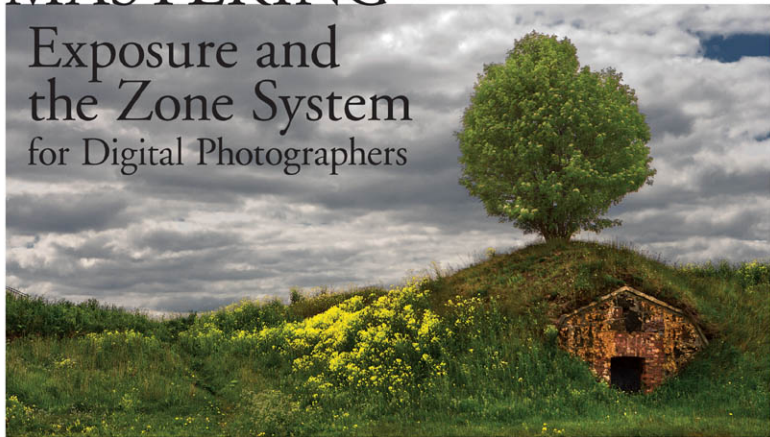


MASTERING

Exposure and the Zone System for Digital Photographers



Lee Varis

MASTERING EXPOSURE AND THE ZONE SYSTEM FOR DIGITAL PHOTOGRAPHERS

Lee Varis

Course Technology PTR

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**Mastering Exposure and the Zone System
for Digital Photographers**
Lee Varis

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*To the memory of Ansel Adams,
the great artistic and technical innovator
of photography in the 20th century—
we owe much of our conceptual foundation
to Ansel, long may his memory live.*

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Acknowledgments

I could not have written this book without the help and support of many people. First, I need to thank my wife, Gila, for putting up with me these past several months and never once threatening to kill me! Thanks also to my kids, Aaron and Erika, for being an inspiration to me.

Another person whose influence has been very valuable inside and outside these pages, my technical editor John Eakin—thank you for being a good friend. Of course, this book would not be possible without the Cengage Learning team: Jenny Davidson, Megan Belanger, Shawn Morningstar—thank you all for making this the best writing experience ever.

I could not have accomplished anything in digital photography without the many teachers I have had over the years: Tony Redhead, Kai Kraus, Ed Manning, Dan Margulis, David Biedney, Al Edgar, Daniel Clark, Jeff Schewe, Bruce Fraser, Chris Murphy, Katrin Eismann, Eric Magnusen, Bryan Allen, and many others who have helped me surf the bleeding edge of digital imaging technology. I stand on the shoulders of giants to make my very modest contribution to the vast world of digital imaging.

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About the Author

Lee Varis has been involved in commercial photography for the past 35 years as a photo-illustrator working in Hollywood. He began working with computer imaging two decades ago, after one of his clients took him to see what he was doing to his photography on the Quantel Paintbox. Lee was hooked and spent many hours hanging out at Electric Paint, one of the first creative imaging services to utilize the new technology for movie posters and album covers. Lee began exploring digital photography using some of the earliest systems available, and he helped Dave Etchells (of Imaging Resource) conduct the very first comprehensive tests of digital camera systems in his photo studio back in 1990. Lee currently works with digital as well as conventional photography in conjunction with computer graphics to create images for print advertising.

Lee's work has been featured on movie posters, video box covers, CD covers, and numerous brochures and catalogs. His creative imaging has been featured in *National Geographic*, *Newsweek*, and *Fortune* magazines as well as trade journals such as *PDN*, *New Media*, *Micro Publishing News*, *Rangefinder*, *Design Graphics*, *Photo Electronic Imaging*, and *PC Photo*.

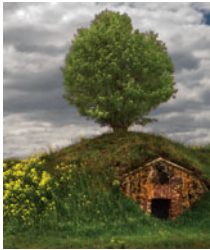
Lee has also been involved with consulting and training activities for numerous corporate clients. He conducted two series of imaging seminars for Apple Computer that took him to most of the major metropolitan areas in the United States. He is currently active in seminar programs with APA, ASMP, PPA, Santa Fe Photographic Workshops, Maine Media Workshops, and Julia Dean Photographic Workshops, as well as ongoing *Photoshop for Digital Photographers* workshops in Los Angeles. He is one of the founding fathers and current president of the Los Angeles Digital Imaging Group (LADIG, a chapter of the USDIG). Lee also serves on the board of the Digital Image Marketing Association (DIMA), a division of PMA, the Photo Marketing Association.

Besides his work in digital photography, Lee is an amateur musician with a passion for collecting and playing unusual instruments. His current favorite instrument is the *oud*, a Middle Eastern lute that was popular with his Greek ancestors. You can usually find him playing music while his computer is processing multiple RAW digital camera files.

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Monolake, August 2003.

Introduction

I was 10 years old when I was bit by the photography bug. My father recruited me to process and print his photographs documenting his safety engineering inspections. These were the driest, most boring informational images showing the conditions of buildings, fire exits, factory assembly lines, etc., but to me it was pure magic to see these images appear gradually in the tray under the safelight. I was in charge of my father's photography (and probably saved him a ton of money) at a time when Ansel Adams' series of books contained the pinnacle of photographic technique. The Zone System was the most sophisticated approach to the craft of photography—something I would discover six years later in a high school photography class. I would learn this art and craft of photography over the course of the next 20 years.

In 1987, I bought my first computer, an Apple Macintosh SE. Initially, I thought to use it to run my business. Hypercard had just been introduced, and I hired a friend to write an invoicing “stack”—a custom implementation that made generating invoices and estimates “push button” easy. This humble little machine had an amazing ability to manipulate images, including photographs, and by 1989, I was exploring computer imaging with a passion. In 1990, I purchased a Mac IIx and was pursuing a career in digital imaging, doing photography, retouching, and image compositing for entertainment industry print advertising—movie posters, video box packaging, and album covers.

Today I've spent almost exactly the same time in digital imaging as I have in traditional film-based photography. This gives me a unique perspective on the changes in photographic technology and it has taught me that there is value in the old craft of photography as taught by Adams. The computer has radically altered the methods used to capture, process, and print images, but the basic concepts of photography have not changed much in the 175 odd years since Henry Fox Talbot created paper negatives. Photographs remain a record of the light falling on a sensitized surface; in essence, it's all about capturing light to recreate a vision, a moment frozen in time. The single most crucial element of this recording process is the moment of exposure!

Which brings us to this volume. I have attempted to distill some 40 odd years of photography experience into a collection of words and images to give you some insight into the basic art of photography as it is practiced today. This information leverages my experience with “old school” photography to build a modern system of exposure control for the 21st century. The testing procedures outlined herein are reminiscent of the classic Zone System but address the special considerations necessary for the current technology of digital image capture and take advantage of the latest software and hardware for digital imaging control. My whole reason for writing this is to hopefully preserve some of the knowledge gained over the last 175 years and simply reinvigorate the concepts of exposure control for a new age of digital precision. The basics of the camera and lens remain the same—only the recording medium has changed.

We will progress through the following general outline:

Digital Imaging Basics

New Digital Zone System

Calibration Procedures

Case Studies

Post Processing

High Dynamic Range Imaging

Emerging Technologies



f16 @ 1/80, ISO 100

Each chapter will cover a different aspect of basic photo imaging as it pertains to mastering exposure for digital photography. This is intended as a practical guide, but we will present some conceptual material as well as step-by-step procedures. There is also a discussion of digital darkroom techniques, but this is not an exhaustive study—rather, it is meant as a framework for exposure decisions in light of post-processing technique. Finally, we will look at some emerging technologies that promise to have a major impact on how we will conceptualize photographic imaging in years to come.

This is not a book about Photoshop, though there is a fair amount of Photoshop in these pages. I assume that the reader is somewhat familiar with the basics of Photoshop and is at least conversant with the latest version (CS5 at the time of publication)—I will present step-by-step techniques in Photoshop, but I will not explain every detail of the interface or preference settings, and so on. I highly recommend that you have a good Photoshop manual on hand when reading this book if you are not confident in your basic Photoshop skills.



f11 @ 1/100, ISO 100, studio flash

This is also not a beginner's guide to photography. I assume the reader is familiar with f-stops and shutter speeds and has some understanding of E.I., E.V., ISO, and the basic operation of his own camera. I will cover the principles of photography and the practical application of those principles to digital capture and post process but I will not spend time showing how to hold a camera or compose a portrait. This is not an exploration of aesthetics, and you will not find any philosophical discussions about the "art" of photography. We are concerned here with craft and all our efforts will be directed to achieving a technically correct image whether or not that image is beautiful artistically.

The field of digital photography is undergoing extremely rapid development and it is hard to be completely current when new equipment, software, and techniques are introduced almost every month. It will have been almost one year from the time I started writing to the time this book is in circulation. There is likely to be some development that will render a portion of the information contained herein obsolete. To mitigate this natural process I will maintain a website for the book with as much updated information as possible to supplement the material presented here. Please sign up and log in to:

www.varis.com/masteringexposure



Remember that the material I present here is based on my experience in photography. I cannot claim to know everything there is to know about digital photography, and the reader would do well to test everything for himself. Photography is used in so many different applications that there will always be some special situation that requires a different approach due to various real-world constraints. I encourage you to develop an understanding of the fundamental principles and not get stuck in a “follow the recipe” approach—learn and adapt this info to your own specific needs. I welcome all readers to send me your own stories about success or failure with my techniques and any creative adaptations to unusual circumstances or solutions to problems that have presented themselves in the course of your work. Send your comments through the website and together we can build a resource for future developments.

A final note: at various points in the following discourse, I recommend certain hardware and/or software. I do not receive any compensation for these recommendations nor am I “on retainer” for any of the companies involved. These products are simply the ones that I’m familiar with and have had success with. There are many options available and I cannot spend time with every different piece of equipment or software application. Please don’t take these suggestions as the ultimate endorsement. We are living in a time where innovation occurs so rapidly that it is impossible to know all of the options that are available now or in the immediate future. My task is to teach the important concepts for digital photography so that you can evaluate new products and techniques as they become available and decide for yourself whether they have value for you.



f6.7 @ 1/60 & f16 @ 1/100, ISO 100, two merged exposures



f5.6 @ 1/500, ISO 200

1

Digital Capture Basics

These days it seems that everyone with a camera is a photographer! The bane of many professional wedding photographers is the relative with an inexpensive DSLR who steps in right after the photographer takes his beautifully composed group shot and snaps off a duplicate (which they then offer to the other relatives for free). And yet, even with all of the sophisticated automation, autofocus, auto-exposure, auto everything, plus an LCD viewing screen on the back of the camera, people will complain that out of every 3,000 pictures they take only two or three are any good. It is the task of the professional photographer to reduce the percentage of failed images to zero, at least as far as technical proficiency goes. In order to be able to reliably photograph any image at any time and thus deliver predictable results requires a level of technical mastery that goes beyond reliance on the automatic functions of the modern camera. It is to that end that this volume is devoted and thus we start by building an understanding of the basic principles of modern photographic technology.

Cameras function a bit like the human eye (Figure 1.1). In both, a lens focuses light through a small hole (iris) onto a receptive surface (retina/film/chip) that translates the varying intensities and colors of the light into some meaningful information. The main distinguishing feature between different cameras and the eye has to do with the receptive surface. The eye's retina is a receptive surface comprising two different structures (rods and cones) with three basic color sensitivities (red, green, and blue). Film is made of one type of structure (silver salt grains suspended in gelatin) with three different layers to receive color. Digital camera chips have one structure of photoreceptor sites on a silicon chip, each of which has one of three different colored filters to record light. The intensity of the light hitting the receptors is what determines the signal level or exposure value.

Digital cameras are similar to eyes in that the camera's chip translates the light into information (electrical signals) directly. Much as the eye translates the light falling on the retina into nerve impulses (electrical signals) that travel to the brain for processing, the electrical signals from a digital camera require processing in a computer "brain" before they can be used to create photos.

The actual process is rather more complex, but a few things are important to understand. Most digital cameras capture images using chips with receptor sites that have red, green, and blue filters arranged in a regular pattern on the surface of the chip. Light intensity is the only thing captured at a receptor site. The level of the signal generated at a given receptor site will determine what tonal value is assigned to the corresponding pixel. During the processing phase, the color of light hitting a receptor is determined by calculating differences in intensities between adjacent sites that have red, green, or blue filters. This process produces an RGB bitmap image. A bitmap is a regular grid of square units of color. These units are called pixels. Color is determined by the relative values of red, green, and blue for each pixel. We, therefore, think of these pixels as being in three "channels" (red, green, and blue) simultaneously so that the complete image is recorded as three different B+W images that form the full-color version.

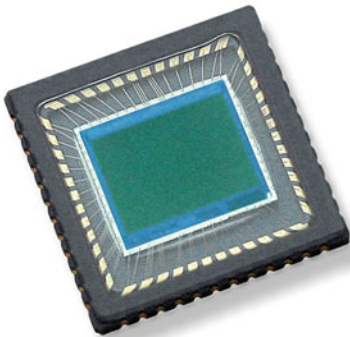


Figure 1.2

A typical digital camera chip.

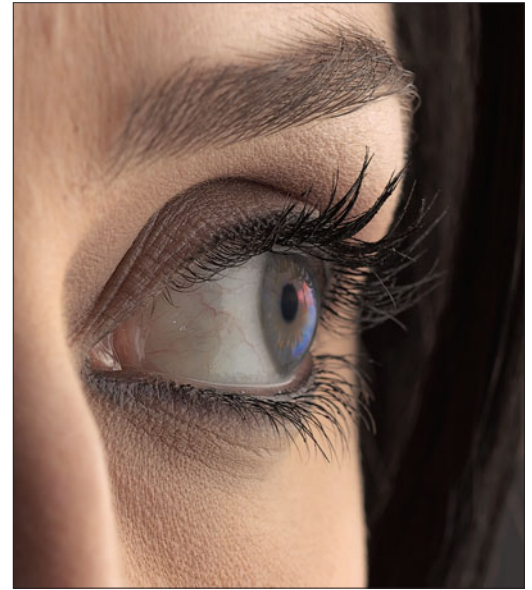
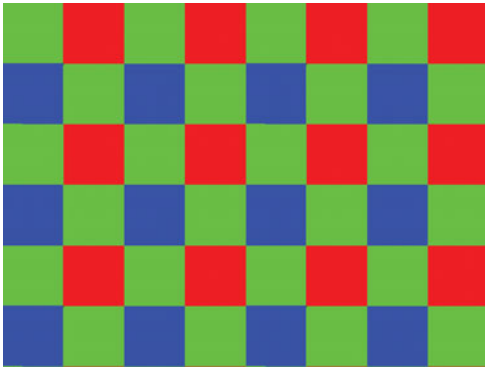


Figure 1.1

Cameras function like the human eye.

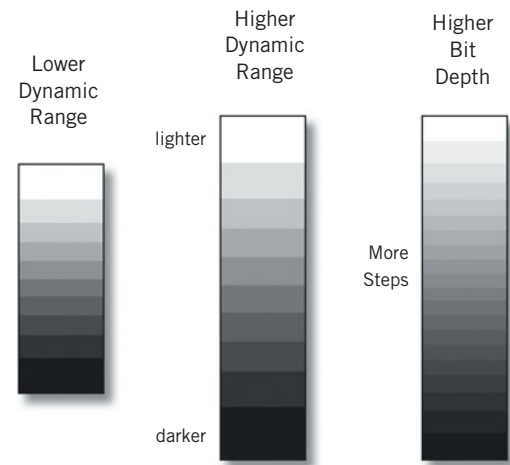
The usual arrangement of red, green, and blue photoreceptors across a digital camera chip (Figure 1.2) surface is called a Bayer pattern. This regular pattern alternates green with red and blue so that there are twice as many green pixels as there are red or blue (Figure 1.3). There are more green pixels because green holds 60 percent of the overall image luminosity (lightness-darkness) in an RGB image. The signals from adjacent pixels are averaged together using complex algorithms to determine the overall color and interpolate this into each pixel in the image. Skin colors sit right between the red and green filter frequencies used in most chip designs, and as it turns out, calculating skin color correctly is difficult. In digital photography, skin color can end up being a little too red. You'll learn how to compensate for this later.

**Figure 1.3**

A Bayer pattern of red, green, and blue pixels has alternating rows of red-green and blue-green pixels resulting in twice as many green pixels as red or blue.

The dynamic range of a captured scene is an important yardstick for quality (Figure 1.4). This is the brightness range from dark to light that affects how much detail can be rendered in the darkest and lightest portions of the scene. This is a particularly important consideration for exposure because we want to know how much exposure we can give a particular scene before important highlight details “clip” or render as pure white. Here it is assumed that as long as a tone renders with some level of gray there will be the opportunity to differentiate some detail that is not “white.” Conversely any shadow value that is just a bit lighter than absolute black will be able to convey some sense of detail. Dynamic range is often represented in f-stops. Digital cameras can sometimes capture a range of 11 f-stops from black to white, where a paper print from a desktop inkjet printer might have, at best, a range of five f-stops. Regular offset lithography, such as magazine printing, has even less dynamic range—typically four f-stops or even less. This disparity between capture and output is at the heart of reproduction problems because we often have to determine how we are going to compress the range of an image to fit the output.

The number and density of receptor sites on the chip determine the resolution of detail. This pixel count is given as either dimensions, such as 4992×3228 , or as a total, such as 16 megapixels, where “mega” means million (totals are usually simplified to the nearest decimal). Therefore, an 8-megapixel chip has less resolution than a 12-megapixel chip. Professional-quality photography can be done with cameras delivering 8 megapixels or more of resolution. Pixel count can be manipulated after the fact through mathematical calculations that interpolate new pixels from existing ones, but the amount of image detail can never exceed the original resolution of the chip. That being said, there is no reason to obsess over the number of pixels available as a standard of quality. Movie posters have been made from images with fewer than 6 megapixels, and the quality of those pixels is more important than the quantity used for photography.

**Figure 1.4**

Dynamic range and bit depth.

You will often hear about “bit depth” in the same breath as dynamic range. Bit depth refers to the number of steps between black and white that are encoded in a digital capture. Higher bit depth captures have a finer density of steps and yield a smoother ramp from black to white; however, bit depth does not determine dynamic range. It is certainly better to have higher bit depth with wider dynamic range, but the two are not necessarily interdependent.

The RAW signal from the camera chip can be processed either in the camera firmware or later in software under user control. There is some debate over the merits of both approaches. Generally, if you opt to have the camera do the processing, you will be shooting JPEG files to the memory card or directly to a computer.

JPEG is a file format that was developed to reduce file size by using mathematical algorithms that simplify the pixel structure in the bitmap image. (JPEG stands for Joint Photographic Experts Group, the organization that developed the file format.) This process is considered lossy because some image detail is “lost” during the process. Digital cameras apply a conservative level of compression or size reduction, and this is generally considered visually lossless. This does not mean that there is no loss—just that the loss is not apparent at first glance. Even the best JPEG file does not carry the same amount of information or image detail as a non-compressed or unaltered version.

The main advantage to shooting JPEGs is that by compressing the file size, you can fit many more images onto a memory card (so you don’t have to change cards as often). Because the files are smaller, they also write faster and enable faster shooting speeds. This can be important for shooting wedding candids, news, sporting events, and any other fast-breaking action. The disadvantage to shooting JPEGs is that you have to accept the camera’s interpretation—of color, contrast, etc.—and you limit the potential quality of the image. You give up some flexibility and quality for speed and convenience.

JPEG Compression Artifacts

JPEG compression works by simplifying adjacent tones; similar tones are assigned the same value. This can cause distinctive “blocky” artifacts and “messy” edges, which are most noticeable in extreme magnifications. JPEG artifacts can become a problem when image files are sharpened for print output or scaled up from smaller sizes. (See Figure 1.5.) For most work destined for offset lithography (magazines and newspapers), JPEG artifacts don’t pose a problem because they are obscured by the printing linescreen.

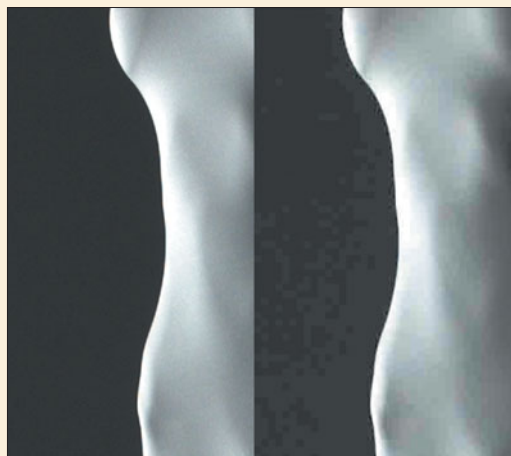


Figure 1.5

JPEG artifacts are visible in the sample to the right.

Tip

I highly recommend that you choose a simple, gray desktop color and select a gray interface option for the overall color scheme for your computer. The idea is to eliminate as many color distractions as possible for the environment in which you will be making color decisions. If the background behind your images is bright blue, you will tend to see everything as warmer than it is because of the color contrast with the blue background. You probably will have a tendency to make your colors too cool as a result. A neutral gray background is the safest choice because it will not bias your judgment one way or another.

Monitor and Calibrator

After pixels are captured and assembled into images, those images need to be viewed and interpreted. Every image creation system must include a monitor to view the captured images. A good monitor is an absolute necessity for any serious photographer. However, a good hardware calibrator is even more important (Figure 1.6). You'll need to purchase a calibrator with the necessary software and use it regularly to keep your display in good working order. Even a mediocre display can be serviceable if it is properly calibrated, but an expensive display is almost useless if it lies to you! Calibrate your display every two weeks to be on the safe side.

There are many hardware calibration devices on the market. Some popular systems are Eye-One Display (X-Rite), ColorEyes Display Pro (Integrated Color), and BasICColor Display (Color Solutions).

If you are concerned with the best possible quality, then you probably will prefer to record the camera's RAW signal and process this data using your computer software in a RAW file workflow. Doing so complicates the process slightly by adding an additional post-processing step to your photography workflow. The main advantage to a RAW file workflow is that you can postpone final decisions on color rendering, tone, and contrast until after the shoot, when you have fewer distractions and you can concentrate on basic photo elements such as lighting, composition, and exposure. You also gain a considerable amount of control over color rendering, tone, and contrast. The disadvantage is that you have to take extra time after the shoot to process your RAW files into a useable format.



Figure 1.6

Monitor calibration is carried out with a small “puck” or colorimeter that measures colors from the screen.

Basic Digital Capture Workflow

You need to develop consistent procedures for capturing, saving, and working with your images. Each picture-taking situation will demand a slightly different series of steps depending on your specific hardware, software, and working preferences. At the most basic level, you will be

- Capturing images
- Downloading image files to a computer
- Adjusting the files (cropping, color correcting, retouching)
- Delivering images (printing, uploading, saving)
- Backing up files (saving and storing)

The basic steps can change slightly depending on whether you are shooting RAW or JPEG, tethered to a computer or to memory cards, archiving original RAW, or converting to DNG. Many of the repetitive tasks can be automated in certain software or using scripts. Look for more details on workflow automation on the website: www.varis.com/MasteringExposure

Most of the digital workflow occurs after the photo shoot because that is where you are working with the captured digital data. A professional workflow maintains a backup protocol from the beginning, always maintaining duplicate copies of files at every step. A typical progression of steps might look like this:

1. After filling your memory card, place it in a card reader and mount on your desktop.
2. Copy the image files to a folder on your computer, rename them, and duplicate the files onto a separate hard drive as a backup.
3. Verify the integrity of the backup (this automatically verifies the first copy).
4. Once you are satisfied that the files are OK, you can reformat the card in the camera before shooting more images.

Digital Negative Format

DNG (Digital Negative) is an open-published RAW file format developed by Adobe to address the need for a standard format for digital camera data. Currently, most camera manufacturers use proprietary file formats unique to their particular cameras. This is equivalent to Nikon cameras using only Nikon film, which would be an unacceptable situation with the photographer at the mercy of the manufacturer to support his images. A big push is underway in the industry to move toward an openly supported file format that will work with all cameras, and most photographers see DNG as becoming that standard.

5. After the photo session, load the files into an image cataloging program and review, edit, adjust, keyword, or otherwise work on the files.
6. Selected files can be prepped for various outputs and/or delivered to the client.
7. Finally, at the end of every day of work, the image archive needs to be backed up to another hard drive with an additional backup kept off-site.

Of course, you might not have enough time to copy, duplicate, and verify while you are shooting, so you might need to have multiple cards on hand. Always strive to have two copies of every image file at any one time. Cards can be downloaded to the computer unattended, so you can always have one copy on the computer and one copy on the card at the very least. Some cameras have the capability to shoot to two separate cards in camera (usually a CF card and an SD card), so you'll have backups automatically as you shoot. An ideal strategy is to copy files from the camera card on to two external hard drives as well as the internal drive in the computer—3 copies plus whatever is on the card. Ultimately you want that second duplicate to cycle off-site and back once a week (Figure 1.7). Another recommended strategy is to convert the duplicates into DNG. This process automatically verifies the integrity of the copy so you know you have all your camera files secure before you reformat the camera cards for re-use.

I highly recommend the application, ImageIngesterPro—the most complete image downloading solution available: <http://basepath.com/ImageIngester>

This app can automate the whole process of downloading images, renaming, making copies onto three different locations, verifying the files, appending metadata, keywords, and GPS info *and* building a custom folder structure on your hard drives (Figure 1.8).

After all the images are shot and backed up, they will have to be evaluated and worked on in some fashion. Professional photographers tend to generate a much higher volume of images and file management can become a real issue. Fortunately, modern software tools, specifically designed with the photographer's needs in mind, have become available. I recommend using an integrated image processing and cataloging application like Adobe Lightroom or Apple Aperture—my own preference is Lightroom.

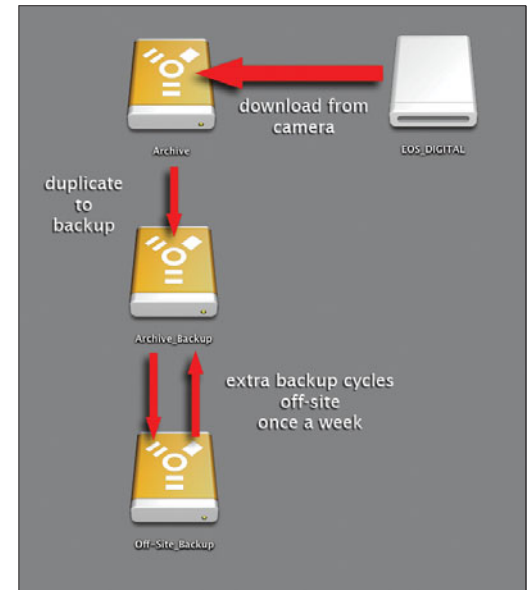


Figure 1.7

A complete backup strategy includes an off-site backup!

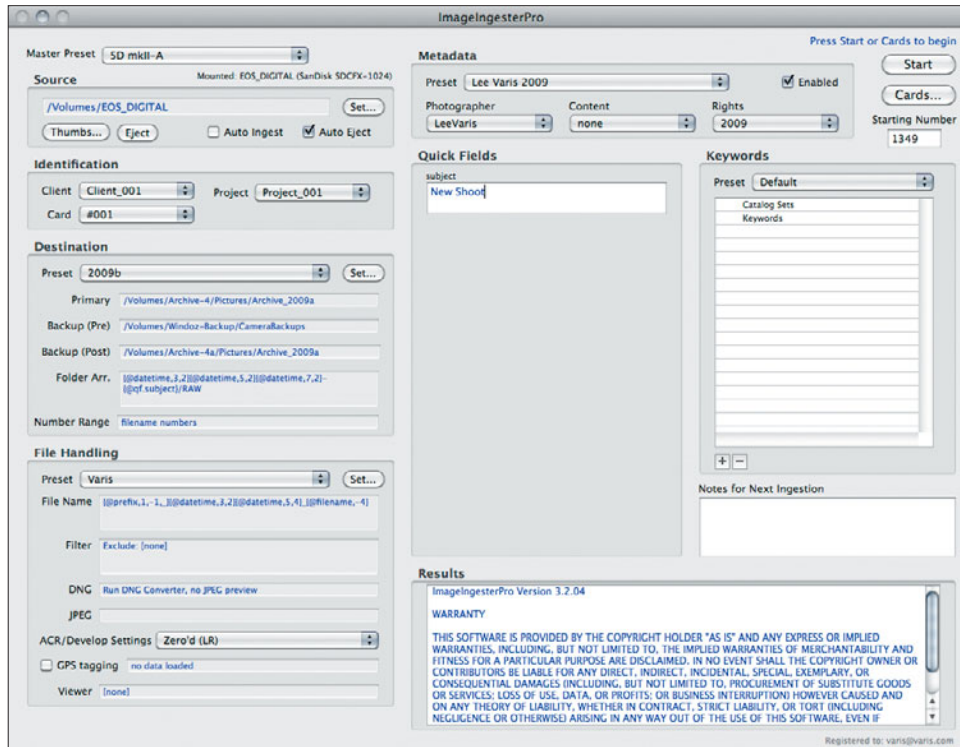


Figure 1.8

ImageIngestorPro handles all possible image-downloading chores.

Setting Up a Lightroom Catalog

Lightroom is an image cataloging system that stores information about images in a separate catalog file. It is beyond the scope of this book to provide full step-by-step instructions for using Lightroom, but I will cover certain features that pertain to the various tasks under discussion. Here, we are concerned with getting started with an image catalog. There are a number of different ways to use Lightroom to organize your images—I prefer to have Lightroom mirror the file organization I have on my hard drives. To accomplish this you need to have some organizational structure in place to begin with. This is how I set up my hard drives (Figure 1.9).

I keep all my images on an external hard drive—this is my image archive that I duplicate onto a second hard drive. This backup drive gets updated every day or whenever I have made any changes to my images or my image catalog. Once a week this duplicate is moved off-site and a third hard drive is brought in and updated to the current state of the image archive—this now becomes my new backup and is maintained every day in the same fashion. After a week of activity, the third drive goes off-site and the second drive is brought back and updated. The two backup drives are continuously cycling on and off-site so I always have a “disaster insurance” copy in the event of a fire, flood, meteor strike, or other such event that would render both my archive and local backup unusable.

The root level of the archive contains two folders—one for the images and one for the Lightroom catalogs. Images and catalogs are organized by year—I make a new catalog every year to correspond to the image folder for that year. Inside the year catalog folder is the Lightroom catalog file, previews file, settings folder, and the identity plate file that I use to “label” the open catalog with the date so I know at a glance which catalog I’m working with. Inside the year image folder are the individual jobs folders, all labeled with the date (year, month, day) and a descriptive name. Inside the job folder is a “RAW” folder that contains the RAW captures as well as a “WIP” folder that contains work in progress PSD files—when images are finished for delivery or printing I make a “Finals” folder for them. Inside the “RAW” folder, the images files are named with my name, followed by the date, followed by the camera’s unique file identifier number.

I download images from shooting sessions directly into this structure. Once that is done and the images are renamed, I am finally ready to import the files into Lightroom. This way the folder structure of the image archive is exactly reflected inside Lightroom so I can always find images from specific shooting dates without having to search or filter or otherwise perform any catalog gymnastics (Figure 1.10). The folder structure is clearly visible in the Folders pane of Lightroom’s Library module.

Lightroom has become my software tool of choice for organizing and processing my growing image collection. Just about every imaging task can be accomplished short of retouching including: slideshows, printing, and web galleries. These functions are also expandable using third-party plug-ins. Lightroom excels at RAW processing and it uses the same engine as Adobe Camera Raw (hereafter referred to as “ACR”). I will cover calibration procedures for Lightroom and ACR in the next chapter but for overall versatility and as a comprehensive workflow tool, I recommend Lightroom.

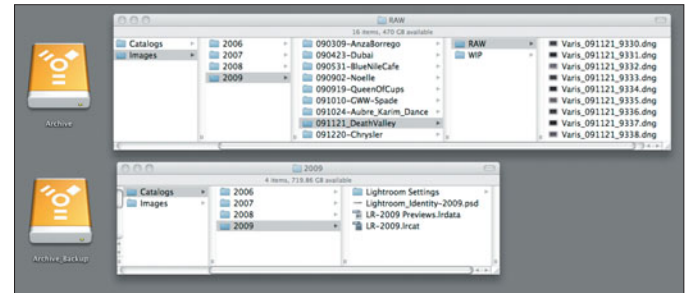


Figure 1.9

Dual external hard drives setup as Archive and Backup.



Figure 1.10

The Lightroom Library module shows the hard drive folder structure at the left in the Folders pane.

Photoshop—the Complete Digital Darkroom

There is a current trend among many photographers to reduce the reliance on Photoshop as an image editor in favor of Lightroom or other RAW processors in an attempt to do as much as possible “in RAW.” The thought is that since the best available data is always going to be the original RAW data, one should work as much as possible directly with the RAW data. There are a number of reasons why this is not yet true, but mostly the current software designed for RAW processing is just not as full featured or mature as Photoshop. There are so many powerful ways of addressing image manipulation in Photoshop, that no RAW processor supports, it is hard to prefer most adjustments in the RAW processor beyond white balance, highlight recovery, and possibly noise reduction. The biggest shortcoming of most RAW processors including ACR and Lightroom is that they lack direct access to the RGB channels in the image. All image adjustments done in a RAW processor, after establishing a white balance and the application of any highlight recovery, occur after the de-mosaic algorithms have been applied so the file is essentially rendered and then adjusted, even though this appears to happen before you hit the export phase. There is no particular qualitative advantage to doing most color and tone adjustments in the RAW processor.

I therefore recommend RAW file adjustments only for comping purposes—get a rough adjusted version for client approval but reprocess a relatively flat, color-neutral version to do a high quality version in Photoshop for finals. Of course, if your work requires a high volume of images, it may be impractical to do Photoshop adjustments for every image that needs to be delivered. In that case, it certainly makes sense to finish as much as possible in the RAW processor and reserve only things that really need that extra finesse for Photoshop. In either case, it is always best to capture as much good data as possible for the final image and that means that you must “get it in-camera.” In general, for digitally captured photographs, that means the brightest exposure that doesn’t “clip” highlight detail.

For the remainder of the book I will be recommending zero slider settings for ACR and Lightroom (Figure 1.11). Partly this is to develop a habit of adequate exposure without relying on the default +50% brightness. The other consideration is for creative image manipulation, which is best carried out in Photoshop. I will cover this topic in detail in Chapter 4.

The basic photo strategy I propose is to expose for the brightest important tone in the image to place it as high as possible in the tonal range, then adjust the contrast and final tonal rendering in Photoshop for creative effect. This will ensure the highest detail, most noise free image possible for any given situation. Before we can talk about how to do this we must determine exactly how our particular capture system—camera plus lens plus lighting—responds to exposure.

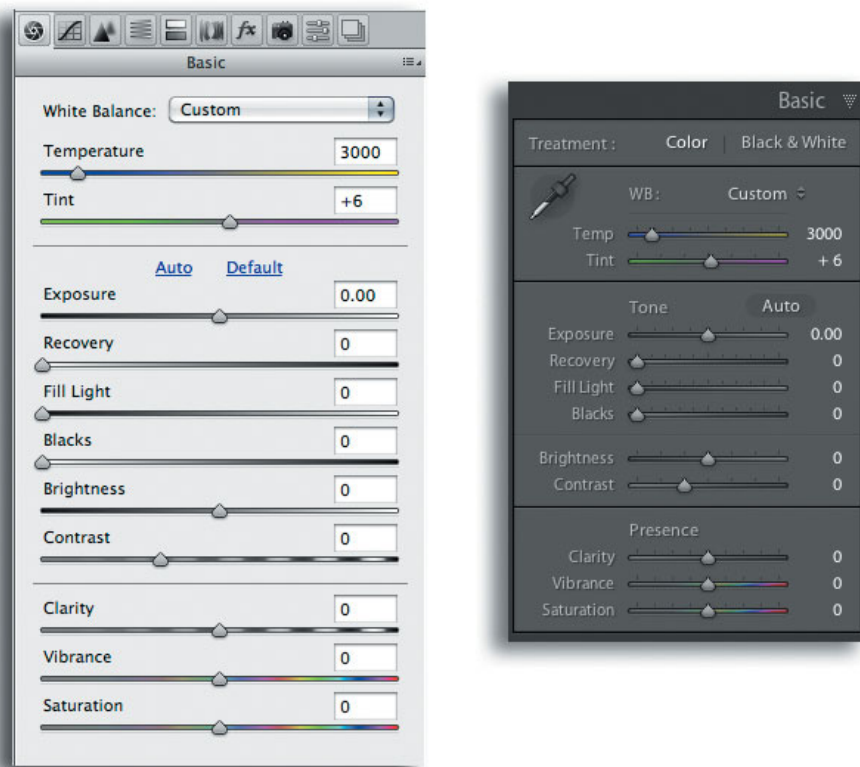


Figure 1.11

Set up “zero slider” settings for most work in ACR (left) and Lightroom (right).

Review

Professional-quality photography requires a certain technical proficiency and those desiring to consistently deliver the highest quality images will need to develop working methods that build on the strengths of digital capture and minimize production errors. This starts with a basic understanding of digital capture technology and a good working knowledge of computers and file management. The photographer needs to design a production workflow that tracks image files from

- The camera to the computer
- Initial storage to additional duplicate storage
- Archiving/cataloging application to creative manipulation applications and back
- From digital file to final outputs for print and/or electronic delivery

Creative decisions occur at many points along the way, as well as before everything gets started and at the moment of image capture, but much of the necessary file management is tedious and error prone. Careful analysis of your workflow is necessary so that you can have confidence in your ability to deliver an image that represents the best quality that can be achieved under any circumstance. There are many ways of working with digitally captured images and a small investment of time spent to develop a personalized workflow will pay off in the long run.

I provide only an outline here of a simple digital photography workflow that utilizes camera storage “cards,” downloading procedures to place images into a Lightroom catalog and from there into Photoshop for the majority of creative image enhancement work. Each photographer will have unique needs in his workflow depending on personal style and the application for his images in the world at large. Some will use different software than what I use. The concepts explored here and in the rest of the book are what is important. It’s not about following a recipe so be aware that you will be adapting the ideas in this book to your own working methods.



2

Digital Zone System

Ansel Adams published his seminal work, *Camera and Lens*, the first installment in his series on the Zone System, in 1948. Until this time, technical information about photography was only useable by engineers and chemists, full of log scales and exposure tables. Adams simplified all of this into a system of identifying and controlling 10 discrete tones that he labeled using Roman numerals I thru X. This system allowed the photographer to pre-visualize the results of an exposure and generate a print that matched the photographer's intention. Even though this system was intended to simplify the technical process of taking and printing photographs, the Zone System was widely regarded as difficult to master and involved a rather tedious testing procedure to implement fully.

Today the same principles that Adams so brilliantly elucidated can be used in the digital environment of contemporary photography. In fact, digital technology offers a level of precision that goes well beyond what was possible using the traditional

methods of Adams' day. A complete zone test can be done in less than a day of shooting and post-process evaluation and this goes a long way towards making the Zone System practical for the average photographer.

To fully appreciate the Zone System, one must have a procedure to test and calibrate a digital capture system. You have to know how your tools will behave "before you shoot" so you can be assured that you will have some level of technical success. The point of the Zone System is to be able to pre-visualize the end result, and today digital technology makes this easier than ever before. However, this doesn't mean that you can skip the testing of your equipment. The steps I will outline here can go a long way towards establishing a high-quality outcome and should be something that every photographer thinks about before shooting. Before we get into the nitty-gritty of digital capture calibration, I will cover some of the conceptual framework for quality image capture.

Calibrating for digital capture requires a basic understanding of photographic principles. Capturing images is really recording light, and that means the first, most important step, is getting the exposure right. Next, we have to render the exposure in a way that conveys our intention for the image. This is a creative, interpretive process that involves the interplay between tone

or value and color. Color gamut is NOT the most critical component of a photographic image. The viewer will respond more strongly to lights and darks in the image over color and that is one reason that B+W images can be so successful. Control overexposure and post processing to manage tone and color will lead to high-quality photographic images.

The Zone Scale

Before we dive into the whole calibration process, let's start with an overview of the Zone System. You can start to get an understanding of the Zone System by building a basic zone step-wedge in Photoshop. I've numbered the steps in the figures noted below.

Figure 2.1 ❶ Start by making a new document ❷ 1 inch high by 6 inches wide ❸ set the color mode to Lab ❹ set the background contents to “White” and ❺ click “OK.”

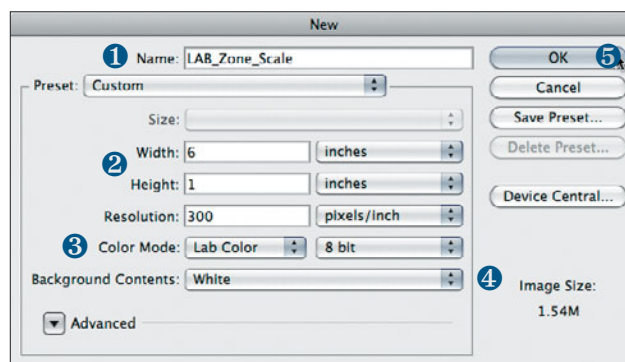


Figure 2.1
Make a new Lab document.

Figure 2.2 In the Channels palette ① select the Lightness channel ② select the Gradient Tool and ③ choose the white to black gradient from the tool option bar. Very important—to make the steps clean, ④ make sure you uncheck the Dither checkbox. Drag out a black to white gradient—hold down the Shift key to constrain it to a perfect horizontal.

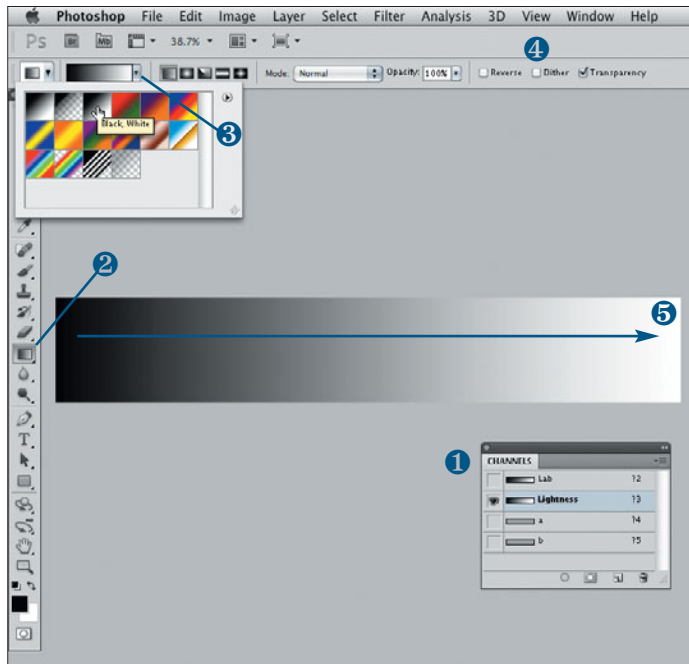


Figure 2.2
Create a black to white gradient in the Lightness channel.

Figure 2.3 ① Select Posterize from the Image > Adjustments menu and ② set the Levels slider to 11.

