DIGITAL PHOTOGRAPHY

ACQUISITION AND PROCESSING TECHNIQUES

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The best photographs result from well-exposed, well-composed, properly-processed images. This book is not intended to be a camera or software manual which expounds on features… instead I prefer to go into detail regarding various techniques which I use for the acquisition and processing of images. While I use Nikon gear, the techniques which I will describe are applicable to other manufacturers' products, and techniques described for processing images in Nikon Capture are applicable to other RAW processing programs and image editors with a few alterations.

Some acquisition techniques which will be discussed include the use of the histogram to determine proper exposure; the use of the various metering modes along with exposure compensation to achieve that exposure in various situations; some reasons for the use of aperture priority, shutter priority or manual mode; techniques for composition of various sorts of subjects; and the use of depth of field for subject isolation or to assist in the creation of a wide-angle composition.

Special attention will be paid to the digital workflow, including organizational methods; batch-processing for pre-selection (to remove unwanted duplicates or mistakes from the group to be processed manually); the selection process itself; and a comprehensive treatise on image processing using Nikon Capture as well as some post-processing techniques in Photoshop. In my workflow, most of the image processing including the color work, White Balance, EV, Levels, Curves and Gamma processing are done in Capture, with post-processing being primarily used for touch-up, rotation, cropping, resizing, etc. The section on processing is documented with screen captures and presented in easily-understandable language. *Zoom in to examine image details*.

An article on Lens Selection and sample images are also included, along with lessons showing step-by-step processing of these images, which were selected to illustrate common histograms. There will also be auxiliary files included to help you to understand luminosity and color, and how they apply to both metering and evaluation of the histogram.

Exposure and the Histogram: A Definition of Terms

Many people reading this book are probably aware of the terms and features I'm going to discuss. If you already know this stuff, bear with me or skip forward a bit.

One of the most powerful things about digital cameras is the ability to see what we're doing… not only can we see the image itself, but we can turn on a **Histogram**: a graphic distribution chart that shows the image in terms of light levels and the number of pixels that are present at each level. The histogram is a chart running left to right from 0 (Black) to 255 (White) with divisions at 64, 128 (middle grey), and 192 (see image to right).

The histogram allows us to see the exposure. If you can evaluate the light levels (**luminosity**) of the scene, you can look at the histogram and determine whether you are underexposed or overexposed — for instance, I was with a student in Yellowstone National Park recently, and we were shooting some pronghorns in strong light. I pointed out to him that the white part of the pronghorn was 240, and to expose accordingly. He took a shot, checked his histogram, and saw the highlights dropping off just past the 192 division on the histogram. He applied +0.7 EV (**E**xposure **V**alue Compensation) and took another shot, nailing the exposure right on the money.

What does the EV control do? The EV control alters the exposure by raising or lowering the aperture or shutter speed. If you have your camera set to *Aperture Priority*, the aperture (lens opening) is fixed. When in *Shutter Priority* the shutter speed is fixed. The EV control alters the one that isn't fixed, opening up the aperture on the lens or lowering the shutter speed for positive EV, and closing down the aperture or raising the shutter speed for negative EV.
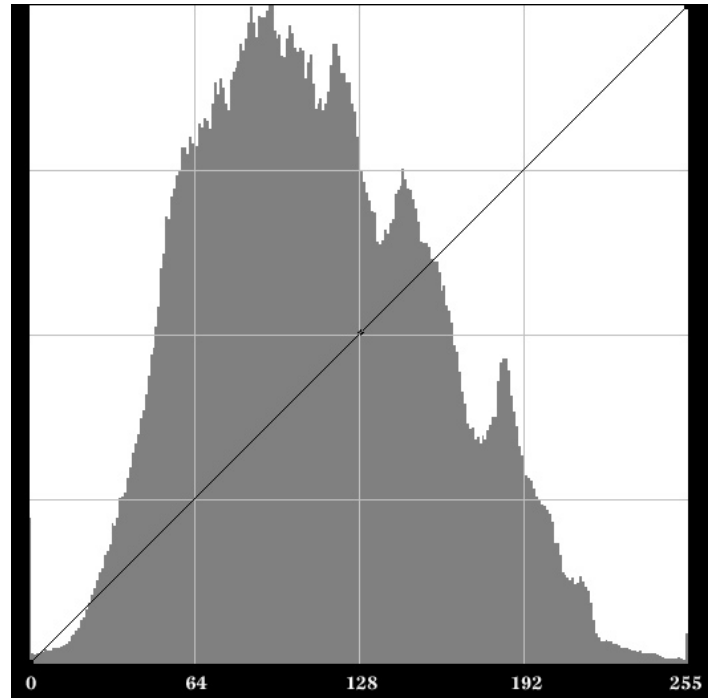
The numbers below the vertical divisions correspond to luminosity level at each division in RGB value (RGB is Red, Green, Blue). There are also greyscale (K) equivalents to each of these values, from left to right on the histogram they are 100 % K (Black), 75 % K (64RGB), 50 % K (128RGB), 25 % K (192RGB) and 0 % K (White). The greyscale values correspond to the percentages seen in the greyscale below.
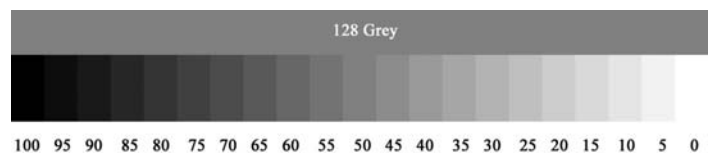
If you overexpose an image, the contrast is lowered and it is possible to severely overexpose highlights. This will result in a large spike on the right side of the histogram (255) and a loss of highlight detail.

If you underexpose an image, the shadows and midtones start to get too dark (block up), and to recover this underexposure yields a noisy result.
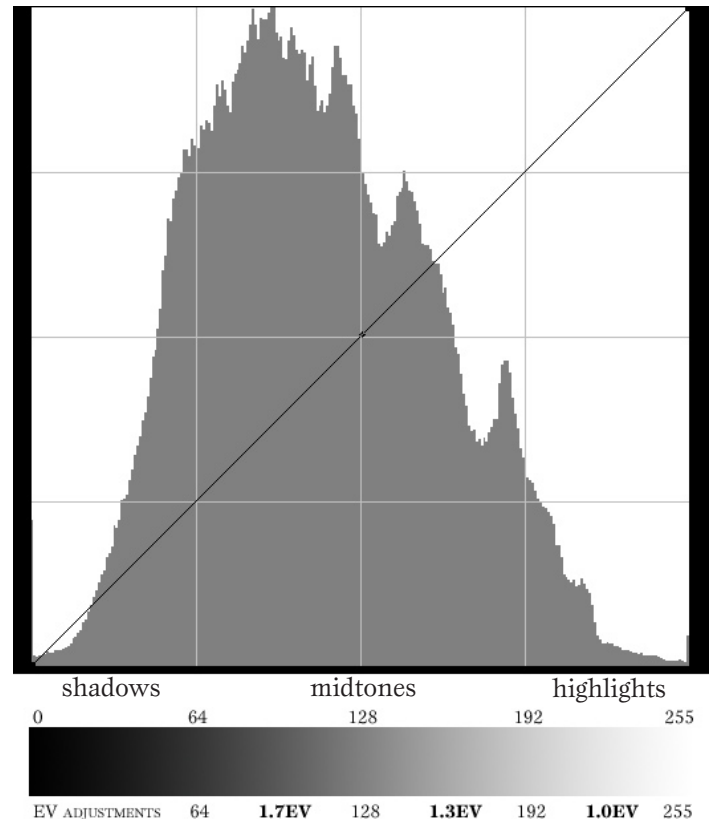
Another powerful feature of the digital camera is the ability to alter the **ISO** (film speed) without changing film (since we don't use film). This works the same as the volume control on your stereo -- it cranks up the gain. As the signal-to-noise level is fixed (the noise is increased along with the signal level when you "raise the volume"), raising the ISO speed increases the shutter speed for a given aperture and exposure at the cost of a higher level of noise.

On the following pages, I am going to get into some rather exhaustive detail regarding the histogram, and will show you how to use a greyscale and color charts to train your eye to see **luminosity** (light levels) in the subjects around you. This will give you a reference to light levels that will assist you when looking at your histogram, so you can judge when an image is overexposed or underexposed.

I am providing you with several files that will allow you to calibrate your eyes (and incidentally adjust the brightness and contrast of your monitor in case you aren't using calibration tools), teach you about color and greyscale luminosities, and RGB color levels. If you spend some time studying these as outlined in the pages to come, you will soon turn into a human light meter and will be able to closely estimate the level of highlights and midtones, and therefore will be able to look at the histogram and *you will know* whether or not you have the exposure correct. The freedom this gives you is tremendous. I wish you could see the looks on the faces of my students when they realize they are consistently hitting exposures within one-third stop, and often within one-tenth. BIG smiles.

Plan on reading the following information several times to understand it. This is not rocket science, of course, but the information requires some digestion before it becomes second nature. Open the greyscale and color charts in your image editor several times per week. Put your mouse cursor over the color patches and get to know the RGB levels (look in your Info palette). Soon, you'll have a good feel for luminosity.

*If you set your aperture to get the depth of field you want, and the exposure is correct but the shutter speed is too low, raising **ISO** increases the shutter speed at the expense of additional noise. You'll have a sharper shot, but with more noise.*

shadows		midtones		highlights	
0	64	128		192	255

| EV ADJUSTMENTS | 64 | **1.7EV** | 128 | **1.3EV** | 192 | **1.0EV** | 255 |

The left side of the histogram shows the shadows, the right side shows the highlights. Midtones are in the middle. You want to acquire the ability to estimate luminosity values of the midtones or highlights so you can adjust the EV.

The histogram above shows the RGB values associated with each division of the histogram as well as a greyscale, and a very important piece of information: the distance in EV between each of the divisions from the mid-shadows to white. If you practice, you will learn to evaluate the subject and highlight luminosities, and can look for them on the histogram. With known values, you can make adjustments based on a knowledge of the distance between the divisions and adjust the exposure as close as your camera will allow.

Exposure and the Histogram: The Histogram Defined

Properly exposing an image makes a major difference in the amount of impact an image has, the character of highlights and shadow detail, and noise levels among other things. It also reduces the amount of processing effort considerably.
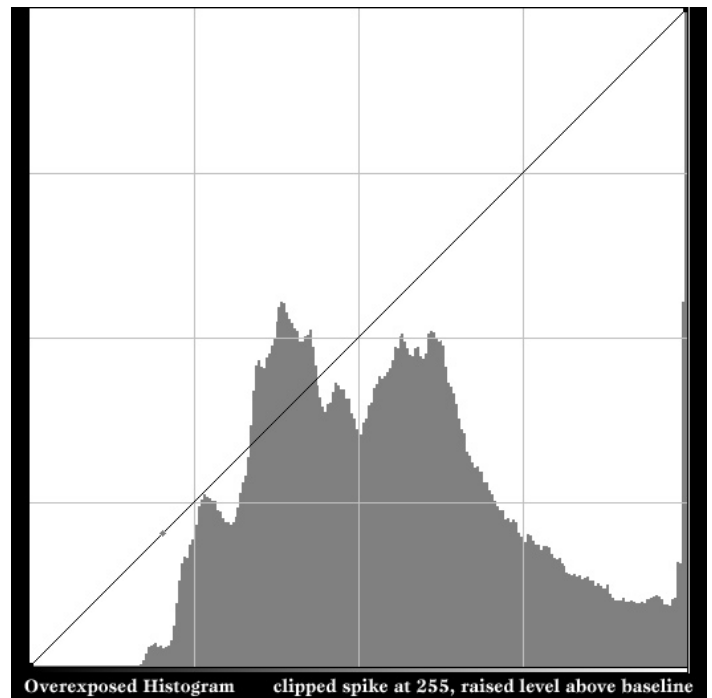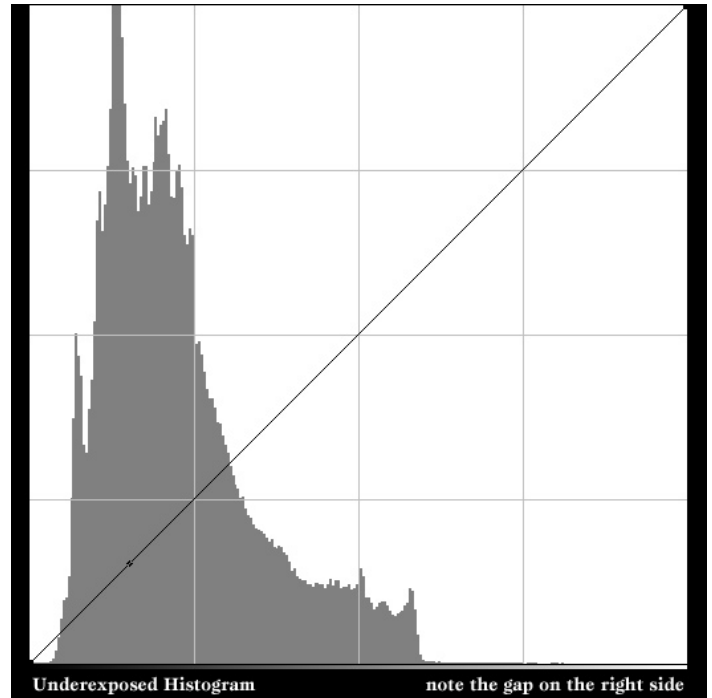
Our goal is to consistently expose images within one-third of a stop (underexposure is preferred to overexposure to avoid blowing highlights and losing detail), although it is possible to recover images that are underexposed by as much as a whole stop or overexposed by as much as ½ stop depending on your standards for noise or loss of highlight detail.

Underexposed images generally leave a gap on the right side of the histogram and are bunched on the left side, overexposed images generally leave a gap on the left side and are bunched on the right. It is possible to have an overexposed or underexposed image that does not look this way, for instance if the brightest highlight was 200 and you show 250, you're 2/3 stop overexposed.

To the right are two histograms of the same subject from Nikon Capture (one underexposed and one overexposed).

Note in the upper histogram how the highlight data, shown at the bottom of the graph, drops from the midtone region just after the centerline (128 division), and the brightest highlight peters out just after the first division left of the right-side margin (192 division). The proper exposure for this image would have shown the drop down from the upper midtones at 200 and the brightest highlights just barely hitting 255. The upper image is underexposed by 1 stop.

The lower image is overexposed by just under a stop. Note the spike at the 255 margin (right side) that goes all the way to the top, and especially the height of the data above the baseline before it rises to the spike. Also, notice the significant gap on the left side. When you see these three characteristics together, it indicates overexposure.

Underexposed Histogram   **note the gap on the right side**

Overexposed Histogram   **clipped spike at 255, raised level above baseline**

Evaluating Luminosity

This image to the right is what you will see when you open the file "*Greyscale.tif*". You will notice that 128 Grey (the strip above the greyscale) is equal to 50 % grey. This corresponds to the center dividing line on your histogram. You can verify the RGB luminosity of each of the K-percentages (listed in the white strip below the greyscale) by using the mouse cursor in your editor (e.g. Photoshop) and looking at the RGB values in the Info palette. This is an easy way for you to get familiar with the RGB levels at various luminosities, it will make it much easier to estimate where highlights and midtones should fall on the histogram, and will greatly improve your ability to get the correct exposure.

The vertical lines on the histogram correspond to the greyscale as shown in the table to the lower right. The divisions from the left to the right margin are listed in both K-values (as seen on the Greyscale) and as RGB-values (which can be seen on the greyscale by holding your mouse cursor over each patch). The RGB values are also shown on the histogram shown above the table, which you'll recognize as the one seen on page 5.

By memorizing the various luminosity levels in the greyscale above, and comparing your knowledge of these luminosity levels with what you see around you, you will have an extremely good feel for how much EV compensation to apply to any given scene depending on the metering mode you are using. Remember that the meters will average the scene to ANSI grey, which is roughly 102 grey or 60 on the greyscale above. It is most useful for you to know 128 grey, however, as it corresponds to the mid-line on your histogram.

If you meter on a subject that is 128 grey, you'll see a spike in the center of the histogram. If the spike doesn't appear where it's expected, you need to apply EV compensation — if it is left of the expected point you apply positive EV, and if it is right of the expected point you apply negative EV. Clear as mud, right? I'll give more detail on the next page…

I have provided you with a number of files on the CD. Throughout this section, you will want to have these files open in your image editor to be able to follow along with the explanations.

Open the file "Greyscale.tif" on the CD.
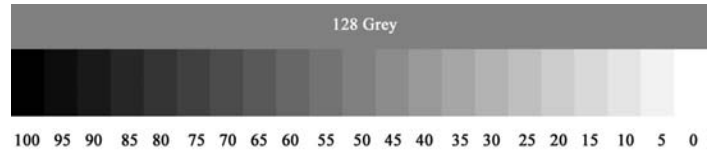
A 5 % greyscale. The percentages listed below the greyscale are in K-values (derived from CMYK: Cyan, Magenta, Yellow and Black). Black is 100 % K (100 % Black), and white is 0 % K (0 % Black).
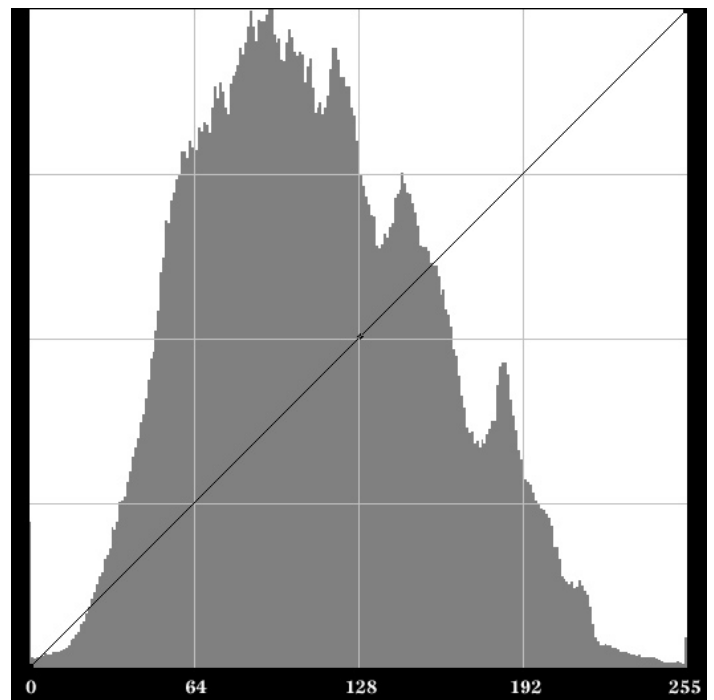
| Division on Histogram	% K	RGB
Left Margin	100	0
between left & center	75	64
Center division	50	128
between center and right	25	192
Right Margin	0	255

To the right is the familiar histogram, and below it is an image that shows greyscale luminosities that correspond to the divisions in the histogram. You have a large version on the CD called *"PrintGrey.tif"*. You can print this image to create a test-target (it will print on a letter page at 10" x 7.75". The test target can be used to help you learn how to adjust EV (exposure compensation). Notice in your shot of the print where each spike shows up on the histogram, and apply EV as necessary to adjust the result so that each spike lands on each division. This will be the correct exposure.

There is one EV between 192 and 255, and 1.3 EV between 128 and 192. (There is 1.7 EV between 64 and 128, but hopefully you will rarely underexpose by this much). This information is very useful to help you determine how much to alter the exposure to correct for what you see on the histogram.

If you are metering something that you know is 192, for instance, and it just hits the right border of the histogram, you are 1 stop overexposed. If you apply -1.0EV, you will either be right on the money or just a bit over- or underexposed, and can make the final adjustment in Capture, knowing you've preserved the highlights. You can adjust exposure in 1/3 stop increments by setting your camera to 1/3 stop in the menus (this is the default).

One thing that I should emphasize here: many people try to preserve all highlights, even those specular highlights that are blown in real life (e.g. sparkles on water, etc.). This is a mistake that will results in underexposed images, and should be avoided. If it's white in real life, you should expose accordingly and allow a spike in the histogram on the right side — otherwise you are going to severely underexpose the rest of the image, and recovering this using gamma and EV compensation after the fact will result in lowered shadow detail and noise in darker areas of the image. I will discuss how to use gamma and EV to adjust an image in the processing section.

Let it go if it's white.
***Don't try to hold the highlight.***
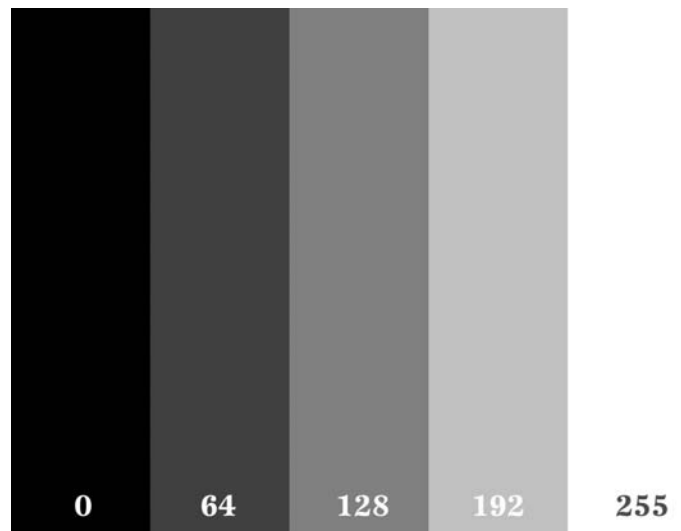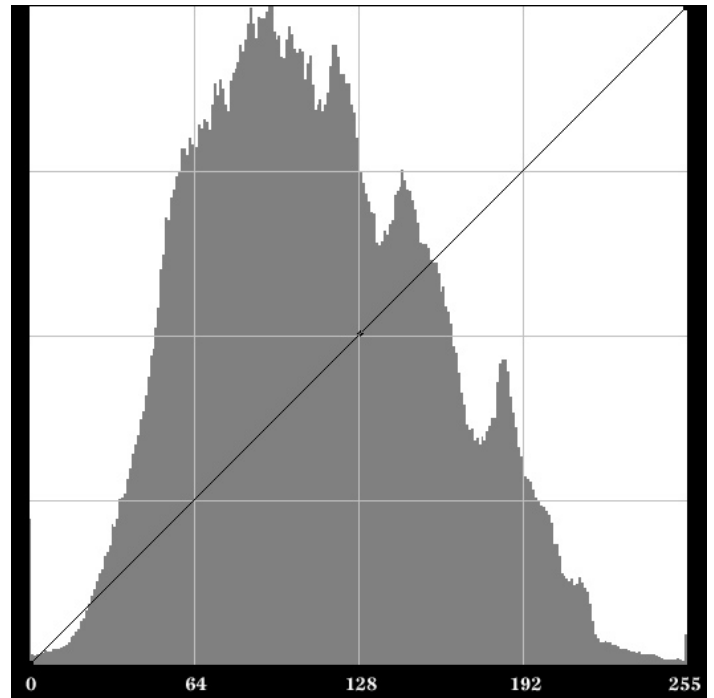
There is a larger version of this image above on your CD called "GreyPrint.tif" which will print on an 8.5" x 11" letter page. You can use this print to practice making EV adjustments, as you will see spikes at the corresponding divisions on the histogram when the image is properly exposed.

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The histograms to the right show the same subject which has a balanced character and midtones that occur exactly at 128. The top histogram is properly exposed, the middle one is overexposed by 0.33 EV, and the bottom one is underexposed by 0.33 EV. Of course, this can be corrected after the fact in Capture, but it's good practice to correct it in-camera. By memorizing the luminosity greyscale and the regions of the histogram, and taking test shots for a while, your eye will become sensitive to subject luminosities and you will soon be able to estimate the luminosity closely without taking test shots… if you do have time you can check yourself and make required EV adjustments as necessary.

One other thing while we're on this subject… many people seem to think that the histogram has to show an even distribution, or that it has to show an exposure that goes all the way to the right margin, or some other preconception of what the histogram should show. What this means is that they really don't know what a histogram is: a distribution curve that shows how many pixels are at a given luminosity value. There simply is *no specific required look* to a histogram… if there is no white in a scene, and the brightest highlight is 200, your histogram should show the data dropping out just past the 192 division mark. If there is white in the scene, and there is a fairly strong specular highlight, you will have a spike at 255 (right margin). If there is an odd color balance, you could conceivably achieve full saturation at a lower value than 255 (e.g. when shooting a red rose on a black background — a subject that is often overexposed to the point where all detail in the rose is lost).

In the next few pages, I will show you some files that I have provided which will help you learn about color and greyscale, and discuss how you can use these files. These will assist you in understanding how the camera sees color, and how various colors will be exposed so you will know what to do with that pesky histogram to make sure you are getting the proper exposure in situations where the color balance of the scene is unusual.
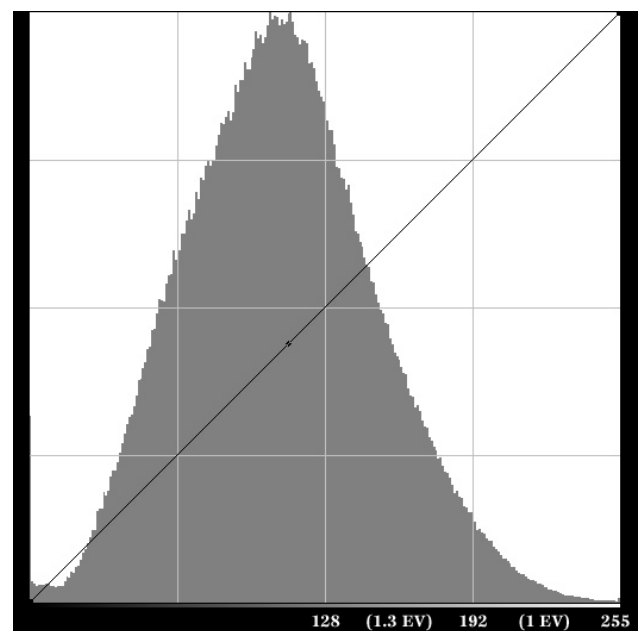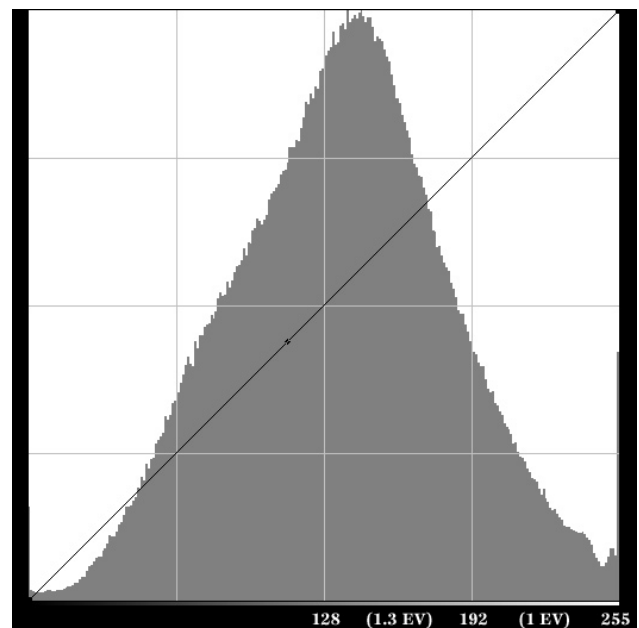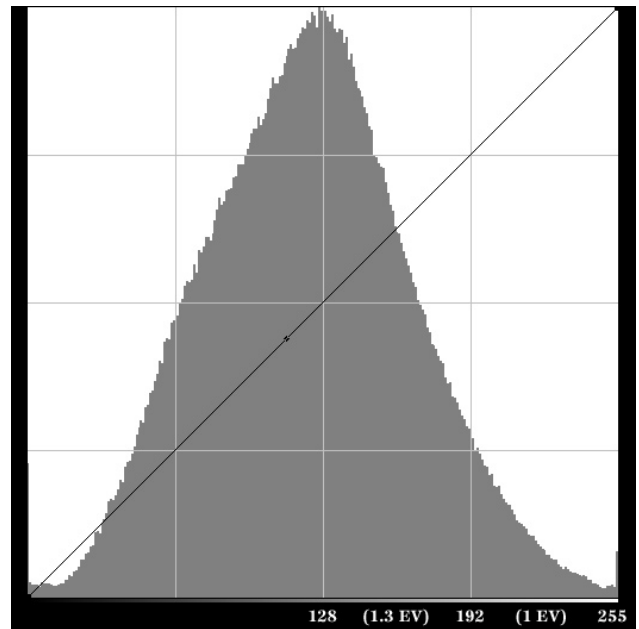
Understanding Color: Defining the Situation

The differences between exposing for grey and for color are somewhat complex. I am going to tie the two principles together with the aid of two tools that I have provided for you on the CD:

"*RGB135_Grey.tif*" and
"*RGB135_Converted.tif*".

Now that you know what the histogram is showing you — the number of pixels at each luminosity level from 0 (black) to 255 (white) — and you know that the histogram shows you a greyscale average because there are no separate Red, Green and Blue (RGB) histograms displayed, you need to be able to understand how the camera evaluates color so you can bias your evaluation of the histogram depending on the color balance in the scene. If the scene has a good balance of Red, Green and Blue (RGB), there will not be a problem, but quite often you will find yourself in situations where one color predominates, or the color balance is skewed in a way that favors one color over another.

The image sensor, which reads grey, has a filter over it that limits the light that enters each well. Most of the sensors we use have what's known as a *Beyer Pattern filter* (which is shown on page 12), that alternates RGRGRG or GBGBGB per each row, limiting the color that enters each well to wavelengths corresponding to these colors. This means that the sensor, which has twice as many Green-sensing wells as Red or Blue, has a color bias towards green and yields a higher resolution when there is green blended with red or blue.

The issue is that you can achieve full saturation in the red channel quite easily, and in situations that have a predominance of red, you will oversaturate the red channel long before the histogram shows the highlights at 255. You need to be able to evaluate color balance to know when this will be a problem, and the only way to do that is to know how colors are put together and their greyscale equivalents.

Some situations where people — even professionals who are used to working with their light meters but who don't have an instinctive feel for color — make this mistake are when shooting red rock (e.g. at Bryce Canyon (Introduction page and the image below) or Sedona, AZ), or when shooting primary red subjects like roses, etc.

An example of how this will help you is the case of the red rock I mentioned… at Bryce Canyon's Visitor's Center, there are a number of printed photographs taken professionally and printed in everything from books to NPS's brochures. Every single shot I looked at showed overexposure of the reddish-orange rock to yellow. If you set exposure properly, you can maintain the red channel without blowing it to yellow, or losing highlight detail.
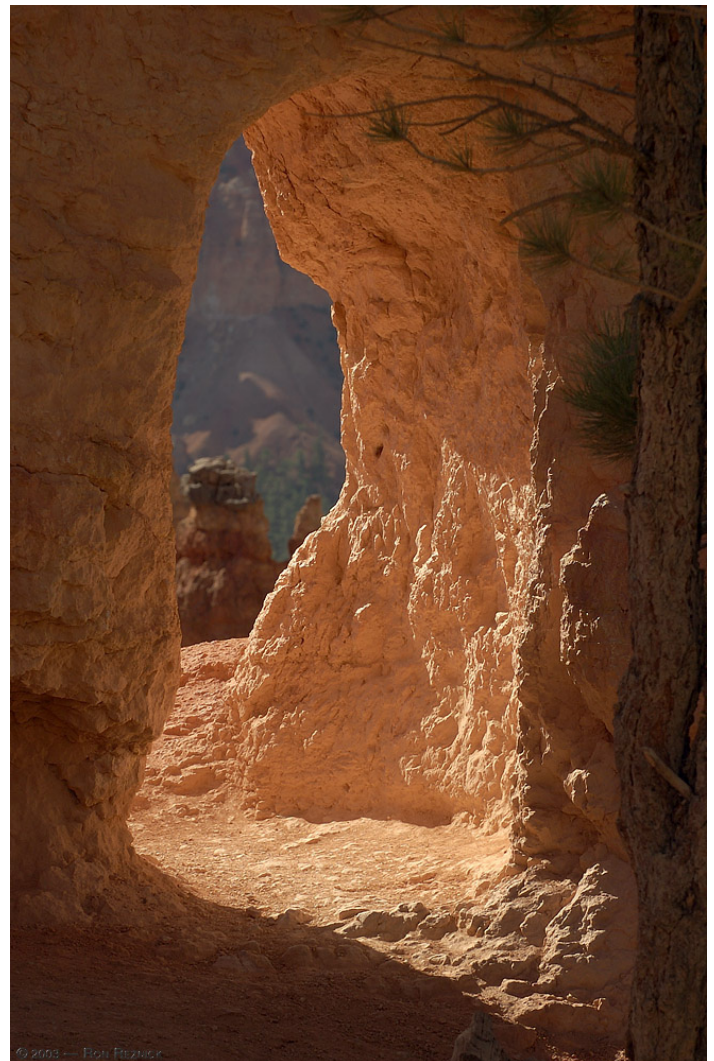
You can familiarize yourself with the composition of various colors by working with the color charts I've given you.

Open the two color charts together in your image editor. Place your cursor over any color (note the color patch's row and column). Now, look on the Info palette… you can see the RGB colors and the balance of R, G and B in each color (using the file "*RGB135_Grey.tif*").

If you place your cursor on the exact same row/column in the greyscale version of the file ("*RGB135_Converted.tif*"), You can see the RGB grey luminosity seen by the camera with the 25 % Red, 50 % Green, 25 % Blue filter over the sensor. This file has been converted to greyscale using the channel mixer set to **25 % Red, 50 % Green and 25 % Blue,** just like the *Beyer Pattern filter* in the camera (shown to the right). This grey luminosity corresponds to the position where that color would show up on the histogram at the proper exposure. Compare to the corresponding grey value seen in the 5 % greyscale "*Greyscale.tif*".

If a particular color's grey luminosity is 64, for instance, that color would show a spike at the division between the left margin and the center division on the histogram (the division that shows 64 Grey). If a color's corresponding grey luminosity is 150, you will see a spike between the center division (128) and the center-right division (192). The way we use this is to estimate either midtone or highlight levels so we can avoid overexposure.

This sort of thing is not learned in a day, so it will require some study, but once you have a good feel for the way colors equate to greyscale equivalents, you will find that you can closely estimate how far below the right margin (255) you need to set the exposure to get correct saturation for a specific color. While you will not require this information for most shooting, in situations where there is an odd color balance, knowing the information here and on the next pages will mean the difference between properly-exposed images and a blown red channel.

Working with Color

Working with color is different than working with greyscale because of the different luminosity values inherent in color, and because of the way the imager (and our brains) see color. ***The imager splits the color so that 100 % of the color is distributed 25 % Red, 50 % Green and 25 % Blue.*** Most imagers use a Beyer pattern filter over each image well: one row would be RGRGRGRG and the next row is GBGBGBGB, followed by another RGRGRGRG, etc. A graphic representation of this is below:
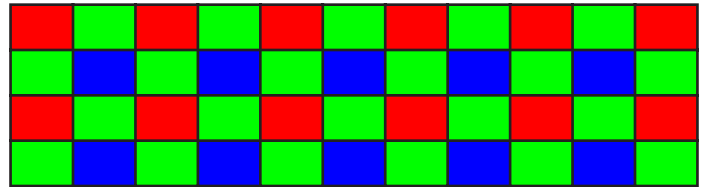
Color interpolation is done on the data to derive the actual color based on the intensities recorded and the information in the surrounding cells, to simplify the process radically. However, if the subject is primary red or blue, as you can see only 25 % of the imaging wells will record data, reducing the resolution. This can bite you occasionally, reducing the resolution of red and blue subjects.

What we really need to know about color when it comes time to expose it properly is the overall luminosity of the color, and how it corresponds to greyscale luminosities. This can be a tricky thing to learn, so I'm giving you some tools to learn this. You can survive without knowing this, of course, but if you do learn this it will make it easier to nail exposures consistently when working with color, which will be nearly all the time as you know.

On the next page, I will show you the RGB135 files and we will again go over the methods you will use to learn color and greyscale equivalents using these files. I know this is rather esoteric, and it will probably require quite a while working with the files before it becomes second nature to you, but the time will be worth it when you find yourself properly exposing very difficult subjects.

I have provided you with "**RGB135_Grey.tif**" on the CD… open that file now. If you are asked what to do with the file's color space when opening the file in your editor, leave it as-is.

This file, shown at the top of the next column, has the familiar greyscale, a strip of Cyan, Magenta and Yellow (CMY), and a standard set of grey and color patches. We're going to use this to learn about color and the corresponding grey luminosities.

"Why learn the corresponding grey luminosities?" Good question. The reason is that the histogram does not show R, G and B, so we need to have a feel for the average luminosity as seen by the imager with it's 25 % Red, 50 % Green, 25 % Blue filter over the wells. I've also supplied you with a version of this file that has been converted to greyscale using the **25/50/25** mix: "**RGB135_Converted.tif**". The combination of these files will teach you about color.

Hold your mouse over the dark blue at E6 and you'll see that the RGB values shown in your Info palette are 0, 0, 153. Now, check the same color patch in the converted greyscale version and you'll see that this color is equivalent to 38 grey.

By doing a conversion to greyscale on the Converted file (discarding color info), you will see that this color patch is equivalent to 85 % K — note where that patch falls on the 5 % greyscale on top of each color chart.

You'll notice that same K value for I6, G2, and H13. Now, check H15. This is primary red, 255, 0, 0. It corresponds to 75 % K or 64 grey.

To expose 255 Red to full saturation with no other color present, you should see a spike at 64 grey. Try several other colors to see the corresponding grey.
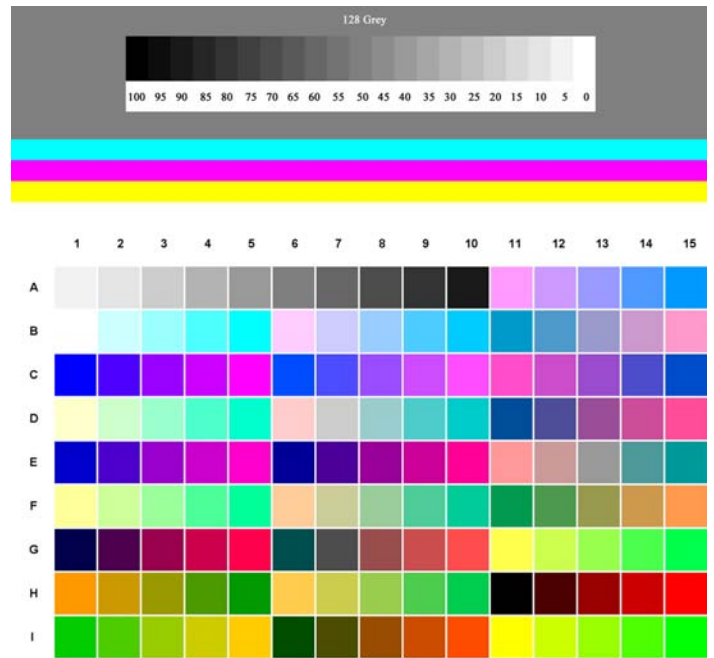
Above is "**RGB135_Grey.tif**" from the CD, and below is "**RGB135_Converted.tif**". Follow along with both files open in your image editor.
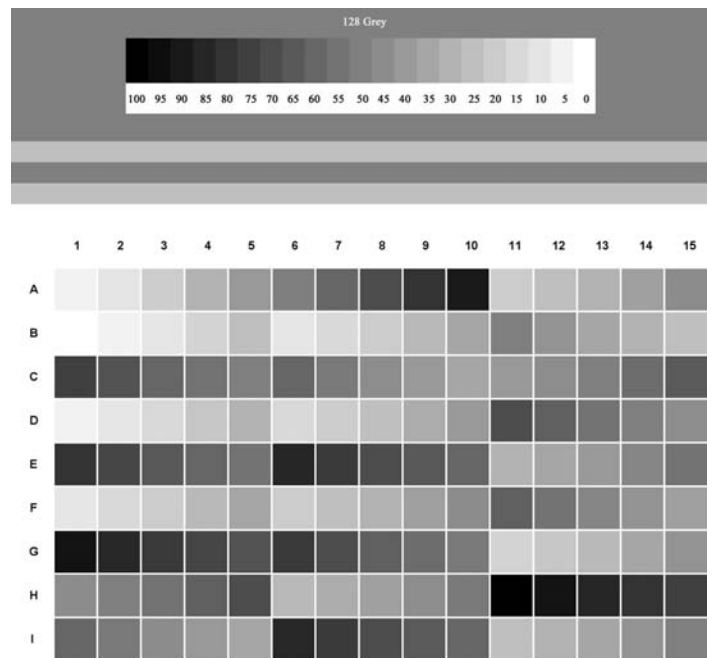
Practice with these files and the 5 % greyscale by viewing them regularly, checking luminosities by using your mouse cursor and the Info palette.

When you go out, see if you can judge the level of things you see… signs, cars, trees, houses, and anything else you come across. Take some shots and check the histograms.

The Light Meters: Which one do I choose and why?

Now that you know what EV is, how to evaluate the exposure with the histogram, and how to adjust the exposure shown on the histogram with EV, we are going to discuss the metering systems: how they work, which ones should be used in various situations, and why you might want to select one metering mode over another.

You have three metering systems: ***Matrix, Spot*** and ***Centerweight***. These meters are calibrated to ANSI grey (roughly 102 grey, or 60 % K on your greyscale). Keep this fact in mind. If the subject you are metering is not ANSI grey (they rarely are), you need to apply EV compensation to correctly expose the image.

Matrix Metering

The Matrix meter uses a special CCD (imaging sensor) to evaluate the entire scene. If your lens communicates distance information (D-type), the sensor evaluates subject distance and color as well as overall luminosity and balance, compares it to a large onboard database, and recommends the correct exposure *for the scene*.

The best times to use Matrix are those where you need to meter the scene itself, whether or not your subject is different in luminosity than the scene.

It frees you to follow action and compose as necessary, without having to lock the exposure. You will of course need to apply EV compensation as necessary.

I usually set my camera in Aperture Priority so I can control the depth of field. If I go into manual mode, I will continue to work with a fixed aperture and adjust EV for changes in the light or scene using the shutter speed. Occasionally, you must have a certain shutter speed, and in that case you will want to work in Shutter Priority or adjust in manual mode using the aperture adjustment.

If your subject is significantly brighter or darker than the scene, the matrix meter will expose for the scene and either underexpose or overexpose the subject. Your job is to apply EV as necessary based on the luminosity difference of the subject in comparison to the scene.

Sometimes, it's a good idea to use the matrix meter, find out what the correct exposure is, then switch to Manual mode and set that exposure manually. When in manual mode, your EV adjustments will not work — you set EV by either altering the shutter speed or aperture, depending on whether you want to maintain a specific depth of field or not.

If the situation calls for manual mode, use it. It can get the shot in situations where using any of the other modes will not.

For instance, recently I was shooting wildlife at a nature preserve, and the subject of the moment was a flock of several hundred Pelicans (white birds), a large number of cormorants (dark birds), plus Snowy Egrets, Great Egrets (white birds) and Great Blue Herons (middle-grey luminosity). The water was just above middle grey with highlights around 200-210 in the light, and 140-150 in shadows. The sky was overcast and very bright. There were dark foliage backgrounds as well as midtone backgrounds.

When using any of the meters except Spot, the changing backgrounds usually forced the white birds to be overexposed. What I finally had to do was take a test shot, find the correct exposure for the bird at that moment, then set that exposure manually. All I had to do then was vary the exposure using either the shutter speed or a combination of shutter and aperture (if I wanted to vary the depth of field). This made a very difficult situation manageable — if the light changed a little I dialed in a little more or a little less exposure.

Spot Metering

Spot metering is used to measure the subject itself and set your exposure based on the subject. You set which *focusing reticle* (the little bracket in the viewfinder you focus with) you want based on the composition, and this reticle becomes the one which is used for metering. You put the reticle on the area of the subject you want to meter, and the meter sets that area to ANSI grey.

Your job, as with the other metering modes, is to know the luminosity difference between the subject and ANSI grey, and apply the correct EV compensation.

If the subject is moving, you can use the **AE Lock** (Auto-exposure lock) button to hold the exposure. This can be somewhat of a pain in the neck though, so if the subject is moving I will generally use Matrix except in special circumstances.

The Spot meter is the only one that allows you to move the area selected (some camera bodies allow you to select more than one spot). This can be a very powerful tool unless you are tracking action. Remember, you can always meter the exposure with spot, determine the correct EV adjustment, then set exposure manually.

The best times to use Spot are those where the subject is relatively static and is widely different in luminosity from the scene. You have to follow the subject with the focusing reticle, so it restricts your compositional abilities unless you use the AE Lock to fix the exposure.

Centerweight Metering

The Centerweight meter works sort of like a giant spot meter that stays in the center of the frame. You can go into the menu and alter the size of the centerweight metering area from the preset (shown as a circle in the viewfinder). I usually set mine to 6mm so it acts like a large central spot meter.

The centerweight meter works just as you'd expect from the name: it averages the luminosities in the center and sets the average to ANSI grey. This can be useful in portrait situations and many other situations where your subject is centered, but just like the spot meter, the subject must remain centered or your exposure will change.

Of course, as always you apply EV compensation to adjust for the difference between the center average and ANSI grey.

If you work with the Centerweight meter the same way that you work with the spot meter, keeping in mind that you will only be metering the center region based on the size of the circle selected in the menu, you'll get it right.

If you understand luminosity levels and know what your histogram should be showing, you can use the metering method which makes sense for the scene, and adjust EV accordingly.
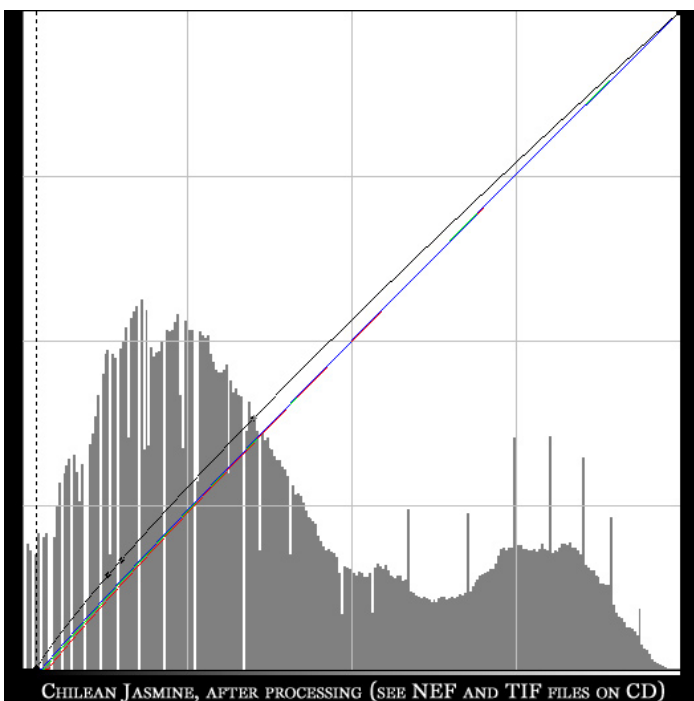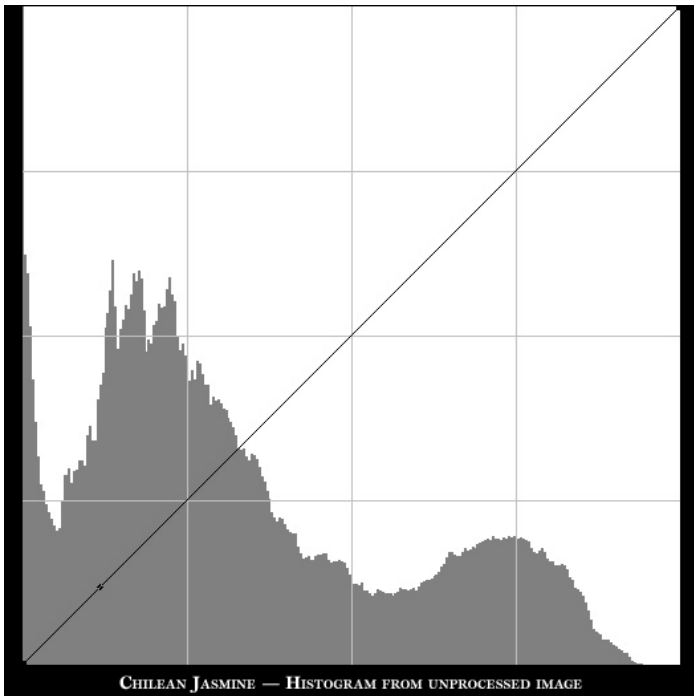
On the following three pages, I show examples of shots taken with the three metering systems, along with the histograms of the original exposures and the processed images, and explain my reasons for using the metering mode and how I used it.

I have included the NEF and processed TIF of each of the shots on the CD, and these images are used in the processing section of the book.

