Color Technology

MTSU School of Journalism
Visual Communication

MIDDLE TENNESSEE STATE UNIVERSITY

MTSU SCHOOL OF JOURNALISM

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Visual Communication

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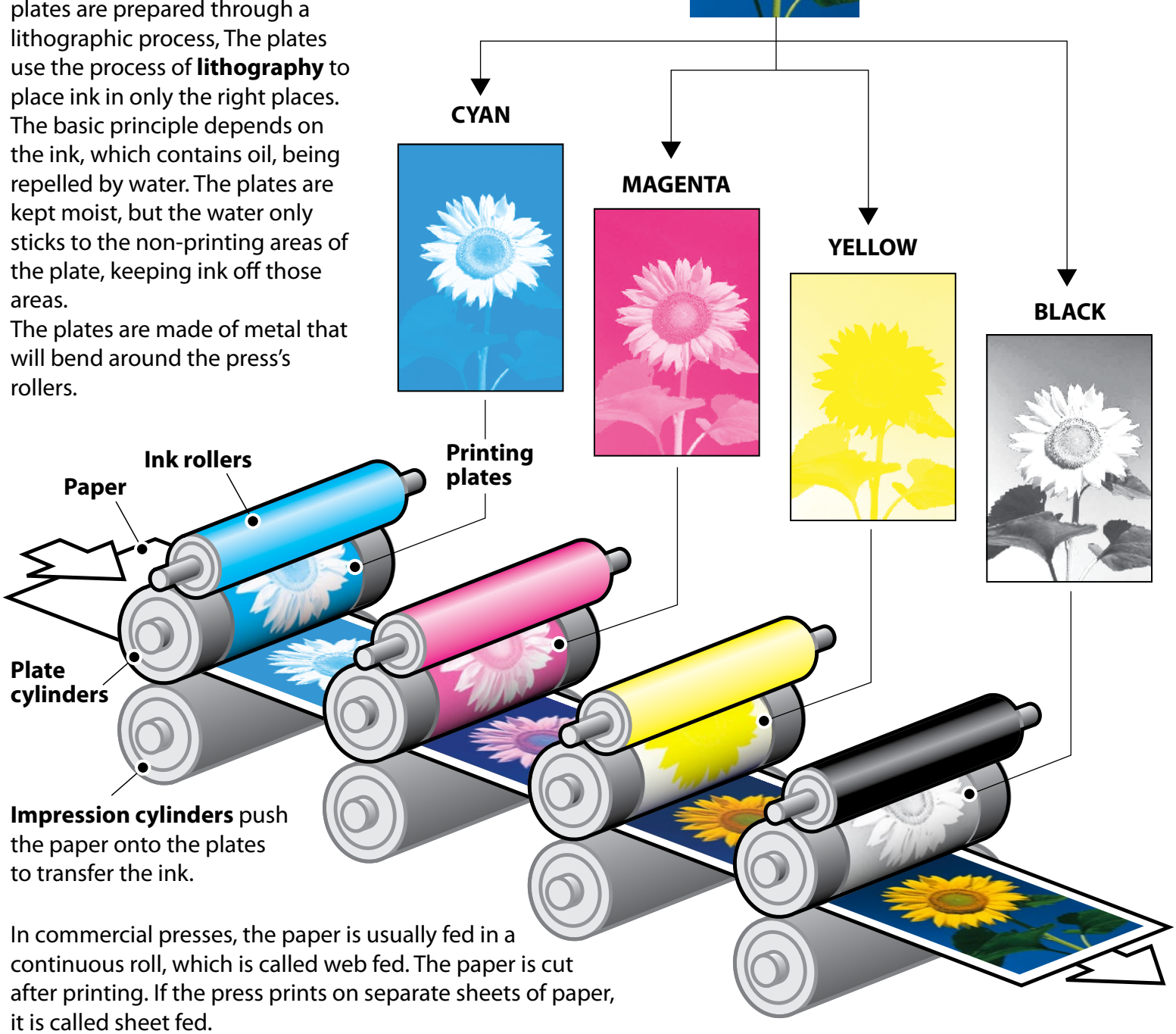
Reproducing color

