

# INPUT OUTPUT

## 08 / IMAGE QUALITY & VIEWING

In this section we will cover common image file formats you are likely to come across and examine image quality in terms of resolution and bit depth. We will cover concepts to help you determine the proper resolution you will need for different types of input or output. You will also have your first assignment using Adobe Photoshop.

### QUALITY

When we talk about quality in an image for print or viewing we are discussing the amount of useful information we have to work with. Bit depth and resolution are what that information is composed of.

#### BIT DEPTH

Bit depth refers to how much color information the scanner can capture. Higher bit depth, results in a larger file size.

- **1-bit:** captures line art (each pixel, or dot, is either black or white)
- **8-bit:** captures grayscale in continuous tone (each pixel can represent a range from pure black at one extreme to pure white at the other, and 254 distinct shades of grey in between)
- **24-bit:** captures RGB color with continuous tone (8 bits for each of the additive primary [red, green, blue] color channels).

#### RESOLUTION

The number of pixels (dots) which comprise a digital image. Each pixel contains information for brightness

and color. Resolution is described in one of two ways: (1) The number of dots (or pixels) per linear inch, e.g. 300 dpi (dots per inch); (2) a measure of the horizontal and vertical dimensions of the digital image, e.g. 1920 x 1080. The higher the resolution, the larger the size of the file, and the finer the detail that can be recorded. In addition, the higher the resolution, the larger a print can be made from the image without discernible pixilation.

### RESOLUTION

- **Dots per inch (DPI)** is usually used to specify the resolution of printing devices, color laser printers range from 300 to 600 dpi, while the photo-quality ink-jet printers in the SF Cage are capable of printing 1200 dpi.
- **Pixels per inch (PPI)** is usually used to specify the resolution of screen devices. A typical desktop or laptop display is about 100 ppi and the typical mobile device is about 175 ppi, give or take.

The term **pixel** is a combination of the words picture and element.

## PRODUCING FILES FOR PRINT

Make sure that you are working with images and photos in the resolution required for your final display environment, otherwise they will end up pixelated when printed. Posters should be produced at a minimum resolution of 250dpi, while fine art photographic-quality images should be produced with at least 1,200dpi. Below is an example of a high-resolution and pixelated image:



## FILE FORMATS

There are many different types of image files, but only two major formats you will use here: Vectors and Bitmaps.

### VECTOR IMAGE

An image format that generates an image using mathematical formulas for drawing objects—usually geometric shapes.

Vector images are often used for logos or flat graphics and are created with programs like Adobe Illustrator. The computer draws them by calculating coordinates in relationship to each other.

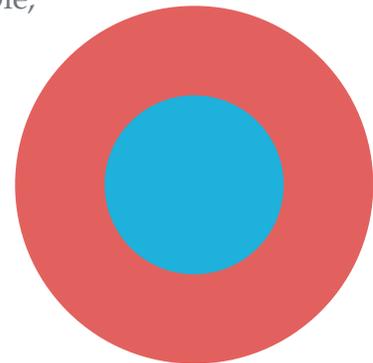
One simple way to understand how a vector works is to imagine a image of a

small circle in the center of a larger circle. We see the shape, but the computer see's instructions like this:

- Create a blue circle 10 units in diameter.
- Then draw a red circle twice as large size around that circle. It might look a bit like this:



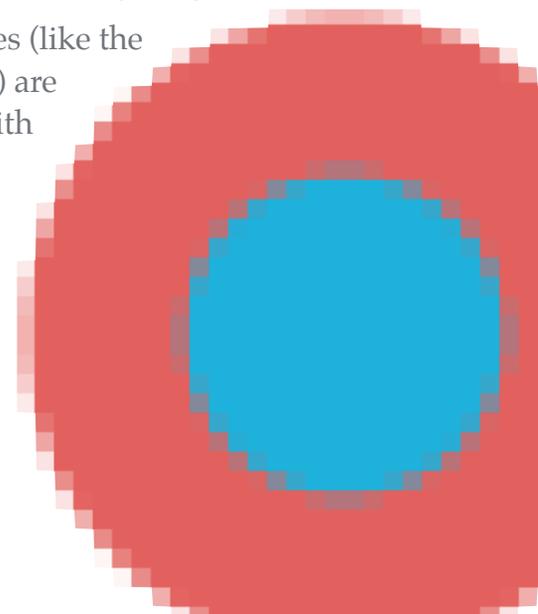
The benefit of vector graphics is they can be scaled without becoming pixelated. You simply change the vectors that define the image and the computer adjusts the rest. For example, this circle was made from the small one above, and notice how the edges remain smooth after resizing.