ChileanJasmine_2625, Matrix Metered

CHILEAN JASMINE — HISTOGRAM FROM UNPROCESSED IMAGE

CHILEAN JASMINE, AFTER PROCESSING (SEE NEF AND TIF FILES ON CD)
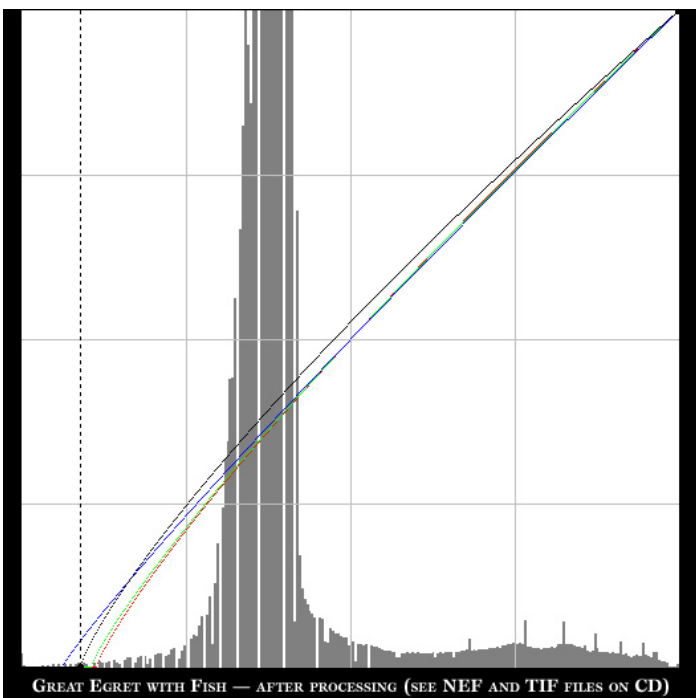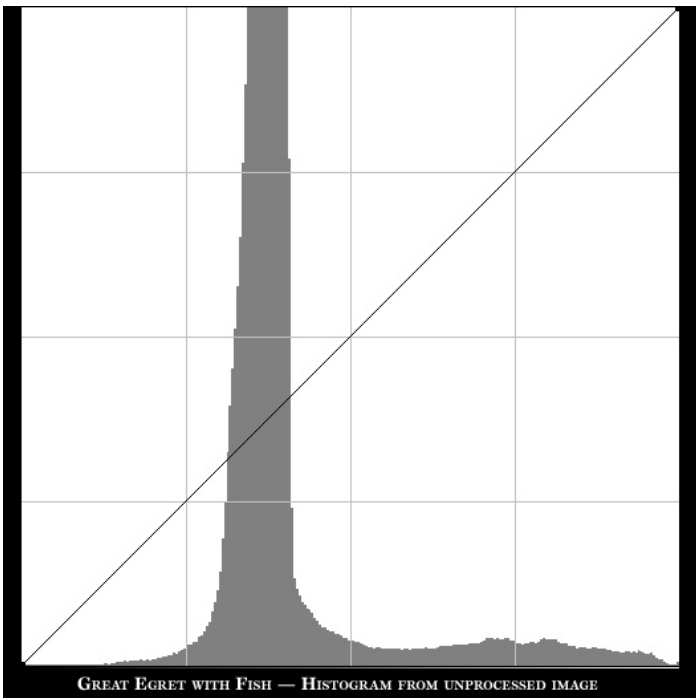
Matrix Metering

The image to the left is an example of a balanced image taken near the end of the day in semi-shade, leaving a little room for processing. As you can see from the upper of the two histograms, there is a gap on the right of the histogram equalling about 0.3EV — once the image was brought in for processing, the white balance was adjusted and the basic Unsharp Mask was applied, it required + 0.17 EV to get to the final exposure setting shown in the lower histogram. You can also see the shadow and gamma adjustments that were applied in processing (this will be discussed in detail in the processing section of this book).

There were two good ways to meter this exposure: one way would have been to spot-meter off the highlight on the far right petal of the Jasmine, which is 246, 237, 249 in the final processed image and 236, 223, 230 in the original. Note that this is relatively neutral, but is significantly brighter than the grey-level that the meter is calibrated to. This means that if you spot-meter on this highlight, you will yield an underexposed image when the camera sets that point to ANSI grey. You must therefore apply + EV of 1.7 stops to yield the correct exposure. The other way would be to use Matrix metering -- this uses a special CCD along with a database of images to look at the entire scene and average that scene using depth data to the focused subject (which assumes the use of a lens that communicates depth information) along with the information in the database of images to create the exposure reading. In images that have a preponderance of shadow information, the subject would be overexposed as a result, and -EV needs to be applied to the Matrix meter reading. In other images where there is more midtone and high-light information than shadow, you would use + EV to compensate for the underexposure (checking the histogram and adjusting). In this case, the balance was nearly perfect and the results of the Matrix meter were used as-is, with no EV compensation.

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GreatEgret_Fish_4156, Spot Metered

GREAT EGRET WITH FISH — HISTOGRAM FROM UNPROCESSED IMAGE

GREAT EGRET WITH FISH — AFTER PROCESSING (SEE NEF AND TIF FILES ON CD)

Spot Metering

Here's a tricky one. This image was taken in the late afternoon on Chincoteague Island, VA. It has been cropped from the original NEF (on your CD). In this case, spot metering was used as the bird was staying in the same general area while fishing (he was without doubt the most successful "fisherman" I've ever seen — he was in this area for over an hour, and got 3-4 of these little silversides per minute…

I could have metered either the water or the bird, and the technique would have been slightly different. In this case, I metered off of the bird and used +1.0EV exposure compensation (see upper histogram). The lower of the two histograms shows the final processed results. If I would have metered off of the water, -0.3 EV exposure compensation would have been required as the water was under ANSI grey and would have slightly overexposed the image. The bird was significantly above and so the image would have been underexposed. I metered the lower wing on a spot just above and behind the top of the thigh — a spot at about 185 grey. Thus, +1.0EV nailed the exposure right on the money.
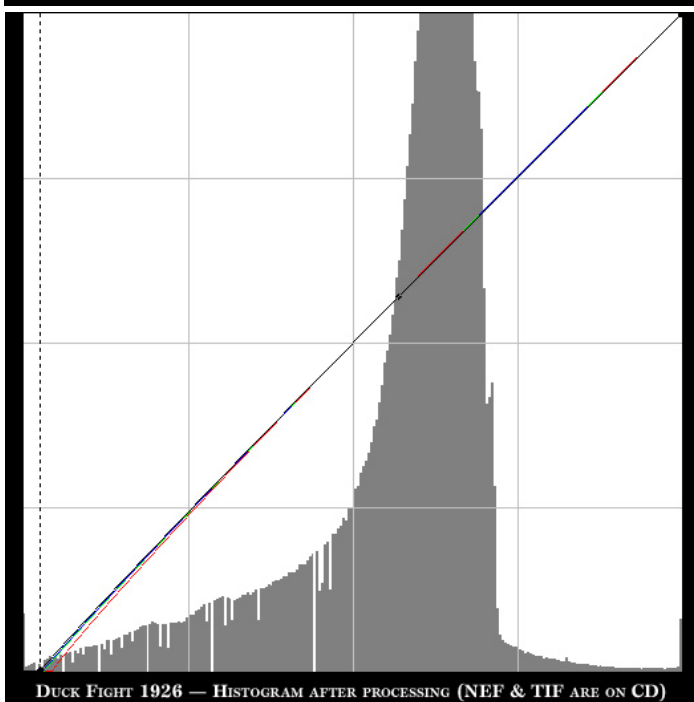
Often, when shooting birds and other wildlife, subjects are moving around a lot (esp. when shooting action or flight shots). In this case, it can be difficult to maintain your focusing reticle on the subject. In situations like this, it is usually best to use Matrix and EV compensation, as you are then exposing for the scene. Unless the light changes, or the subject moves to an area with a significantly different light and shadow balance, you will be more free to compose without worrying about exposure changes.

I can achieve more consistent results with action when I either use Matrix along with EV compensation as outlined above, or meter a scene and take a test shot, then set the exposure in manual mode based on the results. EV adjustments can be made by adjusting shutter speed assuming you want to control the depth of field (DOF) by keeping the aperture fixed.

DuckFight_1926, Centerweight metered

DUCK FIGHT 1926 — HISTOGRAM FROM UNPROCESSED IMAGE

DUCK FIGHT 1926 — HISTOGRAM AFTER PROCESSING (NEF & TIF ARE ON CD)

Centerweight Metering
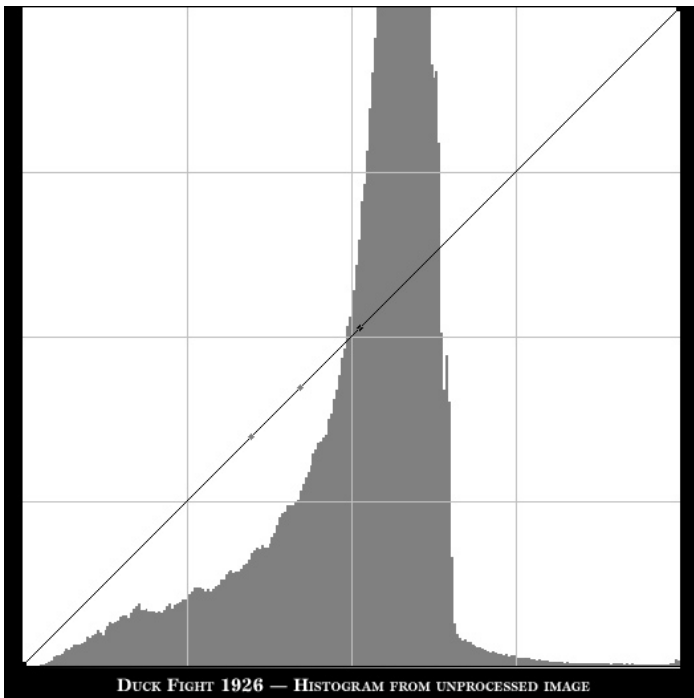
While I rarely use Centerweighted metering, on some occasions it makes sense as you want to place the subject in the center (in this case to frame water droplets trailing behind the duck) and the luminosity of the scene in the center is similar. In this case, I was pressed for time due to the action at hand, so based on my judgement of the scene I switched to Centerweight and +0.7EV. As you can see from the histograms to the left, the image was 0.33EV underexposed (note the flat spot just after the data dropoff at the highlight end in the upper histogram, and the spike at 255 in the lower one caused by the white stripes on the other female Mallard's wing). When shooting action, often you have very little time to make decisions as to how to meter and adjust the exposure… in this case I had to evaluate the scene, alter camera settings, focus and fire in about ½ second to get the shot. In situations like this, being conservative can mean the difference between getting the shot and blowing highlights… it was safer to take a shot that I knew would be a little underexposed rather than taking a chance on blowing the white stripes.

A good rule of thumb:

If the scene is balanced, use Matrix. If the subject is moving within a scene and you need freedom to compose without worrying about placement of the subject, use Matrix. If the subject is essentially static and is significantly different in luminosity than the rest of the scene, and is not going to be composed in the center or does not fill the center of the frame, use Spot. In those situations where the subject is going to be composed in the center of the frame, and the subject luminosity and the rest of the area within the center-circle are relatively close, centerweight metering can be used. Usually, Matrix is so much more effective that I use it far more often than any other metering system.

Acquisition Techniques: Composition of various subjects

There are a vast number of valid compositional styles, some of which are more valid for some subjects than others… Often a style that works for one sort of subject also works for another. This makes learning various styles easier as you gain more experience — what you have learned shooting portrait can apply in many cases to macro work, as well as flowers, wildlife, etc.

Many people have heard or read about "the rule of thirds". This "rule" states that your subject should be placed one-third of the way from the top, bottom, or side of the frame. Sometimes, this makes sense, especially when you are shooting a portrait — a lot depends on what you are trying to convey to the viewer. The image below is composed using the rule of thirds, with the subject facing into the open space. In this case it makes a lot of sense to use this technique…

In the image above, however, the subject is placed in the center to allow the symmetry of the headdress, the 'chestplate' of the feathered tunic, and the dancer's face to balance each other. Each of these are valid within the context of the images.

My point is that the "rule of thirds" should not be looked at as a rule, but as a guideline to be used in those situations where it makes sense. The techniques that I will discuss should be considered to be guidelines as well, and I recommend that you experiment and try to develop techniques that make sense to you, using these guidelines as a basis for experimentation. You should use the frame edges and corners to help guide the eye of the viewer in the direction that you want it to go as well as to help you to align subject elements, etc.

An example of a portrait composed in the center of the frame, using a line leading from the corner to guide the eye to the subject, is the giraffe image below. You'll note that space is left in front of the giraffe for him to look and walk into, and a large amount of negative space was created by defocusing the background — negative (empty) space in the upper left and right corners draws the eye towards the subject, as does the line of the neck leading to/from the lower left corner.

My goal is to guide the viewer's eye.

A study of a large number of people was performed to determine how people looked at images, page layouts, and advertisements. It was found that the majority of people start in the upper left corner and look through an image or ad in either of these two patterns: the letter "Z" or the number "2". They start in the upper left, then either look directly to the right or down and to the right-center, then down to the left corner and directly to the right corner. Depending on their cultural background, some people start in the upper right corner and look down first, then up to the left and down (sort of like a letter "Z" rotated 90 degrees clockwise). Others take a page or image in as sort of a patternless gestalt.

The rule of placing subjects in one of the thirds is not the only valid way of working with a composition. The primary object is to guide the viewer's eye through the image in a way that allows you to convey your message.

An example of using the upper left corner to carry the viewer's eye to the subject: in this shot the line of the trees and bushes is used to carry the eye to the building, which carries the eye up.

In the shot below of a Green Violet-eared Hummingbird, the lines of the subject are used to carry the eye through the composition, and empty space carries the eye to the subject. Using the 135mm lens at f/2 from close range defocused the background, creating the empty space. The line of the bird carries the eye from upper left to lower right, and the eye is carried out of the image by the line of the branch.

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Often, the angle you take the subject from makes an enormous difference in the presentation, as in this shot of a Yellowstone Bison. Always try to look for attractive angles when preparing to compose a shot. While you can't always do so with wildlife, often you will be able to inspect the subject from several different angles. There will nearly always be angles that are more attractive than others.

There are several things going on in the image below, taken on a slightly hazy fall day at Jackson Lake in the Grand Tetons. Note the division into vertical segments, as well as the placement of the boat, the gap in the trees, and the mountain peak at the "rule of thirds" point. Also, note how the bouys both carry the eye from the boat out of the image to the lower right, or into the image from the lower right to the boat, up the mast, and to the mountain peak (depending on how you tend to look at the image). Again, the idea is to carry the eye through the image. I made sure I was shooting from an angle that allowed the bouy line, gap, and mountain peak to be in the positions I wanted, and waited for the wind to push the boat around so it was broadside to my position.

A good way to work with many wide-angle scenics is the "near/far" technique (using a close subject, a subject in the mid-field, and a distant subject to draw the eye in using distance and depth of field). This technique is used in the images below, the first taken in the Grand Tetons, and the second taken at Mammoth Hot Springs in Yellowstone of the Liberty Cap. The Liberty Cap itself is placed in the left third of the frame to allow the use of the shadow to carry the eye to the right in the foreground... coincidentally following the "rule of thirds".

I'll bet by now you've gotten the idea that I don't think of the "rule of thirds" as a rule at all, even though I make use of it along with anything else that allows me to create symmetry, carry the viewer's eye into, through, and out of the image in the manner I intend, and make proper use of space in the image.

On the next page, we'll look at something different: compositional methods in closeup photography. Much of the time, you're going to be concentrating on lines and viewing angles when shooting macro, especially with flowers and small creatures.

In the image below of a Mosquito Hawk, there are two techniques used to carry the eye in: the arc of the leaf from the upper left corner, and the stem placed in the right third of the frame.

When shooting close, you must select the aperture carefully so that the depth of field is large enough to maintain focus on the desired part of the subject. Often, it is best to set up so you are broadside to the subject if you want the entire subject in focus, but you'll notice that in the Katydid and Fly pictures, I took the shot at an angle allowing the more distant parts of the subject to defocus, using that defocus to soften the 3D look. *It is best to focus on the eye of a creature if you can see it, and it is best not to shoot the creature from a rear-angle.*

Watch the corners when composing to see how the lines of your image are interacting with the corners, look for an attractive angle, and carefully consider subject placement in relation to the lines of the image.

In the photos above of a Katydid nymph on a daisy and a golden Ladybug, the lines used to carry the eye are from the upper left corner into the image, and from the lower left corner into the image, (the line carrying the eye to the Katydid is the antenna, the line in the ladybug shot is the flower petal). The subjects are in the center, but it works because of the placement of the flowers they are on and the use of the lines to carry the eye. In the image below of the Fly on a daisy, the eye is carried in to the subject both from the upper left corner across the arc of the petals, and from the lower left corner across the core of the daisy and up the petal to the fly.

The concept here is the use of the focused plane to affect the dimensional character of these two shots. Notice in the left image that the focused plane is set so the rear edge of the crown is in sharp focus and the forward part of the crown is defocused, but in the right image the focused plane is placed in between the front and central buds, and the rear buds are defocused. The first method greatly increases the isolation from the background, the subject "pops" out of the defocused region much more than the other technique, which blends the rear edges with the background, giving a soft look, which is quite often used in portrait techniques. The "pop" method results in a highly 3D look that has a lot of impact, and this technique can be used for a large number of different subjects. The "wow" factor is very high for images taken using this style, and many people when shown otherwise identical images using the two techniques often choose the one with more "pop".

An example of combining the two techniques is shown in the Dahlia shot below, where the right facing flower in front has a very sharp transitional edge, but the rear flower has a very soft look.

When you're shooting flowers, you want the crown of the flower to be sharp, so either place the focused plane between the front of the flower and the crown (soft look), or between the crown and the rear edge to make the flower "pop".

The image above was acquired by following this pair of Sandhill Cranes across a creek-crossed snowy meadow, waiting for an opportunity. I was rewarded by getting a chance to see the mating dance of the Sandhill Cranes, which occurs quite rapidly and doesn't last very long at all. In this image, the viewer's eye is carried using the attention of the cranes… what I did here was use the creek line to initiate movement of the eye across the frame, and let the cranes do the rest. The male did all sorts of maneuvers for about 12 seconds.

From Yellowstone NP. In this column, the primary subject is in an unusual position, facing out of the frame. The pronghorn is aligned with the right edge, and the line of the subject's rump carries the eye down to the younger doe at the lower left completing the line from the upper right to the lower left. The composition below uses the near/far technique, but with a telephoto lens's DOF. The negative space in the upper left brings the eye to the roadway with the oncoming car, the road carries the eye past the mid-field defocused bison to the yellow double-line, the line carries the eye to the bison on the right who is blocking the road, then out of the image.

A little earlier that same day, not far from the meadow, I had an opportunity to get this image of a coyote pouncing on a small marmot. This had to be taken rapidly, and I used the body line of the coyote to lead from the lower left corner in an arc, using his attention to lead the eye back out the lower right corner. I was lucky that the collapsed snow over the creek occupied the upper right, avoiding a total white-out in the top of the frame — I had nothing to do with that, or the fact that the coyote's ear line exactly followed the line of the snowbank. Just luck and good timing…

The photographs on the next two pages show methods of working with architectural lines. In the image above, the eye is carried into the image by aligning the roof line with the top right corner. I'm using the left frame edge for alignment of my vertical reference, but allowed a slight angle between the edges to hold the perspective I was trying to retain in this image. My horizontal reference (the lowest front-facing window on the rear building) is slightly rotated clockwise with reference to the lower edge of the frame. The image above right uses the serpentine railing to carry the eye in from the upper right — it terminates at the wide structural corner at bottom center, which then carries the eye up the building. Note the placement of the right edge of the building in the apex of the curve of the railing. To maintain perspective I had to leave a slight deviation between my vertical reference on the left side of the building and the left frame edge.

The image of the diner interior below uses the hallway opening (right center) as the vertical reference, the clock at the upper left to bring the eye into the image, the perspective convergence to carry the eye through the image past the cooks to the waitress, the counter line to carry the eye back into the image from the right center, and the line of glass blocks to carry the eye out at the lower right corner. A very tricky shot to set up rapidly (45mm).

The images on this page are taken at various focal lengths of the Disney Concert Hall. The top three were taken at 22mm, 24mm and 28mm as the light changed in the late-afternoon, and the lower shots were taken the previous day in the late afternoon with the 45mm. Each was taken from a different perspective selected to take advantage of the radical lines of this building. As the steel part of the building has no true vertical or horizontal lines, it allows you to select the shooting angle and focal length based on what you're trying to convey. In the upper image I framed to create a balance between the converging lines of the two highest towers and centering those towers, as well as bringing the two arcs together at right center. In the next image, I used the right side arc of the tower as a quasi-vertical reference, the line of the lower portion of the building as a horizontal reference, and carried the eye out of the image using the line at the lower left corner. The third image uses the line leading down from the peak of the tower as a vertical reference and again carries the eye out of the image with the line in the lower left corner. The image at the bottom left, taken the previous day with the 45mm in some extremely nice light, uses the arc at the top of the tower to carry the eye from the upper right corner to the bright line at the lower left, which carries the eye out of the image at the lower left corner. The final image below, taken earlier with the 45mm, uses the line leading from the peak of the left tower as a vertical reference and the arc of that tower to carry the eye right, then uses the right edge of the right tower to carry the eye out of the image at the lower right corner.
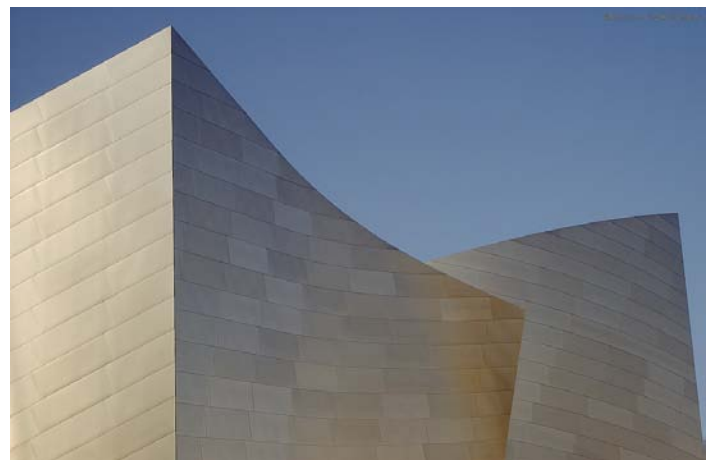
Tips and Tricks

1. To control the "look" of a photo, I primarily shoot in either aperture priority or manual mode — this allows me to control depth of field by selecting the aperture that will give me the character I want. If you're shooting in conditions where the light remains nearly constant but backgrounds change often, once you know the exposure you can switch to manual mode and make the alterations in exposure using the command dial to alter the shutter speed.

2. Know the best range of aperture and distance for each of your lenses and try to stay within these ranges to yield the best results. There will be times when you need to compromise on ultimate quality due to the light levels that are present, or the need for more isolation, etc., but generally you will be more satisfied with the results if you stay within the sweet spot of your lens.

3. When the shutter speed gets marginal, use a stable hold if you can't use a support device. The nearly-bald geek to the right (yours truly) is demonstrating a stable landscape and portrait hold. Using these holds will give you a far higher yield at lower-than-normal shutter speeds. These holds yield consistent results at 1/10 sec. with a 28mm lens. Practice to achieve high yields at under 1/2 the reciprocal of the focal length (< 1/100 sec. at 200mm).

4. Another technique that increases your yield at lower-than-normal shutter speeds is taking several shots in a sequence. I double-tap (take two shots) of nearly anything that is anywhere near the reciprocal of the focal length (e.g. 1/200 for a 200mm lens), and if the shutter speed drops to marginal, I take four shots (e.g. at 1/100 for a 200mm lens). You will find that one (or more) is sharper.

5. If you're shooting a D100 in fairly low light, or shooting a low-contrast subject, you should use the center focus selector as it is a cross-type sensor which is more sensitive to contrast. Acquire your focus lock, then recompose the image while holding focus. The lens will hunt less and your yield will increase.

The Landscape hold shown above is quite a bit more stable than the traditional holding technique, and can be used when shooting in Portrait mode using the Portrait grip as well. The Portrait hold that I prefer to use is shown below. These holds may require that you stretch a bit to improve your flexibility.

6. Along the same lines as Tip #5, when shooting a D1h or D1x in low-light or with a low-contrast subject, acquire focus with one of the center three focusing brackets for the same reason, then recompose if necessary.

7. When using Tip #5 or #6 above, you should be shooting in Continuous AF mode with a D100 or D1-series body, as the Single AF mode is focus priority, and if the area where the active focusing bracket is placed is not in focus, the camera will not fire.

8. If you shoot a D100 body, you have a single button on the rear which controls Auto-Exposure Lock/Auto-Focus Lock (AE/AF Lock) as well as AF-On, selectable via CSM #14. In many situations, such as in Tips #5-7, or when acquiring a focus lock on a subject and then waiting for the action or the moment to shoot, it is to your advantage not to have to hold your shutter button down. By leaving CSM #14 in the AF-On position, the button on the rear of the camera becomes an AF-On button and disables the AF activation from the shutter release. This is quite useful. If you require an exposure lock button, you can change this back (leave CSM #14 active in the menu so you can switch it back rapidly).

9. If you shoot a D1-series or D2-series body, you have both AF-On and AE/AF Lock buttons. You might find it worth your while to set the menus so that AF activation is via the AF-On button only. This will allow you to acquire focus and track independently of the shutter… you can let go of the AF-On button and squeeze off shots without focus hunting.

10. When locking on a moving subject such as a bird in flight, a running animal, etc., you will find it easier to acquire the first focus lock by pre-focusing on a stationary subject somewhere near the same distance, then shift your aim towards your original subject and acquire the lock. This will reduce the time spent hunting for focus significantly.

11. When shooting a wide-angle scenic, don't focus on the background (such as the mountains in the distance). You will achieve better results by focusing in the middle foreground. Try an Internet search to learn more about **hyperfocal distances**.

12. When shooting a building or some other subject that is a lot taller than you with a standard lens (as opposed to a perspective control lens), try to keep the back of your camera as close to parallel with the subject as possible to avoid perspective distortions. Often, this will mean that you have to place your subject high in the frame… you can crop the foreground later. Of course, you can do perspective cropping in post-processing as well.

13. When shooting a dark subject against a bright background, such as the sky, allow your background to overexpose unless you want your subject to be a silhouette, or use fill-flash to bring the subject out of the shadows. Spot-meter your subject, keep in mind the relative luminosity of the subject compared to middle-grey, and use EV compensation to expose for the subject, allowing the background to overexpose). The result will have less noise than pulling the subject out of the shadows after the fact using +EV and gamma-boost.

14. Keep horizons horizontal, and vertical references vertical (unless you are trying to create an artistic composition by radically rotating the frame of reference). You can either use a grid (if your camera offers one), or use the edges of the frame or the focusing brackets as a visual reference.

15. When changing lenses, remove the rear cap from the lens to be mounted (lens 2) first and put it in your pocket. Hold lens 2 in your left hand and place the mounting mark at 10-o'clock. With your left pinkie finger, push the lens release button on the camera and with your right hand, rotate the lens to be removed (lens 1). Remove it from the camera, and quickly mount lens 2 (it should go right into place if you oriented the mounting mark to 10-o'clock). Rotate lens 2 until it locks. Now put the rear cap from your pocket on lens 1 and put it in your bag or lens case. With practice, you should be able to do this in a second or two, keeping dust out of the camera and increasing the speed of lens changes.

16. Mount an extra camera strap on your tripod or monopod so you can sling it from your shoulder rather than carry it in your hand (to keep both hands free in the field).

The Digital Workflow

The Transfer process

My workflow has been developed over several years, and is designed around my concepts of an efficient organizational plan. I am certainly not saying that this is the only way to work in an efficient manner, of course, so please feel free to modify anything and everything you see here to fit your style. The applications I have selected work well, but there are several other ways to conduct your workflow which may fit your style better than those that I have selected.

When you come back from a shoot, the first thing that you need to do is transfer the images to the computer from your cards or other storage media. There are two primary ways to do this: using a dedicated Transfer application; or a simple drag-and-drop from the cards or other media to the hard drive. Some Transfer applications cannot work with USB or Firewire external hard drives as they are designed for use with compactflash or other storage media, so for these sorts of transfers you need to use the drag-and-drop method.

The advantage of using Nikon Transfer, for instance, is that the last two versions have contained the only method available for a user to transfer the Shooting Data to the IPTC Caption (so the shooting data can be read using Photoshop's File Info dialog or any other application which can read the Caption). This function used to be available in Capture itself, so that you could choose to save JPGs or TIFs with the shooting data, but since version 3 this feature has been removed from Capture and the only way to do this has been to use Nikon Transfer. This of course means that any images transferred from an external HD or via the File Manager will not have the shooting data in the Caption unless you add it manually. You can, however, view the shooting data in the original file or in Nikon View from TIFs or JPGs that were processed by Capture. This information can also be seen in ThumbsPlus and copied/pasted into the caption.

Nikon Transfer
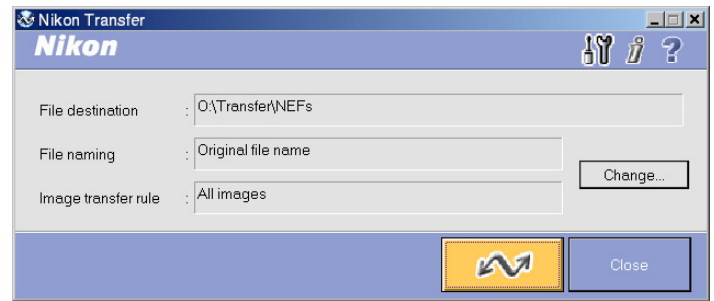
When setting up Nikon Transfer the first time, what I do is create a folder on my hard drive with the name "Transfer". This folder contains several subfolders: "NEFs", "Batch", and "Preview JPGs" depending on the camera(s) I am using. More on this later. The first thing you do is click the button to the right of File Naming labeled "Change", which will bring up the dialog below. Click the "Browse" button and navigate to the folder you plan on using for transfers (the one I use is O:\Transfer\NEFs). I uncheck the box to create a new subfolder for each transfer, as I use separate shoot folders and want all files from a shoot in the same folder. I want all transfers using the original File Name, but you can change this here if desired and exit.
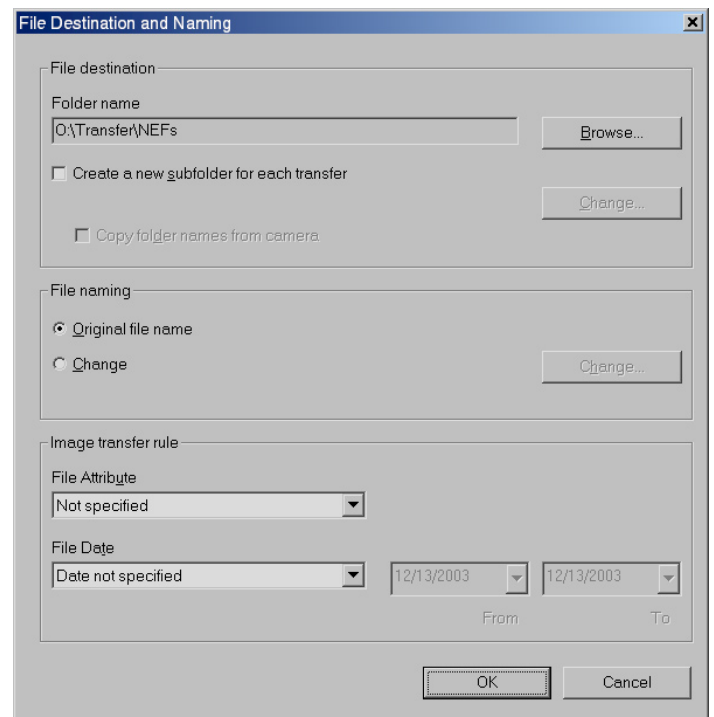
The IPTC Caption
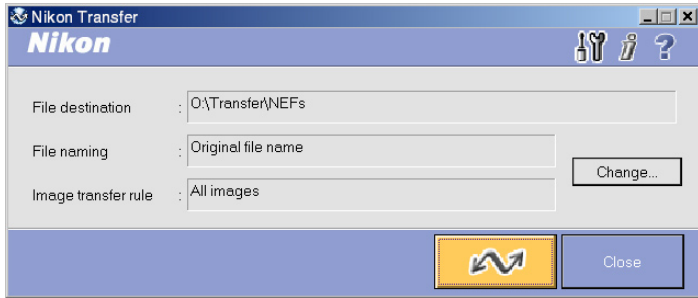
Now, click the little button at the top right, between the tools and the question mark, labeled "*i*". This will bring up the IPTC Caption dialog. If you click the Detail button at lower left you will see the dialog below. I put in my copyright information and website address in all images transferred by placing it in both the visible Caption area (seen in the Simple view as well as the Details view), and also fill in several spots in the Details area by default. You can also add Keywords to images from a shoot here, but remember to change these for every shoot — it may be better for you to keyword images in a database later as you can individually keyword this way. Once you have the information in either the Simple or Detailed IPTC Caption areas that you want, exit this dialog. The information will be present in this dialog until you change it (or reinstall the Nikon View program).
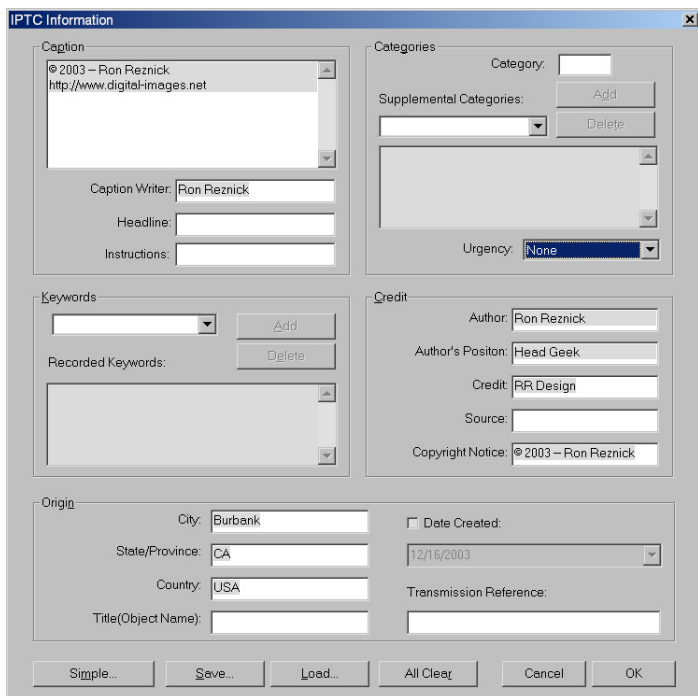

Transfer Options
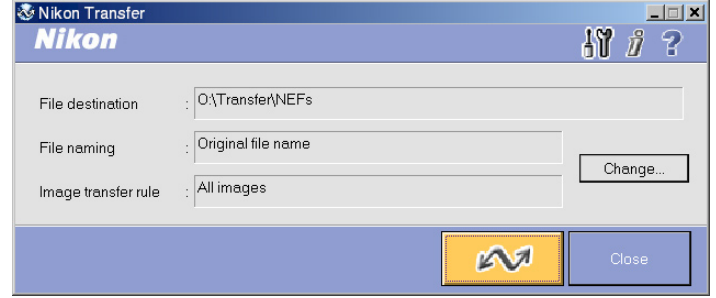
When you click the little button at the top right that looks like tools, to the left of the "*i*", you will enter the Transfer Options dialog, shown below. The first tab is the General tab… here you can tell the application whether or not to launch Nikon View after doing a transfer (I tell it to do nothing), and can syncronize the camera's clock when it is tethered to the computer. If you click the Transfer tab at the top of the dialog you will see the dialog pictured below. Here, you can decide if you want to delete images from the card after transfer, Copy all images (including hidden images), embed the color profile used (I recommend that you use AdobeRGB by the way, as it is a far wider gamut and is better for printing), embed a large preview with NEFs (this is specific to the newer version of Nikon View (6.1) that shipped with the D2h), and most importantly, specify whether to add the IPTC information we set up previously and copy the shooting data to each image. I check all boxes. You can now exit this dialog.
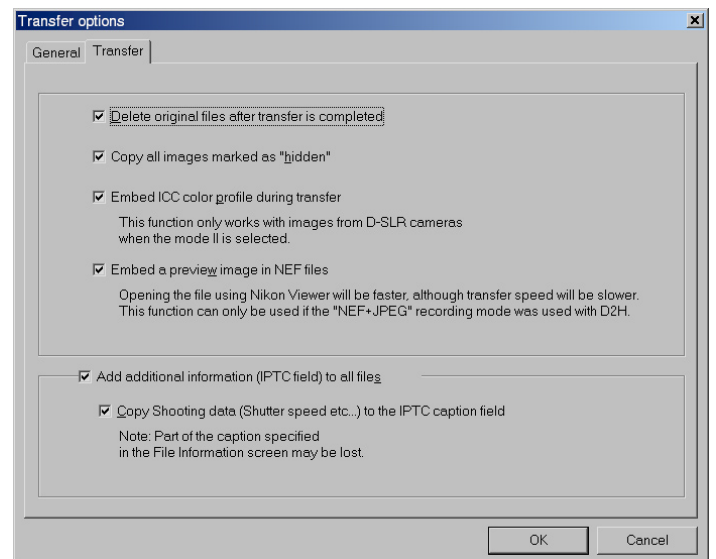
Performing a Transfer
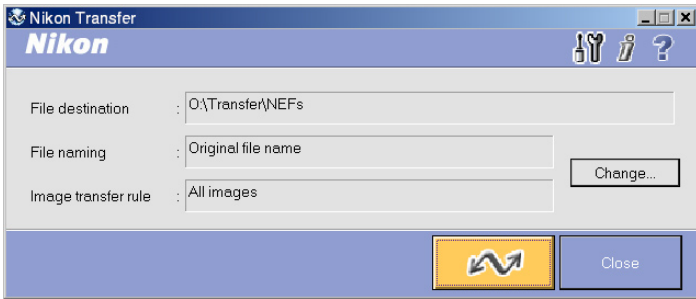
To perform a transfer, simply insert a card in your reader and the application will start, then hit the large Yellow button to the left of the close button. The small dialog seen below will open, and if you have the "Show Thumbnail" checkbox enabled you will see thumbnails as the transfer occurs. When the card is finished transferring images the dialog seen below will disappear… then you can remove the card and either move on to the next step or mount the next card in your reader.

You can minimize the transfer dialog by using the "-" button at the upper right to get it out of the way if you plan on doing something else while transferring images.
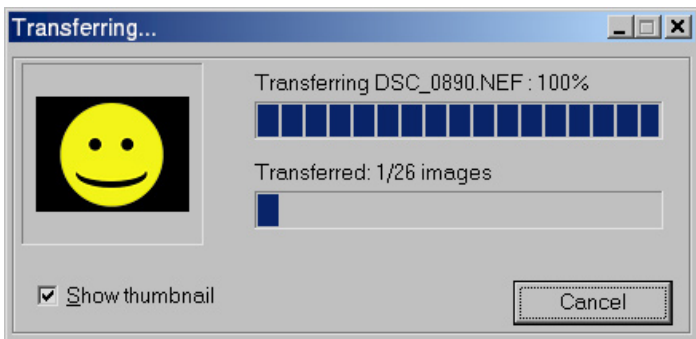
Continue with the transfer process until all images associated with the current shoot are moved to the computer.

The process of transferring from a laptop, an external hard drive, or another storage media such as a DVD or CD is the same as performing any file move on your computer. What you do is open the drive, disc or other media, select the files or folders, and drag them to a location on your hard drive (such as your Transfer folder or a Shoot folder).

The folder structure I use is as follows:

Shoot Folder
> *Batch*
> *Mods*
> *NEFs*
> *PreviewJPGs*
> *Select*
>> *NEFs*
> *TIFs*

The Folder Structure changes depending on which camera you are using… the D2h or another camera that can shoot RAW files as well as JPGs does not require a batch processing step for rapid viewing and comparison of images, thus I use a "PreviewJPGs" folder for D2h shoot folders. The D100, D1h and D1x do not shoot JPGs as well as NEFs, so the most efficient selection method I have found requires that you perform a Batch Process on the NEFs for the purpose of selection of images to manually process, thus I use a Batch folder in shoot folders for images taken by those cameras. The Select folder is a location for selected images, naturally… when you go through the process of selection you will cull flawed images, move selected images to the select folder, and leave images that you may want to process later or re-select second culls from. The Mods folder is for modified files for print or web after post-processing. The TIFs folder is for master files created during processing. I prefer TIF to JPG for these master files due to the color differences and lack of compression artifacts.

Batch Processing

Once you have transferred your images to the NEFs folder, you will want to select images for processing and cull any less-desirable images. If you are shooting a D2h or other camera that allows you to shoot JPGs and RAW files, you will have both in the NEFs folder. In the Windows Explorer, you can click on the heading for "Type" to sort by file type, thus organizing all JPGs and NEFs in order of file type, then select all JPGs and move them to the "PreviewJPGs" folder. If you are shooting a camera that does not allow you to shoot JPGs and RAW together, then it will be useful to batch-process to JPG for the purpose of selection. While you can view the NEFs directly using Nikon View or another application, this is a somewhat slow process and you cannot take advantage of synched viewing, which I will get into in a moment. The ability to view synched images is what makes ThumbsPlus such a powerful tool for the selction process, and is one of the main reasons why I use this program rather than others. Doing this with JPGs or TIFs is faster than doing it with the RAW files themselves… I use JPGs for this selection process, as I will be tossing the batch (or preview JPGs) after I finish the selection and processing anyway, so I prefer to save some space.

To batch-process the RAW files from a D100, D1h or D1x, what I do is use Nikon Capture along with a default setting for USM, sharpening and White Balance to output a JPG that will allow me to select images for manual processing. I leave the Capture "Batch" dialog set to use the "\Transfer\NEFs" folder as the source, and output to the "\Transfer" folder's root using JPG (EXIF) in Excellent quality (you can reduce this quality if you like, but since I delete these files after selection the file size is no problem). Depending on which camera was used to take the shots, I tell the dialog to use the Default camera settings as defined in the next column to run the batch from unless the images were taken indoors or under specialized light conditions, in which case I process one image and use those settings.
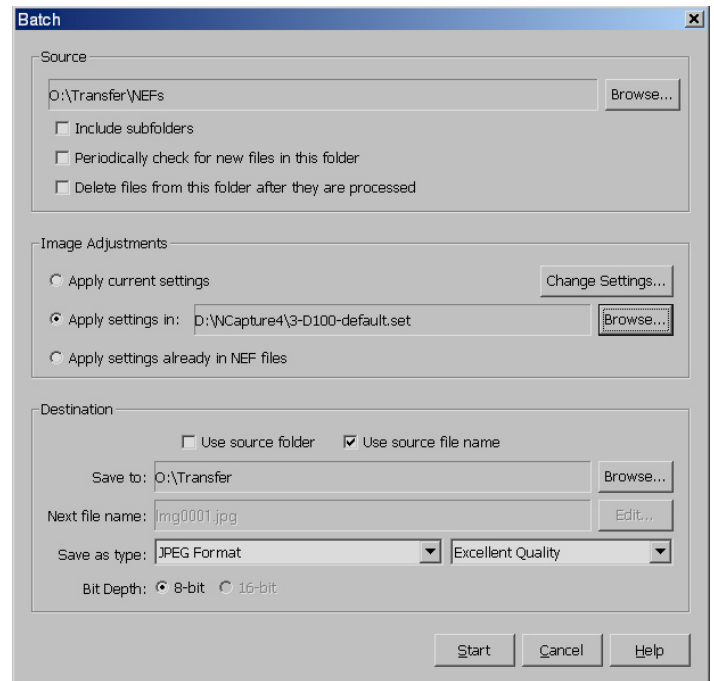
As can be seen in the image above, I use the Source file name for the output JPGs so they can be easily associated with the NEFs. I do not delete the images from the folder (keep your originals). The default settings which I use for the various cameras are:

D100:

Advanced RAW Sharpening = Low

Unsharp Mask (USM) = 48, 5, 8

D1h:

Advanced RAW Sharpening = None

Unsharp Mask (USM) = 66, 5, 4

D1x:

Advanced RAW Sharpening = Low

Unsharp Mask (USM) = 66, 5, 8

D2h:

Advanced RAW Sharpening = None

Unsharp Mask (USM) = 66, 5, 4

If you shoot RAW + JPG with the D2h, there is no need to run a batch. I set camera sharpening to +1 so that the JPGs are sharp enough to evaluate for selection (slightly sharper than a processed TIF), but set default options for RAW files as shown above.

The Selection Process

After the batch-process has been run, you will have a group of JPGs in the root of the Transfer folder. (If you shoot with a D2h and use the RAW+JPG option, the Preview JPGs will be in the same folder as the NEFs). Move these files to the Shoot folder, either in the "Batch" or "PreviewJPGs" subfolder as appropriate. Move the NEFs into the Shoot folder, "NEFs" subfolder. This will clear the Transfer folder for the next shoot (by always performing the Batch process in the Transfer folder, you do not have to constantly change the parameters in the Batch dialog).

I use ThumbsPlus for both cataloging and selection of images (http://www.cerious.com). There are other programs which can be used for this purpose, but the reason I use the ThumbsPlus software is the capability to view images Synched. This is a tremendous advantage when comparing images.

I will very often shoot two images of a subject (the proverbial "double-tap"). If the shutter speed is marginal, I will take four. You will very often find that one is either sharper than the other, the expression is better, the angle or the moment is better, etc. It depends on the subject and the situation, but I will nearly always take two or more shots. I select duplicates (or four), then either right-click and choose "View Synched" or hit Shift-F8. This opens the images together (side-by-side if they are portrait, one above the other if they are landscape orientation). If I prefer to see two landscape images side-by-side, I hit Ctrl-F12 to place them side-by-side. This allows you to see more of each image vertically.

I set ThumbsPlus up so it doesn't resize images shown in a Viewing Window (menu-select "Options, Viewing, Window", and in the section "Initial Stretching" select "Don't Stretch Images"). This allows me to compare the images at 100%. By using the right-click and drag method on any image, both are moved together so you can compare the images directly. Select the best image out of duplicates, and note the file number in the Title Bar so you can move it to the "Select" folder.

I go through a folder of images, deleting any mistakes and the lesser image out of the duplicates (sometimes I keep both duplicates if they are slightly-different and both are up to my standards). As I find the best shots, I move those into the "Select" folder. Once I have culled the folder and pulled out the first selections, I go through it again to see if I missed anything that might be worth working on right away. This second selection usually pulls any images that are left worth processing, but sometimes you may want to go through it again later. If so, leave the batch folder for a later selection. If not, simply delete it.

The next step is to move the NEFs associated with the images you selected. If you have a file manager window open (Windows Explorer), switch to the Shoot folder, "NEFs" subfolder. If not, minimize all windows and open a Windows Explorer or file manager window and navigate to the "NEFs" subfolder within the Shoot folder. Now, open a second window with the "Select" subfolder within the shoot folder (e.g. right-click on the "Select" subfolder and choose "Explore". You should now have two separate windows open, one showing the contents of "Select" and the other "NEFs", with the "Select" folder active. Now, right-click on an empty space on the TaskBar (where the Start button is), and select "Tile Windows Vertically". This will put the windows side-by-side, with the Select folder on the left. You can close the Folders on the left side of the NEFs window if you like.

Select any NEFs that correspond to files in the "Select" folder, and move them into "Select\NEFs". These are the files we will be processing. When you are done, change folders in the "Select" window to "Batch" and compare the NEFs which are left with the contents of the "Batch" folder. Any NEFs which do not have a corresponding JPG are culls. Delete them. If you deleted the "Batch" folder after selection, anything left in the "NEFs" folder after pulling the Select files is trash, and can be deleted. Once you are done you have completed the selection process.

The D2h allows you to shoot NEF+JPG. You can use these JPGs for culling/selection.

Image Processing — Nikon Capture program setup
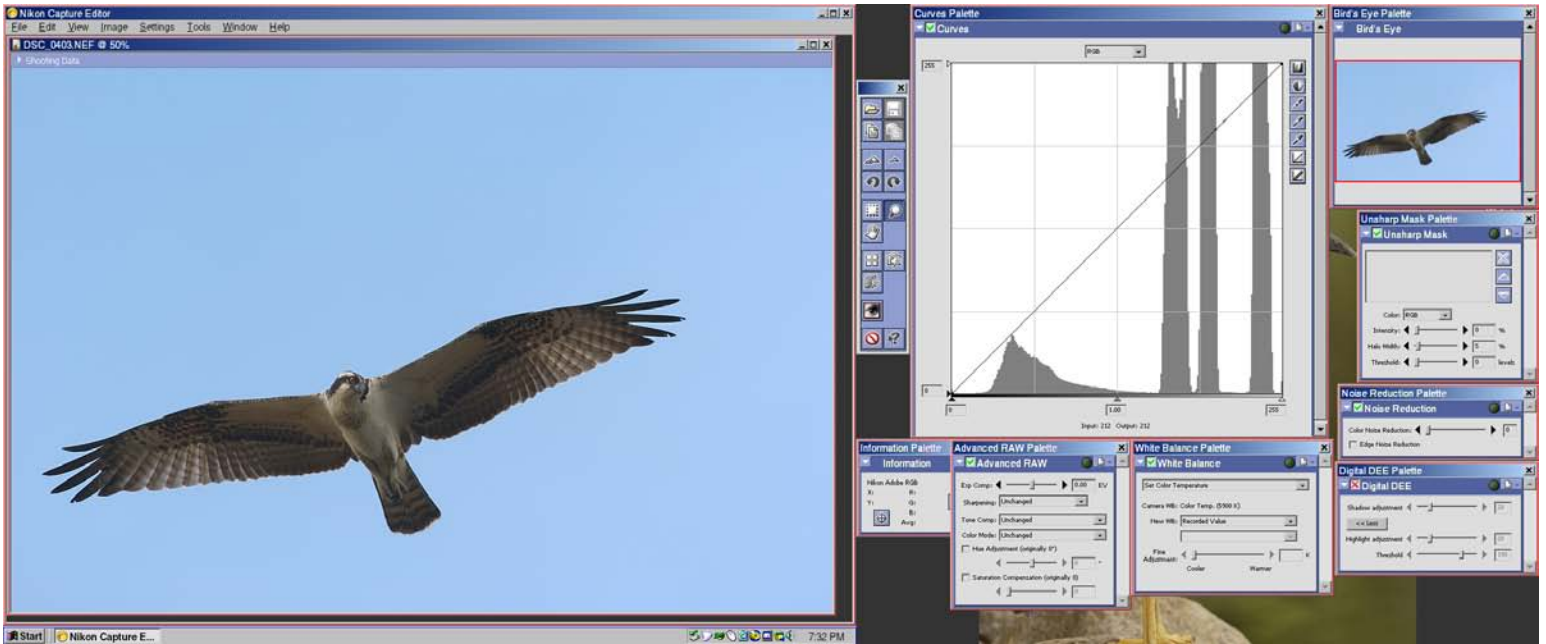
Top: Capture 4, dual-monitor setup. Bottom: Capture 3, single-monitor setup (see next page).
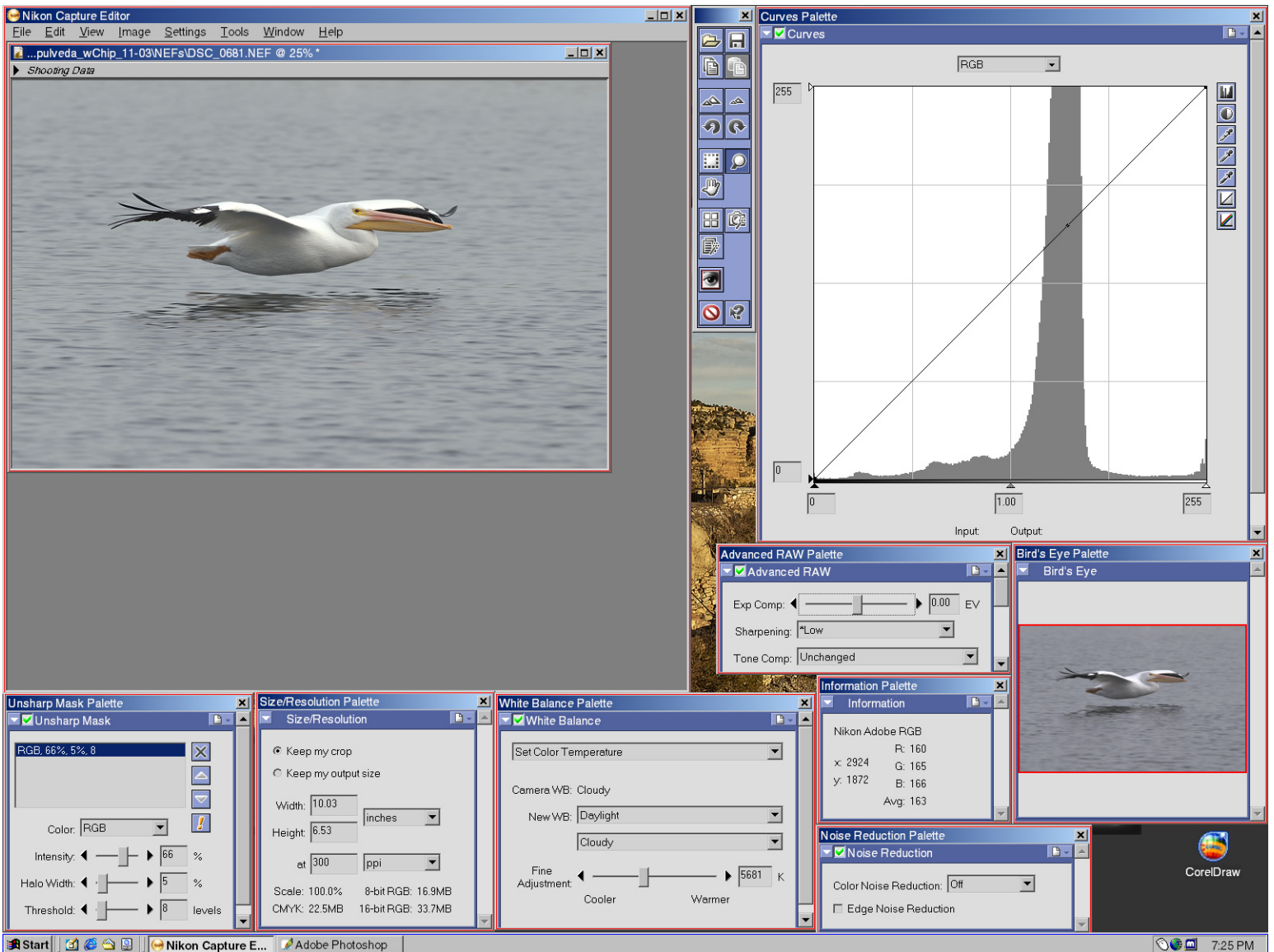
You will notice on page 34 that the upper image (the dual-monitor setup) does not have the size/resolution dialog visible. That layout shows only the top 75% of the 2nd monitor (the #2 monitor is in Portrait mode). When I need size/resolution or other dialogs open, I access them and place them at the lower part of the screen. With a single-monitor setup, I am forced to place any additional dialogs wherever I can, generally below dialogs that are constantly used. The images seen on the previous page are resized differently… the display resolutions are:

Single monitor setup: 1600 x 1200
Dual: #1 is 1280 x 960; #2 is 1024 x 1280

I set the Curves dialog to it's maximum width, and adjust the height to allow me to see the input and output figures below the graph. This gives maximum control over shadow and gamma adjustments. Unfortunately, if you are working at a low screen resolution, expanding the Curves dialog will significantly reduce available screen area, so it is greatly to your advantage to work at as high a screen resolution as your monitor and video card (and your eyes) will allow. Some people use two monitors to allow you to place palettes on a second monitor. The reason for setting up the screen in this fashion is to allow immediate access to adjustment dialogs which will be used constantly during image processing, and still maintain a fairly large image window.

