

Halftones & Four-Colour Work

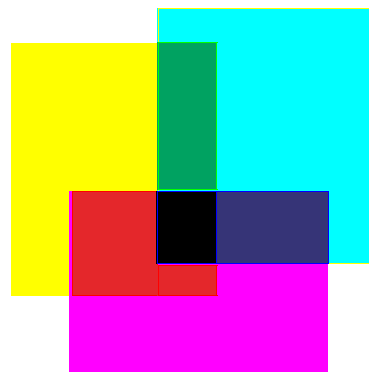
Letterpress (and most other printing methods) will only print ink or not print ink on any particular place to form the image. In other words (and limiting this to black and white only to keep it simple), it doesn't produce full tones like a photograph, where each point in the image can be anywhere in the range from black to white. When illustrations are produced by woodcutting or engraving, the illusion of shades of grey is created by shading: using fine lines and adjusting the spacing to vary the effect. Later engravings used stippling with dots to produce the same result as tools were developed to make such effects easier to cut. Photoengraving could reproduce these effects when they were drawn, but turning photographs themselves into suitable plates that looked like the original photographs was trickier. Various experiments from the 1850s to the 1880 produced plates in which dots of varying size reproduced the shades of grey, but it was the Levy brothers introduction of a screen of crossed lines, placed a short distance in front of the film in the process camera, in 1883 that made the process commercial. This is known as a *halftone* screen, to indicate that it is not a true full tone like a photograph.

Halftone screens vary in the number of lines per inch (or cm) according to the use being made of the final plate. Printing on rough papers such as newsprint or book text paper needed a coarse screen, reducing the detail visible, and limiting the range of shades, while printing on more expensive very smooth coated papers conversely allowed finer detail and a better range of shades. For this reason books up to the end of the letterpress era often had photographs printed on different paper from the text, usually necessitating a group of pages together every so often through the book, or other awkward ways of inserting such pages of different paper.

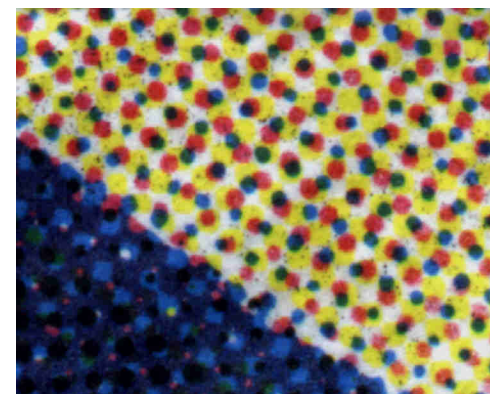
Halftones are still used in current reproduction methods such as computer printing on laser printers, where the process is still fundamentally one of ink/no ink forming the image. However, many of these methods can still use fine dots even on rough papers. Some (such as ink-jet) in effect use a screen for everything including text, making the entire image up of fine dots. If you want to see halftone dots easily, look at a photograph on a street bill-board poster close-up.



A section of a halftone letterpress print enlarged to show the dots. The effects of the paper roughness and the imperfections of inking & printing can also just be seen.



The three primary colours of inks, showing the effects of overlapping.



A four-colour print enlarged to show the dots of each colour: the section top right shows the rosette pattern most clearly.

Printing shades of grey to reproduce a photograph was one thing, printing full-colour is quite a lot more complex. Printers needed to produce coloured work from the start, but Gutenberg simply printed the black text, and left the coloured illustrations to be added by manual illustrators, as was of course routine in book production at the time. He did print some letters in colour, but this usually involved an extra printing for each sheet for each colour. (There were ways to avoid this, but they saved little effort in practice.) For a long time, the situation remained unchanged, but by the start of the nineteenth century the selling advantages of colour in a mass market led to ways of adding colour by printing more colours, or hand-colouring printed illustrations (usually by a form of stencilling), becoming more frequently used. Baxter developed the multi-coloured wood print that was the climax of this, and that tried to match the competition from chromolithography, which could produce finer detail and better gradations of colour in large quantity work by the end of the century.

Meanwhile, however, photoengraving had arrived, and James Clark-Maxwell had investigated light and the idea of colour photography using only three primary colours of light (red, green and blue). This led inexorably to the idea of printing photographs by using the three complementary colours of ink (cyan, magenta and yellow). The colour we see when we look at a printed patch is the colour the ink lets through from the white paper—the ink is like a piece of filter laid on the paper. Ink colours therefore work the opposite way to light: the three primary colours of light add up to make white light, while the three primary colours of inks each cut out one of those colours of

light, to leave black. It didn't help when printers referred to the ink colours as 'red' (magenta) & 'blue' (cyan)!

In practice, the problem lay in finding inks that were the true primary reflective colours, and that were highly transparent, and it was not until the 1970s that inks were produced to make colour photographs really satisfactory. It was also found that a black printing was best included, both to give a better contrast with a true black, and to sharpen the detail in the image. Colour printing is therefore usually (even now, for the same principle applies to other processes than letterpress) done with four colours, and the lines of dots are skewed relative to each other to avoid creating moire patterning. If you examine a colour print in detail, the dots therefore usually form little rosettes of the four colours used. Because of the limitations of the inks, and to avoid halftone dots on plain areas, much colour printing (such as packaging) still uses extra printings of special colours.