Digital image:
CMYK TIF file

LITHOGRAPHIC PRINTING PROCESS

Lithographic presses apply ink to paper through a series of rollers, each one delivering a different color ink. Images being printed are separated out into different plates for each color of ink. The plates are prepared through a lithographic process, The plates use the process of **lithography** to place ink in only the right places. The basic principle depends on the ink, which contains oil, being repelled by water. The plates are kept moist, but the water only sticks to the non-printing areas of the plate, keeping ink off those areas.
The plates are made of metal that will bend around the press's rollers.



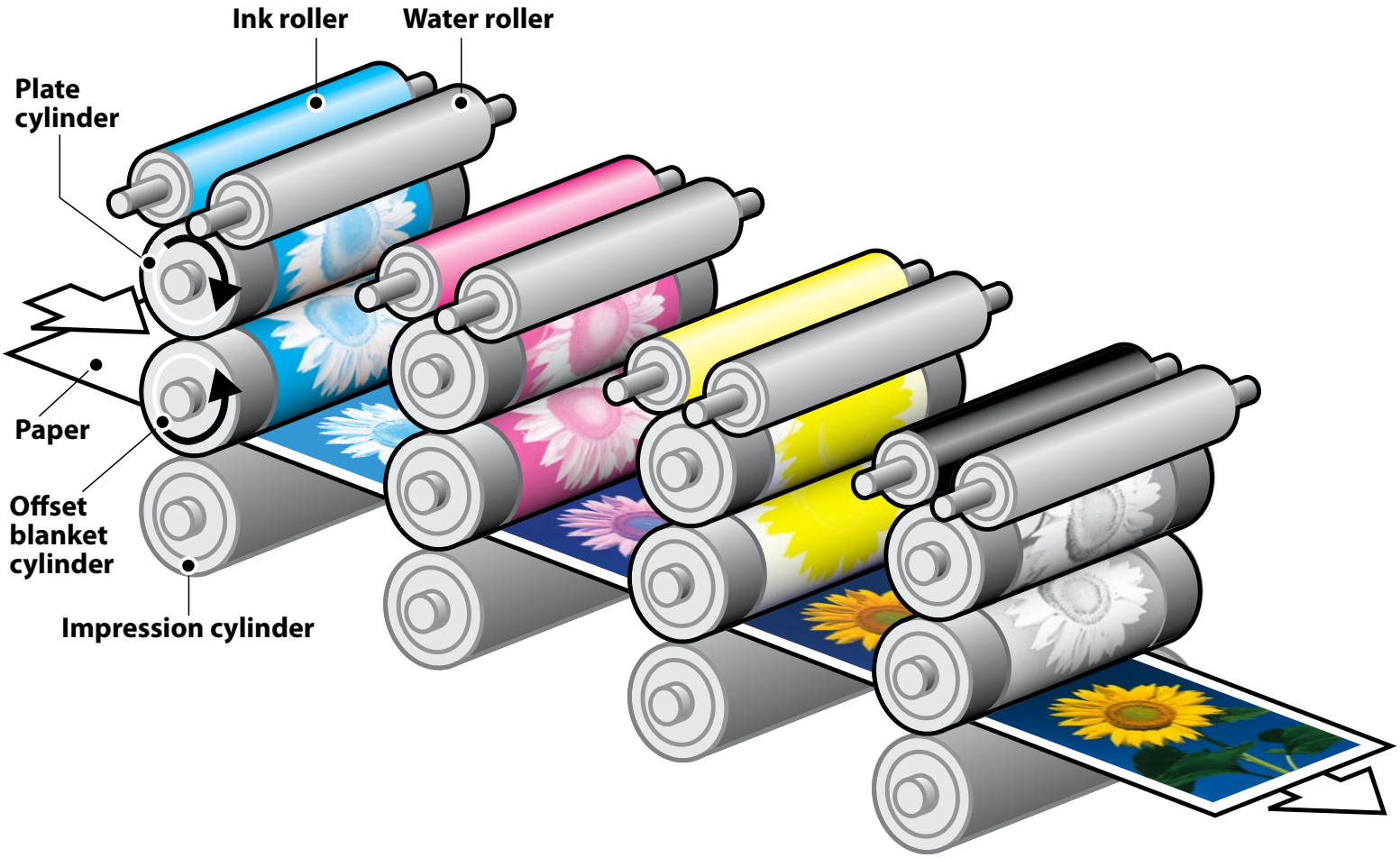
Impression cylinders push the paper onto the plates to transfer the ink.

