or price the three products, and at the press announcement we suggested that in a Corel-style move, Dimensions and Streamline should be available separately but both bundled free with the larger Illustrator. Somehow I doubt this will happen, but thanks to the magic of magazines, publishing and staggered printing, we have a full review of Illustrator and its new companions in this very issue of *PCW*. Remarkable!

What's your type?

A wise person once said: "Typographic arrangement should achieve for the reader what voice tone conveys to the listener." No matter how powerful the written words with which you are dealing, the font style, the type size and the arrangement of these words on the page can make or break your message.

If you want someone's attention, huge characters may not necessarily be the best approach. An enormous amount of empty white space with tiny type in the middle may be more striking. A long line of text may bore or confuse the reader, who will end up looking elsewhere. Try playing around with the leading (space between lines of text) and the kerning or tracking (space between individual characters), both of which can make a difference to how your type looks.

Adobe Illustrator 7 remarkably arrives for Windows, and is reviewed in this issue

How about the fonts themselves? Most of us have more fonts than we know what to do with, so many people end up trying to to get their money's worth by fitting as many varieties on a single page as possible. Unfortunately, not only does this end up looking like a proper dog's dinner, but often, the actual type styles chosen are totally unsuitable for the message your words are trying to convey.

A quick lesson in style is to try to stick to the least number of fonts as possible on a single page. For variety, use different weights from the same family: set a headline or attention-grabbing text in bold, for example. Take the Helvetica, Arial or Futura families for instance, which consist of many different weights of type, from stick-thin to the fattest, boldest characters you've ever seen. Because they're based on the same shapes, they work well together.

Once you've toyed with the idea of trying different weights of the same font, you have to decide what *style* of font you're going to go for. Should it be official-looking, ornate, twirly, messy, quirky, neat or abstract? This, of course, is down to what you've written and the kind of response you want from the reader. A company report shouldn't really be in anything other than a nice, respectable font, whereas a party invitation is the ideal place to try out all those letters made from sausages and bananas. On the other hand, a serious message in a trivial font, or vice versa, can offer a striking contrast that is almost guaranteed to start people thinking.

The best advice is to try many combinations until you get the effect you are looking for. It is also a good idea to show it to other people in order to judge their response — which is often unexpected!

Suitable	Not so suitable
Annual Report	Annual Report
Cool Designs	Cool Designs
It's party time!	It's party time!
Mushroom flan	Mushroom flan
TRENDY RECORDS	Trendy Records
I hereby resign	I hereby resign
Final Demand	Final Demand
I love you	I LOVE YOU

It's a matter of taste what fonts you want to use for which effect, but the above may give you some ideas of occasions when one may be more suitable than another. From the top: • The Annual Report of a large, official company should probably be set in a serious font like Times, as opposed to the Orange font, which looks a little trivial. • A cool design company may want to use a trendy font such as Meta, rather than conservative-looking Times. • If it's party time, you can wheel out wild fonts like Twang and avoid the somewhat staid Palatino. • The handwriting-styled Elli is perfect for food descriptions, whereas plain Helvetica just sits there. • Dolce Vita was used by the trendy record label Talkin' Loud, which wouldn't be seen dead using New York. • When it's time to resign, a sober font like Palatino, perhaps italicised, would be better than Mekanik — unless you're a type designer, of course! • No-one likes receiving final demands, which is why Courier, looking like a machine, is more suitable than the rather pally BrodyEF. • The phrase "I love you" should never really be typed, but when it must appear in print, a nice script font like Pablo (based on Picasso's own handwriting) would be far better than the rather sinister-looking TapeType. (*All these fonts are available from FontWorks.*)

Type trouble

Type can cause you trouble even before you start using it. I'm talking about the actual font files themselves and what they are doing to your precious system.

Many graphics applications offer a generous quantity of free fonts which you may, understandably, decide to install… after all, they are free. However, all font information sits in your system files, which occupy precious memory.

If you've got hundreds of fonts and are wondering why you keep getting all those "out of memory" messages, then you may want to embark on a bit of Spring cleaning. Many utilities, including Adobe Type Manager, allow you to organise your fonts into groups.

Sometimes there's the facility to disable fonts, too, which could benefit your system's performance.

PCW Contacts

Any questions or problems? Contact **Gordon Laing** at the usual *PCW* address or email graphics@pcw.co.uk.

FontWorks 0171 490 5390

Get the picture?

Gordon Laing show us around the gallery of graphics file formats. Exhibits include TIFF, GIFF, JPEG and PCX and our critic gives the low-down on the pros and cons of each.

This month I ask the question: "Why are there so many different graphics file formats?" but I'll make it interesting… honest! There's more than one way to describe and store a picture, and some formats are better than others for different applications. Maybe you want the highest quality, the greatest compatibility, the most flexibility, or perhaps the tightest compression. Whatever, there are lots of graphics file formats out there and it can be a real maze finding your way around and deciding which is the best for you. Hopefully, by the end of this month's column you'll have a much better idea, and be able to make the right choice from that currently imposing Save As dialog box.

Computers are happiest handling digital information, which is either on or off, with no mucking about with maybe, perhaps or sort of. The easiest way for a computer to handle images is with a bitmap description, which is nothing more than a rectangular grid of coloured dots. The grid can be of any size, and the dots or pixels any number of possible colours. The quality of a bitmapped image is down to its number of dots (the resolution) and colours: the higher the resolution, the greater the detail; the more colours, the greater the smoothness of shades and perceived realism.

The number of possible colours is dependent on the number of bits allocated to each dot or pixel. The simplest number of colours is monochrome (black and white) which can be described with a single bit of information per dot or pixel. Eight bits per pixel offers a choice of 256 colours (calculated by 2^8), 16 bits per pixel can supply 65536 colours (2^{16}) while 24 bits per pixel boasts a whopping 16,777,216 colours (2^{24}). Clearly, a bitmap file in 24-bit colour is going to be three times bigger than the same size bitmap in 8-bit colour, or 24 times bigger than the same bitmap in black and white. Full-colour photographic images look best in 24-bit colour, but some images like logos or screenshots can get away with 16- or 8-bit colour, saving storage space and processing time.

The higher the resolution, the greater the detail captured, but bear in mind that more dots or pixels mean a physically larger file occupying more storage space and taking longer to process. That's why high resolution, full-colour images are so large.

Bitmaps are everywhere. Your on-screen Windows or Mac desktop is a bitmap image, typically at a resolution of either 640 x 480, 800 x 600 or 1,024 x 768 pixels. Common screen colour settings are eight or 16 bits per pixel. The space to store these screen images is in your video card's memory which defines the maximum resolution or number of colours in which you can work. Dropping one allows you to increase the other, but if you want more colours and higher resolutions you're going to need more video memory. Two megabytes of video memory is common and capable of displaying a 1,024 x 768 pixel resolution in 16-bit colour, or 800 x 600 resolution in 24-bit colour. If you want 1,024 x 768 in 24-bit, you'll need another 1Mb or 2Mb of video memory.

After all the cunning page descriptions employed to drive printers, the final result is a bitmap image on paper. Printers typically work at much higher resolutions than on-screen, with most models offering 300 to 600 dots per inch (dpi): for a 10 x 8in sheet of paper at 600dpi this means a bitmap measuring 6,000 x 4,800 dots; and if that seems huge, just consider that most laser printers are black-and-white devices, therefore operating at one bit per pixel. The bitmap described would only measure 3.6Mb in mono, but in full 24-bit colour it would be a massive 86.4Mb.

Fortunately, most colour printing can get away with much lower resolutions due to the involving nature of colour to our eyes. Consider your TV set, which looks great with its 24 bits of full colour but is, in fact, only operating at a low resolution of 640 x 480 pixels. The full colour and moving images distract our brain to perceive reality.

Scanners and digital cameras also convert real-life objects into bitmap images. Digital cameras usually offer one or two fixed resolutions, with the typical entry-level models offering 640 x 480 pixels in 24-bit colour. Flatbed scanners, mostly used to digitise photographs or sheets of paper, usually operate at between 300 and 600dpi, and in anything from 1- to 24-bit (or higher) colour. Like the laser printers, a 10 x 8in scan at 600dpi will produce a 6,000 x 4,800 pixel image, amounting to 3.6Mb in mono, or 86.4Mb in 24-bit full-colour.

The question of what resolution to scan at is a subject in its own right, but briefly you should use the highest optical resolution for monochrome images, but select considerably less for colour reproduction. Remember that if you're going to reproduce the image larger than real life, you should scan at a higher resolution, while if you're going to reproduce smaller than life size, then you should use a lower resolution. If you've got your own printer, it's worth scanning the same image at a variety of resolutions and printing them out to compare the differences. You'll be surprised at how small a resolution you can get away with, which is certainly worth knowing to save memory and processing time.

By now you've realised the importance of bitmap files and how large they are in terms of resolution and number of colours. But what about bitmap file formats? You've scanned your picture, or manipulated an image in something like Photoshop, only to find this huge array of options in the Save As box. Essentially, a bitmap file has only to start with a header describing the size of the bitmap and the number of colours it uses before a huge wad of bits follows, describing each individual pixel or dot from top to bottom, one row at a time. So what are the differences between the formats?

We started with a 300dpi greyscale image of 686Kb. Left to right: Saved firstly as a TIFF with LZW compression measuring 450Kb; secondly, saved as a JPEG with high compression measuring 47Kb; thirdly, saved as a GIF measuring 592Kb; and finally, an LZW compressed TIFF again, but this time reduced to 50dpi to measure 20.8Kb. Greyscale images are in 8-bit anyway, hence there is no loss in quality when saved as a GIF

Bit of a TIFF

Probably the most common bitmap file format is the Tagged Image File Format, or TIFF. Originally developed by Aldus, it is one of the most compatible and widespread formats in use today. It's a fairly basic description but in certain instances can handle up to 32-bit CMYK colour for printing or 48 bits for ultra-precise RGB work. Normally eight bits is considered sufficient for numbers of grey levels but the 48-bit format allows 16 bits for extra smoothness and high dynamic range.

TIFFs can also support various types of compression, the most common being run length encoding (RLE), which looks out for portions of the image using the same colours. An uncompressed raw file would describe the colour of each dot individually, but if you've got, say, 50 identically coloured dots in a row, then a compression routine could save space by assuming that the next 50 dots were all the same shade of red. RLE routines perform this task (very effective for certain images) and, better still, do not degrade the quality of the image. This is known as "lossless compression", as opposed to "lossy compression" where there is a variable loss of quality.

TIFF also supports other compression formats which, along with the higher colour options, can sometimes cause incompatibility with lower-end graphics packages. Some can only recognise and display TIFFs up to 24-bit colour or those compressed using LZW (as used in the popular ZIP compression format).

Got DIBs on it

Perhaps the most obviously named bitmap format is BMP which can support up to 24-bit colour and sometimes optional RLE compression. BMPs (also known as DIBs) are, incidentally, used by Windows 3.x and 95 for its backdrops. To create a new backdrop, take your image and save it as a BMP format in the Windows folder. Next time you go to change your backdrop, this image will be available.

Like BMP, PCX (also known as the PC Paintbrush file format) can support colours up to 24-bit and compression using RLE. By now the question of compatibility will have cropped up in the back of your mind. Launch your favourite graphics application and see which formats it supports. Paintbrush, which comes with every version of Windows, supports BMP and PCX files. The very reasonably priced

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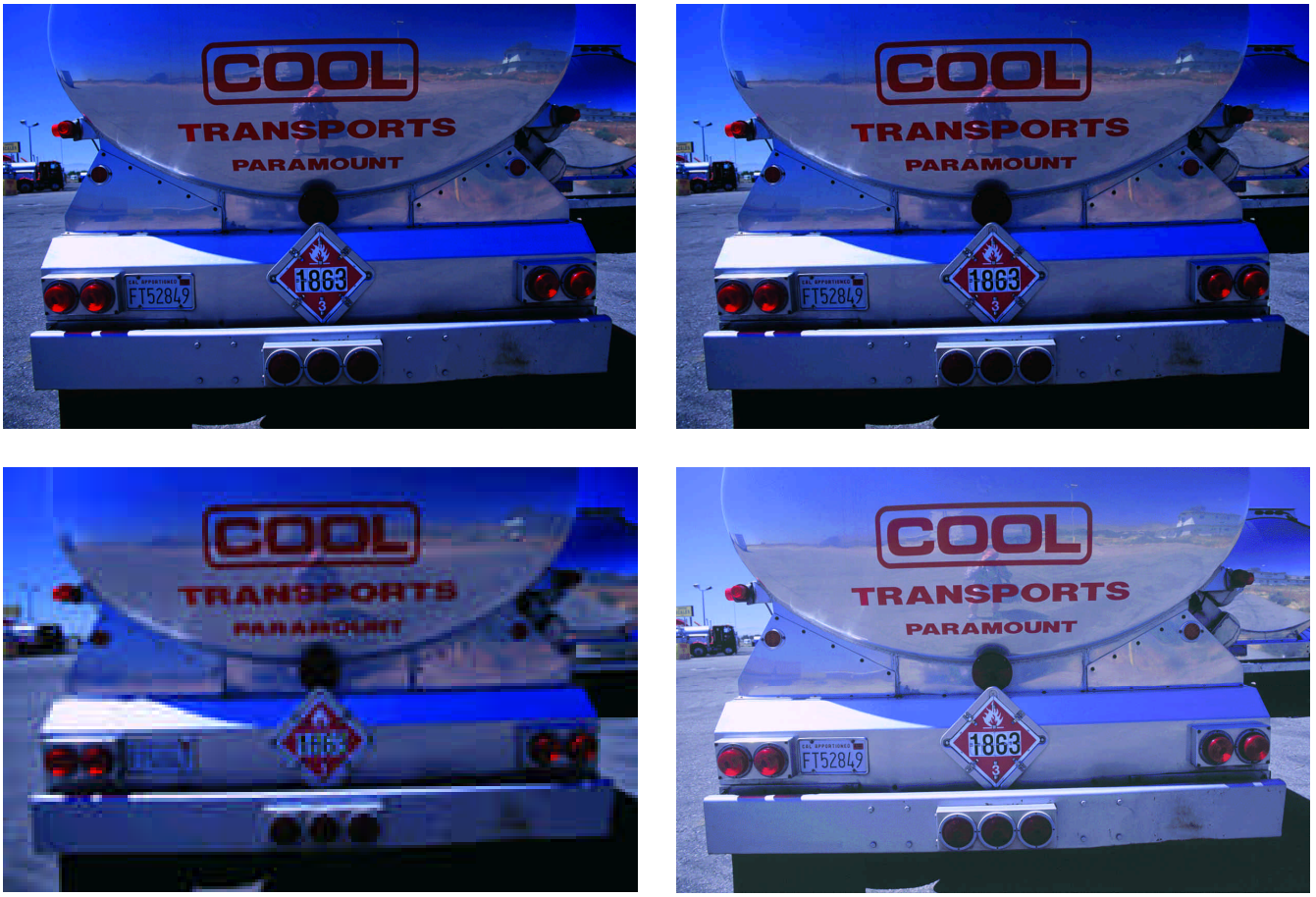

We started with a 300dpi CMYK colour image measuring 3.81Mb. Clockwise from top left: The image saved as a TIFF with LZW compression measuring 2.59Mb; secondly, saved as a JPEG with high compression measuring 99Kb; thirdly, saved as a GIF measuring 430Kb; and finally, an LZW compressed TIFF again, but reduced to 50dpi to measure 74Kb. Notice how the GIF image loses subtle shades when downgraded to 8-bit

PaintShop Pro can handle almost anything you throw at it although, in my view, Adobe Photoshop is the king of file formats, capable of opening the most obscure colour spaces and compressions.

GIF it to me

The ubiquitous Graphics Interchange Format (GIF) was developed by CompuServe as a compressed format for quick exchange while online. Compression and getting the information transferred as quickly as possible is clearly very important in all online applications and the GIF was the first popular format of this kind. It employs compulsory LZW compression but sadly does not support anything above 8-bit colour. However, the recent GIF89a export filter, available for some applications, will support 24-bit RGB images and transparent areas for use in HTML web documents.

The JPEG line

Equally, if not more popular than the GIF on the web, is the Joint Photographic Experts Group (JPEG) format. To confuse matters a little, JPEG is in fact a compression system which can be applied to any file format but typically finds itself used on images. However, there is a JPEG bitmapped file format in wide circulation, supporting 24-bit colour and using the same compression system as its name.

Prior to JPEG compression, we had the choice of RLE and LZW algorithms which worked well on simple images but not continuous-tone colour photographic pictures. JPEG was designed to better handle real-world full-colour images. It is a lossy system, which throws away pieces of information the human eye can't easily see.

When saving an image with JPEG compression, the user is given several choices of quality from low but highly compressed, to high but only compressed a little. At the highest compression, file sizes can shrink to tiny sizes, but the quality is noticeably poor. On the other hand, JPEG offers excellent quality at more modest levels of compression.

It is up to the user to experiment to see what levels of compression they find acceptable, although bear in mind that once lossy compression has been performed, there is no going back; the discarded information is lost forever. For this reason, make sure you have a safe copy of your original image stored in a lossless format such as a TIFF, and experiment with duplicates.

We have merely scraped the surface of bitmapped graphics file formats here, but you now have an idea of what is involved. Which format you choose will depend on your particular requirements, but please bear compatibility in mind, particularly when crossing platforms or going to a very basic system. After that, consider compression in terms of storage or bandwidth — no-one wants to wait around all day downloading an image, and bear in mind that if it is only ever going to appear on-screen, you can get away with resolutions of around 75dpi.

Best of luck!

PCW Contact

Any questions? Write to me at the usual *PCW* address or email graphics@pcw.co.uk.

Colour coded

Don't feel blue when your on-screen colours aren't printing out right. To put you in the pink again, Gordon Laing explains why and tells you how to cope with it using colour coding.

Good news for graphics fans: our annual DTP and monitor group tests appear in this issue. The former covers low-cost products as well as the heavyweights. In our monitor test this year we have concentrated on 17in monitors only, since these make up the bulk of current standalone display purchases. Our group test is broadly split down the middle into those models featuring maximum horizontal scanning frequencies of around 65kHz or 85kHz. This specification defines the highest signal the monitor can lock on to and display. As the group test explains in more detail, there's more than just the scanning frequency involved to display a certain image.