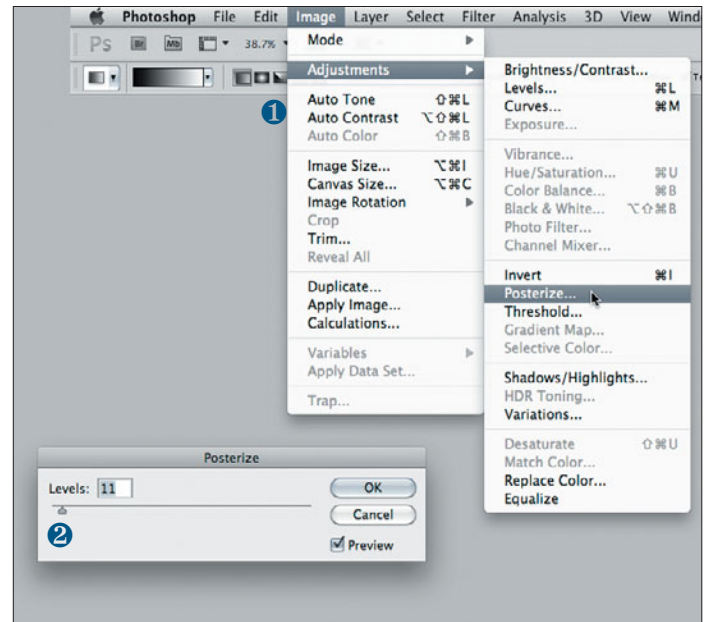


Figure 2.3
Posterize the gradient into 11 steps.

You will then end up with a “step-wedge” that has discrete levels that increment in 10% steps—this is very similar to the scale used in Ansel Adams’ Zone System except that we have 11 steps including “0” for absolute black. This is necessary to place a 50% “step” in the middle of the scale. The resulting steps roughly correspond to the traditional Zone Scale of I to X with Lab values in even percentages mostly equivalent to zone numbers (i.e., I = 10%, II=20%, etc.) (Figure 2.4). We can convert the linear Lab step-wedge into any colorspace we want. You will notice that the linear percentages of Lab do not convert into numerically “even” RGB values. As you can see here for Adobe RGB, 50% is not 128 (halfway between 0 and 255), but 118. This is because RGB workspaces are gamma encoded, distributing steps with a curve function that is similar to the power curve of a cathode ray tube, which, in turn, mimics the human visual response. Thus, gamma 2.2 workspaces like Adobe RGB and sRGB have middle gray at 118, and 1.8 gamma workspaces like ColorMatch RGB place middle gray at 99. You don’t really need to understand the math behind this—just be aware that a value of 50% almost never equates to a value of 128 in any RGB workspace. The Zone Scale can help you visualize value structure in images and identify numerical readings with zone equivalents.

You can use variations on this simple “zone” scale to determine how values will print. Here I’ve built 3 step-wedges—21 steps (5% increments), 41 steps (2.5% increments), and a 61-step-wedge (roughly 1.5% increments, though it’s not completely even across the scale) (Figure 2.5). Convert this to RGB and print. Then look at the print to determine where you lose separation between values. This is especially helpful in visualizing how shadow values become compressed in a print. You may find that you don’t get any separation of values below a level of 15 on certain papers, but others will give you separate “steps” down to a level of 5.

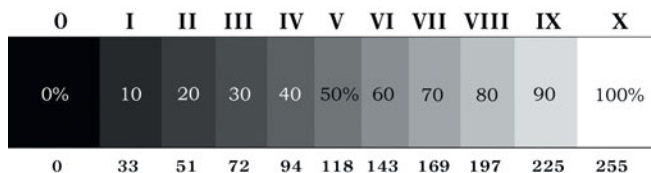


Figure 2.4

The digital zone scale is 11 steps from black to white with 50% gray in the middle.

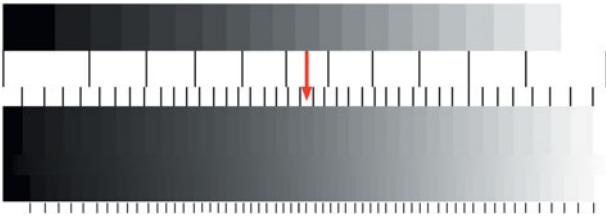


Figure 2.5

Print zone scales to determine tonal rendering of the printer.

The whole point of the Zone System is to develop a way to pre-visualize how an image will print. Keep your “printed” zone scale in hand and you can easily identify values in an image file visually and using Photoshop Lab color readouts in the Info panel. Just set up the Second Color Readout to Lab in the Info Panel Options or use the little eyedropper drop-down in the Info panel itself (Figure 2.6). Now when you read a particular color value, you can check the “L” value to come up with a “zone” equivalent. Here an 87% value would be closest to 90% or zone IX (9).

When we are trying to pre-visualize a digital capture, we want to identify how a given exposure will render as a value in a print. By exposing a scene appropriately, we can keep values within range so that we can easily manipulate the contrast to enhance the image for a print.

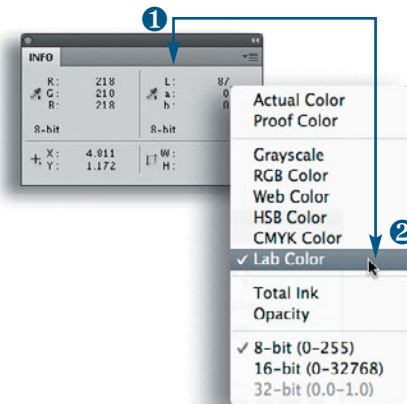


Figure 2.6

Read “L” values in the Info panel to determine the equivalent zone.

This image is represented here in a linear RAW state—zero slider settings in ACR and Lightroom with a linear curve (Figure 2.7). It is as close to a 1:1 representation of what the camera chip captured as possible. If we place a zone scale next

to it, we can see what values inside the image correspond to which zone in the scale. The dark mountains in the foreground (reading $L=19$) are closest to zone II and the snow-covered mountain peak (reading $L=91$) is closest to a zone IX.



Figure 2.7

Compare the values in the zone scale to tones within a scene.

Everything in the image falls within these extremes and that gives us plenty of room to adjust the final image in Photoshop to enhance the detail and local contrast as well as the color to get a great image without introducing a lot of noise or clipping highlight or shadow detail (Figure 2.8). The traditional Zone System was more rigidly dependent on the exposure to “place” image values at a specific “zone.” Photoshop and other image-editing software allow for a lot of flexibility to manipulate tone and contrast and this frees the photographer from

tonal considerations in the middle of the scale. However, highlight and shadow values are still critically limited by the information present in the initial exposure so it is still important to place these values within a useable range by exposing properly. This new digital “zone” system gives us a way of thinking about the value structure of an image and exposing for a digital capture that collects the maximum amount of useable data in a controlled manner.



Figure 2.8

Adjustments in Photoshop can enhance contrast and detail.

When you are analyzing a scene that you want to photograph, you can think in terms of the various tonal “zones” that are present. When I captured the mountain landscape, I was sitting in the passenger seat of a moving car looking out the window. I had my camera and a 1° spot light meter handy. I was able to take a reading of the clouds, the sunlit snow-capped mountain peak, and the dark foreground mountains. The readings were “placed” (matched up with an appropriate f-stop/shutter speed combination) so that the exposure kept the shadow and highlight within a 6-zone range. The exposure was determined based on the relative direction and distance the intended “zone” was from zone V or middle gray—so I opened up from the exposure value of f16 to f8.0 to “place” the snow-capped peak at zone IX, as high as I could go and still have some variation of tone before it “clipped” to white. If I had opened up to f5.6, I would have lost any detail in the snow.

The other consideration was the shadow value. After placing the highlight, I checked to see how far away the shadow reading was—in this case, I was a good 5–5.5 f-stops away but not too far that I would be below zone I. The meter (Sekonic L-758DR Digitalmaster) I was using had a dynamic range display that showed where each exposure setting fell relative to the maximum range for the camera—I could dial up or down the exposure to “fit” the two readings inside the range. This particular scene was just barely contained by the range of the camera so I had no leeway for error. Open up any more and I would have lost detail in the sunlit snow; close down and the shadow area would have dipped below recovering any detail at all.

In retrospect, I feel that I could have sacrificed detail in the small highlight in favor of more detail in the shadow area, which makes up the bulk of the image. Often, with digital capture, you can recover a bit more detail out of an apparently clipped highlight, but when you expose for a zone I value, you get very close to the noise floor where detail is obscured by signal noise, and any attempts to recover detail in a shadow can accentuate existing noise to an unacceptable level.

Of course, in order to make any of this work, you have to know what the dynamic range of your camera is and be able to predict what value a given exposure will produce in the capture. The Ansel Adams Zone System uses a non-linear distribution of zones based on the values rendered with a change of 1 f-stop of exposure on a negative. The digital capture system has a less

clear relationship to the linear 10% progression of values in the digital zone scale, but the overall range of useable exposure can be determined by testing to see where clipping in highlights and shadows occurs. The basic strategy for exposure is to give as much exposure as possible without clipping highlights and then adjust the values later in image processing.

Capture System Calibration

Before we can get to the place where we can pre-visualize the end result, we have to test the capture “system.” That means the camera and lens plus the lighting—the total system! We will look at how to do this using Adobe Camera Raw and Lightroom. A complete calibration procedure involves

- Shooting a range of exposures of a known target to determine the true Exposure Index (E.I.) of the camera.
- Evaluating the exposures to identify the highlight and shadow “endpoints” and thus determine the dynamic range of the camera.
- Comparing the resulting colors of the ideal exposure to known target values to derive a color lookup table to compensate for the camera’s color bias.
- Saving custom settings for the camera to adjust for exposure compensation using the camera’s built-in meter.
- Saving settings in Adobe Camera Raw or Lightroom to use for future processing.

The setup you use for shooting an exposure test depends on your equipment and general shooting methodology. The general procedure is to shoot a range of exposures of a known target value and then pick the exposure that gives you the closest value match to the target—it would be easiest if this reference target is actually a 50% neutral gray surface.

The 18% Gray Card Story

This begs the question, “what is the standard for 50% gray?” The answer is a bit murky. Many reference “gray cards” are referred to as 18% gray. In the printing industry, 18% reflectivity is considered halfway between the white of paper and the black of printing inks. However, actual scene luminance is a bit different from the brightness of printing ink on paper. Light meters are calibrated to an ANSI (American National Standards Institute) standard of 12.3% reflectivity, which is a closer match to 50% luminosity or $L=50$ (in Lab colorspace). For some unknown reason, reference cards in use for photography, if they are calibrated at all, choose 18% to represent medium gray! This may come from Kodak who continues to manufacture and market an 18% gray card. 18% gray actually refers to a printing specification (Kodak’s cards are produced using printing ink on an offset litho press) and presumably this makes it easier to manufacture. The bottom line is that the 18% Kodak gray card is a bit “lighter” than the 12.3% reflectivity that light meters are calibrated to and so, if you expose at the reading you get off the Kodak card, you will be underexposing by about 1/2 f-stop. Ansel Adams was aware of this and made reference to a mysterious “K” factor in his *Camera and Lens* book that had you opening up by 1/2 stop from the reading off the card. In general practice, I prefer the exposure precision afforded by adjusting exposure in 1/3 stop increments; therefore, to avoid overexposing, I only open 1/3 stop from readings taken off 18% gray cards.

However, none of the new digital “gray cards” I know of are actually 50% gray (halfway between black and white)—most are a bit lighter. You can adapt to any target as long as the value is known—lighter values would require you to open up from the reading by the amount that the card deviates from the standard for 50% gray.

The mid-gray patch (third from the right on the bottom row) of the X-Rite ColorChecker 24 patch Classic target (Figure 2.9) has an average “L” value reading of 51%, which makes it closer to 18% reflectivity rather than the ANSI standard of 12.3% reflectance used for light meters. To arrive at an accurate exposure, open up 1/3 stop (.33 EV) from the reading off this patch.



Figure 2.9

The X-Rite ColorChecker 24 patch Classic Color Rendition Chart.

This is a very small target to measure with your camera's light meter, though, even in spot meter mode. The Lastolite EZYBalance (www.lastolite.com) is a popup reflector type of affair with a gray surface (18% gray) on one side and a neutral white on the other, very easy to carry and available in multiple sizes large enough to make it easy to fill the frame of the camera to get an unambiguous reading for medium gray (Figure 2.10). You should, however open up 1/3 to 1/2 stop from the meter reading off the gray side. Another noteworthy gray card is the Digital Gray Card (DGC) from Robin Myers Imaging (www.rmimaging.com) (Figure 2.11). Robin puts the specifications on the back of every card giving RGB values for gamma 1.8 as 133 (R=G=B) and gamma 2.2 as 150 (R=G=B)—a very straightforward value that equates to L=63, just about zone VI (open up 1 stop from meter reading). If you use a DSLR with a built-in meter, you should arrange to use a large gray reference card like the Lastolite. If you use a hand-held spot meter (Figure 2.12), you can read the small ColorChecker gray patch.



Figure 2.10
The Lastolite EZYBalance pop up reflector.

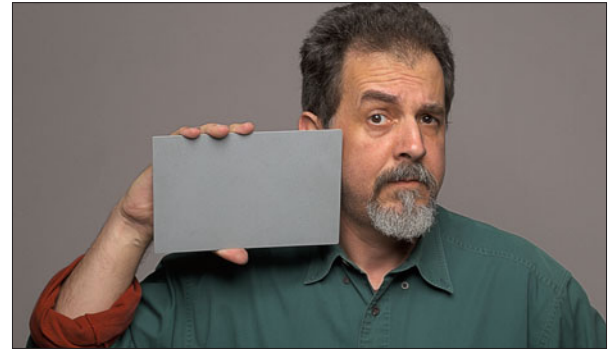


Figure 2.11
The Robin Myers Digital Gray Card.



Figure 2.12
A hand-held spot meter allows you to take a reading of a small 1° angle of view for an accurate reading of a single patch on the ColorChecker Target.

If you use an incident meter (the kind with a small white dome) (Figure 2.13), you can bypass reading off the card and take your reading directly from the light source by pointing the diffuser dome towards the light—this is automatically calibrated to the manufacturer’s ANSI specification of 12.3% reflectance. Finally, you can use the sunny 16 rule—at most locations around the world, outside, in direct open sunlight, the correct exposure will be had at f16 at the shutter speed that matches the E.I. for the camera. My own preference is to use the sunny 16 rule for shooting the test in direct sunlight and the incident meter for tungsten (indoor) lighting because this avoids the ambiguity of the actual reflectance of real-world gray cards. For in-camera metering, I like to use the Lastolite EZYBalance and open up 1/3 stop to arrive at my baseline exposure. Sometimes it is worth double-checking the meter (hand-held or in-camera) against the sunny 16 rule to see if you are off by a significant amount.

Either way, you would establish a starting point for your exposure tests and shoot a wide range of exposures under and over the expected good exposure. Then, bring these captures into Photoshop in a controlled way and evaluate the values rendered for your target. Determine which exposure gave the closest match and calculate the E.I. for that exposure based on how it deviates from the expected E.I. exposure. Once you establish a true exposure index for your capture system, you can move on to color calibration.

To facilitate this analysis, you need to work with an appropriate test target. There are a number of things that go into a good test target. First, assuming that we will also want to do a color calibration as well as exposure calibration, we have to have a standard color reference—here I’m using an X-Rite ColorChecker 24 patch Classic target (Figure 2.14).



Figure 2.13

An incident meter takes a reading of the light falling on the dome diffuser.



Figure 2.14

My personal test target includes a “black trap” and a diffused white reference as well as the X-Rite ColorChecker 24 patch Classic target—I always shoot with a self timer so I can get into the shot for a skin tone reference.

Since skin tone is such a problematic color, it is almost mandatory that you have a human subject in the scene. Though not critical, I like to have a light trap to use for a black reference—this can be a simple box with a smaller hole cut in the lid, lined with black velvet. Some kind of diffused white reference is also good but also not essential—here I use a piece of styrofoam

lens packaging material. You can get by with just shooting the ColorChecker card but having other standard objects (like a person) in the shot makes it easier to visually assess the exposure. With any test target, you will need to write down the E.I. or ISO reference number for the exposure for that frame and place it in the shot.

Color Reference Targets

There are a number of different “color reference” products on the market and it’s important to use the appropriate product for the calibration procedures you will be using. I’ve standardized on Adobe products for my photo imaging—I use Lightroom, Photoshop, and Adobe Camera Raw for everything and these applications are set up to use the X-Rite ColorChecker 24 patch Classic target. That is why I use the ColorChecker target. There are other approaches—I have tried a number of these but have had only limited success and experienced problems with most. One approach that was fairly popular some years ago was to use ICC profiling applications to build custom input profiles for digital cameras. This usually involved the use of more complicated test targets like the X-Rite ColorChecker DC (Figure 2.15). This target is intended for use with software specifically designed to analyze this target—the idea being that more patches of discrete color will render a more accurate profile. My experience with this approach is that it renders smooth gradations with more banding than other approaches using fewer patches for calculation. Also generating a custom input profile requires an additional conversion from that colorspace to a more neutral editing workspace like sRGB or Adobe RGB before you can start adjusting things. With very few exceptions I find this to be more trouble than it is worth and, with no exceptions, it requires more expensive color profiling software.

It has become standard practice now, with most RAW processing software, to simply render out the original RAW file into some standard colorspace using calculations based on proprietary algorithms and be done with it. Adobe has made it possible to create custom lookup tables for camera calibration that works within their RAW processing engine and a couple of software products have emerged to handle this process.

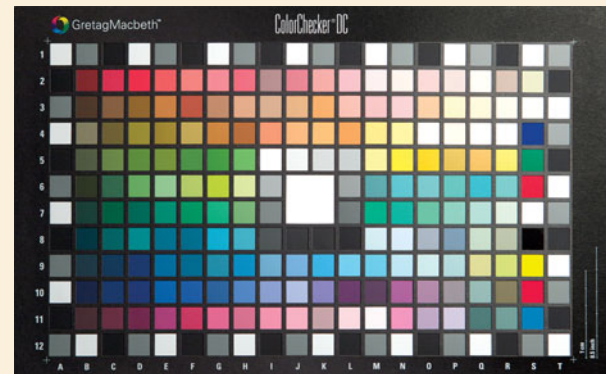


Figure 2.15
The X-Rite ColorChecker DC.

The ideal way to take exposure readings, at least for the test, is to use a hand-held light meter (Figure 2.16). I happen to like the Sekonic multi-meters and I'll look at their new “digital” meter a little later, but any hand-held meter is better than relying on the camera meter for a number of reasons. If you have to use your in-camera meter and you don't have access to a large reference card like the Lastolite EZYBalance, you can move in close enough to fill the frame with the ColorChecker target and use the reading you get from that—not ideal, but it's likely to mimic the way you would use your in-camera meter on a day-to-day manner so it should still provide reasonable test results.

Whatever you do—don't base your exposure off the appearance of the LCD on the back of the camera! (Figure 2.17.) Not only do most viewing conditions prohibit accuracy, but the LCD will only show you how the camera would generate a JPEG—it can't show you what is in the RAW file. The histogram is typically only a composite histogram and even when you can display separate RGB histograms, they are not accurate except as a rough approximation of the camera JPEG. We are looking for better than JPEG performance; otherwise, it's not worth shooting RAW! In practice, I find that relying on the LCD almost always causes you to underexpose the shot. Of course, with a lot of experience, you can “learn” how over-bright the image on the LCD needs to be to arrive at the correct exposure—I personally prefer a more controlled approach.



Figure 2.16
The Sekonic L-758DR
Digitalmaster.



Figure 2.17
Do not be tempted to base your exposure decision off the LCD on the back of your camera.

To determine your ideal Exposure Index, you will shoot a series of exposures that bracket around the exposure for the default E.I. Measure the mid-gray patch on the X-Rite ColorChecker (3rd patch from the right on the bottom row of gray patches), or some other 18% gray reference for your starting point, and remember to open up 1/3 to 1/2 f-stop to compensate for the difference in reflectivity from actual “ANSI” gray. Bracket in 1/3 stop increments and place an E.I. reference on the chart so you have the image file marked for quick reference—for example, using the sunny 16 rule, for f16 @ 1/100, you would write down an expected E.I. of 100. For the next exposure, set the shutter speed to 1/80 and change the E.I. reference to 80. Proceed in this fashion: 64, 50, 40, 32 until you’ve reached at least E.I. 15 and then move on to shorter shutter speeds: 125, 150, 200, 250, 300, 400 until you get up to at least 1000. Bracket wide—you want to make sure that you have exposures at the “endpoints” that clip to white and black on that mid-gray patch. I always try to bracket the exposure using the shutter speed. You may remember, back in the film days, we were told to bracket using f-stops because shutter speeds were not as accurate. Digital capture works differently and the exposure is timed electronically, not by a mechanical shutter; in fact, there is no shutter except for the mirror that has to move away.

Lens f-stops will vary slightly from lens to lens and also, just slightly, across their range. So the shutter speed is the most consistent way to bracket a continuous light source—you only need to use f-stops for flash.

Once you have your exposures, bring the files into your software of choice. If you are using ACR or Lightroom, set all adjustments for linear rendering (zero slider settings) and synchronize all files. Finally, look for the rendering of the mid-gray patch that delivers a numerical reading close to 51% (for Lightroom) or RGB=121.

Step-by-Step: Lightroom

Starting with open shade, place your target in shade so that it is exposed to a broad expanse of blue sky. Try to avoid shooting right under a tree because the green leaves can pollute the color somewhat and you want to test for lighting as close to 6500K as possible. This is not critical for an exposure test, but it is helpful for color calibration (which we will cover later). It is also useful to see how your camera responds to different color temperature light—you may be surprised to find that it doesn’t have the same sensitivity in all conditions.

Note

You will want to shoot the exposure test sequence under three different light conditions that represent the most common lighting environments you will work with—I recommend shooting in open shade (6500K), direct sun (5000K), and indoors with tungsten lighting (3200K).

Shoot your exposure sequence and import the image files into Lightroom (Figure 2.18). Use the “General—Zeroed” develop preset to get everything set up with no adjustments (Figure 2.19). Make sure you are using the Camera Neutral calibration preset to get as unbiased a rendering as possible (Figure 2.20). Once you have your sequence imported, you can survey the images for a quick fix on the best exposure (Figure 2.21). Before you start serious evaluation, do a white balance—click on the light gray patch (second from the left) with the White Balance Tool (eyedropper in the Basic panel of the Develop module). The images will appear very flat, and this can bias your judgment so it is best to evaluate the images using numerical readings off the mid-gray patch.

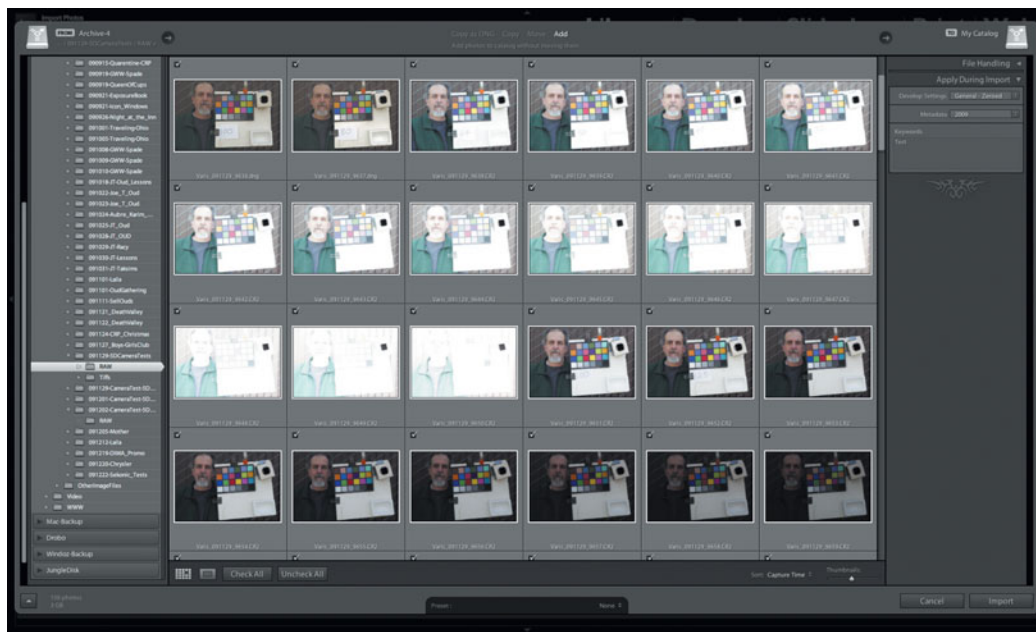


Figure 2.18

Import the test images into Lightroom.



Figure 2.19

Set the Develop Settings to “General—Zeroed” on import.

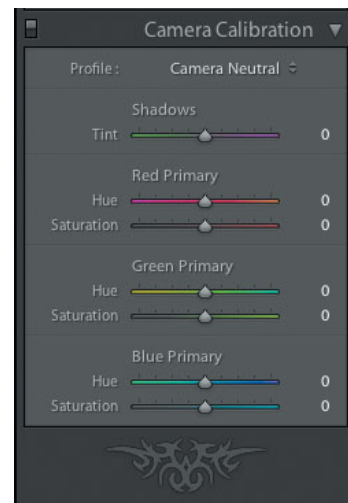


Figure 2.20

In the Develop module, select Camera Neutral in the Camera Calibration pane.

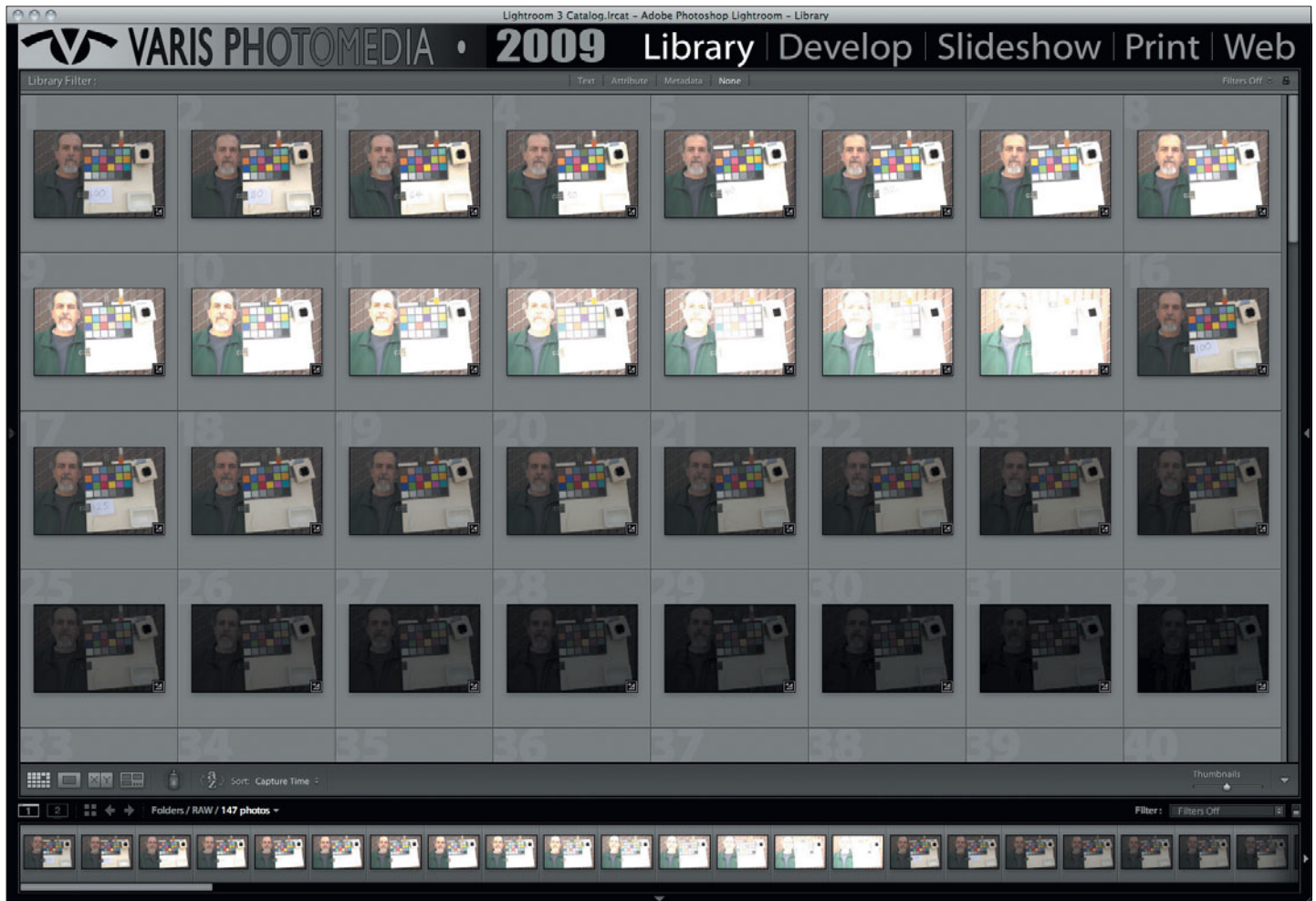


Figure 2.21

Evaluate the exposures for the best overall exposure and zoom into the most likely candidates.

Look for the exposure that gives you a reading close to 51% and, very important, without having the white patch go over 90%! In my example, I have the gray patch closer to 51 at the ISO 64 exposure where it reads 53%—however, the white patch is 100%, clipped (Figure 2.22).



Figure 2.22

This exposure has a good mid-gray patch reading, but the white patch is clipped.

The next exposure down would give me an ISO of 80, and here the gray patch is at 48%. This one still doesn't quite work because the white patch is 93% (Figure 2.23).



Figure 2.23

The mid-gray patch is still close, but the white patch goes past 90%.

So, in the end, I'm back to ISO 100 where the gray patch now reads 43% but the white is at a safe 85% (Figure 2.24). Once you have found the ideal exposure, you can calculate what kind of compensation you will need—plus 1/3 to plus 1 stop are common.



Figure 2.24

The mid-gray patch is somewhat low, but the white patch is now in a safe range at 85%.

It is also common for this compensation factor to be different depending on the color temperature of the light. For my Canon 5D Mark II, the compensation for direct sun is $+2/3$ but for open shade it is “0” (no compensation) and for tungsten it is $+1$. Most of the time you can enter this compensation into your camera settings if you rely on your in-camera meter. I will typically enter an average exposure compensation across all three lighting types for my in-camera meter settings and just leave it there. These compensation factors are a bit like gambling strategies where you are making calculated trade-offs—it’s a

personal choice that depends on how conservative or bold you are. Another thing to consider is that you can often recover up to 1 stop of highlight detail without suffering image degradation, but using Fill Light or something similar to recover shadow detail will result in extra noise. So, if you are going to err, err on the side of overexposure—in my case for this camera, I would use an exposure compensation in camera of $+2/3$ even though that would be overexposing in open shade lighting. I only need to put the Recovery slider at 20 to get the white patch to read 89% (Figure 2.25).



Figure 2.25

Highlight detail can be recovered with the Recovery slider.

After you've determined the exposure compensation, examine the exposure sequence to find an exposure that renders the mid-gray patch at something close to 90% (zone IX) and, on the other side of the spectrum, 10% (zone I). Usually, on the highlight side, it's fairly unambiguous—zone IX happens at the exposure right before the patch simply clips to white or 100% (Figure 2.26). The shadow side of things is a little less clear.

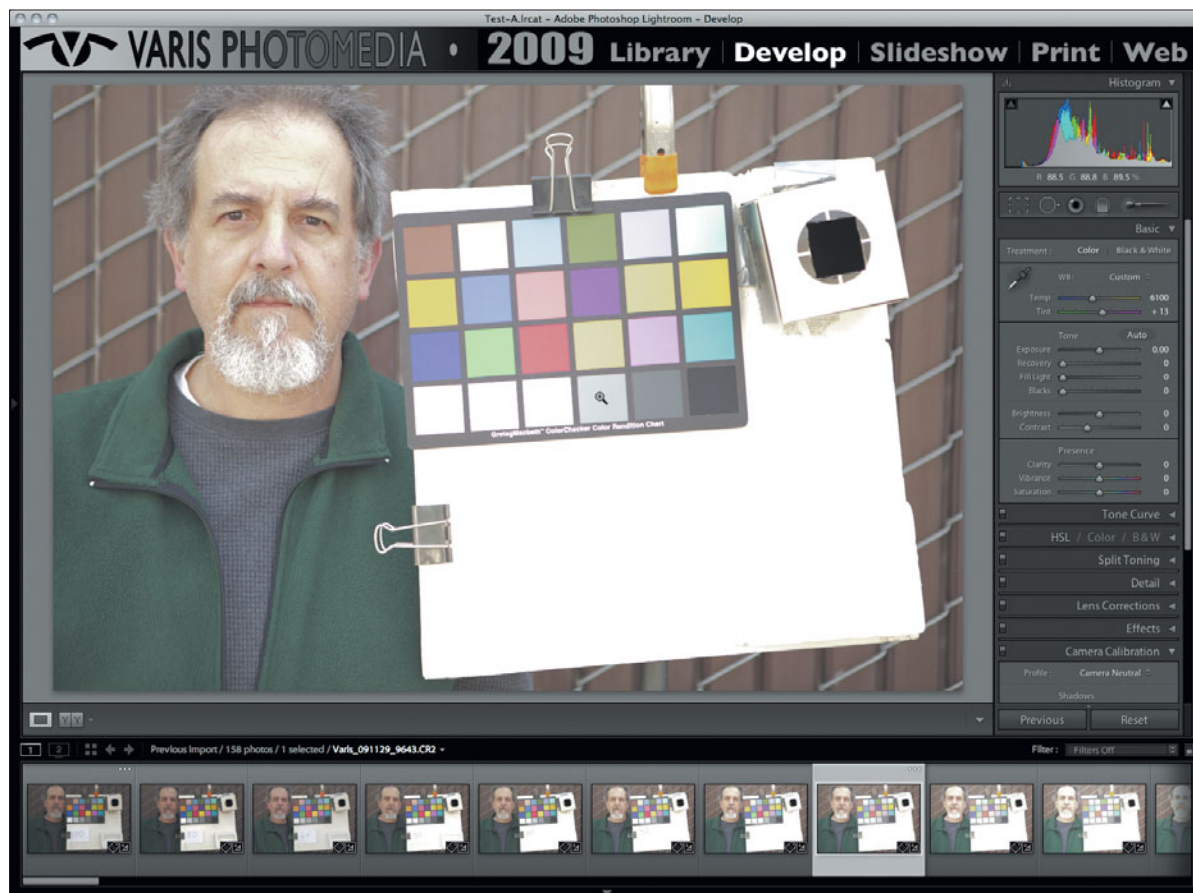


Figure 2.26

The mid-gray patch will go close to 90% right before it clips to 100%.

The low exposure that renders the mid-gray patch at 10% may exhibit a lot of extra noise depending on your particular camera. Zoom in to a 100% view and look closely at the gray patch—the surrounding frame and the darker patch right next to it will show some noise; that’s fine (Figure 2.27). What you need to be on the lookout for is too much noise in the darker gray patch. Typically the value change here from one exposure to the next is very slow and you may have several candidates to choose for something close to 10%—anything under 13% is viable. I go for the exposure right before bad noise starts creeping into the next darker gray patch. What does “bad” noise look like? Again, it’s kind of a personal choice—I can offer some rough guidelines. Avoid exposures that give you lines or uneven blotches of color. Also avoid exposures that show large bright “grains” of red or green—some level of blue noise is acceptable if it is even, like very fine sandpaper.

Remember, we’re trying to identify the last useable tone before black. When you adjust the final image, any added contrast will push the noise tones down into black where it won’t be visible. You can also use the strategy of choosing a conservatively high value for the shadow exposure like 20% and use the Black slider to lower that value to 10% zone I, thus ensuring that all noise is pushed into black.

I try for maximum flexibility and find the lowest exposure that renders a relatively clean gray patch with some even noise in the next darker patch.

Repeat the exposure sequence for direct sun and tungsten lighting—if you do a lot of shooting in the studio with flash lighting, shoot another sequence with flash. Evaluate each situation and determine the exposure compensation and dynamic range for each.

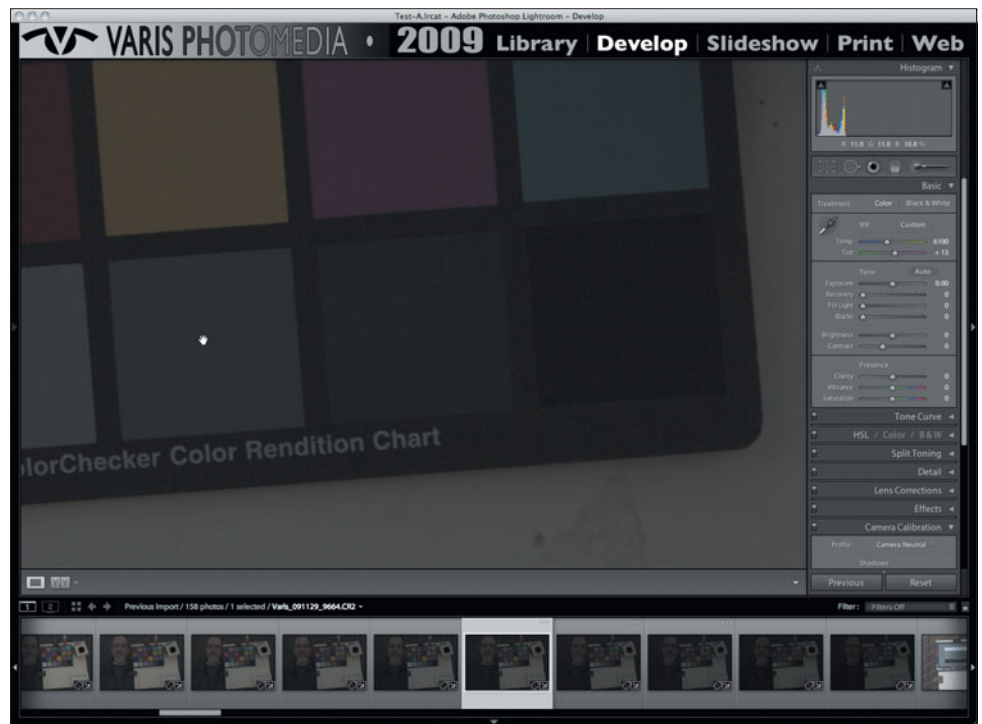


Figure 2.27

The mid-gray patch at zone I (here at 11%).

This is the way my own tests break down for my Canon 5D Mark II:

Canon 5D Mark II w/24-70 Zoom

Lighting	Camera ISO	Exposure Compensation	Zone I	Zone IX	Dynamic Range
Shade	100	none	– 4	+2.33	6.33
Sun	100	+2/3	– 4	+2.33	6.33
Tungsten	500	+1	– 4	+2.66	6.66
Flash	100	+1/3	– 4	+2.33	6.33

I shoot the test for tungsten with the camera ISO set to 500 because that is the lowest ISO setting I am likely to use indoors under tungsten lights. It is interesting to note the progression of exposure compensation for this particular camera—from none under “cool” light and as the temperature warms up (progresses to lower Kelvin numbers) I need to add more exposure. Not all cameras will behave this way—you have to test your specific camera, even if you also have a 5D Mark II.

Try to test for the lowest ISO settings you’re likely to use for the majority of your photography. The very lowest setting will generally give you the cleanest, highest quality captures—you can always increase exposure by setting a higher ISO, but each time you do that you will be accepting more noise and less dynamic range into your captures. The more modern cameras start to show more dramatic reduction in quality after ISO 800 or so and the 6-stop dynamic range you may have at ISO 100 may drop to 5 or 4 stops once you are in 1600–3200 range!

If, however, you find that you do a lot of photography at higher ISO settings, you should test for the exposure compensation at the highest setting you’re likely to use to make sure you know the limits, especially in the shadows!

Armed with this information, you can now make more intelligent exposure decisions. If you are using a hand-held meter, you can set the exposure compensation as an ISO rating. For example, if the exposure compensation is +1/3 from the expected at an ISO rating of 100, you would set the meter to ISO 80. **IMPORTANT NOTE:** Don’t change your camera ISO setting—changing the ISO of the camera affects how the camera records by amplifying the signal off the chip and that **WILL** invalidate your test. Most DSLR cameras will allow you to set exposure compensation in 1/3 stop increments—just enter the amount you got in your test and you’re good to go.

Adobe Camera Raw

The shooting procedure is the same. Once you have shot the exposure sequence, open the RAW captures in ACR, either from Photoshop or Bridge. Make sure you have all your slider settings at “zero” and your tone curve set to “linear,” then do a white balance and synchronize all the captures before you start looking for the best exposure. ACR does not use the same Linear ProPhoto feedback numbers that Lightroom uses. Instead, it displays RGB numbers according to the workflow settings. I recommend using Adobe RGB as your preferred workspace (Figure 2.28). This is the best compromise between working with the ludicrously wide ProPhotoRGB and the gamut-constrained sRGB—it is not so narrow that significant printable colors fall outside of its color gamut but not so wide as to make editing in Photoshop difficult.

Note

Color gamut is the total range of colors defined within a given workspace—thought of as a 3D volume.

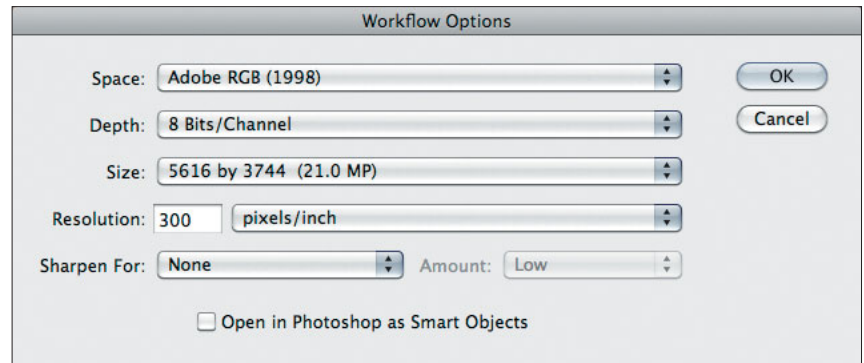


Figure 2.28

The Workflow Options dialog in Adobe Camera Raw.

After you set your workflow preferences, the RGB numbers display will exhibit numbers that represent the chosen workspace in standard RGB from 0 to 255. In Adobe RGB, you will look for the exposure that renders the medium gray patch closest to 121 without pushing the white patch past 245 (Figure 2.29). The low value limit (zone I) will be 33 and the high value limit (zone IX) will be 225. Once you identify these exposures, you can calculate your exposure compensation and the dynamic range for your camera much as in Lightroom.