In commercial presses, the paper is usually fed in a continuous roll, which is called web fed. The paper is cut after printing. If the press prints on separate sheets of paper, it is called sheet fed.

Offset printing

The image on the previous page is an overly simplified diagram of a printing press. Modern commercial presses use an extra roller between the plate and the paper, called the **blanket cylinder**, which has a rubber surface. The ink is transferred from the plate cylinder to the blanket, and then to the paper—this is the offset process. This actually provides a superior print result, as well as preserving the printing plates.

Besides the ink roller, there's also a water roller which keeps the printing plate wet. The water will only stick to the non-printing areas of the plate, and the ink, which is oil-based, will only stick to the dry areas of the plate.



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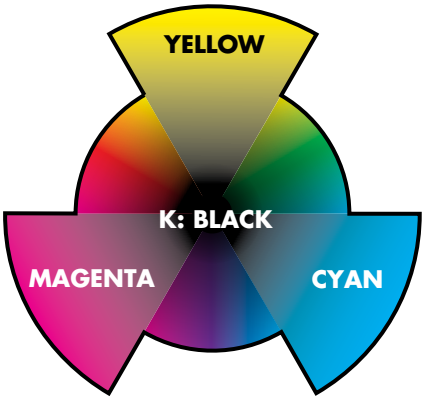
PROCESS COLORS: CMYK

Typically, a press will always have the four process ink colors: **cyan, magenta, yellow and black**. Varying combinations of these four inks can create a range of colors, known as the process gamut.

In Adobe programs, there is a color panel which allows mixing varying percentages of the four process colors. These mixes can then be saved to the swatches panel.

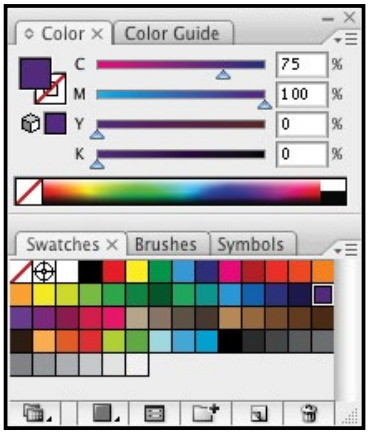
CMYK PROCESS COLOR PRINTING INKS



PROCESS COLORS

Color Panel
CMYK sliders

Swatches Panel
Process color swatches



SPOT COLORS

The range of colors that can be created by mixing the four process inks together is limited. So a press might have extra rollers to apply custom colors as well. These extra ink colors are called spot colors.

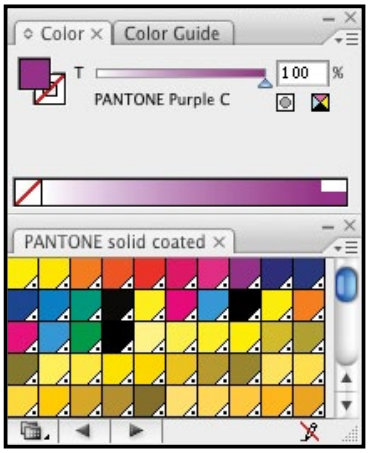
In Adobe programs, spot color swatches are identified by a small triangle in the lower right. Swatch libraries can be opened which correspond to colors available from leading ink manufacturers such as Pantone and Toyo.