In real terms, a 65kHz monitor will be able to display a resolution of up to 1,024 x 768, non-interlaced at a refresh rate of 75-80Hz. An 85kHz monitor will be able to display a resolution of up to 1,280 x 1,024, non-interlaced, also at a refresh rate of 75-80Hz. Again, as the group test explains, interlacing produces an undesirable image for computer applications, while refresh rates above 70Hz are considered flicker-free. In my opinion, a good monitor is essential; far more important than blowing all your budget on speed and storage. Whatever your software application, you'll be staring at your monitor all the time, so it's worth getting a good one. If you're using graphics applications, the need for a quality display is immediately apparent.

It's also worth bearing in mind that your monitor is displaying only what the graphics card is feeding it. The best monitor in the world will flicker if your graphics circuitry is telling it to, so before blaming the tube in front of you, check out those display settings from Windows (the Mac OS tends to enforce a 75Hz refresh rate on resolutions above 640 x 480). You may have to use the utility which came with your graphics card, but a little nosing around here and there will, hopefully, reveal a control panel with refresh-rate settings.

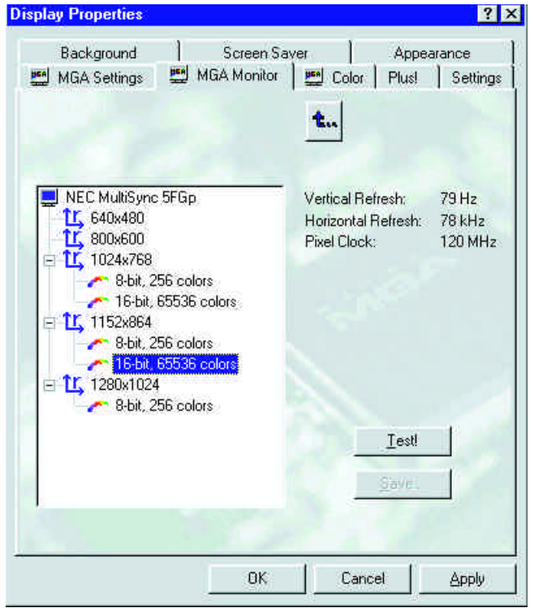

Fig 1 The popular Matrox Millenium graphics card adds its own extras to Win95's display properties. Select a suitable monitor and the card will feed it as high a refresh rate as it can handle

I know we're supposed to support new formats and standards but the plug-and-play monitor specification is a bit odd. It's supposed to allow the monitor to feed back its capabilities to the graphics card to stop you selecting too high a display mode, and to allow your system to arrive at the perfect setting for your equipment. But you often end up with a non-interlaced refresh rate of 60Hz at your selected resolution, which flickers.

Often the best solution is not to select a plug-and-play monitor from the list at all, instead going for a model you know matches your monitor's specs. If you can't find your model on the list, I'd recommend selecting either an NEC 4FG or NEC 5FG, which support modes up to 65 and 85kHz respectively; go for the one which matches your model's maximum horizontal scanning frequency. Now you should be able to go back into your graphics card utility and select a higher refresh rate. If you accidentally opt for something beyond your monitor's specs, the display will go blank, but fortunately Windows 95 and NT will return to your previous settings after ten seconds or so, asking which you'd prefer.

Colour coding

Colour has been the subject of numerous Graphics & DTP columns in the past, but popular demand has brought it back into the picture. It is a fascinating topic, ranging from perceptions of colour to the physics of light. This time it is the turn of the over-used acronym WYSIWYG (you know the one; What You See Is What You Get) and the miracle that is modern graphical computing.

WYSIWYG works to a certain extent. We all take for granted the idea of designing a page layout or even just a carefully-formatted document, and seeing it print out with the same size and styled fonts in the right places. It's fairly cunning if you examine what it entails but the whole thing falls apart when colour is involved. All you really want is for the colours you scan to be the same on-screen as when you print.

But there are two problems. Firstly, different devices (such as monitors and printers) create colours using different means and, believe it or not, many simply cannot produce the same range as others.

The second problem is down to your device's settings. You could have a dull red on-screen, thanks to having your brightness dial too low, and wonder why the printer is outputting a bright red. You should additionally consider that the kind of lighting surrounding you will greatly affect your colour perception. The solutions are to understand the colour capabilities of your devices, followed by calibration and compensation.

So, back to the bad news that not all devices can produce the same range of colours. Monitors produce colours by combining the light emitted by the red, green and blue phosphors on the inside of the glass tube. This is known as an additive process. Printers produce colours by using inks which absorb certain colours of light, leaving the eye to see which colours remain after reflection. This is known as a subtractive process.

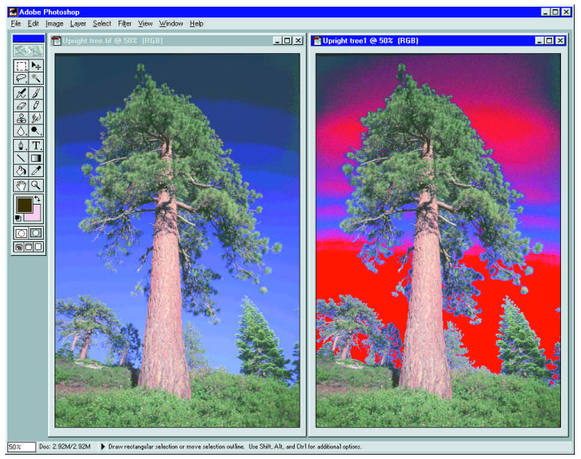

Fig 2 The tree on the left is an original RGB scan containing colours the CMYK process cannot print. A "gamut preview" in Photoshop highlights the problem areas (indicated in red on the tree on the right). The original RGB colours have been lost, as this screenshot had to be converted to CMYK for printing

It would be impractical to print different inks for each shade of every colour in your document, so a technique was developed whereby most colours could be simulated by printing various-sized dots with three colours of ink: cyan, magenta and yellow. In theory, placing equal amounts of these inks should absorb all light to give the impression of shades of grey or black, but in practice you get a muddy brown. Since black is so important (consider the abundance of black type), this three-colour printing process is usually accompanied by a separate black ink. This is a four-colour process, known by the initial letters of the inks involved, apart from black which is referred to as K to avoid confusion with B for Blue. Hence the four-colour printing process used to make virtually every colour magazine and poster is known as CMYK.

Unfortunately, the CMYK colour model is only capable of reproducing a limited range of colours. The RGB (red, blue, green) colour model is capable of a wider range but still nowhere near the complete range of the human eye. The range that a device can display is known as its "gamut", and if you try to get it to reproduce a colour that falls outside its gamut, you'll be disappointed.

It is possible to create a profile of a device's capabilities: say a scanner with reflective or transparent media, or an inkjet with shiny or plain paper. Such profiles could be used to calibrate and compensate for any imperfections (remember, the limited CMYK model is further limited by impurities in the ink and of course the paper on which it's being printed). Profiles could also be used to warn an application that you're working outside its gamut. Photoshop, for instance, can let you know if you're working

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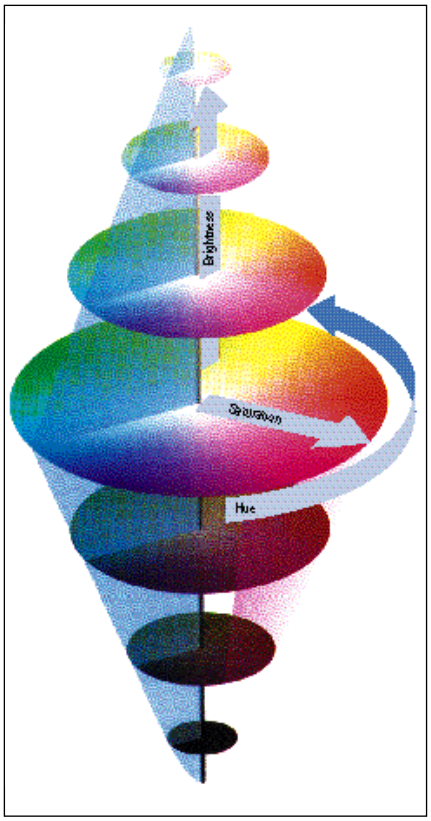

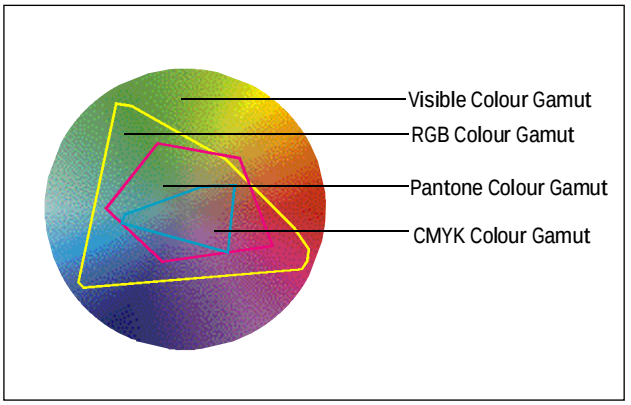

Fig 3 (far left) The CIE colour model of hue, saturation and brightness from which most colour pickers are derived
Fig 4 (left) A section of the CIE model overlaid with the ranges (gamuts) supported by various processes. Notice how some gamuts are wider than others

with a colour that your chosen printer has no intention of reproducing.

For this reason, many illustrators whose work is only going to appear in print don't bother using the RGB or indexed colour modes of applications like Photoshop, but instead start working in CMYK. That way, they know they're not using colours which won't reproduce when their precious work makes the inevitable conversion to CMYK.

Don't get me wrong, though. There's no need to avoid RGB modes from now on. You could be working on an image which is only ever going to appear on-screen, like a web page or CD-ROM title. Also bear in mind that CMYK files are one-third larger than RGB, so if you have your warnings activated you could work cautiously but more quickly in RGB and convert later.

Colour scanners are RGB devices with specific gamuts, too, which begins to make you wonder how any of the colours on your prints even remotely resemble those with which you started. There is a light at the end of the tunnel, however, with colour management systems (CMS).

A CMS system lets you measure the gamut of your devices compared to a standard colour space, such as the CIE model (Figs 3 & 4). To measure a device's gamut, you must scan, display or print a standard reference target, typically consisting of many natural colours, and compare it to a reference "perfect" version, usually supplied on disk with the target. The differences between the original and what your device produces can be used to make a unique profile, or tag, which can then be used to correct for that device's characteristics.

What happens is that an original bright red may be reproduced by a device as dull orange. This is incorporated into the profile for that device, which tells the CMS to take dull oranges from that device and turn them into bright reds. The CMS can, in some instances, modify your graphics card's output to make your monitor reproduce colours as accurately as possible.

If you're serious about colour matching, it's worth employing the aid of a CMS and regularly calibrating your system. Many decent graphics applications come with a CMS; either one of their own or, quite commonly, one devised by Kodak called KPCMS. My particular favourite is Agfa's FotoTune, which allows you to create profiles for each device and use them as exports or filters in Photoshop to convert RGB files into CMYK.

Alternatively you could use spot colours, like those offered in the standard Pantone library. Pantone offers a catalogue full of colour swatches from which you choose the ones you want: pure ink which produces a pure, solid, known colour without all that faffing around mixing cyan, magenta and yellow and wondering whether it's going to turn out right. There are many spot colours which exist outside of the CMYK gamut, allowing you to print, say, bright green, metallic silver or gold.

As explained earlier, using one ink per colour is only practical if your document consists of less than, say, four colours. However, many magazine covers and posters add one or two spot colours to their existing four-colour CMYK printing process for impact, to provide vibrant colours which liven up the image.

If your budget can stretch to six inks but you're not bothered about spot colours, you could consider using colour systems like Pantone Hexachrome, a six-colour process with a wider gamut than CMYK. Pantone also offers a CMS called ColourDrive for Windows 95 which I'll cover in detail, along with Agfa FotoTune and Kodak Precision CMS, in a forthcoming column.

Digital update

Last month I tried out Sony's consumer DSC-F1 digital camera and reckoned it was the best in its league. Bear in mind "its league" involves a working resolution of 640 x 480 pixels, which may not be sufficient for some needs. The optional DPP-M55 colour printer didn't arrive in time for my review, but I've since had a chance to play with it.

Printing from the camera is easy: select the images you want from the DSC-F1, select Print from the menu, and point the camera at the printer. A little infra-red beaming later, and the printer does its thing. It takes just over a minute for the print to arrive, which isn't bad for dye-sublimation technology. As you'd expect from continuous tone dye-sub technology, the colours look excellent; just like real glossy photos. However, even at the small printing size of 113 x 84mm, the low 640 x 480 pixel resolution is quite apparent, particularly so with regards to fine detail.

Digital photography is not yet quite there for many users, but the novelty of making your own colour prints minutes after taking the original photos is certainly pretty cool.

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Retouch and go

Gordon Laing shows how to save what might have been the perfect photo, ruined by blots on the landscape: don't bin it, scan it, and use every trick in the book to total unwanted tourists.

This month, I finally get to bore you with my holiday snaps, thinly disguised as a feature on the tricks and morals of photo-retouching.

But first, the news. Intel's Pentiums with MMX enhancements have finally been announced, so in last month's *PCW* we tested eight MMX PCs. We tried out Adobe Photoshop 4 and CorelDraw 7, both featuring MMX code, on a Pentium 200MHz with MMX. We timed filters, image rotations and colour-mode changes under Photoshop and a screen redraw of Corel's Snowbarn file at a resolution of 1024 x 768 in 16-bit colour. We then swapped the MMX chip for a standard 200MHz Pentium without MMX, and repeated the tests.

The Photoshop results showed speed increases of up to 45 percent, but Corel's faster redraw was thanks mostly to MMX's doubled Level-1 cache. Slightly disappointed, we later discovered that the graphics-card drivers will have to be updated to make use of MMX chips, and only then will we see redraw improvements.

Those wanting a top-of-the-range PC today, particularly for multimedia applications, should go for an MMX model. But the rest of us should be content to wait until we're running mostly 32-bit apps under NT4, then make the more significant upgrade to a Pentium Pro chip — soon to be seen with MMX enhancements too.

Anyone seeking a major hardware upgrade for graphics work should still consider more RAM before plumping for a faster chip. The photo-retouching I describe here involved working on 28Mb files, using a PC fitted with 32Mb. By the time Windows 95 and Photoshop had their share, the system almost ground to a halt. After one very slow day, I took 32Mb of RAM from my home PC to boost my work PC to 64Mb. The difference was amazing, with operations taking mere seconds rather than minutes.

As my main subject this month involves photography, this is a good time to mention digital cameras. Users of Casio's popular, but slightly toy-like, QV-10a and QV-100 cameras may be interested in considering third-party lenses. The Kerridge Computer Company offers a kit for either camera, featuring a 1.5X telephoto and 0.65X wide-angle lens for £64 (plus VAT). A 2X and 4X macro lens kit is also available for the QV-10a at £64 (plus VAT), while a 2X-only macro lens for the QV-100 costs £49.50 (plus VAT).

Kerridge also offers a lighted base and stand, to photograph transparencies with the aid of the optional macro lens. We haven't yet had the opportunity to test these products but those still making their choice of digital camera could do worse than opt for Sony's new DSC-F1, reviewed in this month's First Impressions *(page 70)*. It's a 640 x 480 pixel model with flash, LCD display, infra-red port and the kind of sexy styling at which Sony excels, for £595 (plus VAT).

The morals of manipulation

When I was 14, I stopped mucking around and started taking serious photos. I remember recoiling in horror when I first saw one of my photo pals use a filter: rendering the sky that graduated shade of tobacco so popular in those days. But now, this picture would be inaccurate! The event had not been recorded properly and anyone looking at the picture would be falling for a lie!

Suffice it to say, this extreme response disappeared as soon as I had a go myself. Suddenly, photography had become much more than just finding something nice-looking, pointing the camera at it and clicking. It had finally dawned on me, the number of ways in which a photographer could manipulate a picture without even changing position or lenses. More to the point, it became much more fun.

Later, I found myself spending much longer in the darkroom than outside taking the pictures. Dodging and burning to bring out otherwise hidden details became an obsession. As regular readers will know, my darkroom now resides within my PC and applications like Photoshop, but the principles, goals and morals still remain.

A touch of professionalism

Digitally painting out dirt and scratches can be seen by all as beneficial. You can selectively darken, lighten or even recolour areas of a picture, even though some may consider this to be cheating a bit. Take a one-off trip to a far-off land, for instance: an otherwise perfect photo could have been marred by an overcast sky. Many would consider themselves fairly beaten. But while there's nothing better than capturing the perfect shot, first time, there's still no need to bin a less-than-ideal pic. Why not scan it in and add a blue sky? Or at least darken the area to bring out more detail in the highlights? You may at first share the same horror I experienced when witnessing my first filter, but if you can get over this you'll never look back (the professionals use every trick in the book until they get the picture they want).

This neatly brings me to the biggest graphics job I've ever completed: printing a collection of holiday photos taken during the past two years. Wanting the very best final results, I chose to use professional slide film: Fuji Velvia (50 ASA) and Fuji Provia (100 ASA). Choosing slide film, however, proved to be a bit of a mistake since the 10in x 8in prints I desired were going to cost over £10-a-go at professional labs. Besides, I had originally wanted 12in x 8in prints to show the full 35mm frame, but these had been even more expensive. Consequently, the processed slides just sat there in their sleeves… until now. Towards the end of last year I decided to use my PC to scan the films and print them out the next time I got my hands on a decent colour printer. At the same time I could make any digital enhancements I desired.

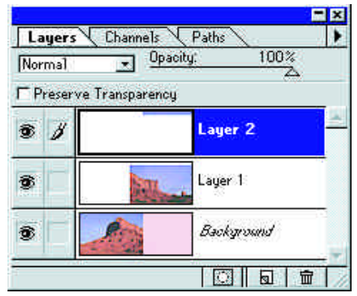
Admittedly, I'm still not keen on the idea of selecting an overcast sky and replacing it with deep blue (the guilt still twinges, deep down). Nevertheless, I suddenly found myself to be not so bothered about man-made aberrations in my otherwise perfect field of view: those horrible signposts, telephone wires, fences, tracks, or even stray holidaymakers, could be easily wiped out using my PC.

Look — can you see the join?

Of course, you should still try to make life easy for yourself by trying to line up your shot to minimise the amount of post-processing work required. For instance, I once came across an extremely long fence crossing my entire field of view; I couldn't climb it, so instead I walked right up to it and pointed the camera along it. There's still a nasty fence to get rid of, but rather than crossing my entire frame, it only measures a couple of millimetres wide.