After setting the Curves dialog width and height, if you find that your screen area is too small to have a reasonably-sized image window and still keep on-screen the adjustment dialogs you require, (e.g. at 1024x768), then your only choice is to give up some control in the Curves dialog and shrink it down if you cannot increase the screen resolution and still maintain 24bit or 32bit color. Do not drop down to 16bit color as gradients will show banding, and your ability to display colors properly will be severely restricted.

The next step is to set up the defaults for the camera bodies you use, and establish what your User Default settings will be. As stated earlier, the USM and Sharpening settings I recommend for the defaults are as follows:

D100:
Sharpening = Low; USM 48, 5, 8
D1h:
Sharpening = None; USM 66, 5, 4
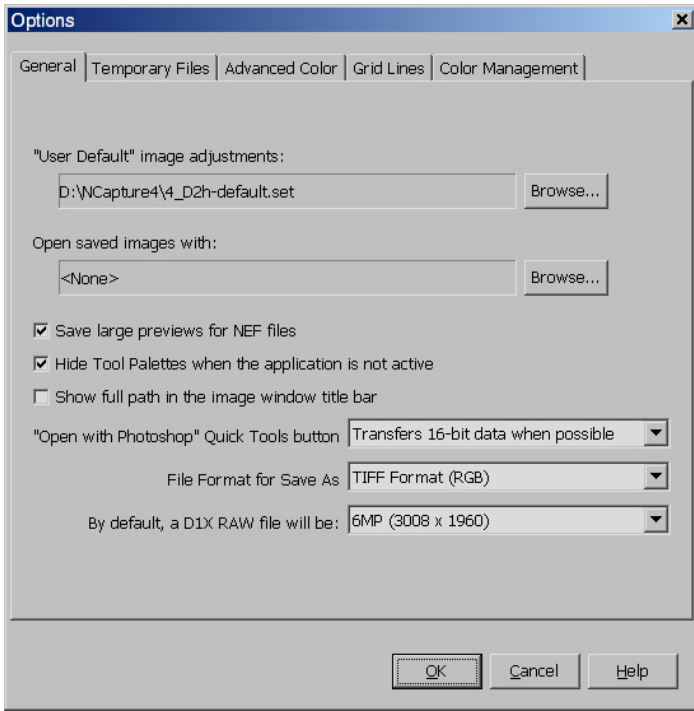**D1x:**
Sharpening = Low; USM 66, 5, 8
D2h:
Sharpening = None; USM 66, 5, 4

Don't take these Sharpening or the USM settings as gospel. For instance, with the D2h, if you have a perfectly sharp image of a bird such as the Osprey at the top of page 34, with converging lines in the feathers up against a blue sky (or another high-contrast edge), you will probably want to reduce the USM intensity (the first number). If you shot at high ISO and there is some noise in the shadows, one of the first things that you do is reduce sharpening… if you're shooting a D100 or D1x, try changing the Sharpening to None. The in-camera or Advanced RAW Sharpening is a zero-threshold sharpening, which means that it sharpens *everything*, including the noise. Once you've done that, if you still have some objectionable noise, try raising the USM threshold (the last number). Sharpening settings depend on the image, but for many images these settings achieve a good yield.

What you look for is a halo around high-contrast edges. Proper sharpening is achieved when you can just see the halo.

Do not apply sharpening to images that are intended to be upsampled later for large prints. Also, final sharpening of the image should be determined based on the media type you intend on using. More on this later…

Options

General | Temporary Files | Advanced Color | Grid Lines | Color Management

"User Default" image adjustments:

D:\NCapture4\4_D2h-default.set　　Browse...

Open saved images with:

<None>　　Browse...

☑ Save large previews for NEF files
☑ Hide Tool Palettes when the application is not active
☐ Show full path in the image window title bar

"Open with Photoshop" Quick Tools button　Transfers 16-bit data when possible ▼
File Format for Save As　TIFF Format (RGB) ▼
By default, a D1X RAW file will be:　6MP (3008 x 1960) ▼

OK　Cancel　Help

Preferences

General | Temporary Files | Advanced Color | Grid Lines | Color Management

"User Default" image adjustments:

D:\NCapture30\3-D100-default.set　　Browse...

Open saved images in:

<None>　　Browse...

OK　Cancel　Help

These two dialogs are from Capture 4. The dialog above shows my D2h setting as the "User Default" setting. The program is set to save large previews for NEFs (although I generally do not save NEFs with changes unless I am saving them for a student's study), and the default "Save As" format is TIF. The dialog below shows that Color Management is set to AdobeRGB as the default, and this profile will be applied overriding any camera settings.

Access this dialog from Tools, Options.
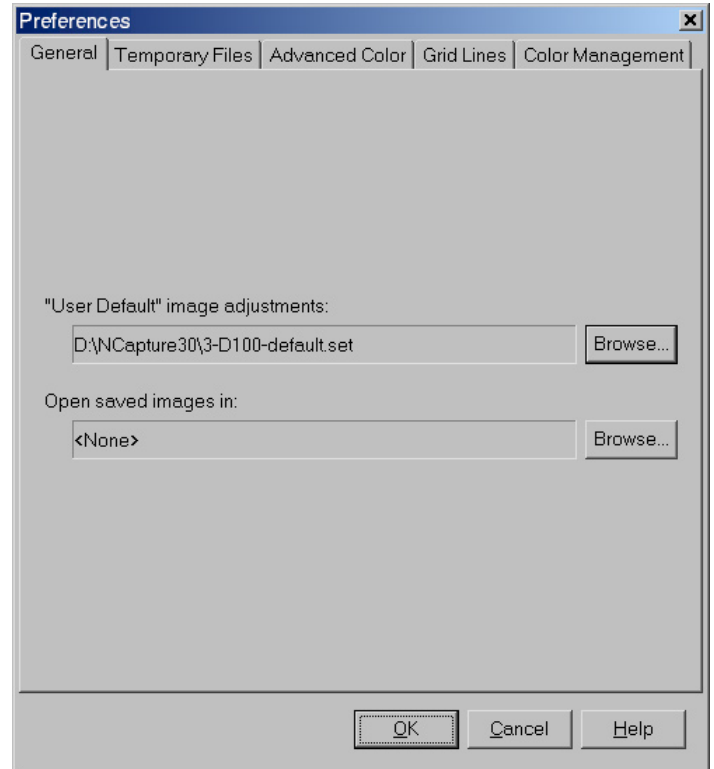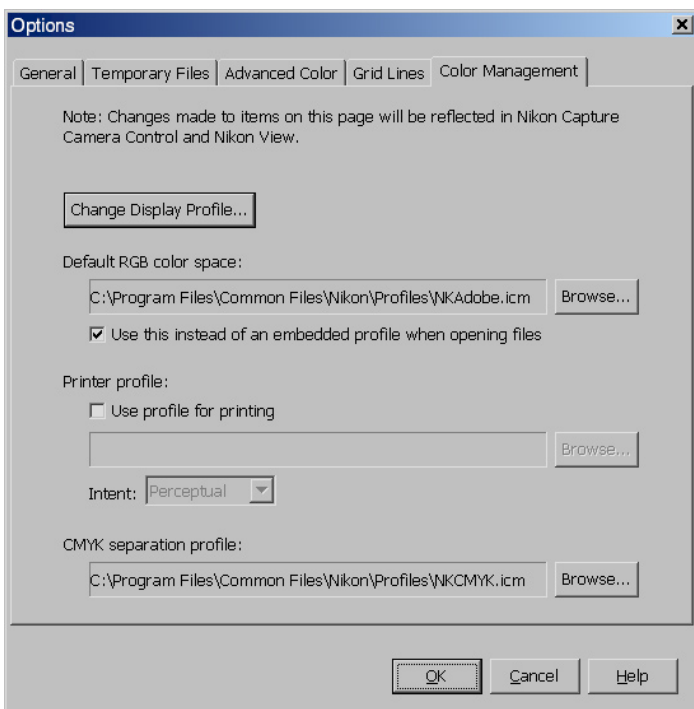
These two dialogs are from Capture 3. The dialog above shows my D100 setting as the "User Default", and the one below has the monitor profile for this system selected, as well as AdobeRGB (which is set to override any profile set in the camera).
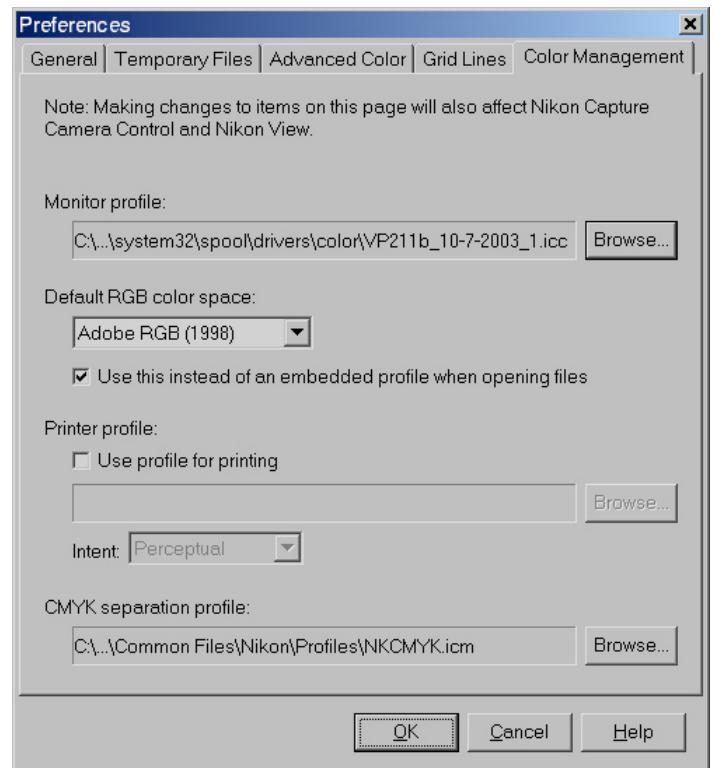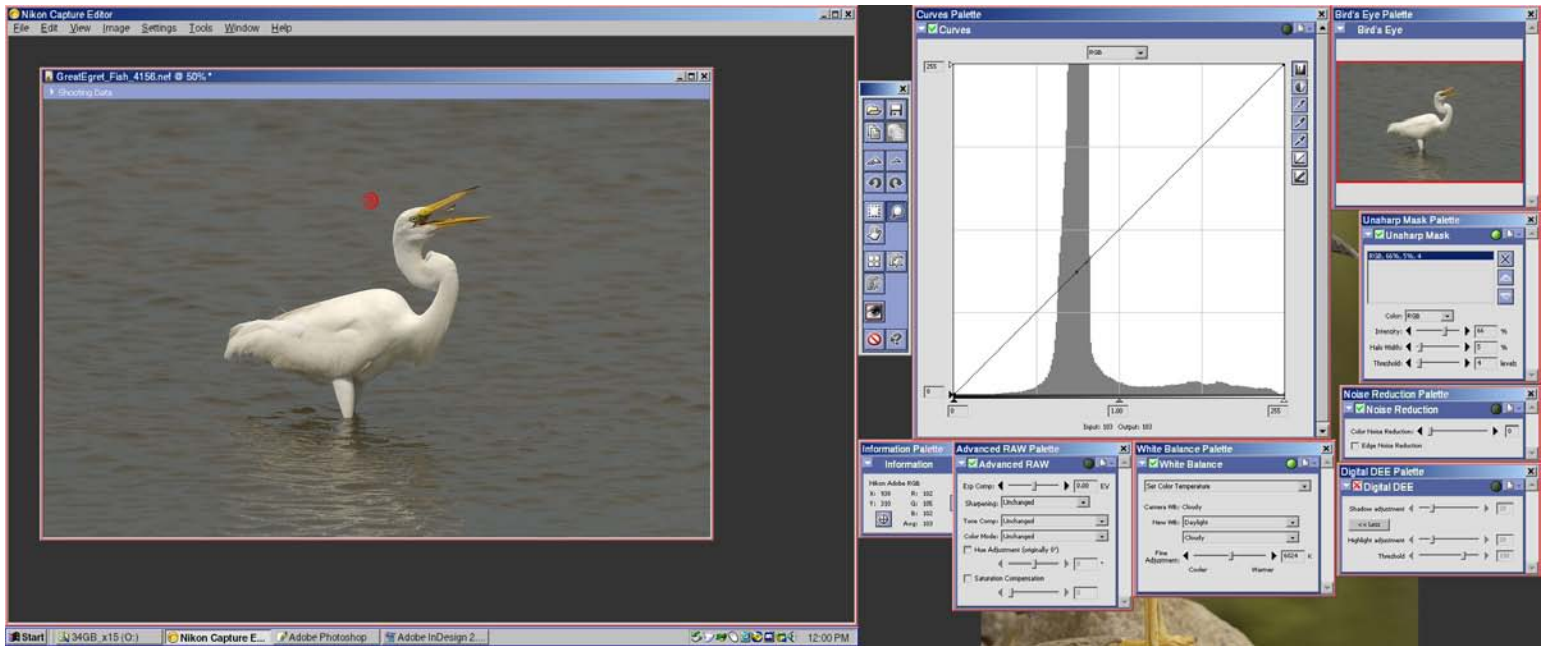
Access this dialog from Edit, Preferences.

Options

General | Temporary Files | Advanced Color | Grid Lines | Color Management

Note: Changes made to items on this page will be reflected in Nikon Capture Camera Control and Nikon View.

Change Display Profile...

Default RGB color space:

C:\Program Files\Common Files\Nikon\Profiles\NKAdobe.icm　Browse...
☑ Use this instead of an embedded profile when opening files

Printer profile:
　☐ Use profile for printing

　　　　Browse...

　Intent:　Perceptual ▼

CMYK separation profile:

C:\Program Files\Common Files\Nikon\Profiles\NKCMYK.icm　Browse...

OK　Cancel　Help

Preferences

General | Temporary Files | Advanced Color | Grid Lines | Color Management

Note: Making changes to items on this page will also affect Nikon Capture Camera Control and Nikon View.

Monitor profile:

C:\...\system32\spool\drivers\color\VP211b_10-7-2003_1.icc　Browse...

Default RGB color space:

Adobe RGB (1998) ▼
☑ Use this instead of an embedded profile when opening files

Printer profile:
　☐ Use profile for printing

　　　　Browse...

　Intent:　Perceptual ▼

CMYK separation profile:

C:\...\Common Files\Nikon\Profiles\NKCMYK.icm　Browse...

OK　Cancel　Help

Open the image above in Nikon Capture (GreatEgret_Fish_4156.nef). Versions saved from Capture 3 and Capture 4 are on the disc (4156c3 and 4156c4)… use the appropriate version. I will show screenshots of the Capture 4 version here — more on this later.

This photo was shot at about 4PM EST at Chincoteague Island, VA, on an overcast day. The sky was quite grey until later that afternoon, as was the water. In this case, to adjust the White Balance (WB), I sampled a smooth area of the water (***the red bullseye***) and checked the Info palette for neutrality.

As you can see, the water is quite neutral at this WB setting (just slightly green). There are other ways of setting WB as well, depending on whether there is a perfectly-neutral subject in the frame, or fairly strong mid-shadow data. I will show you these methods later on other images. As the light was a bit warm (slightly lacking in the blue channel) I could not set grey based on a near-highlight on the Egret, but I could have set grey on a flat portion of the water (although that would have neutralized the slightly-green character of the water).

The next step is to neutralize shadows and gamma in the R, G and B channels.

Gamma = Midtone Luminosity

What we are going to do is take a sample from a shadow with detail (either image detail or color detail) to acquire a point to set the shadows to. In this case, I selected a point in the dark area at the tip of the Egret's beak and checked for the luminosity of that point in the Red channel by looking for the "bug", a cross-mark on the linear diagonal that indicates the target luminosity. I then look to see where the point indicated by the bug intersects with the data in the channel. This is the reference point which I am going to use (see image below).
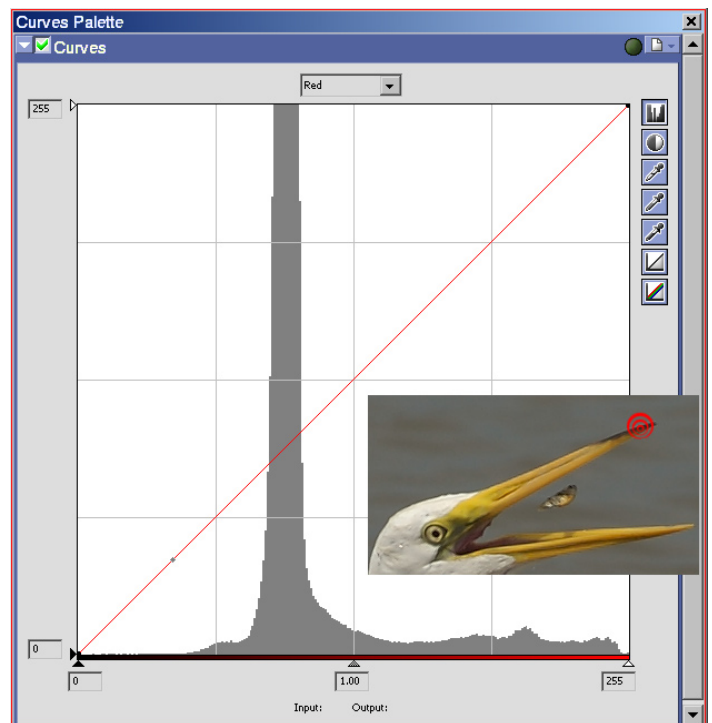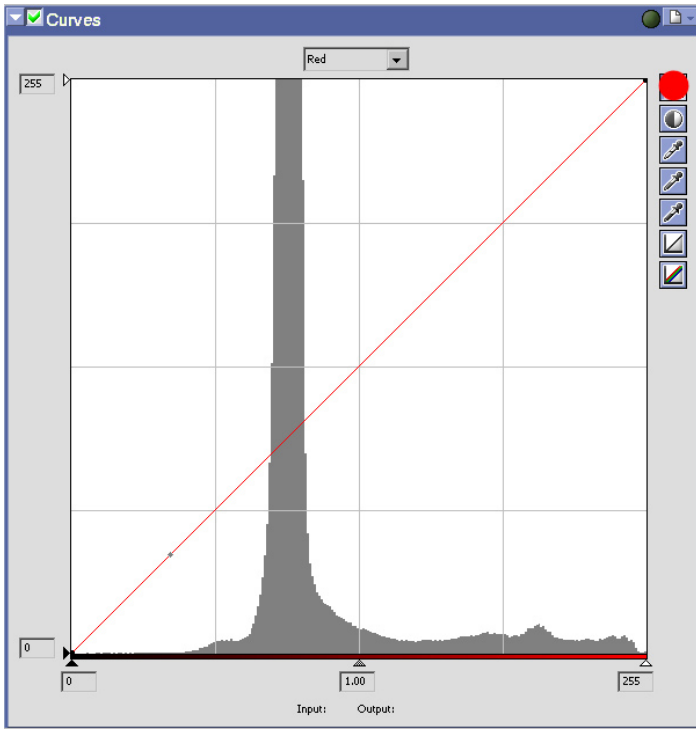
The next step is to activate the Histogram by depressing the top button at the right of the Curves dialog. This will allow the Histogram to show you what you are doing when you make changes. What we are going to do now is pull the shadow slider, just above the "0" at the lower left, below the graph, until the dotted line is just before the point indicated by the "bug" (remember where that is, because when you move your mouse it will also move). The reason for setting the shadows just before that point is so that we retain detail in the area we selected — if you pull to that point or beyond, the selected area will become black.

Notice where the **Gamma** slider is now. The Gamma slider is the one in the middle, at the bottom of the graph, and indicates the midtone luminosity. As you can see above, the slider is on the midline, indicating 128 on the graph. Watch what happens when you pull the shadow slider to the point we have selected (top image in the next column). As you will notice, the Gamma slider moves to the right, and if you look at the image you will see it turn blue-green as luminosity in the Red channel is reduced by your adjustment to the shadows. What you have to do is move the Gamma slider back to it's position at the midline to neutralize Gamma in this channel to compensate for the Shadow adjustment.
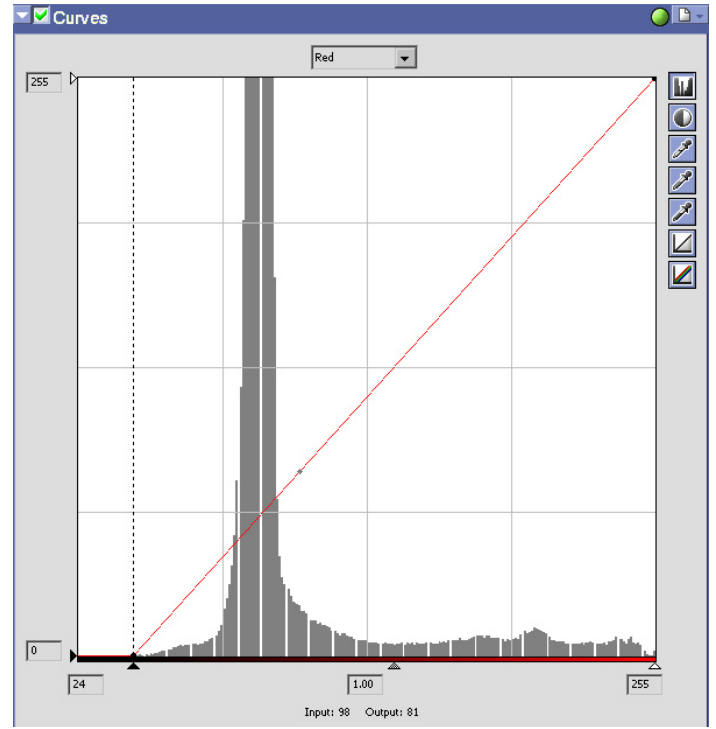
By setting the shadow slider to the point selected, the Curves dialog will be altered as shown above. Note that we are not interested in the actual number shown for Shadows (24), but the point on the curve itself. What we are going to do is set each of the channels to the same point on the curve, to neutralize the shadows. When we make each adjustment, we will neutralize the Gamma for the Shadow adjustment by placing the Gamma slider back on the midline (as shown below).
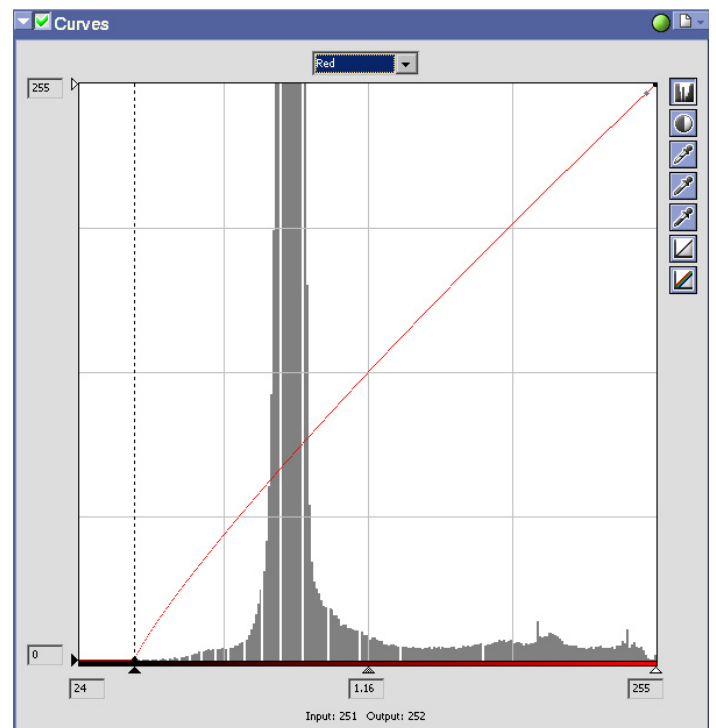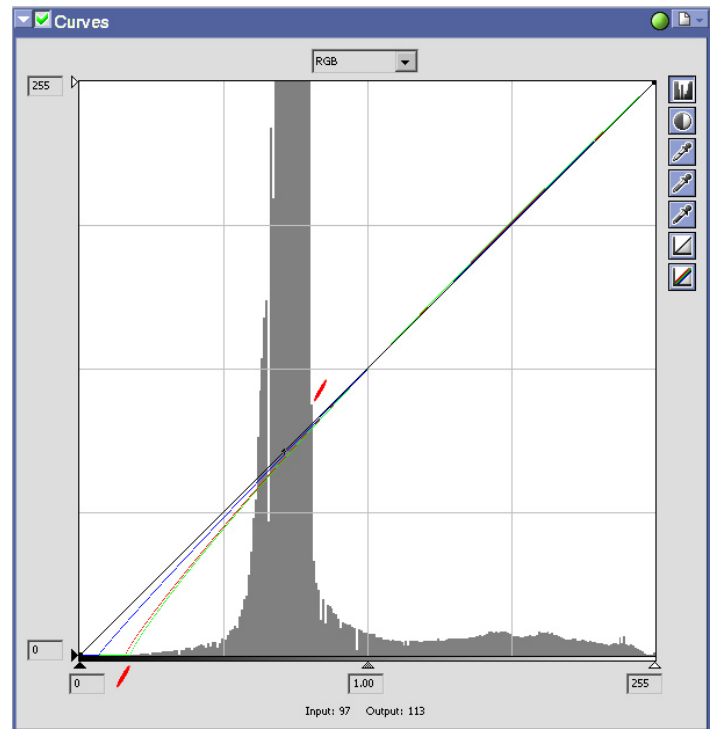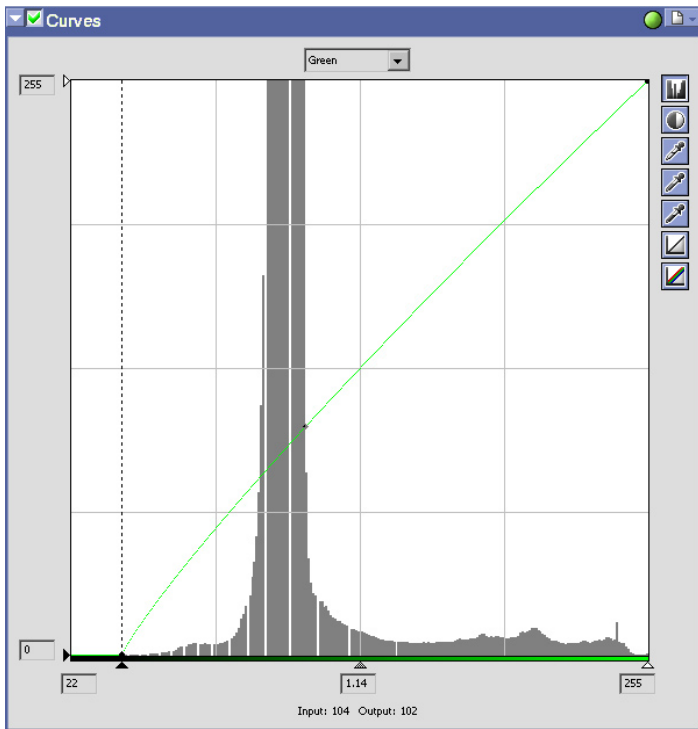
The next step is to set the other two channels using the same technique. If you forget where to put the shadow slider, or the curve is sufficiently different in one channel, check your reference point again and look for the "bug". Make sure that you move the Gamma slider back to the midline after making your Shadow adjustments. The results are shown in the two images above and below. The number for the Shadows and Gamma are different, but the points on the Curve are the same.

Now, zoom back so you can see the entire image on the screen and switch to the RGB (Luminosity) channel. You will see the image shown above… notice that I have marked two points in Red. These are the shadow point (as determined by checking the reference) and the *Gamma Point* as determined by looking at the curve itself and making a judgement call based on the character of the image. Set your Shadow and Gamma to the indicated points and you will yield the following curve.
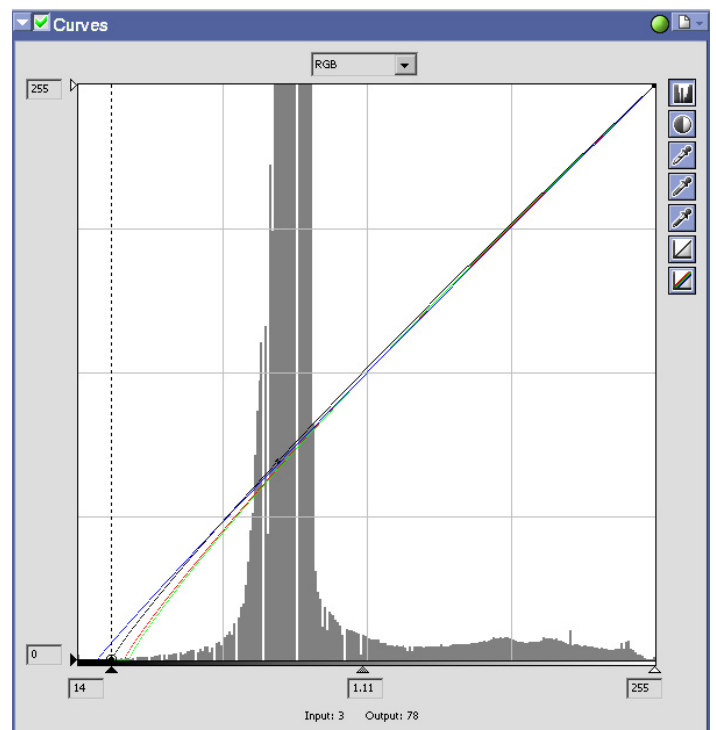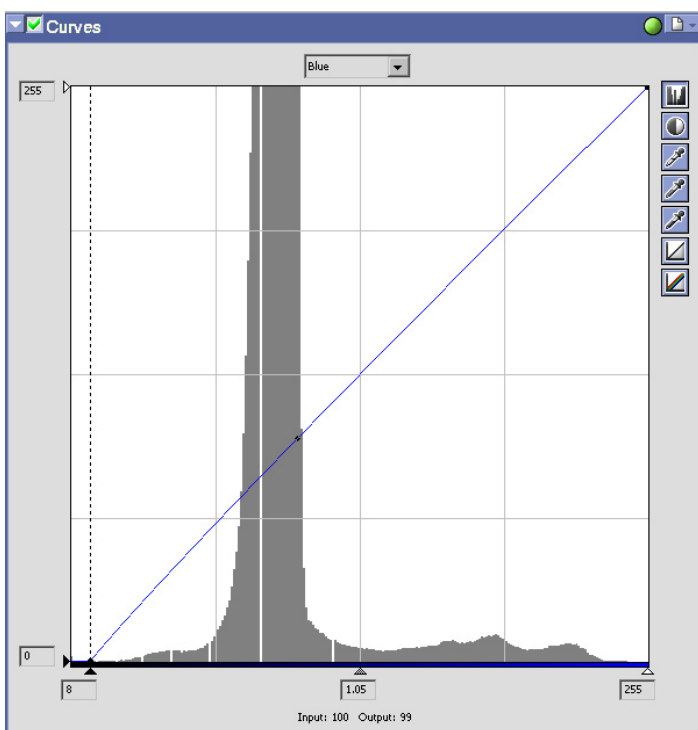
Capture 3 above, Capture 4 below.

There is quite a difference between the image processing upon Opening an image, the Curves display, and the final Output from Capture 3 and Capture 4. The results from Capture 4 are superior to those of Capture 3. Notice especially the color of the Egret's beak. This is truer to the original color. I have included NEFs processed and saved from Capture 3 and Capture 4 of this image so you can compare if you like, but the images following will all be done in Capture 4 (the images shown earlier in the book were all processed in Capture 3). While there remain some issues with Capture 4's memory management at the time of this writing (the program slows down significantly when opening enough images to use about 650MB of RAM, reducing workflow efficiency), the output is of superior quality to any other NEF processing software, and Capture 4 is very highly recommended.

Great Egret — Summary

This image was acquired with the proper exposure, so we did not have to correct the EV before making other adjustments. Later, there will be images that will require some exposure adjustments, and we will discuss how to make these. The steps outlined in the processing of the Great Egret image are as follows:

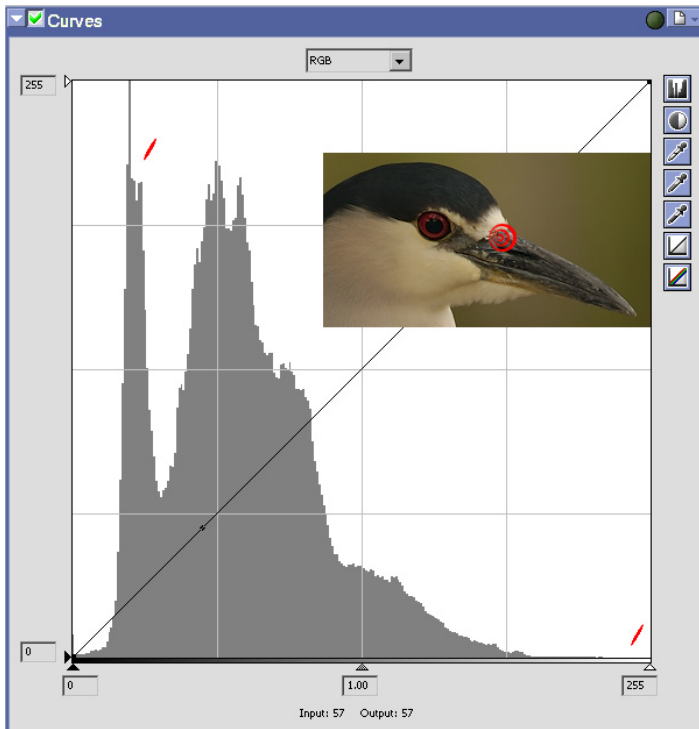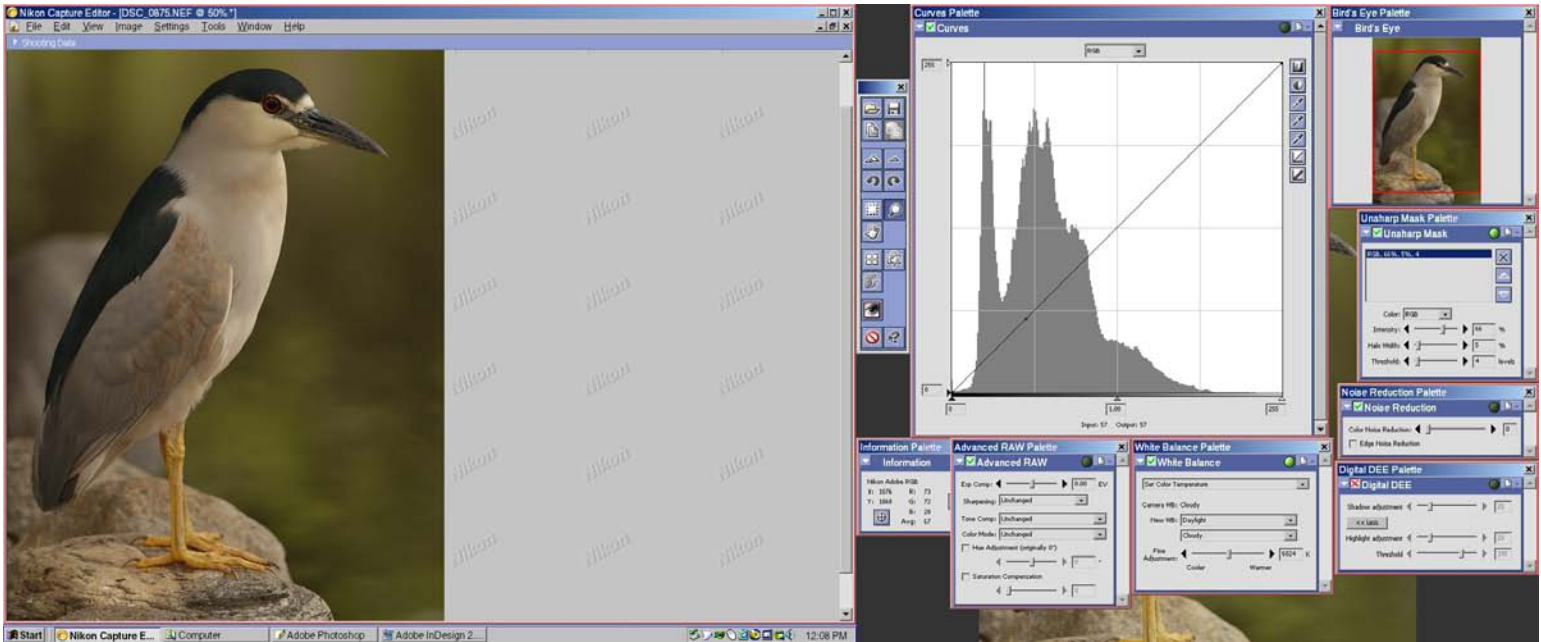1. Check **White Balance** by sampling a neutral area. In this case, WB was correct;

2. Neutralize **Shadows and Gamma** in each of the Red, Green and Blue channels. Sample a **shadow area with detail** and look for the **"bug"**, a cross-shaped indicator on the linear diagonal that shows the luminosity at the point sampled. Move your **shadow slider** (the leftmost slider below the graph) to a point just before the spot indicated by the "bug" to maintain detail in the sampled area, then move the **gamma slider** (the center slider below the graph, which resides at the midline (128 division) before any adjustments have been made) back to the midline to neutralize gamma after making a shadow adjustment. This avoids inducing a color cast;

3. Now, switch to the RGB (Luminosity) channel and zoom back so you can see the entire image (if you zoomed in previously to acquire a target for the shadow adjustments), so the Histogram display is based on the entire image. Acquire a shadow point from a sample area and set your final contrast and gamma by adjusting the RGB Channel's shadow and gamma sliders.
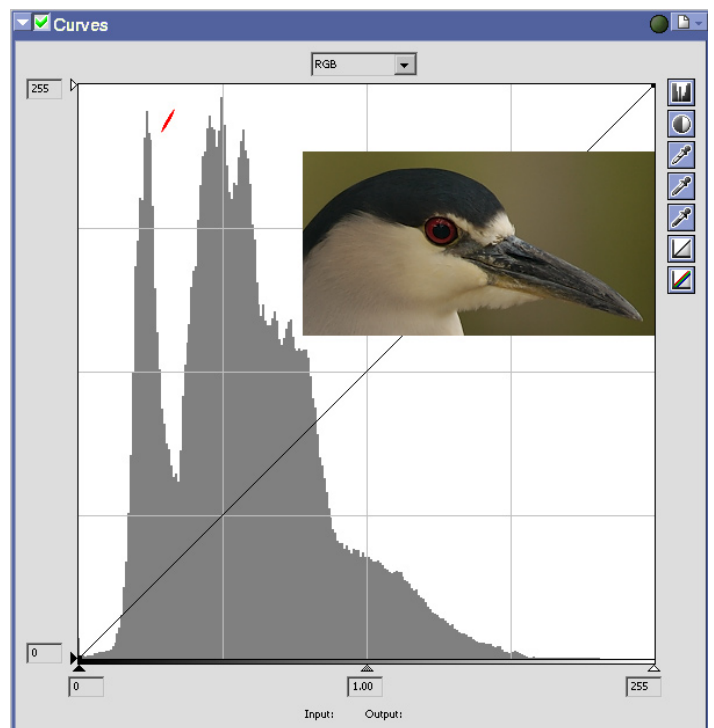
4. Save the final image as TIF (RGB), 8bit. As we have done all of the color work already, there really is no reason to save a 16bit file. The color from a TIF is superior to that of a JPG from my tests (perform some of your own by saving the identical image in JPG and comparing). I also prefer not resaving JPGs as every save induces losses, so I save master files as TIF and only save JPGs for web use.

I will go into greater detail on how to evaluate and select the final Gamma setting as we progress through the Processing section.
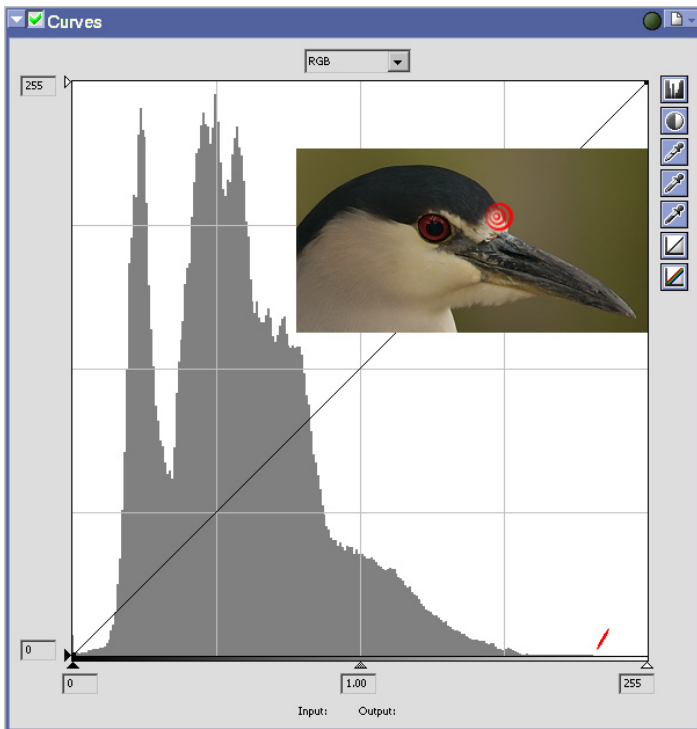
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# Image Processing — Black-Crowned Night Heron

If you want to follow along, open the **BCN_Heron_0875.nef** on the CD. The first thing we need to do is adjust WB and EV. I have marked on the histogram and insert the three points of interest: the mark in the mid-shadows shows the area to watch when setting the WB, the mark in the highlights shows the area to watch when adjusting the EV, and the red bullseye in the insert shows the area to be sampled to verify the WB setting. I will use this image to show you another technique to set WB when no neutral object is present.

At 6024K (Cloudy WB), where the image was shot, the point indicated by the bullseye is 110, 108, 101, slightly lacking in blue, and you will note that the area in the mid-shadows is asymmetrical and lower in amplitude than it is in the histogram below, where it is set to 5681K and the point measures 107, 108, 106. If you have strong data in the mid-shadows, you can use this information in an image without a neutral object to set the WB. *The correct WB is where you achieve maximum amplitude with optimum symmetry.*


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Note the mark above in the highlight area, indicating the brightest part of the forehead as marked by the red bullseye. In the histogram below, the results are shown after +0.33EV has been applied, allowing the highlight region to nearly hit 255 (white). The forehead of this bird was just under white to the eye, and the image was underexposed by 1/3 stop.

The next step is to make shadow/gamma adjustments in the R, G and B channels and then in the RGB (luminosity) channel.
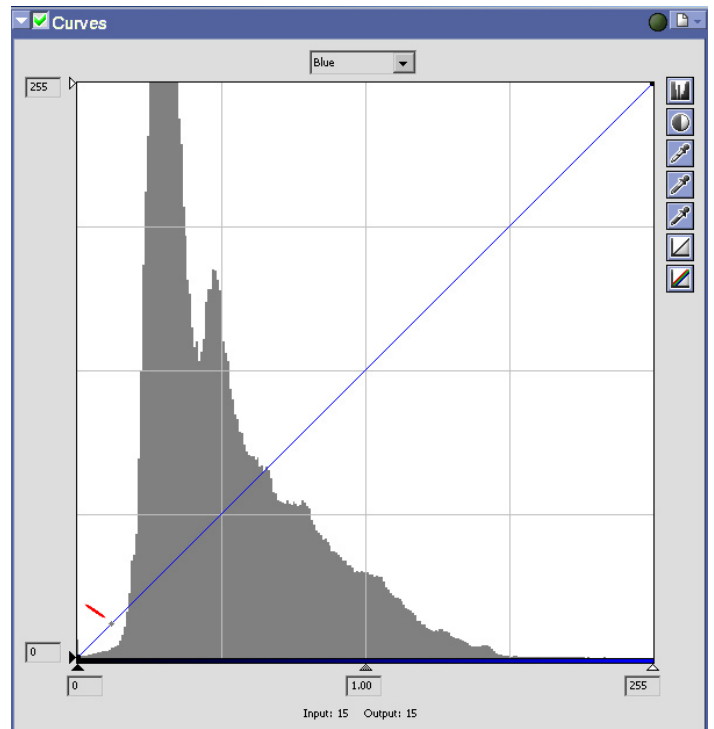

In the image above, note the bullseye placed in the eye and the mark on the linear curve of the Blue channel histogram showing the "bug" location for this point. There is no actual image detail in the eye, and it can be pulled to black, so this point is chosen as the shadow point in the R, G and B channels.