If you use a spot color in your document, an extra printing plate for that color will be created when separations are made in the pre-press process.

SPOT COLORS

Color Panel
Pantone spot color

Swatches Panel
Pantone solid coated swatch library



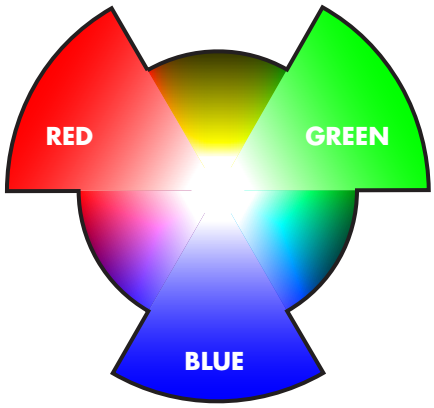
Reproducing color

MONITOR COLORS: RGB

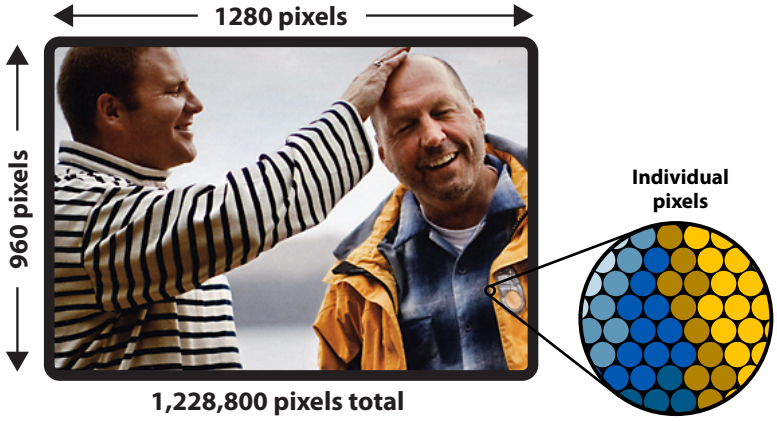
In electronic display devices, color is created by mixing different colored lights together. The three primary light colors are **red, green** and **blue**.

The display is made up of individual points of light called pixels. Each pixel's color is determined by a specific mixture of red, green and blue light. Mixing all three together at maximum intensity produces white.

The resolution of a display is the number of pixels it shows horizontally and vertically: For example, 1280 x 960. Most computers have a range of available resolutions.



RGB ELECTRONIC DISPLAY COLORS

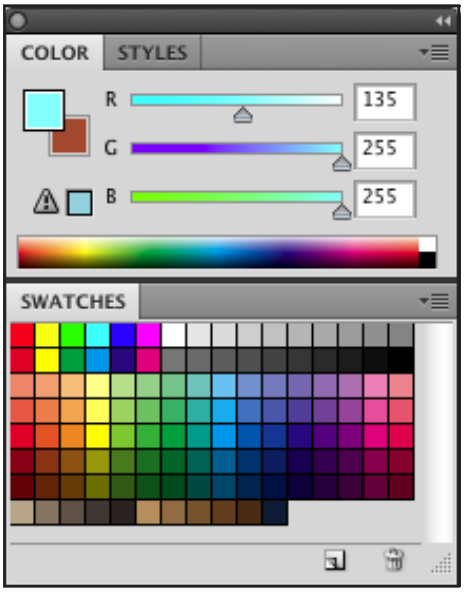


1,228,800 pixels total

RGB COLOR SPACE

The number and range of colors that an electronic device can reproduce depends entirely on the device's hardware and software capabilities. A high-quality display can reproduce millions of colors: There are 256 levels for each of the three colors, so 256 x 256 x 256 = 16,777,216 colors.