### BITMAPS

Sometimes called raster images, these represent an image using a grid (columns and rows) of pixels with a grayscale or color value and a bit depth (how much information is used to describe each pixel).

Bitmapped images (like the circle to the right) are what we work with in digital photography. These images do not scale gracefully like their vector



counterparts so it is important to know their physical dimensions and resolution. Because larger resolution results in larger files sizes bitmaps use compression to manage their file size.

## COMPRESSION

An algorithm used to reduce the size of a file. Compression balances file size with quality and can be either Lossless (without a perceptible loss of image quality) or Lossy (perceptible loss of image quality).

## LOSSLESS

Lossless compression means the file size is reduced, but all the original image information is preserved. This is like folding a piece of paper so it fits in an envelope. The envelope saves space, but we have to unfold the letter before we can read it.

TIFF, BMP, and PSD (Photoshop) are examples of widely used lossless formats.

## LOSSY

Lossy compression throws information away to reduce file size. This would be like cutting the edges off a piece of paper to make it take up less space. Once compressed this way a file can never regain the quality of the original image prior to compression.

JPEG is a widely used lossy formats that is good viewing and original image capture with a camera, but it's not recommended for editing. Other commonly used lossy formats include PNG (typically higher-quality than JPEG)

and GIF (can contain frames and are often used for small animations on web pages).

## EXERCISE

In this exercise we are going to jump into Photoshop to examine the relationship between image size, resolution and file size.

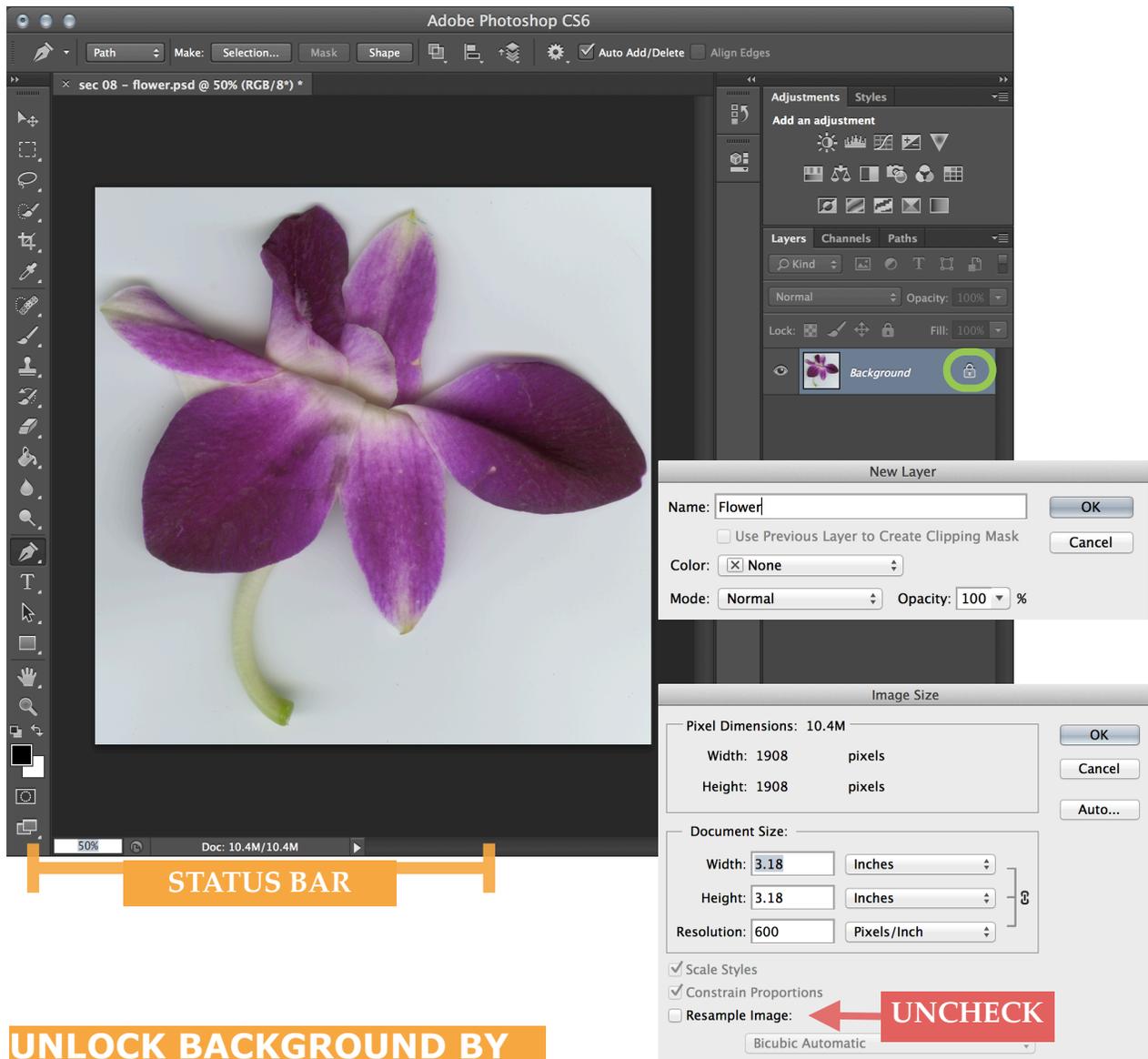
If you are completely new to Photoshop don't worry, just follow along with the steps and use the included illustration to help. A more thorough tour of Photoshop will be presented in later sections.