I also saw opportunities to digitally join two photos to produce a panoramic shot. Here, the usual tips apply; try to use a tripod, or lean on a fence to make sure the shots line up vertically. In one case I had to make do without a support and discovered later, at the joining stage, that the shots were about ten percent off so one of them needed an extra portion of sky. But after a little copying, pasting and smudging between the joins, I am pleased with the results I achieved.

Incidentally, there is an excellent tutorial on the CD that comes with Photoshop 4, which shows how to create a complex



Far left Utah's Monument Valley is just begging for a panoramic shot. I took two photos with my 35mm camera and stuck them together using layers in Photoshop 4 (above)

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Clockwise, from top left: Central Park with a lampost, then without. My terrifyingly white legs… but hey, who are those two blokes by the rock? I'll get rid of them! Monument Valley by moonlight and a cunning car headlight trail; but perhaps it looks better without? A tranquil Californian beach scene… but hang on, spot that fella with the rucksack? He's history! All the above retouching was easily done with Adobe Photoshop's clone tool

panoramic shot, taking multiple frames and foreground parallax into account.

Before letting my photos and their captions do the talking, a short word on the PC hardware employed. I needed an excellent 35mm film scanner and was not let down by the superb Nikon Super CoolScan, a 2700dpi 36-bit model which quickly produced 28Mb (maximum) files. This was connected to an Adaptec 2940UW SCSI card, which also controlled a secondary 2Gb Quantum SCSI hard disk.

The 166MHz Pentium PC I described earlier was fitted with 64Mb RAM. I used Photoshop 4 under Windows 95 and, to maximise performance, set Windows virtual memory to 2.5 times the amount of RAM for both minimum and maximum quantities, thus preventing Windows wasting time resizing its swap file. I also set Photoshop's scratch disk to the physically separate Quantum hard drive, independent from the drive that Windows was using for its own virtual memory. I can't wait to go away on holiday again!

PCW Contacts

Any questions? Write to me at the usual *PCW* address or email me at graphics@pcw.vnu.co.uk

Kerridge Computer Company 01635 523456
FontWorks 0171 490 5390
Sony IT group 0181 760 0500

Signing off

The price of fame — Gordon Laing is fed up with signing his name. Whether it's autograph hunters or correspondence overkill, here's how your computer can do the signature for you.

It may be the month of St. Valentine when you read this, but as I write, we're one week away from Christmas Day. I designed my own card for the season of goodwill, but as I laboriously hand-signed every one, it occurred to me that there must be an easier way of doing it. The signing bit, that is.

Although I feel that using a good old-fashioned pen lends a personal air and wouldn't change it for a thing, there are many occasions when having your signature, or other sample of essential handwriting, on call from your PC could be extremely handy.

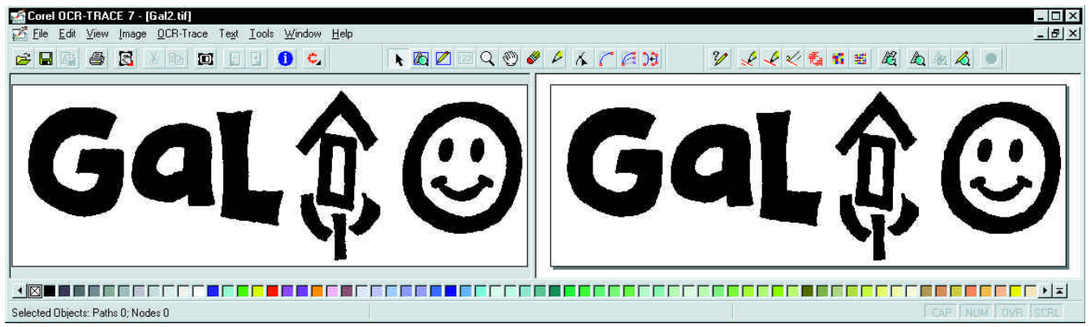
Written and carefully formatted a letter? How many times have you printed it out, stuck it straight into the post and watched it speed away without signing it? What if you're faxing from your PC and want to personalise your memo, without wasting paper at your end? Editor of a leading magazine perhaps? How do these people get their signatures into Quark XPress and consequently in the front of the magazine? Alternatively, you could simply be far too busy or important to do something as banal as signing letters with a pen.

So how else can you do it? The obvious technique is to sign a piece of paper, scan it, and insert the bitmap directly into Word (or whatever else you are using). And that's it — pass Go, collect £200 (for the upgrade to your favourite graphics app) and turn to the next *Hands On* column.

Hang on a minute, though: if it were that simple and effective, this really would be the shortest and, some people may say, the best edition of the *Graphics & DTP* column so far! Fortunately for me, and you of course, there are considerably more twisted means of using scanned handwriting than just plain bitmap-plonking.

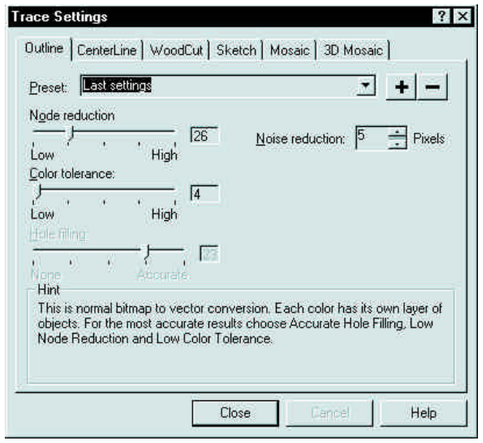
So you've got a logo or signature and want to use it on your computer? The first step is to scan it and produce a bitmap image. The GAL image is one I designed when I was only eight years old!

Top right is an enlargement of the smiley face bitmap, scanned at 100dpi — notice the low resolution. But with the aid of CorelTrace (below) I turned it into a smooth, scalable EPS vector file (right). Bitmap tracing requires a bit of trial and error, playing around with the settings (opposite page, top)



Just sign here…

As regular readers of this column will know, a bitmap is simply a grid of dots which can be coloured, or not. The more dots you have in the same distance (usually measured per inch) the greater the detail that can be captured. The downside is that more dots means bigger files, and as anyone tinkering with large colour scans soon discovers, bitmaps can quickly become unfeasibly large.



(See main caption, opposite)

Scans of signatures should be in black and white (one bit per pixel) or greyscale (eight bits per pixel), as compared to full-colour 24 bits per pixel, and are usually physically small. A typical signature may measure three inches wide by one inch tall which, at 300dpi, results in 33Kb in 1-bit or 270Kb in 8-bit — hardly a huge file out of control.

But before you breathe a sigh of relief, even at a small physical size bitmaps have their disadvantages. In the first place, as soon as you start enlarging them, their undesirable blocky nature becomes visible. You could of course rescan at a higher resolution, but that's when the file sizes begin to grow. So bitmaps have an inherent lack of scalability.

Secondly, you've got to be careful when scanning in greyscale that the background you thought was white doesn't turn out to be a slightly dirty grey when printed with your otherwise pristine document. It's no good having a little grey box surrounding your signature or bits of dirt; in fact, this sort of mistake will end up making you look a lot worse than having forgotten to tag the signature on in the first place.

My advice is to clean up the marks, select the background greys with a magic wand style tool, and replace them with pure white just to make sure. I would even go for anti-aliasing to ensure that the edges are smooth. And you could play completely safe by converting to 1-bit line-art mode, or scanning in this mode to start with, but the results are often hard and jagged. Scanning in greyscale will pick up the nuances where the pen hasn't been pressed as hard, and indeed, the edges of the line itself. Although this may sound rather excessive, you really do notice the difference.

If you want to scale your signature, you'll need to convert your bitmap into a vector file format such as an EPS, using what is known as a bitmap tracer. Most drawing applications come either with this facility built-in or included as an optional utility. Corel's has its CorelTrace utility, now featuring substantial OCR facilities, FreeHand's tracing is built-in, while Adobe offers the standalone and very capable Streamline, although, unsurprisingly, the Windows version is ancient.

Bitmap tracing does just what you would expect from its name. Following user-defined preferences, the application traces the edges of the bitmap, creating an outline using vector bezier curves; just like drawing directly within CorelDraw or FreeHand. The resulting shape is scalable, very small in file size and should, with any luck, closely resemble the original bitmap image.

Tracing works best with very simple images made up of basic lines and curves, such as handwriting and logos. You'll need to play around with the preferences and tolerances before you get what you're looking for, but the final result is often worth it; you may even come across some unexpected gems in the process. Bitmap tracing is particularly useful with printed logos where a small file, which is scalable and device-independent, is very handy.

Font formulation

So you've tried using a bitmap, or even a traced EPS, but you're still having to draw separate picture frames or insert them as graphic objects. One alternative is to create your own font, made up of logos, handwritten characters, or even a whole

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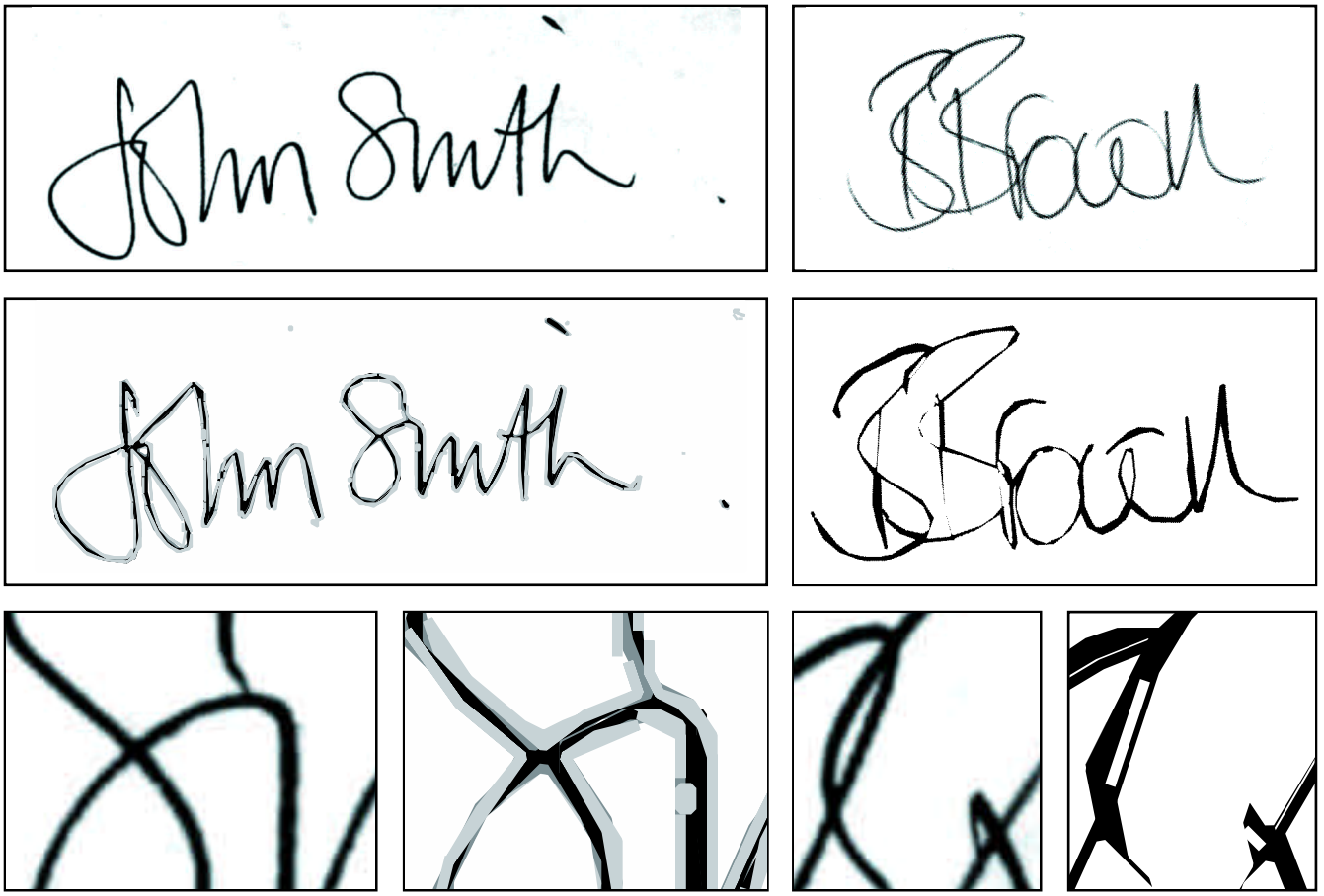

Just sign here: two typical signatures get the computer treatment. Top left and right are the original scans made at 300dpi in 8-bit greyscale; notice some dirt and marks in the background. Middle left and right are the traced EPSs, although the John Smith has been made with three levels of grey, resulting in a less severe outline than the single-level B.Brown. The resolution of the bitmaps along with the smoothness of the outline traces is shown in the four images immediately above, all enlarged five times. From left to right: John Smith bitmap (410Kb), John Smith three-shade EPS (110Kb), B.Brown bitmap (487Kb), and B.Brown single shade EPS (59Kb). You may never have to pick up that pen again!

collection of signatures — imagine having your entire company's signatures stored in a single font file, where pressing "A" could be the accountant, "B" could be the boss and so on.

To do this properly, you really need a dedicated application like Macromedia Fontographer, which comes as part of the FreeHand 7 Graphics suite. Here you can carefully create and tweak each character before mapping them to a character set and exporting as TrueType or Type-1. In fact, Fontographer features built-in bitmap tracing and encourages users to scan their own hand-drawn samples, which are converted into a scalable format; after all, TrueType and Type-1 font formats do use scalable vector descriptions.

CorelDraw boasts an intriguing export to TTF (TrueType font) filter (which I will be looking at in greater detail in a future *Graphics & DTP* column). If any of you have had experience of this, please let me know how you fared.

In the meantime, good luck, have fun, but don't sign anything before you've carefully read the terms and conditions above — and do make sure that no-one gets hold of your precious signing rights and abuses them!

Digital cameras reveal all

Last month's digital camera group test was very revealing, particularly in terms of output in high-quality print. Manufacturers were concerned about us printing sample images from all the cameras, side by side: how could a budget camera compete with one costing ten times that amount, they argued?

A fair point, but in fact almost all models, including those operating at 640 x 480 pixels, looked fine reproduced at 50 x 75mm (approx). This shows how flexible these cheaper cameras can be, effectively operating at 240dpi when reproducing at two inches wide. Of course, had we printed them all at A4, only the expensive Nikon, Minolta and Polaroids would have weathered the test. But a good show for the entry-level nonetheless. I can't wait to get my hands on the forthcoming models I saw at Comdex. If any of you have any digital camera stories or experiences, I'd love to hear about them.

This month's PC group test features the latest Intel chips with MMX technology *[page 166]*. Faster multimedia performance all-round for those applications making the right calls. The good news, in theory, for graphics users is that Photoshop 4 and CorelDraw 7 are both already supposedly accelerated for MMX hardware. This column was written before our test results were available, so refer to that feature for the latest figures.

Next month I'll return to the subject of image manipulation, particularly the enhancement of photographs.

PCW Contact

Duff DTP? I recommend you contact the manufacturer. But if you know of any decent parties, please contact **Gordon Laing** at the VNU address or email graphics@pcw.vnu.co.uk

Digital doings

Using his personalised Christmas card as an example, Gordon Laing shows you how to digitally recreate a stained glass effect. And, the ins and outs of using digital cameras.

I urge all readers of this column to check out our digital camera group test on page 176 — the first undertaken by *Personal Computer World*. My colleague, Adele Dyer, and I decided it was best to visit a well-stocked distributor for the day and try them all out under the same controlled conditions. So we popped down to Guildford to visit the Digital Camera Company, which was packed with more models than we'd ever seen gathered together in one place.

In this month's column I'll cover the subject of using digital cameras, but first a few extra details on how last month's Christmas card image came into being.

Return to the stained glass

Last year I shocked many readers of this column, who turned the page to see a festive photo of myself peering back at them — scary stuff. I printed out a batch of them as Christmas cards, and rather than getting lynched, as I'd first expected, most people asked what I would do next year. That's setting a precedent for you!

Those lucky enough to have a copy of last month's *PCW*, will already have sampled the full force of "Laing's Christmas image" but, unfortunately, I ran out of space in which to fully describe how it was achieved. So indulge me for a while and I'll divulge the gory details to you.

I have always had a fascination with stained glass windows, and fancied making one of my own — digitally, of course. So I hung out around numerous religious establishments and I browsed art books for research. I must admit to also having looked carefully at Christmas cards already on sale, to gain inspiration. Two definite styles emerged: the oldest stained glass windows had wavy strips of lead and quite intricate detail, while the more modern designs were clean, almost Conran-esque.

In all cases, faces and areas of detail too complex to create with whole strips of lead, were hand painted, inscribed or drawn directly onto a clear pane of glass. I kept this in mind for the time when I would finally add my face to the rest of the composition.

Look closely at lead on stained glass windows and you'll see that it's nowhere near solid black. There are various textures and shades of grey running along the lines. This posed a problem which was resolved by an issue of style. I didn't want anything too fussy, so I decided on solid black lines for my lead. This would be an ideal application for a vector drawing package, especially when it came to filling in the gaps with stained glass-like colours.

However, I'm not great with vector drawing apps and, in the absence of a graphics tablet, I decided to draw the basic outlines by hand. Once pencilled out and correct, I went over the lines with a jet black, thick marker pen. Looking closely at existing windows, I noticed the weld marks filling in the areas where one strip of lead crossed or joined another. I ended up placing blobs of inks in the corners of every join on my page to simulate this effect.

Of course my so-called jet black lines were actually as uneven in shade as genuine lead. I quickly rectified this by scanning the page in black and white line art mode. In this mode, a threshold level is set, whereupon anything too light is blanked out as white, and anything darker becomes pure black. Perfect.

At this point I had to make an important decision which I'd neglected last year: how big did I want the picture to be and, equally important, what shape? Last year I chose dimensions, off the top of my head, forgetting to take into account the size of the envelope. And guess what? Correct; I had to buy envelopes which were way too big, so my precious work rattled around inside and got severely mangled.

No mistakes like that this year. So, as a hot tip for anyone considering this kind of thing; make sure you know envelope and printer sizes before you begin! Consider where you're outputting. I started working in CMYK colour space immediately, thereby avoiding any nasty surprises when converting from, say, RGB colour space.

