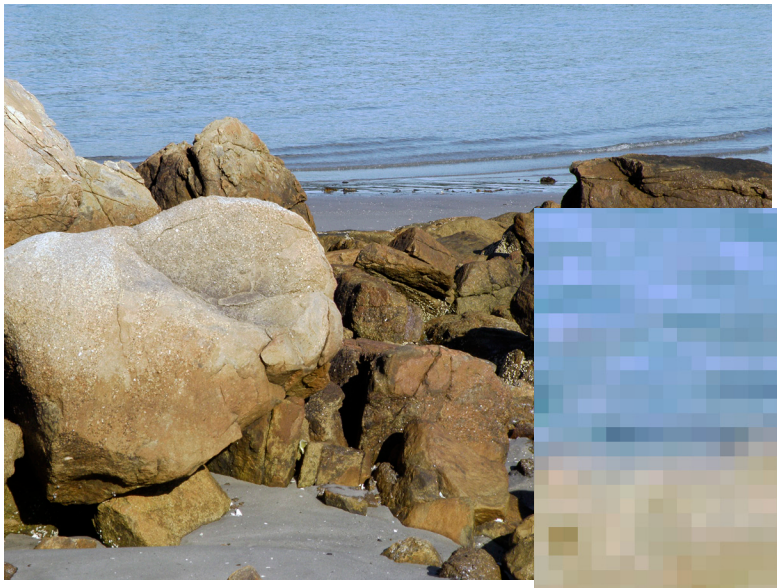
THE BUILDING BLOCKS OF A DIGITAL IMAGE

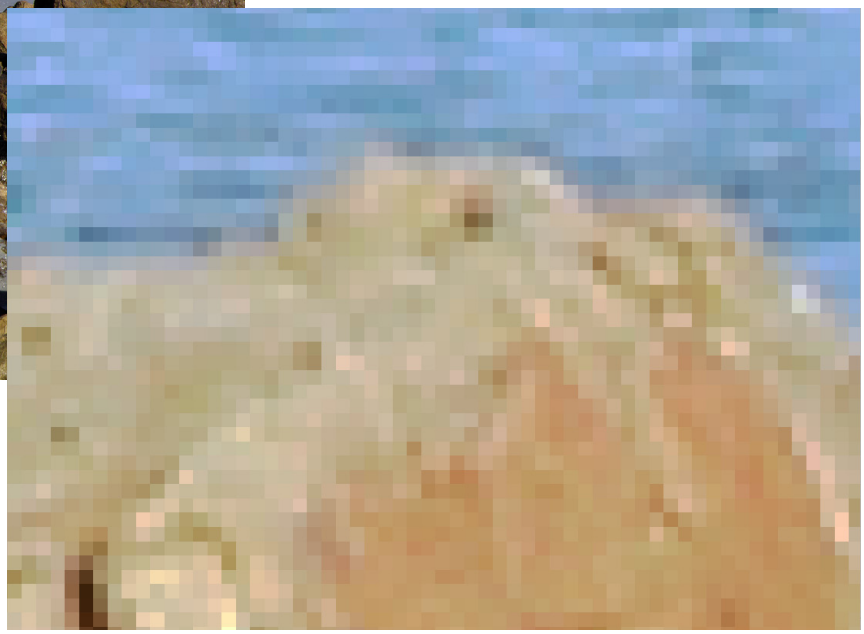
PIXELS
CHANNELS
BIT-DEPTH
= A DIGITAL IMAGE

PIXELS

Pixels are tiny bits of tonal information that make up an image.