After processing several hundred thousand images, I have noticed that quite often, the point to set the shadows is located in the same point shown here: at the apex of the curve where the shadow data starts to rise to the shadow peak (at the point of inflection of the curve). Often, if you see histogram data like this, and you do not see that the shadows are blocked up (jammed up against the black end of the histogram), you will find that the proper shadow point is the apex of the curve, as in this image. This shortcut to the shadow neutralization process can save time in your workflow, but you won't see it every time.
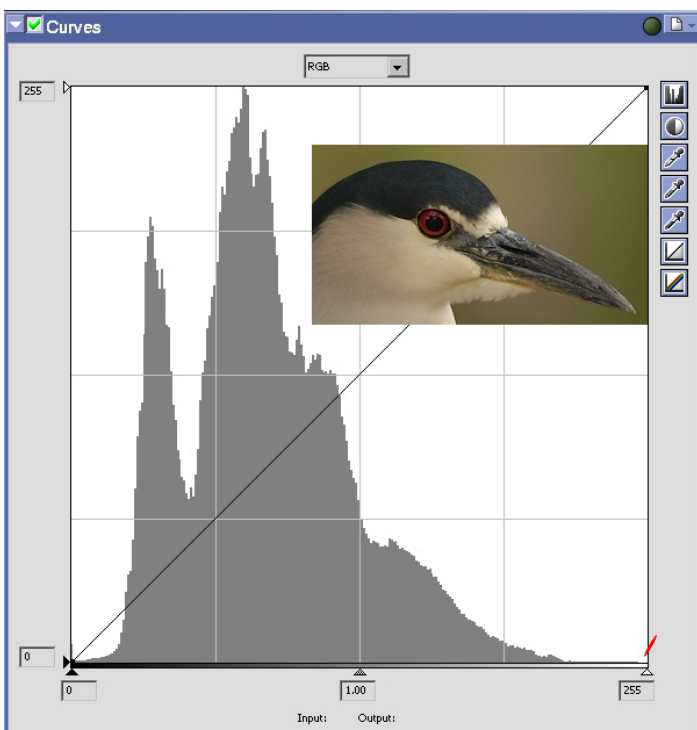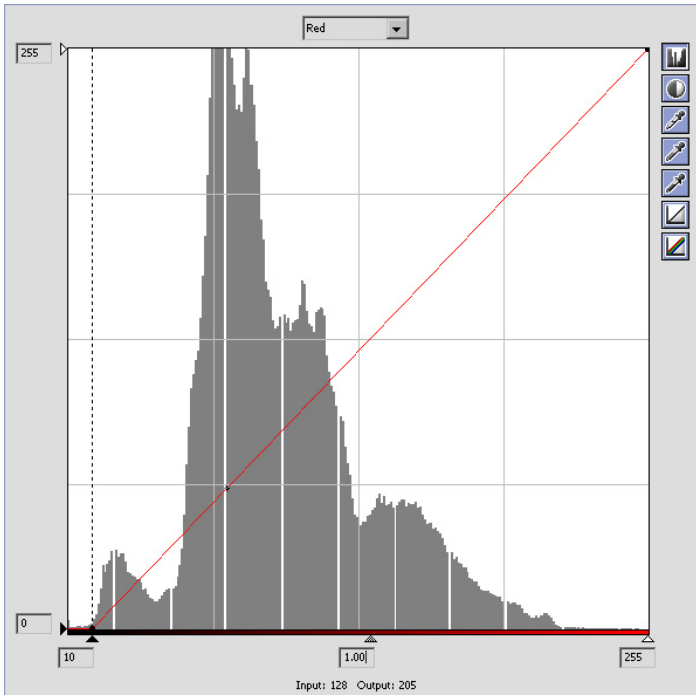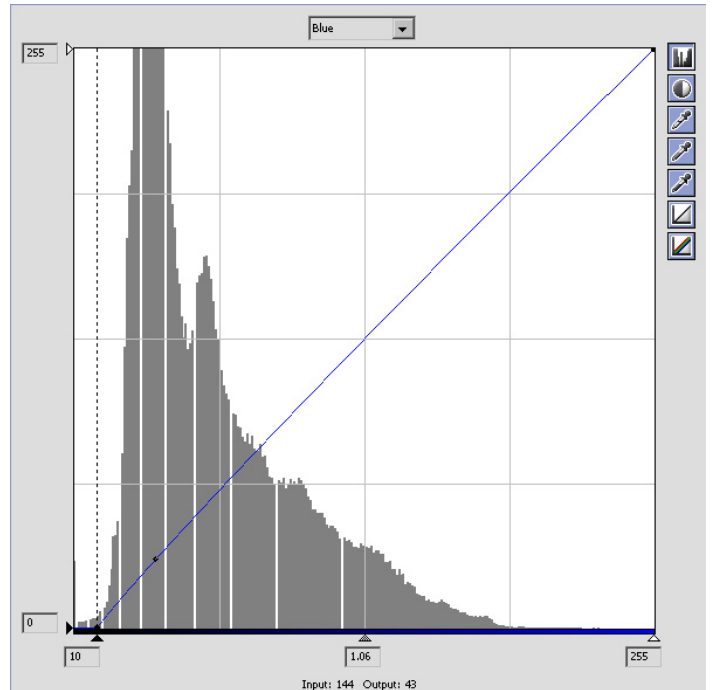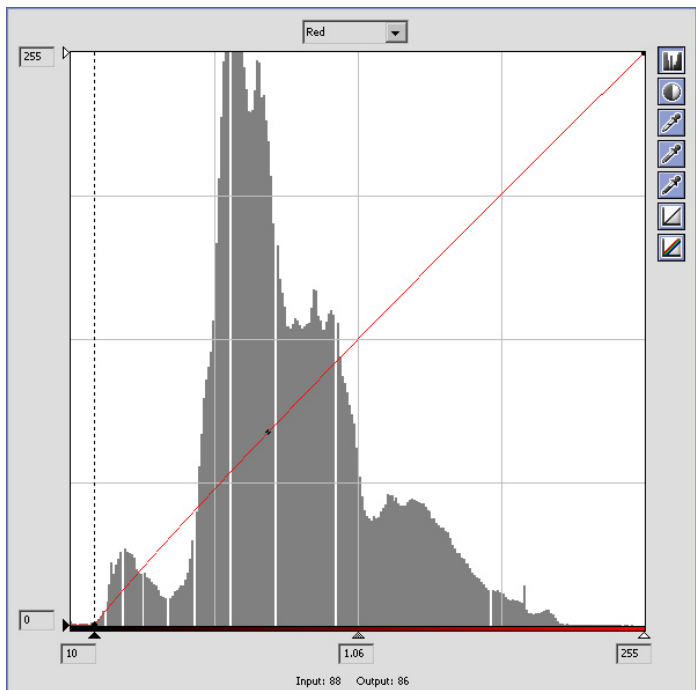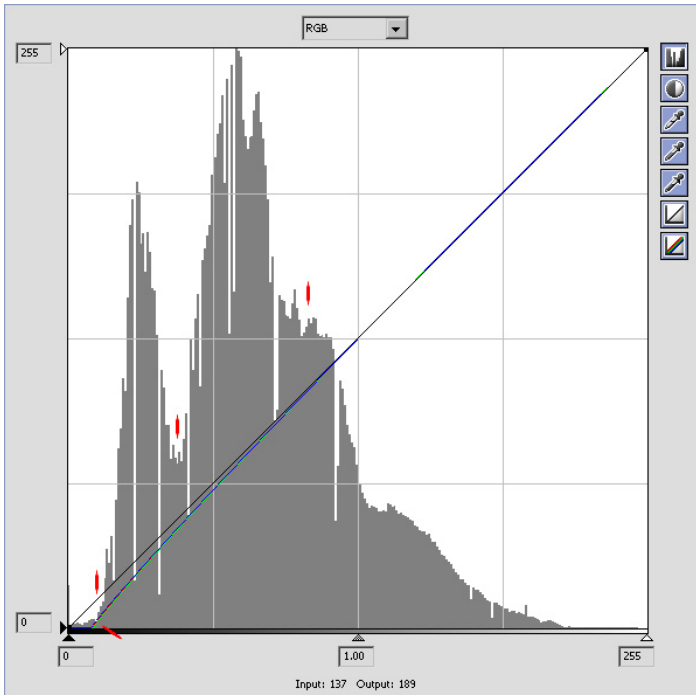
The histogram above shows the Red channel after the shadow slider has been pulled to meet the apex of the curve where it rises to the shadow-peak (the point we have selected to set our shadows). The histogram below shows the Red channel after moving the gamma slider back to the neutral position at the midline (representing the 128 division on the histogram, where the gamma slider resides before making any shadow adjustments). The next job is to duplicate this task on the Green and Blue channel histograms, which are shown in the next column.
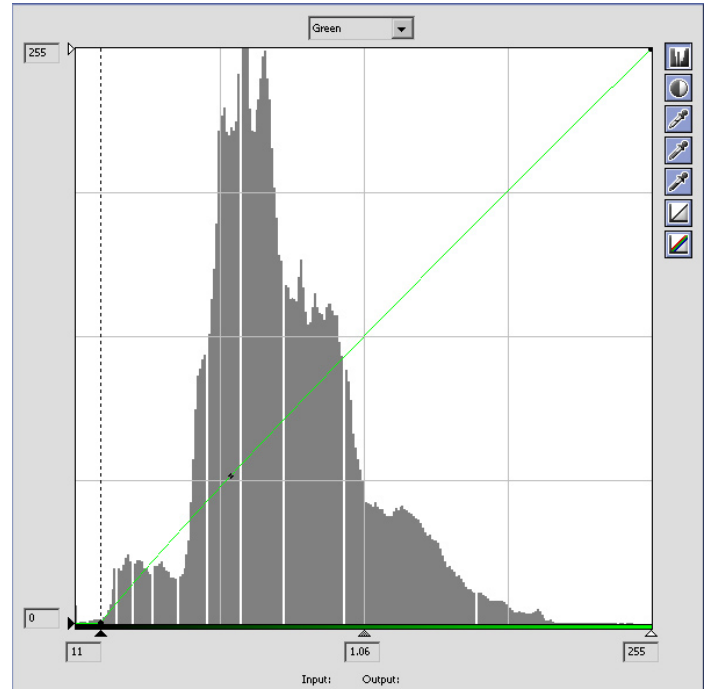
The Green channel histogram shown above has had both the shadow slider and gamma slider adjustments applied, to the same points chosen for the Red channel. The critical item here is to pull the shadows to the same point on the curve. Notice in the histogram below how the shape of the curve in the Blue channel is different than those shown in the Red and Green channels: the midtones are significantly compressed towards the shadow end and the shadow peak is much higher in amplitude, but again the shadow slider has been pulled to the same point on the curve.

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This image was chosen partly because it exhibits two of the *gamma indicators* which you will find in images that have strong midtones: a *"gamma ramp"* and a *"gamma plateau"*. The plateau is the flat region in the midtones between 93 and 115, and the ramp is indicated by the three vertical red markers. The 4th diagonal marker shows the position at the base of the ramp where we will pull the shadow slider to set the final contrast for this image. The histogram below shows the shadow slider in position, and the gamma slider moved until the curve follows the ramp.

Above is the shot before and after processing, the image below is the final image. **BCN_Heron_0875.tif is on the CD**.

44
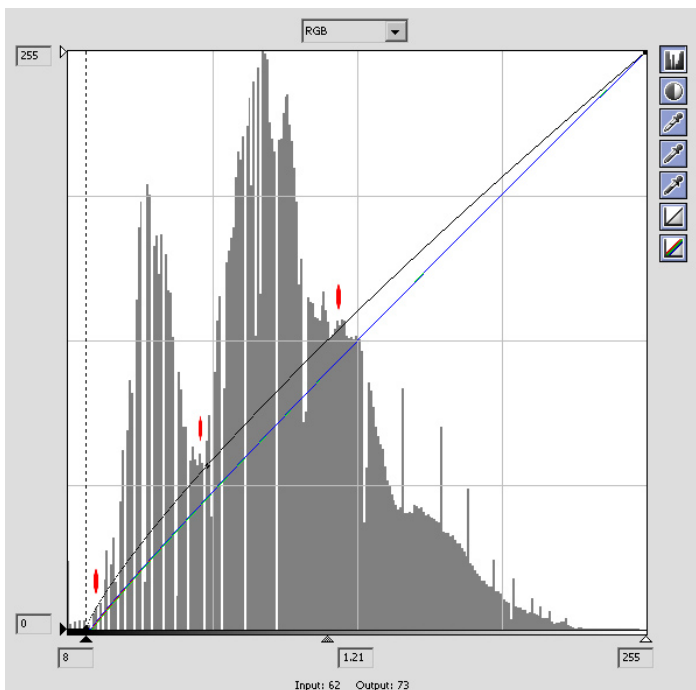
Black-crowned Night Heron — Summary

In the processing of this image, we learned several new things:

1. How to use the **Mid-Shadow Peak** on the histogram to set or verify White Balance. This is especially useful when there is no neutral object in the frame which you can sample to establish neutrality using the Info Palette;

2. How to use the information at the highlight end of the histogram to adjust exposure using the **Advanced RAW EV** control. This is going to be used on many images, and I will show you more about this when we process more images later in this section;

3. How to use a **Shadow Without Detail** to determine the shadow point (the point to which we will pull the shadow slider in order to neutralize the R, G and B channels);

4. This image exhibited several common characteristics which you will see on many histograms. The first of these is that the shadow point occurred at the **Apex of the Curve leading to the Shadow Peak**; the second is that the shape of the curves for the Red, Green and Blue channels were significantly different, but we pulled the shadow slider to **the same point on the curve** to neutralize the shadows. This is very common. In some cases, you will have one channel's shadows blocked up (plastered against the left edge of the histogram), and you will then use that shadow point as the reference point to which you will set the other channels, but in most cases if the image was properly exposed, you will have some latitude to make shadow adjustments. You will often pull the shadow point to the apex of the curve as we did on this image.

5. Finally, this image gave us our first look at both a **"Gamma Plateau"** and a **"Gamma Ramp"**. This allowed us to process the image with specific **"Gamma Indicators"** on the histogram. The empirical information makes the final gamma adjustment points quite easy to see, allowing you to set gamma quickly by placing the shadow point in the RGB channel at the base of the Gamma Ramp, and moving the gamma slider so the curve is on the ramp.

It is not all that common to see a Gamma Ramp and a Gamma Plateau in the same image. More often, you will see one or the other. Sometimes, the ramp is far better defined, and it is quite easy to see. Often, when the image has strong midtones and weak shadows, the Gamma Ramp is on the left side of the midtone peak. Sometimes the Gamma Plateau is just a little bump in the midtones (this usually occurs when the midtones are compressed into the shadows), and sometimes it is very strongly defined. Sometimes, you will find an image with very strong shadow information and very little midtone information. When this occurs, you will often find that there is no Gamma Ramp or Gamma Plateau, and Gamma Point indicators are difficult to see. When this happens you can use the following ranges for Gamma, developed by evaluating hundreds of thousands of images and watching for patterns to emerge:

Gamma Ranges

Low Gamma:	*1.08 to 1.11*
Medium Gamma:	*1.16 to 1.20*
High Gamma:	*1.28 to 1.31*

These ranges do not take into consideration the adjustments made to shadows, and the required adjustments to the gamma slider necessary to bring the image back to neutral gamma. For instance, if your shadow setting is 8, the neutral gamma point will be reached at 1.05. This will alter the Medium Gamma range shown above so that the low point occurs at 1.21 instead of 1.16. What you can do when working on an image that does not have readily-apparent Gamma Indicators is do your work in the R, G and B channels, then in the RGB channel, pull the gamma slider into the ranges shown above and look at the image. Quite often, when you move the gamma slider you will see gamma points appear within one or more of these ranges as the histogram stretches out. If not, evaluate the midtone character and make a judgement call.
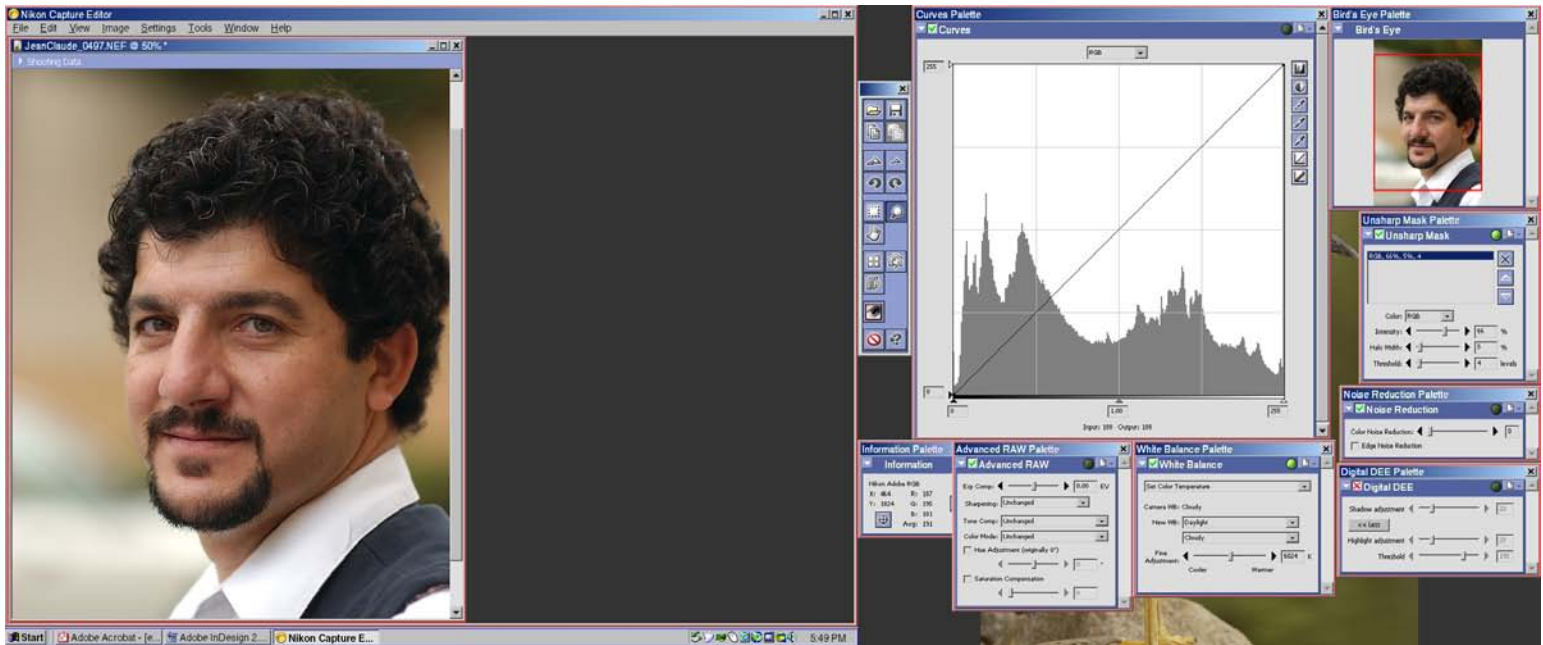
This time, we are going to use a neutral area, indicated by the red bulleye below, to correct White Balance using the *"Set Gray Point"* option in the WB dialog. When selecting an area to sample or set WB, make sure that the area does not have a blown channel.


After White Balance Adjustment
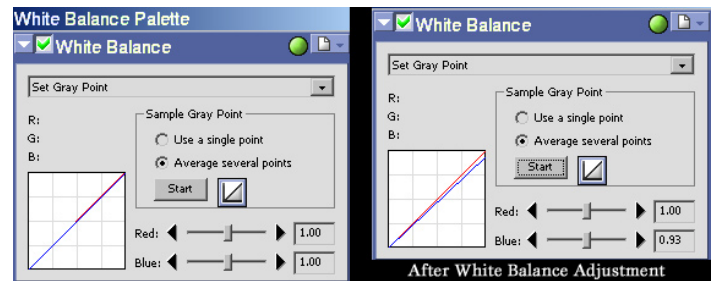
In the image above, you will notice that I have set the WB dialog to the Set Grey Point option. Notice also that the "Average Several Points" option has been selected.

Click the Start button and move the little eyedropper over the target area. Click on a number of spots to average several points. When you have finished sampling points, hit the Stop button (the Start button changes to Stop when activated). Before using the Set Gray Point, the target area was 225, 223, 233. After finishing Set Gray, it is 224, 225, 223.

You have achieved neutrality when the Info dialog shows identical or near-identical values for Red, Green and Blue.

The next step is to set EV. In this image, the highlights on the white shirt actually hit white (255), so we will be able to work on an image that has a significant amount of white in it. In this particular case, the image was mildly overexposed, which will allow us to explore additional techniques as well.

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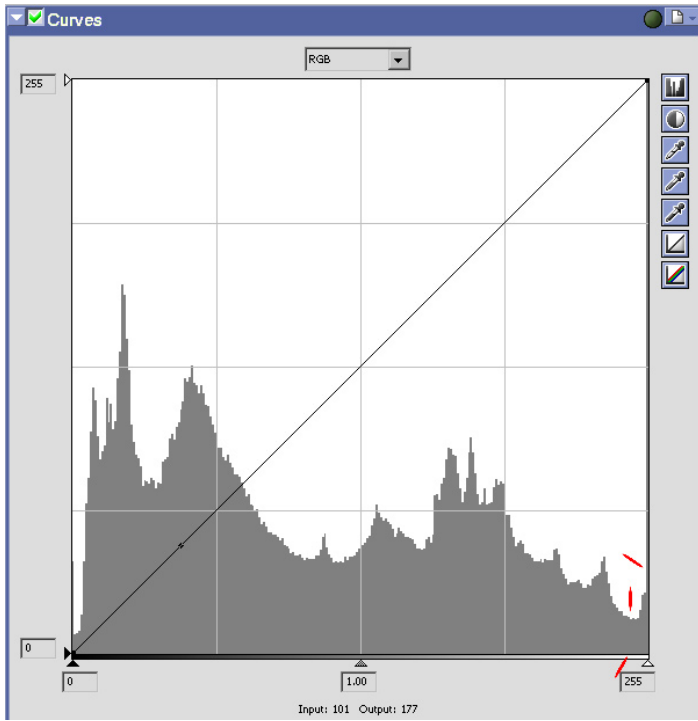
This image was overexposed by 1/4 stop. The points of interest on the curve are indicated in red. Note the height above the baseline at the right end as well as the clipped spike at 255. The red marks in the histogram below show the location of the spike after EV reduction and a gap on the right edge.

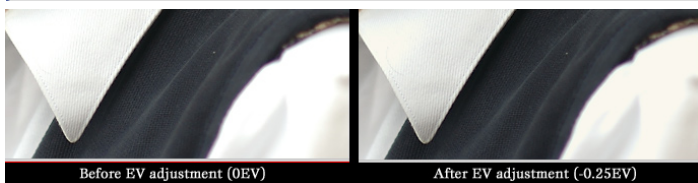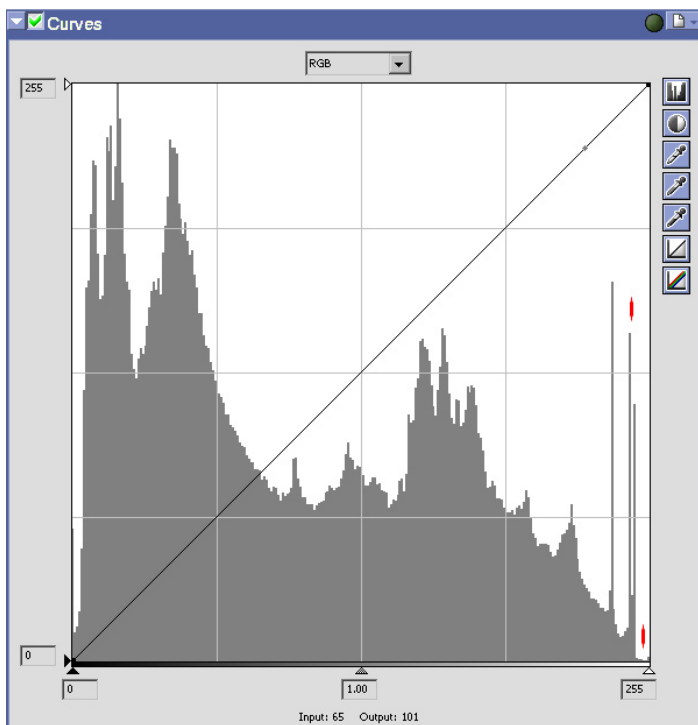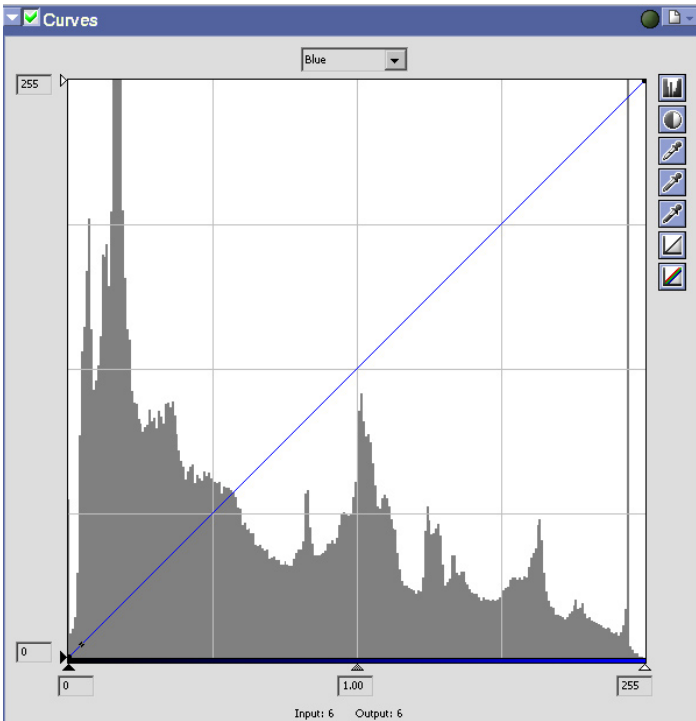Before EV adjustment (0EV)   After EV adjustment (-0.25EV)
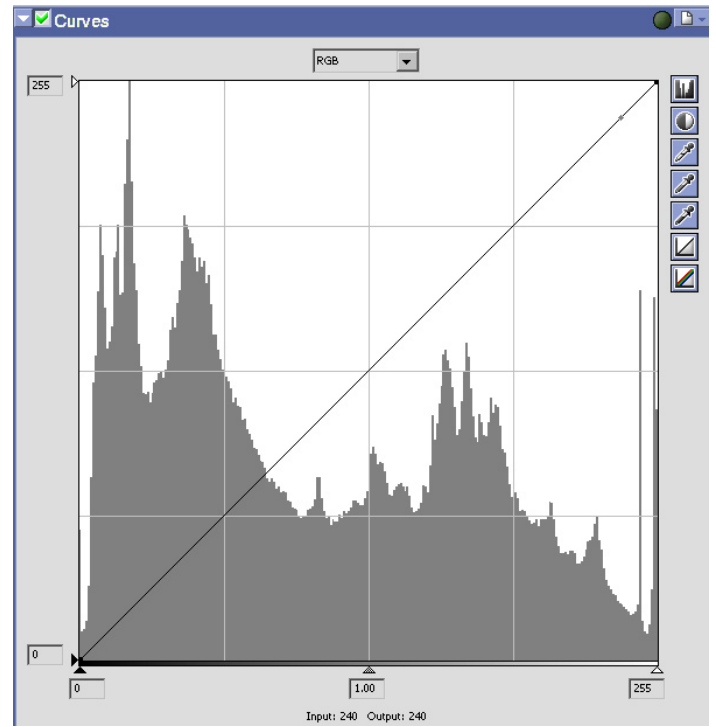
Ideally, this shot would have been taken with -0.33EV of exposure compensation to save the highlights, however, since it wasn't, it is my opinion that to reduce the highlights down to the optimum exposure leaves the highlighted area looking somewhat flat and grey. I therefore tend to place the specular highlight (the spike at the right) so that the spike just barely touches white, as shown in the histogram above. This point is achieved at -0.11EV in the Advanced RAW dialog.

If at all possible, try to avoid overexposure when there is a large amount of white in the scene. If you overexpose by much more than about 1/6 stop, you will have a situation like the one shown in this image where the recovered highlights look flat and grey.

Under normal circumstances you can expect to be able to hold highlight detail with a maximum overexposure of about 0.5 stops. This assumes that you don't mind allowing the highlight to hit white, as I do here.

Remember, we all goof up occasionally (I do quite often). Hopefully, we can learn from our mistakes and do better the next time. The way I look at it is that I have made well over half of all possible mistakes — while I'm still making them regularly, I have a rather large mental database of ways to avoid screwing up, although I am continually adding to it.

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Here we have one of those tricky images where the midtones are somewhat compressed into the shadows, and the gamma indicators are more difficult to see. I've marked the low and medium gamma indicators on the histogram above. As you can see, they are teeny little notches in this image — we don't have those blatant gamma ramps or plateaus to work with. When checking low and medium gamma, I found that I preferred the image at the low gamma point as shown below.

In this image, the shadows are quite dark already. We really don't want to darken them much when we neutralize. By checking an area in the hair with no detail, we can see the point to which we will pull the shadow slider. Notice that it is, as often occurs, at the apex of the curve leading to the shadow peak (as we found when working the Black-Crowned Night Heron). We are going to set each of the Red, Green and Blue channels to this point. Frankly, the R, G and B channels are balanced in this image, but we could use the practice. You'll find each channel balances to 2, 1.01. We'll then take care of the RGB channel.

Jean-Claude — Summary

Many times, when you run into an image like this which has nearly-blocked shadows that are almost perfectly balanced (in this case, exactly balanced once we had done the WB adjustment), you will simply go straight to the RGB channel and do final shadow and gamma contrast adjustments. In this particular case, we went ahead and did the small adjustments in the Red, Green and Blue channels to get some practice.

We did some new things again:

1. We selected a neutral area to sample and used the *"Set Gray Point"* option in the White Balance dialog. We used the **Average Several Points** option, and sampled a number of points in the area to balance the image;

2. We processed an overexposed image, reducing the **EV in the Advanced RAW** dialog until the spike indicating the overexposed white was **just touching the 255 border**. We did check to see what the image would look like if we reduced the exposure by -0.25EV, to reach the correct level, but decided that due to the flat, grey character of the highlighted part of the white shirt, it would be better to leave it slightly overexposed;

3. The last thing we did (after doing the minor shadow/gamma adjustments to the Red, Green and Blue channels) was to do the final gamma adjustments in the RGB. Because we did that minor work in the Red, Green and Blue, and because the shadows were already rather dark, we did not have to make a shadow adjustment in the RGB. This allowed us to do a pure gamma adjustment in the RGB channel, which was a good thing, because this image had **very obscure gamma indicators**.

By performing a pure gamma adjustment when the gamma indicators are either very difficult or impossible to see, sometimes the histogram stretches enough to see the gamma indicators. If not, try the gamma ranges I have given you and look for an indicator to appear, or evaluate the look of the image itself and make a judgement call based on the character of the midtones.

The somewhat compressed character of the mid-shadow-to-midtone transition as seen on this image is not altogether unusual. Sometimes, this sort of thing occurs when you also have very little in the way of midtone information at all, and it becomes very difficult to see the gamma indicators. Remember, when this sort of thing happens, use the gamma ranges I gave you to check both the image and the histogram — often, you will be able to make a rapid judgement call as to the proper level of the midtones. Sometimes, the histogram will stretch out enough when you pull the gamma that you can see the gamma indicators appear. One way or another you will be able to determine the desired gamma. If the image also requires an RGB channel shadow adjustment, you will then know what the proper gamma range will be, and can add that gamma to the gamma point necessary to neutralize for the shadow adjustment you had to make.

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Image Processing — Chilean Jasmine
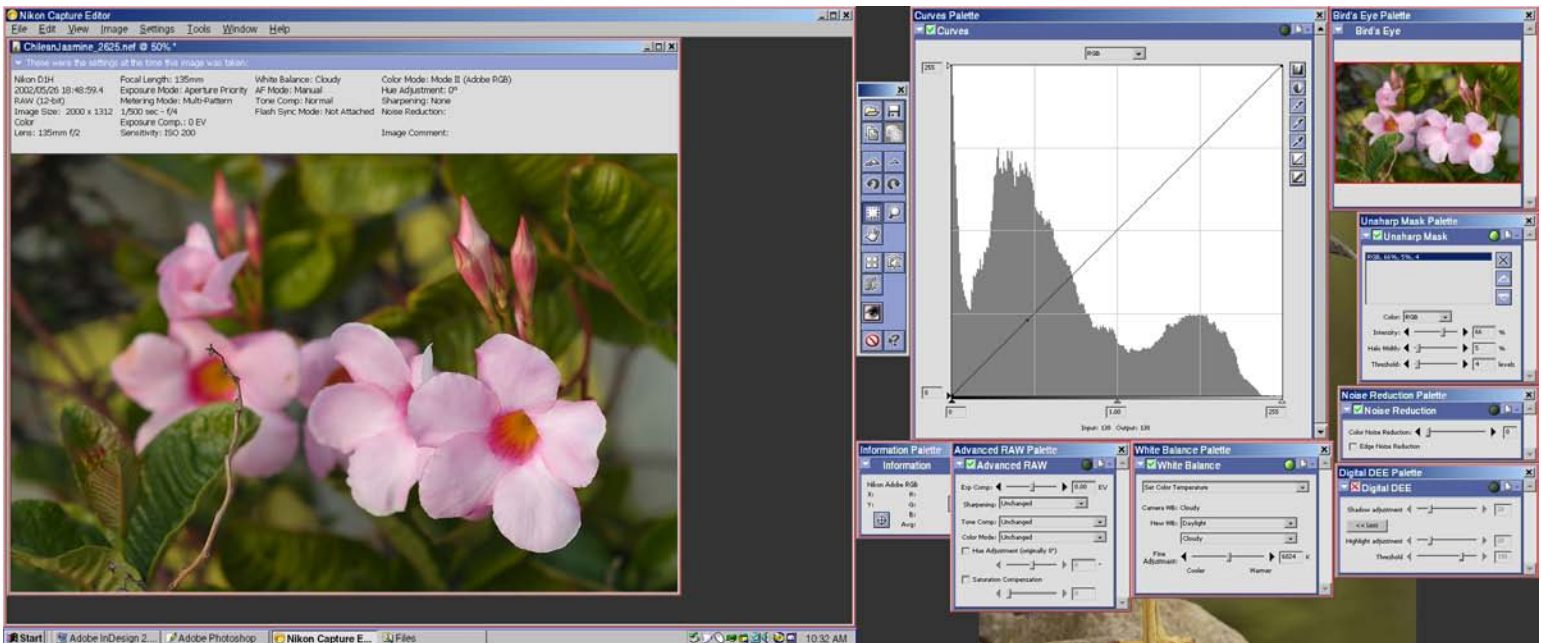
ChileanJasmine_2625.nef offers us an opportunity to work on a file which has several common situations: no neutral regions to sample for WB adjustments and an image that was taken in semi-shade; a blocked Blue channel whose shadow level is irrelevant to the character of the image's gestalt; and as in the last image, a strong shadow character with a weaker midtone level, which causes compression of the lower midtones into the upper shadow region, making it difficult to see the gamma indicators. This will be interesting…

Since we don't have any neutral areas to sample, we're going to use the mid-shadow peak amplitude when setting the WB. In the two histograms below, the left one shows the data at 6024K. The right one shows the histogram after reducing the color temperature to 5524K. Note the mid-shadow data has risen to maximum amplitude. This image was shot in semi-shade, and was indirectly lit, but the light outside of the shade was rather warm as it was the end of the day (note the shooting time). This caused a somewhat unusual WB.
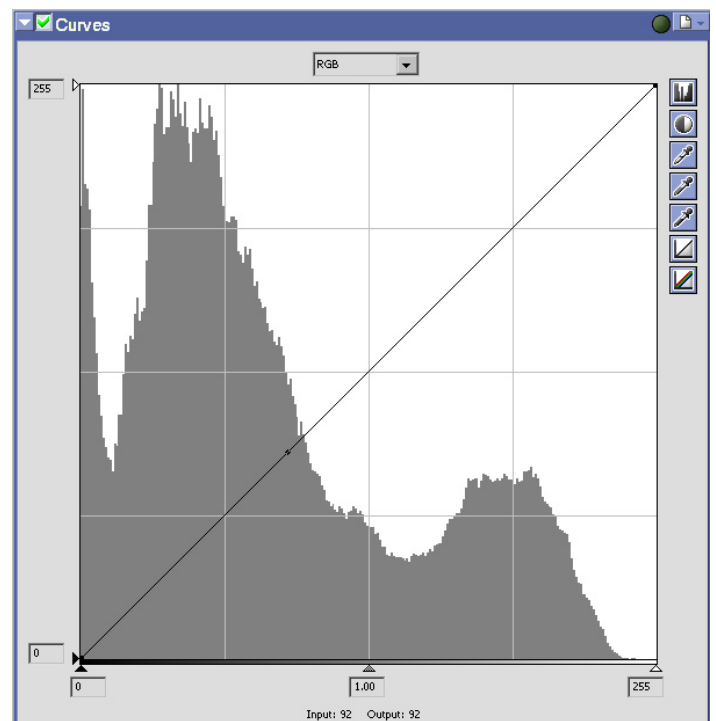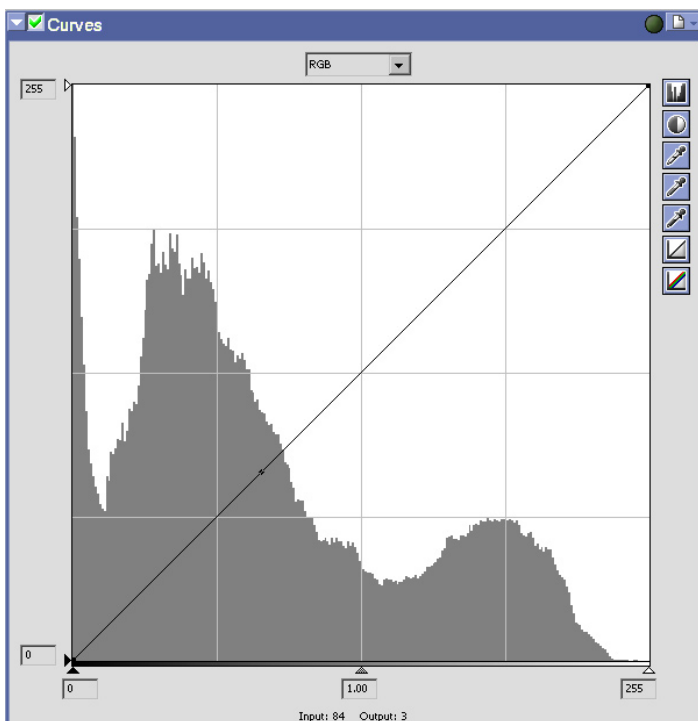
This image above shows the result after setting the WB to 5524K. Note the bullseye at the upper left. This is the area we will use to set the shadow level. Notice below the histogram for the Blue channel. This channel is blocked in the shadows, and normally we would use that shadow level as the reference point to neutralize the shadows, but in this case the darkest relevant shadows in our image are in the 15-20 region, such as the one we selected. As those shadows were not black, we are going to pull the shadow slider to a point just before the point indicated by the "bug" on the histogram below. If you look in a line straight up from the bug, you will see that the bug is indicating the little spike at the top of the mid-shadow peak. We're going to place the shadow point at the bottom of the little valley before the peak so that shadow is not black.
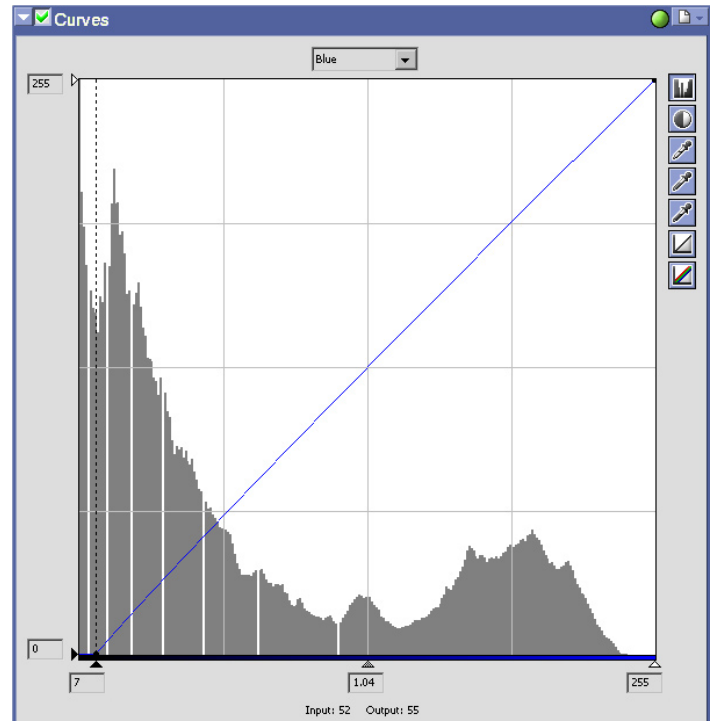
The histogram above shows the results of setting the shadow point in the Blue channel to the bottom of the valley before the mid-shadow peak. The histogram below shows the Green channel. Note the entirely different character of the curve (shadows are not blocked up). When the same spot is sampled, the point indicated on the curve is shown by the "bug". We are going to pull the shadow slider to the point on the curve indicated by the red mark, which corresponds to the same point as the bottom of the little valley above.

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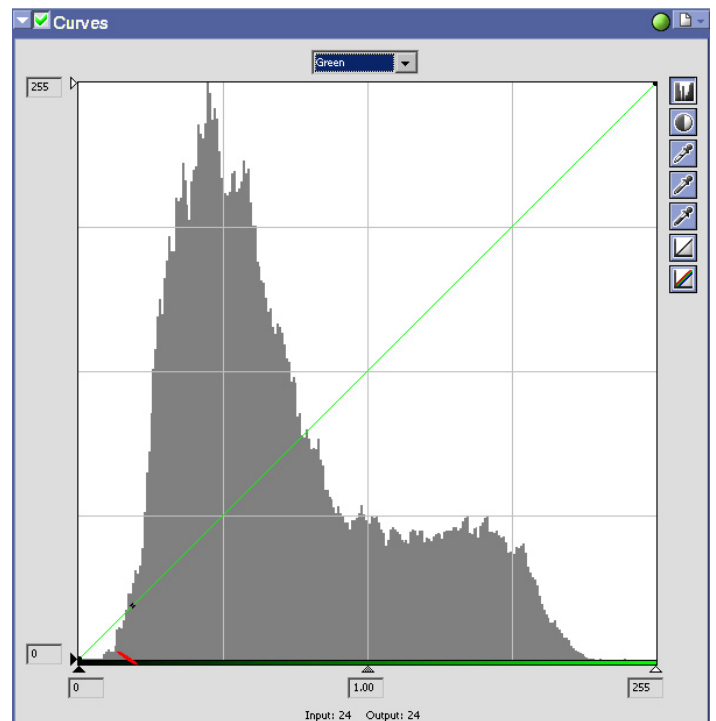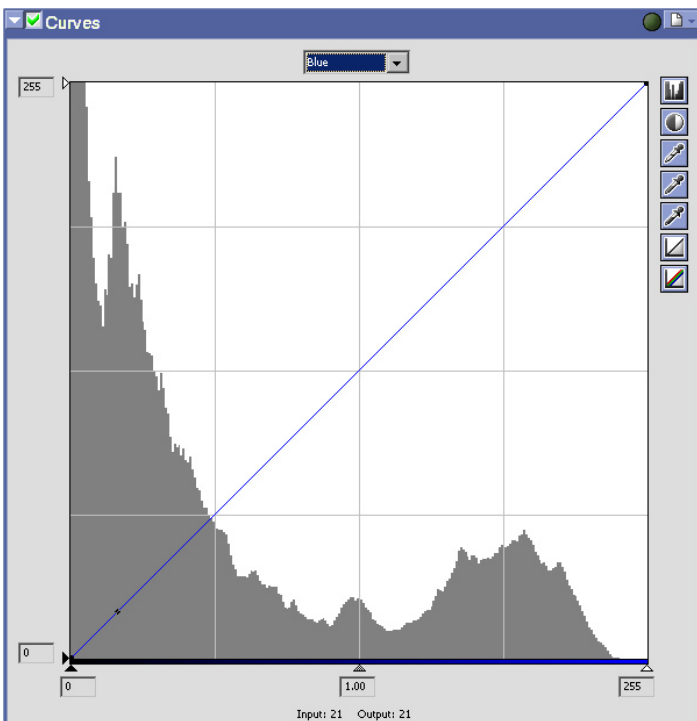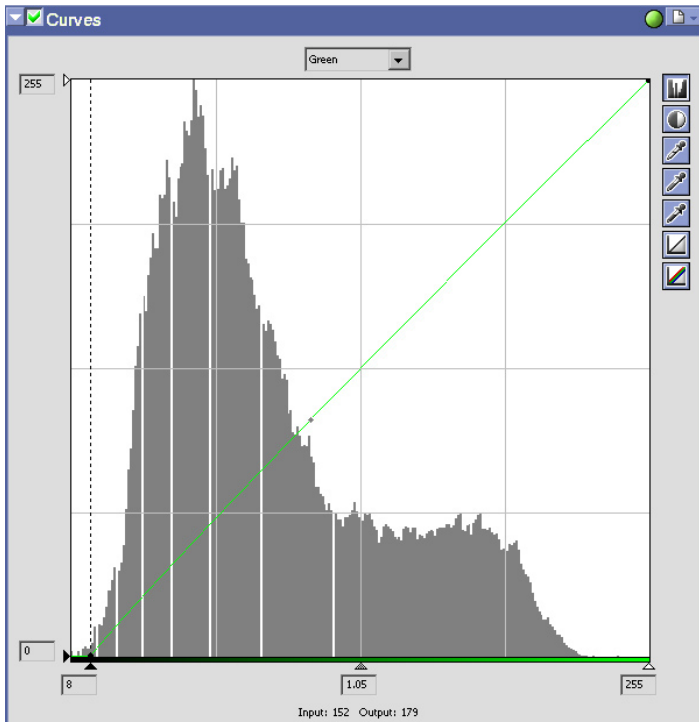
The histogram above shows the results of making the adjustments to the Green channel. The Red channel is going to require a very similar approach, as you can see in the histogram below. The red mark shows the point on the curve that we are targeting, which corresponds to the same area we used on the Green channel curve (notice where the "bug" shows the location on the linear curve of the measured shadow). Make the adjustment shown and you will achieve the results shown in the histogram at the top of the next column.
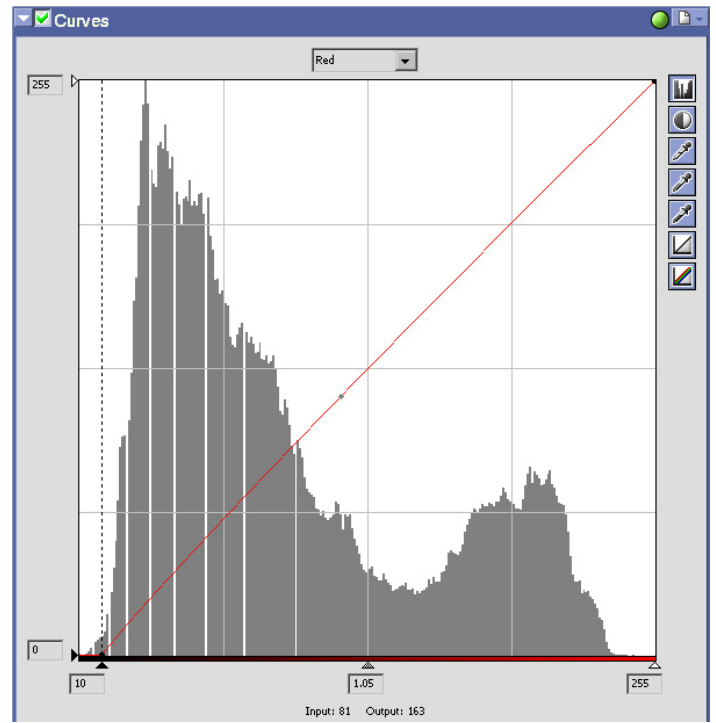
Now it is time to make the shadow and gamma adjustments to the RGB (luminosity) channel. By placing the cursor on the same shadow we've been using for a target, you will see that the "bug" is at the center of the small peak in the mid-shadows, just after the valley marked in red in the histogram below. We are going to pull the shadow slider into the center of that little valley and neutralize the gamma so we can try to see gamma indicators a little more clearly. The results are shown at the top of the next page.
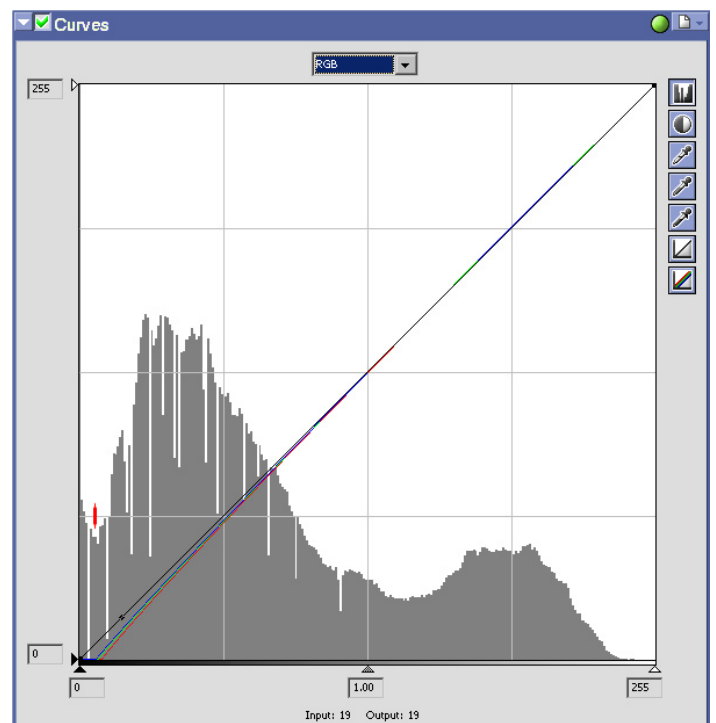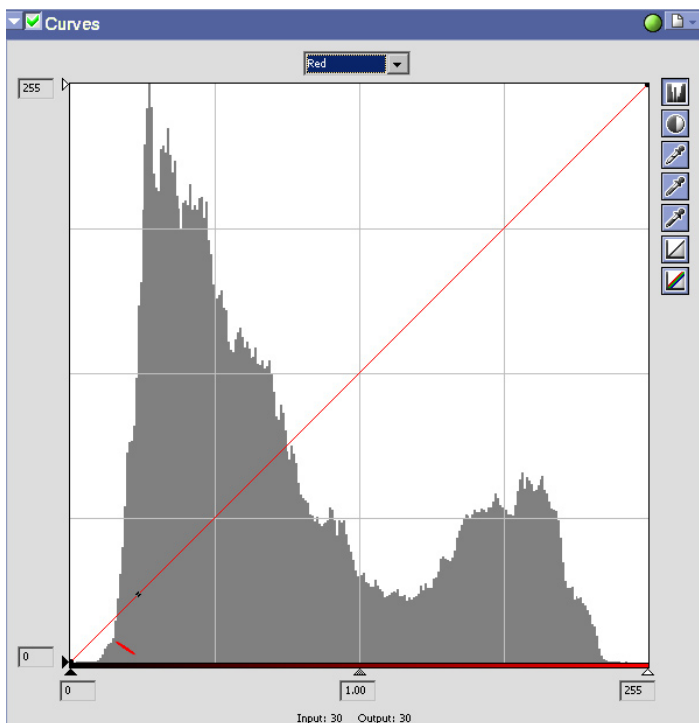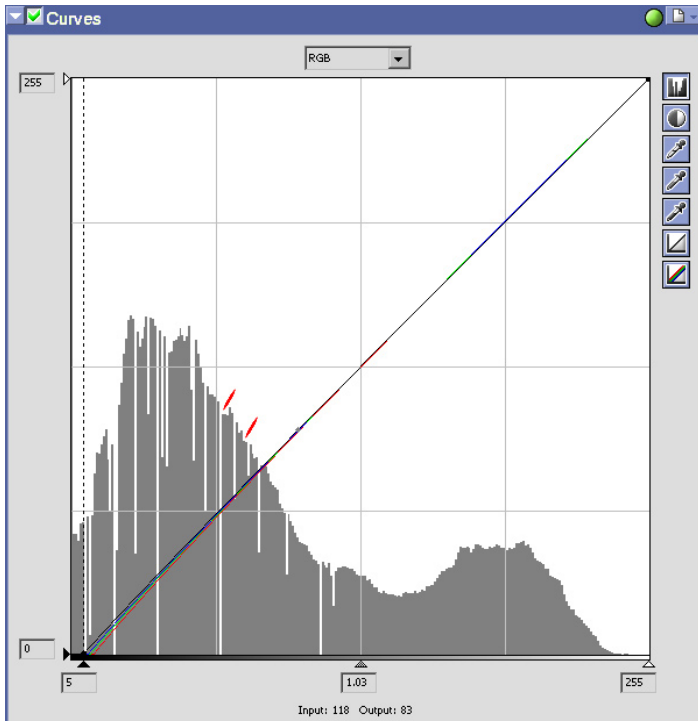
The histogram above shows the RGB channel before doing the final gamma adjustment, but with the shadow adjustment made and the gamma set to neutral. The marks show the low and medium gamma points. Below is the RGB channel after setting to the low gamma point (determined by judgement call to be the correct placement for this image) as well as a final tweak to the exposure by adding +0.17EV. I left the EV correction for last until I had made all WB adjustments… it could have been done earlier though.
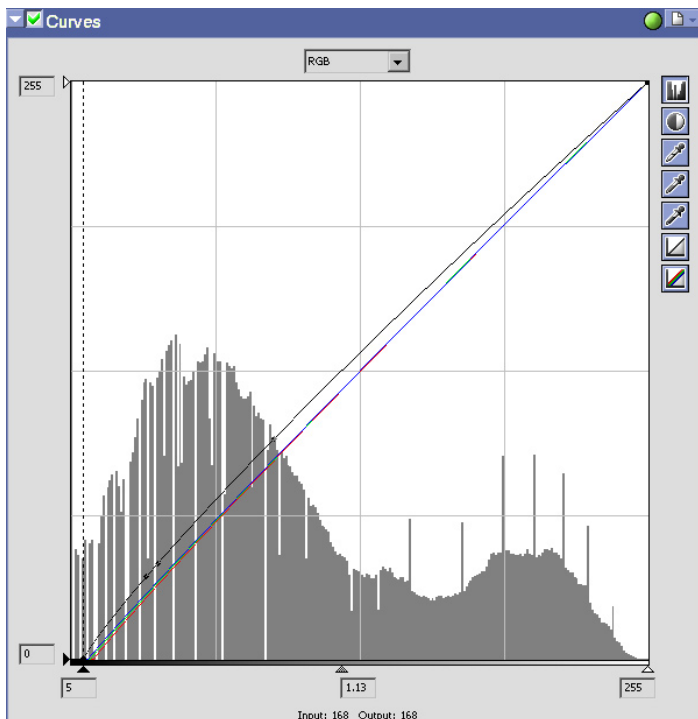
Above, you can see a comparison of the original image and the final image after the processing is complete. The original image was overly warm for the semi-shaded conditions… the lower image is true to the color of the flowers in the conditions they were taken in. There were a number of totally valid ways in which the WB could have been set in this image — we could have raised the WB to roughly 7300K to simulate direct lighting at that time of day, left the WB as it was to simulate indirect lighting without shade at that time of day, or set the WB even lower to simulate the look of full shade on the flowers.