### YOU WILL NEED:

- Mac Running OSX 7 or later
- Photoshop CS 6
- This Sections Exercise Files

### STEPS:

1. Open the .psd exercise file for this section. This launches Photoshop and you should see an image of a flower. Every image in Photoshop exists on a layer. The area displaying layers is called the Layer Palette.
2. Now we are going to unlock our one layer so we can make changes to it. If you look to the right of the interface you will notice a layer called "Background Layer." Do you see the tiny lock icon next to the name?



## UNLOCK BACKGROUND BY RENAMING

One trick to unlock the background layer is to simply rename the layer.

3. Double-click on the words “Background Layer” and the Rename Layer dialog box appears. Naming your layers so they are obvious is a great habit, so let’s call this layer “Flower”
4. Along the bottom of the Photoshop window you will find the Status Bar.

5. Click on the status bar and it will give more information about the image. You should be able to tell the resolution, the height and the width (in both inches and pixels).

6. In the menu bar click Image > Image Size. This opens up the Image Size dialogue.
7. Uncheck “Resample Image” near the bottom of the window on the left hand side. Now you can modify the width, height or resolution and see how it effects the other aspects of the image.
8. Try to change some of the values in the menu. Notice how the resolution decreases when you increase the size and vice versa? Feel free to experiment with these settings, then close the Photoshop file without saving. The work you did in this exercise will help in upcoming sections.

## DOES HIGH RESOLUTION MATTER?

Printers actually pay attention to the resolution settings of your digital file. For example, you will achieve a very different result printing a low-resolution image (100 ppi) intended for the web and a high-resolution image (300 ppi) intended for print. The 100 ppi image will be pixellated (blocky) and the 300 ppi image will look much smoother.

Computer monitors, projectors, mobile devices, and other digital displays control the resolution of the display and therefore, a 100 ppi image will look exactly the same as a 300 ppi image, and this is why the concept of resolution is so

confusing, since you can't really see resolution changes onscreen unless they are very extreme and very low.

If your image is designed for web pages or video projection, resolution doesn't matter as long as you've got at least 72dpi, on the other hand, if you intend to print, resolution really matters.

## CONSIDER SCALE

Think about the work you would like to do as an artist. Do you want to distribute images for the web, have photographs printed in a magazine, or create projections or graphics that can cover entire buildings?

Consider doing some research on currently recommended resolutions for print, web, and other mediums you might work with. Also examine artists who are using low resolution tools to create interesting results. With the tile printing exercise you will get a chance to take low resolution to any scale you like.