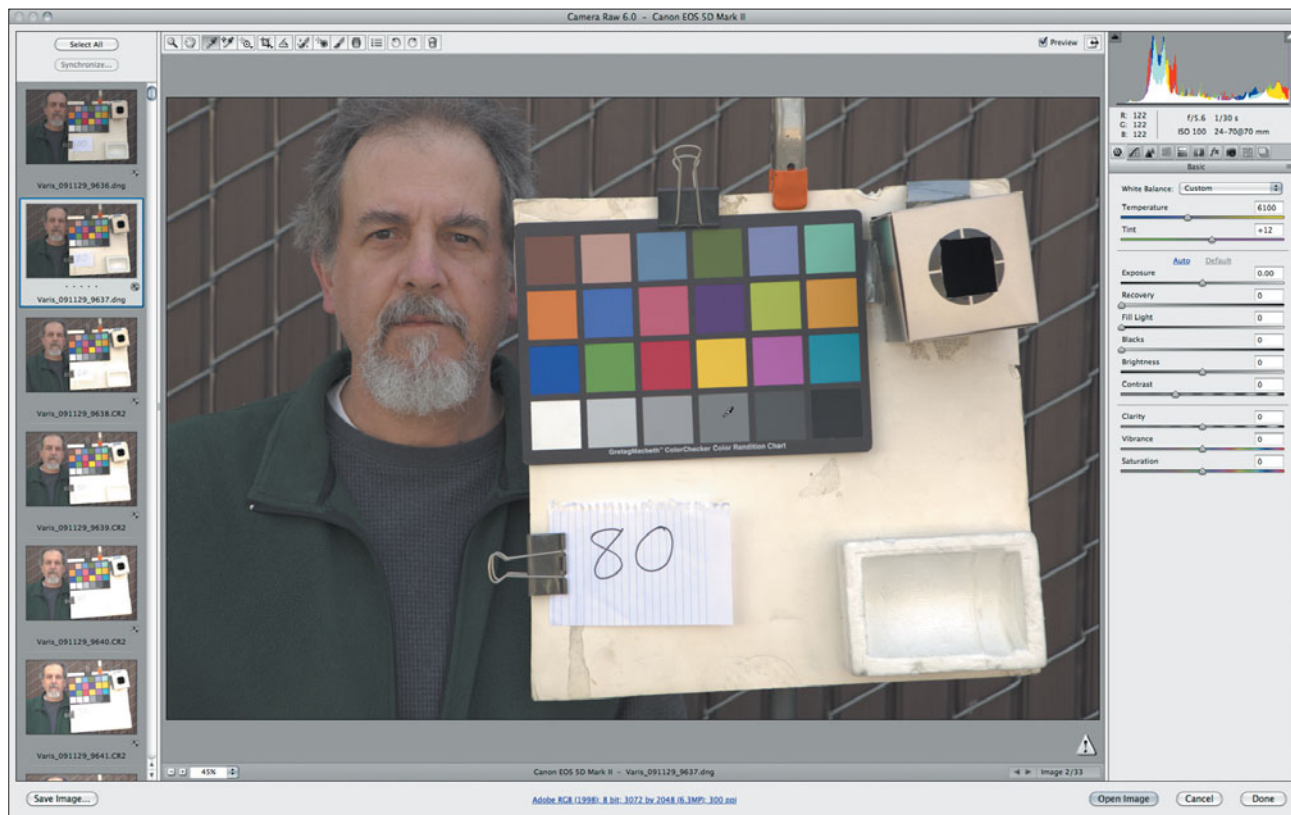


Figure 2.29

Evaluate the exposure in ACR using the RGB numbers just under the histogram.

The Workspace Holy War

There are a lot of heated arguments about what is the best color workspace. There are a lot of comparisons of 3D graphs and ICC profiles and bit depth and on and on. It is very similar to the debate over the merits of 16-bit vs. 8-bit editing. It is unfortunate that so much energy has been devoted to this topic because there are much more important considerations for the photographer seeking to produce high-quality output. At the moment, if your viewing environment is primarily a monitor and your images are going to be viewed mainly on the internet, sRGB is really the maximum color gamut to consider. If you are producing work for publication in magazines, again, sRGB is completely adequate to work in RGB before going to CMYK for final editing. If you are producing fine art prints, Adobe RGB is more than adequate to work with colors that can conceivably be printed on the best inkjet printers. If you are worried about

future print technology, the original RAW file, as shot in the camera, represents the very best data you will ever have access to and it makes more sense to archive that than try to second guess the future of imaging technology by struggling with a relatively primitive wide gamut colorspace like ProPhoto RGB. Of course there are a lot of very sophisticated things you can do with wide gamut colorspaces and if you know about these things you are welcome to utilize these techniques. However, I propose that you would be better served in your work by learning to do creative color correcting in smaller, more print-friendly color workspaces and stop worrying about wild saturated colors that are outside of printing possibility. Most photographers simply won't encounter a significant number of colors outside the Adobe RGB color gamut and the tonal structure (lights and darks) of an image is much more important anyway! I will have more to say about this on the website: www.varis.com/MasteringExposure

The Sekonic L-758DR Exposure Meter

For those photographers looking for even more precision, there is a new “digital” exposure meter from Sekonic that offers the ability to build custom exposure calibrations and store these settings in the meter. To utilize the complete system, they make a special target called an “Exposure Profile Target.” To use this with the L-758DR Digital Master meter, you shoot a specific wide exposure bracket of the target and then import the captures into the Sekonic Data Transfer Software. The program will analyze the exposures and determine the exposure compensation and dynamic range automatically.

You can save settings for multiple “Profiles”—these are not icc. color management profiles but meter profiles intended for a specific camera/lens combination. I prefer to build these profiles for different cameras under different lighting temperatures. You can transfer three “Profiles” to the light meter—these are designated CAMERA-1, CAMERA-2, and CAMERA-3 in the light meter. My preference is to load three profiles that define three lighting temperatures for the same camera and then select the one that matches the situation I'm trying to meter. I find that this gives the most accurate results.

Shooting the Test Target

Sekonic now offers two different targets—the original target consists of seven patches arranged in 1/6th stop decreasing reflectance. The patch set is surrounded by an 18% reflectance gray field with white and black bars above and below respectively. This target requires 11 exposures that include a standard exposure metered from the 18% tone and 5 shots in successive 1EV steps above and below the metered exposure. The new target consists of a central 18% gray patch that is surrounded by 25 patches arranged in 1/6th stop values that are successively brighter and darker. This target only requires three exposures—a standard exposure of the central 18% tone shot at the metered exposure, one shot that is -3EV below metered exposure, and one shot that is $+3\text{EV}$ above the metered exposure. You select the target you are using in the software before analyzing the test results (Figure 2.30).

Shoot either target so that you have the camera at a middle focus distance and the target is not too small in the frame. Shoot the bracket specified for the particular target you are using. Sekonic suggests that you use an f-stop in the middle of the range for your lens and bracket your exposure using the shutter speed. For flash it will be impossible to bracket using shutter speed and nearly impossible to achieve a wide enough bracket for the original target using the f-stops, so you will have to adjust the flash intensity or distance to achieve the appropriate bracket range. While it's not impossible to do this with the original target (11 exposures), it is much more convenient to use the second target (3 exposures) when testing for flash lighting.

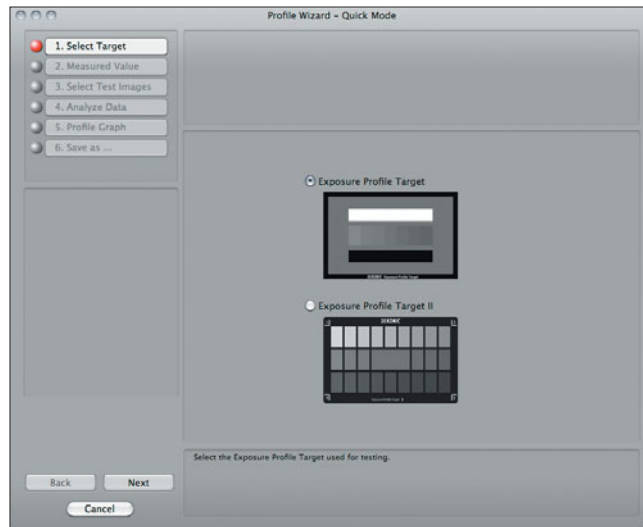


Figure 2.30

The Sekonic Data Transfer software sets up differently depending on which target you are photographing.

Once you have shot the necessary exposures, bring the files into Adobe Camera Raw, Lightroom, or other RAW processor of your choice, crop to the target, and render out flat (zero slider settings) TIFF or JPEG files. These files can then be imported into the Sekonic Data Transfer Software to build the meter profiles. The software comes with reasonably good instructions and it's unnecessary to go through a step-by-step here. However, here are a few suggestions that deviate somewhat from the standard instructions. First, under the Options menu, the “Default of Calculating Setting Change” (Figure 2.31) allows you to set default values for Dynamic Range and Clipping Point in highlight (+) and shadow (–) regions—I find having two values for highlights and shadows to be an unnecessary complication. I simply set both Dynamic Range and Clipping Point fields to zone I and zone IX values so that the same value is entered in both fields—this makes the display on the meter simpler and easier to read (Figure 2.32). When the files are imported and the data is automatically analyzed, the actual values in the fields may shift to represent what was actually recorded in the exposures, but the default “same value entered into both fields” will carry over so you won't have to change anything once the profile is created.

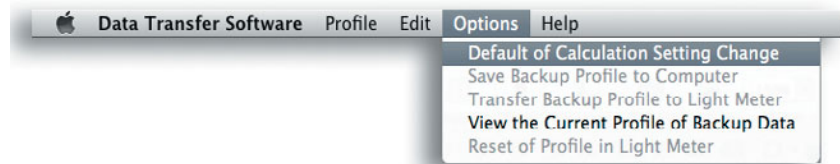


Figure 2.31

Select “Default of Calculating Setting Change” in the Options menu.

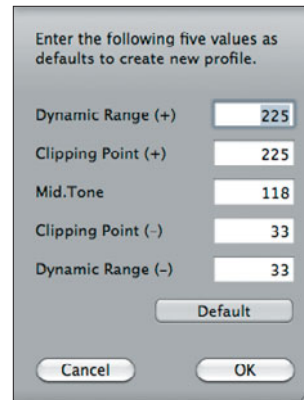


Figure 2.32

Enter the same values for Dynamic Range and Clipping Point in both shadows and highlights.

Once data analysis is complete, you are presented with a graph that displays the recorded values on a curve and shows the dynamic range of the camera in EV numbers (Figure 2.33). The example image shows a camera with a dynamic range of 5.7 EV—just past 2 f-stops above “0” or medium gray, the graph clips to white and you can see the shadow end runs out gradually past 4 f-stops below “0.” The thin vertical green lines show where 225 and 33 fall on the graph and define the limits of good captured data. This is pretty typical for a high quality DSLR.

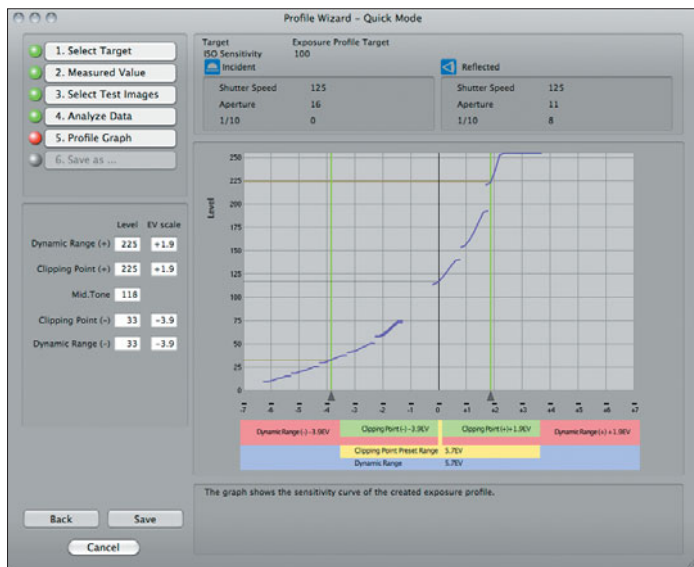


Figure 2.33

The Profile Graph shows the dynamic range of the camera as measured in the test.

Once the settings are stored in the meter, you can use the meter to determine the exposure that maximizes the useable range for a scene. Choose the camera settings you want to use, then push the MID.TONE button. The next reading will be considered the midpoint—push the memory button (on the left side of meter) to save the reading. Then take two more readings for highlight and shadow, pushing the memory button after each reading. These readings will be shown relative to the first mid-point reading on the camera display (Figure 2.34). If one of the readings is outside of the dynamic range, the out-of-range markers will blink; hold down the MID.TONE button and use the jog wheel to adjust the exposure to place the three readings inside the dynamic range of the camera.



Figure 2.34

The Sekonic L-758DR meter allows you to display three readings in relation to the dynamic range of the camera.

This image of a church on the Greek island of Naxos shows a range of tones that offers easy choices for meter readings (Figure 2.35). Reading from the shadow side of the church to the right to place the midtone, the smaller dome in front is the highlight and the shadow, that I want to keep detail in, is the sunlight port-hole window at the bottom of the front tower.

Here we can see that the shadow reading is very close to the bottom of the range at zone I the way I defined it (Figure 2.36). Turning the job wheel, I adjust the values up such that the high-light reading now reaches zone IX, elevating the low values into a better data range (less noise). I don't care about the very dark porthole window—it appears to be missing its glass—that value will “fall off the cliff” into jet-black and I don't need to preserve any detail there. Placing everything as high as possible in the dynamic range of the camera allows for maximum flexibility in manipulating the values within the image in post processing. I am able to hold some texture in the dome highlight and push the contrast—lowering some values to create a dramatic B+W image (Figure 2.37).

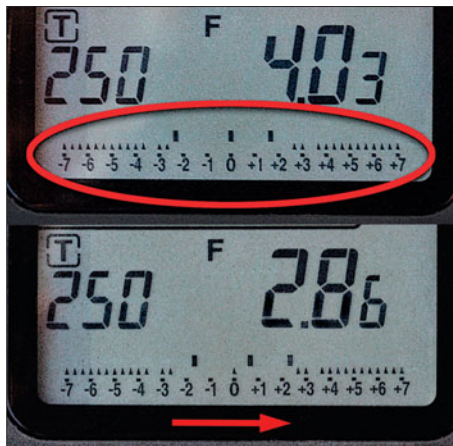


Figure 2.36

Use the jog wheel to move the three exposures higher up in the dynamic range area.



Figure 2.35

This Greek church has very clearly delineated tones to measure with the meter.



Figure 2.37

Careful exposure allows for more options in post processing.

Calibrating for Color

Calibrating for exposure is only half of the calibration process. These days, whether we are creating images for B+W or color, we are shooting in color so it makes sense to be able to capture the most accurate neutral color as possible. Most current digital capture systems create color during post capture processing. RAW processing software is designed to interpolate color information from varying brightness of pixel sites that have a colored filter of red, green, or blue. In essence, there is no color in the RAW data—color is inferred by measuring the brightness of pixel clusters. The colored filters covering the tiny pixel sites are not perfect and, manufacturing processes being what they are, there is some variation from camera to camera even from the same manufacturer. Some RAW processing software is set up to allow for a certain amount of adjustment to calibrate the camera's color to a known target. Adobe's processing software offers this capability through sliders in the Calibrate tab in ACR or the Camera Calibration panel in Lightroom. There is also a stand-alone application from Adobe (in public beta at the time of this writing) that simplifies the process as well as a plug-in from X-rite that almost completely automates the calibration process.

If you have shot your exposure tests using the X-Rite 24 patch ColorChecker, you already have the data necessary to calibrate the color with Adobe's DNG Profile Editor.

Step-by-Step: DNG Profile Editor

DNG Profile Editor is an application designed to modify the lookup tables that Adobe software uses to convert the raw data from the digital camera into a standard color workspace. Every camera supported by Adobe Camera Raw or Lightroom has a lookup table associated with it to enable the raw processor to de-mosaic, or render color from the brightness data recorded under the red, green, or blue pixel sites on the chip. The DNG Profile Editor uses various controls to manipulate the color result generated by the lookup table and re-generate the table as well as a straightforward calibration process that utilizes the X-Rite 24 patch ColorChecker. The software will do an automatic analysis of an image capture of the target and generate a table that can be saved and utilized by Lightroom or ACR. For our purposes, we will use the target analysis function to build an idealized color calibration.

Note

A color lookup table or "clut" is a conversion method whereby an input number is matched to an output number through a table of correspondences that reference Lab color coordinates.

First, select the ideal exposures from your test shots under the different color temperatures and convert the files into DNG format. In Lightroom, go to the Library module and select: Library ► Convert Photo to DNG (Figure 2.38). The DNG Profile Editor can only work with DNG files so you will need to convert all the good exposure shots before opening them into the software. ACR requires that you save the files as new DNGs.

Launch the DNG Profile Editor application and you will be presented with a simple color editor, the first tab at the top of the interface, and the helpful instruction to “Start by opening a DNG Image from the File menu” (Figure 2.39). Open the shot from the open shade test and then click on the Chart tab at the upper right (Figure 2.40). The image should open with white balance you set in Lightroom or ACR. If, for some reason, it doesn’t, simply click on the light gray patch to re-establish a white balance.



Figure 2.38

Convert the native RAW files in Lightroom from the Library menu in the Library module.

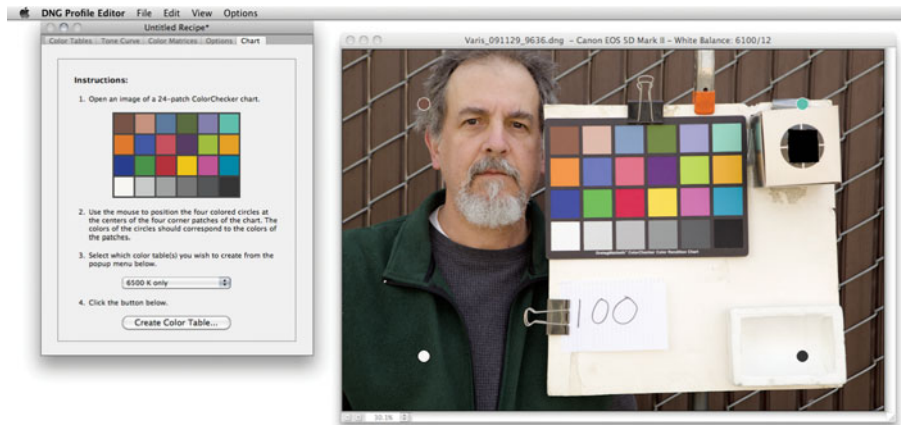


Figure 2.40

Open a test shot and click on the Chart tab.

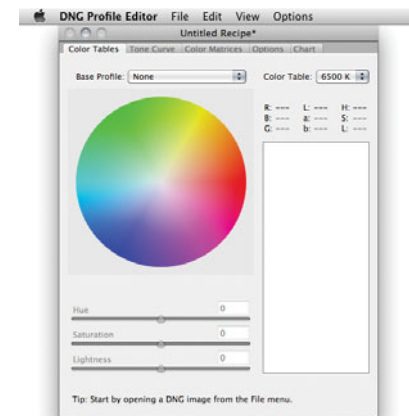


Figure 2.39

The DNG Profile Editor opens with the Color Tables tab active.

Four small colored dots will appear in the image—these are referred to in the on-screen instructions as colored circles. Follow the instructions and position the four colored circles or dots over their respective patches on the target—you can zoom in to the chart image to make it easier to position the dots in the middle of the patches (Figure 2.41). Select the “6500 K only” choice from the popup menu to identify the color temperature of the table you will create. Click on the Create Color Table button and you will be brought back to the Color Tables tab with all the patch colors mapped onto the color wheel—the table is now created (Figure 2.42). If the test was shot correctly and you chose the appropriate exposure, there will be no problems. If, however, the white patch is too bright (clipped), the program will throw up a warning and you’ll have to pick another bracket or re-shoot.



Figure 2.41

You may need to zoom in to position the colored dots accurately.

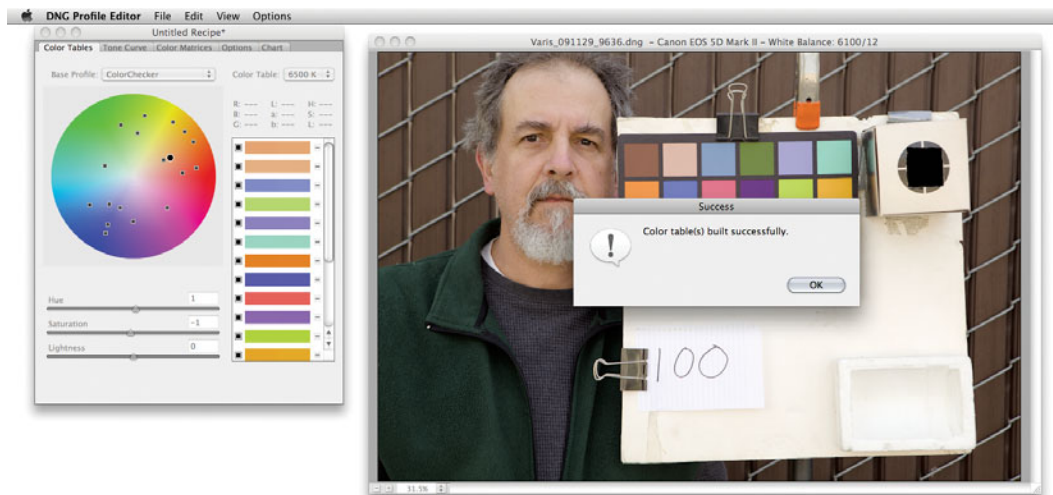


Figure 2.42

After creating the table you will get a confirmation and arrive at the Color Tables tab with values fully populated.

Next, you will create the table for 2850K; in this case, open the tungsten test shot. This is more likely to be at 3000-3400K, depending on what lights you actually used, but it will be close enough for this purpose. Once the tungsten test shot

is open, click on the Chart tab and select 2850 for the table to build and position the dots (Figure 2.43). Again, click on the Create Color Table button and you'll be back at the Color Tables tab, this time with the 2850 table created (Figure 2.44).

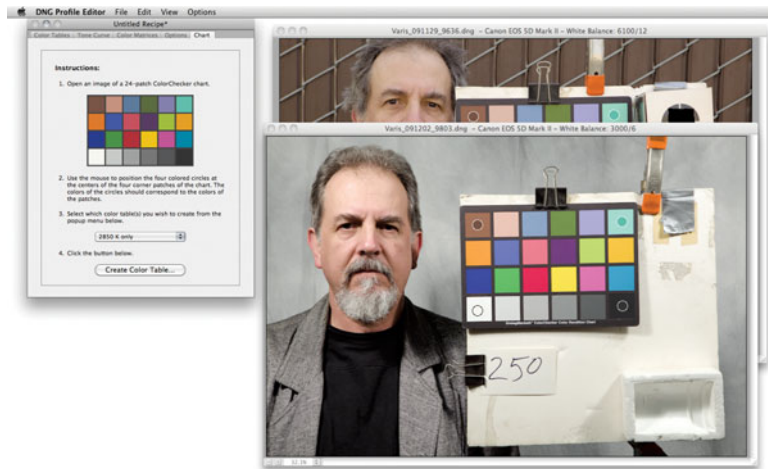


Figure 2.43

Open the second test shot.

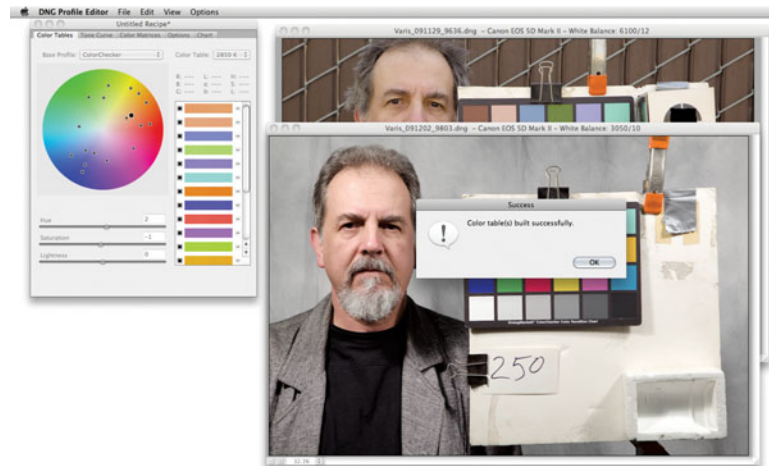


Figure 2.44

Create Table and you will have a complete dual temperature set waiting to be saved.

At this point, all you need to do is select: File ► Export [your camera name] profile...and give the file a meaningful name (Figure 2.45). The DNG Profile Editor finds the correct location for the “profiles” so that they can be used in ACR or Lightroom.

Notice that we opened two test images—one for 6500K and one for 2850K and built individual tables for each. The RAW processing engine that Adobe uses interpolates color values between (and beyond) these common color temperatures to arrive at a correct interpretation of color in a wide range of different lighting conditions. One point of confusion is that there is a third choice, in the tables pop up menu, for “both tables.” If you select this, the DNG Profile Editor will build both the 6500 and the 2850 table from whatever *single* image is open. This is less than ideal for a general-purpose table but it can be useful for a specific lighting condition that might otherwise be problematic. For instance, you might shoot a test target under stadium lighting conditions to build a more accurate color table for the unusual, sodium vapor lighting (and get a better color rendering for the athletic teams’ jerseys). Of course, you would use this table to build a profile you would use only for this one specific lighting condition (more on using the profiles later).

X-Rite ColorChecker Passport

The X-Rite color calibration system utilizes a special version of the ColorChecker target that comes in its own self-enclosed carrying case and includes some extra warming-cooling white balance patches for portraits and landscapes (Figure 2.46). I prefer to use a full-size X-Rite ColorChecker 24 patch Classic target for the exposure tests, but this little target is very convenient for quick color calibration shots. Shoot the target in the lighting you want to test but simply aim for a good exposure—no need to do more than a narrow bracket sequence just to make sure you have a good exposure with which to work.

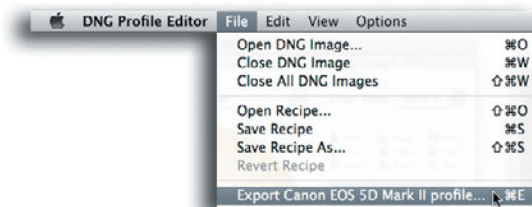


Figure 2.45

Save the complete camera profile from the File menu.



Figure 2.46

The X-Rite ColorChecker Passport target.

The ColorChecker Passport system comes as a stand-alone application as well as a plug-in for Lightroom that almost completely automates the creation of DNG camera profiles within Lightroom. There are very good instructions with the software, but it almost doesn't need any as it's very easy to use. Launch the ColorChecker Passport application and you will see the Wizard interface with instructions that walk you through the process (Figure 2.47).

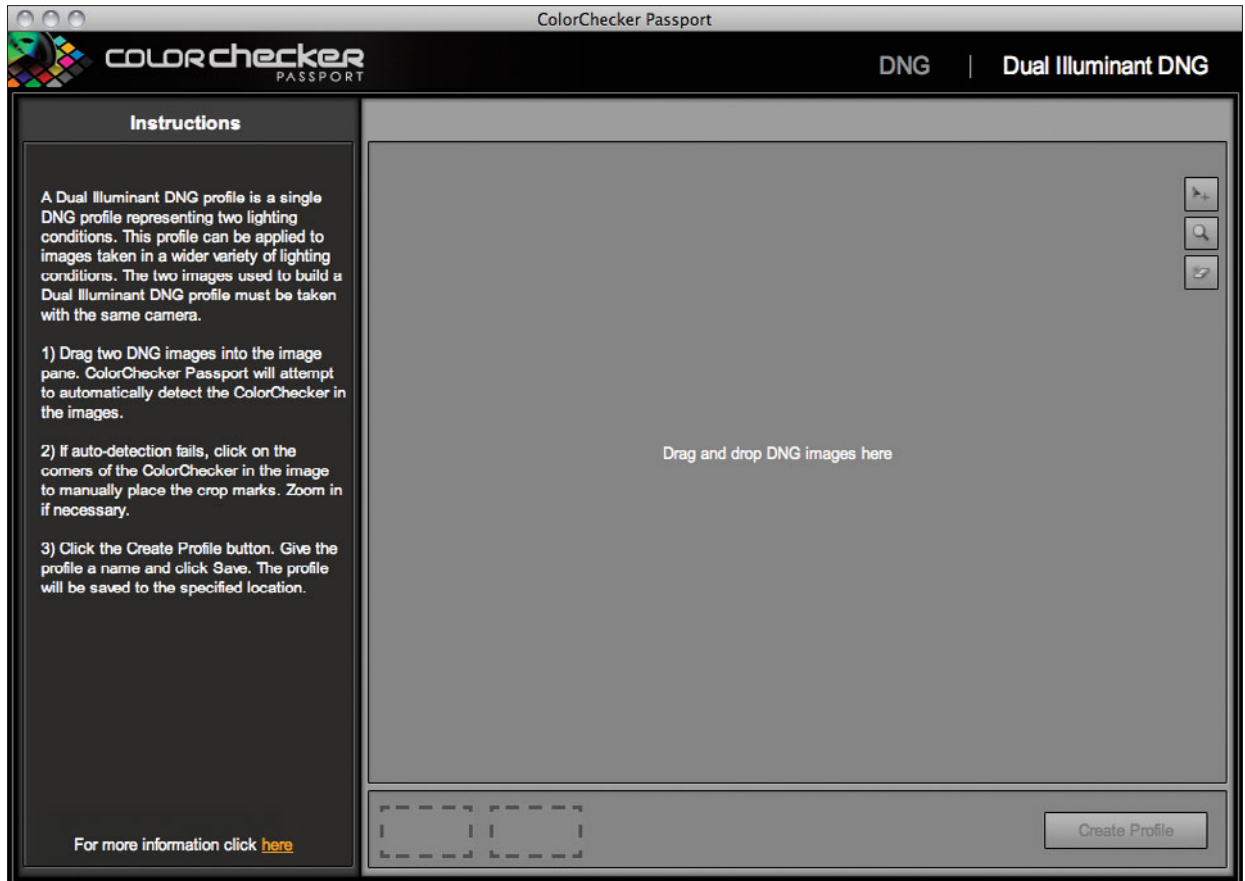


Figure 2.47

The interface of the ColorChecker Passport software provides all the instructions.

Drag two different test shots (preferably under shade and tungsten light) into the large image window—the software will automatically locate the patches for each shot. Then simply click on the Create Profile button, name the resulting file, and you're done (Figure 2.48).

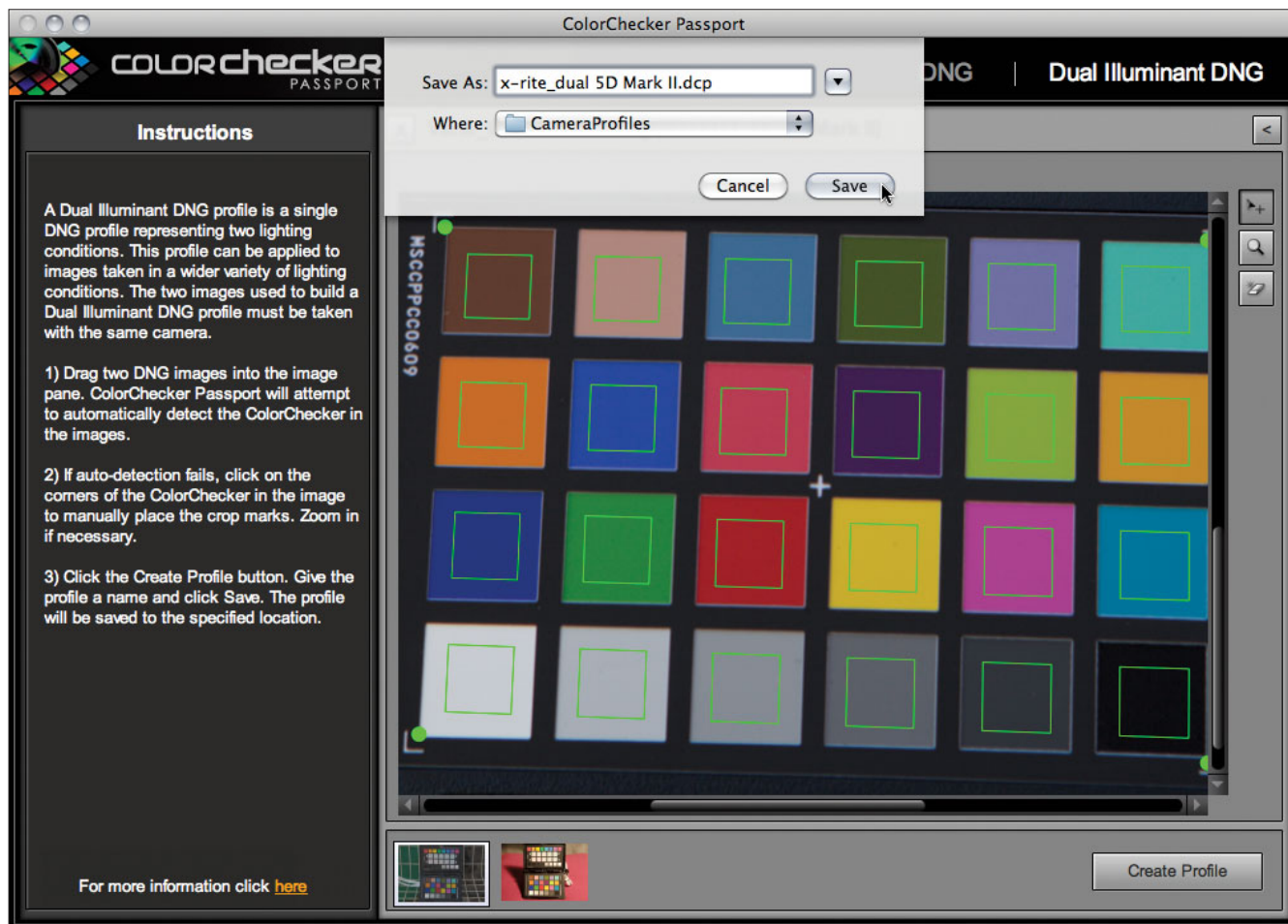


Figure 2.48

Once you drag in the test images, you can create and save a camera profile.

The Lightroom plug-in is particularly easy to use, as you never have to leave Lightroom. The plug-in is invoked from the Export dialog—select X-Rite Presets from the Export to drop-down menu (Figure 2.49). The dialog changes to orient to specifically saving DNG Profiles (Figure 2.50)—the resulting file is automatically saved to the correct location.

Both calibration systems work very well to provide customized camera profiles for your specific camera. The X-Rite software seems to generate slightly more saturated colors and is a bit easier to use, and it comes with the very handy target. I personally prefer the less saturated results I get with Adobe's DNG Profile Editor and the Adobe software offers the ability to manually tweak the color of the profile (note: this is not for the unsophisticated user—you can get into trouble by twisting a lookup table the wrong way). Either one of these tools will make it easy to get the best possible color from your captures.

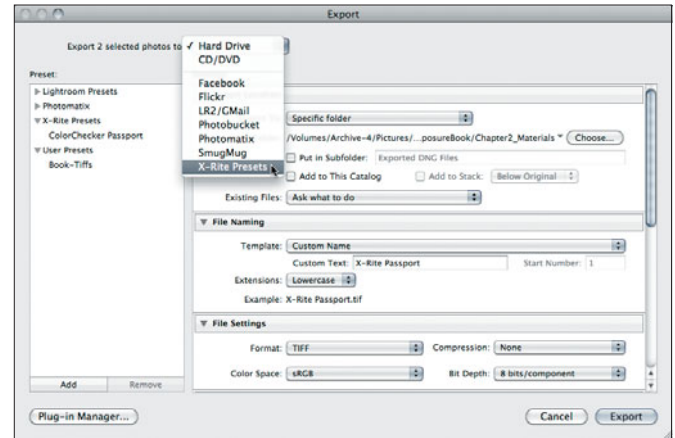


Figure 2.49

The X-Rite ColorChecker plug-in is accessed through the Export dialog in Lightroom.

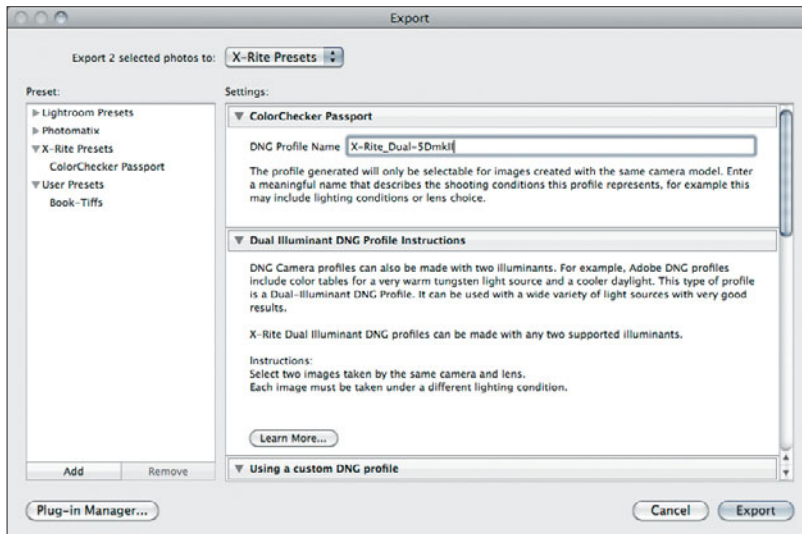


Figure 2.50

Select the X-Rite presets and the dialog changes to accommodate the creation and saving of camera profiles.

Utilizing the Camera Profiles

As I mentioned earlier, these “profiles” are not industry standard ICC profiles but special Adobe formatted color lookup tables that can be used in ACR or Lightroom. Both color calibration applications save the camera profiles in the appropriate place on the computer. To use the profiles in Lightroom, select an image you wish to apply the profile to, go to the Develop module, and, in the Camera Calibration pane, select the profile you saved earlier in the Profiles pop up menu (Figure 2.51). You can save this camera profile along with any develop setting preferences as a new Camera Default. After applying the camera profile, go to the Basic pane, set your white balance to As Shot using the WB pop up, and select Set Default Settings from the Develop menu (Figure 2.52).

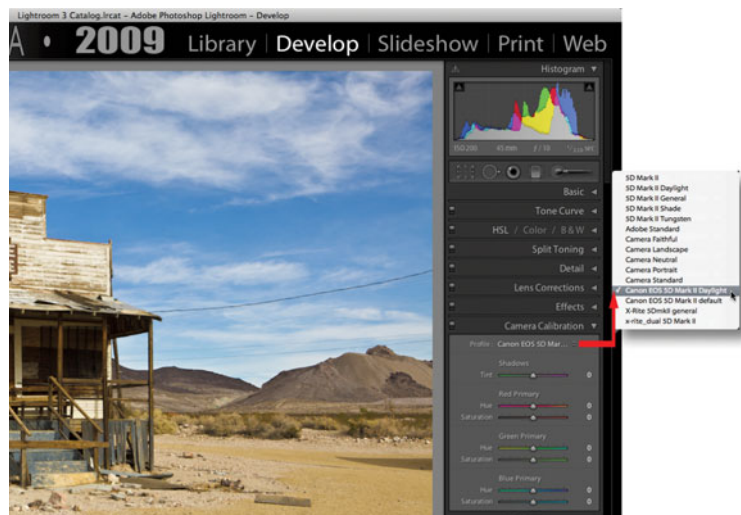


Figure 2.51

Apply a camera profile in Lightroom.



Figure 2.52

Set a default setting in Lightroom.

You'll receive a warning and a confirmation of camera model and serial number. Click the Update to Current Settings button and now every time you import a RAW file from this camera, it will appear with these settings and camera profile. Similarly in ACR, to apply the profile, open the images you wish to apply the profile to into ACR, select them, click on the Camera Calibration tab, and select the profile you saved earlier from the Camera Profile pop up (Figure 2.53). To save a new Camera Raw Default, after applying the profile, go to the Basic pane, set the White Balance to As Shot, and set any additional adjustments you prefer—then select Save New Camera Raw Default from the settings drop-down (Figure 2.54).

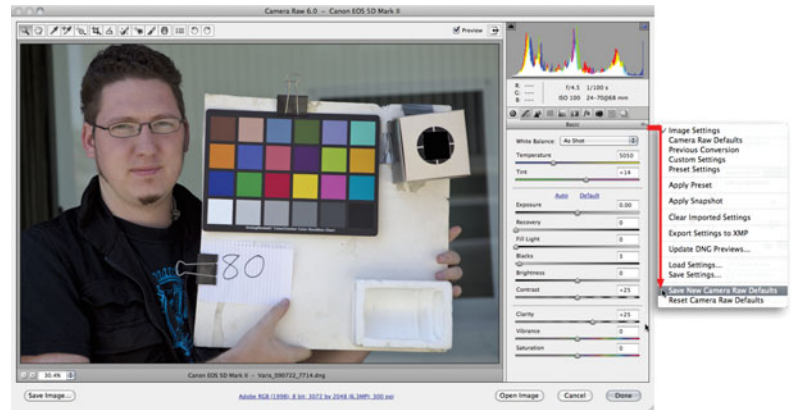


Figure 2.54

Save a new Camera RAW default in ACR.

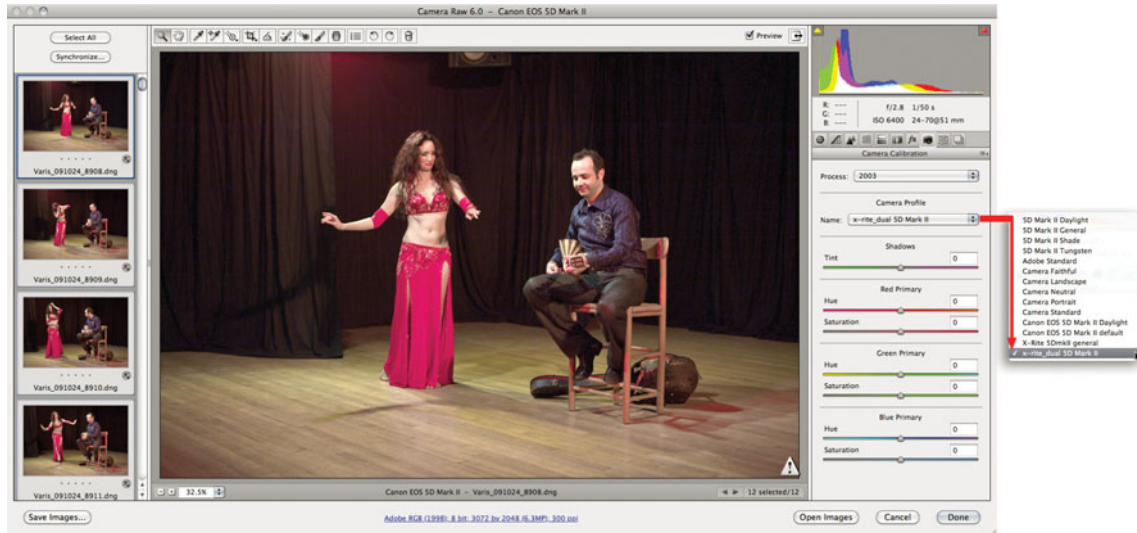


Figure 2.53

Apply a camera profile in ACR.

Testing Procedure Overview

- Shoot an X-Rite 24 patch ColorChecker target in shade, direct sun, and tungsten lighting.
- Measure a mid-gray reference of 18% and open 1/3 to determine base exposure.
- Bracket around the expected normal exposure—5 stops under and 4 stops over.
- Increment exposures by 1/3 stop using shutter speed if possible.
- Change the E.I. reference on a card in the shot to reflect the change for exposure (100, 80, 64, 50 for +1/3 exp.).
- Import files into Lightroom or ACR with zero slider settings.
- Evaluate the exposure sequence for the ideal exposure and determine under- and overexposure limits.
- Use this information to enter an exposure compensation factor in the camera or as an E.I. setting in a hand-held light meter.
- Open the ideal exposures from the shade and tungsten lighting shots into the color calibration software (X-Rite or Adobe), build a camera profile, and save it.
- Set this calibration profile as a camera default in either Lightroom or ACR.



Review

The Digital Zone System helps the photographer pre-visualize values within an image. In order to do this effectively, you have to test your capture system—camera, lens, lighting, and software—to determine the dynamic range of the camera. Take the time to thoroughly test your equipment and you will learn much more than just the dynamic range of your camera. You can begin to develop a sense of intimacy with your camera and lens and predict the outcome of any given exposure so that you can better control the image-making process.

The testing procedure consists of shooting the test target in a controlled manner, capturing a wide range of underexposure, normal, and overexposure to see exactly what the limits of the camera's capturing capabilities are. Ideal exposure is determined with numeric precision so that the maximum amount of useable data is available for post capture manipulation in software. Under- and overexposure limits are similarly determined so that you know how far you can go with a particular important tone in an image. The goal is to be able to give the maximum useable exposure and thus ensure that you have the cleanest, most noise free information in the captured image.