In this case (and in 99 % of images), I prefer to set the WB to yield as close as possible to the reality of the scene as it was shot. Sometimes, either I or my client are after a specific look, and I make alterations as necessary. As photography is both art and science, there can be significant artistic leeway when presenting an image. When conditions call for creating a specific look, do what you must do. Reality is a valid result, but so is the artistic approach.

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Chilean Jasmine — Summary

In this image, we had several challenges:

1. The image was shot in semi-shade near the end of the day, which made adjustment of WB somewhat interesting. We processed for a presentation closest to reality, but there were other valid alternatives (e.g. the one to right);

2. The Blue channel exhibited blocked shadows, but our measured shadow point showed that the level was higher than the blocked shadows, thus we neutralized shadows just below the measured shadow point (maintaining some color detail);

3. The lower midtones were compressed into the upper shadows, thus making it difficult to see the gamma indicators. We did the shadow adjustment to the RGB channel and **brought the gamma to Neutral**, allowing us to examine the lower midtones and see what our options were for the final gamma adjustment. If you still cannot see the gamma indicators, try looking at the RGB channel before making a shadow adjustment and pull the gamma slider into the various ranges, seeing what is revealed after the histogram stretches out (when you pull the gamma slider). In this case, we were able to see gamma indicators with the shadow adjustments made and the gamma set to neutral, and selected the low gamma point.

4. The EV adjustment required for this image was very minor… the image was so close to the correct exposure that EV adjustments would be dependent on the WB setting (higher color temps would raise the Red channel, lower color temps would raise the Blue channel). Since the EV was so close, I preferred to make the WB and shadow/gamma decisions prior to making the EV adjustment. You could, of course, adjust the EV, then the WB, then fine-tune the EV, or reverse that order. In this case I felt it was best to wait for the final EV adjustment.

While being consistent is a good thing, sometimes it makes sense to alter the order of adjustments if it will make your job easier.
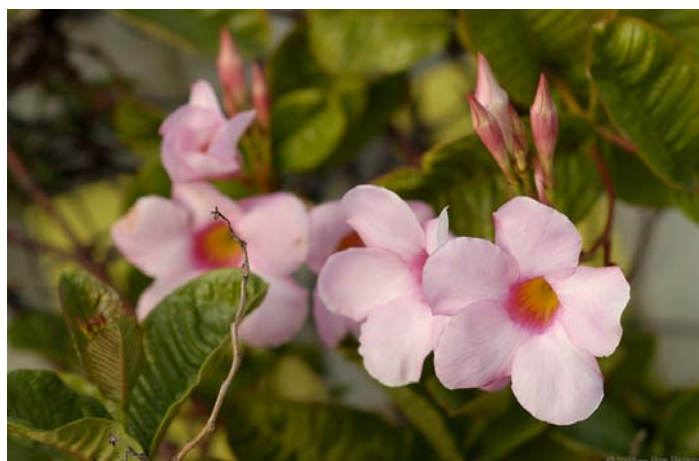
The top image above shows the Chilean Jasmine after processing as we did it together. The lower image above shows the exact same processing except for a change in WB to 7325K and a drop back to 0EV. This was done to make a point. If the long, low sunlight had been directly on the Jasmine it would have looked quite similar to this. The reason for dropping back to 0EV is because raising the WB elevated the Red channel level (and reduced the level of the Blue channel), causing a + EV gain that required the adjustment.

Sometimes, a realistic presentation of the original scene is not what is required for an image. Either you or a client may require the image with a different look than was present in the scene as you shot it. I prefer to present my images as close as possible to a realistic presentation of the scene as I saw it, but every now and then I have to make an change due to a client preference, or I just feel that the shot requires a little extra something for artistic reasons. If you need to make an adjustment to fit a requirement, by all means do so.

Image Processing — The Vietnam Memorial at Night
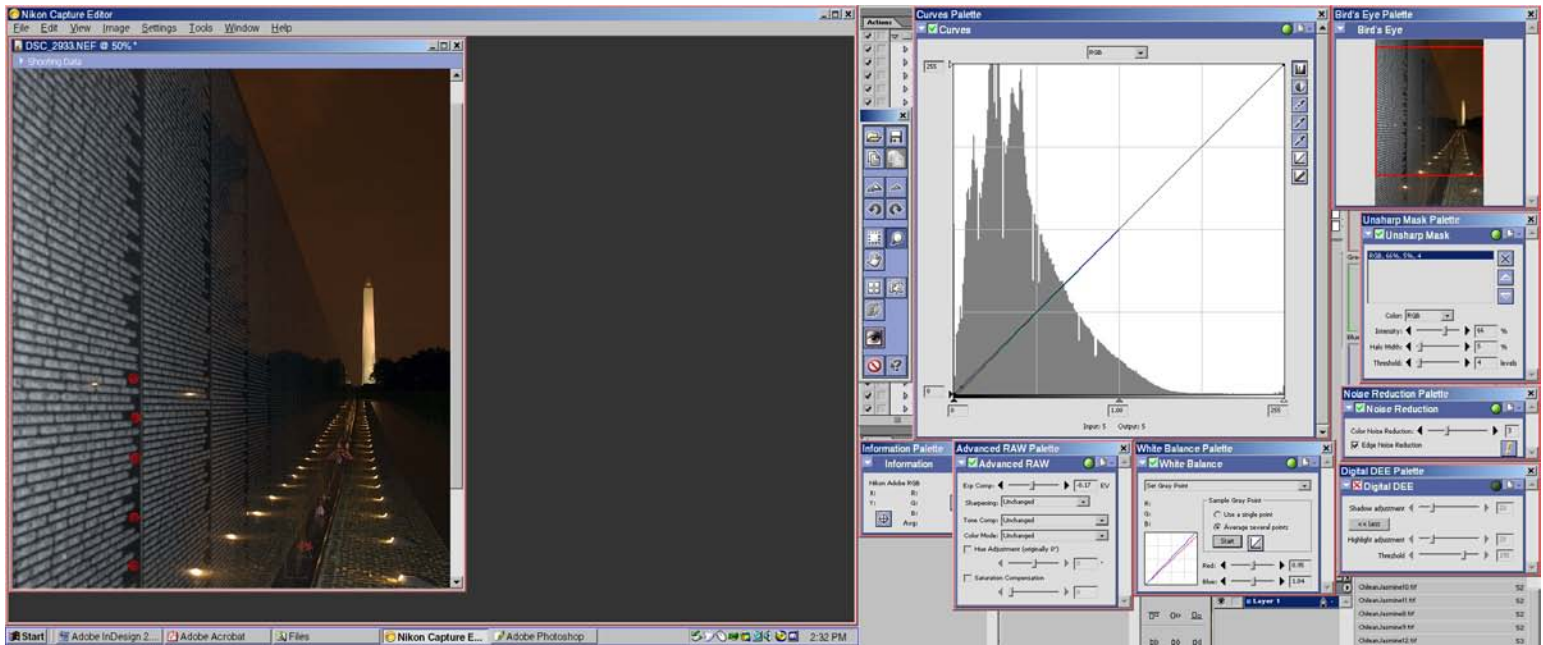
In ***VietnamWall_2933*** (on the CD), I have a number of points marked in red. These are the areas we are going to sample to set the WB, using the Set Gray Point option. Enable "Average Several Points" and click in a few spots in each area. Now, set -0.17EV to bring the specular highlight on the Washington Memorial down a bit. You will notice if you zoom in on the image above that I have applied a Color Noise Reduction (setting = 3) and enabled Edge Noise Reduction. The images below show results before and after application of the Noise Reduction (zoom in for detail).

The image below in this column (the one which has had noise reduction applied) also has an area marked, which we will sample to find the points to set the shadow points. The noise reduction in Capture is less capable when it is compared to some specialized noise reduction programs, such as Neat Image or Noise Ninja, but if you do not have either of those programs, Capture's noise reduction along with a little work in Photoshop will do a good job. The final image on page 57 has had the hot pixels cloned out, the sky selected, and a median filter set to 3 pixels was applied.
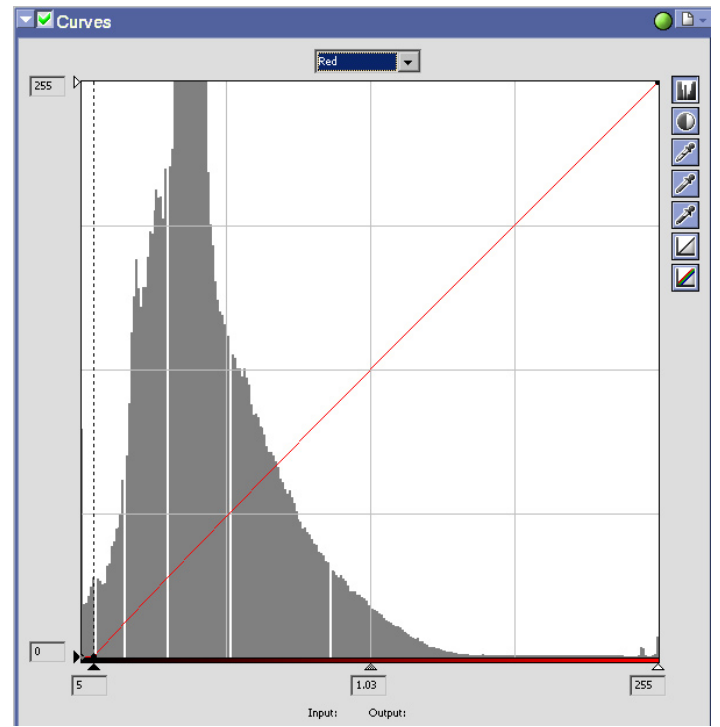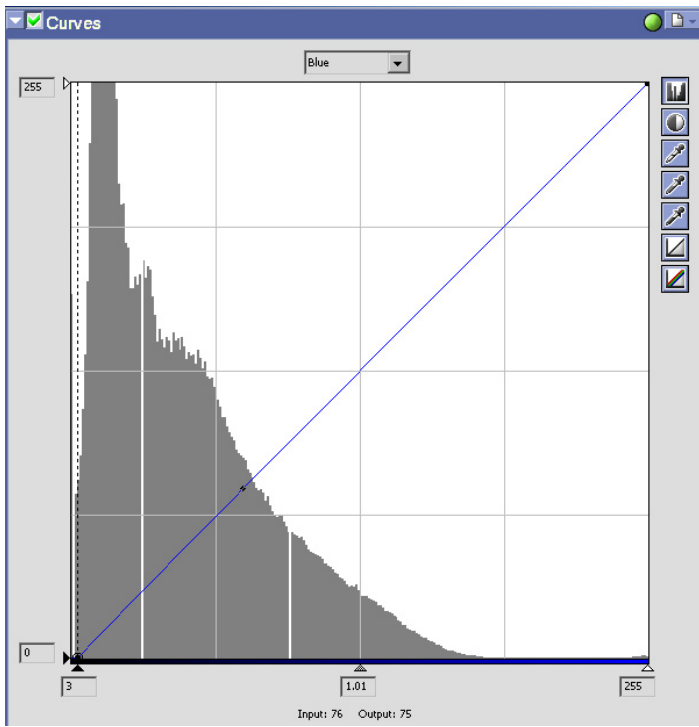
The images on this page show the Red, Green and Blue channels set to a point just above the indicated point displayed by the "bug" after sampling the marked area on the previous page. This was done to set that point to black. This image was achieved using slow-sync flash and a 1/2 sec. exposure to allow the ambient light in the sky to register, but the bushes were pitch black as was the wall below the Washington Monument. The focus point was on the flowers 1/3 of the way from the bottom on the right, in case you're interested.

To maintain the dark character of this scene, we are going to set the shadow point in the RGB channel to the spot marked in the histogram below, and set gamma to neutral (bring it back to the midline, just as we do after making shadow adjustments in the R, G and B channels). The results of this adjustment are shown on the next page. The final image is also shown, which has had the hot pixels cloned out, the sky selected, and the Median filter with a 3 pixel radius applied in Photoshop during post-processing.

The final image at neutral gamma.
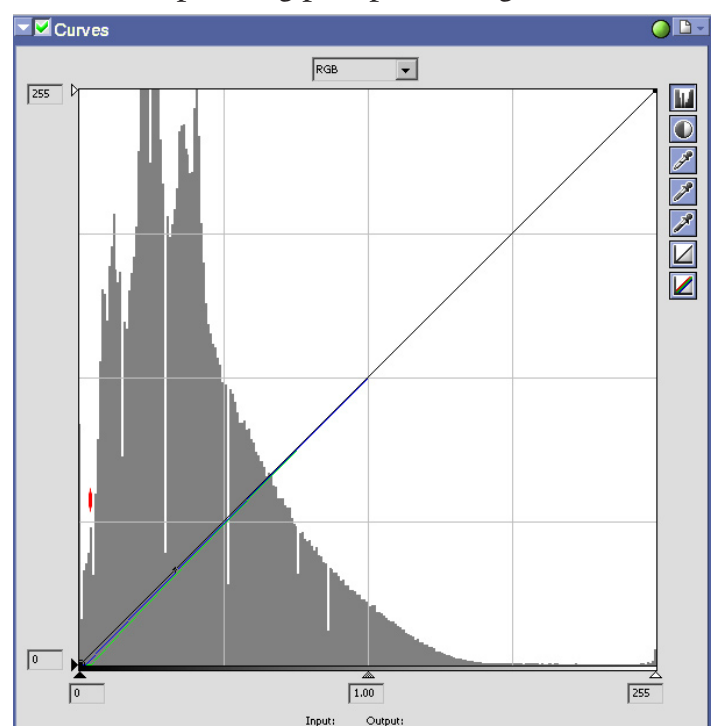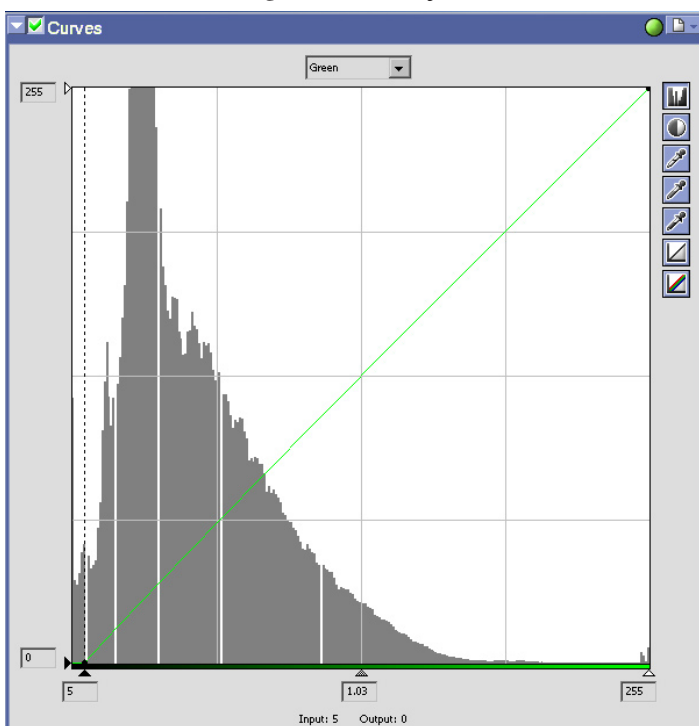
Vietnam Memorial — Summary

For this image, we used many of the same techniques which we have used previously, but with a few modifications:

1. We used **Set Gray** in the WB dialog and sampled several areas that were not reflecting the reddish light in the sky to set neutrality;

2. We set -0.17EV to reduce the highlight on the Washington Monument a little bit;

3. We applied a little noise reduction both by adjusting the slider for Color NR to 3 and by enabling the Edge NR (which sharpens the edges a bit as well). While this smooths the image details somewhat, it also reduces the distracting influence of the noise;

4. We sampled a point that was originally jet-black, found the location on the histogram, and pulled the shadow slider **slightly past that point** to set that point to black;

5. We used a similar technique in the RGB channel to set the shadow point, but to maintain the overall dark character of the scene we set the gamma in the RGB channel to neutral.

6. As there were a few hot pixels left in the sky and on the wall after applying the noise reduction, the image was opened in Photoshop, we cloned out the hot pixels by using the Rubber Stamp tool and sampling an adjacent area, then selected the sky by using the Magic Wand tool set to a tolerance of 10 and clicking on the sky, then filling holes in the selection. The selection was finally touched up by using the Polygonal Lasso in subtraction mode and drawing a line down the wall/sky interface first, then taking the lasso inside the wall to acquire the partially-selected area in the wall, then closing the lasso at the initial point. Once the selection was completed, a Median filter with a radius of 3 pixels was applied to clean up the sky as shown to the left.

This shot was taken with a tripod, using a shutter speed of 1/2 second at 28mm, f/4, ISO 400. The intention was to have the names on the wall defocused in this image, so I focused 8 lights down the wall on the flowers. I also took another shot with the names in focus.
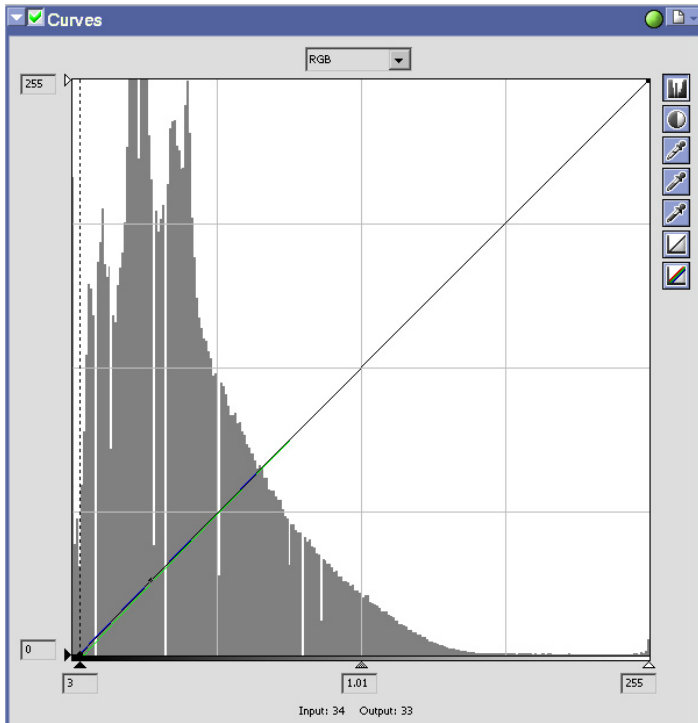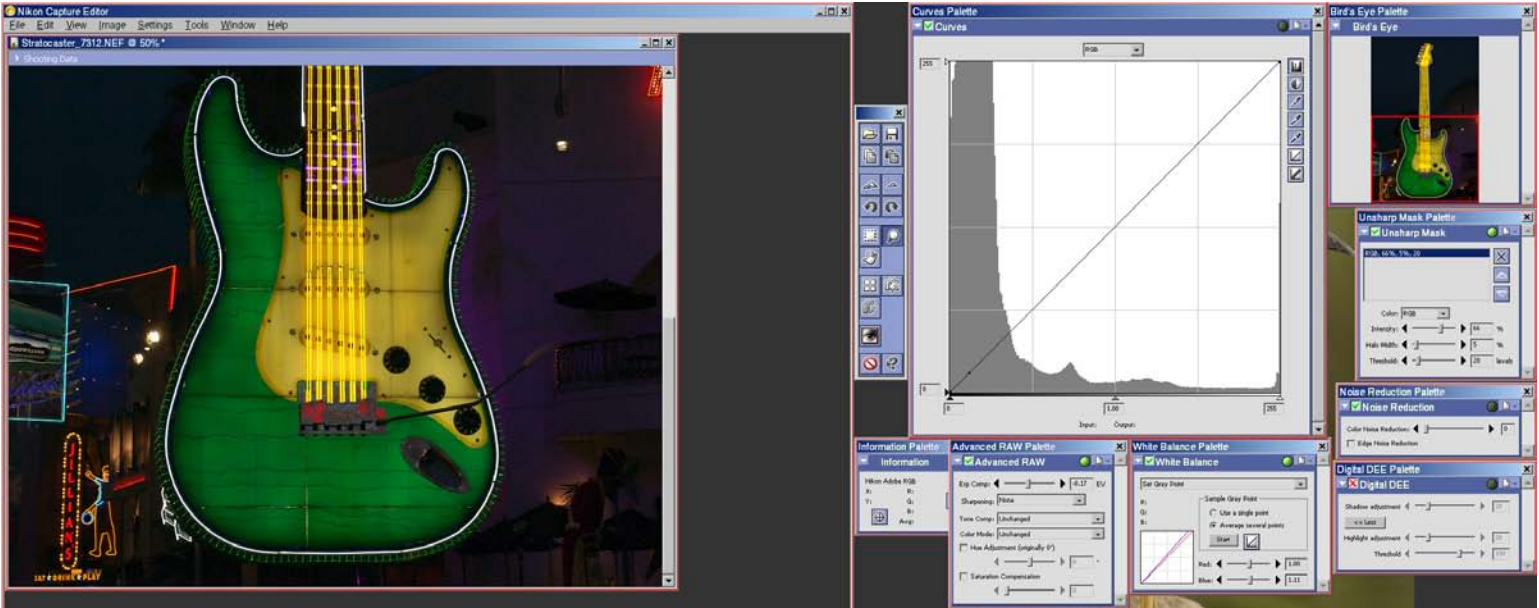
Stratocaster_7312 is a D1x image taken at ISO 800. Normally, as can be seen by loading the D1xDefault.set file on the CD in Capture, the USM setting is 66, 5, 8 and the Advanced RAW Sharpening (or in-Camera Sharpening) is set to Low. In this case, due to the ISO noise, we are going to set the Sharpening to None and raise the threshold of the USM to 20, as shown above (along with reducing the EV to -0.17EV). The results are shown below. This is a method of reducing noise (esp. at high ISO) rather than using noise reduction. It avoids smoothing details, but the image is less sharp.

You'll notice there are red-marked places on the "pickup" (below the strings) on the Stratocaster. This is where we will sample several points to neutralize WB. Once the Sharpening and USM settings have been changed, the EV has been adjusted to -0.17EV, and the WB has been neutralized, we are ready to make adjustments for shadows and gamma.

The image below shows the target area for the shadow adjustments as well as the point location. You'll notice that the "bug" is within the rise to the mid-shadow peak. We're going to pull the shadow slider into the little valley just before the mid-shadow peak. This will darken the shadows (reducing the visible noise as well as increasing contrast). Measure for each channel… the curves are quite different. Set the slider a little bit before the "bug".
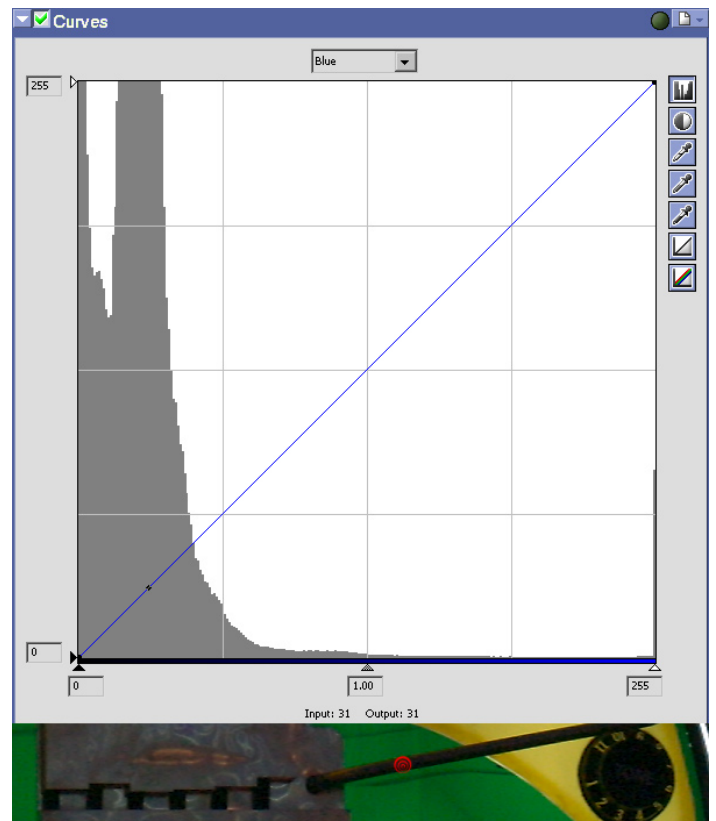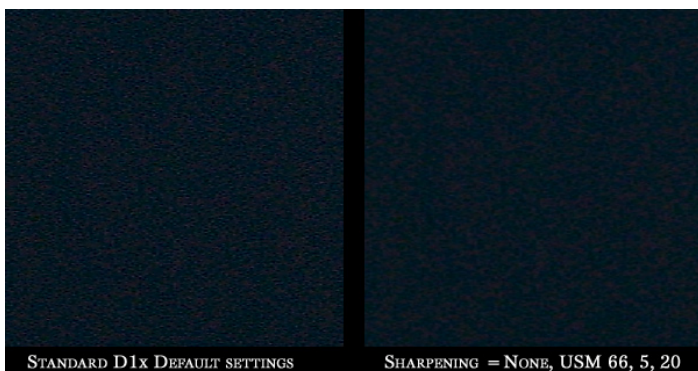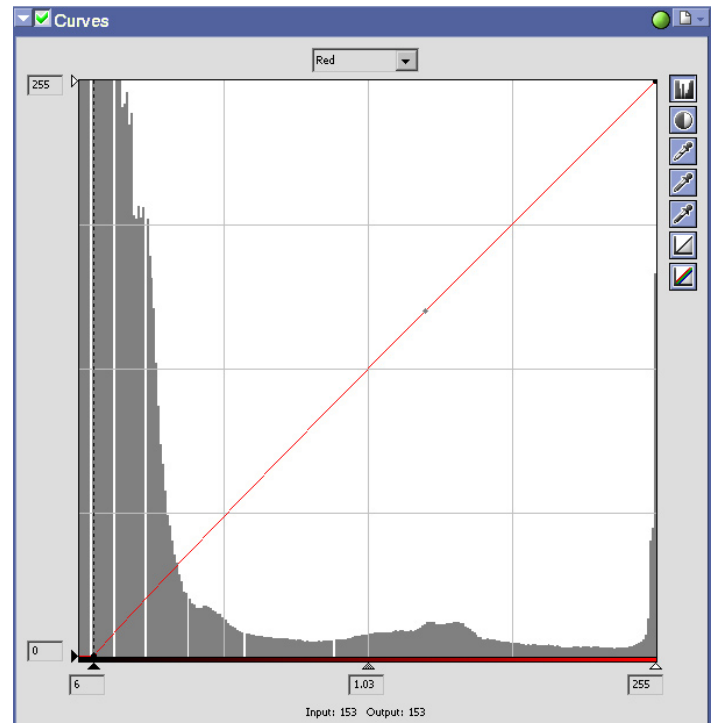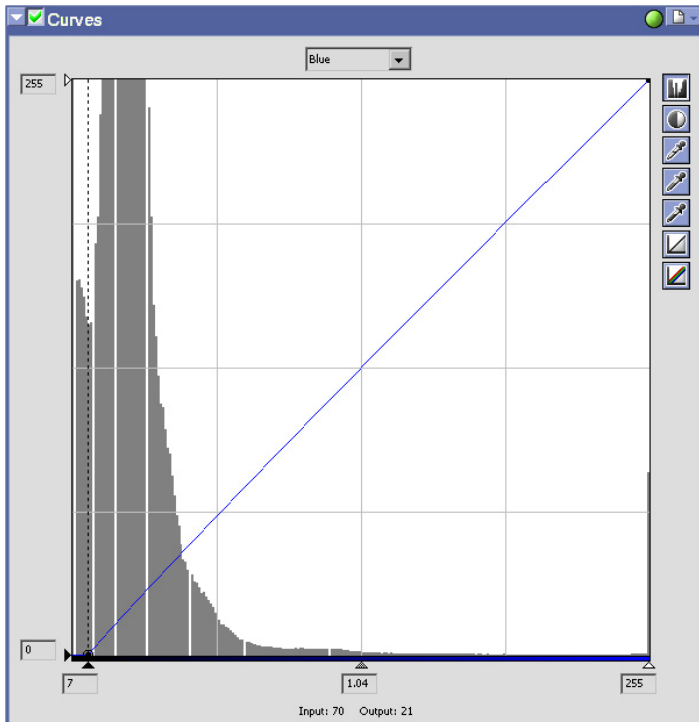
The histograms on this page show the results of the shadow and gamma adjustments. You'll notice that we have completely blocked the shadows… as there is quite a bit of pitch-black in this image, we can get away with that and by doing so, we'll also reduce the visibility of the noise. The position on the curve for the Blue and Green shadow adjustments are quite similar (but at different shadow values), but the Red channel is altogether different — you should remeasure for each channel so you know where to put the slider.

Zoom out until you can see the entire image when working the RGB channel.

We're also going to block the RGB channel shadows. The marks in the histogram below show the position we are going to set the shadow slider to as well as the low and medium gamma points on this image. First set the shadows, then set to each gamma point and evaluate the results. I chose low gamma.

Histogram showing RGB settings above, final image below. Image below was resized to 50 %, USM 75, 0.3, 0 added in Photoshop.
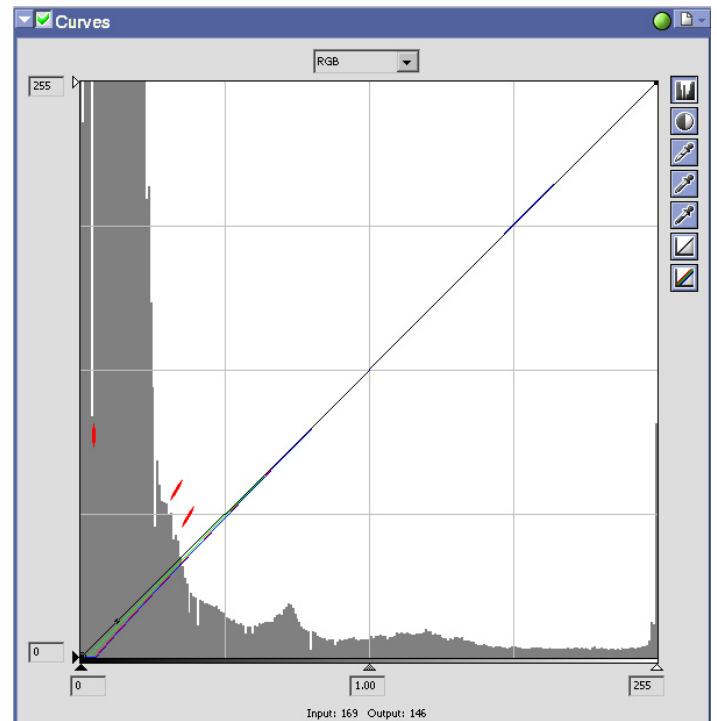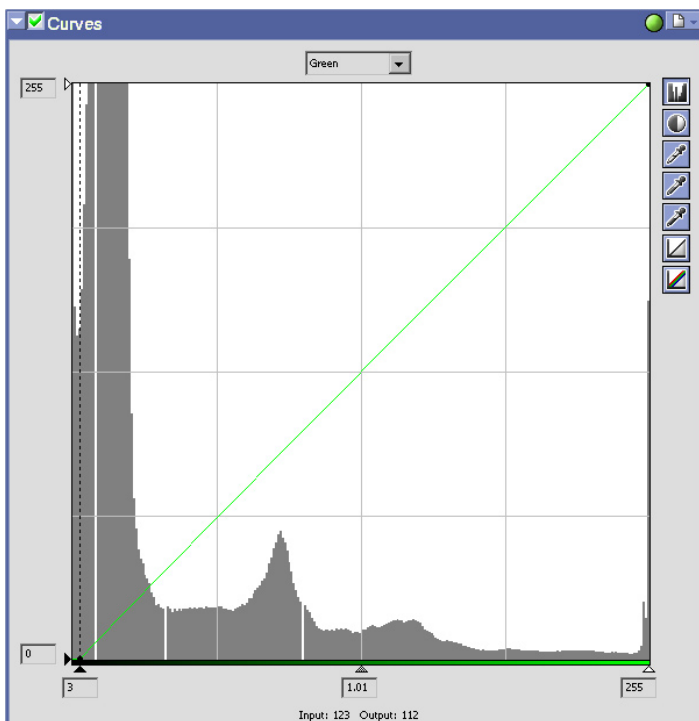
Stratocaster — Summary

With this image, we explored another way to reduce the effects of noise on an image. In this case, we altered the Advanced RAW sharpening and increased the USM threshold so it had less effect on the noise.

*In-Camera or Advanced RAW Sharpening is a zero-threshold sharpening method. This means that it will sharpen **everything**, including the noise. When necessary, you should switch this to None if you use a D2x or D100 (with the D1h and D2h, my default settings are None).*

The methods used for this image:

1. Reset the Sharpening and Unsharp Mask (USM) as outlined above;

2. Reduce EV by -0.17 stop;

3. Sample several neutral points for WB;

4. Set the shadow point ***beyond the exhibited black point*** (blocking the shadows) as the shadows were pitch-black… by blocking the shadows we reduce even further the visibility of the noise in the shadows;

5. ***Zoom out to see the entire image before evaluating the RGB channel***;

6. Mildly blocked the RGB shadows and set gamma to low.

The final image, as shown here, has been resized down to 50 % in Photoshop, and has had a mild USM applied (75 %, 0.3 pixel radius, 0 threshold), further reducing the visibility of noise by increasing pixel density, plus mildly sharpening the image. The final results are quite good for an ISO 800 image taken by the D1x. Zoom in on this image to as much as 400 % to examine the quality. On the CD, you can find the full-size TIF, as with all of the other images in the Processing section.

Image processing — Moose at Sunrise
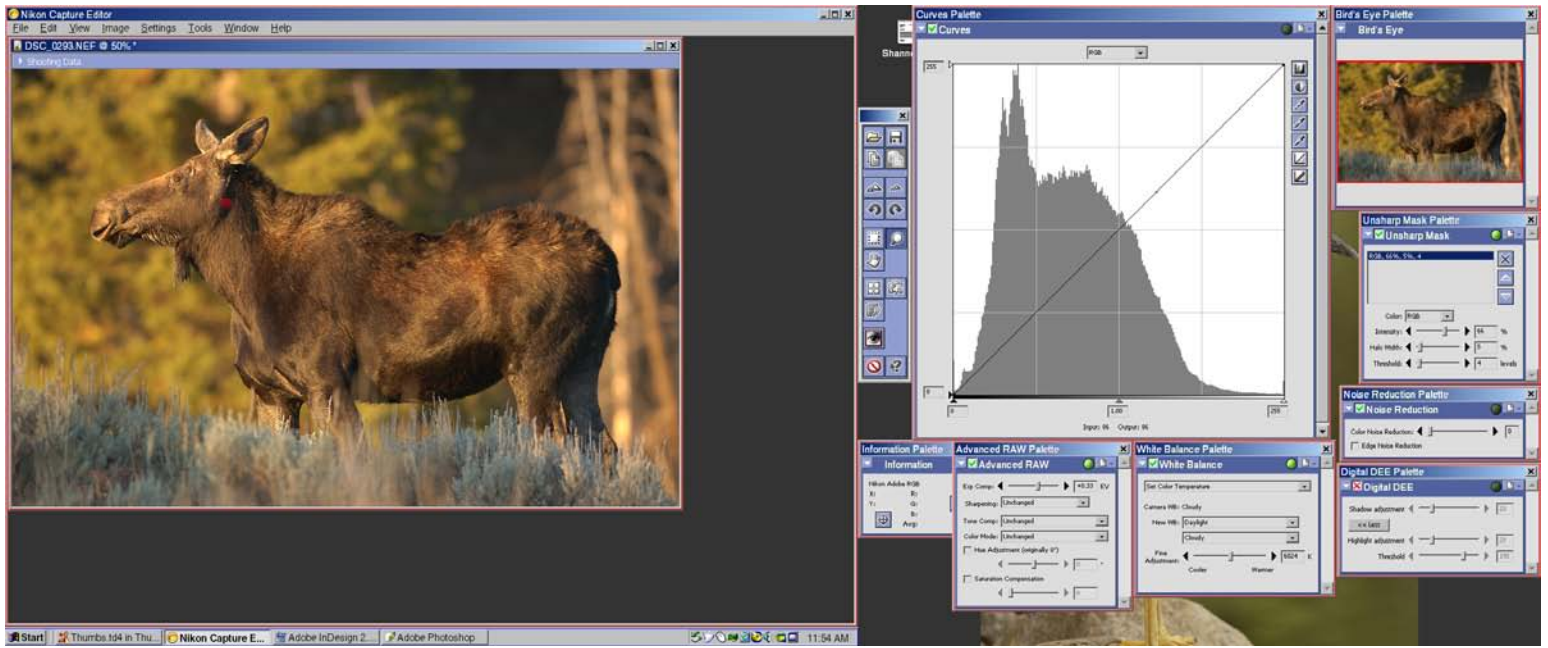
MooseSunrise_0293 was selected to show **strong gamma indicators** as well as how to set the contrast using a **shadow with detail**. The target shadow is indicated above, marked in red. The cropped histograms below show the original image highlights and after being set to +0.33EV, as well as the mid-shadow peak at the original white balance of 6000K and after adjusting for the **maximum amplitude with optimum symmetry** in the peak by raising the WB to 6369K.

In the histogram below, note the location of the gamma line prior to adjustment (at the edge of the **gamma plateau**) as well as that we are selecting to move the shadows **before the indicated point** shown by the "bug". This will allow us to retain the detail in the shadow while still improving contrast. You'll notice that the character of the curves in each channel are quite different in this image, so you'll need to use the reference shadow each time you change channels to check the "bug" location for accurate shadow adjustments.

Original image (0EV)

After application of +0.33EV

Original WB (6000K)

After setting WB to 6369K

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Blue

255

0

7   1.04   255

Input: 63   Output: 242

Red

255

0

8   1.05   255

Input: 122   Output: 122
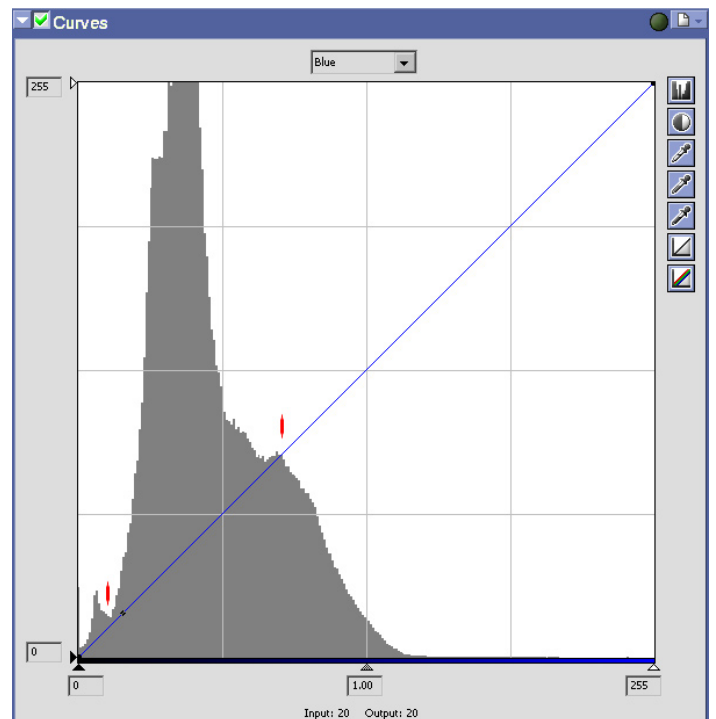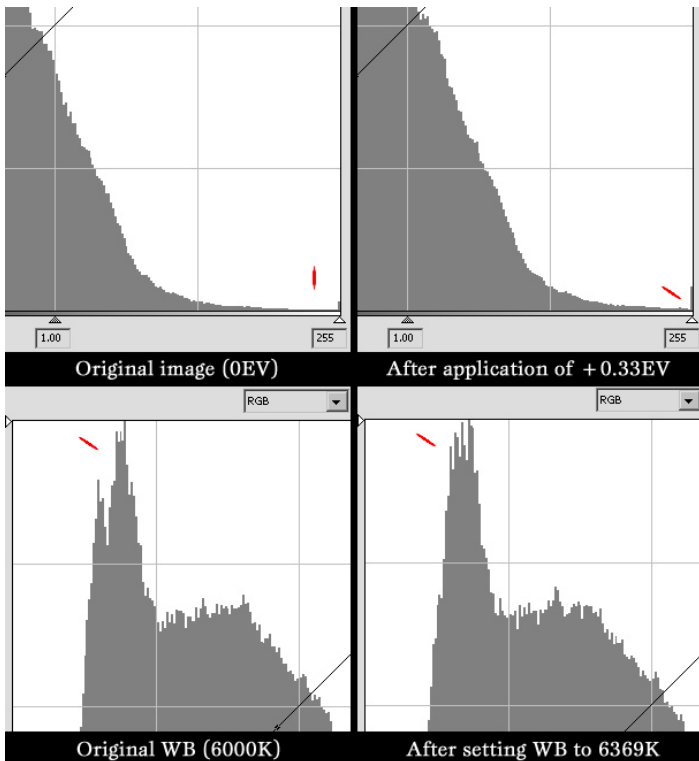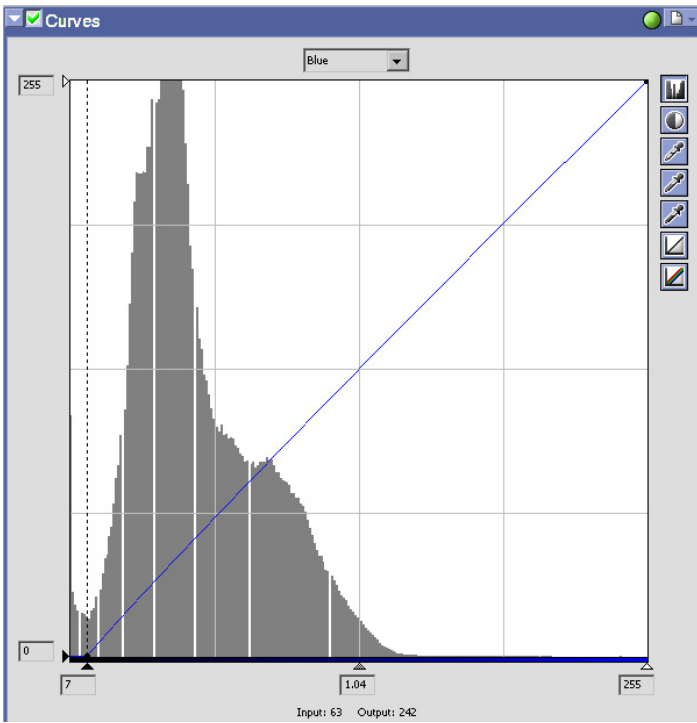
The histogram above, besides showing the shadow and gamma adjustment points for the Blue channel, shows an easily-distinguishable gamma plateau. Training students often tell me that distinguishing gamma plateaus, ramps and points are the most difficult part of processing. A gamma indicator can be blatant or barely capable of being noticed, but sometimes in images where the gamma indicators in the RGB are difficult to see, you will find that in one channel it is easily seen. Look for them and they will be more easily recognized.
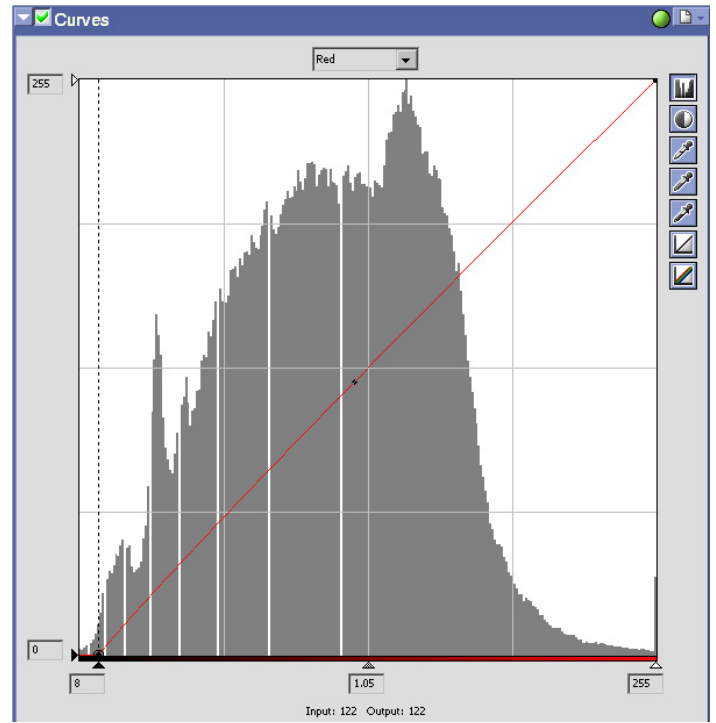
After making the adjustments to shadow and gamma in each channel by measuring the target shadow each time and setting the shadow slider just before the "bug" to retain detail in the shadow, you'll be ready to set the RGB channel. In the histogram below, you'll notice marks indicating the shadow point as well as the smaller and more difficult-to-distinguish gamma plateau in the RGB channel. Let's see what happens when you pull the gamma just a bit too far for the shadow adjustment and how to recognize and fix the problem.