Once that had been worked out and scanned in, I had the job of filling the gaps with colour. I considered solid or graduated fills but decided it would look too child-like and simple. Instead, I reached for the superb Autodesk Texture Universe CD and pulled off several scans of real stained glass windows. A little fiddling with colour balance and I had six or seven pieces of coloured, textured "glass" with which to play around.

The next part was simple; I just copied the glass scans to the clipboard, selected the areas to fill and pasted them in (from the edit menu). I dragged it around to where I wanted it, and Bob's your uncle… (actually, he is my Uncle, so here's a big hello to My Uncle Robert!).

But now I had the potentially tricky task of putting my face onto the head and shoulders I'd drawn. I dug around my photo collection for a full face picture of myself (I had considered taking a digital camera original, but found a suitable print instead). One quick and dirty scan later I had to reduce it to a scribbly level of detail. Fortunately, I'm pale anyway, but I upped the brightness and contrast until I was left with an outline, with faint marks for my eyes, nose and mouth. A couple of Photoshop filters later — particularly the Photocopy filter from Adobe Gallery Effects (now included with Photoshop 4) — and I had the desired effect. A copy, resize and paste later and my masterpiece was finished — for this year anyway!

Digital cameras

In this month's group test we've looked at digital cameras for the first time, and discovered there's more than meets the eye when taking electronic photographs. They are all very different — as different as the multitude of compact and SLR film cameras on the market. Being perfect electronic gadgets, digital cameras are just asking to be abused; imagine over-zealous designers popping mysterious buttons with unidentifiable icons.

During our test, I and my colleague, Adele, took pictures of the same composition from approximately the same distance and angle with every digital camera we could lay our hands on. While many produce images designed for on-screen use only, printing the sample output from each would at least indicate the relative quality of each model.

In theory this is great and, in practice, as you'll see elsewhere in this issue, it worked out reasonably well, but one of the most infuriating things, on certain cameras, was being unable to perfectly compose the images. The trouble is that all the budget digital cameras to date are not SLR designs; instead relying on one lens for the viewfinder and another for the image-taking. Anyone who's ever used such a design on a compact film camera will know the pitfalls of accurate framing, particularly when photographing close up. So parallax error is our perfectly good excuse for not getting the same angle and framing in every shot.

An SLR optical design is, of course, one way to solve the problem, and while many higher-end digital cameras employ this trick, they are, for now, only for the very wealthy. Digital cameras, with their electronic images, offer the LCD screen alternative for budget models.

Casio started the trend with its budget QV-10a digital camera, which was not only cheap but also dispensed with the viewfinder altogether in favour of a small, colour, LCD screen at the rear. Many people criticised the power drainage as well as the undeniable fact that the screen was difficult to see in direct sunlight. But what it did allow, was a precise view of what you were going to get. Even better, LCD screens can be used to view images in memory to verify that you have indeed captured exactly what you were after — a kind of electronic Polaroid.

LCD screens are becoming more commonplace, but I would like to see budget cameras with both a screen and conventional optical viewfinder, for those occasions either when the sun is out, or the batteries are about to die.

Utility is also an issue when it comes to transferring images from camera to PC. Most models offer some kind of lead (usually serial) as a physical connection. Admittedly, you don't have to wait long, but in many cases it's like visiting a particularly slow and image-intensive web site. Far better, in my opinion, are those cameras

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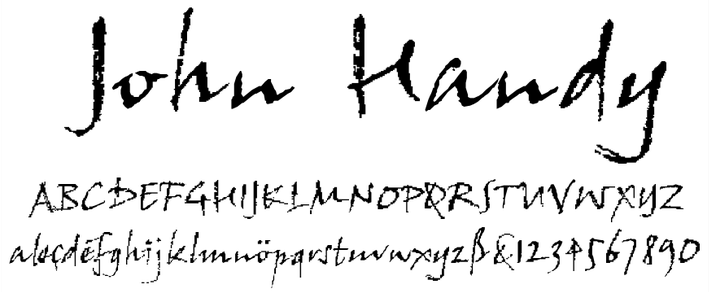
Font of the month



Monotype has launched a package of three handwriting fonts, and last month we featured the lovely Pablo typeface, based on Picasso's signature. This month it's the turn of John Handy, based on British designer Tim Donaldson's own handwriting. In a future column I'll explain how to make a font out of your own scrawls.

In this month's digital camera group test, we photographed the same composition with each model set to its highest quality, and printed the results alongside each other. Although it's unfair to compare the output from products costing ten times as much as its neighbour, or compare those geared up to go into print against those designed for electronic publishing only, it does indicate the relative quality of each camera. Here I've enlarged a portion of the image to really bring out the differences of three different cameras: the lowest resolution Casio QV-10a (top), the mid-performing Agfa (middle), and the high-end Minolta (bottom), which is the only model of the three designed to go into the demanding world of high-resolution printing

which offer card-based storage, usually conforming to the PC Card standard (although sometimes requiring an adaptor). In these cases, you can simply whip out the card and slot it straight into your PC for almost instant access; but of course the average desktop PC owner will again curse the fact that PC Card slots never caught on, outside of portables.

A final word on the subject, for now, regarding software. Like the myriad of hardware controls, the software situation is no different in terms of standards. While some cameras use industry-standard TWAIN drivers, others feature a proprietary solution. There's nothing wrong with this, unless you're a reviewer faced with a thousand varieties.

Fortunately, this writer possessed NBA's PhotoWallet package from The Digital Camera Company. Seemingly designed for poor souls like myself, or companies owning more than one type of digital camera, PhotoWallet will talk to, and extract images from, virtually any digital camera — suffice it to say that updates become available as new cameras appear on the market.

• PCW Contacts

Have you had a digital camera experience you'd like to share? Write to me at the usual *PCW* address, or email me at **graphics@pcw.vnu.co.uk**

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Monotype 0800 371242

Yule be lucky...

Last year, Gordon Laing made his Christmas wishes known. Some came true, some didn't. Here, he reviews the year gone by and, ever hopeful, makes up his present list for 1997.

Ho ho ho! It's Christmas time again in the festive land of graphics and DTP. It's funny that the world seems divided into those who love Christmas but hate New Year, or vice-versa. I definitely fall into the former category, lapping up all that is symbolic in the materialistic Western interpretation.

A couple of years ago, when I was editing this Hands On section, I thought it would be a laugh to have a Christmas wish and rant session every year. Fortunately, for me anyway, Hands On's current captain, Eleanor Turton-Hill, has decided to continue with this tradition. So here goes.

Quark and Adobe

It's been an eventful and quite satisfying year in the world of graphics and desktop publishing. This time last year, Windows 95 was still a fresh and unknown beast, with little native software. Today, we are of course flooded with Windows 95- and NT4-ready products. Sadly, 1996 has not seen an upgrade of two major applications, Quark XPress and Adobe Illustrator, so my joint number-one rant starts here.

XPress 4 is supposedly on its way yet Quark doesn't seem to be in any hurry. After upgrading to Windows 95, I had to download several updates to get XPress 3.3 working correctly on my system; I'm currently on XPress 3.32 revision 3 but printing is not always 100 percent reliable. Interestingly, Quark dropped development of its fabled image editing package, XPosure, but is poised to release Immedia, its internet and multimedia authoring tool. However, the PC Immedia won't be released until well into 1997.

Quark had better watch out, since Adobe's latest PageMaker 6.5 is beginning to look attractive on both platforms. However, Adobe is the target of what is becoming an annual rant. It's none other than Illustrator, which bounds ahead on the Mac but hasn't had a Windows upgrade for years. When I meet Adobe, I comment on how much I admire the company for releasing cross-platform versions of its products almost simultaneously, then gape dumbstruck as Illustrator stumbles uncomfortably into the conversation.

There's still no news to tell, but then, I've always thought FreeHand is a far superior product. Incidentally, FreeHand Graphics Studio 7 is due for release by the end of 1996, along with CorelDraw 7 — a battle of the heavyweight suites we look forward to reviewing soon.

In last January's Graphics & DTP column, I yearned for thumbnail preview icons for graphics files under Windows 95, in the same way that Photoshop generates them on the Macintosh. A few months later my wish was kind of granted by HiJaak 95, which certainly fulfilled the job of creating the icons but, sadly, slowed my PC to a standstill. So I removed it and racked my brains for the answer.

The solution may have arrived in the form of Photoshop 4, which generates thumbnail icons, but only for its native PSD file format on the beta copy — fingers crossed it will work on all file formats when the final is released by the end of 1996.

Photoshop 4 is another winner, despite still not offering some means by which you can quickly work on a low-resolution preview image, record the actions, then have the computer laboriously apply them to the high-resolution original while you're off doing something far more interesting instead.

Particularly welcome, though, is the new Navigation palette, which is great for finding your way around. See last month's review for more details.

Fonts in fashion

Judging by the amount of response I get each time I write about them, fonts are the in thing this year. Regular readers will be pleased to see the return of this column's "Font of the Month", following its two-month absence.

Mid-year I got quite excited about the prospect of OpenType ending the Type-1 versus TrueType font format wars, but sadly, I've heard nothing since.

Web developments have meant more typography on the internet, but this still tends to be displayed as graphics. We'll have to wait and see what happens here.

In the meantime, Adobe released ATM Deluxe which, along with cunning font management, also smooths the outlines of on-screen Type-1 fonts, using similar anti-aliasing techniques to those employed by Microsoft's Plus Pack for TrueType fonts under Windows 95.

Digital doings

1996 has seen a massive commitment by the industry to digital cameras and electronic imaging as a whole. Clearly, someone has come up with enough market research to believe that in 1997, every home computer user will rush out, take digital pictures, scan existing ones, remove unsightly blemishes on friends and relatives, paint moustaches on auntie, and output these masterpieces on colour printers.

The hardware has already started to arrive: everyone and his uncle are releasing digital cameras, while colour inkjet printers are becoming increasingly adept at outputting photographic-quality images. Sony has even announced a mini dye sublimation device for genuinely glossy prints. You want to scan existing pictures? Colour flatbeds are dropping in price, and

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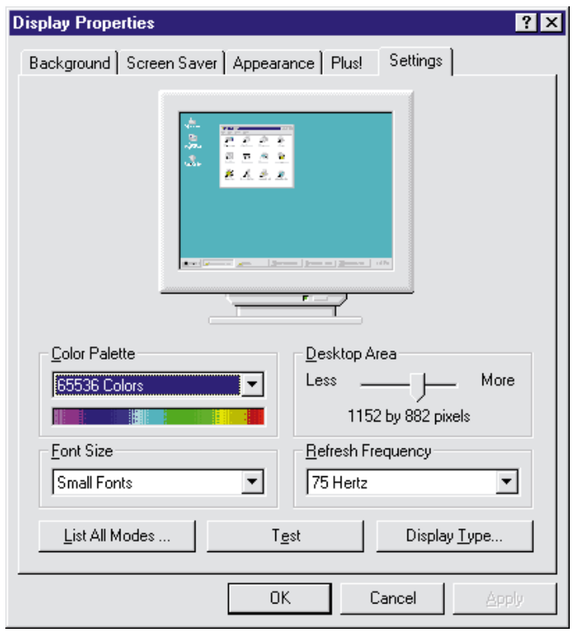
Font of the Month

Monotype has launched a package of three handwriting fonts. Until 31st December 1996, you can buy all three for £45 and even have a cool T-shirt thrown into the bargain. Pablo was created by British designer Trevor Pettit, and is based on the signature of Pablo Picasso.



Left Two wishes come true: Windows NT 4's display control panel, complete with a screen refresh rate box for a Matrox Millennium card. Let's hope 95 has this facility soon

Below Preview icons for graphics files created by Photoshop 4 under Windows 95. Great news for native PSD files in the beta

Is it a heavenly usherette, or is he just doing the washing up? No; it's my Christmas card this year. I'm supposed to be an angelic DJ, spinning the righteous tunes! I've always wanted to do a stained glass window and this year toured the local places of worship for inspiration. In the end I opted not to simulate real lead, but drew heavy black lines on a sheet of paper, then scanned it in line-art mode. The colours are, in fact, real stained glass scans after heavy recolouring and manipulation in Photoshop. I selected the scans in one window, the blank areas in my original, and used Paste Into to fill. I scanned a five-year-old photo (hence the full head of hair!), upped the contrast, then applied the Photocopy filter from Adobe Gallery Effects. A little retouching here and there, and I was finished!

some manufacturers are releasing mini print scanners just for this job (see Kodak's Snapshot Photo Scanner 1, reviewed in this month's First Impressions).

Hardware for graphics users

One of the greatest but most infuriating things about the computer industry is the rate at which hardware drops in price. The good news is that today, you can buy a lot of PC for little cash. But that's bad news for anyone who bought last month, or is too paranoid to make the commitment. This is an issue for graphics users, who often need some serious equipment to do the job.

Santa delivered the goods last year in terms of hardware: 1996 saw RAM halve in price. So, vulture-like, I swooped down for the kill. I now have 32Mb at work and 48Mb at home which, although it may sound slightly over the top, ended up costing me very little. I've always recommended the upgrade from 8Mb to 16Mb, but now equally strongly endorse moving up to 32Mb and beyond. Windows 95 under 32Mb is excellent, particularly if you're using Photoshop and layers. This amount is also the ideal starting point for Windows NT 4 Workstation, about which I'll be writing more in the future.

Big bugbear

Actually, I'm reminded of one enormous bugbear which is the basis of my ultimate wish to Santa: an obvious way of altering the screen refresh rate from Windows 95's display control panel.

This is generally up to the graphics card manufacturer who should write it into the driver, yet there are surprisingly few. Those that do offer the facility also tend to hide it away, which is unforgivable. Interestingly, when installing NT 4, the system recognised a Matrox Millennium card and installed Microsoft's own driver, complete with refresh rate control — the way it should be.

Dear Santa…

My Christmas wishes this year:

1. I'd like to see RAM costs fa again.
2. In an attempt to ban flickering displays, I'd like to see refresh rates easily accessed from the display control panel.
3. Inkjets are improving, but I wish for true photographic quality.
4. Once and for all, I'd like preview thumbnails for graphics file icons in Windows 95 and NT 4.
5. I also wish scanner advertisers would stop confusing buyers with outrageous interpolated resolution claims.
6. Illustrator for Windows, and better use of Windows 95 specifics (recent file lists, right-clicks, etc) for other graphics applications like FreeHand and XPress.
7. How about low-priced, decent digital cameras to really drive the imaging revolution — a great Christmas gadget.
8. And on Christmas morning, every stocking should have an unlocked copy of Adobe's comprehensive Type CD. Now that *would* be a dream come true.

•PCW Contacts

Merry Christmas everyone! If you'd like to send any festive greetings, please email me at **gordon@vnu.co.uk**

FontWorks 0171 490 5390
Monotype 0800 371242

If I scan, you scan

Drums, desktops, flatbeds and handhelds. Gordon Laing explains the different types of scanner and how to achieve the best possible printed results from your efforts.

Okay okay, I know. The Paintshop Pro 4 review I promised you'd find in "First Impressions" last month is in fact published this month and it's written not by me, but Paul Begg. It's all to do with the pressures of becoming *PCW*'s Features Editor! And another apology for the lack of a Font of the Month last issue (and indeed, this time) — time and space ran out on me. I assure you it won't happen again… at least not for the next few months! One consolation for graphics and DTP fans are our extensive reviews of Adobe Photoshop 4 and PageMaker 6.5 elsewhere in this issue [page 180].

Last month, I dipped into the enormous subject of printing your graphics and desktop publishing files and skimmed the surface of preparing for output on commercial printing presses. The gist of what I covered is that a lot of the time you'll want fabulous quality and full colour output which your own personal printer is simply incapable of producing. The answer is to send your files to someone who has a suitable printer and have them do it for you.

There are downsides, of course. You'll know your work back to front but to the printer, it's just another job. Consequently, you'll have to make sure the printer knows precisely what elements are involved, such as fonts, images and even the specific colours used. It will often be your responsibility to ensure that the files are in the correct format and are compatible with the applications used by the printers.

You should also figure out your expectations of quality, preferably before starting work. Just how good do you want it to look? Is the job to be output on special materials or in large volume? Most important of all, how much do you want to spend? Discuss your requirements with several printers and bureaux before making your final decision, and bear in mind that it may be considerably more expensive than you'd first imagined. Remember these bureaux have to cover the (often enormous) investment they have made in high-resolution drum scanners, film imagesetters and high-speed printing presses.

We scanned a printed letter g, measuring only 5mm tall, using a Umax PowerLook flatbed. Left was scanned at the highest optical resolution of 600dpi, while far left was scanned at the highest interpolated resolution of 4,800dpi. Notice how interpolation in this case has created a much smoother result. But not all scanners are this good at interpolation

Skimping and scanning

It's not all doom and gloom, though. There's nothing more exciting than seeing your hard work jump off the screen and onto the printed page. There are plenty of ways you can save money here and there, particularly in the area of image scanning.

Last month, I implied that many people could save a fortune by using their own desktop scanners rather than relying entirely on expensive bureau drum scans. The important word here is "entirely". Unless you're on an extremely tight budget or are satisfied with less than excellent quality, you'll still have to make some drum scans.

A drum scanner is an extremely high-quality device which, typically, can capture finer details and shades than even a top-of-the-range desktop scanner. Drum scanners come into their own when working with transparencies, which are often small, requiring high resolutions, and frequently feature subtle transitions of colours. These nuances are frequently lost on lesser devices. Again, it depends on your expectations and the size at which you wish to reproduce images, but when outputting an image at A4, particularly if it's for the cover of a magazine, or for a poster, it's worth using a drum scanner.

But what about reproducing smaller images, or working on a less exacting job? This is where the often-neglected desktop scanner can really come into its own and begin to save you lots of money. Before launching yourself headfirst into a total DIY job and wondering why it doesn't always come out as planned, please remember why there are thousands of professional scanner operators, designers and artists employed throughout the world. At the same time, it's great fun and extremely fulfilling to complete a job single-handedly, no matter how it turns out, so here goes with the tips.

