STEVE CAPLIN'S A TO Z OF DESIGN

I: Image size

Steve Caplin walks us alphabetically through the concepts essential to success for any jobbing or aspiring designer.

ABOUT THE AUTHOR

Steve Caplin is a designer and illustrator working for a range of national newspapers. His best-selling *How to Cheat in Photoshop*, now in its fourth edition, is published by Focal Press. *http://books.macuser.co.uk/caplin*

Understanding image size is a conundrum that puzzles most designers when they're starting out. Just what is the difference between dots per inch and lines per inch, and how do either relate to the megapixel sizes quoted by the manufacturers of digital cameras? What resolution is required when working for print?

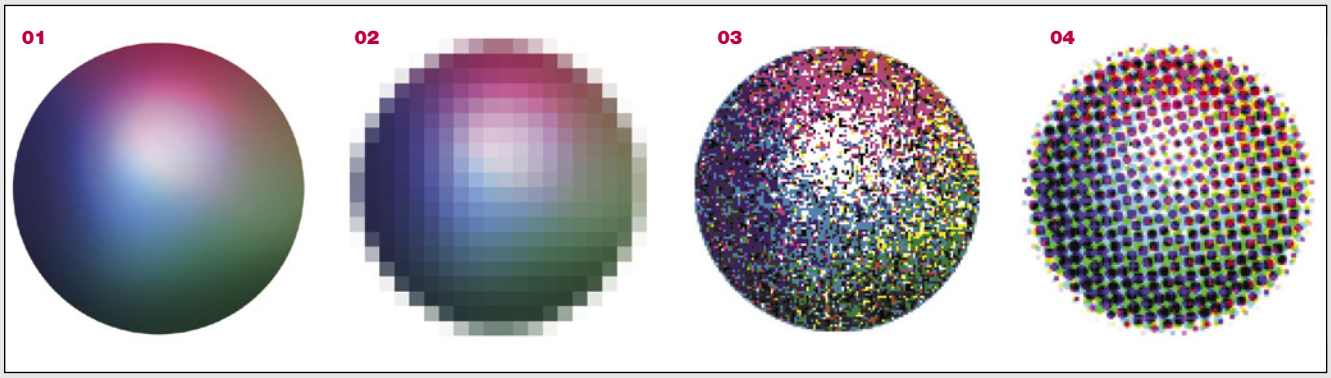
Image size is traditionally measured in dots per inch (dpi), even if you're accustomed to working in centimetres. You can, of course, work in dots per centimetre, but we'll stick to dpi here to be in tune with the convention.

Computer monitors typically display images at 72dpi. This means 72 pixels across and 72 down, which amounts to 5184 physical pixels in each square inch of screen space. This is the resolution you should work at when designing for the web. In Photoshop, when you view an image at '100%', you're seeing it at 72dpi: in other words, each pixel in the image precisely matches one pixel on the screen. Viewing images at a smaller size – say, 50% – entails each pixel on the screen displaying an average of the colour of four pixels in the original document. If you zoom in you can see each pixel with much greater clarity; they will clearly appear as squares.

How colour is displayed depends on the medium on which it appears, and the mechanism that gets it there. On a computer screen, each pixel is a discrete colour. You'll generally work in '8-bit' mode in Photoshop and other imaging applications: this means 2 to the power of 8 (which is 256) shades of each colour. 256 reds x 256 greens x 256 blues = 16,777,216 colours in total.

Commercial printing uses only four basic colours: cyan, magenta, yellow and black. All other colours are simulated by overprinting these four. The bigger the printed dot, the more of that colour is seen; so if in one region there are equal sized cyan and yellow dots, you'll see green. If the cyan dots are twice the size of the yellow, the result will be turquoise. Clearly, these dots need to be tiny if we're not going to notice them; and the smoother the paper, the smaller the dots can be. Newspapers print at around 100dpi; glossy magazines at around 250dpi, occasionally more.

When printing on an inkjet printer, however, the colour is made up from arrays of tiny dots of equal size. The more dots that are clustered together, the stronger the density of that colour. Inkjet printers typically



▲ This smooth image of a ball (01) is converted to pixels of discrete colour when shown on a computer monitor (02). An inkjet printer reproduces the image using a random array of identically sized dots (03); commercial printing uses dots of different sizes to create it (0_)4).

An image captured with a 3.2 megapixel camera would be large enough to be reproduced at half a page size in a newspaper, or half an A4 page in a glossy magazine; the same image would also fill an Apple 30in Cinema Display.

print at 1200dpi, which produces a smooth tonal range with a dot that's barely perceptible.

When working for commercial printing, you need to ensure that the number of dots in your document exceeds the number of dots with which the file will be printed by a factor of around 1.5. So when working for a newspaper, creating your image at 150dpi will generally suffice; for glossy magazine printing, working at 375dpi is standard.

Digital cameras capture pixels on a CCD chip: the better the camera, the more pixels on the chip, and so the higher the resolution at which the image can be recorded. If a camera is quoted as having an image size of 3.2 megapixels, it will produce images that measure 2048 pixels wide by 1536 pixels high. Multiplying these values together – the total number of pixels in the image – produces 3,145,728 pixels overall: and that's what the 3.2 megapixel name refers to.

If printed in a newspaper, a 3.2 megapixel camera could produce a high quality image at up to about 10 x 8 inches. The same image in a glossy magazine could be used at up to around half an A4 page; if printed any larger than this, the pixels in the image would be larger than the printed dot size, and we'd start to see ungainly pixellation in the finished result. When shown on a web page, however, the same image would easily fill the entire area of an Apple 30in Cinema Display screen.

A lot of designers are confused when producing work for billboard posters, which may run to 10ft high by 20ft wide. How on earth do we work at a resolution suitable for that huge size? The answer lies in the fact that these posters are generally seen from a distance, and so don't need anything like the resolution required for magazine work. In practice, the posters tend to be printed at less than 25dpi. This means that our 3.2 megapixel image could be printed at nearly 7ft wide on a poster. When creating poster artwork, it's standard practice to work on an A3 sized document at 300dpi, which will create a high enough resolution for good quality results.

The software that accompanies most flatbed scanners tends, confusingly, to offer the ability to adjust both the size and the resolution of scans. In fact, these both amount to the same thing; it's the number of pixels captured in total that counts, not the relative dimensions. The easy solution is to scan an image at the size you're going to want to use it, at a resolution appropriate for the medium on which it's going to end up – in a newspaper, a magazine, or on the screen. Err on the high side: you can always reduce an image's size in Photoshop, but you can't increase it without loss of quality.

The Image Size dialog in Photoshop has the ability to resample images to any size and resolution you choose, but if you uncheck the 'Resample Image' button, it will adjust the size and resolution together. This is a useful method for turning, say, digital camera captures – which typically have a resolution of 180dpi – into print-ready files with a resolution of 300dpi. When the resulting image is placed on the page, you know you can always reduce or crop it, but you can't expand it without losing quality.