Once you have a good exposure of the test target, color calibration is accomplished using software in an automated fashion. Remember that color is not nearly as critical as value or tone! Ideal color is fairly subjective and the photographer will be compelled to interpret and adjust for creative effect after the image is captured. However, it makes sense to start from a neutral unbiased point and so the color calibration step should be included—just don't lose sleep worrying about how accurate your color is.

Taking the time to fully test and calibrate your equipment will lead to a much more satisfying photography experience. The new digital tools available make this process much less painful than it was in the past. Only by testing and calibrating your image capture system will you be able to take the reins and confidently steer your photographic vision and master the art and science of photography.



f10.0 @ 1/200, ISO 100

3

Studies in Light

Cameras today are really like mini-computers. All electronic, they process information from the lens in a multitude of ways to control all aspects of capturing images from autofocus to auto-exposure. More and more of the photographic decision-making process is being relegated to the machine, leaving only the subject matter and framing to the photographer. But the machine cannot “know” what picture is being made any more than it can “know” the name of the photographer making the picture. Auto-exposure methods rely on comparing the brightness values distributed across the frame to a large database of images to select an exposure that matches with an average of correct exposures that match the pattern of brightness values in the current frame—exposure by statistics! This actually works reasonably well considering that there is still no way the camera “computer” can know what the subject of the picture actually is. The result of these calculations is a mediocre rendering that can most often be rescued with a little post-processing finesse.

The artist desiring better than mediocre results has to learn better post-processing techniques and/or better exposure techniques. The next chapter will deal with post-processing techniques, but the very best strategy for better images is to learn how to arrive at a better exposure in the first place. Not every picture has a full range of tonal values that distribute themselves across the frame in an even, middle-gray tone like the opening image for this chapter! Most of the time there is some lighter or darker tone that takes precedence, and this has to be considered in the exposure decision. The discussion that follows examines several example images and the exposure determinations that produced the resulting renderings. In all cases, metering was done manually, either with a hand-held meter or using the camera meter in manual mode.

Greek Island Churches

Here we have two examples of white buildings, an extreme situation for sunlit architectural landscapes. Figure 3.1 shows a small church in Paros, an island in the Cyclades group. The structure is very white and almost blindingly bright in the full sun. The camera, not knowing that we are looking at a typical Greek white church will tend to underexpose the scene. Ideally, the front face of the church should be at a zone IX brightness or $L=90$ to 95 . A spot meter would be handy—take a reading and open up 2 stops! In this case, I didn't have a spot meter with me—I was in tourist mode and traveling with a smaller DSLR so I had to rely on the camera's meter. Since the church occupied the majority of the frame and it was centrally placed, I figured that I could safely open up 2 stops even though there were other darker tones that could bring the metering average down. The texture of the building was also very smooth so I wasn't too concerned that a very high exposure might place the front in range of clipping—I would be able to utilize the recovery slider to get some tone back into that front surface if necessary. As it turned out, the exposure was almost perfect (basically followed the sunny 16 rule) and very little needed to be done in post to get the rendering here. The big challenge in this situation is getting the exposure high enough so that the red door has a chance of rendering bright red instead of a dark muddy brown—if the scene was exposed at the meter reading or full auto the walls would have been down at zone V or VI ($L=50$ or 60) and that would have placed the red door very low, maybe zone I or II ($L=10$ or $L=20$). Color is subdued at such lower tonal values, and brightening up the values in post processing wouldn't bring out as much color as necessary without additional saturation moves and that would introduce a lot of noise into that red door!



Figure 3.1

Paros Island, Greece—A very bright subject can skew the exposure too dark.

f11 @ 1/200, ISO 100

The second church is on the island of Naxos (Figure 3.2). Here the lighting is more dramatic! The angle of the sun is much lower and is striking the central wall to the right of the stairway almost straight on. There are white surfaces everywhere, bouncing the light around so there is a fair amount of fill light reducing the contrast somewhat and lending a luminous quality to the scene. The gentleman at the foot of the stairs stood there for quite a while, thinking about something—long enough for me to take a reading off that bright wall. Opening up 2 stops put the value just high enough at zone IX or $L=90$, white with a hint of texture. Underexposing here would have resulted in much deeper shadow values and higher contrast after post processing elevated the highlights to the proper level. This would have killed the luminous quality and generated a more somber looking scene.



Figure 3.2

Naxos Island, Greece—Watch out for bright direct reflections off of white surfaces. f11 @ 1/180, ISO 100

Monolake

This shot, taken just before the sun dropped below the mountain ridge, has the “tufa” structures fully sunlit against a dark cloudy sky (Figure 3.3). These tufa are the result of salt deposits that were revealed when the water level in Monolake dropped. They are a dirty brown color a bit brighter than the sand at the shore of the lake but not white. The late afternoon sunlight striking them is lending a warm color and contrasting nicely with the dark clouds. The scene averages out pretty much to a middle value, but I still didn’t want to place the value of the tufa too low—aiming here for a zone VIII placement that could be brought down later in post. Spot metering the tufa, I then opened the exposure $1\frac{2}{3}$ stops. Later in post, I increased the contrast by lowering the values of the shadows and got a nice rich rendering with the darker, cooler background setting off the warm sunlit tufa.



Figure 3.3

Monolake, California—Try to place highlight values high on the scale and bring down later in post to the correct value. f11 @ 1/100, ISO 100

Foliage

Landscapes with green foliage can present a challenge to getting a bright enough exposure. Green foliage tends to underexposure when you accept a medium tone interpretation. For whatever reason, we like green plants to have a more saturated, brighter color in photographs and, even though trees and plants seem to be medium in value, a zone V placement is often too dark. The challenge is that it is sometimes hard to expose light enough without damaging other elements in the scene!

This shot seems to offer an easy choice as the dominant subject is the foliage and the sky is dark and cloudy (Figure 3.4). The reality of the actual scene is that behind the clouds the sky is quite bright. The bright patches in the clouds are very bright—reading off the chart! These bright patches skew the exposure too dark if you simply take the meter reading as is. Metering for the leaves, the grass in the foreground should be brighter than medium gray—aiming for zone VI would give a chance to get the clouds dark enough with some post processing but still leave the greenery light enough to get some color into it. Always be on the lookout for too dark an exposure when shooting against an overcast or cloudy sky. I routinely open 1 stop for these types of subjects against what might seem like a medium gray sky—that sky is a lot brighter than it seems. An in-camera meter will almost always skew too dark. The B+W masters of the past would shoot through a green filter to darken non-green elements and expose for the green values. Similar effects can be achieved in post but we don't have the luxury of using colored filters for color photography and, in many cases, the sky may require some kind of mask to adjust the value appropriately. You must be careful not to open up too much or the bright sky will clip to white with no hope of retrieving any detail at all. This image required a little bit of work in post to darken the sky and lighten the green to arrive at this rendering.



Figure 3.4

Finland, pastoral scene—Beware of seemingly dark cloudy skies. They are often brighter than you think.

f5.6 @ 1/400, ISO 200

The wildflower scene of the next example is an even more extreme version of the same challenge (Figure 3.5). Here the sky is extremely bright because we are shooting almost directly into the sun, which is right behind some clouds. The California poppies are nicely backlit, but the camera will skew the exposure too dark to compensate for the bright sky. In this case, I did not have a hand-held meter available so I tilted the camera down, hiding the sky completely, and took the average reading of the field of flowers. Then I opened up 1 stop and prayed that I would still have enough to recover in the sky later in post processing. The LCD in the back of the camera showed the sky as completely white! Later, the recovery slider just barely revealed some cloud structure and I did a fair amount of manipulating in Photoshop to get something into the sky. The flowers on the other hand were very brightly colored and detailed and it was easy to get the kind of bright happy colors and articulated tones that make this picture!



Figure 3.5

Lancaster, California—Tilt down to meter off the foreground for bright backlit skies.

f11 @ 1/125, ISO 100

While we are on the subject of skies, this example is a classic challenge (Figure 3.6). Backlit clouds are very bright, but it is often hard to decide how much to open the exposure! If you go too far, the rim light on the edges of the clouds will clip out to white with no chance of recovery. If you don't open enough, the landscape will render too dark and you'll end up with a black silhouette landform. The camera will skew the exposure dark and most shots like this that I see have a very dark almost black landscape at the bottom of the frame. You will have to open up at least a stop from a camera average reading. Even using a spot meter is tricky. The middle of the clouds can be anywhere from zone V to VII, with the highlights at the edges coming in close to zone X (L=100 or clipped to white)! In this case, I shot several different exposures to ensure I had a good one to choose from—don't be afraid to “bracket” if you have the time. In fact, knowing that you should bracket can mean the difference between a great shot and a mediocre one.



Figure 3.6

Mohave desert, California—Backlit skies can tend towards underexposure—bracket if you're unsure.

f7.1 @ 1/500, ISO 100

Artificial Light

Natural light outdoors presents certain challenges, but lack of light is usually not one of them. Most artificial lighting situations, however, present a low value challenge and the photographer often has to try to elevate the exposure enough to prevent serious noise issues in the shadows. The first example here is typical (Figure 3.7). This shot of a musician practicing at a music camp is taken under very dim light. The setting is a community cabin, a fairly open space lit by bare light bulbs. He is sitting directly under one of the bulbs and the illumination falls off dramatically behind and around him. The light on his forehead is much brighter as it is closest to the light source and his skin is a higher value than his clothing, which is all fairly dark. It would be a mistake to base the exposure off his forehead—this would result in underexposure for just about everything else in the image. I aimed for a zone V exposure of his dark olive shirt—this put his forehead at a just clipped zone X at +3 stops over the base exposure! The recovery slider could recover enough tone to put some color back into that area, and it is much more important to protect the low value areas from getting too noisy. This was shot at an ISO of 3200 and there is very good detail in every important area, with very low noise visible in the shadow areas.



Figure 3.7

Wael Kakish, Mendocino, California—Do not be fooled by very bright highlights when shooting in dim lighting conditions.
f2.8 @ 1/60, ISO 3200

The next two examples were taken under stage lighting and demonstrate two opposite extremes. The first shot (Figure 3.8) is lit with a normal level of light, and the subjects are evenly lit from multiple light sources directly above and in front of them. It is shot at a high ISO to allow for hand-holding of the camera and some motion-stopping ability. A camera average reading produced a reasonable balance overall between the lit subject and dark background. There is nothing “white” in the scene and slight overexposure of the skin is still within an acceptable range, so no real problem. The only issue was the dark clothing of the musician, and some effort was made in post to get some color back into his shirt. The fill light slider helped put a little more detail into the dancer’s hair, but I didn’t need to use extreme settings so noise was kept to a minimum.



Figure 3.8

Aubre Hill & Karim Nagi—Normal stage lighting should pose no problems.

f2.8 @ 1/60, ISO 6400

The other example is another issue. Figure 3.9 is a composite of multiple shots of a single dancer lit with a single spotlight source with a very strong blue gel—very dim and very contrasty! It is impossible to meter this accurately—very hard to predict how the camera sensor will respond to the strong color, plus it puts all the detail into the blue channel, which is typically the weakest in any color image. I had no other choice here but to base the exposure off the LCD preview. A loupe designed to magnify the LCD is very handy in these situations. The scene was exposed so that the skin went white and appeared clipped on the screen. The challenge was to elevate the exposure enough that the dark clothing would have a chance of rendering with enough detail and lowest possible noise. Maximum recovery slider still left most of the skin white but was able to soften the effect just enough—6400 ISO was still very usable with fairly low noise in the shadows on the clothing. The background was allowed to drop to zero black, though the RAW file had some tone left in the dark curtains behind the dancer.



Figure 3.9

Aubre Hill—Strong colored lighting is impossible to meter accurately, sometimes you have to rely on the LCD preview—aim to overexpose slightly!
f2.8 @ 1/30, ISO 6400

Interior spaces that have a lot of colored light sources can be tricky. Figure 3.10 is a Photomerge composite from three shots—the scene is a chaotic collection of multi-colored light sources. Since most of the visible light is indirect, the exposure was easily metered in camera—opening up to capture more shadow detail would drain the color out of the light sources hurting the overall colorful effect. Fill Light plus Recovery in Lightroom was used to create an HDR-esque “grunge” effect.



Figure 3.10
The Forum Shops, Las Vegas, Nevada—
A vertical Photomerge panorama capture.
f2.8 @ 1/160, ISO 1250

Night Photography

Nighttime, low-light photography can pose some problems when the scene includes light sources. Bright points of light can sometimes skew the exposure too dark and sometimes, if they are small enough, auto-exposure algorithms will do a good job of compensating. If the scene has good general illumination, as is the case with Figure 3.11, you can often use the camera meter reading or full auto. However, you can usually open up 1 stop safely if there is no need to preserve color in small light sources—this particular image could have benefited with a slight overexposure to open shadow values. As it was, I went with the average reading and had to open shadows with some Fill Light in post. Fortunately, I didn't have to go too far with it so I didn't pick up too much noise.



Figure 3.11
Construction site, Las Vegas,
Nevada—You can often open up
for night scenes that include light
sources. f2.8 @ 1/40, ISO 1600

This classic nighttime scene showcases the typical exposure problem (Figure 3.12). A normal camera reading exposure would have only captured the bright lights, leaving everything else almost black. In order to pick up some of the environment, I had to open up—here I only opened 1 stop because I was afraid of losing the colors of the yellow and red lights. This was captured with an older camera and it exhibits quite a bit of noise in the shadows that only got worse when I used Fill Light to brighten the green leaves.



Figure 3.12

Christmas in Los Angeles—Open up exposures of night scenes that contain prominent light sources so that the environment has a chance of being seen. f 2.8 @1/8, ISO 400

One of the most difficult scenes to capture is that of a campfire (Figure 3.13). This curious gathering was shot on a moonlit night with a bright fire illuminating a group of medieval reenactors. Exposure was opened almost 2 stops in an attempt to capture something in the surrounding environment. A little Fill Light was used in the RAW processing to open up the distant background and help provide some context for the campfire scene. High ISO plus long exposure results in a fair amount of noise that hopefully doesn't detract from the overall effect of the image.



Figure 3.13

Nighttime in the current middle ages—One of the toughest situations to capture successfully is the nighttime campfire.

f2.8 @ 3 sec., ISO 3200

Wedding Couple

Before we move on to controlled lighting situations, let's look at a classic exposure problem with available light—the wedding couple! (Figure 3.14.) She wears white and he wears black—a recipe for extreme dynamic range. Here photographer Ken Chernus has avoided a major challenge by placing the subject in the shade. The soft light helps to keep the contrast down—a necessity with the black to white contrast of the subject. A tiny amount of flash on camera fills some shadows and puts nice “catch lights” in the eyes. The overall exposure is keyed off the white dress because that is the most critical value in the scene. If exposure is too high there will be no chance of recovering detail in the dress, and it is all about the dress! Ken took an incident reading for an average value and then did a couple of quick test exposures to determine how high he could get the dress value—accepting a few clipped highlights in the camera display gave a RAW file that had plenty of detail in the fine lace on the bodice! In situations that require quick work it is helpful to get a feel for how much overexposure your camera can take based on the LCD display. The only way to be certain is to shoot the calibration tests and compare the actual results with the display on the back of the camera—for the wedding photographer, it's especially helpful to shoot some tests with actual wedding subjects even if that means renting the clothing and getting some friends to pose for you. If you can place the white dress effectively, you can often elevate the values in the black coat later in post processing to get a more balanced shot.



Figure 3.14

The Wedding Couple—The challenge is to get the exposure high enough that you don't end up with a black hole in the coat, but not so high that you get a "blasted to white" dress. Photo by Ken Chernus. $f5.6 @ 1/250, ISO 400$

Studio Lighting

Controlled lighting in the studio should pose no problems for the photographer because he should be able to view test images on a computer before shooting the majority of his shots. However, real-world scenarios often present the photographer with time-critical, stressful situations where subjects need to be captured quickly and changes need to be made “on-the-fly.” Under these conditions, it is sometimes impractical to preview every setup, and the photographer needs to be prepared to work quickly and confidently with his capture system. Such confidence can only be acquired by doing the calibration tests using the same lighting equipment and setups used in the studio.

Use of a hand-held meter capable of reading short flash durations is an essential practice in studio photography, even if it is only to establish a starting place for the exposure decisions. Once you have established a calibration for your camera, lighting, and meter, you can use good metering technique to make reliable exposure decisions. Incident meter readings are often the fastest way to decide on an average exposure for the lighting you establish in the studio. The basic strategy is to match the light on the dome of the incident meter with the direction and coverage of the light falling on the subject. You walk over to the subject’s position, point the dome of the meter in the general direction of the camera, and arrange to have the shadow falling across the dome more or less mimic the shadows on the subject. The idea here is to arrive at an average between the highlight and shadow in the light falling on the subject splitting the difference in a way that favors the dominant light or the light that occupies the majority of the subject.

Figure 3.15 shows the lovely Erin Manning, shot with standard frontal beauty light—the main light is centered over her covering the major planes of the face, with the shadow falling under her chin. The inset shows how the incident meter was positioned in the light to take the reading—the light is essentially falling the same way across the dome as it does across her face covering 2/3 to 3/4 of the dome’s area. The incident exposure reading will provide a normal value placement regardless of the tonal value of the subject because the meter is reading the brightness of the light rather than the light “reflected” off the subject. In practice, this works well for most subjects that you want to render in a normal fashion. Very light subjects or very dark subjects may require some adjustment depending on the effect you’re looking for.



Figure 3.15

Match the light falling on the dome of the incident meter to mimic the lighting on the subject. f14 @ 1/60, ISO 100, studio flash

Figure 3.16 through Figure 3.18 show different lighting setups with their matching meter light. When you consider how much of the dome to cover with light, you also need to consider the perspective of the camera—in Figure 3.18, half of Erin’s face is lit but the camera only sees 1/4 because she is turned away—the “dome light” thus shows only the 1/4 coverage that the camera sees.

You will notice that when there is more light covering the face, the exposure rendering delivers a darker shadow. When the balance is reversed, the shadow is brighter and the highlight side gets brighter as well. This is a normal consequence of the averaging between the two values. When the ratio of highlight to shadow lighting is within 4 stops, this “averaging” approach is very workable.



Figure 3.16

Rembrandt lighting has 3/4 light coverage on the dome.
f14 @ 1/60, ISO 100, studio flash



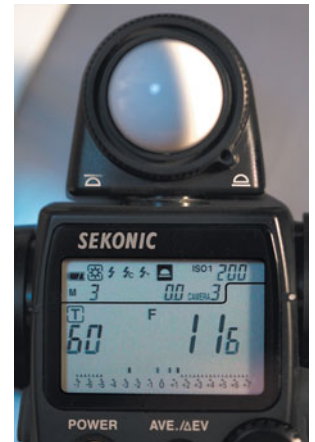
Figure 3.17

The brightest light here only covers 1/4 of the face—the “key” light is now actually the soft fill covering the other 3/4 of the face.
f14 @ 1/60, ISO 100, studio flash



Figure 3.18

Erin’s face is turned away so that the camera only “sees” 1/4 of the brightly lit side. f14 @ 1/60, ISO 100, studio flash



When the ratio exceeds 4 stops, you generally have to favor one side or the other in your reading or you run the risk of having both sides out of range—the highlight will be too light and the shadow will be too dark. In some cases, you may prefer to favor one side or the other in your average calculation, even with close lighting ratios.

It becomes important to be able to quickly establish lighting ratios and adjust the intensity of lights accordingly. To do this, it is useful to be able to take a reading of a light source in isolation. Most of the newer incident meters have a retractable dome for this application (Figure 3.19). Retracting the dome shields it somewhat from off-axis light, allowing you to point at the light source you want to read without picking up a secondary light source. In many instances, you will also have to shade the meter with your hand to prevent a secondary source from “polluting” a reading. Take separate readings of the highlight and shadow sources and calculate the difference to see what your ratio is.



Figure 3.19

Retracting the dome is used for taking separate readings of different light sources to establish lighting ratios.

Figure 3.20 is a dramatic portrait that demonstrates the effective use of lighting ratios to establish a mood. The “key” light is coming from camera right, and though it only occupies about 1/3 of the visible face, it is the light that the exposure is based on. A full 2/3 of the face is in shade with a sliver of “rim” light coming from camera left rear just grazing his neck and cheek to provide a little relief on the dark side of his face. Readings were taken with a retracted dome incident meter and lights adjusted to achieve a 4-stop ratio between the highlight and the shadow side of his face—the shadow reading was 4 stops less than the highlight. The “rim” light appears brighter but is actually set to the same intensity as the “key” light—the apparent brightness is the result of local visual contrast and the angle of incidence, whereby the direct bounce from the light source off the surface of the skin is directed into the lens. Careful attention to lighting ratios ensured that the RAW file had lots of detail everywhere and only minor adjustments to contrast were needed to achieve the result shown here.

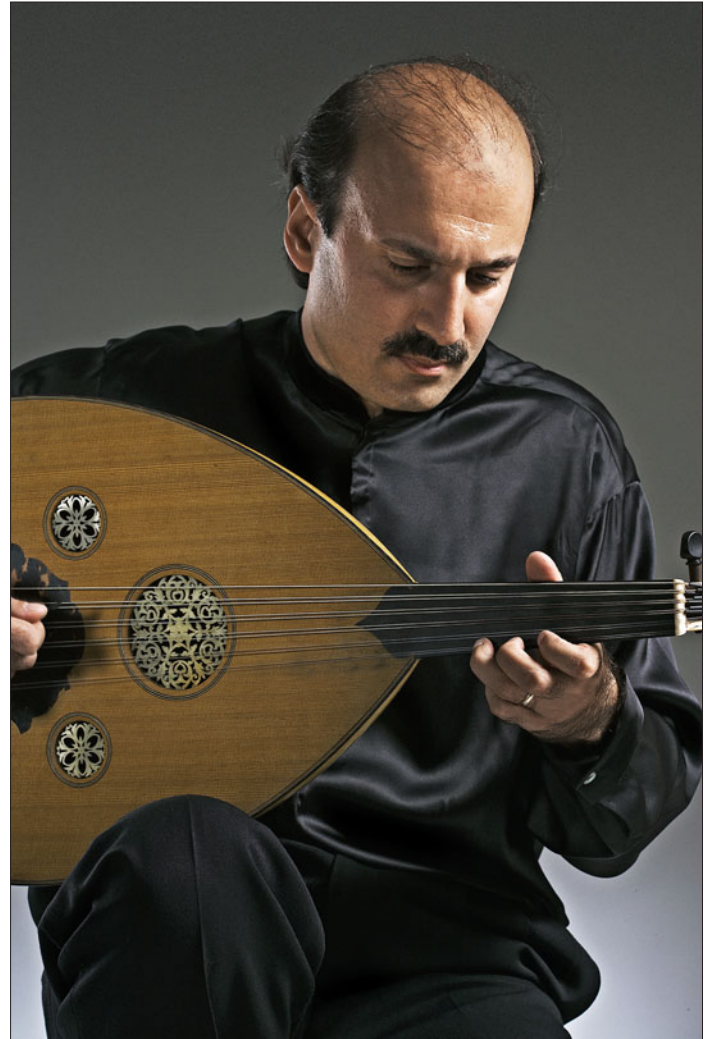


Figure 3.20

Munir Beken plays the oud—Careful readings ensure that lighting ratios fall within a 4-stop ratio. f13 @ 1/60, ISO 100, studio flash

Still Life

The same exposure principles apply to still life subjects. Figure 3.21 represents the same exposure challenge as our wedding couple—a wide value spread between light and dark subjects. In this case, the dark chocolates are placed on a white dish. The challenge is to expose the dish high enough so that the chocolates have a chance of rendering with some color and detail but not so high that you lose subtle tones and shape in the dish. A spot meter reading was taken of the average white value in the dish and exposure was opened 2 stops to “place” the value at zone IX (L=90). The resulting RAW file had the highlight of the chocolate at zone IV, with the darker wrapper coming in at zone III—final post processing pushed the highlight to the clipping limit but still retained some subtle variation in the white plate. If the highlight had been exposed higher there wouldn’t be any variation and the dish would have appeared flat and featureless. Post-process contrast pushed the shadow side of the brown package close to the clipping limit at an RGB level of around 25, just shy of printing black to preserve a hint of brown color in the shadow—the final highlight on the chocolate ended up at L=45.



Figure 3.21

Valerie Chocolates—Placing the white dish at a high zone IX (+2 stops) exposure gave plenty of room for shape in the highlight and color in the dark chocolates.
f2.8 @ 1/30, ISO 50, studio flash

The white flowers in Figure 3.22 were lit with a combination of softbox and hard directional flash head with a gridspot attachment. The subtle highlights are what make this shot. Here the solution is to expose less than the maximum unclipped level to allow for more separation between the lightest highlights from the gridspot and the softer white tones of the top softbox light. Here a reading of the soft white petals was opened up only 1 stop, placing them somewhere between zone V and VI. A post-process contrast move stretched the difference between the soft white and hard highlights so that more shape was visible in the flowers. The lighting ratio was only 1 stop different, but after post-process contrast enhancement the soft white petal came in at zone VII (L=70) and the hard highlight reached to an almost clipped zone X (L=98).



Figure 3.22

White Flowers—Subtle highlights were enhanced by slight underexposure—later the values were elevated with a contrast enhancing post-processing adjustment.

f11 @ 1/60, ISO 100, studio flash

Sometimes you have to sacrifice some highlight in favor of more important tones. Figure 3.23 is a moody shot done for a medical thriller movie poster. This low-key image emphasizes the shadows and is a fairly high-contrast image with sharply directional, high-contrast lighting. There is one light from above with a mirror placed below, duplicating the light source at slightly less intensity to cast the shadow from the scalpel across the fingers of the gloved hand. The exposure is “keyed” off the shadow side of the hand. The actual RAW capture had a clipped highlight on the scalpel, which was turned so that it caught a direct reflection of the light source. There really was no other way to get the light on the scalpel shaft to work as well as the flat blade. So, how does the blade carry the tone it has here? Retouching! A slight gray tone was painted in to give some distinction to the glint at the edge (a little point was also introduced to the tip to make it look scarier).

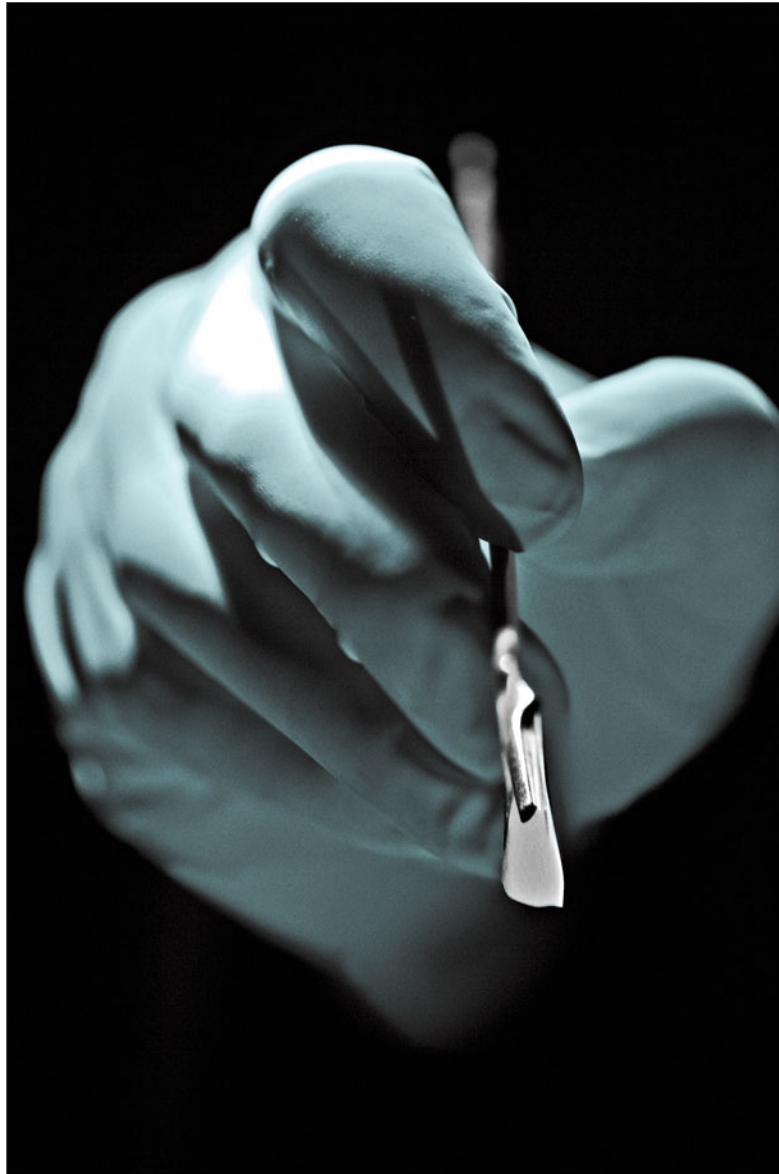


Figure 3.23

Under the Knife—The highlight on the blade was sacrificed and later replaced with retouching—the original had a completely “blasted-to-white” blade.

f2.8 @ 1/60, ISO 50, studio flash

These last two examples illustrate the fact that sometimes exposure decisions have to consider post-processing adjustments for the ultimate impact on the final image. The idea becomes how you expose for important values to make it easier to get the kind of tonal differentiation you want after some post-processing adjustment. Most of the time you simply expose to get good data everywhere in the image and later shape the tones using adjustments in Photoshop/ACR/ Lightroom, etc.

You don't necessarily know what you are going to do to enhance the image later and, in fact, you may not do much at all. Other times you can make a conscious choice to expose in a certain way so that post-processing enhancements can be carried out easier. Of course, that means you need to know what kinds of post-processing enhancements are available and how they can be applied to any given image.



Review

I've tried to include a wide range of real-world photographic scenarios to demonstrate exposure strategies. It is impossible to cover every conceivable situation, but, hopefully, the images presented here can give you a feel for the types of decisions you have to make when confronted with various lighting situations. The basic exposure strategy is always to expose as high as possible without "clipping" important highlights to white. If at all possible you want to keep low values higher than zone I—much better to be at zone II or III. If you are going to have values lower than zone I, you should plan on having those tones render as deep black because elevating those values in post processing will introduce a fair amount of noise into the image.

If the most important tones in the image are very high, near white, then you should consider exposing so that they fall a bit lower in the zone VI to VII range. You can elevate the lightest value in post processing to "stretch" the distance between the near white and white values and thus enhance the tonal "shape" in the image. Do not be tempted to underexpose low-key scenes because you want a dramatic look! You must always remember that it is very easy to make images darker while preserving the highest quality. It is much harder to brighten up an overly dark image without introducing extra noise and muddy colors. Your mantra should be "expose for good data not good look!" The "good look" you are after can be achieved later in the post-process image enhancement phase.



Sepulveda Dam, f16 @ 1/60, ISO 100

4

Post Processing

Film-based photography relied on chemical processing to determine the global contrast of the negative or positive image—most of the detailed tonal control in image making occurred in the print making process. This “post processing” was where the real magic happened and to this day, the term has implied the sort of creative “heavy lifting” that occurs after the image has been captured. Here we are using “post processing” to mean anything that happens after the digital camera has processed the image into a file.

The traditional Zone System utilized initial “Zone” placement during the exposure, followed by controlled chemical development to “push” mid-tone “Zones” up or drag them down—referred to as N+1, N+2 or N-1, and so on. Then, when printing, the photographer would use different contrast paper to further manipulate contrast in a global way and apply dodging and

burning for detailed local control. Stunning images were created in this way and today we marvel at beautiful work done with such primitive tools. It is perhaps important to remember that much of the current photographic aesthetic grew out of the limitations of technique in film-based imagery and today we often reject images that deviate from the limited detail structure of traditional prints as “too digital.”

Today image-makers have such incredible control over every tone and color in an image that it is more often a question of how much to do rather than what is possible. Full responsibility for the image rests with the image creator and this is sometimes a scary place to be. The software tools available for image enhancement make it possible to do anything you want with the image so you are forced to decide what it is you want to do.

I will outline a strategy for image adjustment that approaches the construction of the image in a systematic way and attempts to maximize contrast to provide shape and a sense of dimension to what is ordinarily considered a 2D image. The techniques explored will go well beyond the normal photographic controls for brightness and contrast and allow you to completely reshape the tonal structure of an image to suit your purpose. It is still useful, however, to think of the tonal structure of the image using the 11-zone system we outlined in Chapter 2.

I should also mention at this point that the techniques I'm showing here are based on the pioneering work of Dan Margulis—especially his “Picture Postcard Workflow.” I've attempted to simplify some of his techniques and others are variations that I've developed based on their application to the Digital Zone System and RAW file workflow. The serious student would do well to read Dan's works to enhance his understanding of advanced image construction techniques.

First Steps: RAW Processing Controls

As I've stated earlier, I believe that most of the creative work, post capture, should happen in Photoshop, and the RAW processor is best used to set up the overall color balance and deliver as much detail as possible everywhere in the image. In general, most RAW process software does not provide enough serious numeric feedback to allow for complete color and contrast control—the ones that do suffer from clumsy interfaces that make it difficult to perform adequate corrections. ACR and Lightroom offer the most elegant user interface but still suffer somewhat in the numeric precision department. Figure 4.1 shows the Develop module of Lightroom. We have seen how to use the percentage numbers just under the histogram display to determine neutrals and Zone values, but the linear ProPhoto RGB number percentages are not as helpful for evaluating printable colors. Photoshop allows you to change the number readout in the info panel to a number of useful colorspaces including CMYK and Lab—there is no such option in Lightroom. There is also no way, as yet, to place fixed color samplers so that you can read number changes in several places at once.



Figure 4.1

Lightroom uses a linear ProPhoto colorspace to display RGB number “percentages” that are less than ideal for evaluating printable colors.

ACR, on the other hand, does offer fixed color samplers—up to nine of them! (Figure 4.2.) ACR also displays real-world RGB numbers determined by the work-space chosen in the output settings. However, there is still no option to display either CMYK or Lab, which would make precise color adjustments easier.

To a certain extent this lack of numeric display is offset by an easy to use interface that offers a lot of visual control in relatively intuitive slider adjustments. The casual user can make intelligent adjustments easily and get decent image enhancements in both Lightroom and ACR without ever being aware of any shortcomings. Certainly, for photographers dealing with a high volume of images or a quick turnaround, the ease of use in Lightroom or ACR trumps any advantage in precision that Photoshop may have. So we should at least become familiar with the basic adjustments in Lightroom/ACR before moving on to the more advanced techniques in Photoshop.

Note

It is beyond the scope of this book to offer a complete tutorial on Lightroom, ACR, or Photoshop. Instead, I will provide a general overview and describe some more advanced techniques to outline a creative strategy for using these applications in the context of enhancing captured images.

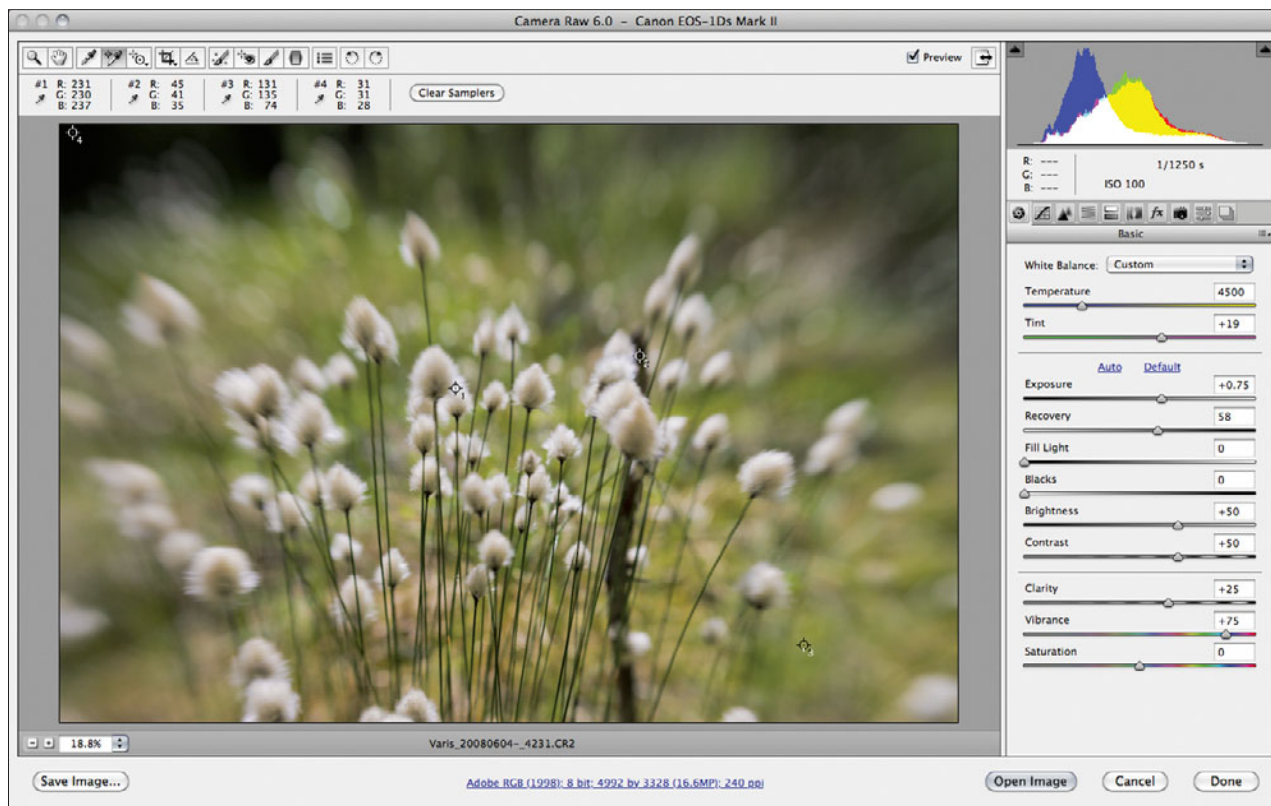


Figure 4.2

Adobe Camera Raw has the ability to place up to nine fixed color samplers to read normal RGB numbers in the image.

Basic Adjustments

The user interfaces for both ACR and Lightroom are fairly consistent and, with the absence of the color samplers in ACR, have only minor cosmetic differences. In general, the sequence of steps follows a natural reading of the interface with a left-to-right and/or top-to-bottom orientation. The “Basic” controls are identical in both with the idea to progress from the top down: First, adjust the White Balance by selecting a preset, clicking on something neutral with the White Balance Tool (eyedropper), or adjusting the Temperature and Tint sliders. Next, one adjusts the exposure slider to establish the appropriate white point brightness, hopefully without clipping too much detail in the highlights. Then, continuing downward, Recovery and Fill Light sliders can be used to compensate somewhat for dynamic range issues. The Black slider places the darkest tone to finalize the dark to light value range and the Brightness, Contrast, Clarity, Vibrance, and Saturation sliders are used to “tweak” the creative effect of the image. Most people can figure out how these controls work in about ten minutes of experimentation.

In an ideal scenario, the Basic controls would be all you would need to get an image into shape for printing and certainly, if you’ve managed to get an ideal exposure, you can stop at this point if you aren’t manipulating the image into some kind of creative interpretation. Perhaps the majority of photographic images fill some kind of utilitarian purpose that requires some level of realism and only simple adjustments for color and contrast are necessary. Let’s look at one scenario in a controlled studio situation.

Figure 4.3 shows a portrait session loaded into Lightroom. This is a very simple photo shoot typical of most executive portraits—the objective is to capture a flattering realistic headshot that can be used in various corporate communication documents. In this case, this is a photograph of Dr. Munir Beken, a professor of music at UCLA’s ethnomusicology department. The exposure was properly determined so that this first view, right out of the camera, looks good with all slider positions at “zero” and even the auto white balance “As Shot” looks pretty reasonable.



Figure 4.3

The portrait as shot with no adjustments in Lightroom.

You can see from Figure 4.4 that the first couple of exposures were shots of my assistant holding the Lastolite EZYBalance for a gray reference in the same lighting setup. This makes it very easy to establish a relatively accurate color rendering for the shots that follow. Select the test shot and use the White Balance Tool to click on the neutral gray target and quickly establish the correct white balance.



Figure 4.4

Click on the gray reference with the White Balance Tool.

Next, hold down the Shift key and click the last image in the setup, thus selecting all the shots taken under the same lighting. Now click on the Sync button at the lower right and you will call up the Synchronize Settings dialog (Figure 4.5). Click on Synchronize and the white balance established in the first shot will be applied to the remaining shots. This simple procedure can get you 90% there, assuming that you are calibrated and you have the correct exposure!



Figure 4.5

Use the Synchronize button to apply the settings from the white balanced test shot to all remaining shots in the same lighting setup.

The other 10% of the adjustments can be done using the Basic controls—in this case, all I did was increase the contrast slightly with +25 Contrast and +25 Clarity (Figure 4.6). This was adjusted on the first portrait and then “Synchronized” with the remaining shots.



Figure 4.6

The results with minor fine-tuning using Contrast and Clarity sliders.

I could do a bit more with this image in Lightroom, but the improvements really wouldn't be worth it. The last improvement can only happen with some detailed retouching in Photoshop to remove the sheen on his forehead and reduce the "shadow" of his beard (Figure 4.7). However, this step could have been avoided by applying a little makeup at the time of the photo shoot!



Figure 4.7

The final image after retouching in Photoshop.

f13 @ 1/60, Flash exposure ISO 100

The use of a good gray reference is especially beneficial in less controlled environments. Here I've again utilized the Lastolite EZYBalance not only for white balance but as an exposure aid as well. My subject, the lovely and talented screenwriter Karin Howard held up the EZYBalance for each location around her home—all shot with available light with a reflector placed out of frame to fill the shadows (Figure 4.8). I was able to read the exposure value for the 18% gray reference from the camera position using my Sekonic meter.



Figure 4.8

A good gray reference can also be used to determine exposure in changing light situations.

Having the reference in the same light made it easy to arrive at the ideal exposure. Then a quick click with the White Balance Tool neutralized the color and again, only minor adjustments were necessary to arrive at a pleasing rendering (Figure 4.9). Without the aid of the gray reference, it would be difficult to keep the green foliage around her from polluting the color of her hair—blond hair is especially susceptible to picking up a green cast in such situations.



Figure 4.9

A good neutral reference can make all the difference in achieving neutral color with subtle environmental color influences.

Creative Manipulation

My feeling is that “straight” photographic rendering is the ideal application for RAW file processors like Lightroom and ACR but that doesn’t mean that creative manipulation is impossible with RAW processing software, as we can see from the following example. Figure 4.10 shows Sepulveda Dam as shot—all zero sliders, no color adjustment.



Figure 4.10

The Sepulveda Dam as shot—no adjustments in Lightroom.

The brightest thing in the scene was the curved “spillway” of this flood control dam. I exposed it high, aiming for a zone IX placement and it arrived in Lightroom with that area reading right around 90% in the RGB average numbers. The histogram crowds the right edge a bit but there is no hint of clipping and all the values are far enough from the end point that there is a lot of room to adjust for tone, contrast, and detail. When I have a good exposure like this with a full range subject and some textural detail in the high value range, I find it worth experimenting with radical slider positions just to see what will happen (Figure 4.11).