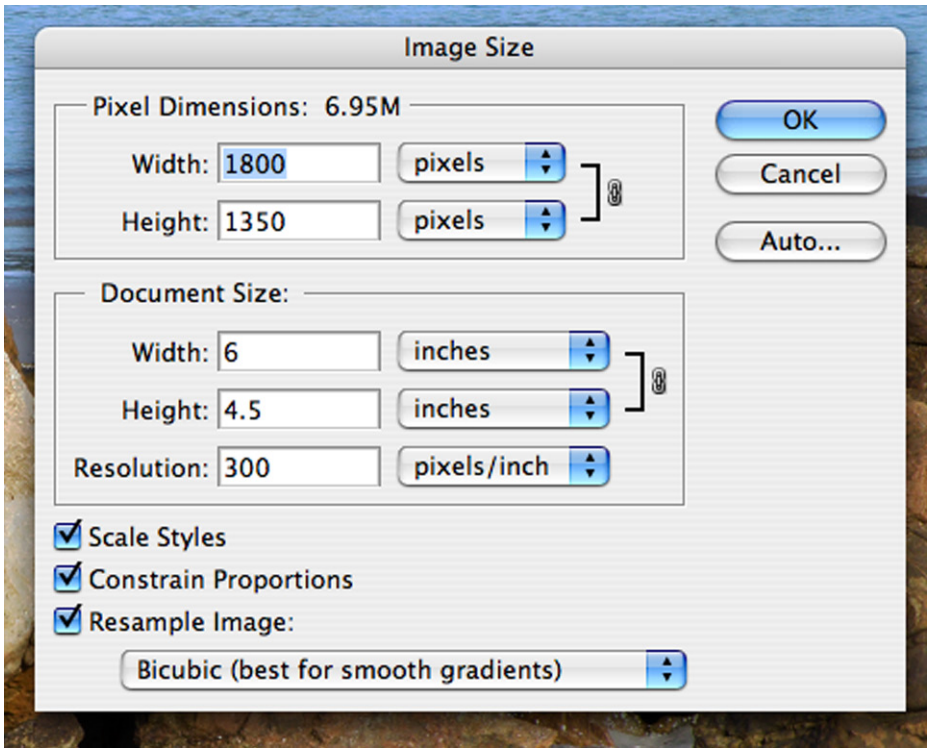


When zoomed into an image, they appear to be like little square bricks of color.



The amount of pixels in an image determine the image size and resolution.

We can see how many pixels are in an image by opening up the Image Size dialog box in photoshop (*image > image size*). The top portion of the box gives us the Pixel Dimensions of the image. If we took the time to count the pixels, we would find that this image has 1800 pixels horizontally across and 1350 pixels vertically.

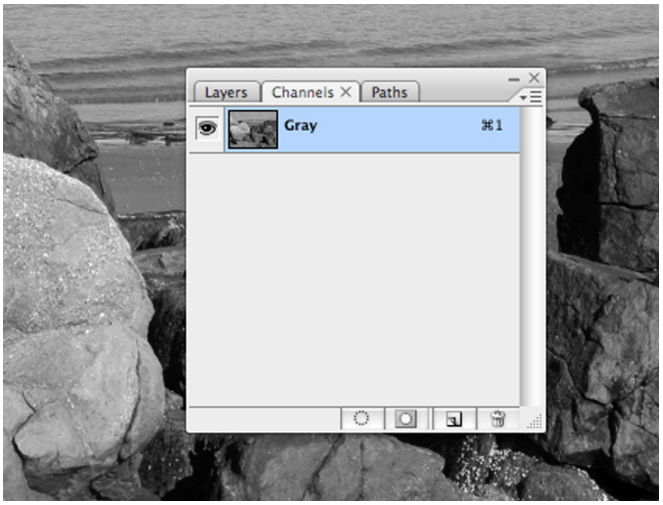


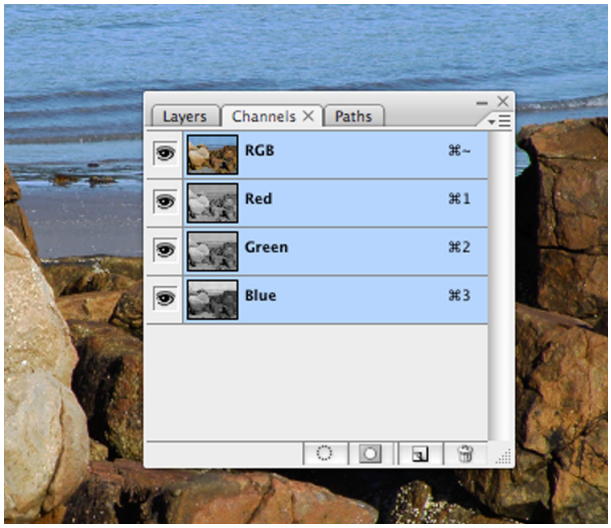
The larger the number of pixels, the higher the image resolution is. This image is 300 pixels per inch, which means that there are 300 pixels within every inch of this image. Width: 300 multiplied by 6 =1800 and Height: 300 multiplied by 4.5 = 1350.

CHANNELS

Another building block of a digital image is channels. The channels window tab is usually next to the layers tab in Photoshop, and it can also be found by going to *window > channels*.

For a grayscale mode image, notice that only one channel of information exists and it is called “Gray.”