Resolutionary talk

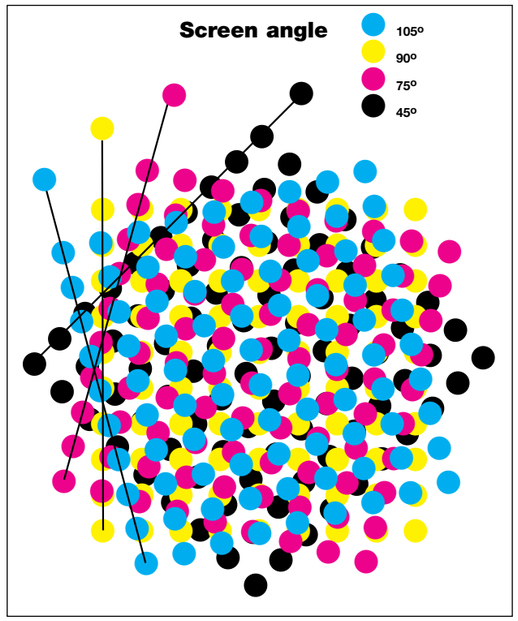
Probably the most misunderstood of all scanner terms is resolution. Advertisers hardly help matters when they start quoting unrealistically high, or often irrelevant, interpolated resolutions. So here's the truth: a scanner's true resolution is its optical resolution, typically either 300, 400 or 600dpi for a flatbed device. Interpolation is the process of taking two adjacent dots, calculating the average between them and sticking another in-between. Effectively, you've doubled the resolution.

It doesn't just stop at doubling, however. Many advertisers talk of interpolated resolutions of 4,800dpi, which looks impressive in an advert. In practice, this means that for every true dot, the scanner is inventing between eight and 16 of its own. Interpolation works better on some occasions than others. The really good systems will consider several real dots and calculate the trend before creating any new ones. The general rule, however, is to take interpolated resolutions with a pinch of salt and only really use them when scanning extremely small or detailed objects, particularly in black and white line art.

Another confusion creeps in with printers. Many people own 300dpi or 600dpi printers and believe quite reasonably that they should therefore go for a 300 or 600dpi scanner, but this only holds true in a minority of cases. One universal scanning truth, regardless of whether you're working with colour, greyscale or black-and-white images, is the larger you want to reproduce them, the higher the resolution you'll need to scan them. Bear this in mind when you're working with tiny originals such as 35mm film, stamps or coins.

Pure black-and-white (not greyscale) images, known as line art, require high scanning resolutions but often work well with interpolation. If you have an A5 original image and want to reproduce it at the same size on a 300dpi laser printer, you should scan it at 300dpi. Easy. If you want to reproduce it at twice the normal size on the same printer, you'll need twice as many dots, so you should be scanning at 600dpi. Similarly, if you want to reproduce it at half size, then you need only scan at 150dpi. If your original is only an inch high and you want it to fill an A4 page of a 300dpi printer, you'll need to enlarge it eight times and scan it at 2,400dpi.

This rule applies to colour and greyscale images but only if printing on a continuous-tone printer, such as one using dye sublimation technology. Unfortunately, these are few and far between, and very expensive. The vast majority of printing takes place on devices which are incapable of printing shades. Remarkable as it may seem, the standard laser printer (and even high-resolution image setters) are incapable of printing anything other than a solid dot, or no dot at all.



In CMYK colour printing, each ink must be placed at a different angle to prevent the halftone dots clashing (look at magazine photos)

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Shades on

Shades are achieved by varying the size and density of dots. Just look closely at newspaper photos or at posters to see that greyscale and colour photos are in fact made up from groups of dots. At a distance, large dots close together are perceived as dark areas, while small dots spaced far apart are light.

The process of converting a continuous-tone photographic image to a group of dots is known as halftoning, and the variable-size dots themselves as halftone dots. Halftoning in greyscale and colour was explained in greater detail last month. The important note this month is that the scanning rules differ.

The screen resolution, or ruling, slightly confuses the matter. This refers to the number of halftone dots per inch, but is usually measured in lines per inch (lpi). Newspaper photos are quite coarse and printed on poor-quality paper at around 75lpi. Decent glossy magazines, such as *PCW*, are printed at 133lpi, while the highest quality art reproductions on the best paper may be printed at 150lpi.

The important thing to remember is that the screen resolution refers to the number of halftone dots per inch, and that these dots vary in size to simulate shades. Unfortunately, most printers are also only able to print one size of dot and thus end up grouping several to make a single halftone dot. These groups are usually a grid of printer dots, say four by four, offering 16 differently-sized halftone dots, resulting in 16 shades of grey. For a screen resolution of 75lpi, you'll need to print 75 of these grids per inch. Since each grid measures four printer dots wide, you'll need a printer resolution of (4 x 75) 300dpi.

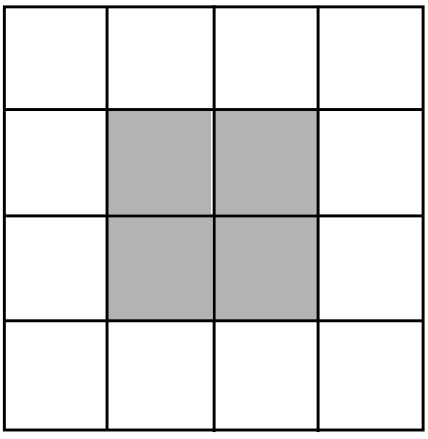
That's why a laser printer isn't great at reproducing shades or photographs. While its resolution is sufficient for solid black text, 300dpi just doesn't cut the mustard for halftoning. In order to reproduce the 256 shades of grey required in this magazine, we need 16 x 16 grids of printer dots which, at 133lpi, means we would need an image setter with a resolution of over 2,000dpi!

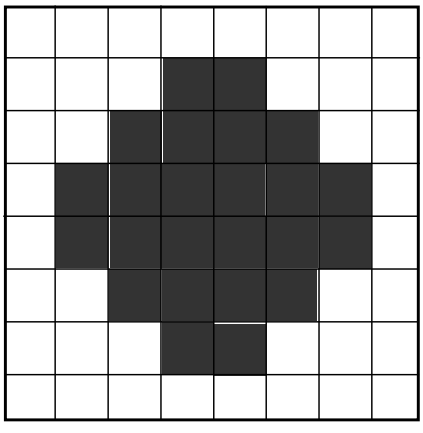
Doing the scan-can

But what about scanning? The general rule for colour and greyscale images, which are to be halftoned by the printer, is to scan at double the screen resolution. If your screen is 133lpi, then somewhere between 250 and 300dpi scanning resolution would be sufficient. If you're printing at 75lpi, then scanning at 150dpi is fine.

This rule applies to same-size reproduction. But if you want to print at twice the original size, you'll need to double the scanning resolution. Printing at half the size means that you can scan at only half the resolution.

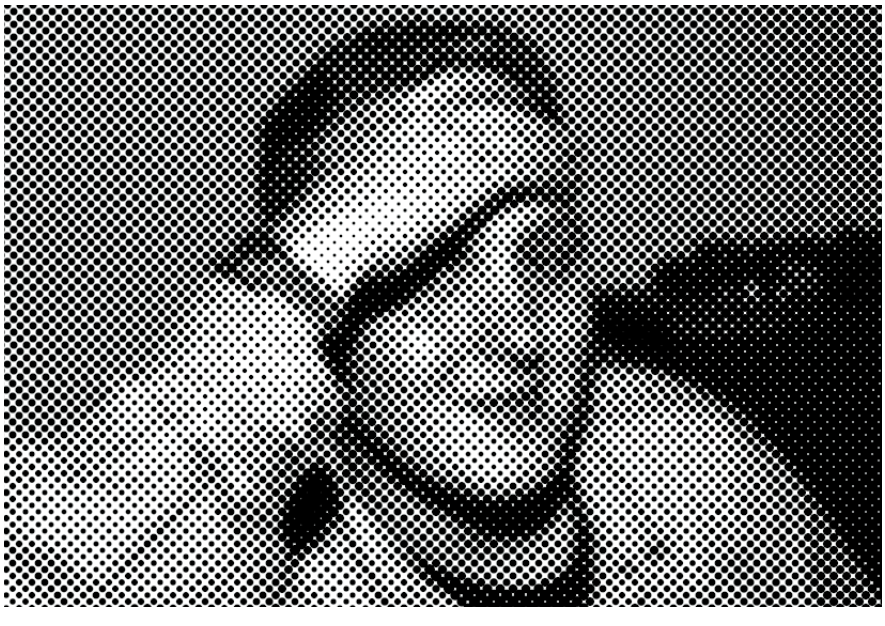
Take an A4 photograph which is to be printed at a quarter of its size in *PCW*. At the same size, we would need to scan at around 300dpi, but at quarter size 75dpi would be sufficient. A 600dpi laser printer is capable of printing an eight by eight grid, offering 64 shades of grey at a screen resolution of 75lpi. The same A4 photograph should be scanned at no more than 150dpi for reproduction at the same size on this printer.





Top A halftone dot made from a 4 x 4 grid can produce 16 combinations, simulating 16 shades. Above An 8 x 8 grid can simulate 64 shades

To reproduce tiny originals at a decent size would require very high resolutions, but for average-sized originals most flatbed scanners are up to producing quite a professional job. But this is only as far as resolution is concerned. Colour capabilities vary enormously between scanners, and between different printers and monitors. A colour you have scanned is rarely the same one that you see on-screen and even less likely to be the same one you see printed. Worse still are colours that happily exist on your screen but which simply cannot be reproduced on the printed page by conventional means. In two months' time I'll talk about how to overcome this seemingly insurmountable problem.



Squint and see how halftoning can simulate shades by using different-sized black dots

PCW Contacts

If you fancy a chat, please write to me at the usual VNU Broadwick Street address, or electronically as **gordon@pcw.ccmail.compuserve.com**

Lasting **impressions**

Aargh! Your graphical work-of-art looks no better than a photocopy when printed out. What are you going to do? Consult Gordon Laing, of course.

It would appear that in the wide world of graphics and desktop publishing the two most popular subjects, in terms of requests or feedback to me anyway, are fonts and preparing for output. No, honestly, they really are. If you want to point me in another direction, please feel free! While there's another font feature brewing, this and next month's pages are devoted to the process of getting your hard work onto quality paper. But first, here are this month's news and snippets.

The legendary PaintShop Pro has returned in the 32-bit guise of version 4 for Windows 95 and NT 4, costing £49.95 (plus VAT) from Digital Workshop. Check out my review in this month's *First Impressions*.

Following its announcement in September, Adobe is gearing up to launch new versions of most of its applications. Due before Christmas is Photoshop 4, PageMaker 6.5, ATM Deluxe 4 and the much-hyped Acrobat 3. An up-to-date Illustrator for Windows is not part of the big roll-out, and its future on the PC platform remains a mystery.

Photoshop and PageMaker

Here's a taster of Photoshop and PageMaker, prior to their forthcoming in-depth reviews.

Photoshop 4 for Windows 3.x, 95 and NT, along with Mac and PowerMac, has addressed several key complaints about previous versions, particularly that of speed. Since we haven't yet tested a final copy we cannot verify performance claims, but the new Navigator palette is a big step forward. This displays the entire image with a box representing what you see in the main window. Instead of blindly moving scroll bars on the main window, you can see where you are at a glance in the Navigator palette, quickly relocate to a new region and zoom in or out as desired.

Features like guides and grids are so obvious, it's a surprise they weren't there earlier. Just drag 'em out as you would with any DTP or illustration package and even get elements to snap to location, if desired. Web designers will like the addition of new filters including Portable Network Graphics (PNG), Progressive JPEG and Adobe's own Acrobat Portable Document Format (PDF). Web formats and page design will be covered in forthcoming columns.

With 48 new effects filters, but still only one undo step, many users will find themselves performing actions they may regret. With Photoshop 4, it is now possible to have an effect as a layer in the Layers palette. Simply move it around to affect different layers and switch it on or off as desired. Those interested in automation will be pleased with the new Actions palette which can store sets of editable instructions to perform on a multitude of files.

PageMaker 6.5, for Windows 95 and NT along with Mac and PowerMac, incorporates several innovative features which should help it recapture DTP market share from Quark XPress. Adobe is trying to maintain a common look and feel among its applications, and PageMaker 6.5 now features a Photoshop-style layers palette.

Placing elements on a page and sending them to the front or back is not a new DTP concept, but now you can place a number of page elements on a layer, then rearrange, hide or view them as desired. Adobe pointed out that you could have text in multiple languages on separate layers of a single document, enabling the selection of each as required.

Although remaining heavily committed to paper-based publishing, Adobe has increased the number of web-designing facilities in PageMaker 6.5. These include drag-and-drop hyperlinks from browsers straight onto your pages, automatic conversion of graphics to GIF and JPEG format, automatic reformatting of publications from portrait to landscape orientation, enhanced HTML export plug-in, and even a dedicated hyperlinks palette.

PageMaker is due for release in November, and Photoshop should be available by the time you read this.

The new-look PageMaker 6.5, with XPress-style frames and Photoshop-like layers

Final output

It's easy to fool yourself into believing your graphics or DTP job is complete after the final save. All you need to do is print it out, and surely that's as simple as pulling down the File menu and letting go at the right point. One click later and you've got your output. Right? Of course not. It *is* possible in some cases to successfully output in one go, but many graphics jobs require more thought and a few extra steps.

The trouble is that few of us have access to either the kind of printers capable of high-speed, high-resolution colour output on a variety of materials in a multitude of sizes, or even the facility to trim pages and bind them together in a magazine format with a shiny cover. Shame, really.

There are standalone colour printers which can satisfy the requirements for many jobs, but if you're after very high quality, perhaps in large format or at a high volume, you're most likely to have to employ outside help and this is where the problems arise.

The bureau, repro house, image setters, outside help or whatever you want to call them, are essentially just a bunch of people who bought a nice, expensive printer and scanner, have expertise on how to use them, and are willing to sell you both by the minute. Sounds great. All you have to do is design your work, get it to them, and they'll print it on their gear. Next thing you know, your work arrives with an invoice and, hopefully, no mistakes.

While invoice mistakes are pretty bad, I'm actually referring to mistakes with your work. But what could possibly go wrong? The main thing to remember is that their machine might not have the same features that you take for granted on yours. They must have the same fonts you've used, for one thing, or substitution will occur. They must open your document using the same application with which it was created: it's no good giving them a PageMaker document if they can only read Quark XPress, however good their conversion filters may be. PC-to-Macintosh conversions and vice versa are even more problematic, and pictures can be a nightmare. It's all very well leaving gaps for photos, but if they don't know what goes where and which way round, you could be in trouble.

Getting your work to them can be fraught with difficulties. There are few graphics files which fit on a floppy disk. With tens or even hundreds of megabytes, you're in the realm of removable drives, such as the SyQuests and Iomegas of this world. Just make sure the bureau has something that can read your disks. One-gigabyte Jaz drives may be cool, but few repro houses are equipped with anything other than the ubiquitous 44Mb 5.25in SyQuest cartridge. Even the later but still dated 88Mb and 200Mb carts are rare.

Perhaps you're in a rush, so the post is no good. Overnight won't do. If a courier is too slow, you could be looking at sending files over the phone. Once again, it's no good having a speedy modem or ISDN line if they don't have one at the other end. The transportation of large files will be covered in a future column, so here we'll concentrate on preparing colour documents for output on a commercial printing press, a process known as pre-press.

A commercial printing press is only capable of printing one colour at a time, each laid down in a separate pass. The fewer the passes, the quicker and, consequently, cheaper the job will be. If your document consists only of black ink, the machine operator has only to fill it with black ink and run your paper once through the press. Perhaps you want black for your text, but a nice bright red logo too? In this case, the printing press is loaded with black ink and the paper is passed through, then the press is reloaded with red ink for a second pass.

On the spot

Pre-mixed inks such as these are known as spot colours and are often chosen from a book in a similar manner to choosing paint at a DIY store. Consistency and accuracy is the beauty of choosing colours in this way. If everyone owns a copy of the book and someone talks about using the red on page 36, everybody knows exactly what colour is being described. The most famous spot colour collections include Pantone, Focoltone and Truematch, which may also feature examples of their inks on a variety of paper types.

So far so good; but what about a full-colour photograph with countless shades? One ink at a time is not going to be suitable for this kind of continuous tone image. In fact, printing more than four to six inks per page becomes prohibitively expensive.

It is possible to fool the eye into perceiving full colour by mixing varying amounts of the key primaries. Monitors and television sets transmit red, green and blue light which mix to create any colour required. All of them together make white but if none are present you get black. This is

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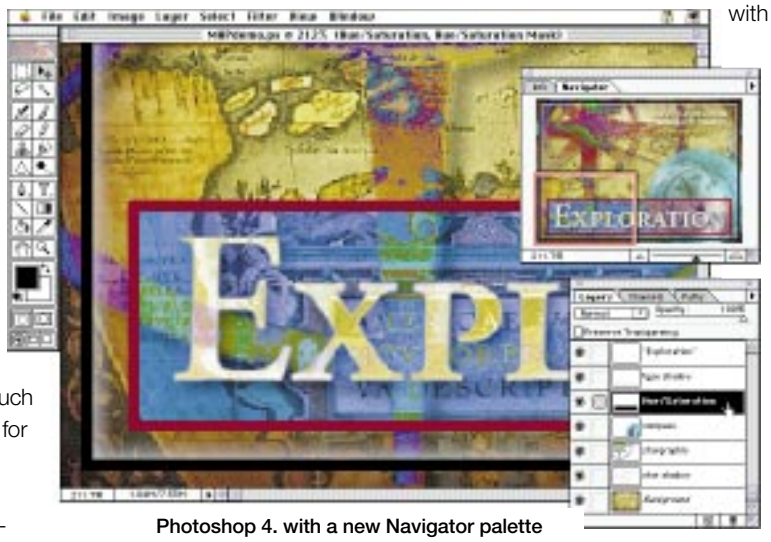
known as the additive RGB model.

However, on a printed page the inks absorb incident light, the remainder of which is reflected to our eyes. This absorption, or subtraction, of light by the inks results in a colour model based on cyan, magenta and yellow primaries. Magenta ink absorbs, or subtracts, green from white light, leaving red and blue light which mix to make magenta light. We therefore perceive magenta ink as magenta colour. Mixing cyan, magenta and yellow ink means all light is absorbed, resulting in the perception of black. More obviously, no ink at all results in white.

This is all hunky-dory in theory, but physically mixing cyan, magenta and yellow ink on paper results in muddy brown. Since black is such an essential colour, particularly for type, most printing processes include a dedicated black-ink pass, hence, the common four-colour subtractive CMYK process, K representing black.