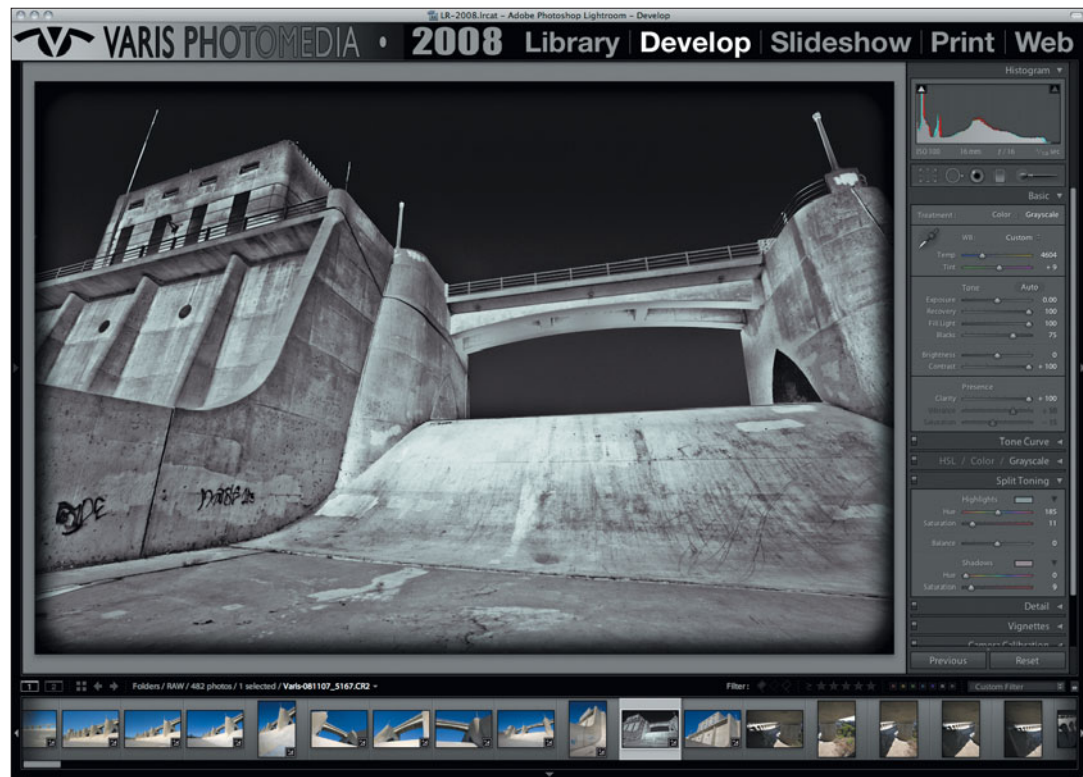


Figure 4.11
Sliders to 100 for the Industrial Grunge look.

Here I've used a "Sliders to 100" strategy—Recovery, Fill Light, Contrast, and Clarity sliders are all pushed to 100. The black slider is then used to adjust the overall brightness and add extra contrast into the scene. The image was put into grayscale and additional darkening was done with the Gradient Tool and the Brush Tool. There are all kinds of posterization and tonal reversals all over the image but it works to create an industrial grunge look for a very dramatic rendering. This type of treatment is only really successful if the image starts off in good shape with good tone distribution and no underexposed areas. Most photographers start off with images that are slightly underexposed and their images rapidly fall apart when subjected to such severe adjustments.

Figure 4.12 shows how much you can do with Lightroom/ACR and also illustrates some drawbacks.

Figure 4.12

The Los Angeles River as shot—an impossible dynamic range shot into the sun with a very dark foreground—no Lightroom adjustments.

f13 @ 1/400, ISO 1600



This was a grab shot off of a bridge in downtown Los Angeles. Shooting directly into the setting sun I knew that I didn't want to underexpose the foreground too much, and so I opened up from the in-camera meter and prayed that I'd be able to get enough out of the sky with the Recovery slider. I shot quickly without taking time to reset the ISO but managed to sort of "split the difference" between the overexposed sky and underexposed foreground. The dark tones at the bottom of the frame come in around zone I (10-15% in Lightroom RGB numbers), just about as low as I could tolerate. The sky is kind of a mess—major areas of clipping at 100%. Keeping my fingers crossed I push the Recovery slider to 100 and... (Figure 4.13).

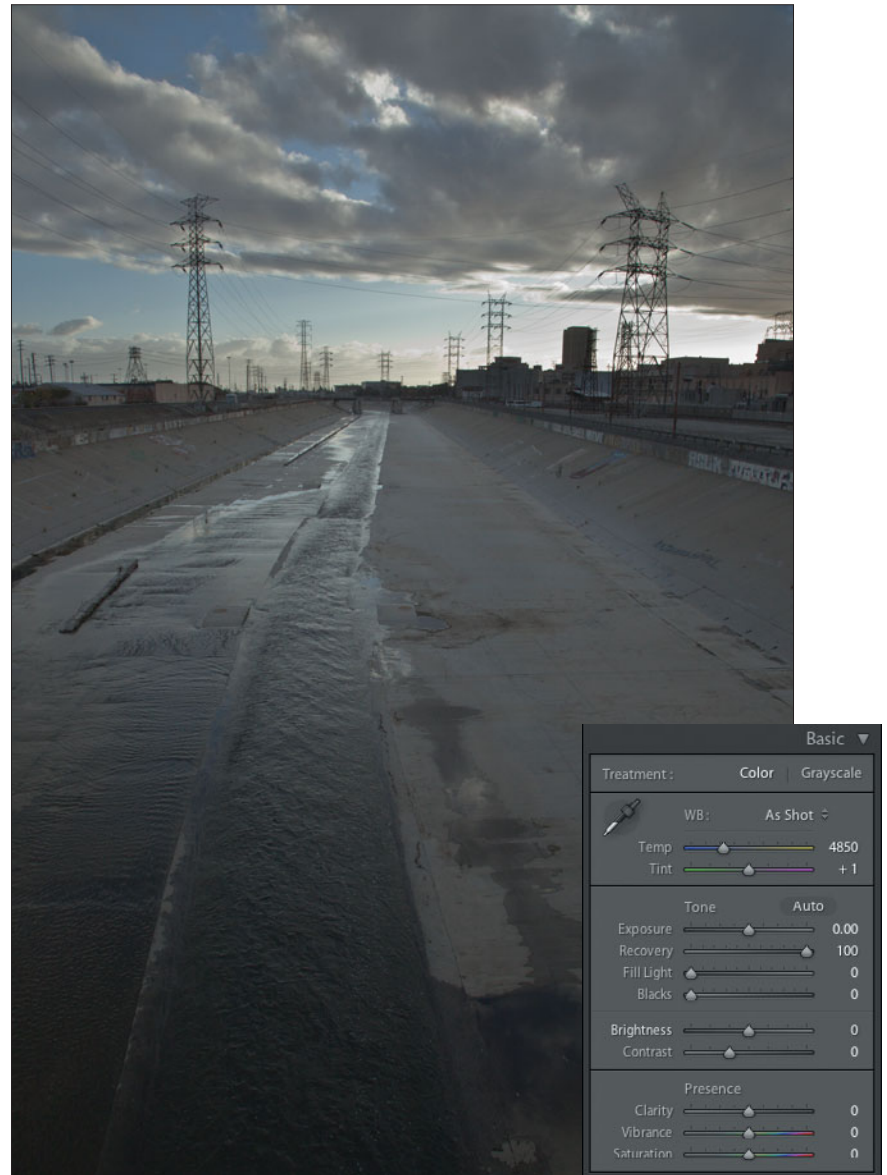
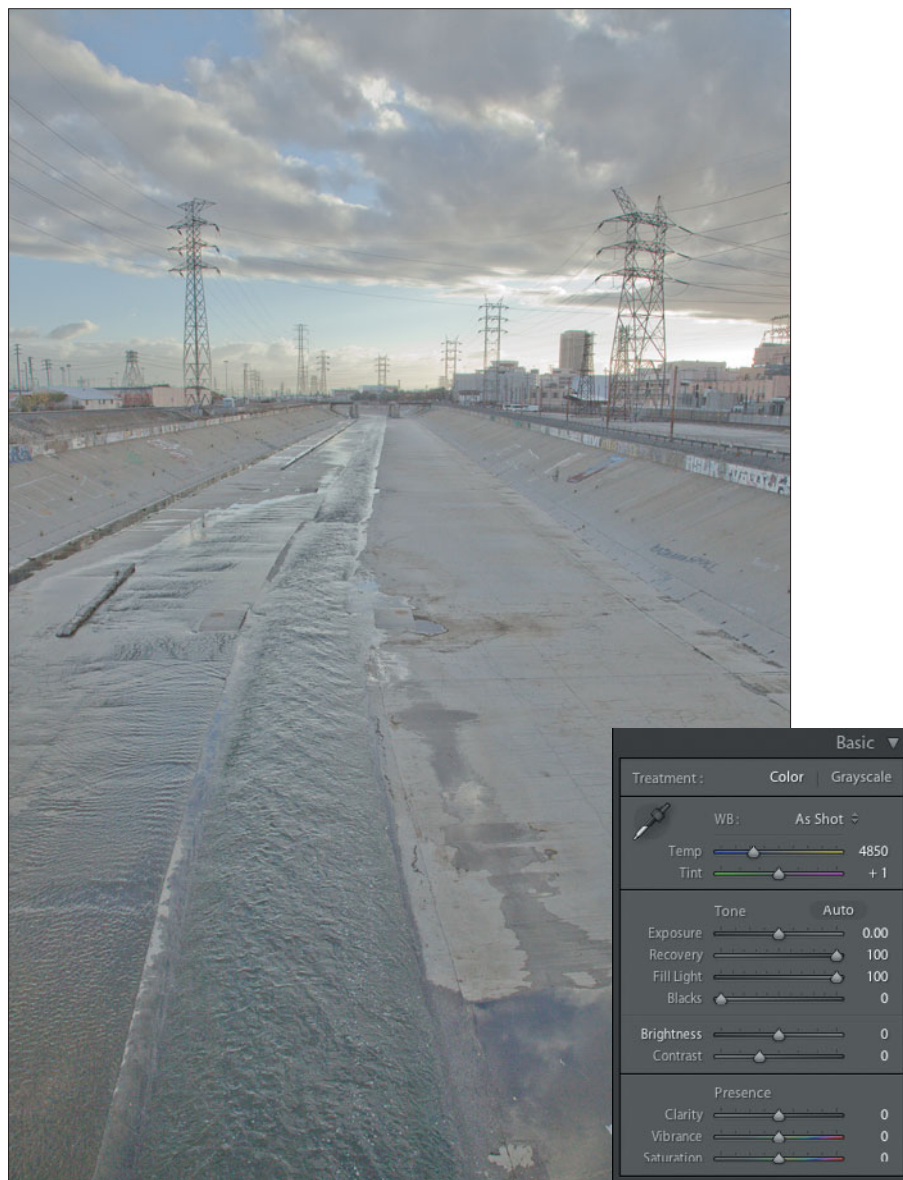


Figure 4.13

Pushing the Recovery slider all the way to 100 puts some detail back into the sky.

My prayers are answered and a fair amount of detail returns to the sky—there is still an area to the right without detail, but things are looking much better. Next I need to work on the foreground. This time it's the Fill Light slider that is pressed into service—let's see what 100 does here (Figure 4.14).

Figure 4.14
Fill light opens up the foreground a considerable amount!



Wow! It seems that there is an amazing amount of information lurking in the low values. This makes some sense as we saw that there are more “*f*-stops” of latitude on the shadow side of the mid point in the digital capture, and by making sure that the exposure kept values above zone I, we have something to play with. The image is now fairly washed out, but it is easy to add contrast and weight to the image.

Start by pushing Contrast and Clarity to 100 and then use the Black slider to introduce some darker values back into the image (Figure 4.15).



Figure 4.15

Contrast, Clarity, and the Black slider can be used to put some weight back into the image.



Now let's see if we can darken the sky further. This requires the use of the Gradient Tool (Figure 4.16). First ❶ select the Gradient Tool from the row of icons under the histogram. Then ❷ set up the sliders for the effect—here I'm using a -0.78 Exposure slider to hopefully add some darker tones to the sky. Finally ❸, drag in the image from just above the horizon to just below, centering the transition on the horizon.



Figure 4.16

Use the Gradient Tool to darken the sky.

So, now we are looking pretty good (Figure 4.17). To me, the image is begging to be B+W. Click on Treatment: Grayscale in the upper-right corner of the Basic panel and we have Figure 4.18.

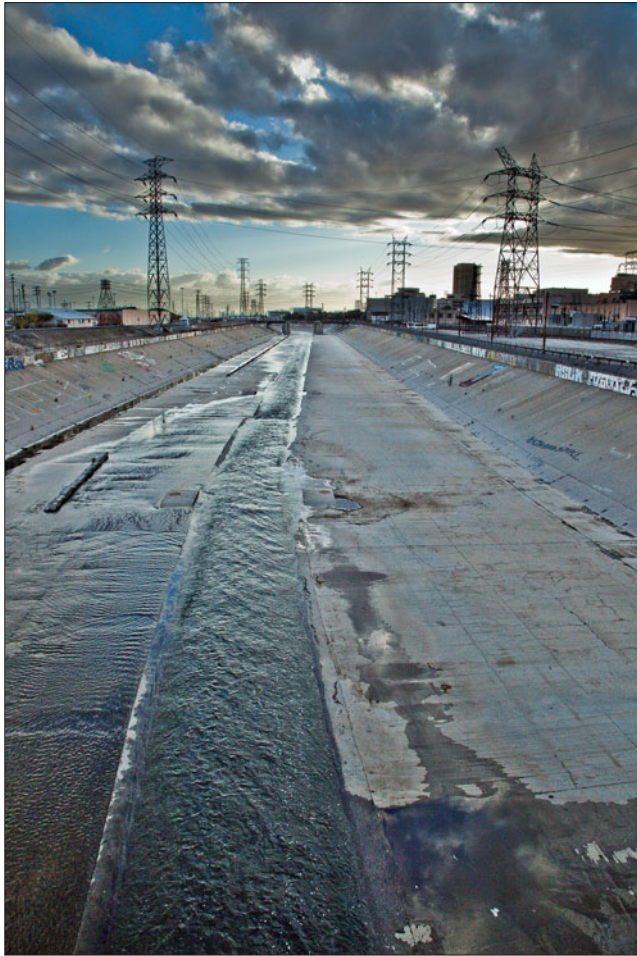


Figure 4.17

The image after using the Gradient Tool to darken the sky.



Figure 4.18

Click on Grayscale in the Basic panel to convert to B+W.

It seems that all is good in the world, but let's look closer! If we zoom in to the horizon where the sky transitions into the industrial landscape, we can see problems (Figure 4.19). Where did these “Mackie lines” come from?



Figure 4.19

Notice the “lines” around the edges of the buildings and towers against the sky.

The odd tone reversal lines are the result of applying Recovery and Fill Light together at high settings in the same image. This reveals one of the drawbacks to adjusting the image so severely in Lightroom or ACR. Much has been said about the non-destructive workflow of RAW file processors, but, in fact, there are serious limits to the kind of adjustment moves that are non-destructive in the rendered image! If we look closely, there are all kinds of strange artifacts throughout the image. While these are not visible in a small print, they become serious problems at the large sizes that are possible with the better DSLR cameras available today. Now, for some, this can be turned into a strength—a stylized look with the “flaws” as signature effect.

At the moment though this looks more like an imaging defect and a solution has to be found.

If the result is due to the combined use of Recovery and Fill Light then perhaps the solution is to be found in eliminating one of these sliders from the equation. Before proceeding, however, I'd like to be able to return to this version easily. First let's make a “Virtual Copy”. In Lightroom, select Photo ► Create Virtual Copy. This will create a second instance of this image and we will work with this version. Now push the Fill Light slider all the way back to zero (Figure 4.20).



Figure 4.20

Without the benefit of the Fill Light slider, the foreground becomes very dark but the reversal lines disappear.

Now I want to combine these two versions, replacing the bad horizon lines with just the horizon from the second darker version. This is a job for Photoshop! Lightroom makes it very easy to open both images into Photoshop in one document. Select both versions (Shift-click to select the additional one) and then select Photo > Edit In > Open as Layers in Photoshop (Figure 4.21). You will be taken to Photoshop with both versions neatly stacked on top of each other. Here I have the dark version on top (Figure 4.22).

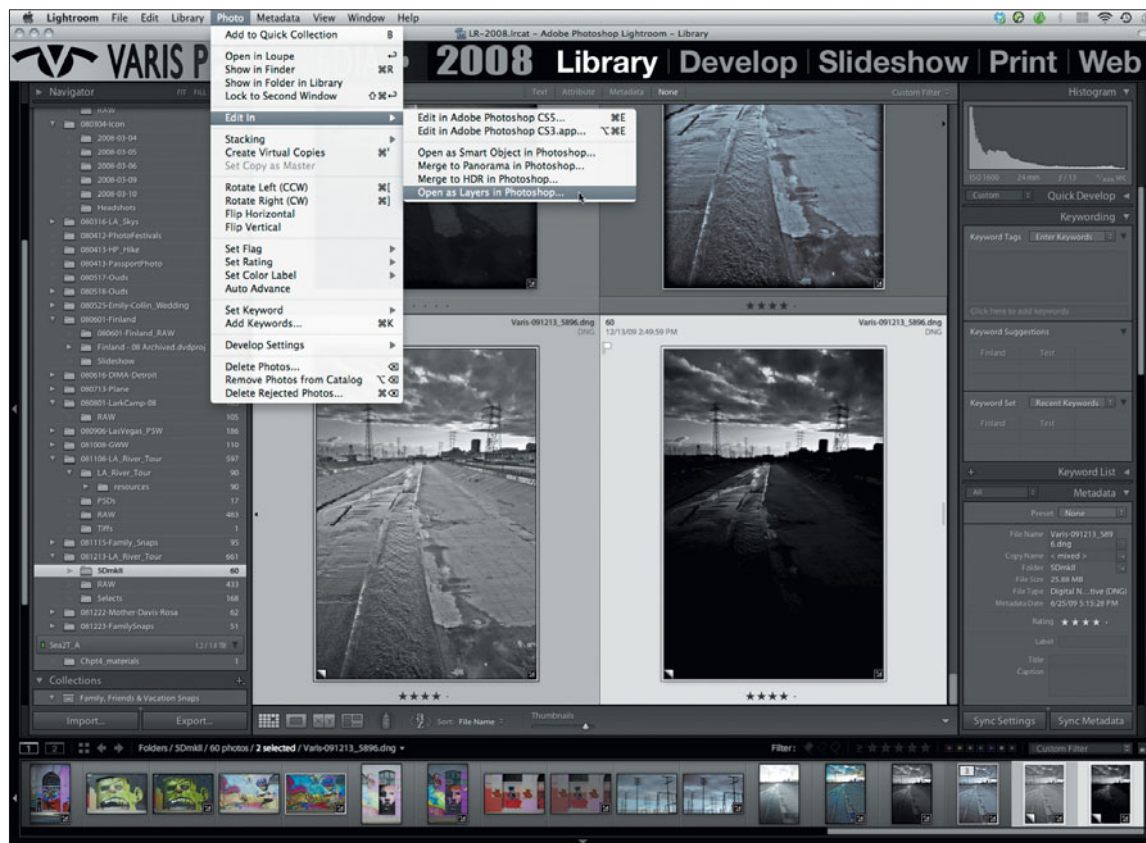


Figure 4.21

Both versions can be brought into Photoshop as layers directly from Lightroom.

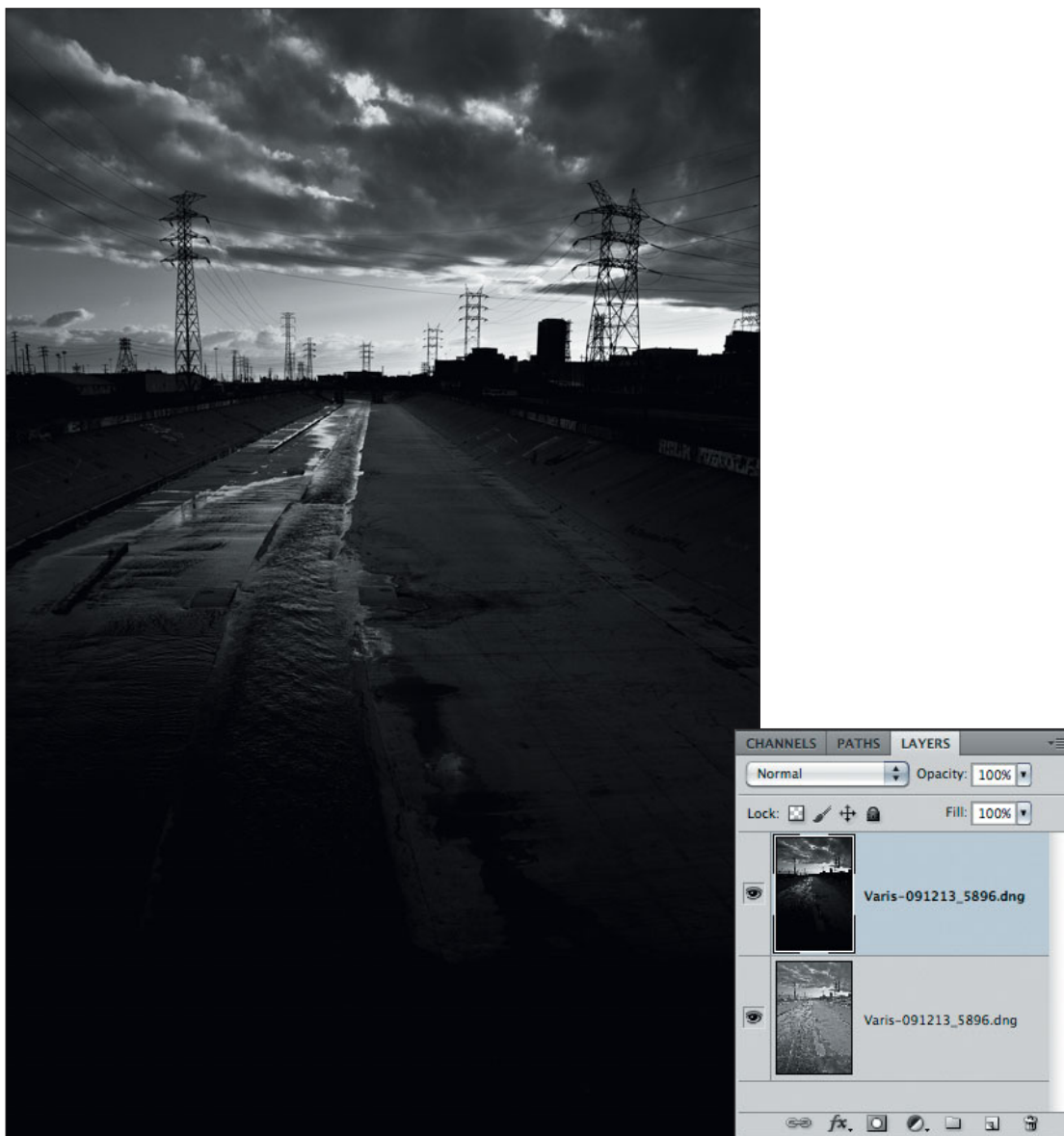


Figure 4.22
The darker version is on top in the layer stack.

Option/Alt-click on the layer mask icon at the bottom of the Layers panel to create a black layer mask and hide the top layer (Figure 4.23).

Now, with the new mask highlighted, simply paint with white into the mask over the area of the horizon on the image—this will reveal the dark but line-free horizon from the top layer (Figure 4.24).

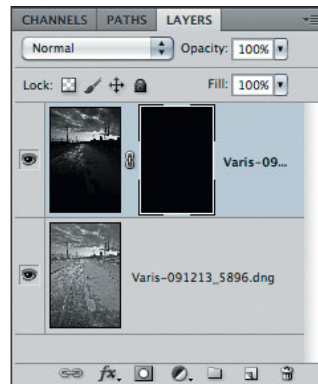


Figure 4.23

Make a black layer mask to hide the top layer.

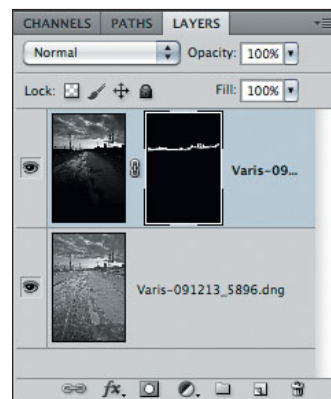
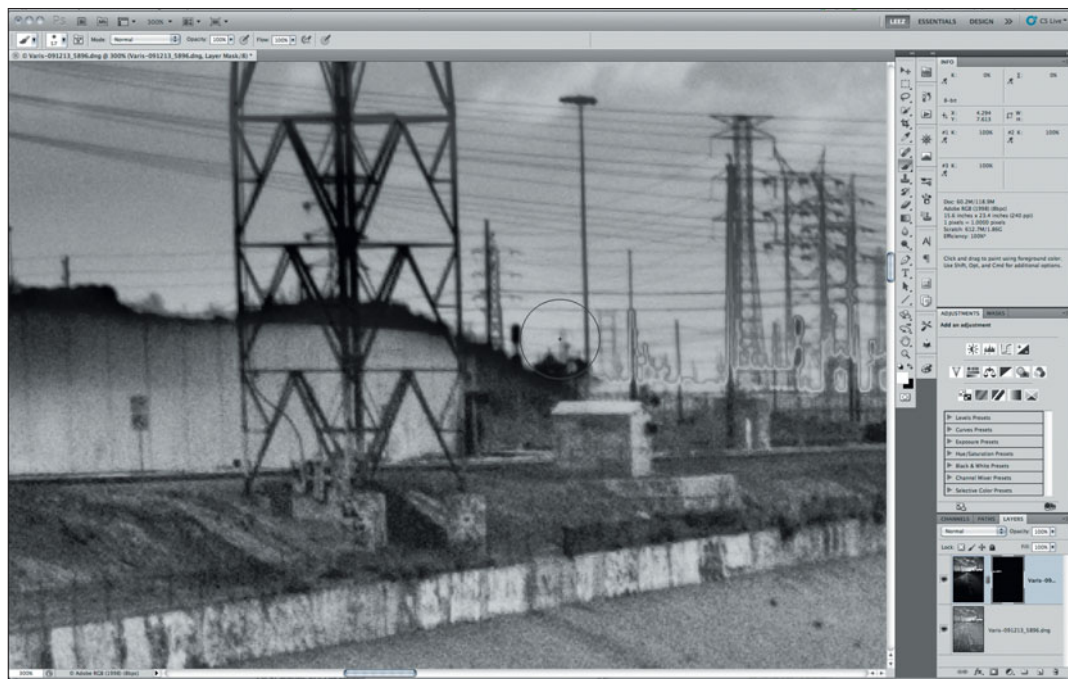


Figure 4.24

Paint out the bad Mackie lines by brushing white into the layer mask over the horizon.

After working the image a bit and successfully covering up the horizon defects, I decided I liked a bit of the darker sky from the second version, so I brought some of that back with a gradient in the layer mask and balanced it out with a gradient in the foreground area to arrive at this final version (Figure 4.25). Compare this with the original in Figure 4.12!

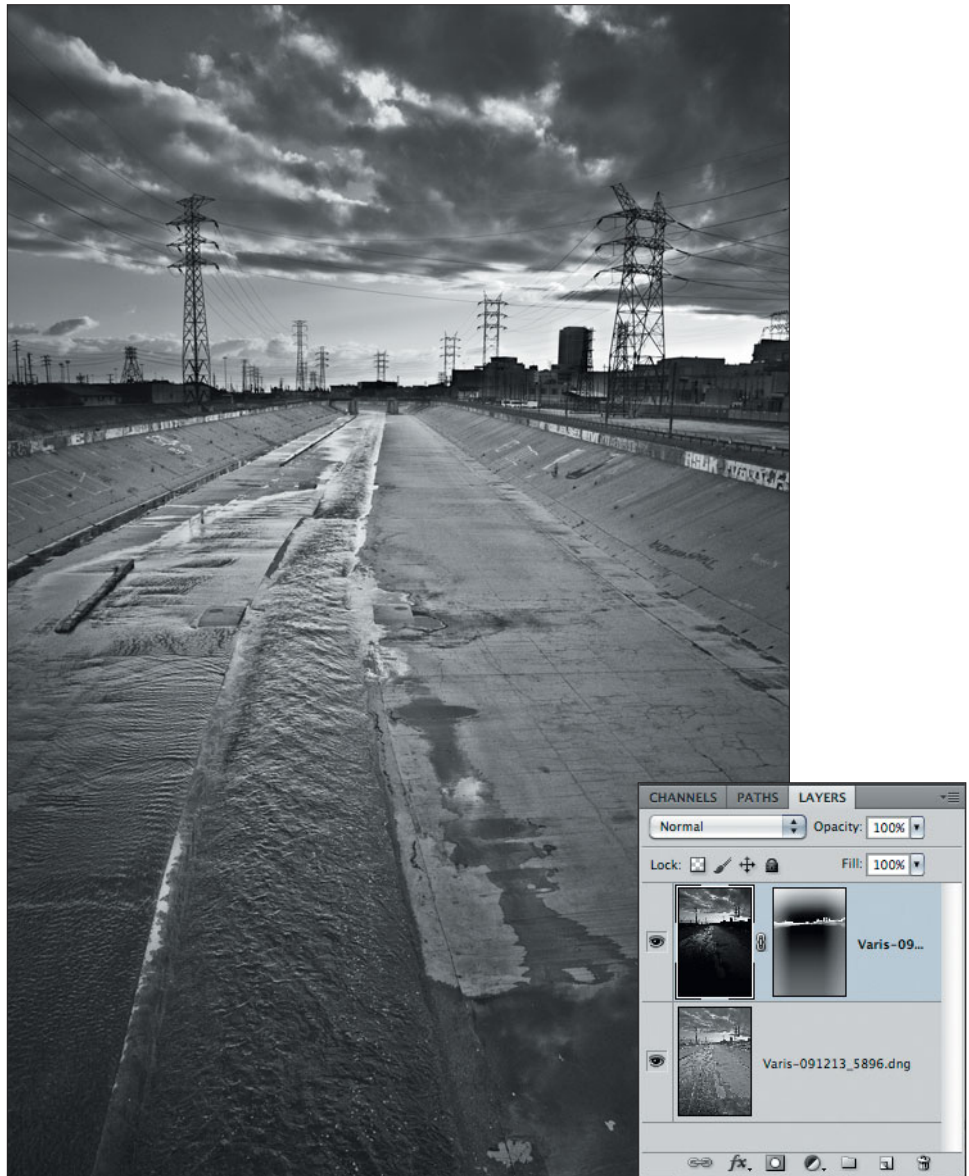


Figure 4.25

The final version blends the two layers together and introduces some of the darker sky and foreground to create an enhanced contrast rendering.

While this example showed most of the creative manipulation being done in Lightroom, it also shows that we have to be wary of relying on easy slider controls exclusively. We did get lucky with this image, but part of that luck has to do with the quality of the starting image file. The most important aspect being that this image was not seriously underexposed and it was relatively easy to recover highlight detail with the Recovery slider. This type of image is actually better addressed by the HDR techniques I will cover in the next chapter, but it is useful to know that much can be done using a combination of Lightroom/ACR and Photoshop to enhance the details and tonal separation hiding in the RAW image file.

The biggest weakness in the RAW processor is the lack of any direct access to the channel structure of the rendered image—we don't even get a channel-by-channel preview! This channel access and control is one of the biggest strengths for Photoshop. Much better quality can be had by using a Photoshop-centric approach to image enhancement even though it requires more steps and less intuitive techniques. The rest of this chapter will concern itself with the development of this new approach.

B+W Tone Control

Advanced tone control starts with an understanding of B+W translations from color images. Our last example was relatively easy to convert into B+W because it was a mostly monochromatic image. There is much to be learned, however, by working with very colorful images and converting those into B+W. The following exploration is meant to develop a conceptual understanding of luminosity as separate from color, and we will later apply this to tone control in color imagery.

Let's start with this vibrant image of a sunflower (Figure 4.26).



Figure 4.26

The challenge—convert this colorful image into B+W. f16 @ 1/100, ISO 100

There are, of course, a number of different ways to convert this color image into B+W, including the newer Black & White adjustment in Photoshop. However, we are after a higher purpose, and to reach that goal we start with the realization that all color images are actually made up of at least three different B+W images. Yes, I am talking about the individual RGB channels all of which contain only brightness information (Figure 4.27). The color is interpreted from the brightness levels of the Red, Green, and Blue channels—an additive process.



Figure 4.27

The color image is composed of three different B+W images—Red, Green, Blue.

The implication here is that we can take advantage of these differences to create an idealized B+W rendering. Perhaps the easiest way to do this is to use the Channel Mixer Adjustment in Photoshop. We will apply this as an adjustment layer—go to the Adjustments panel and click on the Channel Mixer icon (Figure 4.28).

Select “Black & White with Green Filter (RGB)” from the Channel Mixer presets drop-down, and you will get a B+W rendering that is the same as the green channel by itself (Figure 4.29).

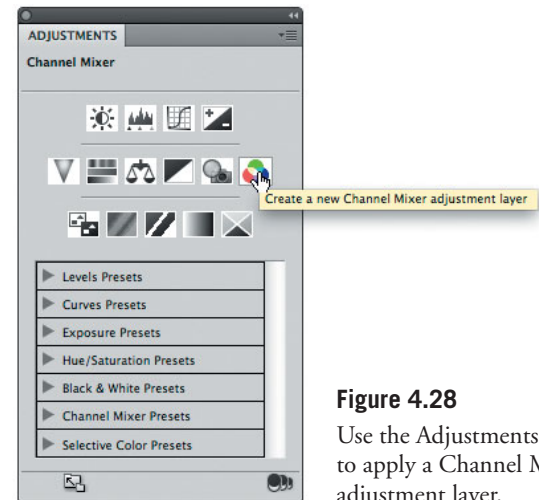


Figure 4.28

Use the Adjustments panel to apply a Channel Mixer adjustment layer.

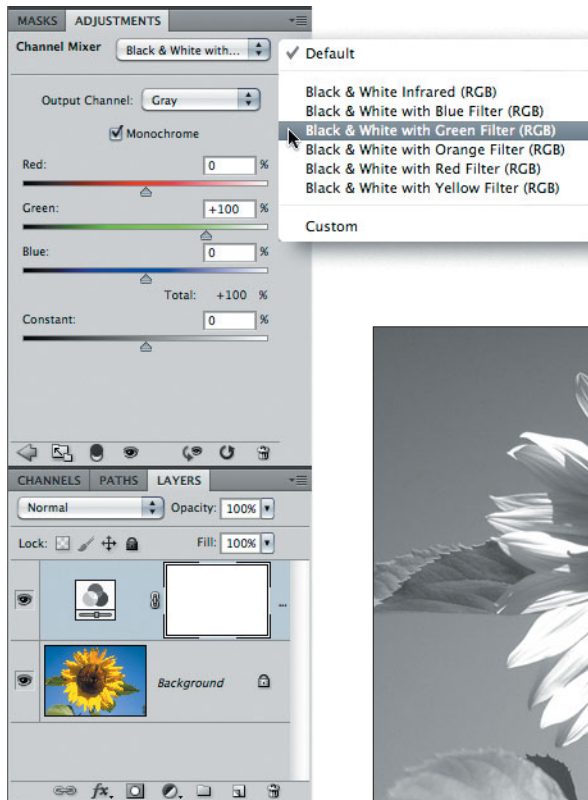


Figure 4.29

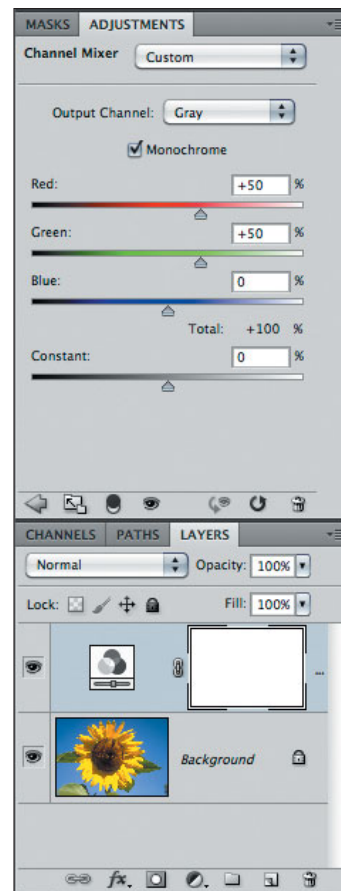
The Black & White with Green Filter default results in a B+W rendering that is the same as the green channel.

Now that we have a basic “mix” established, it is easy to play around with different combinations. Note that as long as the “Total” of the mix is 100 you will not alter the white point of the overall luminosity. So, we may want to blend in more of the Red channel to darken the sky a bit—if we use a 50/50 blend of Red and Green, the highlights on the petals of the flower remain white but the sky gets a little darker (Figure 4.30).



Figure 4.30

The 50/50 Red/Green mix makes the sky darker without darkening the flower.



We can think of the Channel Mixer as a way of using traditional B+W camera filters “after-the-fact,” hence the naming of the presets: Black & White with Red Filter (RGB), and so on. Our current mix here would approximate the appearance of an orange filter with B+W panchromatic film. The obvious advantage of this “digital” approach is that the creative decision can be postponed; we don’t have to calculate a “filter factor” (the exposure darkening effect of the filter) and we don’t have to suffer any optical degradation from placing an additional piece of glass in front of the lens!

An additional benefit of this approach is that you can do things that are not possible with traditional camera filters. While you would normally avoid altering the “total” of 100, you can actually subtract brightness from the mix with negative slider positions. We can achieve something similar to an infrared look by subtracting the Blue channel (Figure 4.31). Here a setting of -50 in the Blue slider turns the sky black. The reason the flower doesn’t get darker is that, in the blue channel, the flower is black so there is no value to subtract. However, the sky is light so when we subtract those light values from the mix we can darken the sky considerably without altering the brightness of the flower.

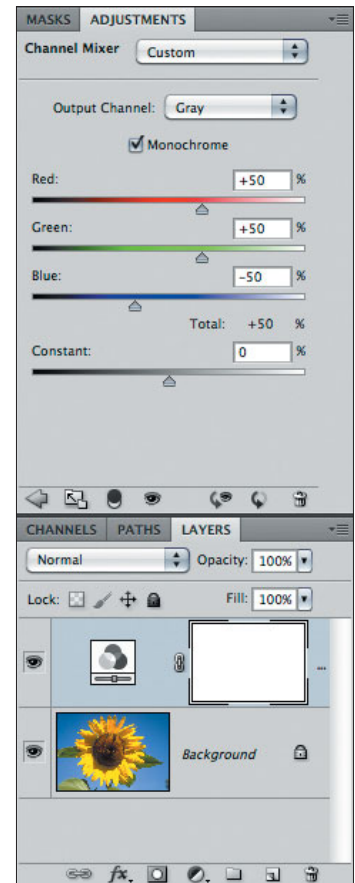
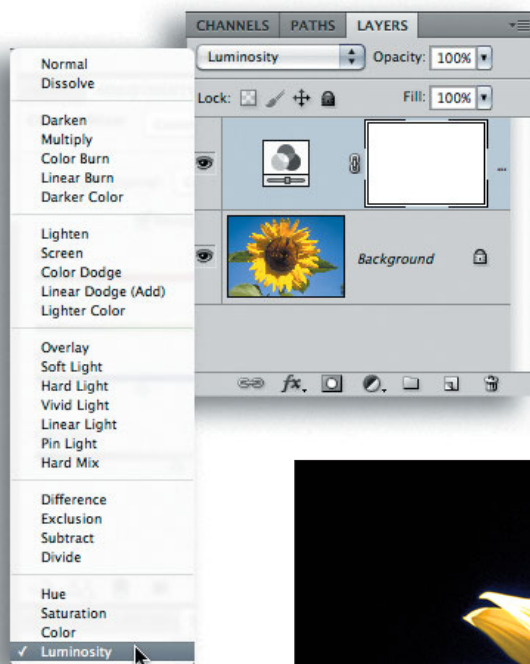


Figure 4.31

The Channel Mixer can also subtract values; in this case, darkening the sky.



It should be obvious by now that we can create a wide range of tonal rendering effects by manipulating the channel values in the image to create a B+W image. Something very interesting happens when you change the layer apply mode for this Channel Mixer adjustment layer to Luminosity! (Figure 4.32)



Figure 4.32

The B+W luminosity of the “channel mix” is applied to the color image for a very dramatic rendering!

The infrared B+W rendering is now in color and the result goes beyond what could normally be achieved with Basic controls in Lightroom or regular curves in Photoshop. Additional control can be exercised by taking advantage of the layer mask. Placing a gradient into the mask gives us a unique graduated filter effect (Figure 4.33).

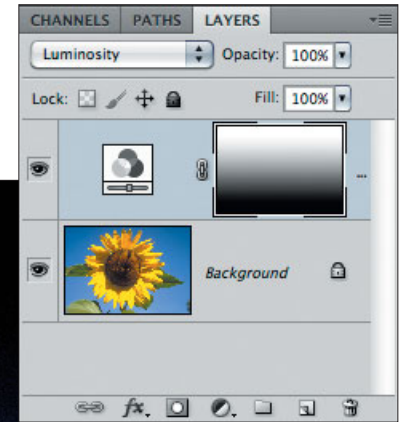
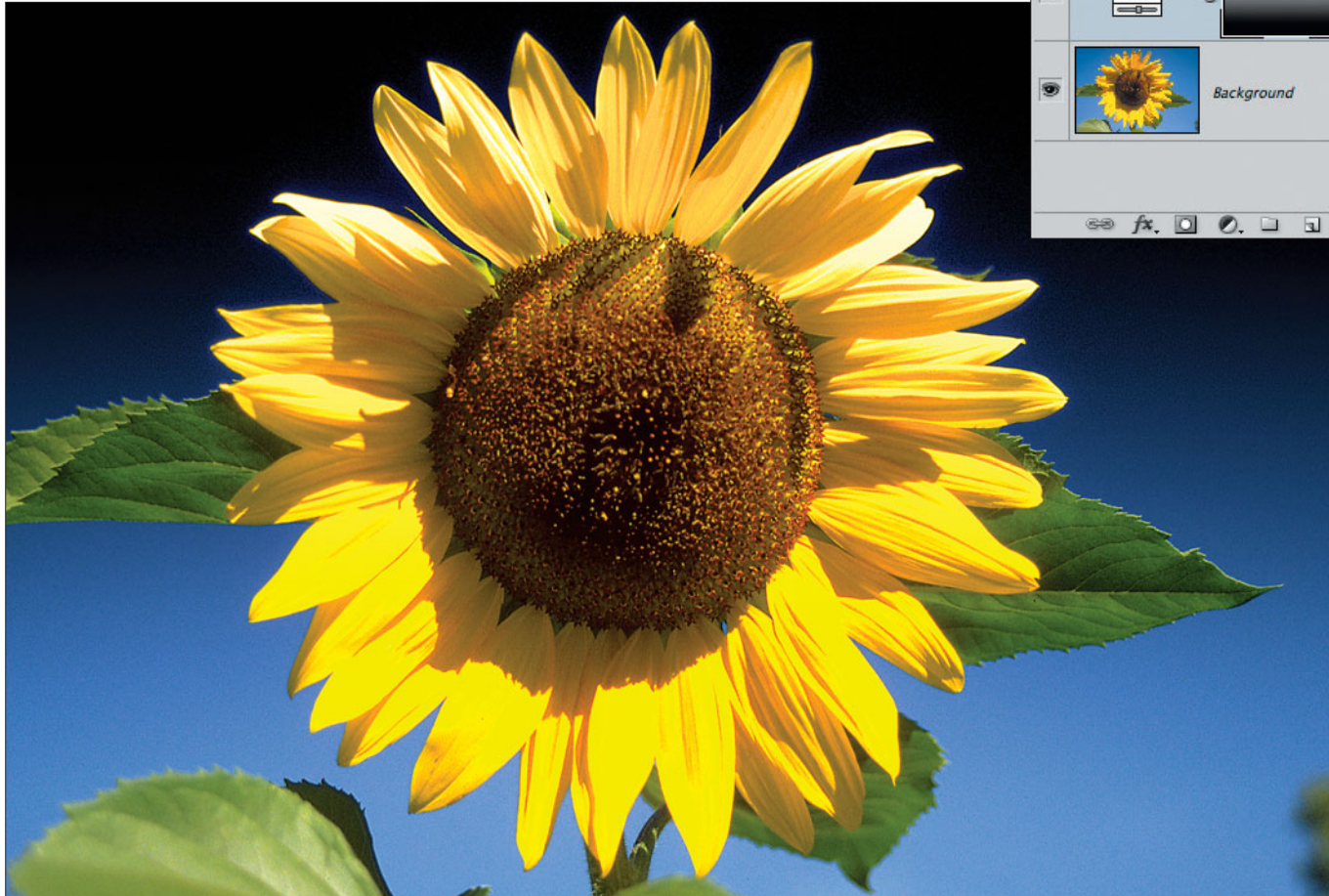


Figure 4.33

A layer mask turns the effect into a graduated filter.