Green

255

0

9   1.05   255

Input: 122   Output: 236

RGB

255

0

0   1.00   255

Input: 170   Output: 207
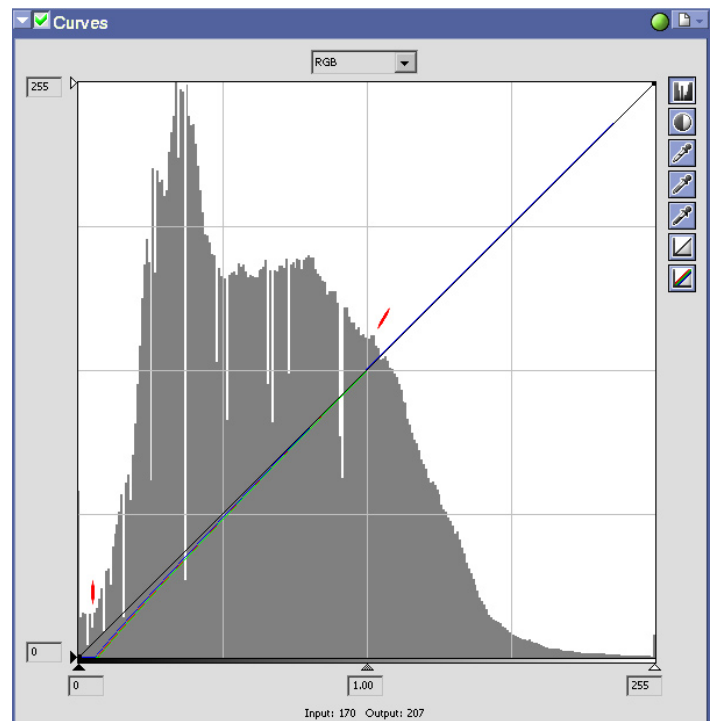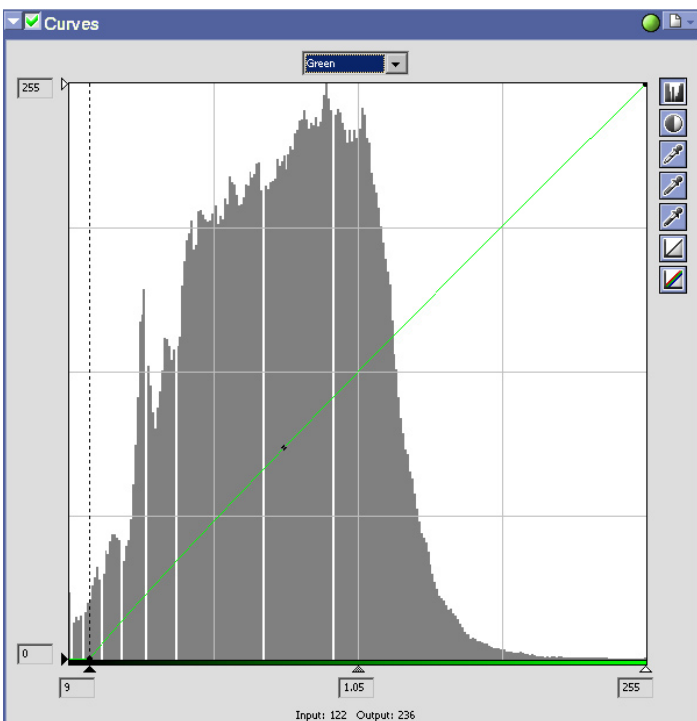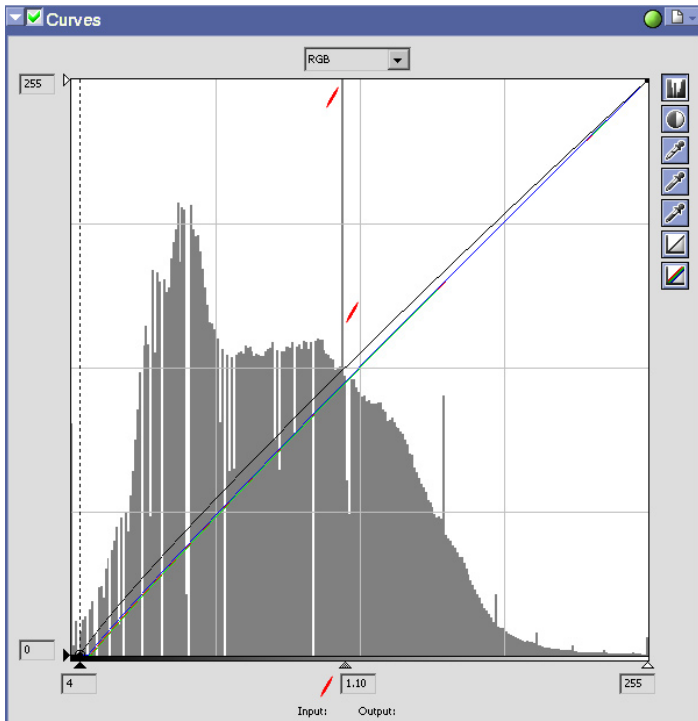
In the histogram above, notice the ***clipped spike*** at the end of the gamma plateau, and that the histogram has dropped in amplitude. The spike hit the top of the graph (clipped) and forced the data to drop in amplitude to display the spike. This occurs when the gamma adjustment is too high for the shadow adjustment we've set. By backing off just a small amount on the gamma adjustment, the spike disappears and the histogram regains amplitude. Sometimes when you see this happen, the answer is to readjust the shadow slider.
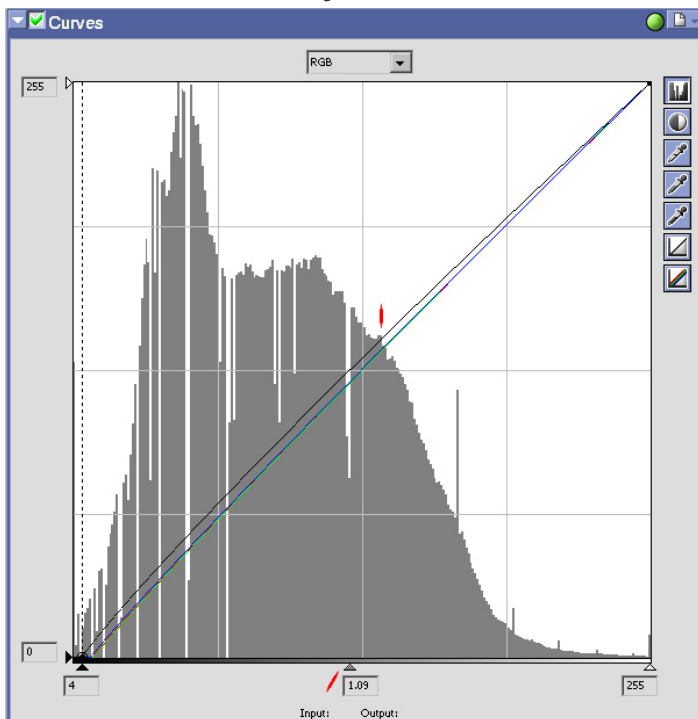
MooseSunrise_0293 was a rather tricky shot to process, as are many images taken at sunrise or sunset. It was also a difficult shot to expose properly, especially considering that moose don't hang around too long at sunrise. This female stopped for about three seconds to look at the sunrise, then took off into the forest. To make certain that I'd get the shot (I took two), I underexposed a little to give myself some room for safety, primarily to avoid blowing the red channel (the light at sunrise has a strong red component). There was no time to take a test-shot and check the histogram for accuracy, so I made my best call and backed off 1/3 stop for safety. The image above shows a comparison before and after processing, and the image on the next page shows the final image after processing and after being resized down to 75 % and with a mild Unsharp Mask applied in Photoshop (75 % intensity, 0.3 radius, 0 threshold).

While I slightly missed my focus point (on the eye), this was a very neat moment to capture as well as a rather stressful situation due to the need to make a rapid judgement call to get the shot exposed properly. While the shot was not quite perfect, I was still very pleased with the results.

The advantage of having trained yourself to recognize luminosity — both when there are neutrals in the scene and in situations where one channel is predominant — and knowing how the camera's selected metering mode will see the scene, is that you can then rapidly make an evaluation of the scene when you don't have time to take a test shot. I estimated that I needed to set -0.3EV to the matrix meter to hit the exposure, and set it to -0.7EV to allow a margin of safety.

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Moose at Sunrise — Summary

The image above is after a resize to 75 % in Photoshop and with a USM of 75, 0.3, 0 (the full-size TIF is on the CD).

MooseSunrise_0293 required us to use several methods we learned in earlier images, as well as giving us an opportunity to work on and see some new things.

1. The EV was set by checking the highlight end of the histogram, noting the flat spot and adding EV until the data in the highlights nearly reached the spike which indicated full saturation in the red channel;

2. As there were no neutrals in this scene, the WB was adjusted until the mid-shadow peak showed the ***maximum amplitude with optimum symmetry***;

3. We had an opportunity to see in the Blue channel an easily-distinguished ***gamma plateau***. While the plateau in the RGB channel was not as easy to see in this image, it was fairly well-defined, and we need practice looking for gamma indicators;

4. We set the shadows using as a reference point a ***shadow with detail***. When using a shadow with detail, you set the shadow slider before the indicated point to maintain detail in the selected shadows;

5. We had very a different histogram character in each of the Red, Green and Blue channels, so we had to go back to the point we used as a reference for the shadows when setting each channel to look for the "bug" location;

6. We had an opportunity to see what happens when making an excessive gamma adjustment for the shadow point selected. When you do this, often spikes appear which can clip (go beyond the top of the histogram chart). When this occurs, you need to either back off on your gamma adjustment a little bit, or if you have not yet reached the gamma setting, it means your shadow point is not quite correct (make an adjustment to the shadow setting). Sometimes this can cause you to chase your tail a little — you may have to set the shadow point, adjust gamma a little, reset shadows, move the gamma again, etc. until the points have been reached and the histogram is in balance. It can get tricky sometimes.

This shot offered several opportunities. The first of these occurred before the shot was even taken. I knew that I'd only have a very short time to make the decisions required to get the correct exposure, as the moose would not be there long when the sun came up. When the moment arrived, I quickly evaluated the scene, set the EV based on my estimation of how the camera would expose in Matrix given the color balance (skewed towards Red due to the long light at sunrise), and applied my estimated EV setting with a 0.3EV safety net. Because of this safety net of 0.3EV, I did not blow the red channel. As it turned out, I could have gone with my initial estimate, but that would have been right on the money (in retrospect), and it could just as easily have been 1/3 overexposed, which would have caused a problem in the highlights.

Since there were no neutrals we had to use another method to set the WB (as outlined above). We were able to set shadows using the shadow-with-detail method, and we were also able to see the effect of clipping when making a gamma adjustment that did not match the shadow adjustment chosen.

An altogether interesting experience. I hope you enjoyed it as much as I did…

Image Processing — The Tomb of the Unknown Soldier
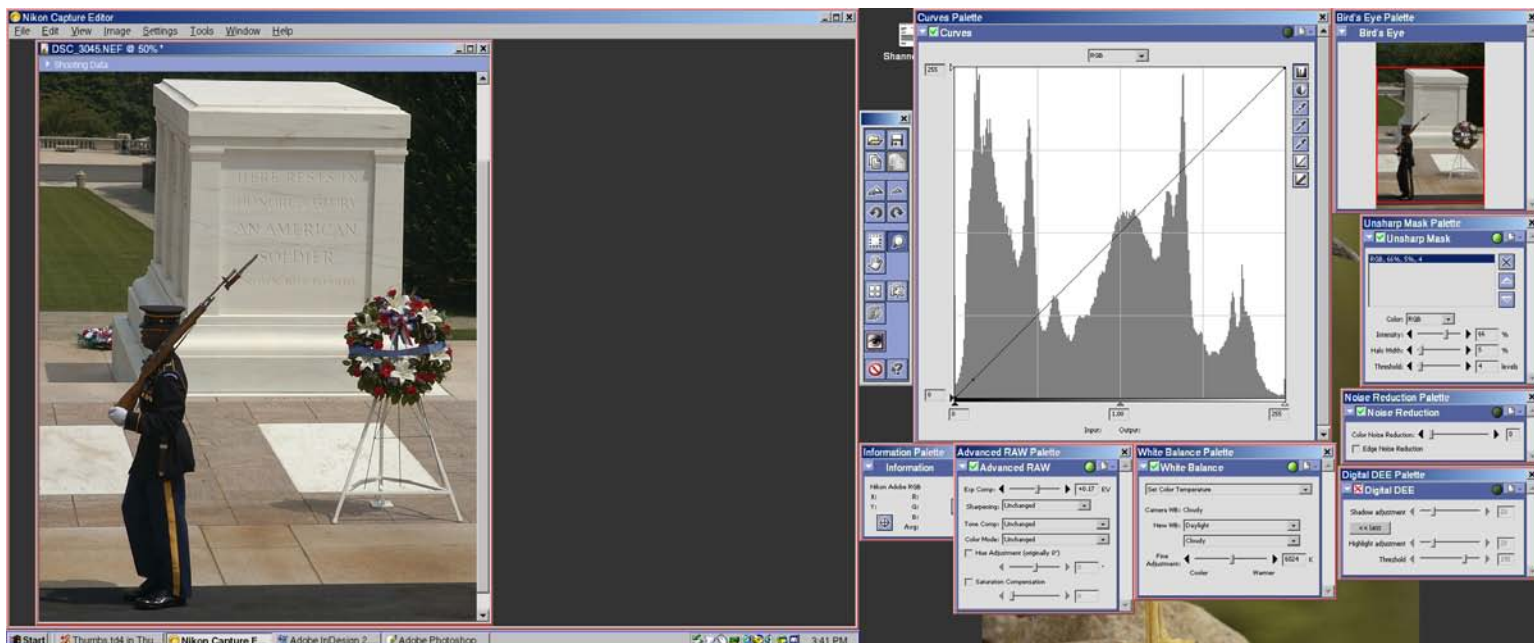
Yet another tricky shot (I do keep doing that to you, don't I?), **UnkSoldier_3045** has a very wide dynamic range with critical detail in the shadows as well as in the upper midtone and lower highlight areas. This image was exposed using spot-metering: I set the bracket on the tomb directly under the word "Known" and added +1.3EV. This yielded an exposure that turned out to be 0.25EV under, as can be seen below. The White Balance was spot-on as set in-camera (6000K), as can be verified by checking the guard's shoes and the white ribbons on the flower arrangements.

In this image, our primary issues will be to preserve the shadow and highlight detail, as well as pull some additional detail out of the shadows to get a better presentation of the guard. This will require some gamma work, and this image has a blind gamma ramp and a highly-reactive histogram which will make it difficult for us to hit the gamma targets.
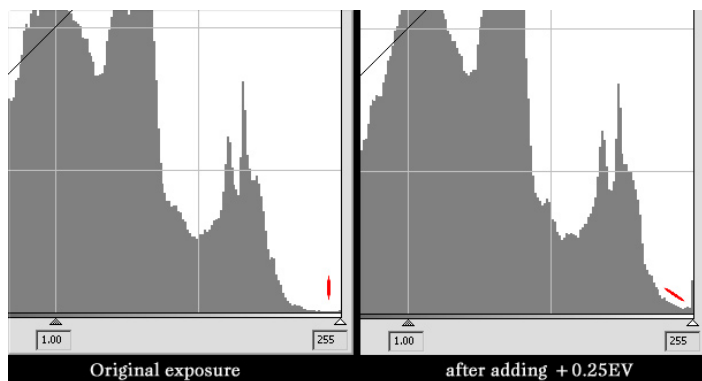
In this image, we are going to use the most-blocked channel as a shadow-reference. Open the Blue channel and note the position where the shadows hit the left margin. The point on the curve in the Red and Green channels that corresponds to this same point is where we will set the Red and Green shadow sliders. This will neutralize the shadows without blocking them up any more than they already are. Note the mark on the histogram below. Also note that the target point shows an output reading of 10 at the bottom center.

Original exposure   after adding +0.25EV
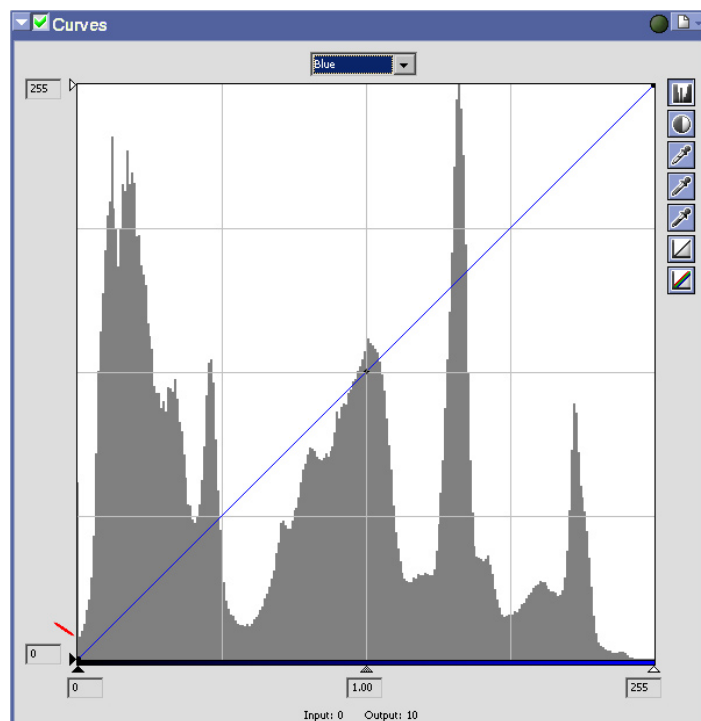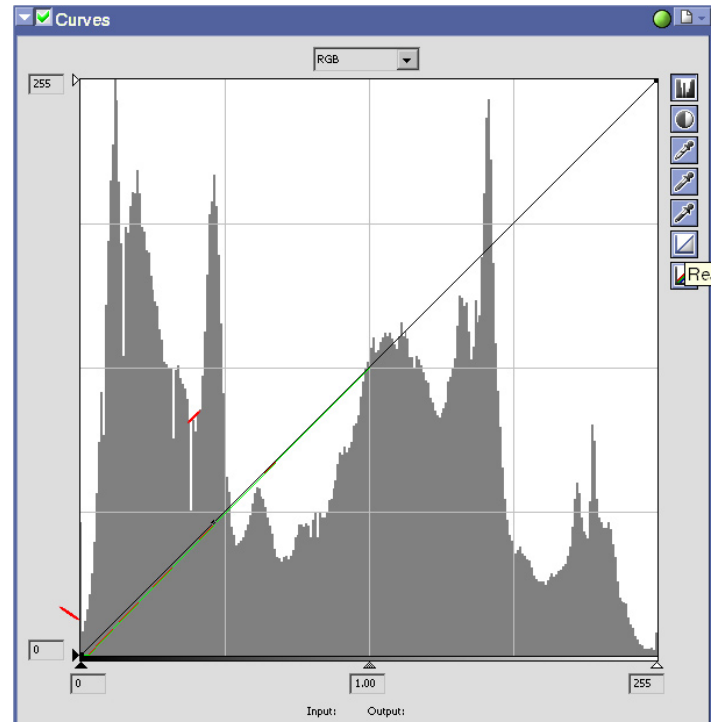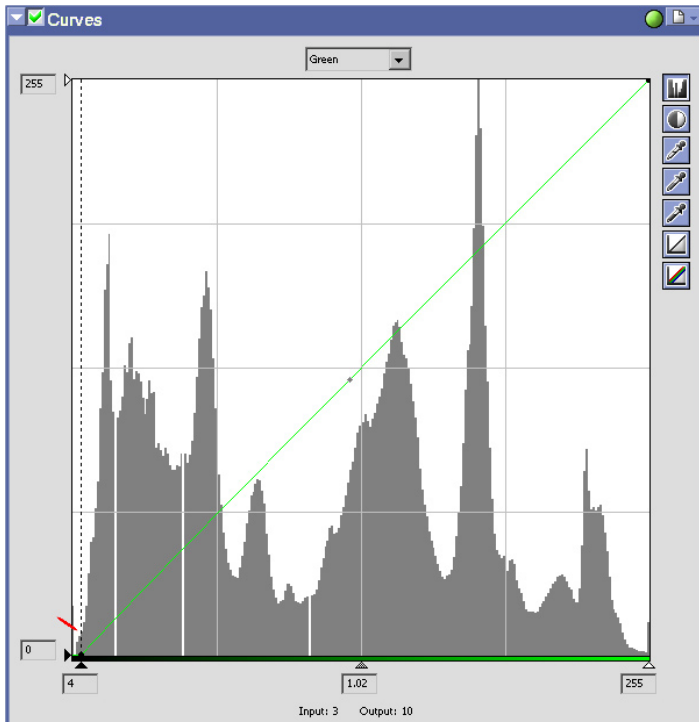
Notice the output reading at the bottom center of the two histograms below. I placed my cursor on the curve and watched as this reading changed… when I reached the point on the curve where the reading reached 10 I noted the location on the curve, then moved the shadow slider until the dotted line intersected this point. The marks on each histogram indicate the point where the dotted line leading up from the shadow slider intersects the point corresponding to 10 on the curve.

The gamma setting is somewhat tricky on this image. The marks on the histogram above show the target regions that we will be watching as we move the gamma slider. You will not see the gamma ramp in the deep shadows until you pull the slider near the target point indicated by the upper of the two marks above. This histogram is highly reactive — the gamma curve aligns with the gamma ramp and the target point just as the histogram begins to clip. Miss by a bit on either side and it clips.
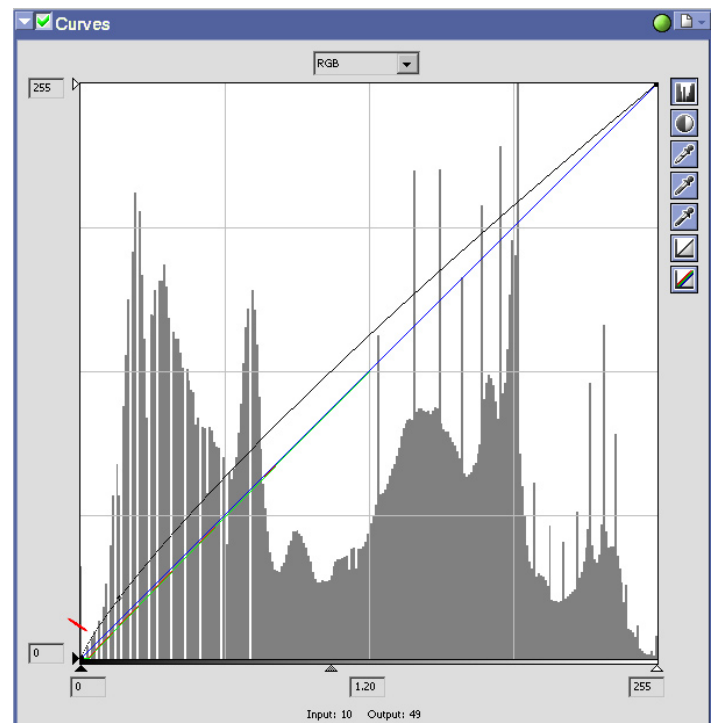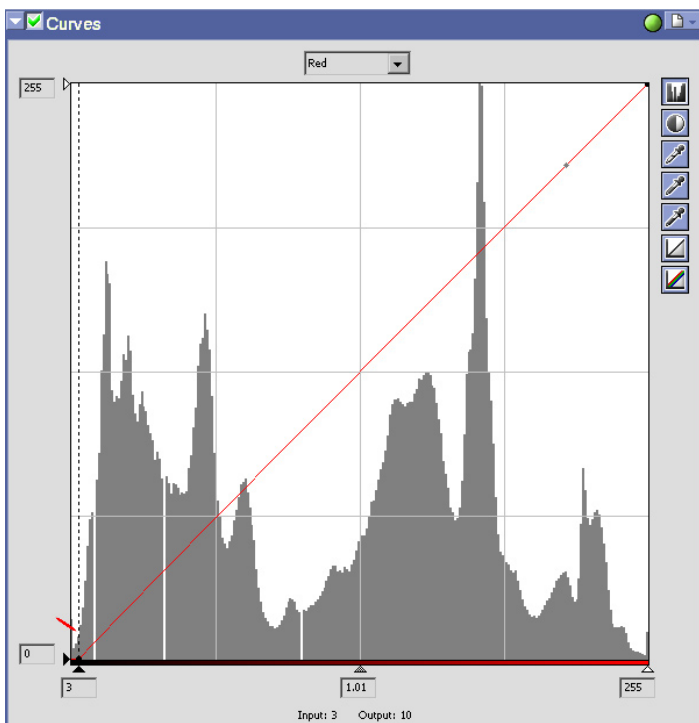
The Tomb of the Unknown Soldier — Summary

Before processing   After processing
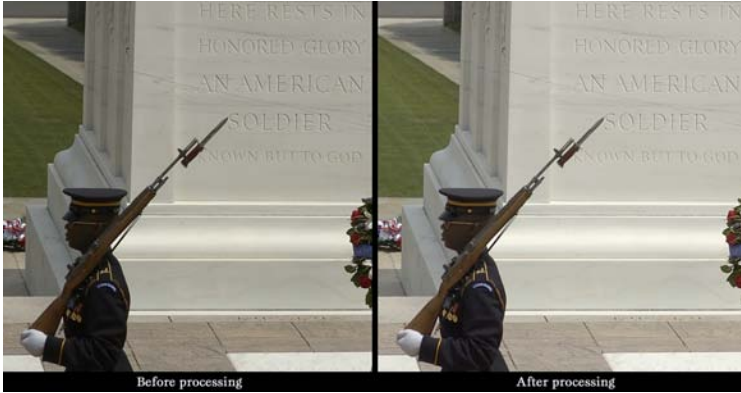
As you can see in the comparative image above, we recovered a significant amount of shadow detail from the guard while maintaining contrast. This image again has allowed us to explore several new things (as we have been doing all along in this section — I'll bet you've noticed that pattern already):

1. We adjusted EV by noting the distance between the highlight data and 255, and setting the EV to yield a smooth curve from the highlight data to the full-saturation spike;

2. As this image has a very wide dynamic range, with a lot of detail information in the shadows, we didn't want to block the shadows up any more than they already were, so we *used the most-blocked shadow as a point of reference* to set the other channel's shadow points, by measuring the point where the Blue channel's histogram hit the zero margin;

3. We examined the RGB channel histogram to find the gamma point, knowing that it would be well above neutral since we needed to bring the shadows up by quite a bit. The gamma ramp in the shadows was not visible until we pulled the gamma, because it was compressed into the shadow data, thus we could not see it until the gamma had been moved a bit. If you can't see the gamma target (or the ramp), you can use the ranges we discussed earlier and explore these to try to find the right region in which to place the gamma. If you had done this, you would have soon seen the gamma ramp and would have been able to make the adjustment based on a visible target rather than an informed guess. With practice you'll see your gamma targets easier.

This image also had an extremely reactive histogram, which clipped quite easily. As we didn't want to make a global shadow adjustment (in the RGB channel), this made it even more difficult to hit the proper gamma point, as the correct point was very small between clipping zones. If your Curves dialog was not stretched to it's maximum width, it is not likely that you could hit the target gamma on an image like this as you would not have enough control. Images with highly-reactive histograms come up fairly often, depending on the sort of things that you tend to shoot. Sometimes you can 'chase your tail' by adjusting the shadows, then gamma, then shadows again. In this case we couldn't as we wanted to maintain the shadow levels as they were.

Image processing: Digital DEE — An Overview
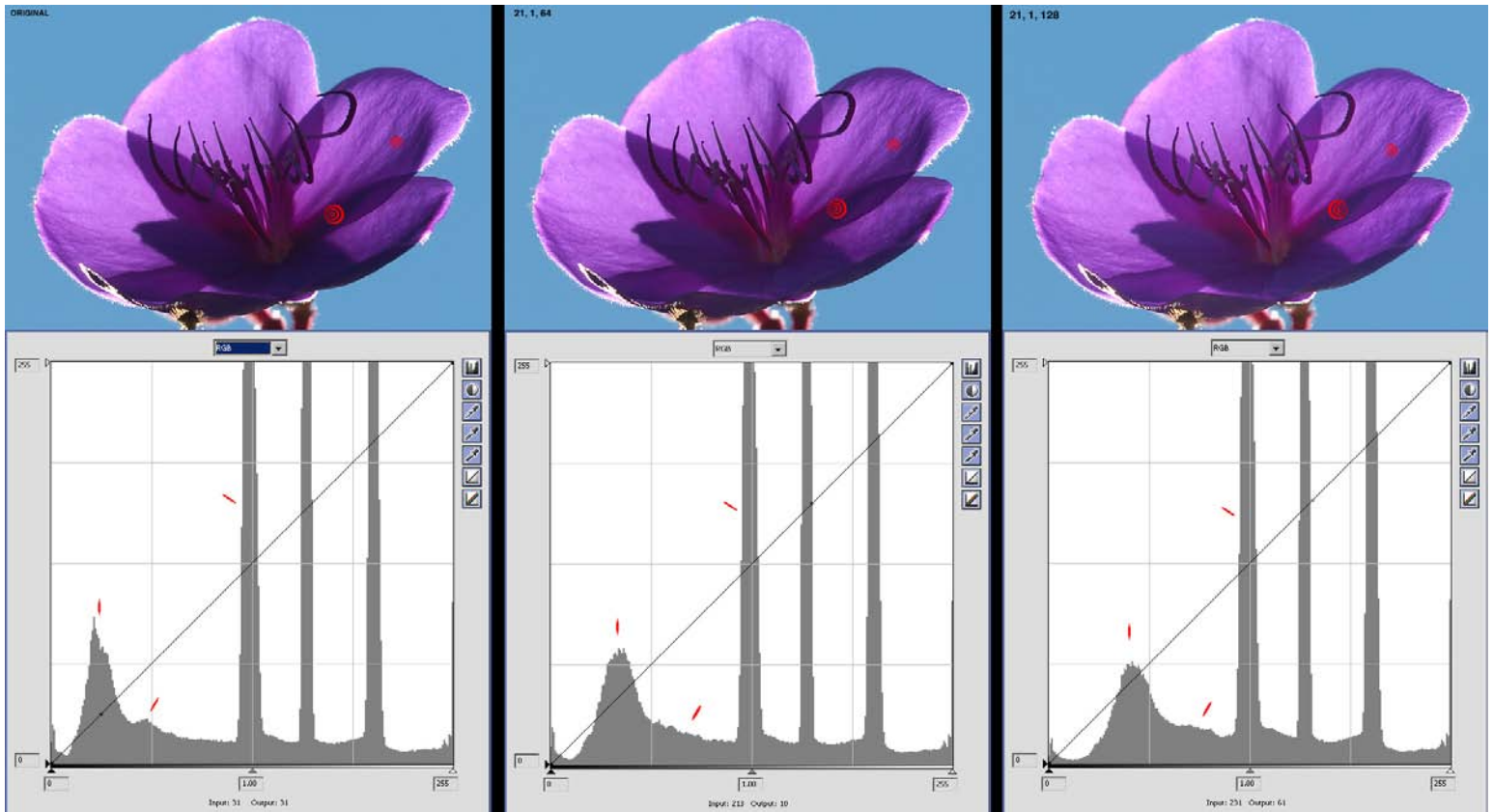
This image is from a D2h... as Digital DEE is a new feature added to Capture 4, and you must have Capture 4 to process D2h shots, it made sense to use a D2h shot for this section.

Digital ***D**ynamic **E**xposure **E**xtender* (DEE) is designed to recover shadow detail in underexposed areas of a backlit subject, or overexposed areas. I use it primarily for the former effect. In the image of the backlit Princess Flower here, the core of the flower exhibits shadows which are centered around 30 (leftmost peak, marked on the flower with a large bullseye). You'll also note the lightest shadow is at 128 (the central peak, marked on the flower with a small bullseye). The region that we will be working on is the shadow peak and the mid-shadow area (the mark between the two peaks on the histogram. The idea is to raise the two regions in the shadows without compressing the mid-shadow data into the midtone region, thus pulling information out of the shadows but still maintaining a well defined transition between the mid-shadows and the midtones. (Digital DEE often will also improve the shadow-peak symmetry).

The sequence above shows the results of keeping the amount of shadow adjustment fixed and setting the threshold first to the level of the mid-shadow data (at 64 in the original image), then setting it to the level of the lightest shadow. You'll notice that the shadow peak and mid-shadow data are both moved right, but the lightest part of the shadows stay at 128. You'll also note that as the threshold is raised, the mid-shadow data becomes more compressed towards the midtones, and the shadow peak drops in amplitude (less pixels are present in the shadow area) as it is raised towards the mid-shadow region.

These two settings illustrate the two techniques I prefer using with Digital DEE. I will either set the threshold to the level of the mid-shadow data or to the level of the lightest shadow and watch both the image and the histogram. What I'm generally looking for is a smooth rise from the mid-shadow data to the midtones on the histogram, and a revelation of obscured mid-shadow data without a great increase in noise when looking at the image. I make the channel adjustments after DEE.

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Digital DEE can jump right out and bite you if you're not careful with it. Remember that you are pushing the shadow area up, and underexposed shadow areas contain noise as well as image detail. You should set the maximum amount of shadow adjustment so that the noise is just becoming apparent, and then make your normal shadow adjustments to fine-tune the contrast as well as balance the image. It is really very easy to end up with noisy shadows when using this feature, so I prefer to keep the amount of shadow adjustment to a low level and make my adjustments primarily with the threshold, coarse-tuning the amount of shadow adjustment once the proper threshold has been set and fine-tuning the image using the Red, Green, Blue and RGB channels. I will use Digital DEE sparingly, and only when the midtones need to be maintained in their current position but shadow detail has to come up (therefore a global gamma adjustment is the incorrect method).

Below, I've placed the original image side-by-side with the final processed image (you have **PrincessFlower_3013** in both NEF and TIF on your CD). Look at the mid-shadow to midtone transition on both histograms… and remember the way we generally set the highlight data when adjusting EV. Note the flat area before the 128 peak in the original image, and the smooth rise to the 128 peak in the processed image.
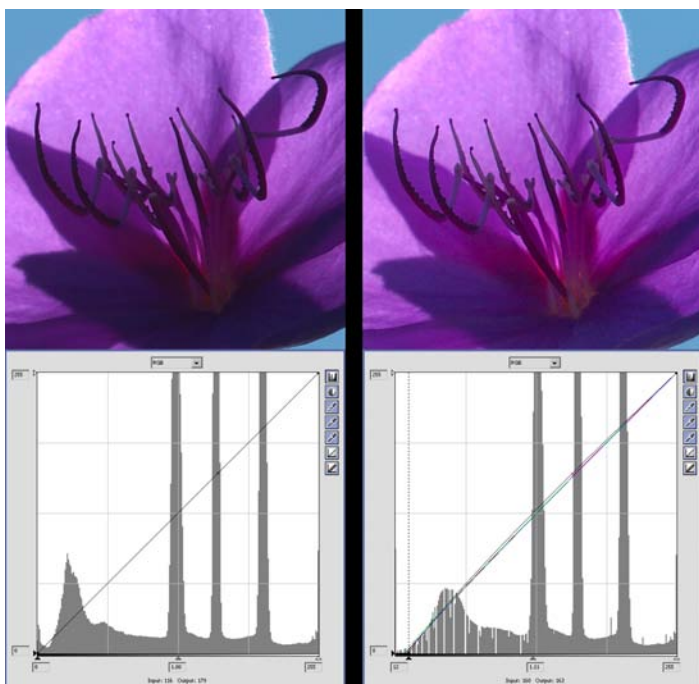
This sort of back-lit image can be really tricky to handle sometimes. The traditional way of dealing with it is to use fill-flash to bring up the shadow areas a bit in the same way that we just did with Digital DEE. The use of fill-flash is a valid method, of course, but often it can be difficult to impossible for the color balance to be maintained as the flash has a different character than the light on the scene (you can use gels on the flash, but this can be a rather fiddly process), and getting the shadow balance right can also be difficult. It is most certainly not something that can be done in a spontaneous manner, and of course the fill-flash technique can't be used at all if you don't have your flash with you. Digital DEE can offer you the option of applying a "digital fill-flash" after the fact, and as long as you are conservative the results can be quite good.

(In the image above, I've cloned out the partial flower petal in the lower left corner where the copyright is placed).

By the way, you've probably noticed that in the histogram below the processed image at the bottom of the column to the left, I've set the RGB gamma so that it is aligned with the *gamma ramp* which was revealed after final adjustment with Digital DEE and the Red, Green and Blue shadow adjustments were performed. We'll work on another image that shows how to set gamma using a gamma ramp in the shadow area as our next (and the final) project in this section on processing with Nikon Capture.
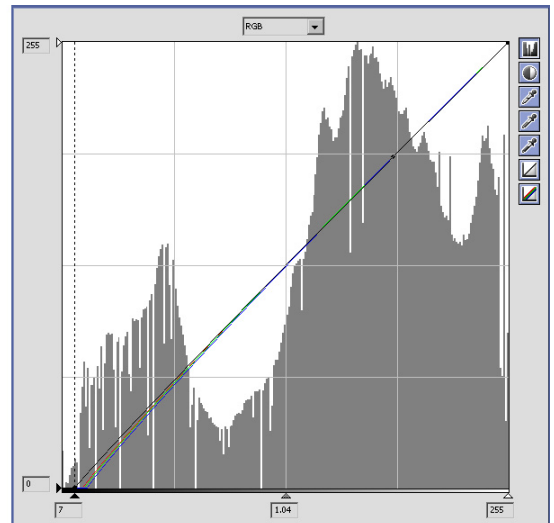
Before Digital DEE adjustments (upper image)
*(Note location and **asymmetry** of shadow peak*
and the character of the gamma ramp)

After Digital DEE adjustments of 16,1,64 is set
*(Note location and **symmetry** of shadow peak*
and the character of the gamma ramp)
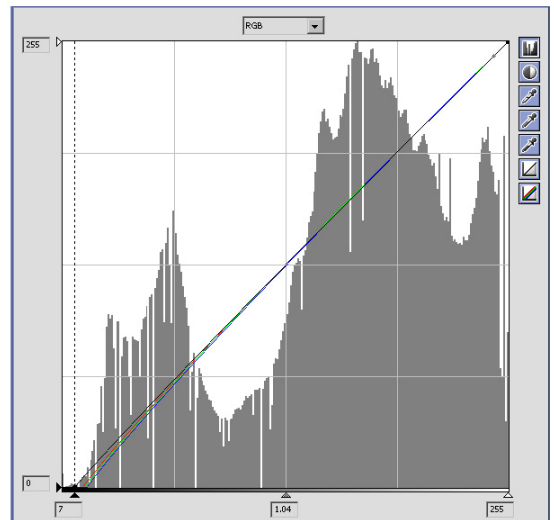
The backlit Long-Billed Curlew shown in the images above (**LB_Curlew_3429.nef** is on the CD, along with two TIFs showing pre-DEE and post-DEE results with the same processing) shows the effects of using subtle DEE to bring out the shadowed feather detail, again in a similar fashion to what would be done with fill-flash. Note the histogram at the top right, showing the asymmetrical upper-shadow peak just below the 64 division on the histogram. Normally, you would set the threshold for DEE to about 100 given a shadow peak in this location, and set the shadow adjustment so the desired effect was achieved, however this reduces the contrast too much to maintain the look I was after in this shot.

Given the fact that this bird was strongly and obviously backlit, what I was trying to achieve here was a more subtle effect… my intention was to bring out the character of the shadowed feather-detail but still maintain the contrast caused by the strongly backlit conditions (note that there is very little information in the midtone areas — by setting the DEE threshold to 100 or so it pushes the midtones up by quite a bit). What I did instead was set the DEE threshold to 64, just above the luminosity level of the unadjusted upper-shadow peak. As you can see, this pushed only the mid-shadow data up, improving the symmetry of both the peak and the gamma ramp, and bringing up the feather detail as desired.
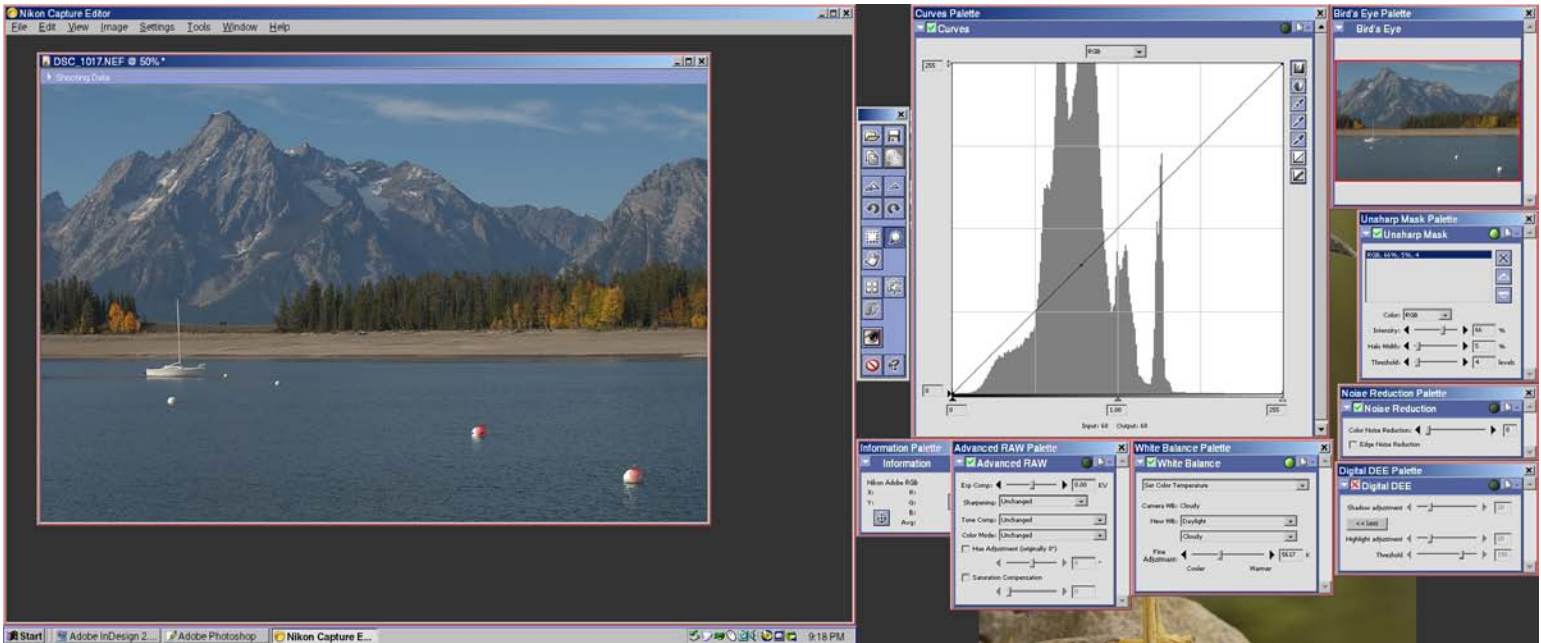
You've done such a good job with all of the difficult shots that I've decided to wrap up this section with an easy one… you can thank me the next time we run into each other.

GrandTetons_1017 was taken on a rather hazy day at Jackson Lake. This is one of those images that, besides being a little low in contrast, also drops off at the midtone-to-highlight transition before spiking a little at 255 (due to the reflections off of the white bouys). There is no gradual rise to white. You'll run into those now and then… while most of the time you can set EV based on a gradual rise to white, if you get one of these babies you have to watch the highlight detail to set the EV. In the cropped histogram below you can see the spike I mentioned. The red marks on the bouys above show the points used to evaluate areas on the boys that were not fully-saturated for the purpose of setting WB (via the info dialog) and checking the EV.
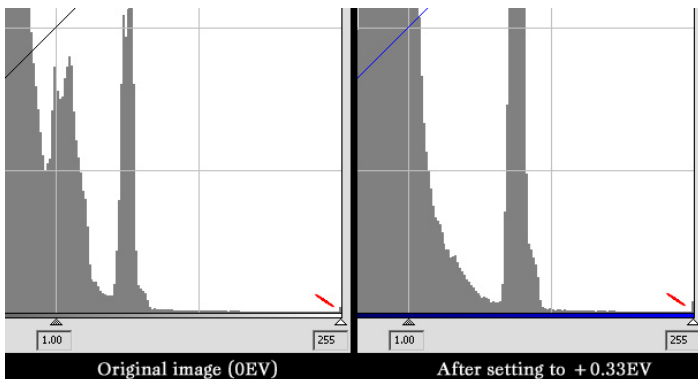
As this is a rather low-contrast image, there is not a lot of shadow information in it. Notice the location of the "bug" below, high up on the mid-shadow peak. The target point was the marked shadow in the trees, shown below the histogram. As we want to maintain this detail, we're going to set the shadow point below the "bug", at the point marked in red (the apex of the curve rising to the peak… does this shadow-point ring a bell?).

Original image (0EV) After setting to + 0.33EV
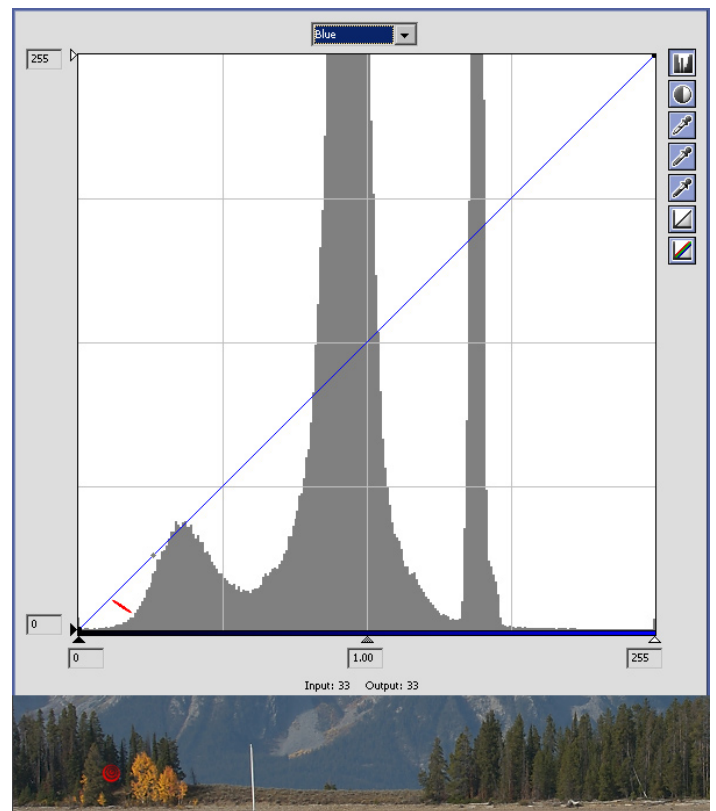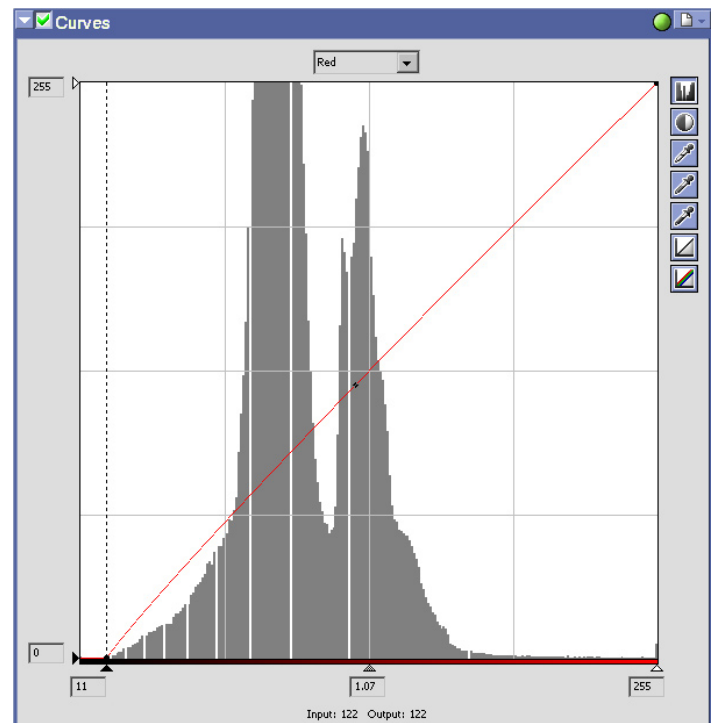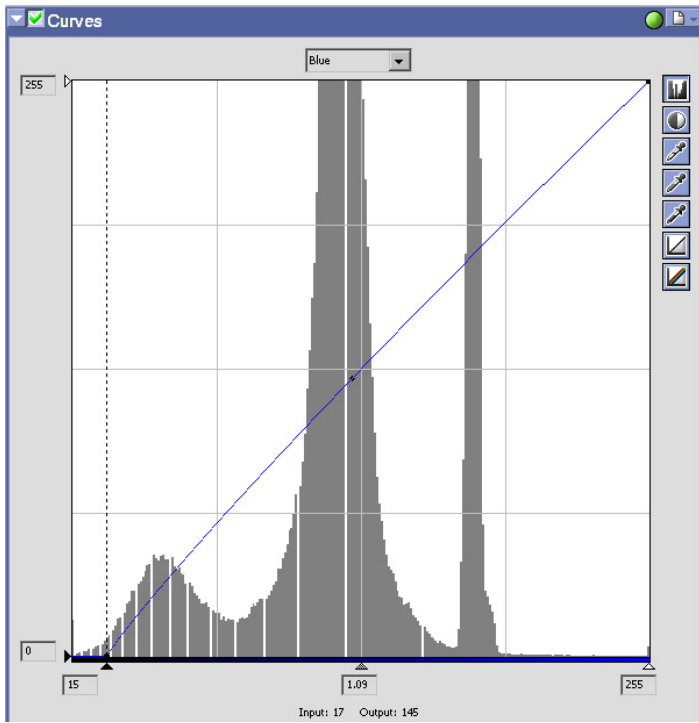
Above is the Blue channel after setting the shadow and gamma sliders. The same sort of work is going to be done on the Green and Red channels, as you've done before in the other images that we've been working on. I told you this was going to be an easy one.

After making the adjustments to the Red, Green and Blue channels, as usual we go into the RGB channel… and, lo and behold! What do we see here? Could it be? Is that thing on the left side a blatantly-visible gamma ramp?

Yes, you guessed it… that's exactly what it is. Very often, when you're dealing with an image that has strong midtones and weak shadows, you'll see the gamma indicators on the left side of the midtone region. In this case we have a very obvious gamma ramp. All you have to do is bring the shadow slider to the base of the ramp and move the gamma slider until the black curve is sitting on the ramp and… voila! Couldn't be easier, could it?

And you thought this was difficult…

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Above, you can see the results of setting the shadow slider to the base of the gamma ramp, and setting the gamma curve to follow the top of the ramp. Below, you can see the comparative image showing the shot before and after processing.

After all of the radically-tricky images we've been working on, this one was a piece of cake, wasn't it? You're probably wondering why I put this one in the book, right?

The reason was to illustrate the points that the gamma indicators will quite often show up on the left side of the midtone area when the midtones are appreciably stronger than the shadows, and also to give you a chance to see a very obvious gamma ramp. The more you see these things, the easier it will be for you to find them when they aren't quite as easily seen.

Grand Tetons — Summary

We have come to the end of the Capture processing section, and we've finished off the section with an image that was very easy to process using the techniques we've learned. The processing of this shot involved:

1. Realizing that there was little in the lower-highlight region, so the EV was set based on the amount of highlight detail in the transition region of the bouys, just before they spiked to white;

2. The WB was set from the same region, sampling the areas and adjusting the WB slider until neutrality was achieved on the Info dialog;

3. An area containing a Shadow with Detail was sampled, and the shadows were set to a point before the level indicated by the bug (the apex of the curve leading up to the mid-shadow peak, as so often occurs);

4. The RGB shadow and gamma were set by following a gamma ramp which resided at the base of the mid-shadow area. The shadow slider was placed at the base of the ramp, and the gamma curve (the black line) was set so that it ran along the top of the ramp.

This concludes the section on processing in Nikon Capture. In the next section, we'll explore how these techniques can be used if you are going to process in Adobe Camera RAW, and some post-processing techniques in Adobe Photoshop.