Photoshop 4. with a new Navigator palette and effects applied as layers

Commercial printing presses, like most printers, are incapable of printing shades of an ink. It either places a dot of ink, or it doesn't. Consequently, shades are created by printing dots of different sizes, a process known as halftoning. When viewed from a distance, groups of big dots are perceived as dark, while groups of small dots are perceived as light. Look closely at a newspaper photo and you'll immediately see the differently-sized dots working in groups to give the impression of shades.

Full-colour CMYK printing uses exactly the same trick but places the dots at four different angles to ensure they don't overlap. The resulting rosette (as it is known) can be seen on any billboard poster or, using a magnifying glass, viewed on a magazine page. When you see a solid colour with no rosette pattern, you've found an example of a spot colour which in full-colour printing would be an expensive fifth pass. Most magazines can afford to use a spot colour on their covers, usually for the logo which must stand out.

Along with looking good, spot colours can also be used to provide colours that the CMYK model simply cannot create, such as those which fall out of the possible range, or specialist ones like gold, silver or laminate.

It is possible to print shades of spot colours. These are known as tints, and are described as a percentage of the original. Tints are also created using the halftone process. Once you know what you're looking for, you'll easily recognise which colours have been used, especially on food and drinks packaging.

The printing press needs to know which inks to put where. In practice, it is supplied with a separate plate for each ink, resulting in, say, five plates to describe cyan, magenta, yellow, black and an additional spot colour. We don't have to worry about plate-making, only that these component colours must be separated from the original full-colour image and from each other.

Fortunately, colour separations can easily be made by most decent graphics and DTP applications. Have a closer look at the options in your printer dialogue box and you'll commonly find the facility to separate colours. The application and printer driver then outputs sheets dedicated to each ink used: one for cyan, another for magenta and so on. These sheets are subsequently made into the plates which drive the printing press. Since each sheet is clearly labelled as to which ink it will eventually represent, there's no need for it to be made in anything other than black and white. Even if you're not going to use a printing press, it's a valuable educational exercise to take a full-colour document and have your application separate it, to illustrate the theory.

The resolution of an image represented by halftones is down to how many of the different-sized dots you can place on the page. Most printers are not only incapable of printing shades, but are also unable to print different-sized dots. Consequently, each halftone dot is made up of many printer dots. The more dots your printer has to play with, the greater the number and variety of halftone dots it can create.

Magazines such as *PCW* print 133 halftone dots per inch (known as lines per inch, or lpi) and require 256 shades of grey. This means 256 possible sizes for the halftone dots. It is achieved with a 16 x 16 grid of printer dots and turning various amounts of them on or off. To make the separations we therefore need to use a printer that is capable of printing 16 dots, 133 times per inch. That's over 2,000dpi, which is why most repro houses, with their expensive printers, make the separations themselves. Of course, if you've got a 1,200dpi laser and require neither as many shades of grey nor lpi, you could save money and make your own separations. Remember, you will be charged for the amount of time it takes to make the separations, so if your pages are complex and full of big images, they will be pricey. Repro houses use high-resolution printers (image setters) which output on transparent film, because most paper has difficulty resolving such small dots and film is easier to make plates with.

I hope that's cleared up a few uncertainties and got you thinking about using the facilities of a repro house. Next month, I'll talk about the unfortunate fact that CMYK inks can only print a limited range of colours and, worse still, are incapable of reproducing many of the colours you see on-screen. I'll go over colour management systems that ensure you don't get any nasty surprises, as well as the truths about expensive repro house scanning, including the times when the job can be done equally well for nothing, using your own desktop scanner.

PCW Contacts

Any repro tips and tricks? Please get in touch with me at the usual VNU Broadwick Street address, or electronically as
gordon@pcw.ccmail.compuserve.com

Adobe 0181 606 4000
Digital Workshop 01295 258335
Fontworks 0171 490 5390

Snap happy

Present yourself in the best possible light, in the strangest locations — and do it using your PC. Gordon Laing looks forward to digital photography and image manipulation.

If we're to believe what the major graphics and imaging manufacturers are saying, and put two-and-two together concerning forthcoming product launches, then photography and computers, digital or otherwise, are going to be the next big thing. It's all coming together. Inkjet printers are being developed to a point where they'll be offering true photographic quality on glossy paper by next year, scanners are becoming increasingly commonplace, and just about everybody and his uncle are releasing digital cameras. The next thing you know, Kodak, Hewlett-Packard, Microsoft and Live Picture go and announce a new imaging format that, while interesting, could be described as Photo CD Mark II.

Yes, it's all happening, so this month I'll fill you in on all the gossip and news. Font fans will be interested in the new AgfaType CD 7.0 collection, and readers will be pleased to learn of a long-awaited upgrade to Adobe Type Manager.

ATM Deluxe 4

After what seems like an eternity, Adobe has announced a new version of Type Manager: ATM Deluxe 4.0 for Windows 95, NT and Macintosh. This will be of particular interest to NT users, who previously had to convert their Type-1 fonts to the TrueType format. ATM addresses many of the problems I have mentioned in earlier columns concerning TrueType and Type-1 font technologies, although so far there's no mention of OpenType.

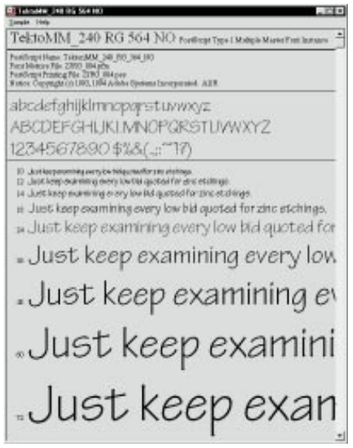
A couple of months ago I printed samples of TrueType fonts with on-screen font-smoothing activated from the Microsoft Windows 95 Plus Pack, compared to Type-1 fonts, as rasterised on-screen by ATM.

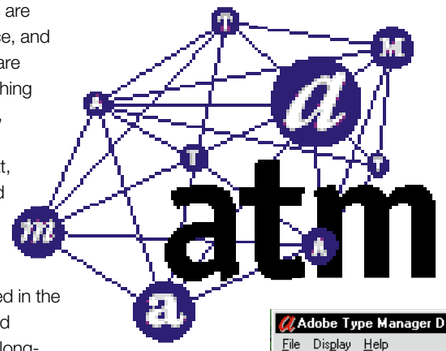
ATM was first marketed as a cure for the "jaggies", by creating bitmaps on-screen at any size — brilliant stuff, and for years we were all satisfied with the results. Then anti-aliasing came along, where grey-shaded dots were placed in the jagged steps of a bitmap outline. When viewed from a distance, the outline appeared smoother.

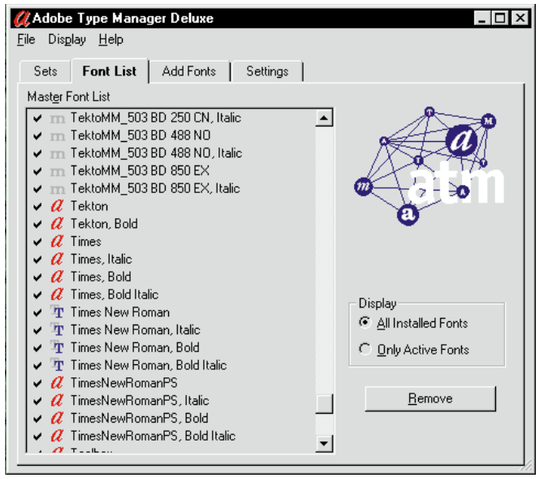
Adobe offered the facility for type in Photoshop, but sadly not from earlier versions of ATM. Buy the Microsoft Plus Pack for Windows 95, and anti-aliasing smoothing is offered for TrueType fonts only. Now ATM 4 will do the smoothing job for Type-1 fonts. It will also manage TrueType fonts, along with Adobe's PostScript Type-1 format.

If you've ever discovered hoards of fonts clogging up your system folders and slowing your machine down, then you'll appreciate the facility to group them into suitably-named sets. Activate and deactivate sets at will and you can even export sets to other machines or across platforms, although the sets contain only lists, not the fonts themselves.

You can finally preview on-screen fonts, and there's improved support for creating







At last, a new Adobe Type Manager: ATM, soon to be available in Deluxe version 4

Right **ATM 4 can manage all your font formats, including TrueType, Type-1 and Multiple Master**

Above right **ATM 4 is able to offer previews of all fonts. Notice that font smoothing is now available for Type-1 formats**

Font of the Month

bayer type
architype

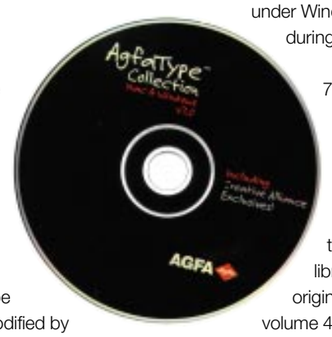
abçdéfghijklmnöpqrstuvwxyz
ß&1234567890

This issue's Font of the Month is Bayer, a typeface revived for Architype Volume 2, created exclusively for the AgfaType library. It was designed by David Quay and is supplied by FontWorks. Quay and fellow award-winning British designer, Freda Sack, established the Foundry in London, in 1990, to design original-quality PostScipt fonts.

multiple master fonts. These latter have the facility to adjust various aspects of the style, such as weight and width. It's a subject I'll be covering in detail in the near future.

And the real bonus? The Windows 95 version was released in July, to be followed by the Macintosh version a month later. Both will ship with 30 fonts, including Minion Condensed, Utopia and Tekton multiple master families, and display faces including Lithos, Nueva, Willow and Critter. There will probably be a special introductory offer for the first three months of sale.

And in the news…



Those concerned with other platforms may be interested to learn than SunSoft has licensed an advanced TrueType font processor for use in its Solaris operating system.

The original TrueType processor has been modified by Bitstream to provide what it describes as a complete typographic technology solution. In other words, Solaris users will have access to the huge number of TrueType fonts available.

The almost legendary Paint Shop Pro has returned in version 4 for Windows 95. Costing £49.95 on floppy or CD, or £19.95 for an upgrade (add VAT to both prices), it will no doubt put many heavyweight and heavily-priced photo-retouching applications to shame. A full review will be published in our *First Impressions* section, soon. Contact Digital Workshop.

Registered users of PageMaker 6 for Windows should look out for version 6.01 winging its way to them. This free, updated CD includes three new plug-ins, as well as a new version of the HTML Author Plug-in, improved Kodak Precision transforms, updated PostScript printer description files and a Quark XPress document converter. This converts from XPress for Windows to PageMaker for Windows but works only under Windows 95. It will be tested during the coming months.

The AgfaType Collection 7.0 dual-platform type CD is now available free of charge from the usual font suppliers. It contains 4,300 typefaces: 500 more than version 6.0. Four libraries are featured: the original Adobe Library up to volume 405, the Agfa Type and Symbols library (over 10,000 images), and débuting on the CD format are the Cornerstone Collection and the Creative Alliance Library. The latter includes a selection of Art Parts EPS illustrations, faces from FontHaus, and more. Do get hold of a copy and check it out. But before you get too excited about getting 4,300 free typefaces, remember they're all locked until you phone for individual keys with your credit card handy.

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The digital future

On a recent trip to visit Hewlett-Packard on its home turf, many of us were surprised by one of the company's announcements. Well, more of an implication really. It was revealed that there will more than likely be a Hewlett-Packard digital camera sometime next year. The company seems obsessed with getting as many people as possible to use their PCs for photography and image manipulation.

H-P, like its competitors, is working desperately hard on producing a cheap colour inkjet printer, capable of producing photographic-quality results, by the middle of next year. These machines will not be optimised for plain paper, but the decent glossy stock we're used to handling for standard colour prints.

We were shown a video which featured the H-P family at home. The PC was, of course, the H-P Pavilion (reviewed in *First Impressions, PCW* September), which features a built-in colour scanner capable of swallowing A5-sized prints in a manner similar to an in-car CD player. Dad was using this PC to scan his favourite family snap and to electronically retouch junior's satanic red-eye.

Junior runs in and snaps Dad, with his H-P digital camera, producing an image ready to be downloaded to the PC at a later date for further fun; of course, the final result is a beautiful colour print from an H-P inkjet. The essential point is that the printout is a new and improved personalised and customised photo, but one of the same image and print quality as the original.

Stacks of prints

This is the concept that H-P and many others are trying to encourage. Take your stacks of unseen prints and customise them into something useful with your PC. Digitally remove red-eye or other unsightly blemishes, trim the shot, cut people out and paste them in new and uncompromising locations — the possibilities are endless.

The trouble is that no-one's yet built a printer which can trim the edges off a sheet of paper to produce a postcard-sized print. The solution is to encourage A4 applications. How about a calendar with your pets on it? Or a montage of holiday shots? Remember that once on your PC you can add captions, titles or a whole variety of accompanying text and graphics.

The big problem with computer imaging is the cost of the equipment with which to do it. Most computer users expect to save their files and move around them in a matter of seconds, as they're used to working with plain text or spreadsheet files. Give them a large graphics file and watch how fast they lose interest when any kind of manipulations occupy their machine for the next half a minute or so.

Those of us who work with graphics files are used to waiting a while, even on high-spec machines, but the truth is that there are loads of people out there who don't know what to expect, might have an average machine, yet quite fancy the idea of image manipulation. Short of educating them on the finer points of making a cup of tea while waiting for a Photoshop filter to finish, or upgrading their hardware to handle the load, it's up to the manufacturers to come up with a cunning plan to ensure their potential new market isn't deterred.

FLASHPIX™

Enter the new FlashPix image file format: a collaboration between Eastman Kodak, Hewlett-Packard, Microsoft and Live Picture. Kodak is familiar with trying to popularise a new image format, although PhotoCD, despite being technically excellent, failed on a few counts. The ultimate failure was the company's decision to market it both as a view-on-the-TV home format and as a professional publishing tool. It never caught on in the home, while most publishing professionals were either unhappy with the unusual colour space or unprepared for the large file sizes.

As we know, Hewlett-Packard is keen to get as many people into digital imaging as possible so that it can shift a ton of colour printers. Live Picture is involved with professional imaging and Microsoft is lending its OLE support, along with wanting to have a finger in every pie.

On the surface, FlashPix appears to share many concepts with PhotoCD. At the time of writing there were few technical details available, but here is the gist of it: FlashPix will support images of any size and resolution but, like PhotoCD, it will store each image at multiple resolutions. The clever bit is that each resolution is sub-divided into square tiles. This allows applications to load only the section of the image on which you're working, saving your computer the time and effort required to load the whole thing in one go. A fairly modest machine should be able to handle large files with speed. It's similar to how Macromedia X-Res 2 operates.

Another cunning plan is to store scripts describing the editing operations you've made separately from the image itself. In theory, this means operations performed on a low-resolution image could be applied at a later date to a larger one. It's not yet certain how scripts will be implemented, but they are said to be contained with the image data inside a "structured storage container". Microsoft's OLE Structured Storage ensures the files are compatible with existing storage architectures such as OLE II, OpenDoc, and Java and Netscape plug-ins. When opening an image, a FlashPix-savvy application will apply the script to the raw image data. The application should also select a suitable resolution on which to perform the script.

FlashPix offers three compression options: uncompressed, single-colour compression, and variable JPEG compression. It supports multiple colour spaces, which include PhotoCD's Photo YCC, a calibrated monochrome option for greyscale images, and a calibrated RGB space, entitled NIFRGB. Uncalibrated versions of these three will allow existing uncalibrated files to be converted into the FlashPix format.

If it works, FlashPix will be transparent to the end-user. The only thing they'll notice is greater speed and ease of operation. If the applications are designed properly, they'll worry about selecting the correct image resolution, while tiling and scripts ensure that modest hardware configurations aren't bogged down with processing. When it arrives later this year, FlashPix, accompanied by suitably updated applications, could open up the world of digital imaging to what the developers hope will be a huge new market.

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Optical illusions

Flatbeds, handhelds, document... They're all types of scanner. As an extra dimension to this month's group test, Gordon Laing puts you in the picture.

First things first. Last month's *Graphics and DTP* suffered a last-minute change, with the unfortunate result of an incorrect caption for the font-smoothing examples. It also doesn't take a genius to spot that our reproduction house failed to properly convert any of the screenshot TIFFs into CMYK, resulting in a load of black-and-white pics. Oh well, the joys of layout and reproduction.

For those interested in font smoothing, the caption should have read as follows.

"From the top working down: 8 point TrueType Times, 8 point Type-1 Times, 18 point TrueType Times, and 18 point Type-1 Times, all enlarged to indicate the differences. As explained last month, Windows 95 Plus Pack offers on-screen anti-aliasing smoothing of TrueType fonts, which makes the ATM rendered Type-1 fonts look particularly jagged."

Thanks to everybody who has written to me about the typography pieces that have appeared in these pages over the past few months. There's lots more in the pipeline. However, a complementary piece to this month's scanner group test occupies our attention here.

Scanners: the basics

Starting on page 126, we've tested and reviewed 18 devices: four handhelds, six flatbeds and eight document scanners. What type of scanner should you buy? Many people head straight for the flatbeds when they might be far better off with a document scanner. Then there's the minefield of resolution and colour bit depth, where in theory bigger is better. But do you need it, and what exactly can you use it for anyway?

As with all purchasing decisions, you must first decide exactly what you want to do with the scanner, what standard of performance you are expecting from it, and how much you are prepared to spend.

It's best to start by deciding what kind of images you wish to scan. An increasingly popular scanning application is optical character recognition (OCR): the computer tries to convert a scanned page of words into an electronic text document; it is effectively reading the words. OCR, explained in greater detail within the group test, is not an infallible process. Even the most sophisticated OCR packages will make mistakes, particularly with badly-printed originals, and you will always have to proof-read the resulting document. Even so, the main body of the text will be present, making OCR a huge time-saver for those who do a lot of retyping.

OCR does not require a colour scanner, although many OCR packages can make use of greyscale information to better recognise character shapes. It's often handy to have some sort of automatic sheet feeder, letting you leave the device to scan several pages of text at once. If your original is not in sheet form, like a book or a magazine, you can photocopy the page and feed that through instead.

If OCR is going to be your primary scanning application, you should consider a document scanner. This breed of scanner is becoming the most popular thanks to their ease of use, low price and small size. Most are about the same size as a roll of kitchen paper, and feature built-in sheet-feeders which drag the pages through like a fax machine. They're cheap, too, costing between £99 and £250.