The idea that B+W luminosity can be used to manipulate color tonal range and contrast opens up a new frontier of creative possibilities, and this will be a key component in the following exploration of post-capture tone and color control.

This new approach to creative image manipulation does not invalidate the necessity to test and calibrate your capture system, as it depends on having good, high quality channel structure in your digital captures. You have to get it “right” in the capture phase to allow for the dramatic tone effects that are possible when your channels are noise free and have a smooth tonal range.

Image Enhancement Workflow Overview

Before we go further, I'd like to establish an overall strategy for fine image enhancement that we can apply in a step-by-step approach.

1. Capture the image—get a good exposure that places the range of the image within zone I through zone IX (L= 10 to 90).
2. Set white balance and basic color in Lightroom/ACR—do not attempt to adjust fully but use Recovery or Fill Light to bring the extremes within range of the zone I to zone IX limits. Do not boost Saturation or Vibrance! The resulting image should appear flat and dull but have smooth tonal range in the individual channels.
3. Open into Photoshop and check the neutral colors and correct for any obvious colorcasts or off-subject colors—hopefully not necessary if step 2 is done successfully.
4. Look at the channels with the intention of building better luminosity detail and contrast. Blend channels in a layer structure above the color image so that you can apply the grayscale information as luminosity against the color image.
5. Once you have luminosity applied, duplicate the merged layers to a new document and convert this to Lab for color enhancement.
6. Apply curves or layer apply modes to build saturation or otherwise enhance the color in Lab—aim for a little more color than you think you need.
7. Flatten the Lab document and drag onto the original RGB layers.
8. Look at using “a” and/or “b” channels in Overlay apply mode to further enhance contrast on top of the existing layers.
9. Adjust layer opacity of the various “enhancement” layers to taste and compare with original image.
10. Apply a final curves layer to place endpoints and do minor tweaks to color.

There are numerous variations on the individual steps, but the overall approach has proven itself over a wide range of imagery, and it allows for infinite refinement as your Photoshop skills improve. At the moment some of these steps may not be entirely obvious—the best way to explain these steps is to go through an image enhancement project from beginning to end.

We start in Lightroom with Figure 4.34.



Figure 4.34

Industry in a Southwestern Landscape. f20 @ 1/400, ISO 400

I'm not sure what this industrial facility is, but it seems that the plume is steam so this may be some kind of power plant. At any rate, exposure was based off a reading of the white clouds—the brightest areas placed at zone VIII. I didn't want to place them too high because I wanted to be sure to retain as much detail as possible in the clouds, so I only opened +1 2/3 stops. This left the foreground areas a bit suppressed with low values close to zone I. Here in Lightroom, I can see that the histogram has all the values peaked towards the middle and I can probably raise everything just a little because it seems like I've got more room on the highlight side than I originally anticipated. My first step, however, is to check white balance to the clouds just to make sure I've got a good neutral white point by clicking in a highlight area of the cloud with the eyedropper. Next, I pushed the Exposure slider to +33 to put the lightest part of the clouds right up to the edge of the histogram, right before clipping. Finally, I was still concerned that the foreground was going to be too dark to work with so I pushed the Fill Light slider to +33 to open up the low values where they end up just above zone II (about 23% in Lightroom RGB) (Figure 4.35). Last step, select: Photo > Edit in > Edit in Adobe Photoshop (Figure 4.36).



Figure 4.35

The image is brightened slightly and the low values elevated slightly to bring everything into range for further editing in Photoshop.

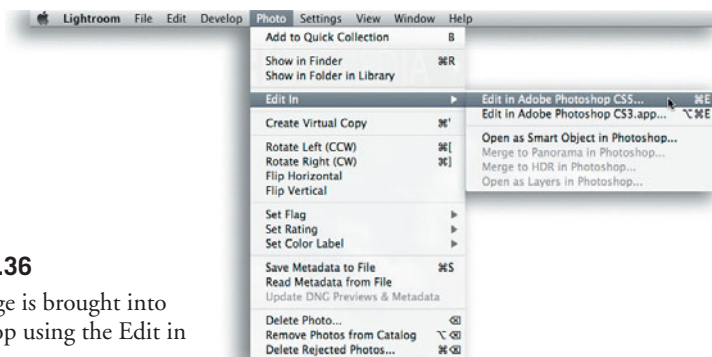
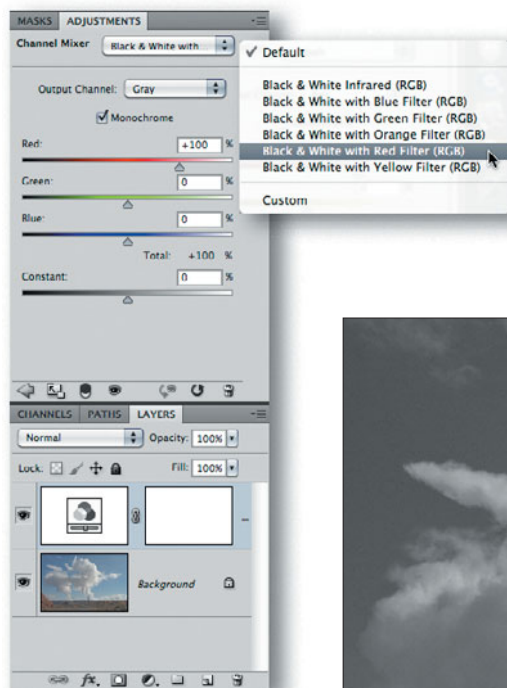


Figure 4.36

The image is brought into Photoshop using the Edit in menu item.



When the image is opened in Photoshop, we can examine the individual channels to see if we can find better contrast there. As it turns out the Red channel is clearly better than either of the others so we'll put a Channel Mixer adjustment on top. Select the Black & White with Red Filter preset from the drop-down in the Channel Mixer panel. Now we have Figure 4.37, a B+W rendering that, coincidentally, has stretched the contrast a bit with the black point down at a zone I (RGB = 30).



Figure 4.37

The Red Channel B+W rendering from the Channel Mixer adjustment layer.

Change the layer apply mode to Luminosity and we have Figure 4.38—the sky has gotten darker and the foreground lighter!



Figure 4.38

Applying the Red Channel Mixer layer in Luminosity mode has darkened the sky and lightened the foreground.

Something interesting happens if we repeat the procedure: make a new Channel Mixer adjustment on top, select Black & White with Red Filter, and change the apply mode to Luminosity. The sky gets even darker and the foreground even lighter. The process is iterative! (Figure 4.39)



Figure 4.39

Repeating the Channel Mixer procedure results in even more contrast.

What's happening is that when the luminosity is replaced with the Red channel, it has an effect on all three color channels so the new Red channel has even more contrast. We can't repeat this indefinitely, however because the process is increasing the amount of visible noise. The Red channel typically has more noise than the Green channel (which normally carries more of the overall luminosity) and when we amplify the Red channel in this way we will pick up additional noise. Luckily, repeating the Channel Mixer twice seems to be all that is needed here.

Now that we've enhanced the contrast of the image, we have to think about the color; at the moment, things are looking pretty dull. We definitely need more saturation just about everywhere. This suggests a correction in Lab. We can always get a better saturation enhancement in Lab than we can using the Hue/Saturation adjustment. First, we will duplicate the document! Select Image > Duplicate from the menu; then check Duplicate Merged Layers Only and rename to append "Lab" (Figure 4.40).

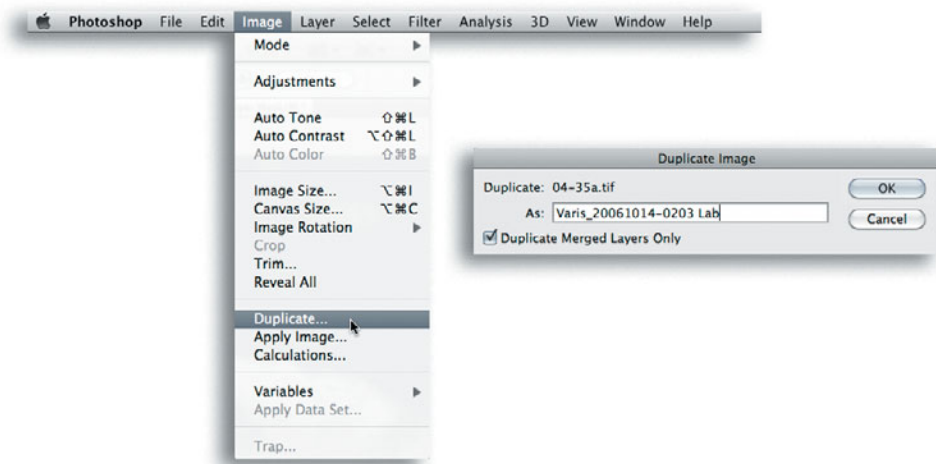


Figure 4.40

Duplicate the merged layer to create a copy that we can turn into Lab mode.

Once we have our duplicate, select: Image > Mode > Lab Color and duplicate the Background to a new layer. Change the layer apply mode to Overlay and we get Figure 4.41.



Figure 4.41

Overlay layer apply mode creates an enhanced contrast effect when the image is applied to itself.

Overlay is a contrast-enhancing apply mode and we certainly have increased the contrast—a lot! We also have improved color saturation, but the contrast is too much. However, the interesting feature of Lab is that luminosity and thus contrast is in a separate channel from the color so we can take advantage of this and eliminate the contrast effect leaving only the saturation effect.

Select Blending Options from the Layers panel options flyaway and then uncheck the “L” channel in the Advanced Blending area of the dialog (Figure 4.42).

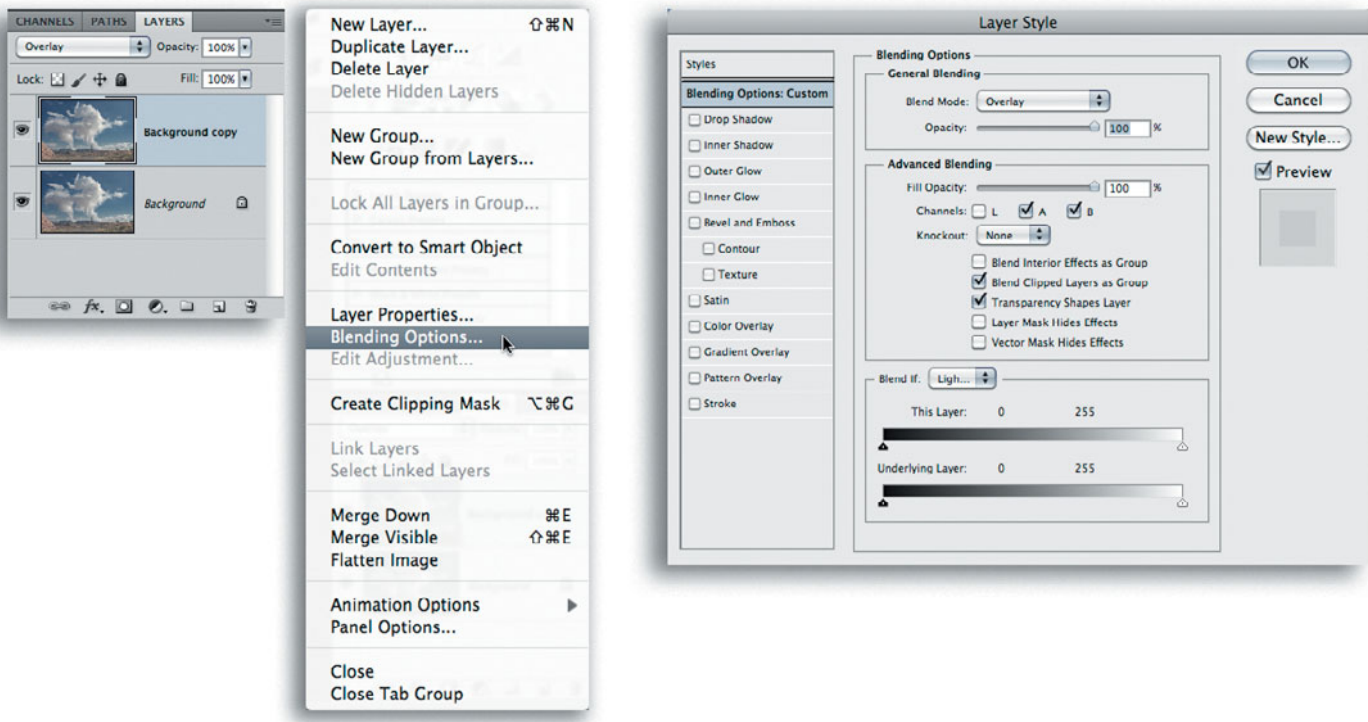


Figure 4.42

Uncheck the “L” channel in the Blending Options dialog.

Now we end up with the extra saturation but without all the extra contrast (Figure 4.43).



Figure 4.43

Eliminating the contrast reveals the amount of extra saturation in the Overlay apply mode.

This works because we limited the Overlay effect from the “L” channel but it still allowed us to enhance the contrast in the “a” and “b” channels. When contrast is enhanced in these channels we end up with more saturation. Right now the sky looks good but I’d like to get more color into the green foliage in the foreground. Let’s duplicate the top layer (the one with the blending options applied) to increase the saturation again. This will push the saturation of the blue too far but we can eliminate that easily by using the Blending Options again. Call up the Blending Options dialog for the new top layer and select the “b” channel from the Blend If drop-down. Now push the This Layer black point slider from the left to the exact center where it will read 128 (Figure 4.44). This will eliminate the extra saturation from blue. Now I want to remove just a little bit of the extra red in the foreground rocks—select the “a” channel from the Blend If drop-down and push the White point slider from the right to the exact center (128 again). This eliminates the extra red—to bring some of it back, split the slider by Option/Alt-clicking and drag the two halves apart to the right pulling some of the color back.

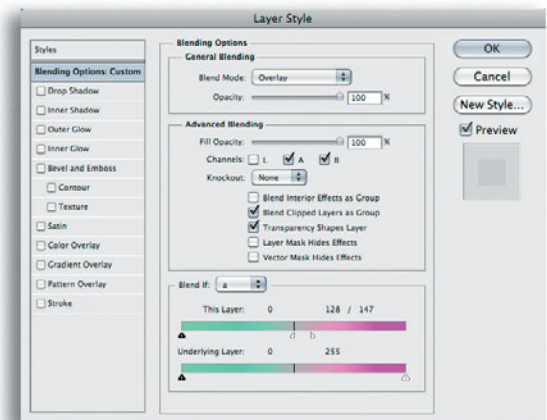
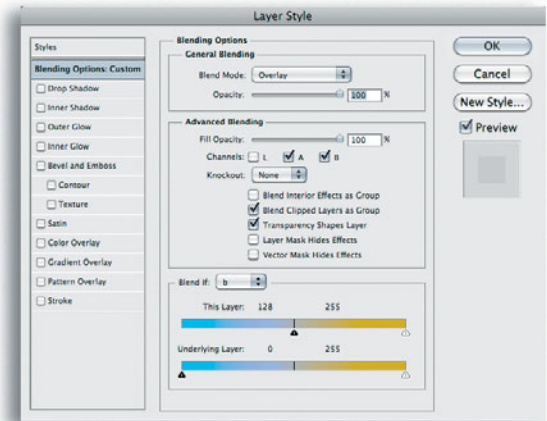
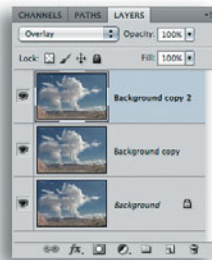


Figure 4.44

A controlled second Overlay apply is used to add more saturation to the green and a little bit to the red.

We now arrive at Figure 4.45. This now seems to be just the right amount of color. So now we can drag this back into the original RGB document to finalize the contrast and color. Flatten the image, select the Move Tool (the little cross with floating arrow icon at the top of the Tool panel) and click inside the Lab document window. Hold down the Shift key and drag into the window for the RGB original document, or, if you have the documents arranged as tabs, drag onto the “tab” for the original RGB document and let go once the document comes forward. This will drop the newly saturated image in register over the original document layers.



Figure 4.45

The foreground area has picked up a little more color from the last Overlay layer.

For maximum flexibility, you could change the apply mode for this new layer to Color so you could readjust the contrast layers underneath it, or you can leave it in Normal mode and apply any additional corrections on top. Let's leave this in Normal mode for the moment. I have one more trick up my sleeve however, and this will illustrate one more important concept.

Since we have a Lab version of this image open, we can take advantage of the additional channels to look for any additional tone and contrast enhancements. To do this we will use a little known feature that has been in Photoshop since version 3—the Apply Image command. First, make a new empty layer at the top of the stack—click on the new layer icon at the bottom of the Layers panel. With this empty layer selected go to the Image menu and select Image ➤ Apply Image. The resulting dialog allows you to search the open documents and apply any channel into the targeted layer. Select the Lab document as the Source from the drop-down and select “b” from the Channel drop-down (Figure 4.46). Click OK and the “b” channel is applied.

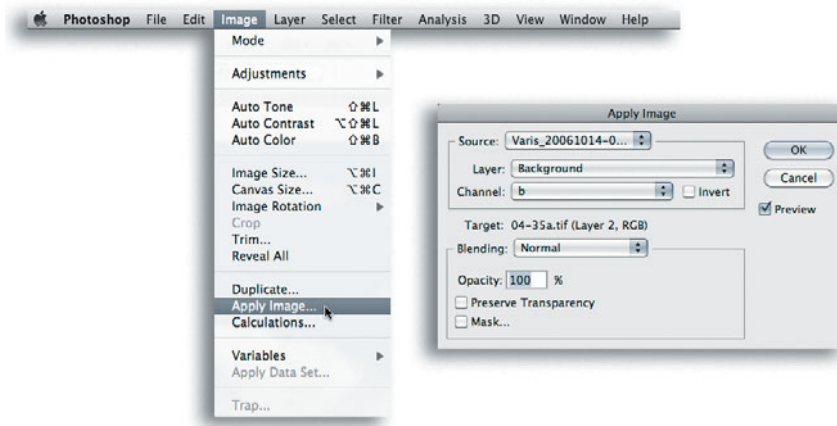


Figure 4.46

Apply Image is used to get the “b” channel into the empty layer in the RGB document.

Now you are probably wondering where I'm going with this (Figure 4.47). The “b” channel seems pretty useless—dull, gray, and flat, but wait...



Figure 4.47

What's happening here?

Change the layer apply mode to Overlay and we get Figure 4.48—quite a different animal indeed!

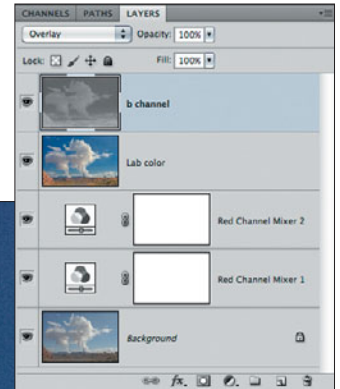


Figure 4.48

Changing the apply mode to Overlay makes all the difference!

What has happened is really quite magical. Overlay works based on tone and color deviation from medium gray. When a tone in the Overlay layer is medium gray or 128 in RGB values, it has no effect on the underlying layers. When it is lighter than the underlying layer, it makes the image lighter. When it is darker, it makes the image darker. The “b” channel in Lab represents the blue-yellow color range in the image. Blue in the “b” channel is darker than medium gray. Yellow is lighter than

medium gray. So our “b” channel when applied as an Overlay layer is darkening the sky and lightening everything else except the neutral clouds. We have managed to turn on the lights in the foreground and add extra contrast and dimension to the sky in a way that enhances the 3D effect in the image. Now with a few very minor curve tweaks for color and some sharpening, we can get to the final image in Figure 4.49. Compare this to the original in Figure 4.35. The difference is startling!



Figure 4.49

The final image has come a long way from its starting point.

Detailed Workflow Review

1. Our Basic image enhancement strategy starts with the capture. We want to expose so that the values in the image from dark to light fall within a 6-stop range. As much as possible, we want to favor higher values up to but not beyond zone IX, so if we can place values higher than normal, that's fine. They can always be made darker later in post.
2. The RAW processor should be set up to give the most neutral color by establishing an accurate white balance or setting a known neutral color. The values should be arranged to stay away from the shadow side—do not set the Black slider in the Basic panel higher than zero. Aim for a relatively flat image with sliders at or close to zero. Use Fill Light and Recovery sparingly and never use both in the same image. If you have to brighten the image, use the Exposure slider if possible without clipping any high values. If the image is particularly colorful, consider exporting to ProPhoto colorspace; there will be smoother tones in the individual channels, which will be useful for luminosity blends later. Otherwise, don't worry and use Adobe RGB as the best compromise workspace.
3. Once the image is open in Photoshop, check the neutral colors and correct for any obvious colorcasts or off subject colors. All the subsequent moves will tend to exaggerate any color defects so it is best to take care of as many color issues as possible at this point. If the color moves are likely to hurt contrast or damage the channel integrity, consider setting the curve apply mode to Color.
4. Examine the individual channels to see if you can construct better overall luminosity from the grayscale info. Consider blending or layering different channels to get ideal contrast and tonal separation in different areas of the image. Apply the enhanced B+W luminosity to the color image in a luminosity layer. Duplicate the merged layers to a new document.
5. Convert the duplicate to Lab and enhance color saturation and possibly contrast through Overlay blends and/or curves. Try to build up more color than you think you'll need and pay special attention to greens.
6. Flatten the Lab document and shift-drag on top of the RGB original to register it in a new layer.
7. Apply the color from the Lab layer to the underlying layers and see if you want to adjust luminosity in the underlying layers based on the effect of the enhanced color. Consider reducing the opacity of the Lab color layer if the saturation is too garish.
8. Look at applying either the “a” or “b” channels to an empty layer and using Overlay to further enhance contrast or lighten and/or darken a specific range of color in the image. Compare with the original image and adjust the opacities and/or add layer masks to refine the effects in different areas.
9. Apply a final Curves adjustment layer to set the appropriate black-and-white points and fine-tune color and contrast.

The general philosophy of this approach is that images benefit from local contrast that enhances the sense of 3D shape, and more detail is considered better. However, some images do not respond well to this level of enhancement and in some cases less is more. It is very useful to have prepared a more conservative version of the image that can be blended back into the more enhanced version. In some cases different areas of the image will demand different treatments. At this point it may seem like this series of steps is very complicated and time consuming, but as you get more familiar with this approach, it becomes very fast and you can generate variations very quickly.

It is better to try different variations and build them quickly than to do detailed work on just one—this gives you a chance to evaluate different approaches with the idea of blending the best parts together.

There are other techniques that can be integrated into the basic strategy outline above. Different combinations of layer apply modes and blurs, layer masks, and even CMYK black channel moves can contribute even more advanced image manipulations. Unfortunately, there isn't enough space in this volume to cover everything, but I will go over one more example—you'll be able to find additional examples and multi-step tutorials on the website: www.varis.com/MasteringExposureBook.

Advanced Image Enhancements

The next example is a shot of “the Wave”—a famous, wind-eroded land formation in the Coyote Buttes area in Canyon Country, near the border of Arizona and Utah. This project shows how multiple RGB channels can be used to build more separation of tones and enhanced contrast and introduces a technique for reducing saturation in the shadow regions (Figure 4.50).

The shot came straight from the camera with no adjustments. No exposure challenge here—a full range subject with no obvious defects. We might be inclined to simply add a little contrast and call it a day. One can never be sure how good an image can get until you try to take it beyond the normal interpretation—it's better to go too far and then come back than never go far enough with it. So let's use our Luminosity apply strategy to see where it takes us.



Figure 4.50

The Wave—as shot, no adjustments. f16 @ 1/100, ISO 100

First, examine the RGB channels (Figure 4.51).

Red is the lightest—obviously because the sandstone rocks are mostly red—but it also has the darkest sky. Green is the grayest with pretty good texture. Blue is the darkest, but it has the most contrast between the dark and light striations in the rock. In order to build contrast in the scene we'll start with the Blue channel.

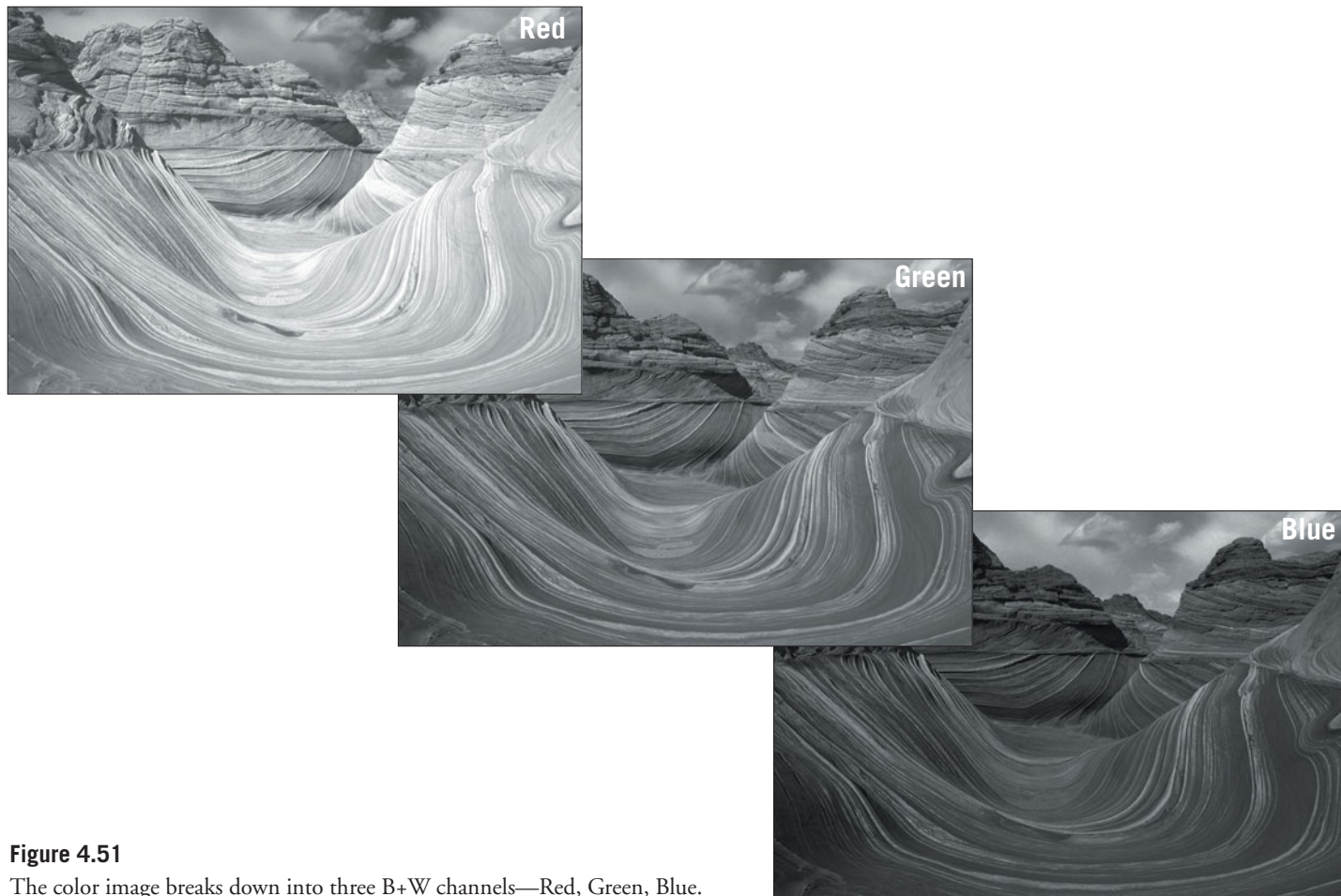


Figure 4.51

The color image breaks down into three B+W channels—Red, Green, Blue.

Instead of using a Channel Mixer layer to give the Blue channel luminosity, we'll use the Apply Image command. Make an empty layer above the background and select: Image > Apply Image, add the Blue channel in the source, and click OK (Figure 4.52).

Once the Blue channel appears in the layer, change the apply mode to Luminosity. The image will now appear very dark, but we are just beginning to build up contrast (Figure 4.53).



Figure 4.53

The Blue channel luminosity layer makes the image darker but introduces more separation between the light and dark striations in the rock.

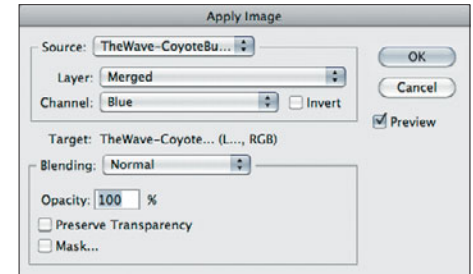
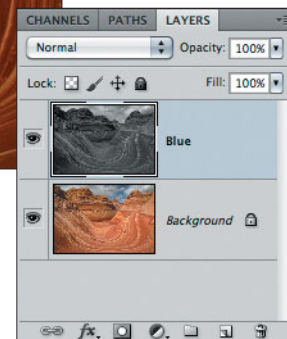


Figure 4.52

Use the Apply Image command to add the blue channel into the empty layer.

Note

The Blending mode doesn't matter when applying into an empty layer, but it has implications in other applications. So, for the sake of clarity, my screenshots will show "Blending" as "Normal."



Now we are going to use the Green channel to make the Blue channel lighter and increase tonal separation at the same time. To prepare for this, we have to make another empty layer, but this time we'll "group it" with the Blue layer. Hold down the Option/Alt key and click on the new layer icon at the bottom of the Layers panel—the Layer Options dialog will appear. Name the layer Green, check Use Previous Layer to Create Clipping Mask, and then click OK (Figure 4.54).

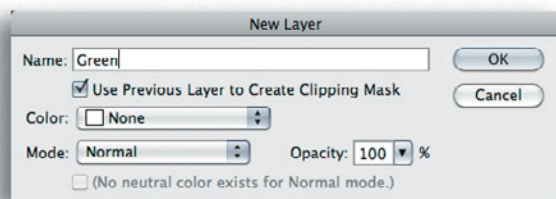
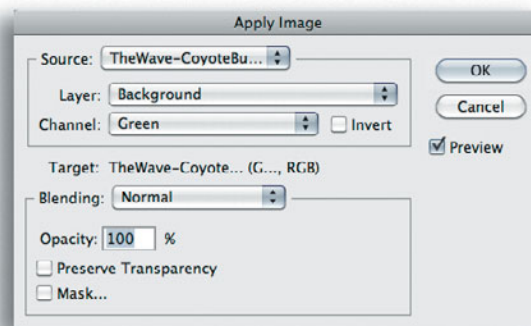


Figure 4.54

Use Layer Options to group the new Green layer with the Blue luminosity layer.

Now click Apply Image and select Background in the Layer field and Green in the Channel field and click OK. The Green channel will be applied to the empty layer and that layer, now constrained by the Blue luminosity layer, will replace the luminosity, and it will make the image appear as if it's back to normal. Now it's time to experiment with different apply modes to see what kind of effect we can have on the blue channel luminosity other than simply replacing it.



Linear Dodge (Add) apply mode lightens overall but maintains the contrast. It's too bright, so back off on the opacity to control the intensity of the effect (Figure 4.55). What's happening is that the Green layer is being applied to the Blue layer to brighten it, and the result is being applied to the original color in Luminosity mode—by using the Blue layer as a Clipping

Mask, we force the layers that are "grouped" above it to apply into the Blue layer and not independently over the whole image. This way we are only affecting the luminosity and not color, as would normally be the case if we didn't group the layers. We can build up multiple grouped layers to affect the luminosity layer in complex ways.

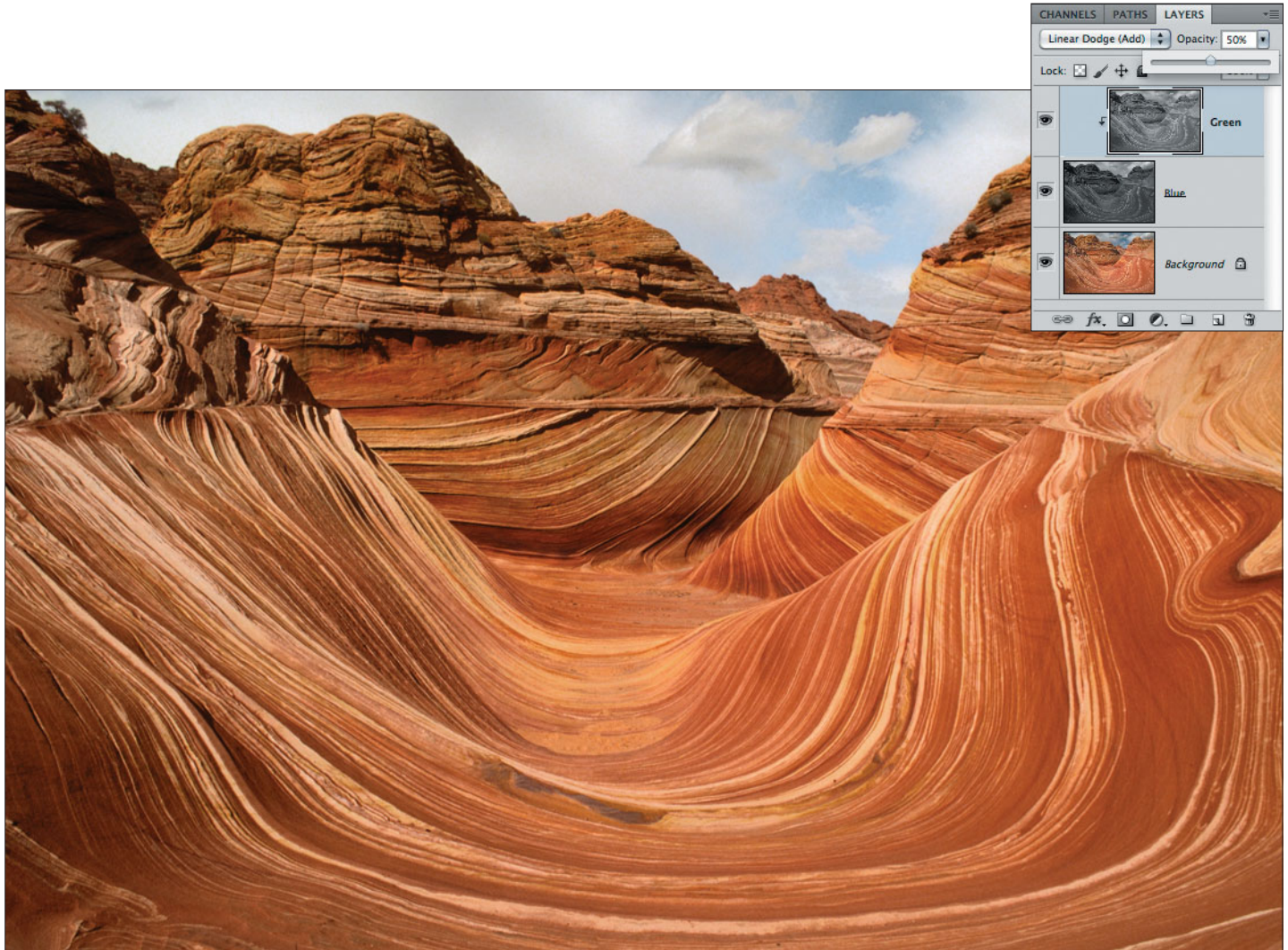


Figure 4.55

The Linear Dodge (Add) application of the Green layer to the Blue layer brightens the image without reducing the contrast.

I want to add just a little more contrast. Copy this last Green layer by dragging it onto the new layer icon at the bottom of the Layers panel. Now change the apply mode of this new grouped layer to Overlay—you'll see a boost in contrast! (Figure 4.56) At this point, you can adjust the opacity of the two Green layers to regulate the overall contrast in the red rocks to taste. The beauty of having these independent layers is that the effect can be adjusted and changed as the project progresses. Right now we've managed to make the rocks look very good but we've ruined the sky—it's all washed out!



Figure 4.56

The grouped layers have increased the contrast and tonal separation in the red rocks but also washed out the detail in the sky.

The remedy for this situation rests with the Red channel. Make another empty layer and group it with the underlying layers as before. Select Apply Image and grab the Red channel from the background for the Source (Figure 4.57). When the layer appears, change the apply mode to Darken—the detail in the sky returns (Figure 4.58).

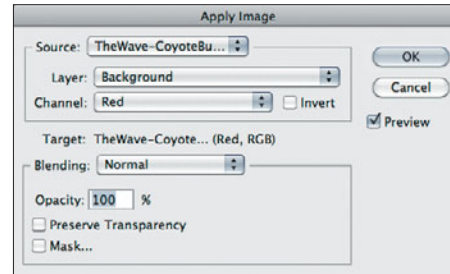


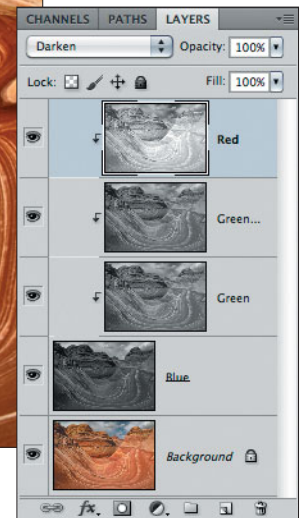
Figure 4.57

Apply the Red Channel from the Background to a new grouped empty layer.



Figure 4.58

Set the Red layer to Darken mode to restore the detail to the sky.



The Red channel is lighter everywhere except the sky, so when we use Darken, it only applies the values that are darker to the underlying layers. Now I'd like to add some contrast to the sky so it matches better with the rocks. Duplicate the Red layer, as we did before with the Green, and change the apply mode to Soft Light. This increases the contrast in the sky but it also lightens everything because Soft Light is similar to Overlay in that it will darken and lighten based on the deviation from middle gray. Since the Red layer is mostly lighter everywhere, it lightens the image. We only want to use the lighten portion of the Soft Light apply! To achieve this, select Blending Options from the Layer panel options flyaway or double-click in an empty area next to the layer thumbnail in the Layers panel. Push the white point slider in This Layer gradient of the Blend If section to the exact center (128) to hide the lightening portion of the Soft Light effect (Figure 4.59).

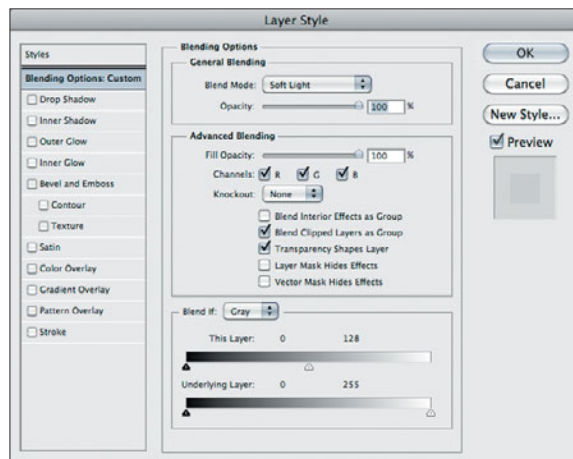


Figure 4.59

Hide the lightening effects of the Soft Light layer by using the Blend If slider in the Blending Options dialog.

Time to move on to color, and that means Lab. Duplicate the document (with merged layers) and convert to Lab. Duplicate the Background to a new layer and change the apply mode to Overlay, then call up Blending Options and uncheck the “L” channel to limit the Overlay effect to saturation. We end up with Figure 4.61—pass me the sunglasses!

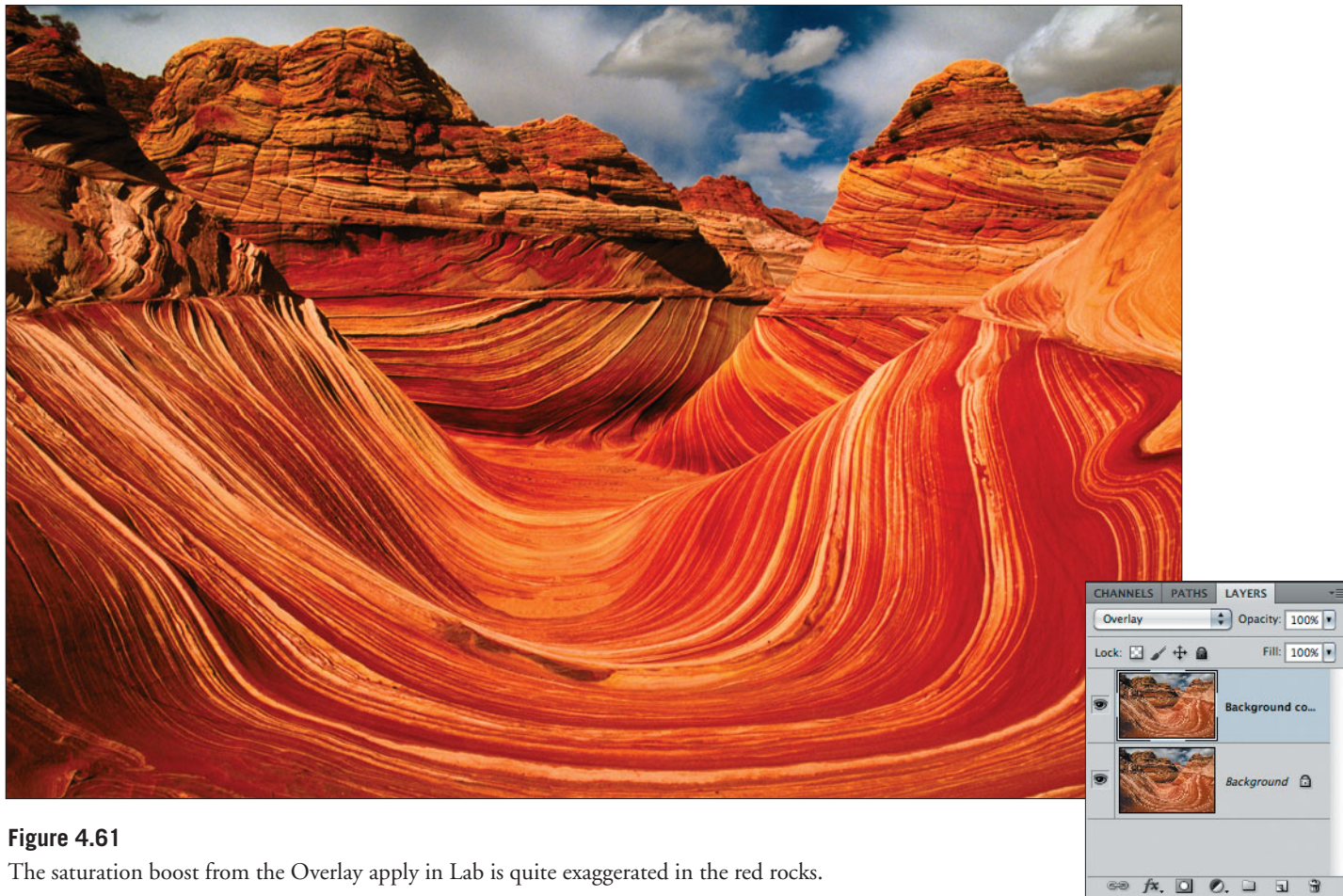


Figure 4.61

The saturation boost from the Overlay apply in Lab is quite exaggerated in the red rocks.