The original image in RGB color mode has 4 channels:

1.) A Red Channel
2.) A Green Channel
3.) A Blue Channel
4.) A Composite Color Channel of the 3 RGB Channels

Important Note
An RGB color image is actually made up of 3 grayscale channels, which means that all the red, green, and blue (RGB) values are broken down in terms of grayscale tone (dark to light.) Color bits are then assigned to these channels in the composite channel and the color is determined by the output device (monitor, projector, printer, etc...) This is why color is difficult to manage consistently as it changes from one output device to the next.

BIT-DEPTH

Bit-depth is a difficult concept at first, but it is an important one to understand when working with digital images. Bit-depth, also known as color depth, refers to the number of bits used to represent tone in each pixel. The bit depth is determined by bpp (bits per pixel.)

Black and White Bitmap Mode-- 1 Bit Image with 2 possible colors

An image in the two-toned Black and White Bitmap mode (*image > mode > bitmap*) has the simplest bit-depth.

Here is a zoomed in view of the pixels of an image in Bitmap mode. The bit-depth of the image is 1, because the image can only be assigned 1 of 2 tones: black or white.

Grayscale Mode-- 8 Bit Image with 256 possible colors

A Bitmap image is two-toned, and a grayscale image is called a multitonal image.

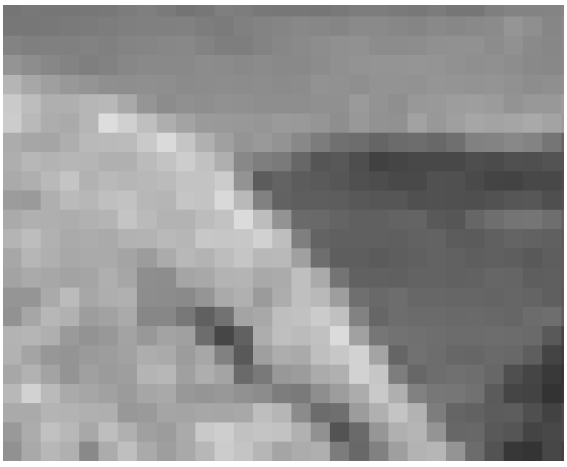
The bit-depth is determined by the RGB grayscale values. Each pixel can be one of the following bits of color:

3 bits Red, 3 bits Green, and 2 bits Blue (3 + 3 + 2 = 8).

Blue has one less bit than Red and Green, because our human eyes are less sensitive to blue.

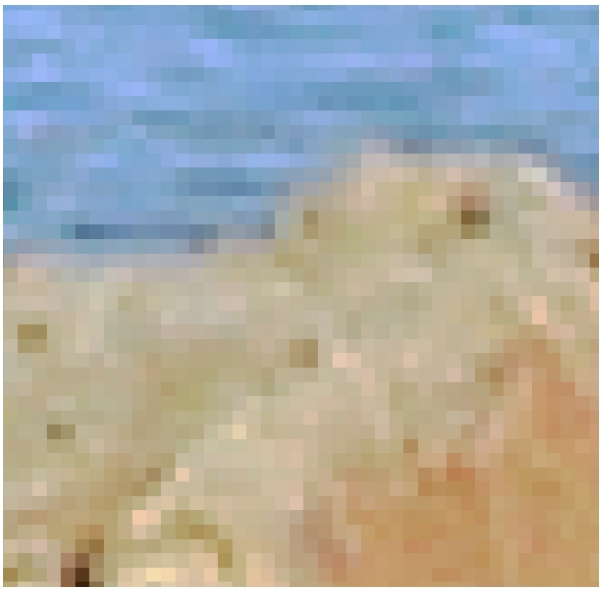
Remember, as we saw with the Bitmap image, 1 bit = 2 possible colors, so 3 bits of Red actually equals 8 possible values. (2 * 2 * 2 = 8). Blue only has 2 bits so that means, (2 *2 = 4), it only has 4 possible values.

We calculate the total number of possible colors by multiplying the possible values of Red, Green and Blue (8 * 8 * 4 = 256).



Truecolor RGB Mode--24 bit image with 16.7 million possible colors

An image scanned at 24-bits or photographed at a high resolution is a Truecolor RGB image.



A 24-bit depth image means that each pixel is made up of 8 bits of Red, 8 bits of Green, and 8 bits of Blue. (At this stage, the blue maintains the same bits as R and G.) So that is 8 + 8 + 8 = 24.

We determine that there are 16.7 million possible colors in a 24-bit image in the following way:

Remember, an RGB color image is made up of 3 grayscale channels and a 4th color composite channel. Each of the 3 channels, Red, Green, and Blue, are its own separate 8 bit grayscale image with 256 possible colors. When the channels are composited together, we have 256 * 256 * 256 = 16.7 million.