

Digital Imaging Fundamentals and Quick Start for Photoshop

Loosely written around Photoshop version 5, but should be applicable to most other versions.
(by Ron Gross, 2003)

Where do digital images come from?

1) Digital images come from a photograph, drawing, or other document that is scanned using a flatbed scanner like the HP ScanJet 3c. Digital images also come from scanned film (negative or positive transparency), using a specialized scanner like the Nikon Coolscan series of film scanners.

2) Digital images also come "ready made" as photographs taken with a digital camera and stored as files, either compressed (JPEG), uncompressed (TIFF), or in a proprietary "raw" format chosen by the camera manufacturer.

3) Digitally created art or drawings from programs like Adobe Illustrator or Autodesk AutoCad, or Arc View GIS. These programs have the unique property of also using "vector" formatting in that the "images" can actually be stored instructions on how to re-draw the final image.

There are other sources of digital images but the general idea is any image that is now stored in a digital form.

What is resolution?

Resolution defines the number of pixels per unit of on screen or on paper size of the image you are viewing or printing.

If you scan a 4 x 6 inch picture at 300 dpi (dots per inch) your resultant image will be 1200 vertical (high) pixels by 1800 horizontal (wide) pixels. The pseudo dimension "long" should be avoided as only ropes and hoses have length.

Another confusing area is how dimension is stated. 4 inches by 6 inches (4x6) is a common print size, 4 inches high by 6 inches wide. Computer display screen sizes on the other hand, like 800 pixels horizontal by 600 pixels vertical (800x600) specify the width first then the height. Most image and paper dimensions

usually specify the width first, like letter paper being 8.5" x 11". There are no hard rules, so be aware of possible inconsistencies.

More than web page images printing forces you to think about how resolution affects your output size, desired print quality, and the printer's capabilities. When you print this using a 300 dpi setting on an inkjet printer, the printed size will be 4 x 6 inches. If you print at 600 dpi, the resultant print will be 2 x 3 inches. If you print at 150 dpi, the resultant print will be 8 x 12 inches.

In general, the higher the resolution or the more pixels per inch you start and subsequently print with, the better the output looks. This can be very subjective depending on who you talk to. The best idea is to experiment and use what works for you.

Viewing this same picture on your computer display, you will probably have to scroll around to see the whole thing since your display size is probably set to something like 1024 x 768 pixels or 800 x 600 pixels, not enough to display the whole picture at once.

Software will often be used to "downsize" or "resample" the image to a resolution that will fit the size of the screen or window. The 300 dpi scanned image, if resampled to 50% will yield a new size of 600 x 900, and at 33.33% will give an image of 400 x 600, both suitable for viewing onscreen. Of course, you can scan the image at the size you intend to use it at, but this requires planning and knowledge of the image's final destination.

When creating an image for display on screen, as in a web page, you will probably want to do this resizing yourself (a common Photoshop operation) so you know exactly how the final image will look. Nothing is perfect, and someone will undoubtedly have a smaller screen size and complain that they still have to scroll to see the whole thing. The other guy will have a large monitor with a large screen size and complain that the image is not big enough. So much for pleasing everyone.

The following demonstrates how resolution affects image quality and applies both to on-

screen viewing and to the printed output. For a given size of output, more pixels mean smaller pixel size and higher resolution or a clearer image (zoom in on the image to see the difference).



Common sizes for screen resolution today are 800 x 600, 1024 x 768. Note the aspect ratio of 4 to 3. 1280 x 1024 is widely used for larger monitors but is a misnomer because of the odd aspect ratio, the 1024 should be 960 for the correct 4 to 3 aspect ratio that most monitors have. Many older video cards don't support 1280 x 960, not sure why. There are larger sizes like 1600 x 1200, you are limited only by the available video memory, monitor size, your application, and how good your eyes are. My personal choice is 1024 x 768 for a 17 inch monitor and 1280 x 960 for a 21 inch. Again, this is a subjective issue and everyone has a personal preference and their reasons behind it.

One last note about screen resolution deals with the number of colors. For photography work, you should be using 24 bit color, sometimes called "millions of colors", "16 million colors", or "true color". Some video adapters don't have a 24 bit mode but do have a 32 bit mode. Choose 32 bit, even though the images themselves will most likely be stored and worked on in 24 bit mode.

Photographs look more natural using the larger number of colors. Gamers often use only 256 colors (8 bit) because of speed, the fewer colors that have to be generated and displayed, the faster it goes. Photographs at this color setting look horrible. 16 bit color is acceptable if the video adapter only supports that much, but most new adapters will support 24 bit "true color". 32 bit and higher color bit depths have their application, but will not be addressed here.

On to Photoshop.

Start Photoshop and a mess of imposing of windows show up.

Using the File...Open...dialogs, select an image file for editing/printing. Alternatively, use Windows Explorer or an image browser and drag the file to Photoshop. This last method can have many variations.

Some very basic operations that may be performed on nearly all new image files you wish to print or publish on a web page. All are under the Image...Adjust menu.

Levels. Used to set the black and white point of the image and for increasing or decreasing midtone levels. Simply put, brightness and contrast with more control than the traditional controls with those names. Brightness and contrast are in the Adjust... menu, but I find I rarely use them.

Color Balance. Adjusts the colors towards or away from the Red, Green, and Blue screen pixels. This requires a bit of practice and experimentation.

Hue/Saturation. Adjusts the level of color (saturation) and the hue (color value) These are almost identical to the color controls on a TV.

The next tool is found under the Filters menu. Sharpening. Use sparingly and experiment with the unsharp mask with a value of 50%, .5 pixels, 0 threshold.

Under Image...Image Size and Canvas Size are tools for sizing (re-sampling) and sizing (cropping) the image. Image size is used to set the dimensions of an image without re-sampling, or can be used to change the actual size, with larger or smaller, with re-sampling.

Canvas size is more like the crop tool in that it either crops the image to a specified size or adds white (or colored/transparent) space around it, like putting the image on a larger sheet of paper.

On the toolbar to the right of the window are many tools, some are multiple (hold the left mouse button down over them and the rest appear to the right). Waving the mouse over

the various tools will tell you what they are.
This is an area that requires time and experimentation.

Some basic tools that you will use a lot are the marquis tool to select areas in an image, the crop tool to do just that (and more), the zoom tool, the paint bucket tool to fill selected area with color, the text tool, the paint brush tools, and on and on.

....more to come.