The software packages vary, but the best combinations of device and drivers fire up automatically as soon as a sheet is fed into the machine. All boast OCR and some kind of document management software. You can use a document scanner as a fax machine, but you'll need a fax modem, which will offer suitable software.

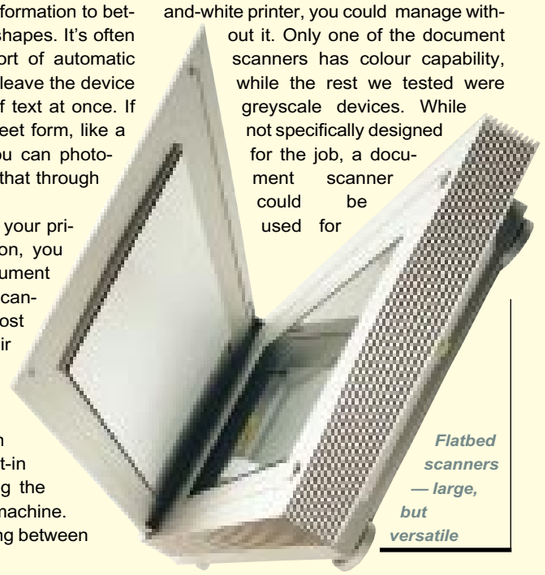
A flatbed scanner is perfectly capable of doing OCR, but if you want it to sift through a wad of sheets, you'll need to buy an additional automatic document feeder (ADF). These are expensive and not available for all models. A flatbed does have the advantage of being able to scan thick originals, such as books, magazines and even solid objects laid carefully on the glass plate.

A handheld scanner could be used for OCR, but is not recommended for any documents wider than the typical four-inch scanning width. This eliminates the vast majority of A4 documents. Handhelds often feature software which can stitch multiple scans together to make one big image, but this is not recommended for OCR.

Dealing with photographs

The other big scanning application is getting photographic images into your computer. Once scanned, a photo can be manipulated to improve the quality and remove or add desired elements. Afterwards it can be printed again, placed in a DTP document, or viewed on-screen on, say, a web site or CD-ROM title. Where the image ends up is the most important factor in choosing a suitable scanner.

In virtually all cases you'll want colour, although if you're only printing on a black-and-white printer, you could manage without it. Only one of the document scanners has colour capability, while the rest we tested were greyscale devices. While not specifically designed for the job, a document scanner could be used for digitising printed photographic images, although most only offer low resolutions which could be limiting.



Flatbed scanners — large, but versatile

Handheld scanners — limited, but small and cheap

It's easy to get carried away with flat, reflective originals, such as printed photos and sheets of paper. Three-dimensional reflective originals, such as coins and keys, can be carefully placed on the surface of a flatbed, but flatbeds have a very limited depth of field and can only cope with objects small enough to fit on the plate. If you want to digitise a larger object and optionally keep the whole thing in focus, you'll need a digital camera.

Digital camera... action!

You may not have realised, but a digital camera carries a rectangular CCD imaging device which, when connected to a computer, produces the same kind of bitmapped files a plain scanner does. You could photograph your three-dimensional object, like a person, house or landscape, using a conventional camera and then scan the print using a conventional scanner.

What if your original isn't reflective at all, but transmissive like film transparencies? Scanning film is big business, but requires the light to be picked up after it has travelled *through* the original, rather than reflected off it. Many flatbed scanners offer an optional transparency adaptor, which is little more than a new lid with a built-in light source. These cost about £500 and have one big disadvantage — they are still limited by the resolution of your CCD transport, typically between 300 and 600dpi.

300 dots per inch may be more than adequate when scanning a photo several inches across, but film originals tend to be much smaller. Take 35mm, which measures about 1in x 1.5in. Even a 600dpi scanner won't be able to offer enough resolution to reproduce a 35mm transparency, or reflective original for that matter, to much larger than double the size.

It's the dots that do it

It ultimately depends on how many dots per inch your output device requires, but as far as going into colour print is concerned, flatbed scanners with transparency adaptors are usually not good enough for 35mm film. In professional cases, they only become useful for 5in x 4in originals or higher. Exceptions include the very high-end Agfa DuoScan and Umax PowerLook 2000 flatbeds, both costing just short of £4,000 (plus VAT RRP).

You want small-format film scanned well? You'll need a dedicated film scanner, which concentrates all its dots into a tiny distance, where flatbeds in comparison lounge over eight or so inches. A film scanner may have the same number of elements on its CCD as a flatbed, but by limiting them exclusively to a very small area, their resolution could be over 2000dpi compared to the flatbed's 300.

If you only scan film, you may want to look into buying a proper film scanner; but the rest of us, who want occasional decent 35mm film scans without the investment, can turn to Kodak's Photo CD. The Photo

Font of the Month

Another display face from Fontek this month, available as a single weight for only £35 (plus VAT).

Document scanners — small, cheap and great for OCR

CD format is capable of storing up to 100 35mm images on a single recordable CD. Each image is stored in five resolutions, from a tiny thumbnail up to a whopping 18Mb file, certainly good enough for reproduction in a magazine after sharpening and colour correction. Most commercial photo labs with a two-week turnaround time charge less than a couple of pounds per image. Professional Photo CD labs can handle up to 5in x 4in film.

And so, to interpolation

Resolution plays a big part in scanning, and advertisers often try to confuse the issue by quoting the maximum interpolated resolutions of their scanners. Interpolation is the process of making up values in-between real ones to bump up the figures. It can work well for black-and-white line art originals, but is best experimented with rather than relied on. Check out our half-page in the group test where the same letter "g" was scanned at the highest claimed interpolated resolution of each flatbed, and see how some don't quite measure up. It's the horizontal optical resolution that counts, and for most CCD scanners (handheld, document or flatbed), that's between 300 and 600dpi.

It's safe to say that all of today's scanners boast optical resolutions capable of OCR work, but as identified in the earlier comments about scanning tiny originals like film, higher resolving powers can come in handy. As soon as you've discovered which scanning resolution is good enough for your output device, make a note of it. Remember that if you want to reproduce the original at twice the size in the same quality, you'll need to double the resolution. That's why 35mm film scanners may boast resolutions of several thousand dots per inch in order to produce images that can be reproduced to many times their original physical size.

Scanning for reproduction in glossy magazines requires extremely high resolutions. The image setters used to print these magazines work at about 2400dpi. Outputting to a laser printer, even at 600dpi, is clearly much more forgiving. Take your monitor, which, depending on its size and the mode you're running in, will only be working at a resolution of between 70 and 100dpi. That's why you often have to zoom out several times in order to view entire scans with your limited number of on-screen dots.

The outlook is bright

Increasingly common applications for on-screen images are internet web pages or multimedia CD-ROM titles; viewing on-screen only requires quite modest or even low resolutions. One danger to be aware of is brightness and colour matching. Let's say your scan looks great on your monitor, which could be at a bright setting. When viewed on someone else's monitor, which could be much darker, the image will not look anywhere near as good. Check out how it looks on other systems before you pat yourself on the back on your fabulous homemade web page or CD title.

Before going any further, please note that you shouldn't necessarily scan at 600dpi if you've got a 600dpi printer. Most printers are incapable of printing shades, and can only either leave a dot or no dot at all. To simulate shades, they use a technique known as half-toning where different-sized dots are grouped to represent a shade when viewed from a distance. The bigger the dots or the closer together they are, the darker the perception. Similarly, the smaller or the further apart the dots are, the lighter the perception. Just look at a newspaper photograph closely to see how a greyscale image is printed with only solid black dots of varying size.

The upshot of this is that a printer usually has to place several dots to represent one shaded dot provided by the scanner. A 600dpi printer simulating 64 grey levels needs no higher than a 75dpi scan for same-size reproduction. Higher scanning resolutions need only be used for higher resolution printers, reproducing the original larger than real size, or for scanning black-and-white line art.

Bits and bobs

The last hurdle for now is bit-depth. Earlier scanners were either colour or not. Now there are different types of colour scanners, identified by the number of bits per dot or pixel. The first CCD colour scanners were described as having 24 bits. These are the same bits as used to describe your graphics-card display.

In a digital system you must have a finite number of colours or shades. How many shades of grey should a digital system have between pure black and pure white in order for the human eye not to discern the steps? A figure convenient for computers was 256, which in binary is 8 bits or a single byte. Full colour can be made up of a combination of red, green and blue light. 8 bits per colour makes 24 bits in all for full-colour scanning. Or does it?

The best analogy is building a car to perform well at 70mph. Should its top speed be 70mph? No. We all know that in order to perform well at 70mph, your car should be capable of a much higher top speed. It's is the same with scanners which suffer from undesirable noise, particularly in the least significant bits which represent the dark, shadowy areas of an image. In reality, a 24-bit scanner may be able to supply 20 good bits.

Then there's the problem of image manipulation. Every time you make an overall colour or brightness/contrast adjustment, you lose quality. Starting with more than 24 bits will ensure that after correction and noise clean-up, you'll still have a good 24 to work with. Enter the recent 30 and 36-bit scanners, capable of picking up all those tricky shadow and highlight details that were lost on inferior models. They are more expensive, but make a difference when scanning higher-density originals such as film, and/or for reproduction on high-quality output devices.

Drumming it in

Drum scanners are very expensive devices which use photo-multiplier tubes instead of CCDs, and offer a much higher tonal dynamic range than a typical CCD scanner. The tonal dynamic range relates precisely to the scanner's density rating, which for CCD flatbeds should be indicated by the number of bits. A true 36-bit CCD device should begin to approach the tonal dynamic range offered by a drum scanner. High-end flatbeds from manufacturers like Agfa and Umax claim to offer drum-quality output. One of these two flatbeds will leave little change from £4,000, while getting a bureau to do your work for you will set you back around £20 per drum scan.

● *I hope this column has helped you choose what kind of scanner you need. All you have to do now is turn to the group test to see which models we recommend.*

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Fontastic!

OpenType format may herald an end to the font wars: Gordon Laing examines the implications. Plus, CorelDraw for the PowerMac, fonts in Windows 95, and a real smooth operator.

Lots of font news this month. First on the agenda is Windows 95 and how it handles fonts, including enhancements over 3.x. Next is the spectacular news of the forthcoming OpenType format, developed by Adobe and Microsoft, which, it is claimed, will end the TrueType and Type-1 font wars by tying the two together. But before launching head first into fonts, here's a short aside for those who, like myself, didn't believe CorelDraw for Macintosh would ever make it beyond a myth.

Canadians bite the Apple

Yes, it's true! CorelDraw is finally going to happen for the Apple Macintosh platform. I've just got hold of far-from-finished Beta-1 and Beta-2 copies, although the ever-optimistic Canadian company is convinced that the final shrink-wrapped product will be available by the end of summer.

First things first: it's Power Macintosh only, without any plans for a 68000 version. You'll need a decent-spec machine too, with at least 16Mb of RAM and, of course, stacks of disk space if you want to install the ubiquitous clip-art and fonts.

Despite rumours of version 7 for Windows by the end of the year, Corel has opted to release version 6 for the Mac. It is, however, quite a different package to version 6 for Windows.

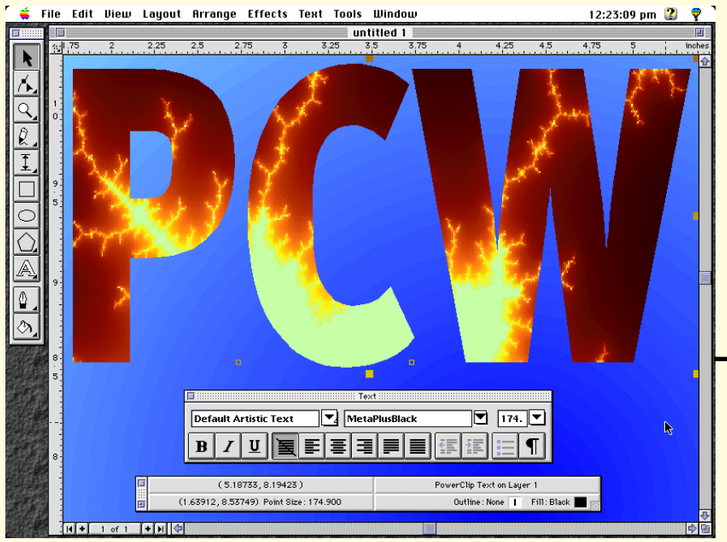
The main drawing and layout application itself is present, although with a new-look interface. Corel PhotoPaint, the Windows bitmap photo-retouching editor, is missing, but is replaced by something similar called Corel Impressionist.

CorelTrace, used to convert bitmaps into vector form, is here, as is CorelDream 3D, the modelling and rendering module, new to Windows version 6 although seen here in a later form. A brand new texture generator, CorelTexture, is unique to the Macintosh suite, as is the inclusion of WordPerfect 3.51, fresh from the Corel acquisition. But get this: there are rumours of Corel bundling Draw alone with its forthcoming Windows office suite.

Fonts are handled by the Master-Juggler utility, while Kodak Precision Colour Management System looks after… well, the colour management. CorelDraw wouldn't be the same without the reams of clip-art and font libraries, and indeed, the Mac pack sports a similar but not identical array to the Windows version.

CorelDraw 6 for Macintosh will undoubtedly offer excellent value with its many applications, utilities and extras. While there are some differences, the drawing portion is claimed to be 100 percent compatible with files created in CorelDraw 3, 4, 5 and 6 for Windows (our early copy was almost 100 percent). Corel reckons users will include those familiar with the PC version, or those in mixed platform environments desiring compatibility — there are certainly some curious Mac users out there who want to see what all the fuss is about.

It is doubtful whether Mac illustrators will become evangelical and wholeheartedly embrace the other side — I remain a firm believer in FreeHand — but at least the option is there. More importantly, a company as competitive as Corel will shake up the market and force complacent products to shape up or get out.



Some said it would never happen, but it's finally on the way: CorelDraw for Power Macintosh, expected for release sometime this summer, complete with the usual array of programs, fonts, clip-art and freebees we've come to expect from the Canada-based graphic gurus

Font frenzy

Anyone using Windows 95 may think it handles fonts in essentially the same way as Windows 3.x, but there are in fact quite a few enhancements for TrueType. As explained last month, Microsoft and Apple developed the TrueType font format together and have built software into their respective operating systems to rasterise the outline shapes.

Adobe Type Manager, ATM, is required to rasterise Adobe Type-1 PostScript outlines for either Windows or the Macintosh. You'll need ATM 3.02 to work under Windows 95, but it doesn't offer any enhancements over earlier versions designed for Windows 3.x. Windows 95, however, boasts many built-in enhancements for the TrueType 1.0 format to enhance performance and appearance, and support international characters.

You'll be pleased to learn that Windows 95 has a 32-bit TrueType rasteriser, which performs outline-to-bitmap conversions much quicker. Converting vector outlines into bitmaps at very small point sizes often results in an illegible character, due to too few pixels to play with. Hinting is the process of adding information to a character's outline, slightly altering various aspects to improve its appearance at small point sizes. The TrueType hinting process actually works quicker with the new 32-bit rasteriser.

Windows 95 also supports TrueType fonts with embedded bitmaps. Sometimes, even with hinting, a character is just too complicated to be rendered legibly at small point sizes. In these instances, a pre-rendered bitmap may be automatically substituted. This process is transparent to the application and the user.

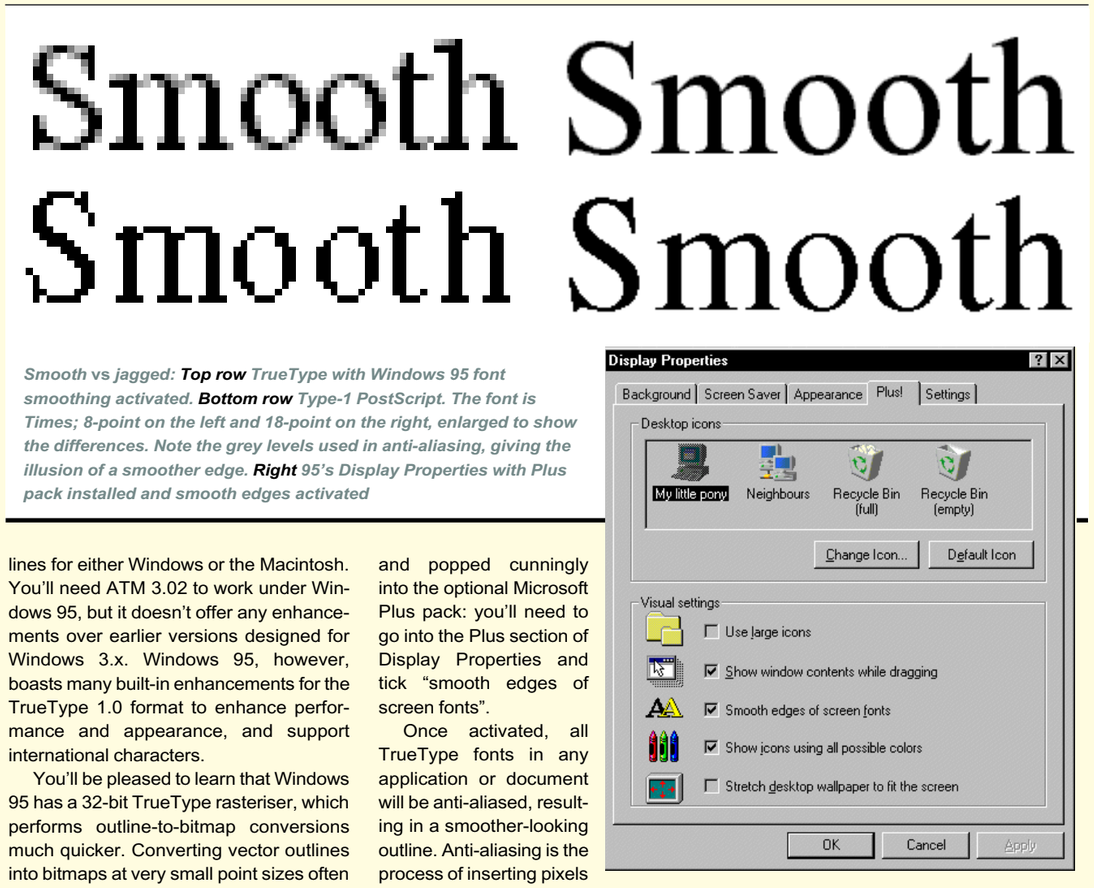
File space is used more efficiently by allowing TrueType fonts to share common character shapes, avoiding unnecessary duplication. Microsoft manages this with a TrueType collection (TCC) file, as yet implemented only in the Far Eastern version of Windows 95.