The Adobe Photoshop RAW converter in Photoshop CS is another option for the conversion of RAW files from any supported camera to TIF, JPG or other file formats. What I am going to do is show you how to apply the same techniques we have developed in Nikon Capture to Photoshop CS RAW, with the target being to get as close as possible to the same output quality from Photoshop. The first thing that must be done to the image in the RAW dialog is to adjust the Temperature (WB). I measured the area marked below (the same area we measured in Capture), and adjusted both Temperature and Tint until I achieved neutrality (shown in the info area at the lower right of the Preview: 105, 107, 103). These values are very close to correct, but had to be achieved at a lower temperature than Capture and by also using the Tint control.
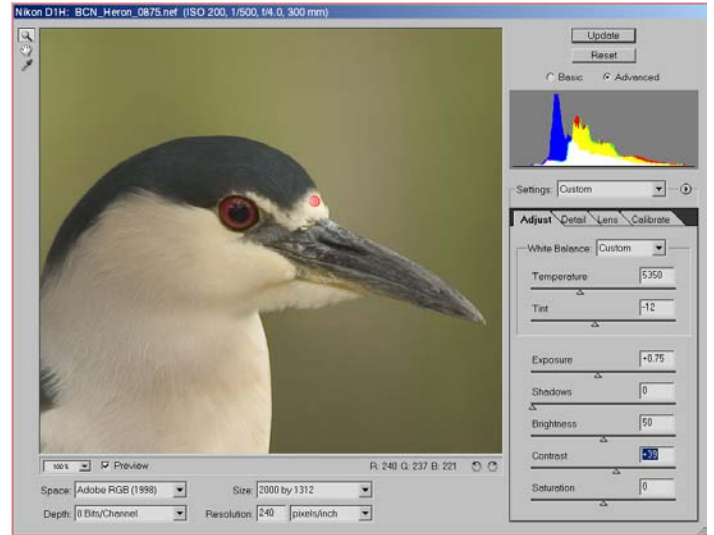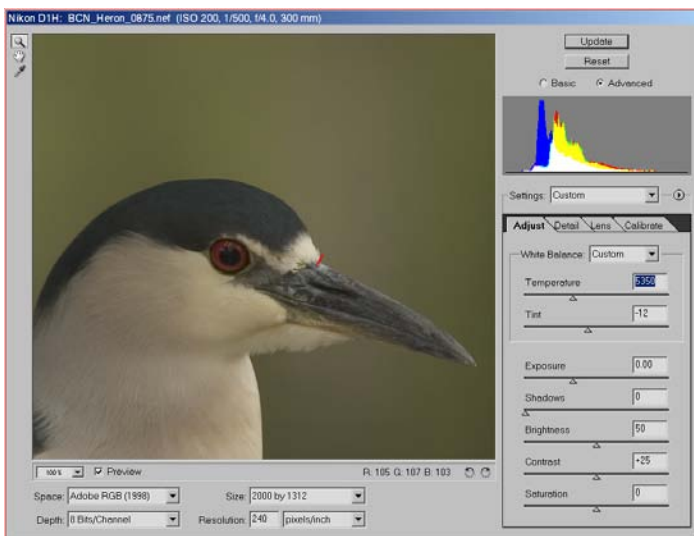
The next step is to adjust Exposure (EV) while watching both the smaller, less-detailed histogram and a known value, shown by the marked bullseye above. To yield the value of ~ 240, I had to both set Exposure to + 0.75 and to offset the reduced contrast, I had to increase the Contrast control to + 39. The next step is to set a Shadow-level bias. In Photoshop CS RAW, you cannot adjust gamma to correct for a shadow adjustment, and cannot easily alter the separate shadow levels in R, G and B channels, thus this work will be done within Photoshop itself. What you can do is apply a pre-bias to the shadows to save time later. I have done this by watching the shadow level on the histogram while altering the Shadow adjustment, stopping just before the shadows started to clip (see red mark below). We will work on the channels within Photoshop.
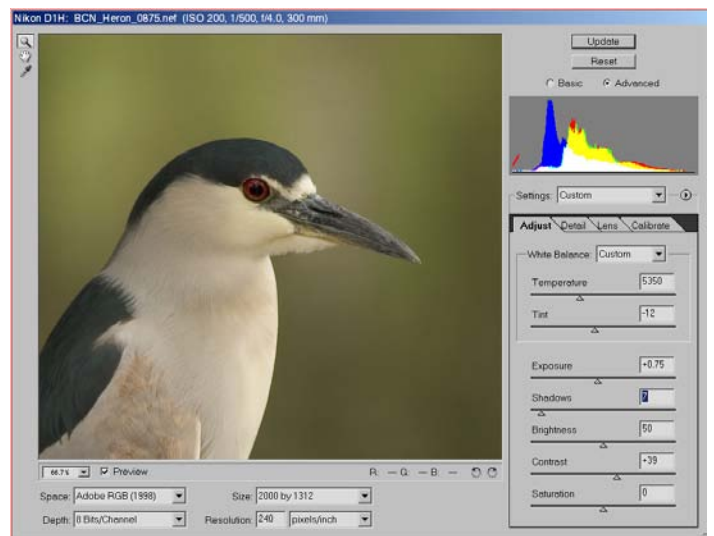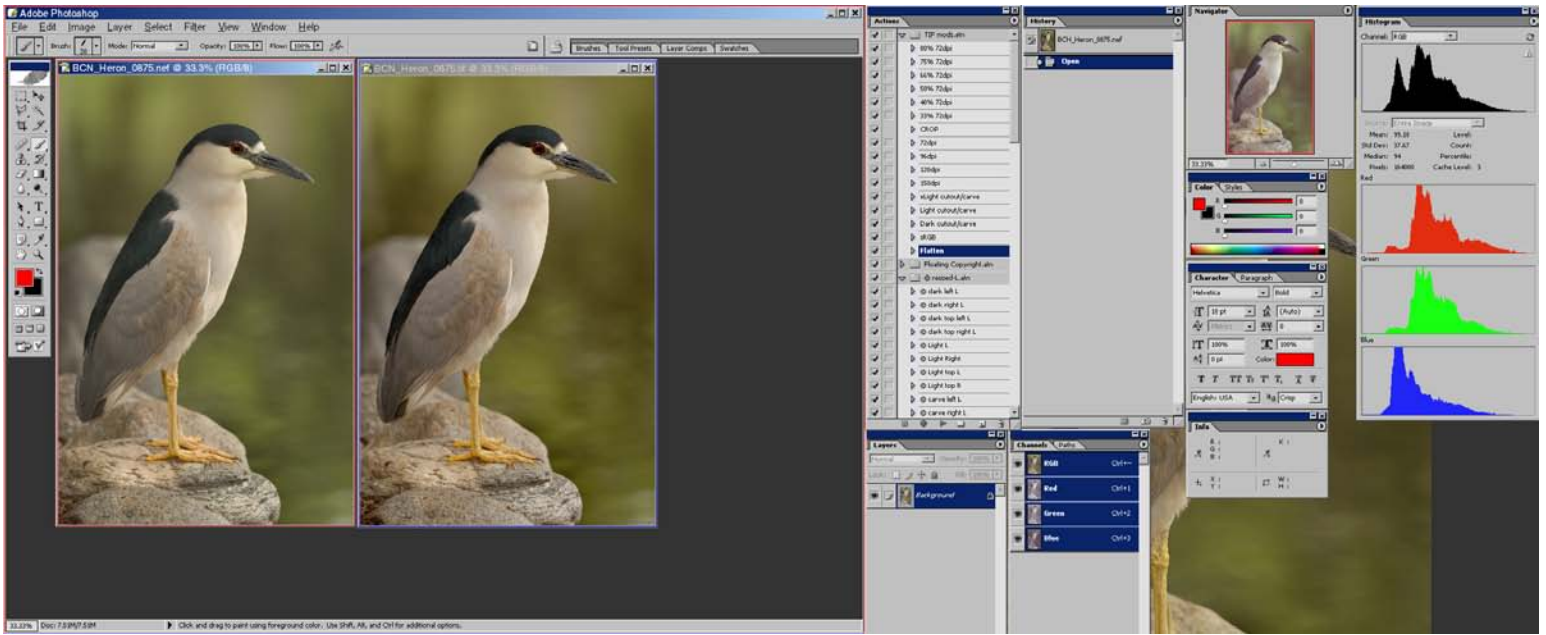
Above, we see the converted image in Photoshop on the left, next to the final output from Capture on the right. An examination of the image and the split histogram shown far right indicates that the shadow levels still need some channel-balancing and increased contrast has to be applied to the image. One of the really useful features in Photoshop CS is that they have now given us the ability to view the R, G and B histograms along with the RGB, the LAB luminosity, or a color overlay. These histograms are also active (they show the results of adjustments), and if you work levels or curves in the background layer (rather than an adjustment layer), you can see the gamma changes as you make adjustments, which is critical to making the gamma compensation for shadow adjustments. Below, you can see a series of adjustments done using Curves in Photoshop (a similar result can be achieved with Levels). Zoom to view details.

In the composite below, the Red channel has been adjusted until the shadow data just hits the Zero border, then the gamma is brought back to the mid-point by raising a point to 128, 128 (watch the histogram and you'll see the bright red midtone-area overlay the dull red indicating the original level). The Green channel is adjusted to bring the shadow rise to the same region as the Red channel, and gamma is adjusted in the same way. The Blue channel is adjusted until it begins to clip (spike at the Zero end), then the gamma is adjusted (watch the midtone-area). The RGB is trickier, as after the shadow adjustment is done until it just begins to clip, two gamma adjustments are required: one to align the mid-shadow peak (Blue channel data) with the original level, and then the midtone gamma is adjusted. Watch for clipping as this adjustment is finicky. Both of these adjustments are shown below the lower RGB curve.
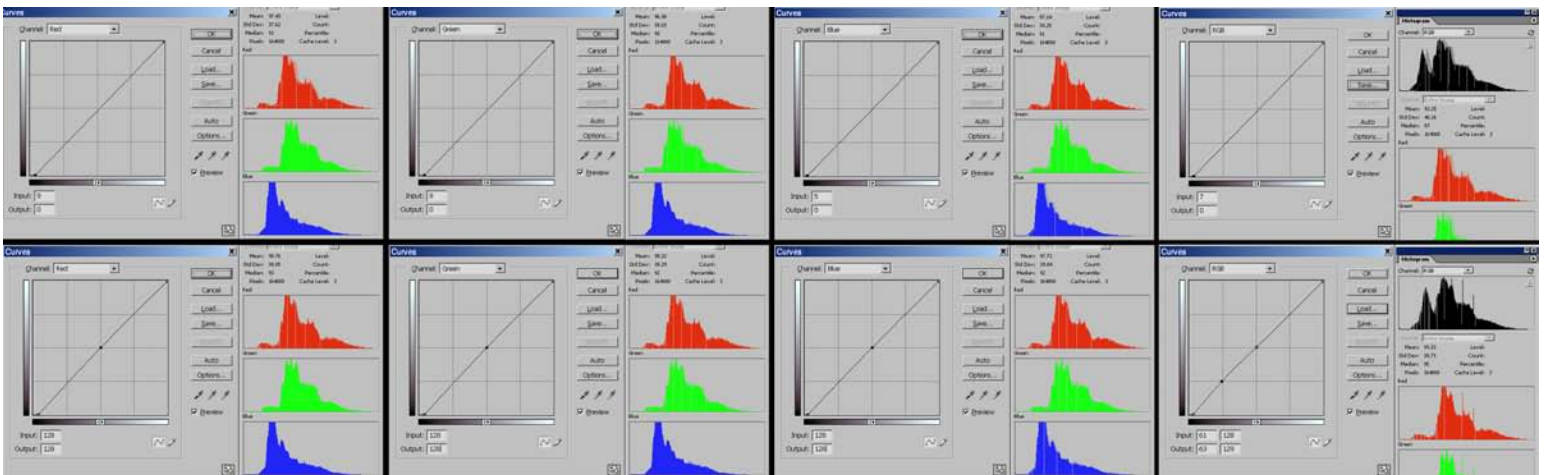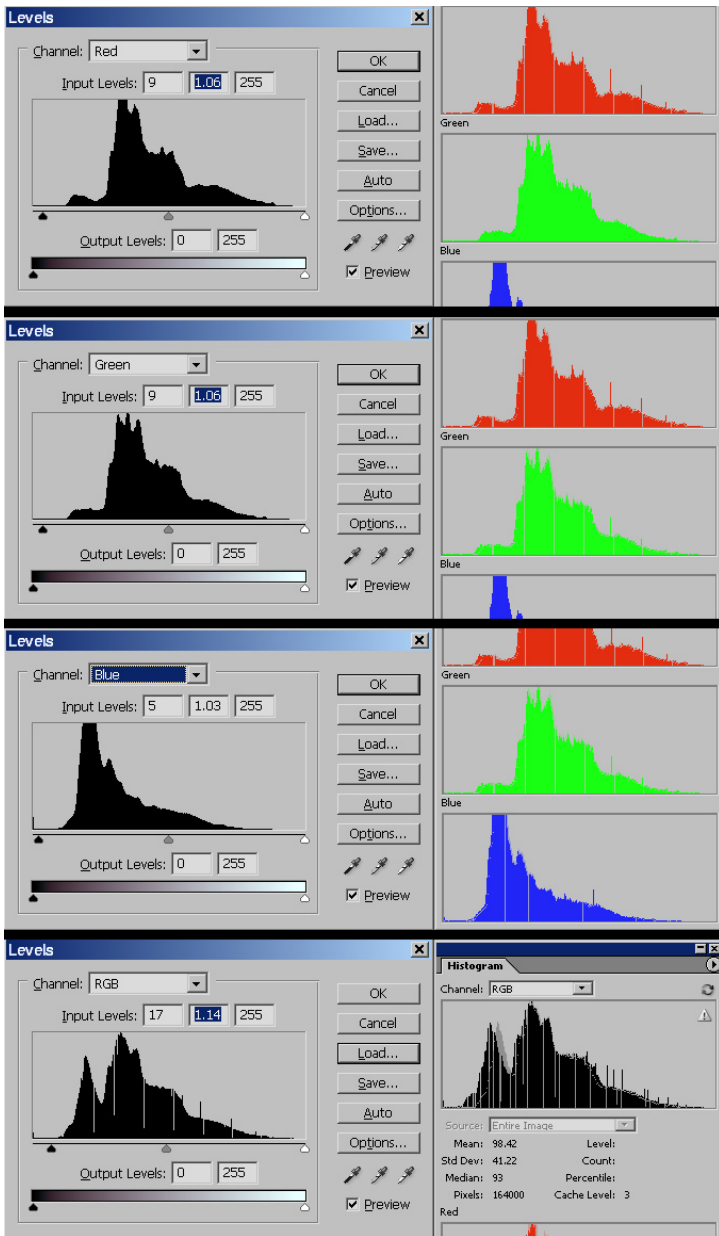
The screenshots above show the same sort of work done using Levels. It is not possible to do mid-shadow alignments in levels as it is in curves, and many people prefer the higher-contrast look without the mid-shadow adjustment, but I wanted to show how that is done as many times this adjustment is required. On the next column is a comparative analysis of the three images. The TIFs from Photoshop are included on the CD (**BCN_Heron_PSlev** and **BCN_Heron_PScur**). An Unsharp Mask of 210, 0.3, 3 was applied to these images.

There are numerous excellent books that detail Photoshop technique… this section was intended to show you how you could apply the Capture techniques using CS RAW. I personally prefer the quality and efficiency of Capture.

As Photoshop's histogram is active (and in the background layer shows both the original and altered histograms in each channel) it is possible to process using many techniques we learned in Capture. Photoshop's Curves and Levels dialogs are separate tools, and the histogram is compressed in both horizontal and vertical dimensions and without reference points. This reduces our capabilities and efficiency, requiring a different workflow.

Summary: Photoshop CS RAW processing

The techniques we learned in Capture processing are applicable in other editing programs, with some changes in flexibility, efficiency, speed, and quality of results. In situations where it is not possible to use Nikon Capture, the techniques are still valuable elsewhere. In Photoshop's CS RAW Converter, some of the work has to be performed outside of the program window, within the RAW Converter module, and other work must be performed inside the program itself.

Based on my experience, Exposure adjustments within the CS RAW Converter are calibrated differently than Capture — the adjustment required to reach identical luminosity levels of a known target is higher in CS RAW by about 0.5 stop (this can sometimes allow you to recover a badly overexposed image), and you often have to make adjustments to both Temperature and Tint to yield the same result you would get with a White Balance adjustment in Capture.

The RAW Converter dialog does not allow adjustment of individual channel shadow levels and gamma, and only allows adjustment of global shadows, therefore any fine-tuning of individual channel levels and gamma must be done within the program window itself using either Curves or Levels. Photoshop now has an active histogram which can show each channel in it's own window along with your choice of display for the image's global characteristics, making it possible to do reasonably-consistent processing now, but the limited size of the histogram and the reduced information caused by the size of the display makes it more difficult to find critical information.

As Levels and Curves must be worked separately, it is a little more time-consuming, although they can be worked in separate layers to facilitate fine-tuning of adjustments. Unfortunately, when Levels and Curves are processed in layers, the unaltered histogram is not shown behind the altered histogram, reducing the ability to see what you're doing. I prefer therefore to process levels and/or curves in the background layer.

Overall, the capabilities of the RAW converter and Photoshop have been greatly increased in the CS version, and it is now able to yield a far better result than the previous versions. It also offers the ability for users of cameras other than Nikon to use the techniques that can be applied in Nikon Capture, which can be difficult to impossible in RAW conversion software offered by some camera companies. There are other program options for RAW conversion which are not addressed here (e.g. Capture One dSLR), which have other limitations and benefits.

I prefer the image quality yielded by Nikon Capture, however, the ability to apply the techniques in other programs gives photographers who shoot other camera brands the ability to use these techniques. Select the software that makes sense for your workflow.

Photoshop Processing — Post-processing techniques

So… you now have a set of master TIFs which you've processed in Capture (or another converter), and you need to do some editing to prepare for output. The operative word in the previous sentence is "output" — you need to decide how you plan to output the image prior to making some of the decisions that you will make in post-processing. While a number of things need to be done to an image regardless of how you are going to output the image, some techniques are done when you are outputting for the web which are not done when you are preparing an image for printing, and vice-versa.

This book is not an all-inclusive manual on Photoshop techniques — there are a number of very good manuals on Photoshop out there. What I'm going to do is give you some tips as to what is generally required for images (which have already been color-corrected and have had the work we've discussed previously done) to prepare them for the web or print. I will go into detail on the most-used techniques, but again, this is not going to cover a comprehensive set of Photoshop techniques.

Image Rotation

Occasionally a shot requires rotation. You'll notice in the crop below (in which I created a rotational offset) that the verticals on the monument are not vertical and the balustrade in the background (upper left corner) as well as the horizontals on the monument are not horizontal. We need to fix that…
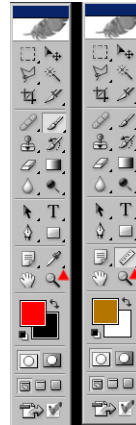
There is an easy way to do this adjustment — much faster than using arbitrary methods. In the Tool palette, you have an eyedropper tool with a little triangle at the lower right corner of the tool icon. If you click this little triangle (marked on the palette at the apex of my red triangle marker) a flyout opens showing alternate tools. Select the Measure tool (ruler icon).
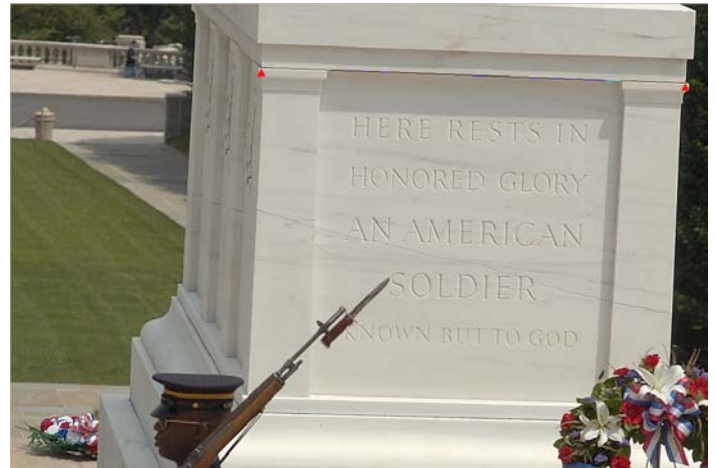
Now, using the Measure tool, draw a line between the two points marked in red on the image above by click and drag. Follow the horizontal line across the monument, and release when you reach the opposite point. If you need to adjust the measurement line, put your cursor on one of the end-nodes on your line and click-drag to move it to where it needs to be. Now, menu-select *Image; Rotate Canvas; Arbitrary*. Crop as necessary. Wasn't that easy?

Cropping an Image

Speaking of cropping (as we were), you have two ways to crop. You can use either the Crop tool (shortcut = **C**), or the Rectangular Marquee tool (**M**). When using the Marquee tool, make sure that it is set to Rectangular (look at the Tool Icon at the top left of the Tool Palette). If you want to set a fixed aspect ratio (e.g. 8 x 10 (4:5); 6 x 4 (3:2), etc.) or a fixed size in pixels, you're better off using the Marquee tool (the Property Bar will allow you to select Normal (drag to set the Marquee); Fixed Aspect Ratio; or Fixed Size). I set my default units in Photoshop to Pixels, thus my Fixed Size units are Pixels. Some folks would rather have that be in inches, but this is going to be based on the image size divided by the pixel density, so it's best to work in Pixels in my opinion and then set density afterwards based on the output size required for prints.

If you use the Crop tool, and set a fixed size (or aspect ratio) in the Property Bar, it is going to resample the image. I'd rather be in control of that myself, thus I prefer to use a Marquee crop. If you're going to perform a "Normal" (arbitrary) crop, without going for a fixed size or aspect ratio, you can use either method. I still use the Marquee tool, because if your crop is going to be near (but not on) an image border, the crop tool tends to jump to the border when you get close and this can cause trouble sometimes.

Let's assume you're going to use the Marquee tool. Decide whether you're going to use Normal (drag a Marquee with no fixed ratio), Fixed Aspect Ratio (drag to set size), or Fixed Size (click to set location). Once the Marquee is set up, you can move it around by putting your cursor inside the Marquee and click-drag. When you have it where you want it, menu-select **Image; Crop**. Now, hit **CTRL-D** to deselect the Marquee. I set up an action for these two steps as it's done a lot.

The one main advantage of using the Crop tool for arbitrary crops is that you can adjust the crop after it's been placed. If you make a mistake in size with the Marquee tool, you have to redo it. **To Crop, double-click inside the selection**.

Creating an Action

In Photoshop, you will often find yourself doing repetitive tasks. Many images require you to do similar things (e.g. Cropping, doing a specific resize, etc.). It saves a lot of time if you Automate these sorts of tasks. One of the powerful features of Photoshop is the ability to set up Actions. These are Macros, which are automated tasks, in which each step in the task is recorded, and can be played back later. Actions can even be concatenated… you can create an Action that contains other Actions (with or without other steps added in).

I separate different kinds of Actions in my Actions palette into **sets**, to make them both easily accessible and to allow me to clean up the Actions palette by closing (but not removing) a set when not using that group.

To create a set, click the little right-facing arrow at the top right corner of the Actions palette and select **New Set**. Name that set as desired. To add an Action within that set, first select the Set in the Actions palette, then click the little arrow at the top right of the palette and select **New Action**.

To create the Action itself, once you have started a New Action, simply perform the tasks you want the Action to do, then click the Stop Recording (square) button at the lower left of the Actions palette. Voila. Simple…

If you need to add something to an Action later, select the Action, then click the Record button (just to the right of the Stop button). If you need to change the order of parts of the Action you can drag them into the order you want within the Action. If you want to use another Action within the Action you are creating, when it gets to the point in the Action to use the other Action, simply select that Action and hit the Play button (the right-facing arrow directly to the right of the Record button). When you're through adding stuff, just hit Stop Recording.

For instance, to create an Action for **Crop from Marquee**, *first drag a marquee… then create a New Action, name it Crop, menu-select* **Image; Crop**, *hit* **CTRL-D**, *Stop Recording.*

Cropping for Perspective

Often, when shooting architecture with a wide-angle lens, it is extremely difficult to keep the imaging plane of the camera parallel with the building's front and still frame it. When the imaging plane is not parallel, the building looks as if it is falling in on itself as well as tipping away from you. Perspective Control lenses are made to alleviate this issue, but when you shoot without one it's possible to get a better result by using a Perspective Crop. To do this, you enable Perspective on the Property Bar for the Crop tool, and drag your cropping rectangle as usual. Once you have set the cropping rectangle, you will have active spots at the corners of the rectangle that can be moved. Generally, I will move these so that they are near-parallel with reference lines on the sides of the building. I leave a slight angle to avoid an un-natural look.

The image to the left shows what the cropping area looks like after moving the active spots. Double-click inside the cropping rectangle to set the crop.

What we've done has altered the aspect ratios. Correct that by stretching the image non-proportionally.

Menu-select *Image; Image Size* and turn off Constrain Proportions. In this image, I used 109 % for height and 97 % for width. I generally compare structural elements to the original side-by-side to select the ratios.

Removing Dust-Bunnies

One thing that we run into using digital SLR cameras with interchangeable lenses is dust getting into the camera during a lens change. This dust will, without fail, eventually migrate onto the imaging sensor causing spots (AKA "dust-bunnies"). These spots are more apparent in smooth areas of color (such as the sky) and at smaller apertures. Cleaning the sensor now and then is necessary, but when you run into these annoying critters you will need to remove them in post-processing.

The crop above shows a dust-bunny which I've selected and darkened to make it easier for you to see. To fix this little beast, select the Stamp tool (*S*), and set a soft, round brush a little larger than the dust-bunny itself (in this case, 45 pixels). Now, hold down the ALT key and click on the sky next to the bunny. This will set the area we are going to clone from. The Stamp (Clone) tool replaces the color in the area you paint on with color from the selected area. Now, click on the dust bunny a few times or paint over it. Voila. Gone.

Another option in Photoshop 7 or CS is to use the Healing Brush (*J*). The difference between the Healing Brush and the Stamp tool is that the Healing Brush blends color from the selected area. This can be more useful when touching up blemishes and suchlike. Use whichever of these two tools makes the most sense when doing touch-up work, but remember the following:

*A major difference in the operation of the Stamp tool and the Healing Brush is that the area you select to blend from with the Healing Brush will remain the same even when you move to blend on another area of your image. With the Stamp tool, the area selected will define the distance and direction from the working area. Move to another area and you'll clone from the same distance and direction, **not the same spot**.*

Resizing an Image for the web

When resizing an image down, you have several choices to make. First, you have to decide if the image composition can be improved by cropping or if you want to use the image as it was composed in the viewfinder. Second, you need to decide what the dimension of the longest side should be at it's maximum. Then you can decide how you are going to resize.

When resizing down, the algorithm essentially throws away pixels. What you want to do to get the best results is have it throw away whole numbers of pixels… otherwise the quality can suffer. You can, of course, resize down to a fixed size, but unless this size is an integer division of the original the results can be noticeably poorer in quality than a size that is a natural division of the original.

What I mean by this is that when resizing down by 50 %, you throw away every other pixel. When resizing down to 75 % of the original size, you throw away one pixel in four.

To resize an image, menu-select **Image; Image Size**, and make sure Resample Image is checked at the bottom of the dialog. Then, change the units to Percent. You can then type in the percentage change you want.

I use 80 %, 75 %, 66 %, 50 %, 33 %, 25 % and 20 % depending on the final size required and the original size. The only time I resize down to a pixel dimension directly is when I am making a thumbnail, or in another situation where absolute image quality is not critical. Often, I will resize down to nearly the final size and do a mild crop to get the exact size I want to use for the web… for instance, if I want an image of 800x600 or 900x600 and the original was a D1h shot (2000x1312), I will resize down by 50 % and then set my crop based on the best composition (either 800x600 or 900x600). If the image cannot be cropped and I must have no more than 800 pixels, I first resize down to 80 %, then to 50 %, which yields 800x525.

I have created Actions for percentages, as well as for several thumbnail sizes. This saves time when resizing a large number of images.

Upsampling an image

Occasionally, you'll either want to crop back to a small subject taken at distance and still make a fair-sized print, or you'll want to make a print of a fairly-detailed subject at a size that requires more pixels than the native image size to achieve a print density that will yield the quality desired for fine details on the media you plan to use. This is going to require upsampling the image (blowing the image up). This technique *does not* require explosives.

Sorry about the low-level geek humor. I simply couldn't resist.

There are a number of methods which can be used to increase the size of an image. Some of these require dedicated software (such as Genuine Fractals), some are sub-routines that are contained within software that does other things (such as Qimage's Lanczos interpolation), and some can be done directly within Photoshop with or without the use of a plugin. The choice you will make will be determined by the geometric character of the image itself if quality of the result is important.

If you happen to have Photoshop CS, the new resizing algorithms included with the program are improved significantly. If you don't, this feature (along with the greatly-improved CS Raw Converter) are well worth the upgrade price. From the testing I did, I can say that a stepped upsample using Photoshop CS yielded very high-quality results, not quite up to the quality of Genuine Fractals but very good indeed. Samples are shown to the right.

Until Photoshop CS, my rule of thumb was to use Lanczos interpolation if the image had acute angles with sharp corners, Genuine Fractals for just about anything else (esp. for very large blowups), and Stepped Bicubic (upsampling in stages using Photoshop's Bicubic algorithm) in a pinch. Genuine Fractals is a rather expensive option though… the program, which costs $160, yields a crisper edge with a greater amount of detail, but it has a very slightly oversmoothed look (similar to a slight overuse of noise reduction software). In my opinion, this is still the best option.

To upsample using the stepped method using Photoshop CS's new algorithms, menu-select *Image; Image Size*, make sure that Resample Image is checked, and set the units to percent. Set either dimension to 110 %, select the algorithm you prefer for this image (e.g. Bicubic Smoother or Bicubic Sharper), and hit OK. Repeat as often as necessary to achieve the size required. In some cases, I have found that using a combination of these two algorithms yields a better result. You can set up an action to run these steps automatically (I created 1x, 5x and 10x Actions).

You can apply an Unsharp Mask to the results after completion of the upsample, based on the requirements for the type of output and the media used. Sometimes, it is a good idea to apply this in different stages with different amounts of intensity and using different thresholds to get the best results, depending on the type of media used and the amount of detail in the image. It is greatly to your advantage to upsample only a TIF original (not a JPG), as upsampling will also increase the size of JPG artifacts. The end result will be far better with a TIF.

Below, you can see results of upsampling using the Photoshop CS Bicubic Smoother and Bicubic Sharper algorithms along with a Genuine Fractals upsample to a similar size.
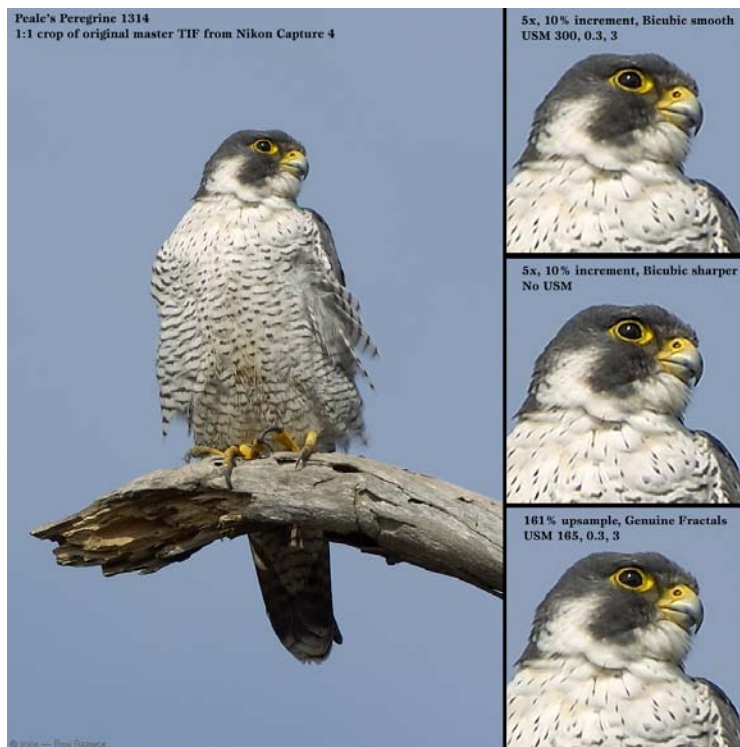
Unsharp Mask

There are several ways and reasons to apply an Unsharp Mask (USM). You've noticed that we apply a USM as part of our primary processing in Capture (or elsewhere). There is an anti-aliasing filter over the imaging sensor in the camera that is intended to reduce moire effects, reduce infrared sensitivity, etc. One of the results of this AA filter is a softening of image detail. We apply that initial USM to offset this softening. The intention of this initial USM is to define edge detail ***without causing a halo around high-contrast edges***.

This image above shows a 1:1 crop from a master TIF, with only the USM applied during processing in Capture, and an oversharpened inset. Note the marks showing high-contrast edges. Zoom in and you'll see dark halos around the light edges. This (along with light halos around dark edges) is what to avoid…

There are situations where applying what would normally be considered oversharpening is exactly the right thing to do. For instance, if you are going to be printing on a media such as matte, watercolor, canvas, or other media where the ink spreads out a little (high dot-gain media), you can not only get away with extra sharpening depending on the surface, but you will find that your results are more pleasing when you apply extra sharpening.

The rule of thumb here is to apply the appropriate amount of sharpening for the situation at hand. Know your media.

You'll notice in the image shown to the left that the original is slightly undersharpened. By being conservative in the original processing-application of USM, it allows you to upsample or apply a final USM without sharpening artifacts which were created during the initial application of USM. The final USM (as well as the initial level of USM applied in processing) should be applied taking into consideration the character of the image, whether there are high-contrast converging lines (which tend to show the effects of sharpening more than widely-spaced lines), the size of the output and media being used, and a number of other factors. For this reason it is an extremely good idea to be rather conservative in your initial application of USM during processing, and to avoid applying USM in the post-processing stages until the end of the post phase, just before saving the final image.

I would recommend working with intensities in the following ranges in Photoshop: 50, 75, 100, 125, 150, and 200. Work with a low radius, between 0.3 and 0.7 pixels, and set your threshold based on the level of noise. I generally use either a 0, 1 or 3 threshold. A very common USM setting for my images in post-processing is 75, 0.3, 1 for the web.

Sometimes, you can get away with a very mild halo at the edges to bring out detail elsewhere in the image. In other cases, if you need to bring out interior detail but need to preserve very high-contrast edges (or if you're trying to sharpen only certain areas in an image that should be soft overall, such as the eyes and lips in a soft-look portrait), then using selective sharpening is a good idea.

There are several good articles on Selective Sharpening available on the web. One option, using layer masks, is described here:

http://www.gbbc.org.uk/crh/selsharp.htm

Another USM technique that is quite useful for shots taken on hazy days is what I call ***Contrast USM***. This is a low-intensity, large-radius USM which doesn't sharpen, but removes a 'veil' from the image. Try these settings and see what they do: 12 % , 200px, 0.

Saving for the Web

There are several schools of thought when it comes to saving images for the web. The first thing many people wonder is what size they should use when saving web images. I have done a study of the people who have visited my website:

http://www.digital-images.net

The results to date have shown that the 55,000 unique visitors in the last two years used the following screen resolutions:

1024x768 (39.4%); 1280x1024 (29.1%); 800x600 (13.3%); 1152x864 (7.9%); 1600x1200 (6.5%); Others: (3.8%).

Since 83% of the people visiting my website use screen resolutions of 1024x768 or higher, I feel that it is reasonable to use an image size of 800x600 or 900x600 as a standard size -- it will easily fit within their window without scrolling. A number of people have asked me whether I was worried that images would be stolen from my website, the copyright mark cloned off, and used for various purposes. Their thought was that since the images are fairly large, that this would be a problem, and they prefer to use images no larger than 600x400 due to potential theft.

My answer to this issue is to not worry about it: while people will tend to steal images now and then, the size is only consistent with quality use on the web or as a small print (or as wallpaper). I don't mind folks using my images for wallpaper, and if someone snatches an image for their website, eventually someone will point it out to me. I prefer to show images large enough for people to enjoy them when putting shots up on the web. You have to decide this one for yourself, of course.

Another issue is how large a file size to allow for the web. Many people are using high-speed access these days, and it is less necessary to keep image sizes under 75kb. Often, the compression required to keep the size down affects the image quality significantly…

What I would recommend is doing an experiment with various JPG compression ratios, with images containing high-contrast edges and smooth areas of color near these edges. Create JPGs using compression levels of 6, 7, 8 and 9 in Photoshop, and examine the smooth areas near the high-contrast edges. Look for JPG artifacts. I have found that I can accept compression 8 JPGs for thumbnails, and occasionally compression 7, but for display images I prefer using compression 9.

Photoshop has in the more recent versions offered a Save for Web option that gives you additional capabilities, including a large before/after preview, a compression slider with single-unit increments between 0 and 100 (offering finer control than the standard JPG save), variable blur, and other options. I don't personally use this, but in some situations (esp. when experimenting to find the settings you prefer), this feature can be very useful. Given the volume of shots I work with, it would greatly increase the time required, but I do recommend checking it out. If nothing else, the before/after preview will allow you to get a very rapid feel for your visual threshold for compression artifacts, and you'll understand JPGs quite well with a short time spent.

To summarize my typical workflow to save for the web, I generally resize down to near my final target size, crop to the final target size (if the image requires a crop), apply an Unsharp Mask, apply my copyright mark to the appropriate corner (I use Eye Candy 4000 to create text effects, which can be gotten from http://www.alienskin.com), and save the image as a JPG with compression 9. I then resize this down to 220 pixels on the long side and save in a separate "Thumbs" folder at compression 7 (or 8) for my thumbnail.

Take the time to become familiar with the characteristics of JPGs at various compression levels, and spend a little time thinking about the pixel dimensions and file size-range you would prefer using when posting images. The time spent planning will be worthwhile.

Saving for Print Output

As always, there are a number of things to consider when preparing an image for print. Primary among these is a knowledge of the printer you are intending to use for output, along with the media's surface and dot-gain characteristics. Techniques used in preparing an image for inkjet output is different than preparing it for a service bureau or an image-setter, and the various papers handle detail in different ways. The level of detail in the image also has a lot to do with the print density required, and the output size and media type will determine how you sharpen the image.

The first thing I'd like to mention is that you very rarely require 300dpi as a print density. This figure was arrived at when digital images were first being prepared for image-setters that had a line screen of 150 lines per inch (LPI). The rule of thumb used by art directors for these images was twice the line screen, thus 300dpi. For the most part, this is overkill — most RIPs (Raster Image Processors… the computer that prepares images and runs the printer) throw away extra data not required for the printer, and the larger image cost RIP time. A number of years ago, a friend of mine who is a professional printer made me aware of a study done by himself and a group of his colleagues to determine the optimum ratio of DPI:LPI to conserve RIP time and still yield a top-quality image. The ratio they came up with was $1.414 \times LPI = DPI$ (the square root of two). For a 150 line screen, this yields 210dpi. Granted, a lot of art directors still go by the old rule of thumb, and it's not usually a good idea to try to tell them their job, but I thought I'd mention this.

Some printers, such as the Fuji Frontier that is used by a lot of high-volume digital-photo printing operations, are set up to work with 300dpi, and the printer-operators generally do not know how to operate their RIPs (often they are students, working at Costco or WalMart). If the RIP is set up to work at a default of 300dpi, and does not scan the header to use the density you set the print at, then you'd better use this density to avoid trouble.

Another situation where it is a good idea to use 300dpi is the case of using 10-micron-process printing. This process, generally used for high-end books on heavy, hard-surfaced papers, has a very fine equivalent line screen, and using 300dpi (or more) is necessary.

Let's discuss preparing for inkjet prints.

Stochastic printers (like the Epsons) generally work best with a maximum of 240dpi, but this is only necessary when the image is very finely detailed, and is going to be printed on hard-surfaced (glossy) paper. A good rule of thumb for inkjet use is as follows:

Media Type	Image Detail	Print Density
Glossy	High	210-240dpi
Glossy	Medium	180-210dpi
Glossy	Low	150-180dpi
Matte	High	180-210dpi
Matte	Medium	150-180dpi
Matte	Low	120-150dpi
Canvas/Watercolor	High	150-180dpi
Canvas/Watercolor	Medium	120-150dpi
Canvas/Watercolor	Low	100-120dpi

As you move down in detail within a specific media type, or down the chart in media types, more USM will yield the best results.

It is recommended that you use either a generic profile for the printer and paper type you intend to use when printing, or have your specific printer profiled for various papers and use that profile when printing. It is not within the scope of this book to discuss color management and profiling, but there are good books on the subject as well as information available on the web. A web-search for Printer Color Management will find many links, e.g.:

http://www.creativepro.com/story/feature/2440.html

http://www.creativepro.com/story/feature/14331.html

http://www.color.org/whycolormanagement.pdf

Determine the size and media you're using for an image, whether the image requires upsampling, then set print density and USM, and Save As (or print directly).

Nikkor 500mm f/4 AFS-II and 45mm f/2.8P

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My kits are selected for maximum flexibility in low-light, portrait, scenic, macro, tele-closeup and telephoto work. My field lenses were chosen for the ability to shoot at distance as well as extreme closeups — flexibility is of utmost importance to me. I have decided after testing a large number of lenses that for the most part, primes are far more attractive to me than zooms even though zooms are more convenient. I have set up my kits so that I can cover the range with lightweight sets and the capabilities I need for a specific shoot, although that meant that the number of lenses is higher and there is less convenience. The performance achieved is far greater though.

I am pretty critical when it comes to detail retrieval and fine-detail rendition. When you are first moving to the SLR and assuming that you are using decent-quality lenses, until you start examining things carefully it is likely that you will be very pleased. When you look at the edges of the frame, or open the lens aperture up, or go beyond the 'sweet-spot' distance for the lens in question given a certain aperture, if you can start to see loss of fine detail or reductions in sharpness you might not be happy with that lens's performance at some point in the future. Some lenses have a high degree of flare in certain conditions. All have a 'sweet-spot' range of apertures and distance — often the range changes depending on the aperture. Essentially, what I look for is contrast, sharpness, and most especially fine detail retrieval. While you can process for more contrast, and to a certain extent you can sharpen detail that is rendered, if the detail is not there you cannot pull it out of thin air.

Basically, I want a lens to perform it's function properly, to a high quality standard, within a range of apertures and distances that allow me to make proper use of the lens in the situation for which it was designed, and I'm willing to accept some reduction in performance when using the lens outside of that range. If a lens forces me into unacceptable compromises when I attempt to put it to it's intended usage, that annoys me. If I try to use it within an aperture/distance range that makes sense for the purpose I acquired the lens for, and the results are not satisfactory to my admittedly ridiculous standards, that annoys me too. I do of course expect lesser results if I'm trying to make a lens go outside its sweet spot, but I don't allow a lens that annoys me to live here.

What I've tried to do is give my evaluations of various lenses and some suggestions as to what to look for and how to make decisions on glass. You have to decide what sort of compromises you are willing to make. Everything is a compromise of one sort or another, and as long as those compromises fit within your needs, a lens will be a good tool for you.

Lens Selection

The Short Version

A few important thoughts come to mind when I consider the course I took through the sea of lenses… or at least I think they are the important issues that I would wish I had felt in my gut when building a kit from scratch.

1. don't consider extremely wide-range zooms, as few are even as good as the decent consumer-grade lenses, and a very few are quite expensive and as good as the better-grade lenses but with some compromise. Results from one of the mid-grade, medium-range zooms is generally far better, the better-grade medium-range zooms produce consistently superior saturation and detail.

2. consider starting with a 50mm prime and either a very good wide zoom (expensive) or a 24mm prime (inexpensive and generally the best WA focal length). Learning to use the perspective of a 50mm lens teaches composition very fast, plus it is useful in low available light and focuses quite close. The perspective is natural and the 50mm lenses are extremely sharp. Much the same could be said for a 24mm prime lens, but it is quite convenient to be able to compose with a wide angle zoom. All but the very best of the wide angle zooms are lower-performing lenses than the 24mm prime in almost all respects, and those expensive top-grade lenses only equal that performance (or are close).

3. don't skimp on a long lens. Instead, carefully consider how you are likely to use a long lens, and remember that heavy lenses are not easy to hold for long periods of time, requiring regular workouts or support devices. Average grade lenses will rapidly disappoint as you find their limits, and tend to not hold their value, so you'll want the best glass you can afford. If you carefully consider your needs, you can choose between a lightweight, fast prime set and a convenient, heavy zoom (and other relevant decisions, like price) with the long view in mind.

Zooms are convenient to be sure, but personally I don't think the best way to work is to cover the focal range with zooms. If zooms are your chosen tools, the way I'd work is with a wide zoom and a long zoom, but use a normal-range prime. The two that I would consider would be either the above-mentioned 50mm f/1.4 or a normal-range macro lens, depending on your needs (low-light or macro).

If you are a macro nut, and want to get the bee's-eye view, remember that the working distance at maximum magnification on a 60mm macro lens puts the element very close to the subject. Working with a ~ 100mm lens gives more working distance needed for insects, lizards and other small creatures that spook easily, and it is possible to hand-hold… unlike a 200mm macro telephoto that is difficult to control at anything under 1:3 hand-held in marginal light (although it really isn't much problem in good light at somewhat lesser magnifications). Macro zooms rarely go beyond 1:4 or 1:3 due to limits in close-focusing ability and the performance near maximum magnification is generally poor on those zooms near the edges of the frame. One notable exception is the Nikkor 70-180mm Micro zoom lens, which is an incredibly nice tool but rather expensive.

Knowing the limitations of various types of lenses will allow you to select more wisely. Nothing works well in every situation, and trying to make one lens a do-it-all solution generally results in mediocrity. There are, however, some good general-purpose solutions.

The Long Version

During the course of deciding on a lens set that would fulfill my needs, I owned and/or tested a fair number of lenses, including third-party lenses, both prime and zoom. Impressions of some of these other lenses might be of use to the person looking for a lens or lenses for use with a similar set of needs. I shoot scenic, animals, flowers, macro, and art primarily when shooting for my own uses, and anything from people to product when commissioned to do so. My choices have been made with these needs and ultimate quality vs. price in mind.

General-purpose lenses

Many people want a lens that can be used as a do-it-all travel or general-use lens. When I started with the D1, the first lens I chose was the 24-120mm f/3.5-5.6 Nikkor, based on a recommendation from two people I respected. This lens has a fairly wide range, from medium-wide to short telephoto, and has a reasonably wide maximum aperture for a fairly bright viewfinder, however, images from this lens are soft unless the lens is stopped down to at least f/8. At f/11, the results are quite good, but of course the depth of field at that aperture does not offer much subject isolation. In addition, at the 24mm end there is significant barrel distortion, and I was never satisfied with the images taken at the 120mm end for a number of reasons. Another major detraction of this lens is the poor defocused character (the out-of-focus, blurred region highlights show dark centers and very bright edges, and these highlights are extremely distracting). From around 28mm to about 105mm, the lens does a fairly good job when stopped down to f/8-f/11 however.

Nikkor makes a lens that is in that very range, the 28-105mm f/3.5-4.5. This lens offers significantly better performance at all focal lengths and apertures, is a faster lens at the long end, offers a decent macro mode for those times when you want to focus closer,

and overall is the general-purpose zoom that I recommend using to anyone who asks. While it is not up to the performance of the expensive AFS zooms, it has a wider focal-length range, is very light, and costs in the neighborhood of $325 making it in my opinion the ultimate choice for a general-purpose lens.

'Normal' lenses

The 'Normal' range is very difficult, as there are so many uses for lenses in this range and nothing does it all. I have rethought this range far more often than any other, and have tested lenses extensively. I hope the summary below helps you in your decision-making process…

There are a number of options when it comes to 'normal' lenses (those that approximate the field of view of the human eye). Deciding on a prime or a zoom in this range is difficult — the prime lenses offer exceptional performance and faster apertures at a lower price, but have distance or other limitations and of course are limited to a single focal-length. The better-grade zooms are much larger and heavier, slower-aperture, more costly, and for the most part have a different set of limitations.

When I decided that the general-purpose lenses did not satisfy my needs for ultimate quality, I started looking at the Tokina 28-80mm f/2.8. I compared it to the Nikkor 50mm f/1.4 and the Nikkor 35-70mm f/2.8D. The Tokina meters a bit underexposed in all but bright daylight, has a slight lack of contrast in comparison to the Nikkor lenses, and is a little undersaturated in color, plus the color balance is slightly off requiring that all images be color-adjusted in post-processing. It is quite soft at f/2.8 (more so than the 35-70/2.8D Nikkor), and the flare and ghosting when a bright light source is in-frame or just outside of the frame is heavy (this is improved by stopping down the lens). Both samples of the lens illustrated the same characteristics, and were ultimately sent back to the dealer.

The Nikkor 35-70mm f/2.8D on the other hand, while not quite as detailed or contrasty as the 50mm prime, was very good in all respects. It is still soft at f/2.8, but not as soft as the Tokina. Contrast is excellent, and as long as the hood is used it is fairly resistant to flare and ghosting. The hood is less useful at the long end than it is at the wide end (a very good option for a hood other than the bayonet model offered for the 35-70 is the HN-24 metal screw-in hood, which does a better job without vignetting — at least on the D1-series bodies). The 35-70/2.8D is well-built, with a metal barrel, a useful 'macro' mode that allows the lens to manually close-focus to under a foot at the 35mm end, and is fairly sharp and detailed when compared to most other zooms and many primes. The major detractions are the relatively narrow range and the push-pull zoom design (which you do rapidly get used to). It should be basically looked at as a very good 35mm f/2.8, a slower 50mm, and a 70mm in a pinch. I tested a new 35-70 during my recent excursion through the Normal-range, and after processing the images remembered why I sold this lens — in comparison to top-quality primes and the very best zooms the lens is soft on finer details, it doesn't resolve well at the 70mm end, and based on my standards it's just-adequate at distance and less than that for closeups except at the 35mm end. Don't get me wrong… this is a very good zoom (better than just about anything else out there in its range) but I'm getting really picky these days.