We can tame the reds with a Blending Options move. Call up Blending Options and change the Blend If drop-down to the “a” channel. Push the White point slider in from the right to the exact center (128) and then “split” the slider by Option/Alt-dragging the right half back to the right to bring back just a little of the red saturation (Figure 4.62).

We can add more saturation to just the blue by duplicating the layer again and doing something similar using the “b” channel slider in Blending Options (Figure 4.63).

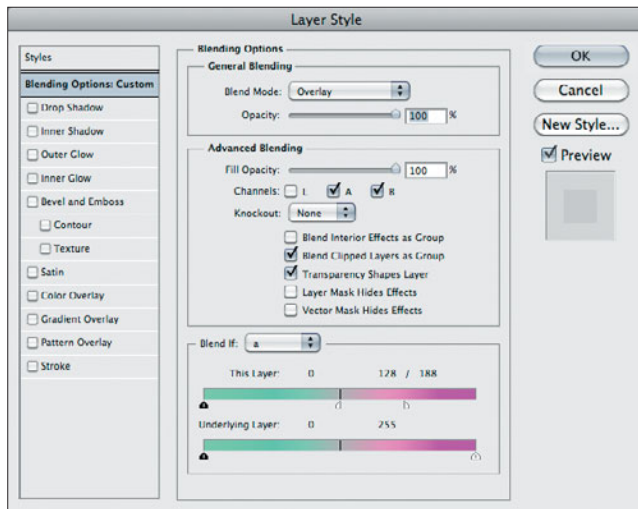


Figure 4.62

Use the Blend If sliders in the “a” channel to blend through the extra saturation in the Blending Options dialog.

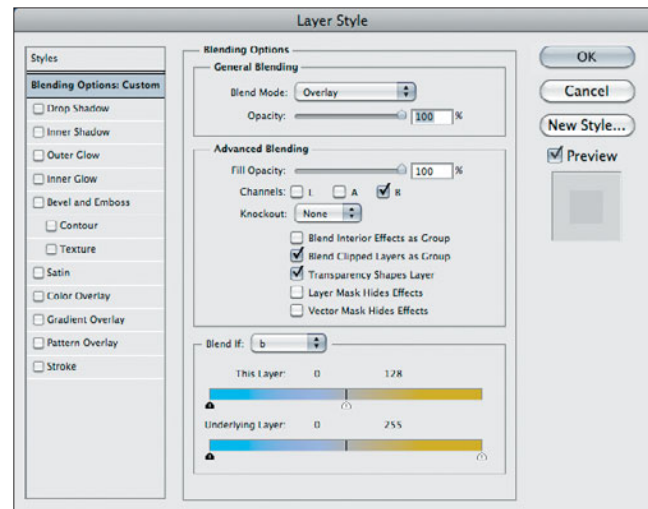


Figure 4.63

Limit the additional saturation from the extra Overlay using the Blend If slider in the “b” channel.

The final Lab document is ready to be flattened and brought back into the original RGB layers (Figure 4.64).

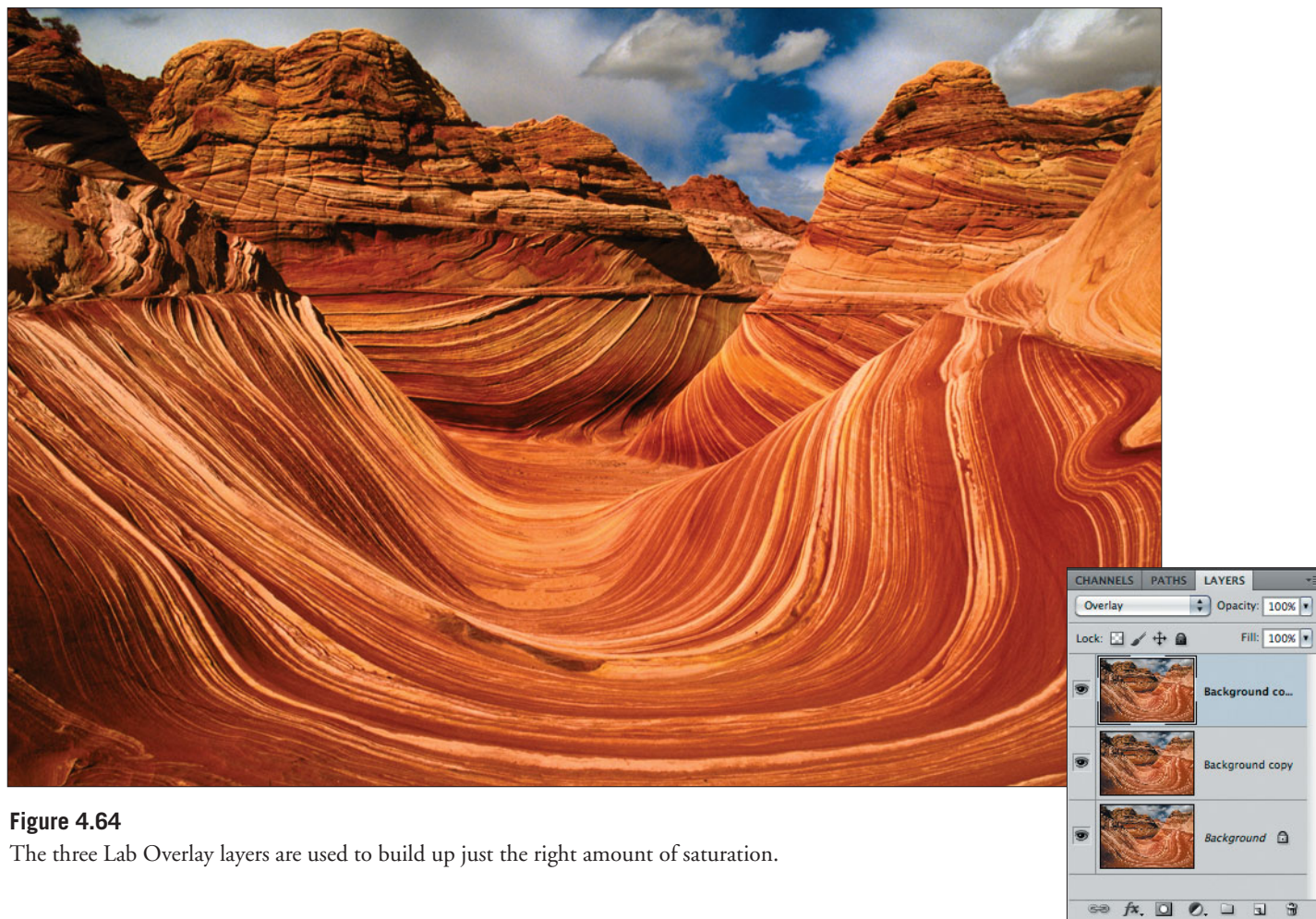


Figure 4.64

The three Lab Overlay layers are used to build up just the right amount of saturation.

Flatten and drag the Lab document, using the Move Tool, over the RGB document while holding down the Shift key. Make sure this new color layer is at the top of the layer stack and ungroup it by Option/Alt-clicking on the divider line between the layers. Then change the layer apply mode to Color. You can now adjust the opacity of this color layer or any of the underlying layers to affect the overall balance of color and contrast to taste (Figure 4.65).

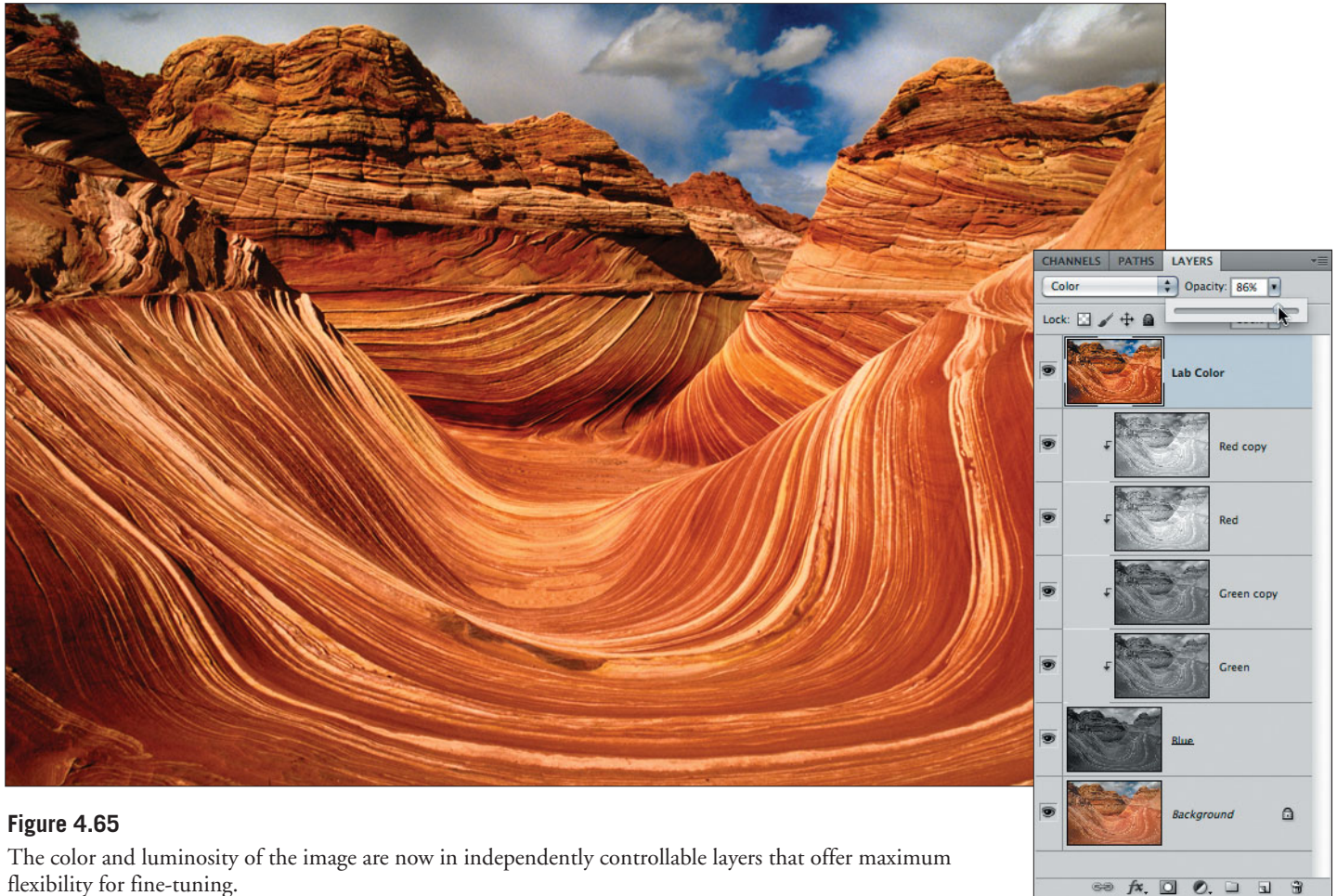


Figure 4.65

The color and luminosity of the image are now in independently controllable layers that offer maximum flexibility for fine-tuning.

There is only one more, subtle concept with an additional technique I'd like to offer here. At this point, if you use the Eyedropper to read RGB numbers for the dark shadows, you will find them high in red—a normal black point will be neutral, all channel values equal. This is a normal consequence of the lack of light—you will end up with less and less color as the value approaches black. Because we artificially boosted the saturation in this image we have too much color in the shadows. It will help the image look more natural if we can ramp off the saturation effect in the shadows. To do this, make a Solid Color adjustment layer by selecting from the adjustment layer icon at the bottom of the Layers panel—you will not find it in the Adjustments panel. Select a gray, zero saturation color from the resulting color picker (Figure 4.66). Click OK and the layer comes up and covers the image completely. At this point, you could change the apply mode to Color, but for now I'd like to leave it where it is to better illustrate how we will limit the application of this layer to the shadows.

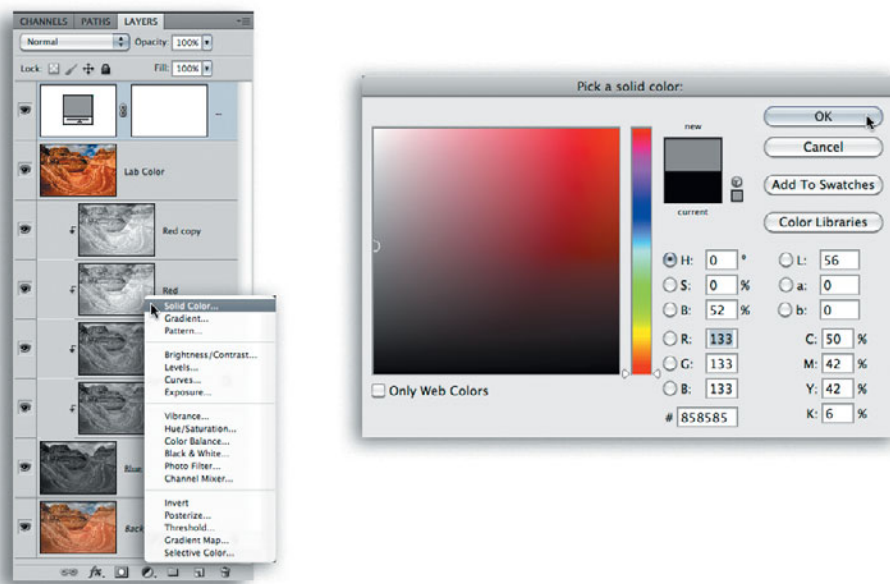


Figure 4.66

The Solid Color Adjustment layer will be used to reduce saturation in the shadows in the next step.

Call up the Blending Options dialog and slowly push the White point slider in the Underlying Layer gradient in the Blend If section towards the left. This will start to reveal more and more of the image. Stop when only the darkest shadows are still covered (Figure 4.67).

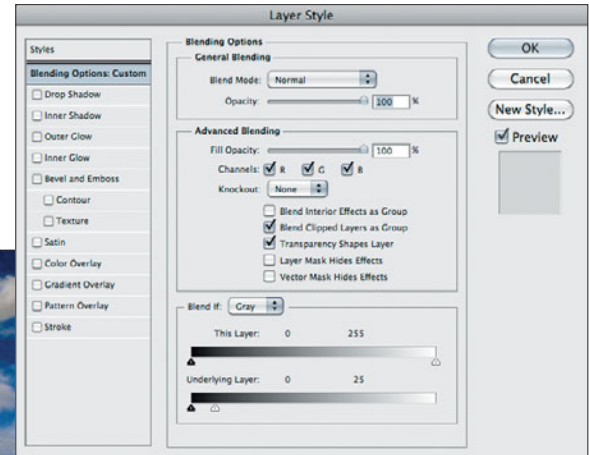


Figure 4.67

The gray color is blended using Blending Options until it only covers the darkest shadows.

Soften the harsh transition by “splitting” the slider—Option/Alt-drag the two halves apart (Figure 4.68).

Now change the layer apply mode to Color, and you will find that the shadows have become more neutral—you can adjust the extent of the desaturation to include more or less of the image and you can do something similar for the highlights as well using another gray solid color layer if you like. I chose to desaturate the clouds a bit for the final version in Figure 4.69. A final curve adjustment is used only to set appropriate endpoints and make minor adjustments to color.

Compare the version on the next page with the original in Figure 4.50! At first it might have seemed like very little was needed because the shot was pretty good the way it was. Again, as I said earlier, you never know how good an image can be unless you try to take it beyond what would be considered normal. Undoubtedly some people would say that these corrections are too colorful and/or too contrasty. It is a simple thing to blend two versions together to arrive at a compromise rendering if you decide that it has gone too far.

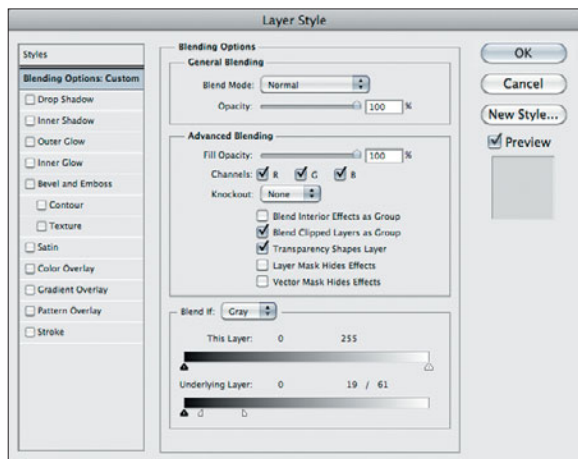


Figure 4.68

Soften the transition between the gray color and the image by splitting the slider apart.

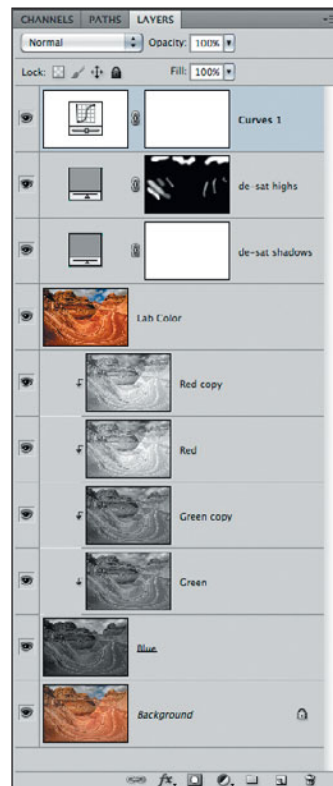


Figure 4.69a

Adjust the extent of the desaturation.

The beauty of this approach to correction is that it relies only on the structure of the image itself. Once the capture system is calibrated, images can be captured with a generous amount of information that can then be shaped to a tremendous extent utilizing the inherent channel structure of the image.

The application of the image against itself protects against posterization and banding because new values are calculated at every pixel position rather than having levels spread apart to force separation between tones when using a curve.



Figure 4.69b

The Final version with layers show enhanced contrast, 3D shape, and color.

Parting Shots

While space does not permit more step-by-step descriptions of this process, I can leave you with a few more before and after examples. More examples and step-by-step tutorials can be found on the website: www.varis.com/MasteringExposure.



Figure 4.70

Bridge—LA River Crossing, unadjusted. $f7.1 @ 1/50$, ISO 100

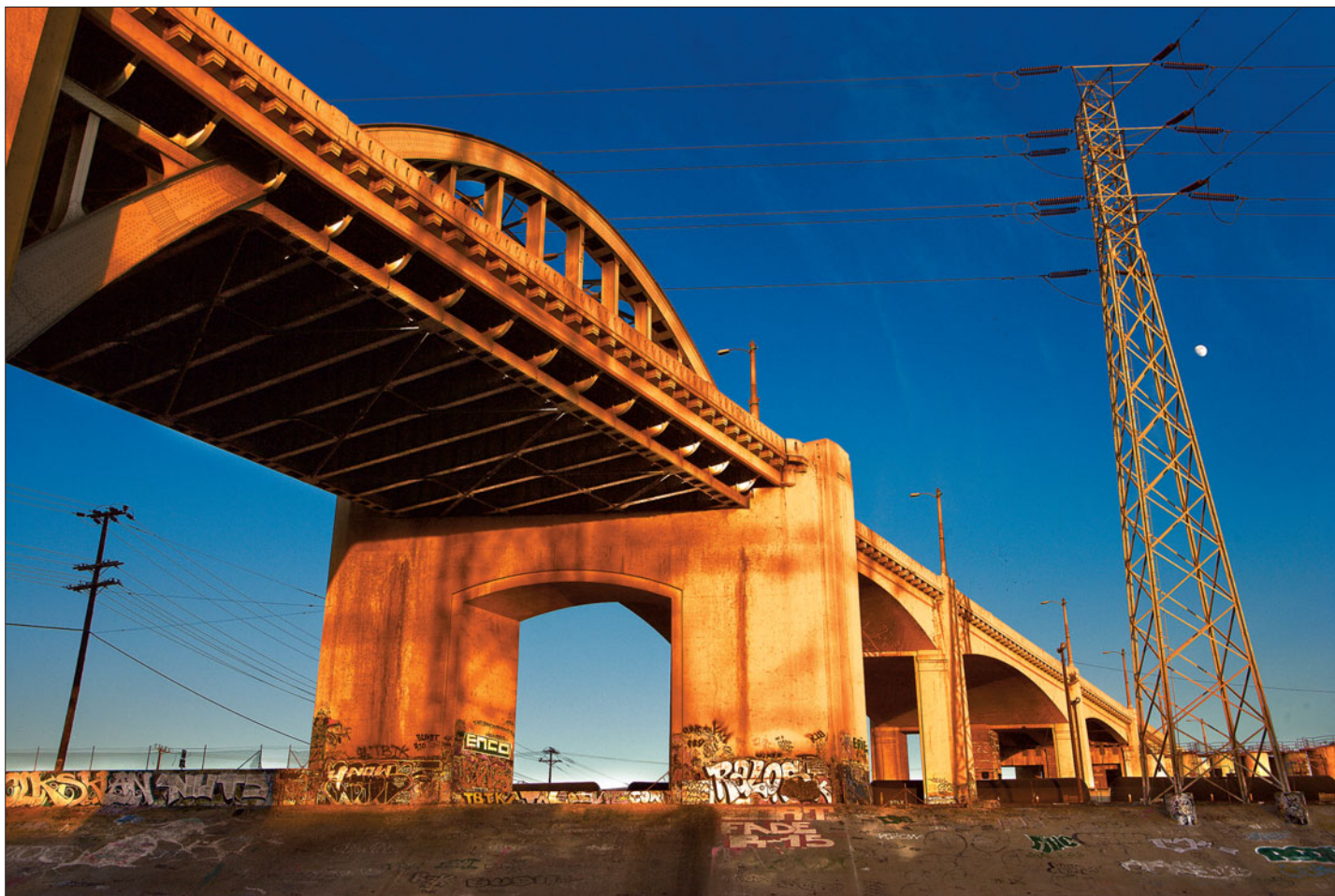


Figure 4.71

Luminosity Adjusted with Red, Green, Blue and inverted "b" channel—saturation in Lab.



Figure 4.72

Tide Rocks, Leo Carillo State
Beach, Calif., unadjusted.

f14 @ 1/40, ISO 100



Figure 4.73

Luminosity adjusted with Red, Green, Blue and inverted “b” channels, Blue channel mask—saturation in Lab.



Figure 4.74

Roadside Reeds, Sandusky Ohio, unadjusted. $f5.6 @ 1/100$, ISO 100



Figure 4.75

Luminosity adjusted with Green, Red, “b”, and inverted “a” channels, Blue channel mask—saturation in Lab.



Figure 4.76

Trees, Yosemite, Calif., unadjusted. $f2.8 @ 1/125$, ISO 100



Figure 4.77

Luminosity adjusted with Green and “b” channels, Channel Mixer shading—saturation in Lab.



Bridge at Sundown by Gary Coyne.

f4.5 @ 1/125, 1/30, & 1/8, ISO 100

HDR—The Fine Art of Cheating

There have been a number of technical innovations in photography over the past several years, but perhaps none is more game changing than HDR (High Dynamic Range) photography. The basic idea with High Dynamic Range photography is that you can take several exposures that will capture detail at various levels across a wide value range in a real-world image and combine all of them into a special HDR file. This file encodes the full range of tone detail from coal black shadows to bright backlit clouds, *plus* you have the ability to “tone map” all of these details into the more limited range of a paper print! As long as you can capture multiple exposures of your subject with no movement (or minimal movement) between shots, there is no longer any exposure problem and complete control over the rendering to print can be achieved long after the image has been captured.

We’ll look at the new HDR features of Photoshop CS5 as well as the mature HDR app Photomatix (<http://www.hdrsoft.com>). Both of these applications work with multiple exposures to build HDR files and tone map into a regular TIFF file for printing. Each application offers various controls with the tone mapping function with some overlap in capabilities, but each program also has subtle differences in rendering. The introduction of full tone mapping control in Photoshop CS5 means that HDR photography is entering the mainstream, and it is well worth the effort to learn about the HDR workflow as it has many benefits for the serious photographer.

Capturing HDR Images

The process for capturing HDR images is very simple. Basically, the photographer shoots a wide bracket (several exposures under and over a target “normal” exposure) and then chooses an appropriate selection of exposures to combine into an HDR file. Ideally, one should shoot from a tripod to minimize movement displacement between shots, but, if the shutter speed is fast enough, it is possible to shoot a 3-shot auto-bracket hand-held. Different cameras have different options for “bracketing” exposures, and in just about every case, you should select the widest bracket possible—it’s all about covering the widest dynamic range. If at all possible, it is desirable to capture more overexposures than underexposures because the typical image suffers more from loss of detail in the shadows. In most instances, a minimum of three exposures is needed for a good HDR file, but as many as ten exposures can be used. Try to arrange exposures to fall in even steps, that is, increment exposure evenly—every 1 f-stop or every 2 f-stops, etc. It usually works better for the HDR tone mapping if each exposure is evenly spaced from each other. It is helpful to have a light meter at the scene (even though you are bracketing exposures) to check to make sure you are exposing for adequate detail at the extremes. Another capture tip, for those times when you need to manually bracket exposures, is to set your camera’s exposure level increments to .5 stops instead of .3 (most often this is some kind of custom function setting in the camera). This makes it easier to “count clicks” to arrive at the bracket range you need for the scene.

This scene was shot at Rhyolite, a ghost town near Death Valley, California (Figure 5.1). While it didn’t present an extremely wide brightness range, it was a very high contrast scene with a very bright wall at the left that was giving a direct reflection off the sunlight striking it. I bracketed the exposure more to give myself some options than to create an HDR image. At a normal sunny 16 exposure (f16 @ 1/ISO) the wall came in around 1.5 stops brighter, and on my camera that put it up around zone VIII—this was mainly due to the angle of incidence effect of the sun position relative to the lens. I was concerned that I wouldn’t get enough texture into the wall if it was exposed that high so I opted to bracket 2 stops on either side. After evaluating the exposures I decided to try an HDR using these three exposure extremes.

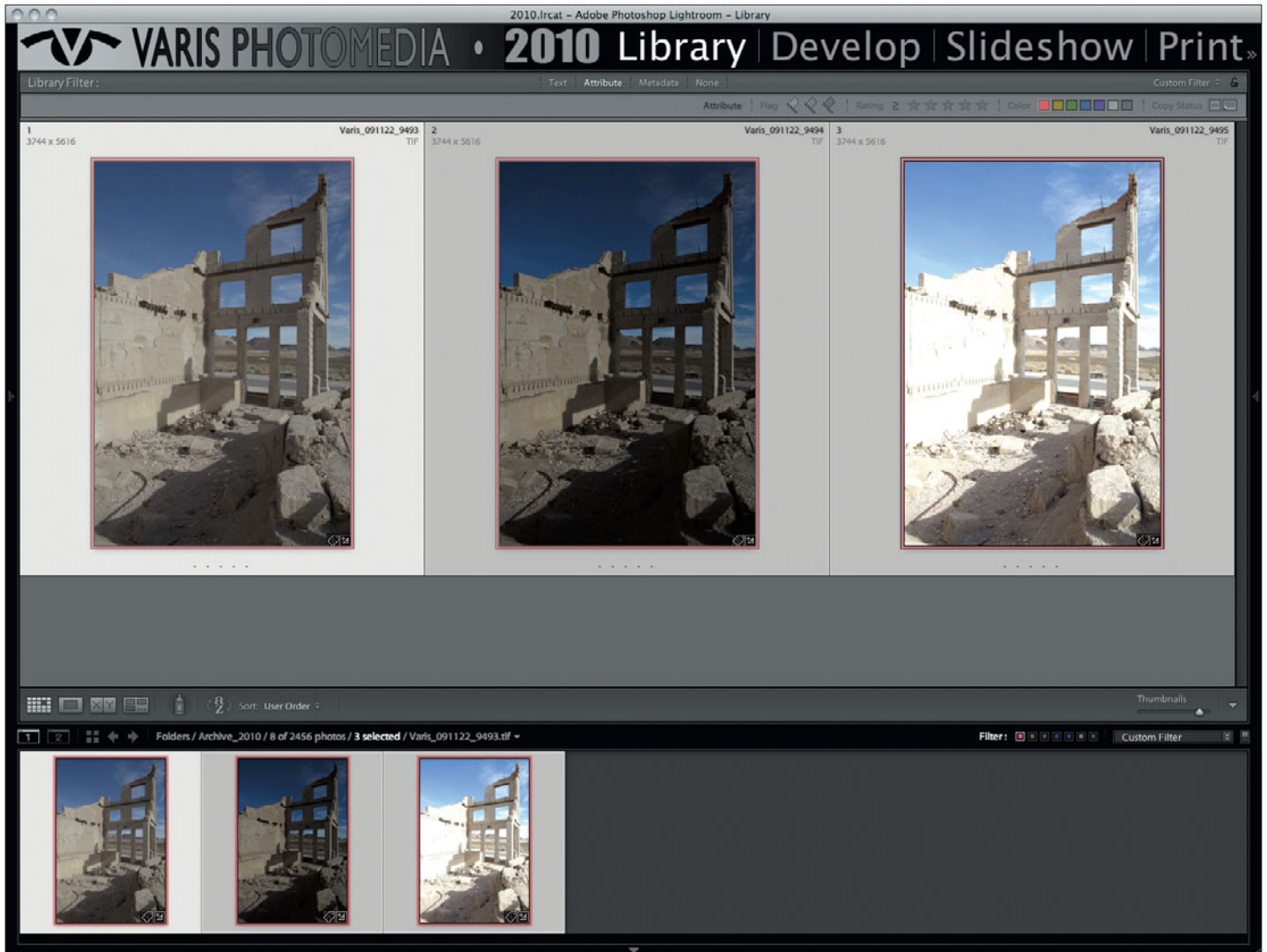


Figure 5.1

Wall at Rhyolite—three exposures are the starting point for an HDR image.

f10 @ 1/320, f10 @ 1/1250, and f10 @ 1/80, ISO 200

This image seemed to me to be all about texture! One of the features of HDR photography is the unique ability of HDR tone mapping to emphasize texture in a way that is hard to achieve using other methods. So, onward to HDR!

Select the three exposures in Lightroom and choose Photo ▶ Edit In ▶ Merge to HDR in Photoshop (Figure 5.2).

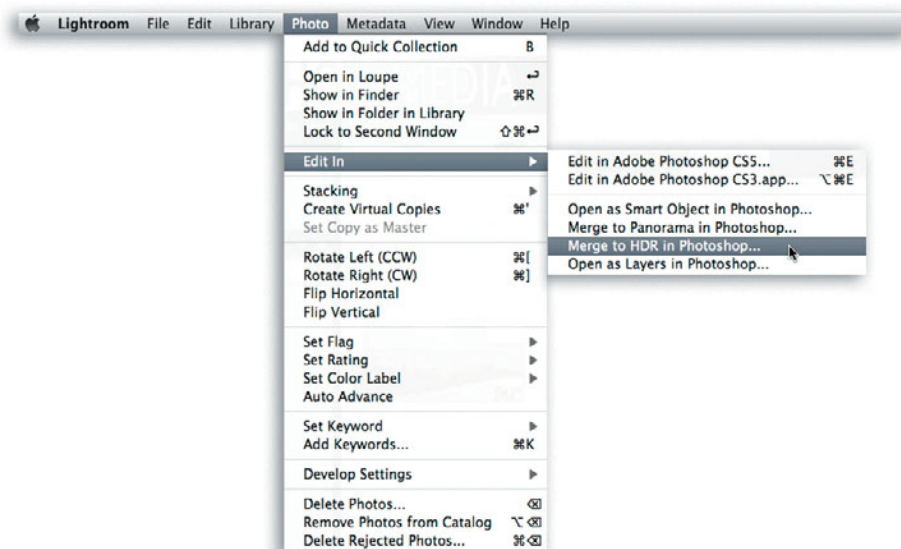


Figure 5.2

You can export directly out of Lightroom into Photoshop to build the HDR image.

Once you do this, you'll be presented with the Photoshop Merge to HDR Pro dialog (Figure 5.3). Normally, the dialog will open in the Local Adaptation mode—the other three modes are Equalize Histogram, Exposure and Gamma, and Highlight Compression, and can be accessed from the Mode drop-down menu. I haven't found these modes to be particularly useful, as they usually don't generate as nice an image to start with (Figures 5.4, 5.5, and 5.6).

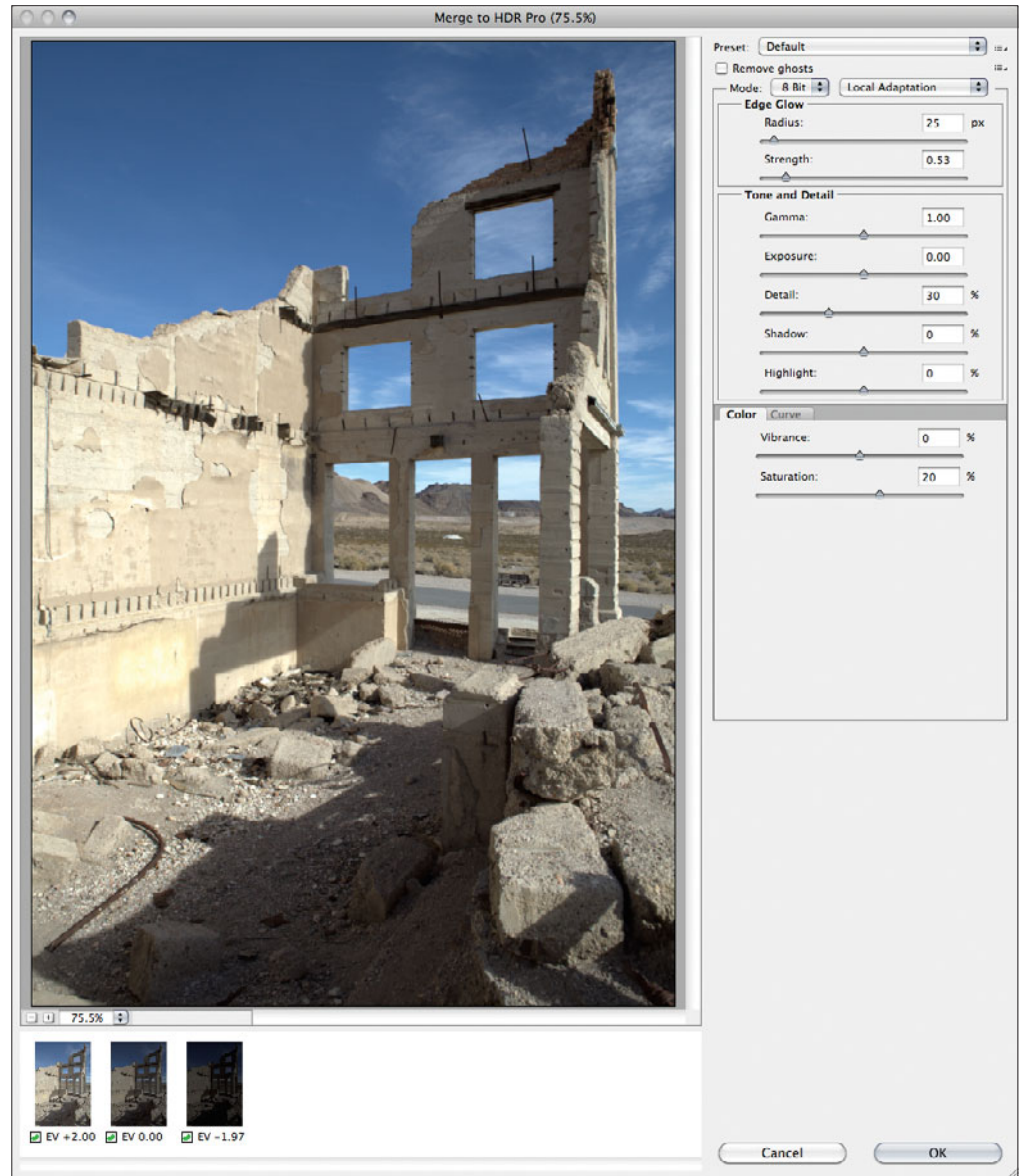


Figure 5.3

The Default view of the Merge to HDR Pro dialog.

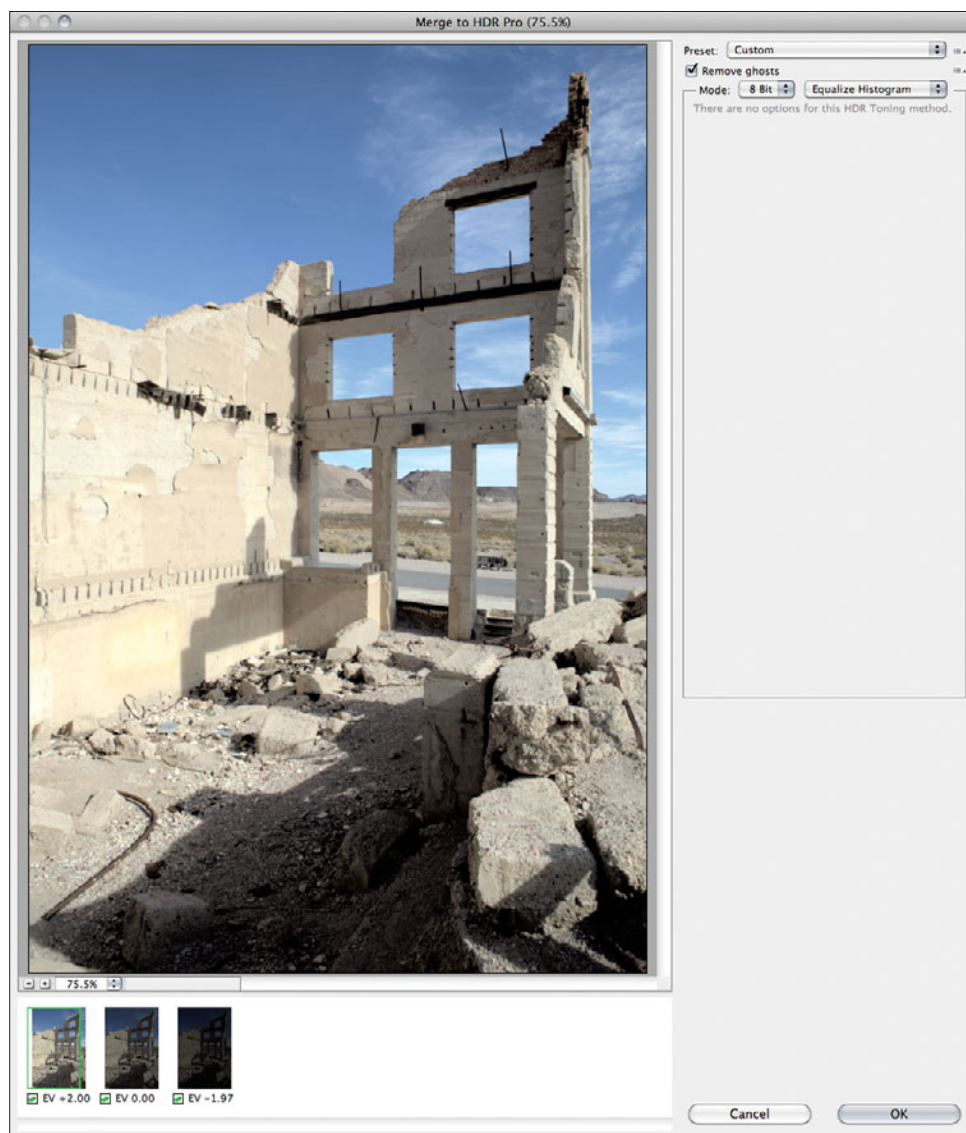


Figure 5.4
Equalize
Histogram
mode.

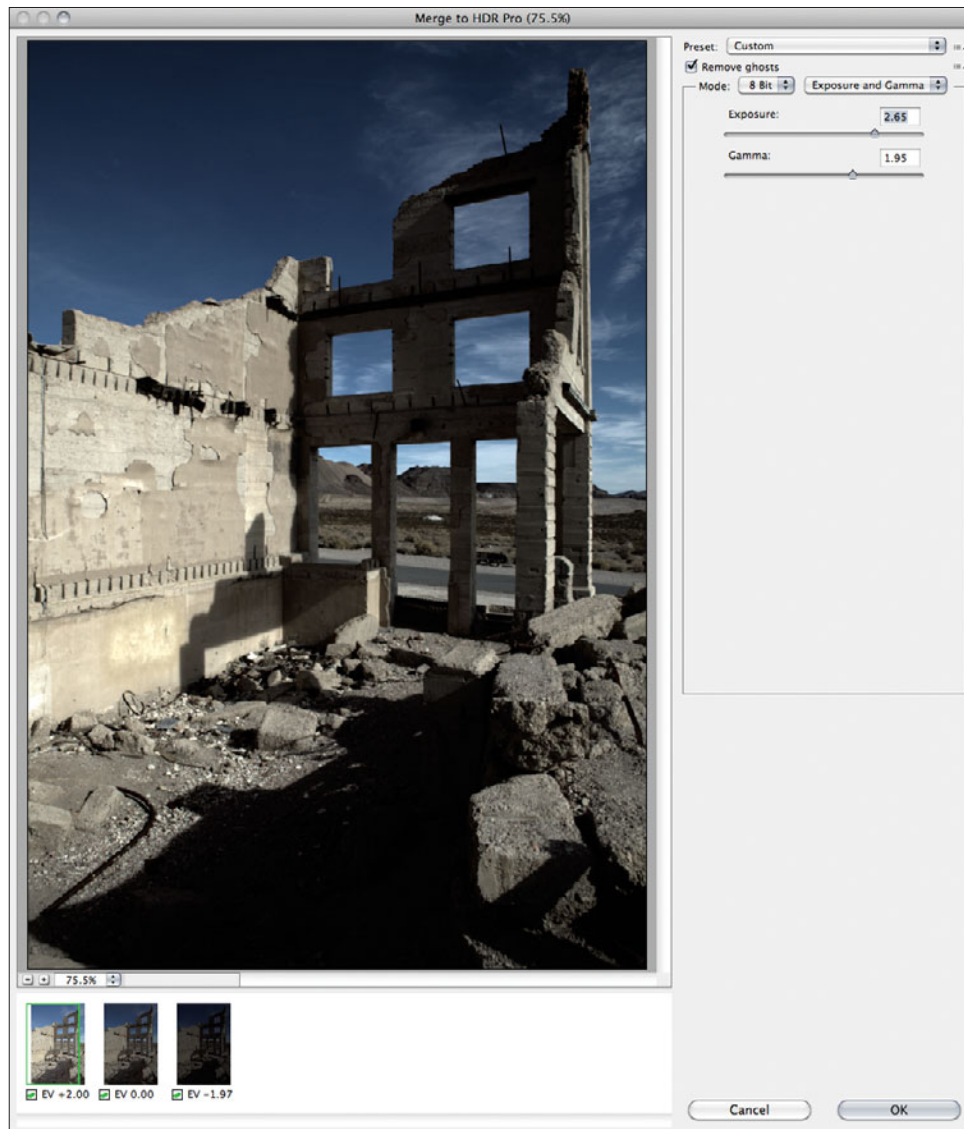


Figure 5.5
Exposure and
Gamma mode.

