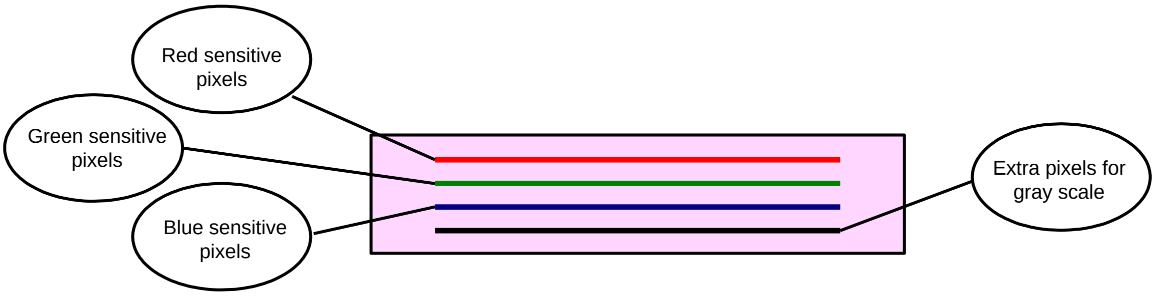
The Pixel Race

More pixels are better, so bigger numbers are important. Unfortunately, this is not always true. Some vendors add pixels together that cannot be used simultaneously, just to get a bigger number than the competition.

Let us explain this misrepresentation by using an example from a well known large format scanner vendor. They are using a couple of CCD cameras in their scanners with a width of 7,500 pixels. Color CCDs are made out of three rows of CCD elements, arranged side by side, with a color filter for red, green and blue on the top. At each exposure time, they capture three lines with 7,500 pixels each which are slightly offset by the distance between the CCD rows. The three different lines have to be shifted later to form the correct RGB pixel. In this case, it is meaningful to claim either three rows of 7,500 pixels or 22,500 pixels altogether.



Some CCD vendors have added a fourth row of pixels with no color filter to their chips. The reason is that for b/w scans, the output of the forth row is used instead of combining the three colors to form a correct grayscale image. This extra piece of hardware seems redundant because it is possible achieve the same (or even better) results with just three primary colors. There is only one reason that justifies it and this is the higher speed possible in grayscale mode if the image processing hardware is too slow to keep up with the triple data rate coming out of the color CCD row.

A camera like the one described above has either 22,500 pixels in color mode or 7,500 in grayscale mode. The marketing department of a well known large format scanner vendor has now come up with the idea of claiming that their cameras have 30,000 pixels although they can never be used at the same time. The educated user should always be aware of these little marketing tricks and question numbers like this. What counts at the end of the day is quality, real optical resolution and speed.

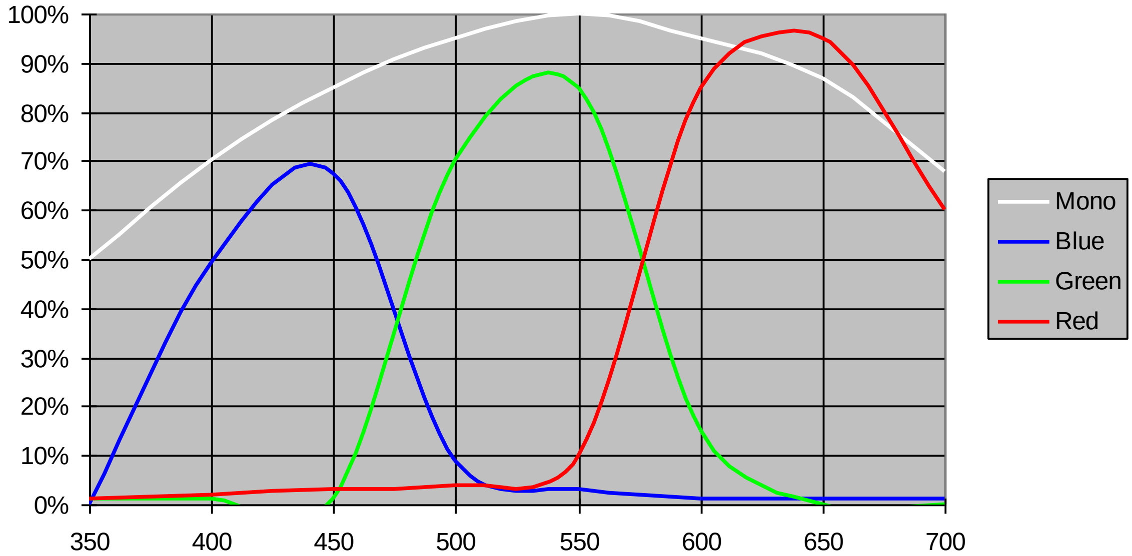
Our scanners are scanning at the same speed in color and black & white, making it unnecessary to add a fourth CCD row for speed reasons. Also all our scanners convert a RGB scan into a gray scale scan in a photometric correct way, which is almost impossible if using a dedicated fourth array.

There is also a difference in quality in using the single row CCD for the grayscale images. The responsiveness of a monochrome CCD element to different colors is significantly different than the responsiveness of the human eye.

If individual red, green and blue channels are present, the process of white balance will adjust the response of each channel in a way, that the reference target appears **white** afterwards. After this adjustment is made, the response of the whole system including the illumination is very similar to the human eye perception, resulting in precise and vivid colors.

When we combine the red, green and blue CCD signals to a grayscale image, the different contribution of each color is taken into account which results in a grayscale image very close to human perception. The factors applied to the individual colors are standardized by CIE www.wikipedia.org/wiki/CIE and are used in photography, television and print processes.

Relative Spectral Sensitivity



If the image is only scanned with a monochrome sensor this balance cannot be performed. Consequently the gray scale representation of each color depends largely on the response of the CCD chip, the specific color temperature of the illumination system and other factors. The resulting gray scale image will show some colors way too dark and other colors much brighter than present in the original.

Our scanners always scan in color, to achieve the highest possible quality even if the output selected is to be gray scale or binary.