However, even if you specify a particular mix of RGB in your document, the resulting color will appear differently on devices of different manufacture and that have different color settings applied.



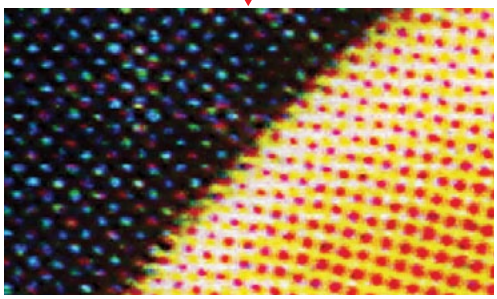
PHOTOSHOP'S COLOR PANEL

RGB sliders: Each color has 256 levels: 0-255

Reproducing color

VARYING PRINTING COLORS

The inks in a printing press only come in solid colors. To make variations in value and intensity, a process called **screening** is employed.
Screening reduces solid areas of color to a pattern of small dots arranged in rows. To make a color lighter or darker, the size of the dots are smaller or bigger. By mixing in dots of a contrasting hue, the color can be made duller.



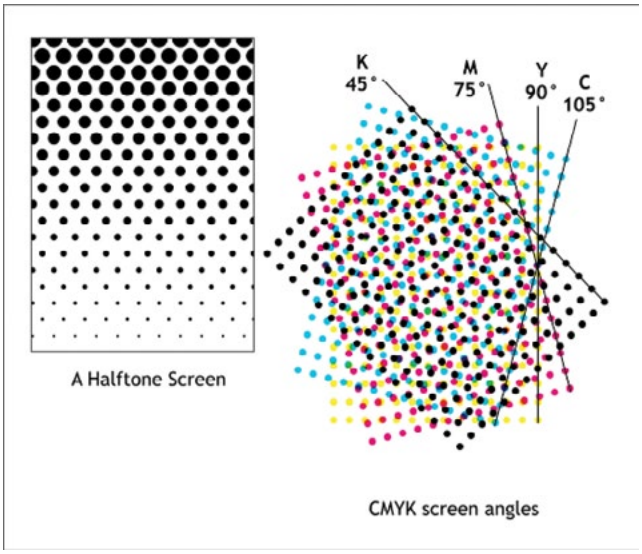
Closeup of a 150 lpi photo from a magazine. Individual ink dots can be seen in a screen pattern.

LINE SCREEN

The fineness of the dot pattern is measured by how many rows there are in an inch. Generally the range is from 85 lpi (lines per inch) to 150. Newspapers and other low-quality publications usually print at 85 lpi, while high-quality, glossy publications such as fashion magazines print at 150 lpi.

The screen for each of the process colors is usually set at a different angle to avoid unwanted patterns.

When preparing a photo for print production, the resolution should be double the line screen—so, a photo to be used in an 85 lpi newspaper would be set at a resolution of 170 ppi, or pixels per inch. So generally the range of resolution when preparing photos for printing is 170-300 ppi.



Reproducing color

GAMUTS

The word gamut simply means range. So the gamut of a device, whether a printing press or an electronic display, is how many colors it can reproduce of all the colors that are visible to the human eye.

Not surprisingly, the number of colors that can be reproduced with just the CMYK process inks is limited. The most vivid colors are the ones closest to the pure ink colors of cyan, magenta and yellow; the more they get mixed, the more limited the results.

Adding more ink colors, such as with Pantone or Toyo inks, extends the range, but there's a limit to what can be reproduced on a piece of paper, no matter how vivid the inks.

RGB displays have a wider gamut, since light will naturally be more intense than ink on paper, but even they can't, at the current level of technology, match the full range of visible colors. Notice that they do best in the red, green and blue corners, and that fidelity drops off for colors in between.