The 45mm f/2.8P manual lens is very intriguing… it offers excellent detail and sharpness as well as extremely smooth defocused areas and good shadow detail-retrieval at f/2.8-f/5.6 at close-to-medium distance, and becomes increasingly mundane as you stop it down more or move beyond about 10-12 feet (best performance at distance is achieved at f/8-f/11). My brother-in-law bought me one in Japan (thanks Wabo!), and after shooting with the lens I have to say that for a subject that is inside 10 feet, which you want to shoot between f/2.8 and f/5.6, it offers similar character to that you get from the 85mm f/1.4D. The best performance is achieved with a subject between 3 and 7 feet at f/4 to f/5.6 if you are picky, but overall performance from f/2.8 to f/8 is really very good. It's a bit soft at infinity as compared to the very best lenses, but considering the performance for a close subject this is acceptable (it reminds me in this respect of the character of the 28mm f/2.8 AIS, which is tremendously good for close subjects but a little soft at infinity). It is sharper at f/2.8 for close work than either of the 50mm lenses and way sharper than a zoom at distance. At f/4 to f/5.6 it is pretty darned near perfect. The 45mm f/2.8P makes a fabulous travel, indoor or street-shooting lens, and it weighs nearly nothing. The construction quality is exceptionally nice, and it comes with an NC filter and a neat inverted-bowl hood as well as a special lens cap that fits with the hood in place. The filter and hood nearly double the depth of the lens… this thing is teeny. A very unobtrusive, very flexible normal lens. The smooth character and ease of use is very attractive, and the 'coolness factor' is very high. I really like it.

The 50mm primes (f/1.8 and f/1.4D) are exceptional performers — the f/1.8 lens does a fabulous job from f/4 to f/11 and from 5 feet to infinity, and is quite good at f/2.8 and f/16. It is one of the best lenses available in the 'normal' range for medium-to-good light work, especially for infinity work. The f/1.4D is noticeably better at f/2.8 to f/4, about equal at f/5.6-f/8, and a lesser performer at f/11. It can be shot at f/2 in a pinch as long as you don't mind the edges and corners being a little soft. The 50/1.8 has a little less distortion, but the construction quality is annoying in my opinion (considering the quality of the optics, I guess they had to cut corners on the construction quality to sell it for under $90). The only real issue with the 50mm lenses, besides the fact that they don't do as good a job close-up as they do at medium-to-long distance (and it's a small problem given the cost), is that they offer a rather mundane field of view and perspective for most people (most folks (including me) would rather shoot either a wider or longer lens most of the time) but for the utmost performance at the least cost (and definitely for a single-lens outing) the 50mm

lenses are among the best lenses you can put on the camera (I owned the 50mm f/1.4D for 2 years, finally selling it to gain flexibility).

The 60mm f/2.8D Micro is without a doubt the sharpest and highest contrast AF 'normal' lens for close work, and under 7 feet I doubt whether there is a better lens made, but as you go beyond about 10 feet it gets progressively softer… although the results are quite good when shooting small apertures. It's still better than many lenses at distance, but compared to what it will do for close-work (especially very close work) it's character at distance is not in the same league. The 60mm Micro lens is sharper and offers higher-contrast at macro distances than the 105mm Micro, and compares in character with the 200mm f/4 AF Micro, but the working distance is extremely short. It's best suited for static subjects when really close as the working distance is too short for insects and shy animals — it's a fabulous flower, plant and large subject field lens though, and it's often used as a normal lens.

If a single lens is desired for wide aperture work, extreme closeups and infinity as well, you may want to consider the 55mm f/2.8 AIS Micro. You lose Matrix metering, aperture reporting, and AF, of course, but the focusing precision is tremendous, construction quality is superb, distance focus is every bit as sharp and detailed as close-focus is, quality at f/2.8 is exceptional, and the only reason why this wouldn't be a perfect single-lens solution is that the focusing precision makes it slow to focus at any range under 2 feet (of course, that's where you really need the precision), and there is too little focus-ring travel for adjustments between 7 feet and infinity, making medium-range focusing tricky — plus of course it's a fully manual lens.

After going through the entire gamut of lenses that I considered as being up to my standards for quality, I finally ended up trying the 28-70 f/2.8 AFS zoom. This lens is very good when shooting between 1.5 feet and 10 feet, and is quite good at distance, although it is a little softer. Contrast is very high, although the lens tends to underexpose by 1/3-1/2 stop except in bright light so it is a good idea to compensate for that. The performance wide open, especially at 28-35mm, is softer than I like for anything detailed -- edge-performance and detail-retrieval doesn't reach my standards until f/5. From f/5 to f/11 the lens really is the class act zoom lens though, and from 50mm to 70mm it does a fairly good job at f/4 as well. It is heavy (very), fat, intimidating, and very, very expensive, but the ability to compose from medium-wide to short-tele finally made me spring for the lens. The hood does a good job (it ought to — it's enormous), but the lens still has a tendency to flare in adverse conditions so you have to be careful shooting into the sun. I thought long and hard about this range, and tried everything else (testing each lens to death and owning both the 50mm f/1.4D and 35-70mm f/2.8D for quite some time before checking everything out again), but after considerable thought I finally decided that this lens had to be tried. It is a large, bulky, heavy, very expensive lens for its range (did I mention that this is like having a coffee can on the front of your camera?), and its AFS motor and the flexibility of focal-range allow you to get a high shot percentage, but the quality of those shots for the most part is well below the quality achieved with primes. After nearly a month of shooting this lens, I had only two shots that I considered portfolio quality (although I had quite a number of very good shots), so I returned this lens. I am going back to the 17-35 AFS and 85/1.4D for general use in this range, and when I need a single lens I'll use either the 45mm f/2.8P for wide aperture work and as a general-purpose normal lens, or the 60mm f/2.8D Micro for field closeup work. More flexibility, less convenience, tremendously better results.

Closeup lenses

You want:

1. Control of depth of field at a wide range of focusing distances, yet within a very small area of focus (roughly between 1:1 and 1:3) you want extreme focusing precision, so you can place the depth of field zone where you want it (it is very shallow at these focusing distances);

2. High contrast, fine-detail resolution and edge definition at close focusing distances, with smooth subject/background transitions;

3. Flat field rendition (no or low distortions) across a majority of the frame within the target aperture ranges;

4. Flexibility of aperture with predictable quality of results;

5. Flexibility of distance of focus at a wide range of apertures for use as a standard lens.

Remember that these lenses are primarily designed with optimizations for closeup work. The 200mm reaches 1:1 at 20" from the imaging plane. If you use the hood, that's about 10" in front of the hood. If not, add 2.75", making it about 12.5" from the front of the lens. The 105mm is about 7.5" from the end of the lens at 1:1, and the 60mm is about 5.75". I use an HN-23 hood on the 60mm and that gives me about 4" at 1:1, but I don't use the 60mm in the field at 1:1 often — usually between 1:2 and 1:4 when I'm shooting closeups with the 60. You can see the difference in working distance at maximum magnifications.

The 60mm is a very high-contrast, flat-field lens for use at close distance to 3-5 feet. It excels at close work, and falls off in performance as you exceed 7-10 feet. As you go beyond the 7 foot range, focusing precision falls off because the lens has the gearing set so precision is highest at the closer end of the range. You also need to stop down the lens to the f/8 to f/16 region for best results at distance. It is without a doubt one of the sharpest lenses in the under 7ft. range, and the quality under 3 feet is exceptional. The lens does not have an exquisitely beautiful defocused region, so except when focusing really close

with the background transition occurring significantly behind the subject it's a good idea to avoid highlighted backgrounds (they can get distracting). Defocused transitions are good. It works best between f/5.6 and f/16 at short-to-medium distances, f/8 to f/16 when really close or beyond 7 feet. As you open up the aperture you lose some sharpness at the edges and the quality of the near-subject defocused region becomes a noticeable part of the subject. It works quite well at wider apertures but not up to the standards of the lens's quality at middle apertures.

The 105mm loses a little contrast and sharpness to the 60mm, gains a little more reach (~80mm at 1:1. The focal length reduces as you focus closer), and a little more working distance. The 105mm is a better lens if you are planning on shooting small creatures up-close hand-held. The reduction in contrast and sharpness is offset by the flexibility of working distance and a little extra reach in some shooting styles. Again, this lens is at it's best in the same general aperture ranges as the 60mm. The overall image quality is lesser than the 60mm, but flexibility is greater in the field. This may not be an issue in a controlled environment with fixed subjects, and in that case the better short closeup lens is the 60mm.

The 200 Micro offers aperture and distance flexibility, exquisitely-smooth defocused transitions and backgrounds, a high contrast, extremely fine edge-definition and detail retrieval, and maximum working distance. You can shoot that lens from f/4 to f/11 with confidence, at any distance (stop down a little for edge-to-edge sharpness at distance). The detraction is weight, length, and cost. I chose to use the combination of the 200mm and 60mm Micros to give me maximum flexibility and quality at the widest range of apertures and shooting distances. The costs were high and I have to carry two lenses in some situations, although the 200 Micro makes an excellent single field-lens.

Given a need for a closeup lens for product photography, you have a different pair of choices: if you need control over the plane of focus and perspective, using the tilt-and-shift capabilities of the 85mm PC Micro will give you this control. The lens requires stop-down setting and is complex to set up and meter with if you use the tilt/shift capabilities, so you have to be far more deliberate to work with the lens, but the results it yields are not achievable without the T/S capabilities. It's an expensive, specialized lens that happens to be designed with this particular usage in mind. In the studio, with inanimate objects that can benefit from perspective control and control of the focusing plane, it is invaluable. The other option for uses like this is the 60 Micro, which excels at close compositions of 3D subjects. You need to decide whether you require control over the focusing plane and perspective, then whether you are willing to give up some conveniences of use to gain that control.

Hopefully you have enough information to decide what your best choice would be in a closeup lens.

Analyze your shooting style, and select lenses that make sense for you.

There are several situations in which I generally shoot. I walk a lot — often 100-120 miles per month. There are times when I am certain as to which focal lengths I will need, and other times when I may run into anything. Carrying the whole kit with me is simply not an option due to weight alone, so I have set up my kits in a way that allows me to carry a variety of focal lengths in several different ways depending on the situations in which I might find myself. I attempt to draw on my experience shooting in different situations to allow me to choose the most efficient lens complement while carrying the least amount of weight. Over the course of a 10 mile hike at altitude, or even a 10 mile hike near sea level, keeping the weight down is a very good thing as I'm sure you know. Besides, you do sometimes have to carry food,

water, and occasionally spare clothing so unless you enjoy feeling like a pack mule (been there…), planning for weight is a necessity. What I try to do is balance low weight (shooting and carrying weights) with quality in the ranges of aperture, distance, and focal length that I foresee needing for the shoot.

What you should try to do is define your shooting needs in terms of absolute quality desired, flexibility (aperture, distance, focal range, size, focusing speed, etc.), budget, and other relevant areas. This will help you to define what sorts of lenses might be required. Then, if possible, try to specify a kit that will allow you to do as many things as possible with the least number of lenses. While zooms offer flexibility of focal length, they generally have limits re: focusing distance and aperture that may offset the advantages of focal length variability. Sometimes assembling a kit consisting of primes and zooms gives the most flexibility.

For instance: while I tend towards primes for image quality and aperture flexibility, and will sometimes shoot a single focal length as an exercise, I generally try to select kits with three lenses or less to cover every possible shooting situation I might find myself in on a specific shoot. Occasionally, this requires four lenses, (e.g. the 17-35, 85, 135 and 300 when I have to be ready for anything), but I try for three or less. I use a wide zoom in many situations and have just acquired the 70-200mm f/2.8 AFS/VR for a general-purpose long zoom — this new zoom rivals the quality of primes. This gives me a two-lens travel kit at the expense of wide-aperture capabilities (by adding the 45/2.8P or 85/1.4D I could add the low-light capability). The AFS/VR will not replace the specialized primes in it's range, but it will remove the need for carrying them in a travel/general-use situation where the typical shooting requirement is at medium-to-long distance (the primes I use in that range work best at close-to-medium distances and wider apertures).

Carefully consider your needs… this will make lens selection easier.

Telephoto Lenses

There are several ways to look at the telephoto lens situation in my opinion:

1. You are shooting primarily at distance, yet require focal length flexibility and aperture flexibility, and are likely to be shooting at medium apertures primarily (f/5.6 to f/8, with occasional excursions to f/4 or f/11).

2. You are shooting in lower light conditions fairly often, and will be primarily shooting wider apertures and medium distance, with occasional excursions to closer distances or medium apertures.

3. You are shooting in the field, require extreme flexibility of focusing distance (you might shoot flowers or small animals one minute, and reach out for a bird, larger animal, or distant scenery the next), as well as flexibility of aperture — at very close or long distances you will likely be shooting f/8-f/11, but want the ability to shoot wider apertures over a fairly wide range of distances and still maintain quality.

4. Some combination of the above.

The first situation above is perfect for the use of a telephoto zoom. These offer flexibility of focal length in a single lens, with top-quality results between f/5.6 and f/11 at medium-to-long distances, and progressively lesser performance as you open the aperture up. The 70-200 AFS/VR offers high-speed focusing and vibration reduction as well as very good performance with or without the TC-14e teleconverter (100-280mm f/4) — in either case the best performance is achieved stopped down a bit. Defocused character at wider apertures is quite good in the AFS/VR. The earlier versions of the medium-telephoto zoom lens (AFS and AF-D, AF ED push-pull) as well as third-party options have one of more of the features missing, although the AFS version (with high-speed focusing motor) is quite good. The AF-D is without the focusing motor and vibration reduction, is a lesser performer at f/4 or at closer distances, but still focuses

quite fast and works very well at medium-to-long distances between f/5.6 and f/11. The earlier 80-200 AF ED (push-pull version without tripod collar) that I tested tended to over-expose and had lower contrast. These zooms offer flexibility of focal length, at the expense of wide aperture and close-up work, a higher shooting weight, lower contrast in some cases and a tendency towards flare. This situation can also be covered with a short-telephoto and medium-telephoto prime lens set, which lowers shooting weight, improves performance in many situations and esp. at wider apertures, and generally improves shorter-range performance at the expense of single-lens flexibility.

The second situation is perfect for a set of high-grade primes. The 85mm f/1.4D, 105mm f/2DC and 135mm f/2DC all work very well at wider apertures, allowing for shallower depth of field and higher shutter speeds. The 105mm is an excellent single-lens solution for this situation, and it really does do very well at f/2… better at f/2.8-f/8. The combination I use in this situation is the 85 and 135, as I need the ability to reach out to the subject in some low-light telephoto situations, as well as a short-tele for portrait and similar-range work, and sometimes a tool that can be shot in very low light at f/1.4 and provide top quality results in the center of the frame. There are a number of other choices in lenses in this range, including lenses that handle situation #1 above a little better than the very fast telephoto primes, at the expense of their quality at wider apertures (e.g. the 85mm f/1.8D).

The third situation requires a specialized lens if you hope to do quality work in all situations. There are some zooms that offer closeup capabilities — most are better at distance than up-close but are adequate for limited closeup work. Some primes that are designed for longer-range work also do a very good job for close-telephoto. You can also carry a closeup lens (diopter) to add onto your telephoto lens. Any of these options work (some better than others) for closeups, but there are a few specialized lenses that can do

well in the field, in all situations. The Nikkor 70-180mm Micro zoom was designed specifically for this sort of work, and while it is excellent close-in, I found that it had some compromises when used as a standard telephoto at wider apertures, which made me decide to go a different way. The 200mm AF Micro allows me to have enough reach for many field situations that require a longer lens, yet still focus extremely close (1:1) while maintaining maximum working distance, and it is capable of yielding a clean image from f/4 to f/11 (and f/16 depending on focusing distance)… at the expense of focal length flexibility. When I am working with the 200 Micro I invariably carry the 60 Micro as well, which also focuses extremely close and allows me to have a shorter focal-length available at need (the 60 Micro is exceptional at close-to-medium range, but performance falls off at distance). Another option for a field telephoto that is capable of dramatic, lesser-magnification closeups is the 300mm f/4 AFS, which goes nearly 1:3 at it's minimum focusing distance of 4.75 feet and does a very good job up-close.

While the 200mm focal length is an excellent mid-telephoto range, the 200mm f/4 AF Micro is a specialized type of 200mm. It is a tool that is highly-corrected for close-work, and while it yields top-grade quality between f/4 and f/11 and at any distance between right-in-your-face (min. focusing distance = 20" from the film plane — about a foot in front of the lens) and infinity — the requirement for precision focusing at close range means that you have a slow adjustment of focus at closer distances due to the gearing, and a very short travel for adjustments at distance. This makes use at distance trickier, and also slows down overall focusing speed to the point where, even with the limiter, the 200mm Micro is no focusing speed-demon. It's a little slower than the 180mm f/2.8D prime, which is in itself no speed demon.

What the 200 Micro will do is yield tremendous closeups out to about 10 feet with extreme focusing accuracy both manually (recommended) or via AF if you give it a little

time to focus (and use the focus-range limiter appropriately). On the other hand, while the focusing is slower, it really does do a superb job that cannot be achieved with the zooms in it's range or the primes. It's the perfect field telephoto in that it can be used to reach out a bit for birds assuming you're not trying to track flight shots, then immediately do a telephoto landscape, then immediately do an extreme closeup of a praying mantis or something. It can be used for wildlife and water droplets, and nearly anything else that doesn't move too fast. For focusing speed, there are other tools.

Sometimes, I carry a mixed kit consisting of the 60mm Micro and the 135mm f/2DC to have the ability to shoot wide aperture close-range to medium-long telephoto, and extreme-closeup to medium-range at medium apertures with two lightweight tools.

The thing is, with a telephoto you can get lenses that are designed for use at 10 ft. to infinity with extreme precision and quality, lenses that are designed for close-to-medium range work with extreme precision and quality, or compromise lenses in some respect. This goes for a lot of situations and telephoto focal lengths. Define your situation… you may find that a 70/80-200mm f/2.8 zoom is adequate for your needs assuming that you do a lot of your work at f/5.6 to f/11, and can accept some compromise in detail and sharpness as you open the lens up wider than about f/5 or focus near the minimum focusing distance (in the range of about 5-8 feet). Some lenses are capable of excellence beyond their primary range of design as long as you know how they work best.

For high speed action and flexibility of focal length, a 70/80-200 is tough to beat. The new AFS/VR medium zoom is a truly spectacular lens — assuming it is within your price range (see the review here). Personally, I am very spoiled by primes, and looked for a long time (several times) for a medium-telephoto

zoom that I could accept. I am willing to carry specialized lenses that have a range of use outside their specialization. I learn the limitations and make decisions on what to carry based on my needs. There are certain situations where the primes are still necessary (see #2 & #3 above), but for situations described in #1 above as well as some field situations, travel, medium-range high-speed action, etc. the AFS/VR zoom is a fully-capable tool that has finally tempted me to give a good home to a medium-telephoto zoom.

You need to decide whether being able to change focal lengths by zooming or adding a 1.4x TC is a better option for you than having lenses optimized for a situation. Do you need a field telephoto with a high-speed focusing system, or is close-focusing more important? Do you work at wide apertures often? Do you need rapid focal length changes more often? Are you willing to buy an expensive, high-speed zoom as well as a teleconverter to get reach and flexibility at the expense of wide aperture work and closeup work, or are you willing to work with primes? If you are going to need wide aperture capabilities *and* a long lens (300mm or greater) you had better be willing to spend some serious money though… the high-speed long telephotos are quite expensive.

Lens Kit Descriptions:

When selecting kits, I will first decide whether I am likely to need to shoot wide-aperture or not and then base my selection on the focal-length needs for the shoot. Sometimes, I will allow myself the option of shooting across the aperture range but at different focal lengths or distances. All lenses have a sweet-spot for aperture and distance — some are quite wide and others are narrower. I try to mix lenses in my kit based either on similarity of character or flexibility within the needs of the shoot.

One way to gain flexibility is with the use of zooms… this generally restricts what you can do at wider apertures as zooms tend to operate best at middle apertures. Sometimes, I will mix the wide zoom with the high-speed short or mid-telephoto for this reason, or the high-speed wide-angle with the telephoto zoom. At other times I will work with both the wide-angle and telephoto zooms, and plan on shooting middle-aperture work for the most part (the AFS/VR works very well at f/4, but the 17-35 is best from f/5.6 on).

When selecting prime-kits, generally I will select lenses that are similar in character but widely separated in focal length, but sometimes it is useful to mix widely-variant lens designs (e.g.: sometimes I will carry the 60 Micro with the 135/2DC to get extreme-closeup to medium-range excellence at middle-to-small apertures, along with a wide-aperture telephoto). Again, plan your lens selection based on the requirements for the shoot, but give yourself as much flexibility as possible.

Some favorite combinations include:
- 28mm and 85mm f/1.4D;
- 45mm f/2.8P and 135mm f/2DC;
- 28mm f/1.4D, 85mm f/1.4D and 135mm f/2DC

- 60mm Micro and 200mm Micro;
- 60mm Micro and 135mm f/2DC

- 17-35mm AFS and 85mm f/1.4D;
- 17-35mm AFS, 85mm f/1.4D and 135mm f/2DC;
- 17-35mm AFS and 70-200mm AFS/VR

- 70-200mm AFS/VR and 300mm f/2.8 AFS-II plus TC-14e;
- 135mm f/2DC and 300mm f/2.8 AFS-II plus TC-14e

Favorite single-lens options:

• 28mm f/1.4D for a wide-angle that can be shot in nearly any light;

• 45mm f/2.8 for a lightweight normal lens that can be shot at any distance and aperture;

• 85mm f/1.4D for the optimum portrait lens and wide-aperture telephoto;

• 200mm Micro for a field lens that can be shot at any distance and aperture;

• 70-200 AFS/VR plus TC-14e for a telephoto lens that can be shot at a wide range of focal lengths, distances and apertures.

Tripod Heads

For those times when a tripod is essential, I use the Gitzo 1228 Carbon Fiber tripod as my primary tripod, or my old Gitzo Sport Performance Tatalux (current model 1126), the latter generally with a short center-column for low-angle macro work and low-angle telephoto and the former as my general-use tripod. Usually, the 'prototype' head on the left is used for macro and portrait work with an L-Bracket or a lens on a tripod collar, and the Ultimate head as a general-use head. The 'prototype' is especially useful for birds-in-flight and other action shots — it offers 360-degree freedom of rotation at up to a 45-degree angle when the head is free. The Ultimate Head is a tremendously fast and versatile head for portrait work, scenic work, and any other use where a lightweight head capable of handling most lenses in any situation is needed. Both are very lightweight at under 1 lb., and are beautifully machined.

http://acratech.net/prod01.htm

The prototype head is also used whenever I am using the Gitzo 1588 monopod, which is generally used with either the 300mm f/2.8 or the 500mm f/4, in situations where a tripod is less convenient or not an option.

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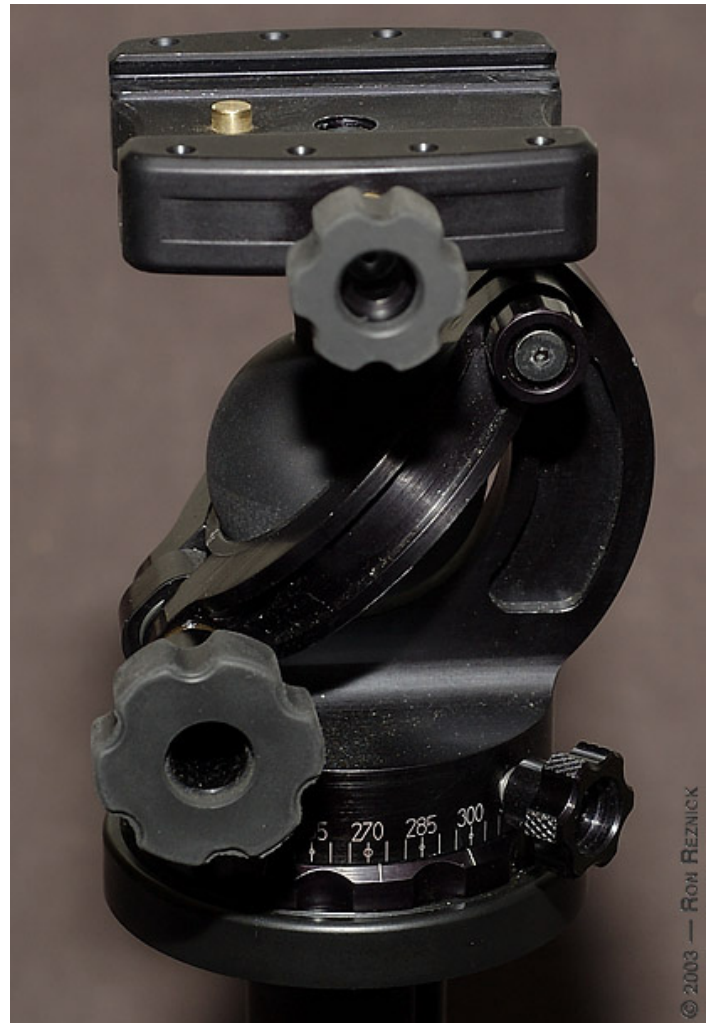
Summary of my lens complement

(and a few very highly-recommended lenses I've owned in the past):

Nikkor 17-35mm f/2.8D AFS: You may have noticed that I have both this lens, and the combination of the 28mm f/1.4D and 45mm f/2.8P, which cover very similar ranges. The reason for the overlap is that this lens offers flexibility of focal length and superb results at medium-to-small apertures at any distance. By f/5.6 the lens is very sharp, and it holds that quality to f/11, beyond which diffraction begins to reduce sharpness.There is a mild barrel distortion on straight lines near the edges of the frame at the wide end, mostly noticeable if a horizon is placed near the top of the frame at 17mm, so I of course avoid doing this. Otherwise, this lens is equal to or better than the primes it is intended to replace within this aperture range. I use the primes when shooting wide apertures (or the 45/P by itself when having a lightweight, general-purpose lens makes sense), but for travel and many other situations where flexibility of focal length is of critical importance, this lens is invaluable.

Nikkor 24mm f/2.8D: A very small, sharp lens with excellent contrast, low distortion, and at 9.5 oz. it is a featherweight that is easy to carry along anywhere. The perfect wide angle complement to the 50mm f/1.4D as it uses the same 52mm filters. The lens is nearly at optimum performance by f/5, and from f/5.6 to f/16 it is hard to find fault with it.

Nikkor 28mm f/2.8 AIS: This little manual-focus lens is Nikon's most highly-corrected wide-angle. With 8 elements in 8 groups (all are separate), the Nikon engineers really went all out in the design, and with close-range correction (CRC — a floating-element design that allows the lens to do well at both close and distance focus), this lens does a great job, especially up-close (it focuses closer than the Mi-

cro lenses, with the minimum-focus distance being 0.2m). What this lens really is spectacular at is close-range work at all apertures (it's a little soft at distance, but unbelievably sharp for close-to-medium range work). It is a great low-light wide-angle and also works as a WA closeup lens for a different perspective than you can get with the Micro lenses. If you add the chip and contacts to make it a "P" lens the lens reports aperture and allows control of aperture from the camera as well as the use of Matrix metering (like the 45mm f/2.8P).

Nikkor 28mm f/1.4D: The low-light wonder-lens. This very expensive wide angle does a truly superior job at medium-to-long distances between f/2 and f/8, at close-to-medium distances between f/2.8 and f/8, and when shooting fairly-close between f/4 and f/8. It is a little soft at f/1.4, and at f/2 when at close-to-medium range, but only in comparison to the superb results achievable at smaller apertures. The ability to shoot this lens hand-held at very slow shutter speeds using wide apertures with an extremely high yield offers a freedom to shoot indoors, at dawn or dusk, or at night, that is simply not achievable with other lenses. The HK-7 hood recommended for this lens is too shallow and wide to shade the lens against incident light. While the HK-4 hood is as wide, the 'outer wall' is taller and it shades the front element better without introducing vignetting.

Nikkor 28-70mm f/2.8D AFS: Built like a tank, heavy, large and very expensive, but the optics in this beast are the best around in a flexible, medium-range zoom — it's the quintessential PJ lens, offering fast acquisition and composition. The 28-70 f/2.8 AFS is very good under 10-12 feet, and is good at distance (slightly softer). It has a tendency to flare in adverse conditions, so care must be used if shooting towards the sun. The lens is best from f/5 to f/11, a little soft at f/4, and acceptable at f/2.8 from about 40mm to 70mm (it's too soft at f/2.8 for anything but use in a pinch at the wide end). This lens is the class act if what you are looking for is

single-lens flexibility in the medium-wide to short-tele range, and the focusing speed and tracking ability is nothing short of amazing. It is capable of getting the shot in nearly any medium-to-good light situation, but the quality of the shot acquired is well under the quality you get from a prime… but if you have the need for flexibility and high standards for image quality there isn't any other option besides carrying 2 or 3 primes in this range.

Nikkor 45mm f/2.8P (also see photo at top of page): The 45mm is a very simple, yet highly-refined lens design. The lack of numerous air-to-glass interfaces of the modified-Tessar design, combined with the coatings, make the contrast of this lens very high when shooting into adverse lighting conditions — which seems to happen a lot when shooting normal-range outdoor work.

The focus throw is very short, it is a small, well-built piece, and the 45mm is an extremely easy lens to operate and predict. It is my contention that for many shallow-DOF situations, closeups, and wide-aperture work, manual focus is not a hardship… it is more often a necessity to be assured that the focus point is placed properly. Of course I use AF when it makes sense to do so, but there are several lenses that I find myself focusing manually quite often. The 135/2DC at f/2-f/2.8 has a depth of field character like that of the 300mm f/2.8 lenses — quite shallow yet with good transitions. The shallow DOF requires extreme care in placement of the focusing point, and it can be so shallow that it is not all that rare that AF misses the actual spot by enough to alter the composition. The same can be said for the 85/1.4D at f/1.4-f/2, and about macro lenses when focusing close. The fact that I do not have the option of AF with the 45mm does not hurt as the lens can be focused as fast and as precisely (sometimes more precisely with greater ease) than an AF lens. The shadow-detail retrieval is exceptional.

The lens is very, very sharp across it's range of operation, and between f/2.8 and f/11. It is extremely versatile, and is definitely

the sharpest Normal lens at f/2.8. It also reveals quite a bit of fine detail, although it is eclipsed in some respects by the 60/2.8D Micro at some apertures and distances.

The defocused character is important in certain kinds of shots, at various apertures dependent on distance from the lens-to-subject-to-background. When there are highlighted background or foreground elements, the character of the defocused region can become an important part of the subject itself as well as either enhance the quality of an image, or become distracting to an extreme and thereby detract from the image quality. I feel that this sort of thing is almost as important for certain sorts of Normal-lens uses as it is in telephoto work, and the 45mm has by far the best defocused character of all of the Normal lenses.

The fact that it is small and lightweight, built like a precision instrument, and extremely cool, has nothing much to do with anything other than user-pleasure and confidence in the lens's construction quality, for what that is worth.

What I like most about this lens in comparison to others in the Normal Range is that the character is similar to that of other lenses in the top category at a sometimes extremely-useful focal length. Yes, I agree that often a wider or longer lens is a better option, and I regularly make use of a kit consisting of the 17-35 and 85mm (or 28 and 85) and avoid the Normal Range altogether, but it says a lot for this lens that you can put it to many of the same uses as those fine tools without loss of quality, just the change in perspective (and the need for some foot-framing). The fact that it is exceptional at wide-aperture closeup work, wide-aperture scenic, near-far compositions at medium-to-small apertures and long-range scenics at apertures around f/8-f/11 (all in the same lens) makes this little featherweight a very versatile single-lens option.

Nikkor 50mm f/1.4D: A very small (9 oz.), extremely sharp normal lens for low-light work and general photography. The perspective is natural, and detail is exceptional. The lens focuses down to 1.5 feet and is clean at

f/2. By f/2.8, it is uniformly sharp across the frame — by f/4 it is exquisitely clean and ideal for low-light situations such as available light close-portrait, museums, etc. The lens is fairly resistant to flare, and is quite inexpensive. It does a better job beyond 5 feet than it does up-close, but it is a very, very good lens and is the lens I recommend that folks start with.

Nikkor 55mm f/2.8 AIS Micro: A bench-mark lens, this is nearly perfect for any use, any distance or aperture, that a normal-FL lens can be put to. It is sharp at infinity, sharp at f/2.8 to f/16, just a tad soft at f/22 (diffraction) but usable at this aperture at close-focus distances to my standards, and usable in a pinch at f/32 for intergalactic depth of field. The performance up-close is tremendous, the build-quality and focusing precision is un-matched, and the only caveat is that it does not report or allow control of aperture and matrix metering is lost. This lens might be capable of modification to the "P" version by addition of the chip and contacts, but when I tried to have that done, the part was not available.

Nikkor 60mm f/2.8D Micro: While the 60 Micro is not as sharp at f/2.8 to f/4 or at distance as the 55 AIS Micro, it is every bit as good between f/5.6 and f/16 and under 7-8 feet, and offers higher contrast, AF, Matrix metering, the ability to go to 1:1 without the need for extension tubes, and aperture control from and reporting to the camera. This lens at macro distances has the highest contrast and best sharpness of all of the macro lenses, and offers similar character to that of the 200 AF Micro, but of course the working distance is quite short, so it is best used for static subjects at close distances. The lens is usable at more open apertures as long as you don't mind a little softness around the edges, and many people use it for a normal lens (although it is less sharp at distance, and loses fine detail beyond about 12 feet in comparison to its tremendous performance at closer range). This lens is designed for flat-field work and many folks also use it for close-range copying of documents and slides. I use it as a normal-FL closeup and field lens along with the 135/2 or 200 Micro.

Nikkor 85mm f/1.4D: A fairly substantial hunk of glass, the 85mm f/1.4D is uniformly sharp across the frame from f/2 to nearly f/8, is exquisitely sharp and with high contrast from f/2.8 to f/5.6, and is extremely resistant to flare and ghosting when shot with the filter off and the hood on. Perfect for portrait and medium-distance work, and with exceptionally smooth defocused areas, the only negative here is the cost. The lens can be used for landscape work at f/5.6 to f/8. This really is one of the finest tools you can put on your camera — the quality of results from the lens are truly amazing.

Nikkor 105mm f/2.8D Micro: The 105 AF Micro is a compromise lens… while not quite as good as the 60 Micro or 200 AF Micro, it offers more working distance than the 60 and is significantly easier to hand-hold than the 200 at near-maximum magnifications. The lens is quite sharp in the sweet spot — optimum sharpness is achieved between f/5.6 and f/11, although the difference at f/16 is barely perceptible. The lens works best at distances under 15 feet (it's softer beyond that range) and between f/2.8-f/4 it loses edge definition a bit and contrast in the outer frame. The focal length reduces significantly as you focus between 1:2 and 1:1, making the lens roughly 80mm at minimum focusing distance. It is a good portrait lens at wider apertures for work in the 7-15 foot range as well, as long as the subject is kept near the center of the frame. Overall, I preferred the results from the 60 and 200 for field work and the 85/1.4D for portrait, so I finally sold this lens, but I do occasionally miss the flexibility for hand-held closeup work in gardens, etc. For best contrast, using either an HN-23, HN-24 or preferably an HN-30 hood on the 62mm barrel thread is desirable.

Nikkor 135mm f/2 DC: This high-speed telephoto offers beautiful defocused-region blurring similar to the 85/1.4D, extreme sharpness and detail retrieval between f/4 and f/5.6, excellent performance from f/2.8 to f/8, it's sharp in the center at f/2 (with a loss in contrast at the edges), it's reasonably lightweight and fast-focusing with good AF-accuracy (necessary for wide-aperture work), has smooth manual focusing (with the same type of A/M rotating collar-lock as the 85/1.4 and AF Micro lenses), a built-in, lockable hood, and a trick up it's sleeve. This lens offers the ability to control the spherical-aberration correction at wide apertures between under- and over-correction, allowing you to selectively defocus the foreground or background. I highly recommend the B + W 72mm Telephoto hood as the built-in hood is far too short (as is the built-in hood for the 180/2.8D which also benefits from the B + W hood).

The lens is at it's best at close-to-middle distance, or at medium-to-long distance when your subject fills the frame. The results from this lens tend to show reduced contrast at distance into bright light, but at distance in the forest or in another diffused-light or shadowed environment the lens is an exceptional tool. If you can approach your subject, the lens really starts to offer tremendous character, shallow depth of field options, and excellent shadow detail and defocused-region control.

The Defocus Control has 11 detented positions, from left (Front) to right (Rear). The F positions adjust correction of spherical aberration to alter the defocused character in front of the subject, and the R positions alter the defocused character behind the subject. The positions to the extreme left and right are unmarked. The other positions are marked from left to right, from f/5.6 to Neutral to f/5.6 (see photo). Below is information regarding the best place to set the lens for subject sharpness and contrast (you can of course in normal shooting use the Neutral position):

The defocus ring gives a very ethereal effect that is mostly noticeable at f/2.

Another interesting thing is that the DC control, when started from max detent F and moving to max detent R moves the subject with each detent closer to the camera. At most settings it moves to the left a bit. At a few it just moves closer. I had my lens adjusted to correct for a slight misalignment, and after running a test the DC Control settings have been changed for optimum subject sharpness:

- At f/2, the best subject sharpness occurs at the Neutral setting (pre-adjustment this was at f/2R).
- At f/2.8, the best subject sharpness occurs at the Neutral setting (pre-adjustment this was at f/2.8R).
- At f/4, the best subject sharpness occurs at the f/2.8R setting (pre-adjustment this was at Neutral).
- At f/5.6, the best subject sharpness occurs at the f/2R or f/2.8R setting (pre-adjustment this was at Neutral).

The Spherical Aberration causes a diffuse halo effect around edges, that is most prominent at the wider apertures. As I said, it's a rather ethereal look that I can see a lot of uses for with some sorts of flower and portrait shots.

An interesting and very useful lens, the 135/2 gives unbelievably good results at f/4 to f/5.6 and exceeds the performance of any short-to-medium tele except the 85/1.4 and 105/2DC when set to f/2.8. It can be used at f/2 in a pinch if you can accept a little softening in the center and softer, lower-contrast results at the edges, making it indispensable when you need extra reach in lower-light conditions.

Nikkor 180mm f/2.8D EDIF: Quite possibly the perfect medium telephoto lens. Very sharp from medium-range to infinity, smooth defocused areas, excellent isolation of the subject at f/2.8 (where it is soft in comparison to the performance at f/4 or smaller apertures), small and with reasonable focusing speed for

a non-AFS telephoto, but with a tendency to hunt in lower-contrast situations. From f/5.6 to f/16 there is literally nothing to fault about the quality. From f/4 to f/5.6, you can detect a trace of softness when compared to the performance from f/5.6 on, but I have no qualms about using the lens at f/4. Shadow detail is very good, and corner-to-corner sharpness at infinity focus is amazing. The 180 is the perfect medium-distance portrait lens for tight shots. It's also perfect for long scenic and medium-to-long distance shots of large subjects. It does a darned good job with close-portrait of small subjects too — an all-around winner of a lens as long as the focal length is right. It's light too, so it makes the perfect complement to the 105mm and 50mm. When you're carrying either or both, it gives you a telephoto option with no compromises, that weighs little enough that you can carry it even if you don't think you'll need it — just in case. A great lens, but after two years I sold it, tested some medium-focal-length zooms, and finally ended up with the 200mm f/4 Micro EDIF-AF.

Nikkor 70-200mm f/2.8 AFS/VR: This is an exceptional lens. Hereinafter I'll just call it the AFS/VR. The lens was announced in February 2002, and the Nikon-shooting world has awaited the release of this lens with extreme anticipation. It looks as if it was well worth the wait.

The AFS/VR is a significantly more compact package than the previous AFS lens, as the barrel of the lens is over much of it's length quite a bit smaller in diameter than the 80-200 AFS, and feels far less bulky as a result. The weight is over 5 oz. less (with tripod foot mounted). The overall feel of the lens is still a bit heavy, of course (it does, after all, weigh three pounds), but it is balanced very well. The lens has 21 elements arranged in 15 groups (5 ED elements to control chromatic aberration), is an Internal Focus lens (the lens does not extend when zooming or focusing), has a minimum focus distance of 1.5m (5ft.) or 1.4m (55") in manual-focus mode, takes a 77mm filter, and comes with a locking scal-

loped hood and a newly-designed lens cap that allows clamp-retraction by pinching from the center as well as from the outsides, allowing easy removal of the lens cap from within the hood. This is a sorely-needed feature for those who tend to keep hoods on their lenses (I've looked for something like this for my 85mm f/1.4D for a long time) and I'll be ordering an extra for that lens. It also comes with one of the ballistic-nylon CL-series cases, which are tremendously more usable in the field than the older style of hard case (which is always left at home).

The AFS/VR is designated a G-type, meaning that there is no aperture ring on the lens itself as it is designed to be controlled by the command dial on modern bodies, so there are a number of older bodies on which this lens cannot work. For full-functionality, the lens must be used on F/N 65, F/N 80, F100 and F5 film bodies or the D1-series and D100 digital bodies.

The AFS/VR has three AF-lock buttons placed so they are directly in front of the manual focusing ring. Having gotten used to working with the AF-On button as the AF-activator (taking AF off of the shutter), this is not something that I personally need, but for those using the D100, for instance, in the standard mode where the AE/AF Lock button has not been changed to an AF-On button via the CSM Settings Menu, these AF-Locks allow deactivation of the AF-Activation on the shutter button, which can be extremely useful in situations where you pre-focus and wait for the action before shooting (the camera will immediately fire without re-hunting for focus). A wide, stepped focusing ring is immediately behind the AF-Lock buttons. Behind a 2/3" blank spot (where the VR logo is located) is the narrower zoom ring, which moves quite smoothly. Behind this is the gold-finished and engraved product label, the non-removable tripod-ring, and then a featureless barrel terminated by the mount, which has a rubber seal around the perimeter to reduce dust and water entry.

On the left side of the lens, below the gold-finished product label, is the bank of four switches that control the functions of the lens. These are the M/A-M switch that allows full-time manual over-ride of the AF system (M/A) or manual focusing (M); the focusing-range limiter (Full or infinity-to-2.5m); VR On/Off; and VR Normal/Active. VR is activated by half-pressing the shutter button. Normal VR will detect panning motion and only correct for movement in the direction perpendicular to the panning motion. Active VR will detect and correct for motion in any direction, such as on a moving car or boat, and should not be used for panning. VR should be used in conjunction with a tripod only if the head is free, as it will actually yield poorer results otherwise as the VR lens group will induce some motion on it's own. The Vibration Reduction system works exceptionally well.

The tripod collar is an ingenious design, consisting of the non-removable ring with a dovetailed connection, to which is mounted the detachable foot. The foot has a locking wheel and a safety lock that keeps the lens from being able to slip off the dovetailed connection by extending a plastic latch into a threaded insert mounted in a tapped hole in the dovetail on the lens itself. This insert allows you to mount a monopod directly to the lens without using the foot if desired (I use a machined rod with the standard thread that allows the rod to act as a quick-release for a monopod). When the foot is detached the lens has a very clean line, facilitating hand-holding (which will be the way many people will use this lens due to the Vibration Reduction). The ring can also be rotated out of the way of your hand if you need to keep the mounting foot on while hand-holding the lens.

This lens marks the first time that the AFS Silent-Wave Motor has been mated to the VR Vibration Reduction system. The combination of the two creates a lens that acquires a focus lock with commendable speed (that can be increased further by the use of the focus-range limiter), tracks a moving subject with precision even if the subject is moving directly towards the camera, and simultaneously reduces the effects of camera shake or a vibrating platform while allowing panning motion in one direction. The two work together quite well, and in combination with the fact that this lens is a constant-aperture f/2.8, it allows for higher shutter speeds that will make shots possible in lower light (whether the subject is static or moving). The VR system really does allow sharp shots in three stops lower light than a non-VR lens, and assuming the use of good hand-holding technique this can yield a usable shot in truly ridiculous light.

I tested the lens against several primes in it's range, including in the extended range offered by the use of the TC-14e teleconverter, which can be used with this lens without loss of AFS or VR functionality. With the teleconverter attached, the lens becomes a 100-280mm f/4 AFS/VR. The primes I tested this with were the 85mm f/1.4D, the 135mm f/2DC, the 200mm f/4 AF Micro, and the 300mm f/4 AFS. I tested against a life-size bust of Abraham Lincoln, on a tripod, moving the tripod so that the framing at 85mm, 135mm and 200mm were identical – the 280/300mm shots were framed a little tighter than the others. Tests were conducted at f/2.8-f/8 at 85mm and 135mm, and f/4 to f/8 at 200mm and 280/300mm. These primes are exceptional lenses, and the tests were therefore an extreme challenge for the AFS/VR.

The AFS/VR held it's own against the primes quite nicely, showing smooth defocused transitions at wider apertures as well as smooth defocused regions (while not quite as smooth as the 85/1.4D and 135/2DC, they were without a doubt the best I have ever seen from a zoom — better than most prime lenses). Detail rendering of the AFS/VR was excellent — while the primes were sharper at wider apertures for the most part (there was an oddity shown that I can't explain… even though I carefully locked on the same spot for each focal-length test, the AFS/VR showed greater depth of field than the primes did), the sharpness of the zoom was nearly-equal or equal to the primes at most apertures, and shadow detail retrieval was in some cases superior, attesting to the quality of the coatings

and optical design of this zoom. Considering the number of elements, the contrast and shadow-retrieval results are exceptional.

One thing that must be mentioned: the number of elements means a large number of air-to-glass interfaces. This creates a tendency for this lens to flare easily in adverse lighting conditions, where a bright light source is glancing across the frame or is directly in-frame. This can radically affect contrast, and should be taken into consideration when framing a shot. Many zooms have this problem due to the larger number of elements, and the AFS/VR is no exception… as a matter of fact it has a stronger tendency to flare than some of the other high-performance zooms. It also exhibits ghosting in these conditions. Both effects are easily visible in the viewfinder, so they are avoidable, but sometimes this can cause a problem taking a shot in adverse lighting conditions. This is not a good lens to shoot directly into bright lights, or with a bright light in the corner or just outside of the frame.

Another result of these tests, and the shooting test performed on the previous day, is the revelation that the lens performs tremendously well with the TC-14e teleconverter. I took a number of shots on both days with the TC-14e, on the first day in direct comparison with the bare lens at 200mm and at 150mm + TC (210mm), and on the second day at 200mm + TC (280mm) vs. the 300mm prime. In both cases, the quality of the zoom + TC was nearly equal or equal to either itself (without TC) or the 300mm f/4 AFS prime. While the combination is a little softer and lower in contrast at f/4-f/5 than the 300mm, it is very close. This increases the flexibility of this excellent zoom.

The AFS/VR shows excellent performance from f/4 to f/8, and this performance extends to f/11 at the short to medium end of the zoom. The lens is totally usable at f/2.8, assuming you can accept some softness and mildly lesser rendering of fine details.

Nikkor 200mm f/4D Micro EDIF-AF: The premiere tele-macro lens, this baby is long when you mount the HN-30 hood, but it is extremely well-balanced on the D1-series body. The focusing ring is somewhat stiff (which allows precision movements for fine adjustment, at the expense of a little extra effort). For AF, use the limiter — it's a bit slower than the 180mm, and allows focusing to under 2.5 feet. Manual is of course best when you are focusing much under 3 feet, or into trees, etc. Resolution of detail at all focal distances from extreme close-focus to infinity is superb — up close, the lens is amazing. It has exceptional contrast, resolves a tremendous amount of detail, and is quite controllable, but when you get inside about 1:3 or so (roughly 3 feet), it requires enough light to keep the shutter speed well up at the desired aperture, or a support device must be used. On a tripod, the 200 Micro yields truly superior macro shots. It costs an arm and at least half a leg… but it's worth it for the tremendous results. The lens is very good at all apertures between f/4 and f/11, but it is best used at wider apertures only at longer range or with a subject that requires maximum isolation at shorter range… f/8 to f/11 provides best results at very close range.

Nikkor 300mm f/4 AFS: With its AFS motor, this lens locks on the subject quickly and tracks with precision. At 3lbs., it is not light, but it is capable of being used hand-held (I always do) and is a superb lens for action and other situations where rapid acquisition and tracking is necessary (e.g. catching a hummingbird in flight). It is a little soft at f/4, but stopping down to f/5.6 offers excellent performance (and the loss of detail at f/4 is so slight that I have no qualms about shooting the lens wide open). Excellent contrast, smooth defocused areas (9-bladed aperture), and it focuses down to 4.75 feet for some truly amazing closeups. In combination with the TC-14e teleconverter, you have a 420mm f/5.6 lens with the AFS motor intact, and it is usable at f/5.6, although stopping down to f/8 gets the best performance out of the combination. The 300/4 has the A/M-M focusing switch, so you

can do manual override with AF enabled for the best of both techniques. A fantastic lens... the only thing wrong with it is the tripod collar (which flexes), but by wedging minicell foam or another brace between the lens body and the top of the tripod mount (or acquiring the Kirk Photo aftermarket tripod collar) that problem can be gotten around.

Nikkor 300mm f/2.8 AFS-II: The 300mm f/2.8 AFS-II is a magnesium-shelled version of Nikon's venerable design. This version has a reduced minimum focusing distance (down to 7.5ft. from 10ft., 7.2ft. when using MF) and a reduction in weight from 6.8 lbs. to 5.6 lbs. The AF system is extremely fast and sure, acquiring a lock very rapidly and silently and tracking with precision even when the subject is moving quickly towards the camera. The defocused character is exquisite, esp. with water in the background, and transitions to the blurred region are very smooth. It operates extremely well with the TC-14e to yield a very fast-focusing 420mm f/4 with exceptionally beautiful character. The lens can be shot wide open with top-grade results, and exhibits very high contrast and finely-detailed line definition. This lens, while difficult for me to shoot hand-held, is an absolute dream to use when mounted on a Wimberly Sidekick. It is an expensive, large lens but the results it returns are well worth the effort required to carry it into the field. Very highly recommended.

Nikkor 500mm f/4 AFS-II: One of Nikon's three super-telephoto lenses, this beast of a lens is about the same size as the 300mm f/2.8 AFS-II with the hood in shooting position... before you put the 500mm lens hood on. It's big, but it's smaller and lighter than it's more expensive two brothers: the 400mm f/2.8 and 600mm f/4 AFS-II lenses. It's far easier to handle in the field as it weighs only two pounds more than the 300mm f/2.8 AFS-II. It focuses quite fast, between 16 feet and infinity, resolves detail extremely well even wide open, and has beautiful defocused character. Like the 300mm, it works very well with the TC-14e and Sidekick, and is a fabulous lens.

I sincerely hope that you continue to enjoy the book and that it helps you get the most out of your photography for many years to come.

Thank you for your time and patronage,

— Ron Reznick —
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