Greyscale rasterisation is responsible for the greatest improvement in TrueType appearance under Windows 95, although the feature was removed from the beta and popped cunningly into the optional Microsoft Plus pack: you'll need to go into the Plus section of Display Properties and tick "smooth edges of screen fonts".

Once activated, all TrueType fonts in any application or document will be anti-aliased, resulting in a smoother-looking outline. Anti-aliasing is the process of inserting pixels of intermediate background and foreground shade into the jagged steps of a bitmap, which fools the eye, at a distance, into perceiving a smoother shape. Under Windows 95 it works very well, and is particularly noticeable when compared side by side with non-anti-aliased type. Check out our example *[above]* with and without smoothing. The smoothy is a TrueType font, while the jaggie is a Type-1 font; sadly, ATM does not offer an anti-aliasing facility despite one being available for type within Adobe Photoshop.

Windows 95 uses three intermediate levels of grey, along with plain black and white, to create a smoothed character. The greyscale converter figures out which level of grey to use by considering how much of the original outline would fall into the pixel's space. If a large percentage of the outline falls into the pixel's area, a dark grey is chosen, while a small percentage would result in a light grey.

Next month I'll be delving into the complexities of character sets, particularly those with more than 128 or 256 on offer, ideal for complex languages. In the meantime, Windows 95 supports a curious halfway house between Windows ANSI (256 character) and double-byte sets (up to 65,536 characters). It's called Windows Glyph list 4 (WGL4) and was developed by Microsoft. Described as a Pan-European character set, WGL4 consists of 652 characters required in Western, Central and Eastern European writing systems, including Greek and Turkish.



*Smooth vs jagged: **Top row** TrueType with Windows 95 font smoothing activated. **Bottom row** Type-1 PostScript. The font is Times; 8-point on the left and 18-point on the right, enlarged to show the differences. Note the grey levels used in anti-aliasing, giving the illusion of a smoother edge. **Right** 95's Display Properties with Plus pack installed and smooth edges activated*

OpenType

Now for this month's big news. As reported in last month's *Newsprint*, the font format wars could be over. Adobe and Microsoft have got together to develop the OpenType font format, which combines TrueType and Type-1 technologies. Right now details aren't 100 percent solid, but here's what I've gleaned so far.

To be accurate, OpenType is an extension of TrueType Open, with added support for Adobe Type-1 information. An OpenType font could contain either TrueType or Type 1 information, or both. The interesting and slightly unclear part is what, precisely, will do the rasterisation.

Font of the Month

Orange

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abçdéfghijklmnöpqrstuvwxyzßЄ1234567890

After months of serious body fonts I thought it was time for a bit of fun. This month and next sees the return of the display face to my *Font of the Month* section. Here's Orange, from the Fontek collection, available from FontWorks. Fontek has a wide range of single-weight display faces selling for only £35 (plus VAT) — a welcome change from pricey type collections.

TrueType information will be rasterised as usual by software built in to the operating system, while Type-1 information will be rasterised by ATM. However, there is said to be some means by which Type-1 information could be converted to TrueType, probably to be implemented in the next version of Windows 95 and, presumably, Macintosh System 7. This could mean the end of ATM, unless Adobe comes up with (or even wants to come up with) a super-duper new version, with outstanding facilities and support.

All existing Type-1 and TrueType fonts will be supported by OpenType and should work transparently as far as the user is concerned. Microsoft and Adobe will promote and develop OpenType fonts, while Adobe will convert some of its popular Type-1 fonts to the OpenType format. This certainly implies the end of ATM in favour of OpenType support built in to the OS, although the possibility of a Type-1 rasteriser built into Windows has not yet been dismissed. Either way, thanks to the Type-1 to TrueType converter, all Type-1 fonts will work with Windows out of the box.

You won't be surprised to learn there's a pronounced Internet slant to the OpenType initiative. Any users of the World Wide Web who are into fonts will know the limitations of what can be used as text on a Web page. Depending on your browser, you're usually limited to just one or two typefaces; anything else has to be embedded as a bandwidth-greedy graphic.

Adobe and Microsoft are submitting a proposal to the World Wide Web Consortium for font embedding using OpenType technology. The first benefit is the faster downloading of fonts thanks to compression technology incorporated into OpenType. The second benefit is, of course, better-looking Web pages, which is good news for everyone.

It is expected that Microsoft's Internet Explorer will support font downloading later this year. The forthcoming Adobe Acrobat 3 will probably support OpenType, as will future versions of Windows.

Next month I'll delve into the different character sets, from old-faithful ASCII, through Windows ANSI, ending up in the territory of double bytes offering up to 65,000 characters and ideal for those particularly difficult languages. Also, when is a character really a glyph? And more details on WGL4. Those who can't wait should immediately check out the source for most of my information this and next month: Microsoft's superb Web site on http://www.microsoft.com/truetype.

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Type casting

If you thought Sans Serif was a resort in Spain, read on. Gordon Laing tells you things you always wanted to know about fonts but were afraid to ask.

"Typographic arrangement should achieve for the reader what voice tone conveys to the listener."

We're talking about fonts — I can't get enough of the things. However much my colleagues snigger at my obsession, I know they have a secret yearning to join me in a little typographic trainspotting. You see, they're really into it, too. It's just that they don't yet realise it.

With the advent of personal computers, graphical user interfaces and vector page description languages (such as PostScript, the digital typeface) are an everyday reality. All Windows and Macintosh users take scalability, what-you-see-is-what-you-get and smooth output for granted.

But like most aspects of computing, there's a fair amount of technology working behind the scenes. Unsurprisingly, there are also competing formats and implementations, each fighting for your attention.

It's always handy to understand the inner workings, and it's been a while since the subject's been covered, so this month's *Graphics & DTP* is everything you wanted to know about fonts but were afraid to ask.

Font or fount?

So, what is a font? Those with active vocabularies will almost certainly think of baptism, but as far as typefaces are concerned, the dictionary immediately passes the buck on to the word "fount", which it describes as "a complete assortment of types of one sort, with all that is necessary for printing in that kind of letter".

The word fount comes from the Latin, "to cast". Indeed, much of electronic publishing terminology harks back to the old days of the printing press. The part about "all that is necessary for printing" refers to the old, individually cast, characters; one for each style and size. The word "font" is an Americanism of "fount", but in its electronic form means much the same thing, in that each comes with "all that is necessary for printing".

Who's Mimi? For now, a demonstration of proportional spaced fonts. The letter m is usually the widest character, and the letter i the thinnest. At the top is Courier, a non-proportionally spaced font. Notice how the serifs are artificially widened to make all characters the same width. Below is Times, a proportionally spaced font, with naturally thin i's and wide m's. Out of interest, a wide dash is known typographically as an em dash, since it is the same width as a letter m in that font style; narrow dashes are en dashes

Serif or sans-serif?

There was a time, not so long ago, when all computers were limited to displaying one font on their monitors. Similar to mechanical typewriters, all the letters took up the same amount of space on the page, regardless of their actual size. This is known as mono or non-proportional spacing.

Look at the letters m and i. The i is much narrower, but occupies the same space on the page as any other letter in a non-proportional system. This extra space looked messy and spurred type designers to artificially widen the narrower characters to fill the gaps. The design they came up with for typewriters was Courier, a style familiar to all of us and over-used in recent times to convey a retro or Mission Impossible-type mood.

At the time, most printers came with the option of choosing from a couple of built-in fonts. These were usually selected by a switch on the printer and were described simply as Serif, or Sans-serif. Serifs are lines or curves projecting from the end of a letterform. Fonts with these additional strokes are known as serif fonts.

The word "serif" is derived from the chiseling marks found in Roman stone monuments; indeed, serif fonts are often referred to as Roman. However, uncapitalised roman describes vertical characters as opposed to italic. Italic characters slope to the right and are often known as oblique.

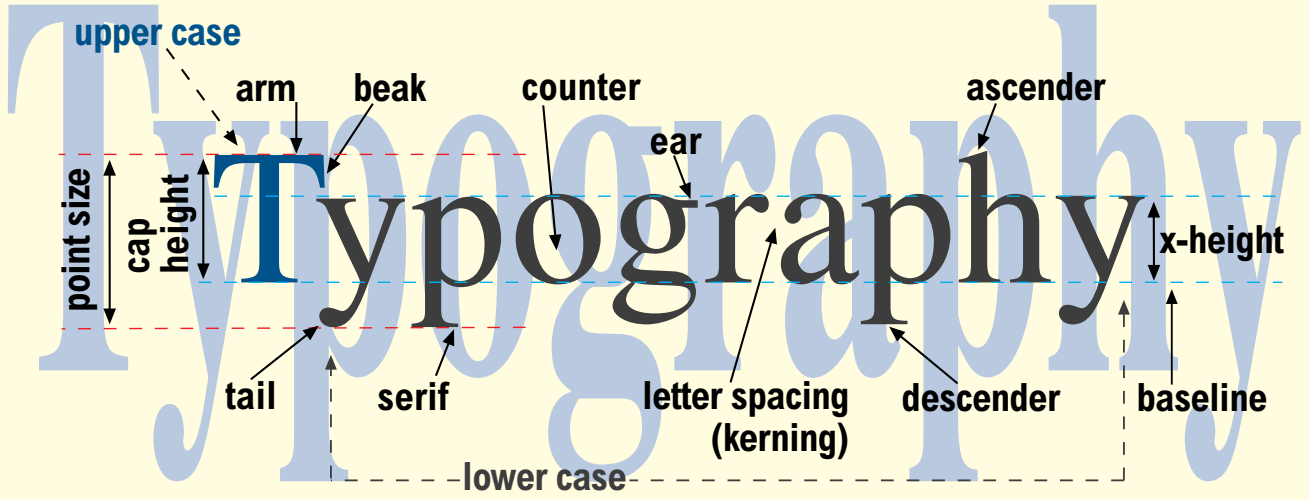
"Sans" is the French word meaning "without"; making sans-serif fonts those without the additional strokes. Probably the most famous sans-serif font is Helvetica (or Arial).

Times is the best known serif font. Studies have shown that at body-text sizes, serif fonts are easier to read — the idea being that the serifs help guide the eye from letter to letter. At larger or smaller than body-text sizes, sans-serif fonts seem to work better.

The advent of WYSIWYG

Proportional spacing and scalable fonts arrived on the desktop around 1984 courtesy of Adobe, just one year after it developed the PostScript page description language.

The shape of each character in Adobe's Type 1



font format is described by a PostScript program. These descriptions can be displayed and printed at any resolution, in any colour and at any degree of rotation. Each character incorporates spacing information.

Type 1 fonts also contain hinting information. Certain line weights and serifs may look great on characters output at two inches high but could look fiddly, or even illegible, at smaller sizes. Hinting is the process of adding information to a character's outline, slightly altering various aspects to improve its appearance at low resolutions and point sizes.

PostScript software and Type 1 fonts are device independent, meaning they are not tied to a specific device or resolution. The same Type 1 font can be used for a 72dpi display screen, a 300dpi laser printer or a 2400dpi imagesetter. In order to be printed or displayed it must still be turned into a bitmap, but the same single outline description can be used for all devices; one very flexible file, requiring little space and offering the desirable prospect of consistency across devices.

The process of turning a vector outline (such as a Type 1 font) into a bitmap at the desired resolution for printing, or display, is known as rasterisation. If you wanted to view or print the shape, it needed to be rasterised into a bitmap. PostScript printers could rasterise Type 1 fonts for printing, but for a while nothing could do it for on-screen use. Each Type 1 font consisted of several files: one for the vector outline (useful for the printer alone), and a small collection of pre-rasterised bitmaps for on-screen use. Hence the terms "printer font" and "screen font".

When a size was chosen for which a bitmap didn't exist, the on-screen result appeared jagged. Imagine zooming in and out of documents, effectively requesting countless bitmaps at obscure sizes: it looked like we were stuck with the jaggies for a while.

Then, in 1989, Adobe Type Manager (ATM) arrived. It took outline printer fonts and rasterised them on the fly, at any resolution, for on-screen use. This apparently processor-intensive task was absorbed by faster hardware becoming available, and any pause of a couple of seconds as the screen re-drew was more than compensated for by the smooth and accurate font shapes.

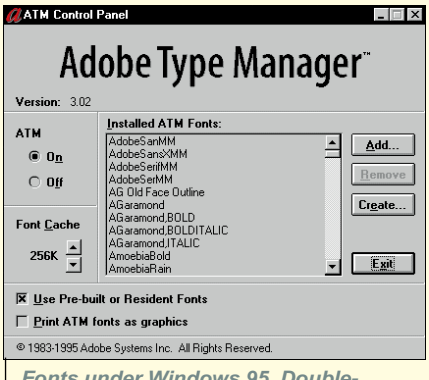
ATM could even rasterise Type 1 fonts for non-PostScript printers. Under Windows, it even handled the installation and management of Type 1 fonts — a totally invaluable utility for Windows or Macintosh users of Type 1 fonts.

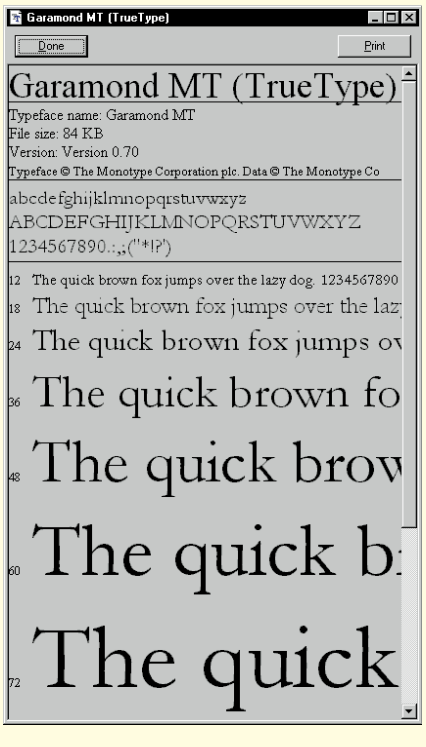
Just my type

You'd be forgiven for thinking the digital type world consisted entirely of fonts encoded in Adobe's Type 1 format. While Type 1 was the original and remains the standard in professional publishing, other formats and implementations sprung up to compete.

TrueType was developed as a joint venture by Apple and Microsoft. Windows 3.x, NT, 95 and Macintosh System 7.x operating systems come with a rasteriser for TrueType, but not Type 1 fonts. ATM is the only rasteriser for Type 1 fonts, costs £40, and is bundled with many applications, notably those from Lotus and, unsurprisingly, Adobe. Incidentally, ATM is built into IBM's OS/2.

TrueType fonts do not require accompanying pre-rasterised bitmaps on either Windows or Macintosh. It is possible, but not recommended, to use Type 1 fonts on a Macintosh without ATM. On such a Mac, the system relies on screen fonts for display and that's why all Macintosh Type 1 fonts must have at least one pre-rasterised bitmap screen font for compatibility. Since





Fonts under Windows 95. Double-clicking a TrueType font file offers the helpful information, right. PostScript Type 1 fonts are handled by Adobe Type Manager, ATM, above. The current version does not offer previews of Type 1 fonts

Font of the Month

FF Meta+

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abçdéfghijklmnöpqrstuvwxyzß&1234567890

Windows requires ATM to install Type 1 fonts (which can also rasterise them), bitmaps are not required.

Each OS happily operates with TrueType and Type 1 fonts simultaneously — even in the same document. But which is better?

Adobe claims that ATM is relatively more intelligent than the TrueType rasterisers. Consequently, Type 1 fonts can be smaller in file size than TrueType and take less time to download to a printer. Smaller file sizes require less space on your hard disk, too. On the other hand, Windows only downloads the actual characters of a TrueType font used in a document, whereas ATM downloads the whole character set.

PostScript and Type 1 still dominates the professional printing world. It's been around longest and consequently has an almost religious following in publishing circles. Although TrueType is catching up fast, there are currently more fonts available in the Type 1 format.

In publishing, there's the big issue of making sure the people who print your pages have exactly the same fonts you've used on your document. Missing fonts, resulting in substitution and reflow, is a surprisingly common nightmare. Merely sharing the same names isn't enough: the fonts have to come from the same foundry and supplier and this level of certainty is only truly offered by Type 1. One big endorsement comes from the International Standards Organisation, which in ISO specification 9541 identifies Adobe's Type 1 format as the worldwide standard for outline fonts.

Of course, if you're outputting only to a local printer or aren't bothered about absolute perfection, then any format will do. In this situation, it boils down to price and availability. There are a huge number of budget collections, more often than not in TrueType format, many consisting of subtly different copies of famous *proper* fonts.

Serious typographers will gasp with horror that anyone could even consider using these imposters. but they're more than sufficient for the majority of users.

Bitmaps — the last word

With scalable outline fonts galore, you'd wonder whether it's worth bothering with bitmaps ever again. The answer is a resounding, "kind-of ".

Many Windows and Macintosh system fonts are bitmaps — they're the ones you find on title bars, on menus and under icons. They look fine at that fixed size but try to scale them and the jagged edges will reveal themselves.

FON files are Windows bitmap fonts without accompanying outlines. They may consist of bitmaps at a number of sizes and are often used within email messages to ensure compatibility with as many other systems as possible.

Adobe Type 3 fonts are bitmap descriptions not requiring ATM but are rarely seen these days. One small advantage over Type 1 and TrueType is their ability to contain anything other than a solid fill — they could have a pattern of some kind.

A final word on file extensions. TTFs are, unsurprisingly, the TrueType outline files while Type 1 Windows fonts consist typically of two files: PFM and PFB. The PFB is the outline description, while the PFM contains information about the font such as letter spacing.

Next month we'll take a further look at fonts, including character sets and the many gems the Internet has to offer.

Font of the Month

Typographer Eric Spiekermann's aversion to Helvetica as a corporate typeface is well known. His alternative, Meta, was designed in 1991 and has become Fontworks' best-selling typeface. Eric has revised his original design, adding additional weights and cleaning up the kerning and some outlines. The result is the fabulous FF Meta+ *(pictured above)*, exclusively available from FontWorks.

PCW Contacts

Any burning font questions or tips? Write to me at the *PCW* address on Broadwick Street or email me as **gordon_laing@pcw.ccmail.compuserve.com**

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