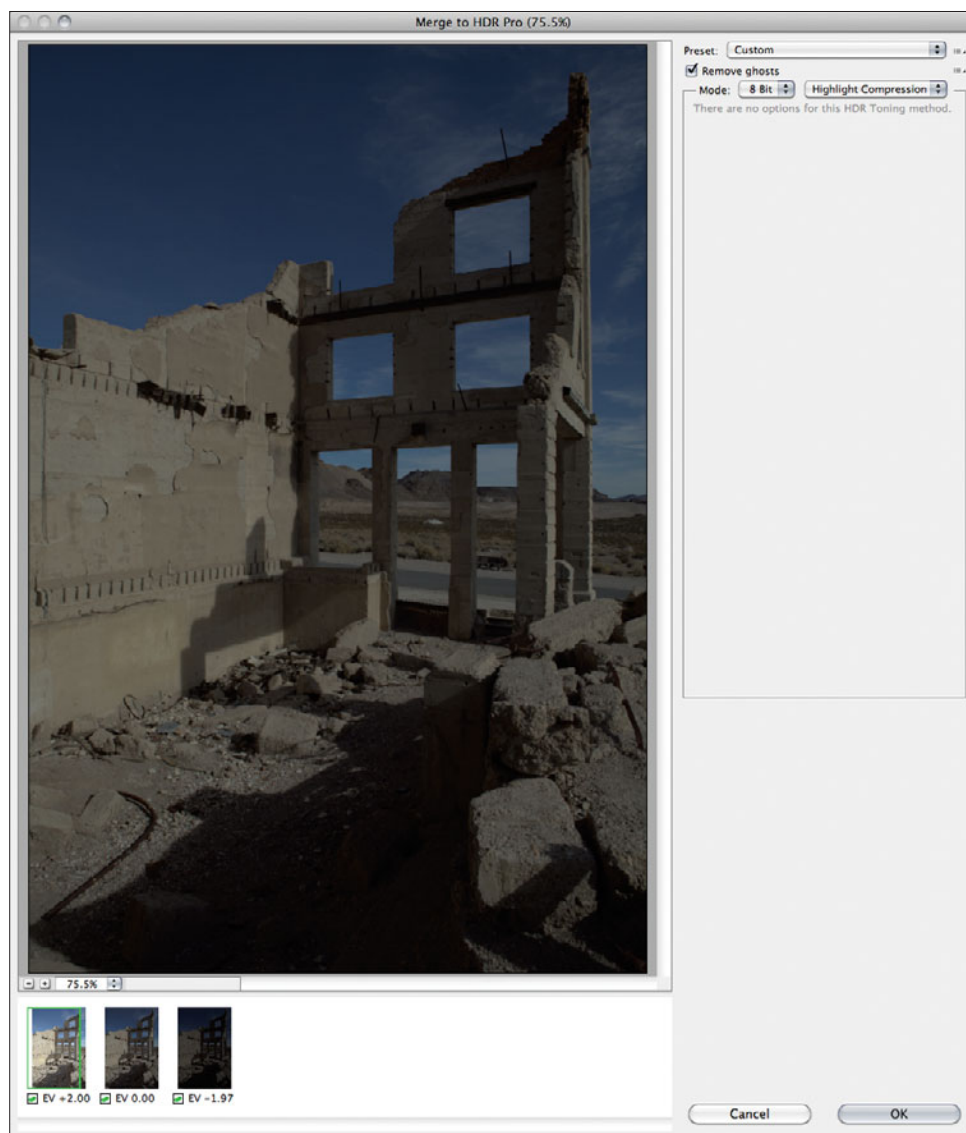


Figure 5.6
Highlight
Compression
mode.

Tone Mapping HDR images

Returning to the Local Adaptation mode, there are a number of presets available from the Preset menu at the top of the dialog—these range from basic settings like Photorealistic (Figure 5.7) to the more severe Surrealistic (Figure 5.8) and the downright bizarre Surrealistic Low Contrast (Figure 5.9). These presets are really just places to start experimenting because each scene will be affected in different ways by the various slider controls. The basic approach would be to pick something that looks close to what you're going for and start from there.

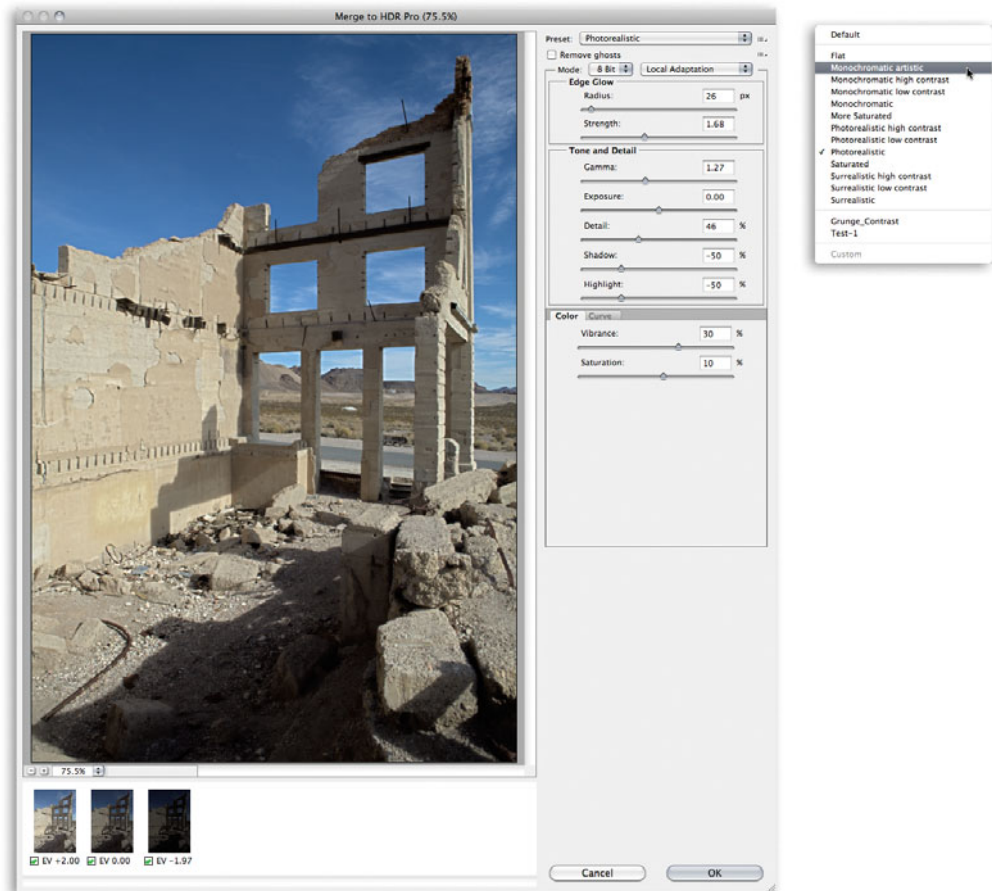


Figure 5.7

The Photorealistic preset, showing the drop-down menu for the other presets.

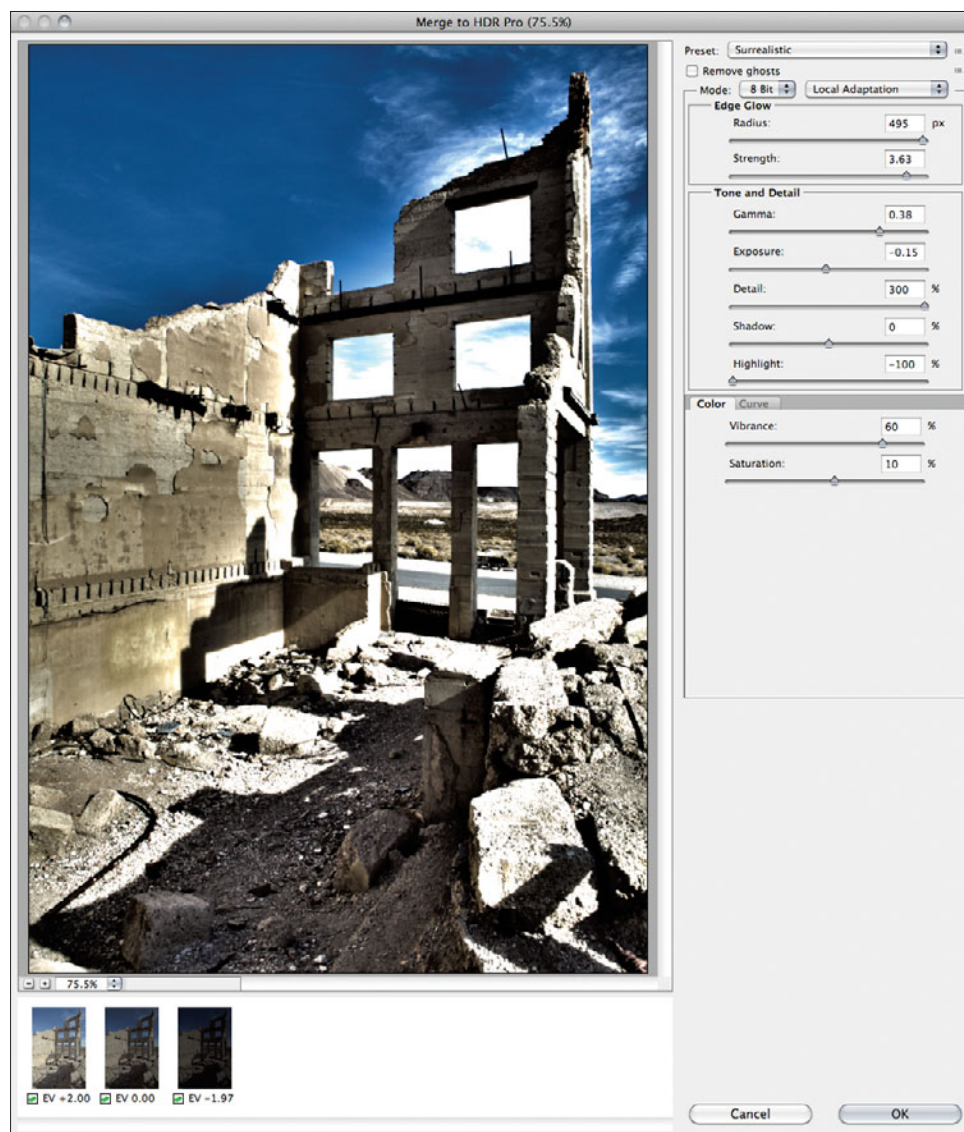
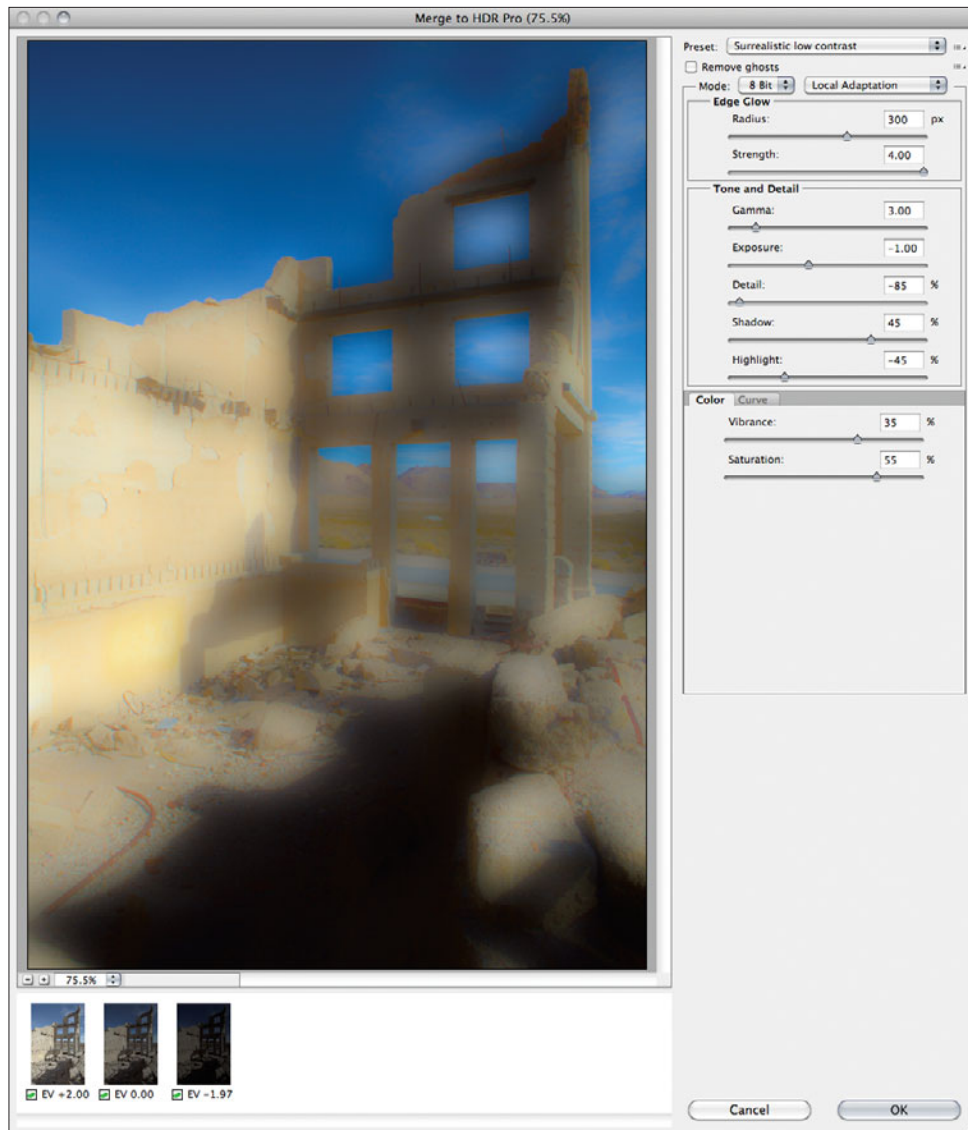


Figure 5.8

The Surrealistic preset is a starting place for the “grunge” contrast effect.

**Figure 5.9**

The Surrealistic Low Contrast preset offers a kind of impressionistic effect.

My intention for this image was to get to a photographic textured look that wasn't weird looking but a more "normal" photograph. To that end, I often find that it's better to generate a relatively "flat" version that can be enhanced in much the same way as one might do with a normal RAW file rendering. I therefore started with the Flat preset (Figure 5.10) and adjusted sliders to lower the highlight brightness and open up the shadows as well as boost the saturation a bit. This was achieved using the Gamma, Exposure, and Saturation sliders (Figure 5.11).

Note

I should mention here that there is a little checkbox under the preset menu called "Remove Ghosts"—you can see that it is checked in the screenshot. This checkbox instructs Photoshop to attempt to remove ghosting artifacts caused by "subtle" subject movement—in this image the clouds are moving slightly from one shot to the next. This adds a little bit to the processing time so if you know that you don't have any subject movement, don't check it (there is a similar feature in Photomatix).

The Detail slider enhanced the texture. Click on OK to open into Photoshop—next to Mode you can choose 8 bit, 16 bit or full HDR 32 bit, which preserves the editable HDR file. In this case I simply opened as a regular 8-bit file.

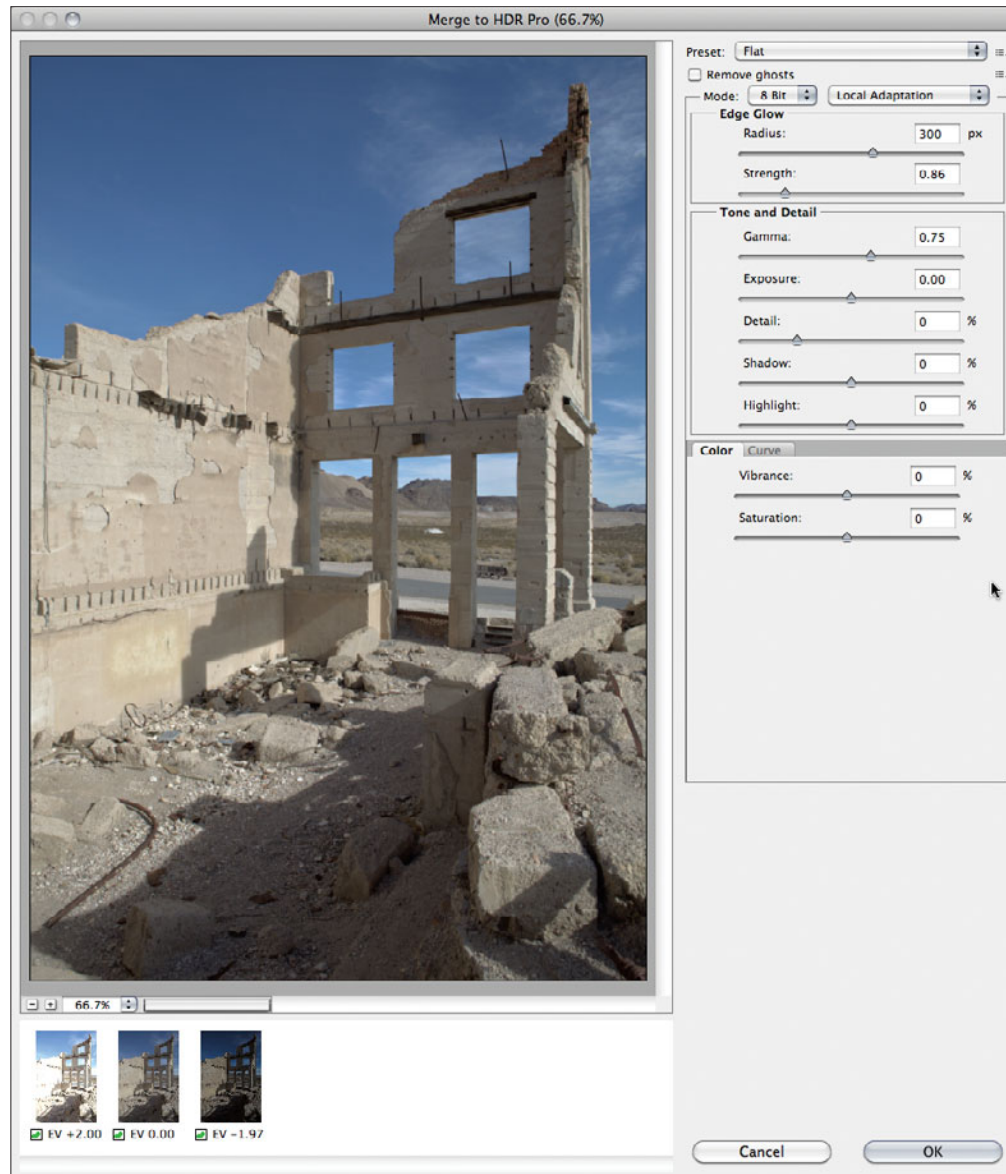


Figure 5.10
The Flat preset
is chosen for the
starting point.

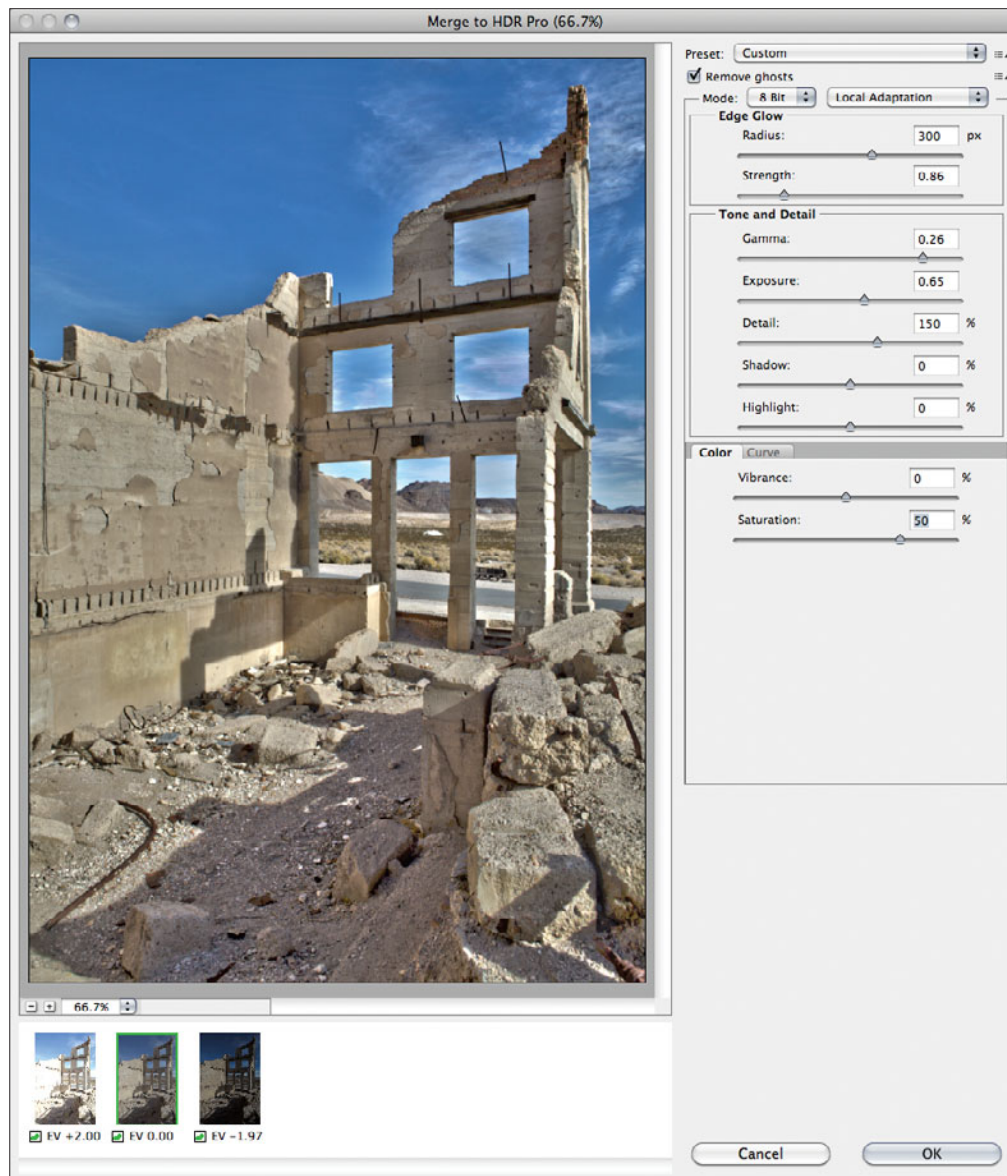


Figure 5.11
Sliders adjust
contrast, brightness,
and saturation.

Figure 5.12 shows the image as it enters Photoshop from the dialog. We can now use the same kind of luminosity and color enhancements introduced in the last chapter.



Figure 5.12

The image after tone mapping was applied in the Merge to HDR Pro dialog.

In Figure 5.13 the image has had channel luminosity and Lab color applied along with some high-pass sharpening to further enhance the texture. The HDR file allowed for a lot more detail to be brought into the highlights and shadows, but it was not used to render an impossible brightness range—more as an enhancement than an exposure solution.



Figure 5.13

Contrast and color enhancing moves were applied in Photoshop to arrive at this final result.

Let's now look at a real exposure problem and its HDR solution. Figure 5.14 is a classic image challenge that is best handled in HDR. This series of exposures covers an inside-outside challenge. This abandoned train car shot in Rhyolite combines the brightness range outside the windows with the shadowy interior and definitely requires extra exposures to cover the range.



Figure 5.14

This series of exposures begs for an HDR solution.

Starting this time with the Photorealistic preset (Figure 5.15) I adjusted the sliders to open up the shadow even more (Figure 5.16).

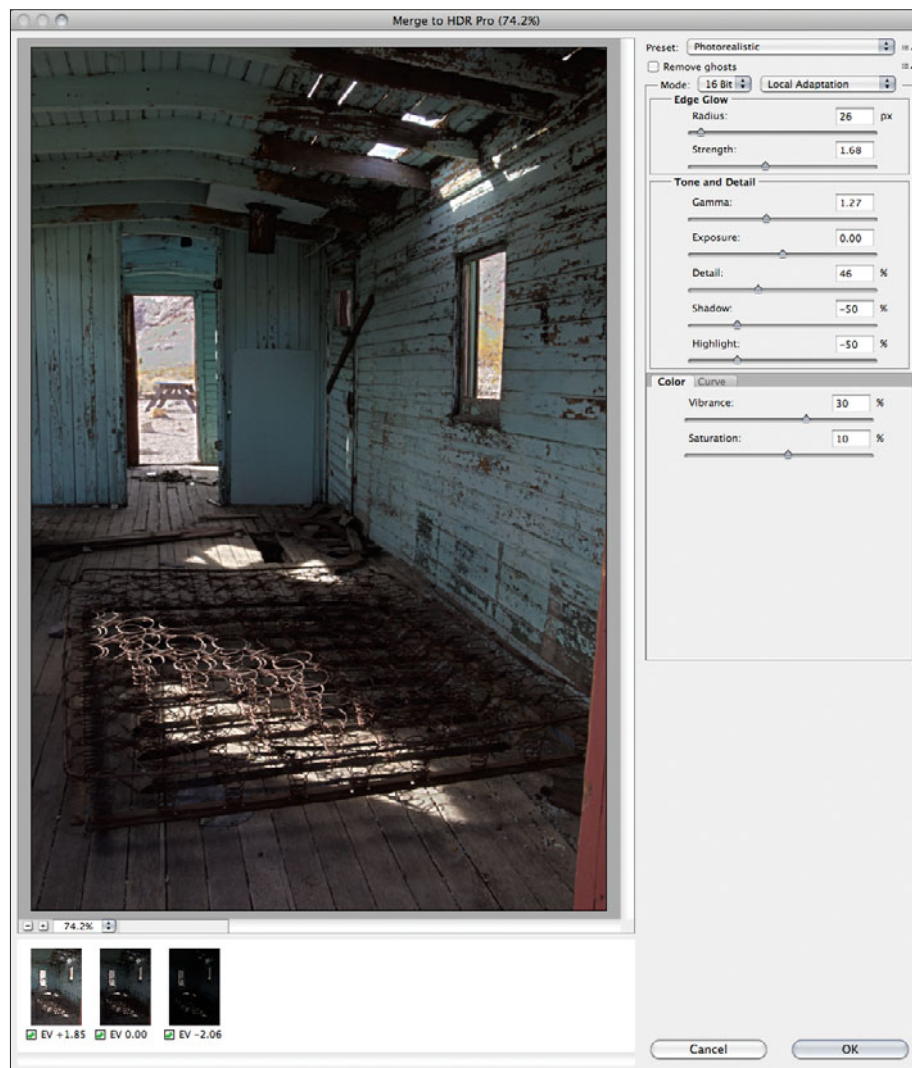
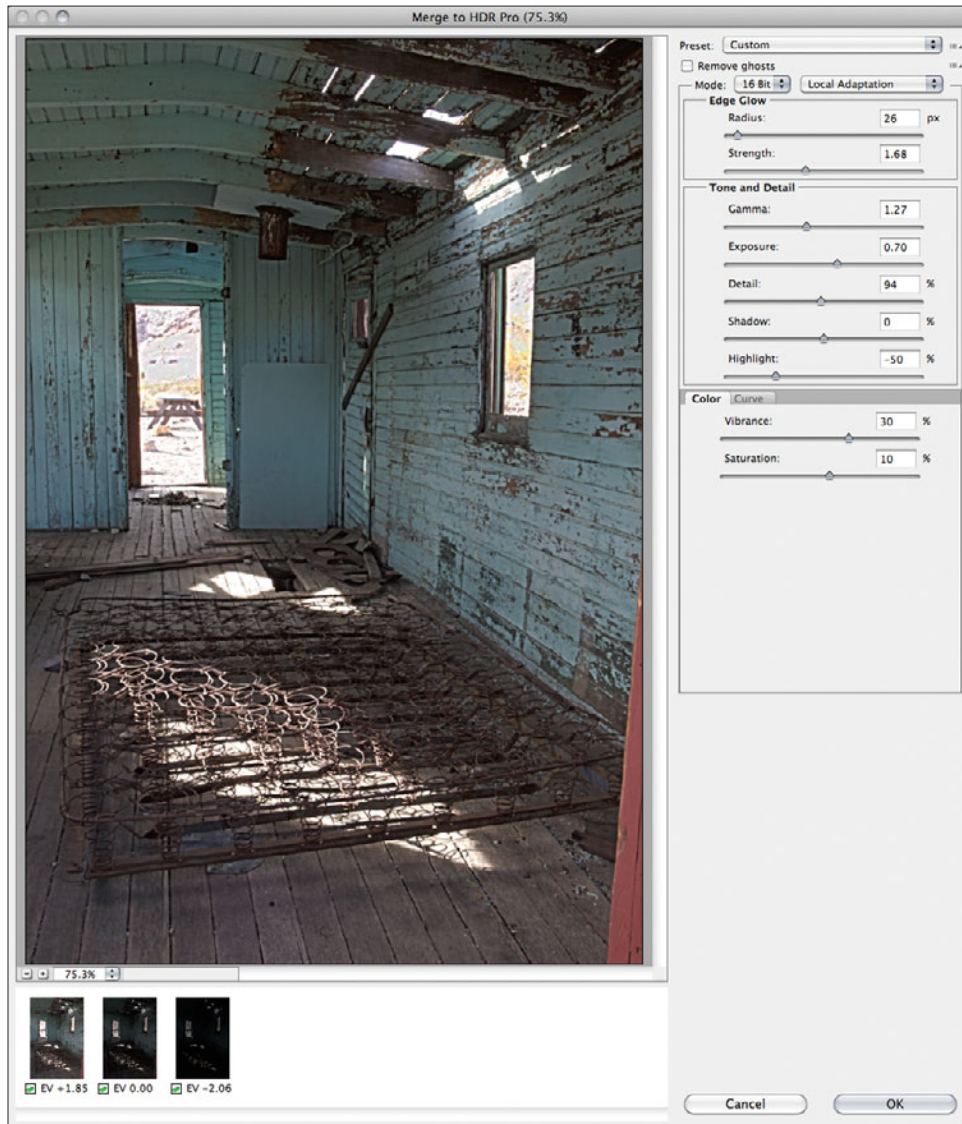


Figure 5.15

The starting point is the Photorealistic preset.

**Figure 5.16**

Sliders are adjusted for a fairly conservative version.

After processing this HDR file into Photoshop, I re-entered the dialog from Lightroom to generate a more radical version from the three original shots (Figure 5.17).

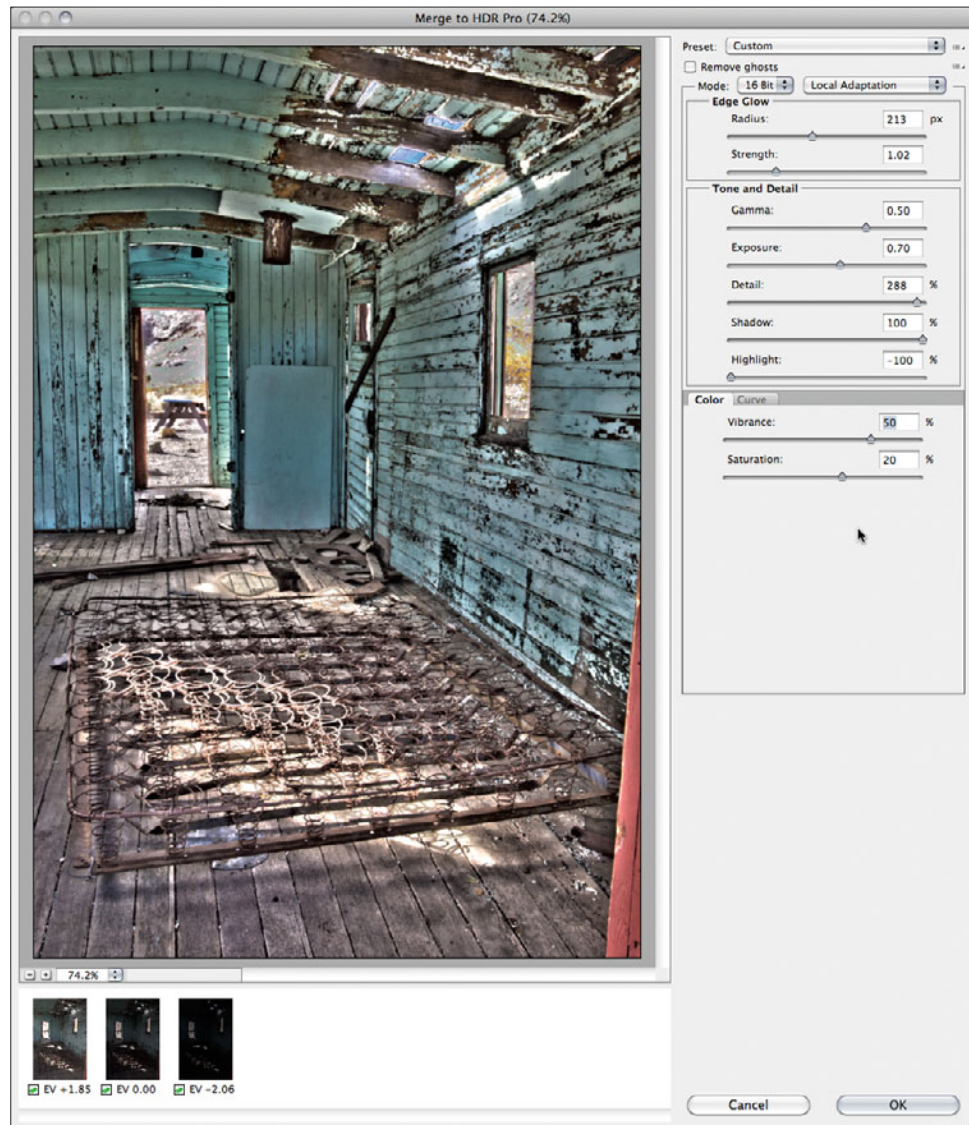


Figure 5.17

A more radical textured version is prepared.

This highly textured version exhibited some artifacts in the bright highlights on the floor of the interior. I decided to hide these artifacts by blending the two versions together using Photoshop Layers for the final image (Figure 5.18).

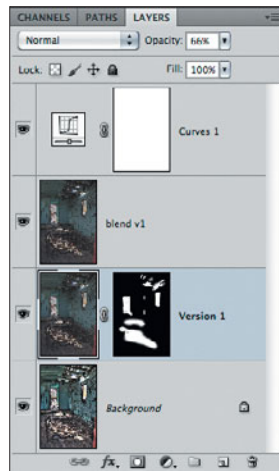


Figure 5.18

Both versions are combined in Photoshop layers to render the final version favoring the textured rendering but hiding the defects with the more conservative version.



I've been concentrating on the new HDR features of Photoshop but there are other applications that provide HDR creation and tone mapping—most notably Photomatix. Each application has strengths and weaknesses and they also produce slightly different results depending on the image. The next example shows a situation where Photomatix is a better solution than Photoshop. First, let's look at Photoshop HDR.

Figure 5.19 shows a series of interior shots that exhibit an extreme brightness range. The bracket is over a 6-stop range! Opening into Merge to HDR Pro in Photoshop, the rendering I'm looking for produces Mackie lines (posterized edge lines) around the window light hitting the floor (Figure 5.20). We could retouch this or blend it with a more conservative version but, instead, let's see what we can do in Photomatix. Photomatix is a stand-alone application that provides full HDR tone mapping capabilities—it also has a convenient export plug-in for Lightroom as well as a plug-in for Photoshop. We will export directly from Lightroom (assuming you've installed the export plug-in for Photomatix, select: File > Export with Preset > Photomatix Pro) (Figure 5.21). The Export dialog allows you to set up the parameters for the HDR file and allows an option to automatically re-import back into Lightroom.

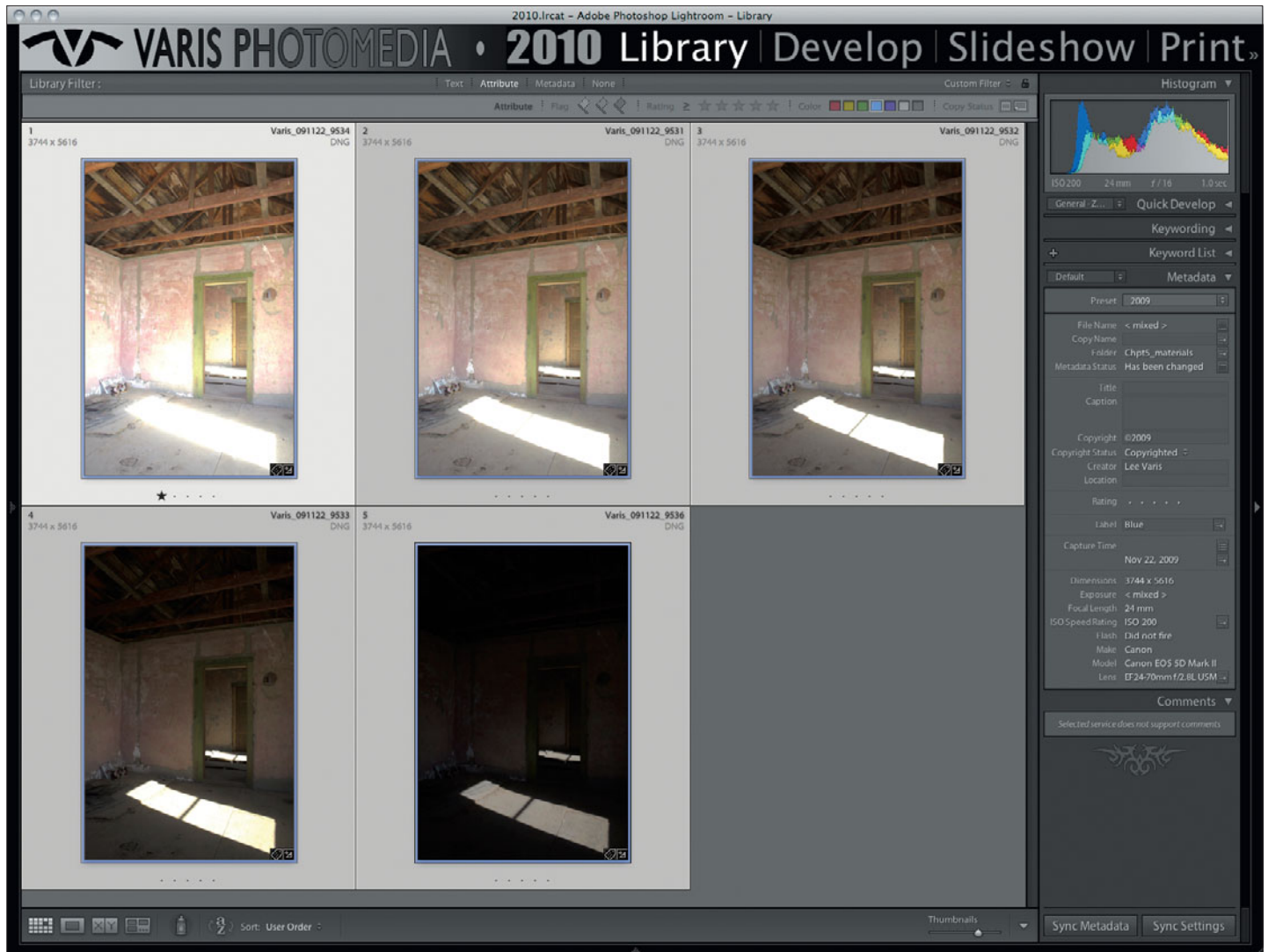
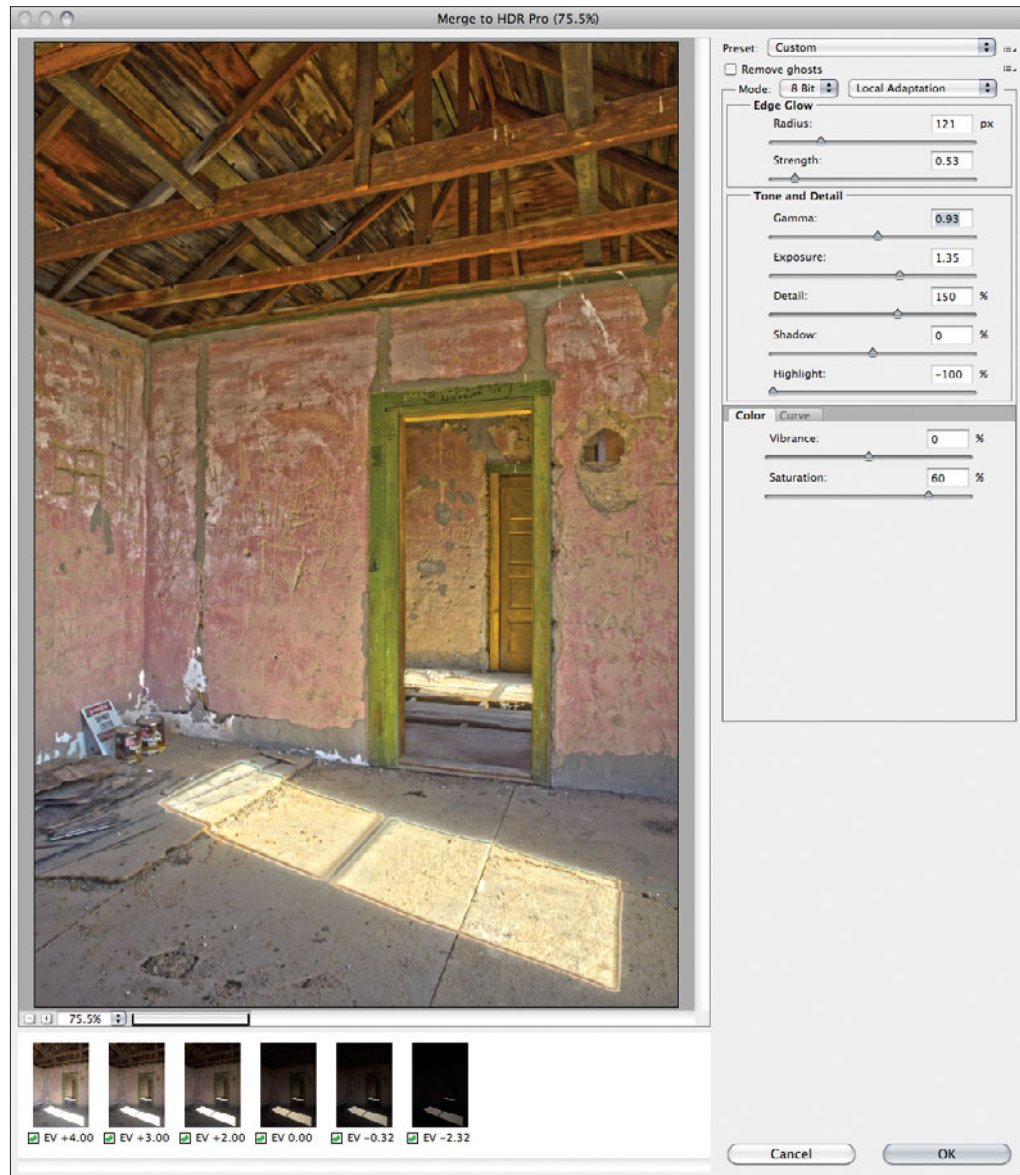


Figure 5.19

This series of 6 exposures covers the extreme brightness range of the scene.

**Figure 5.20**

The Photoshop HDR tone mapping produces some edge artifacts in this particular image mapping.

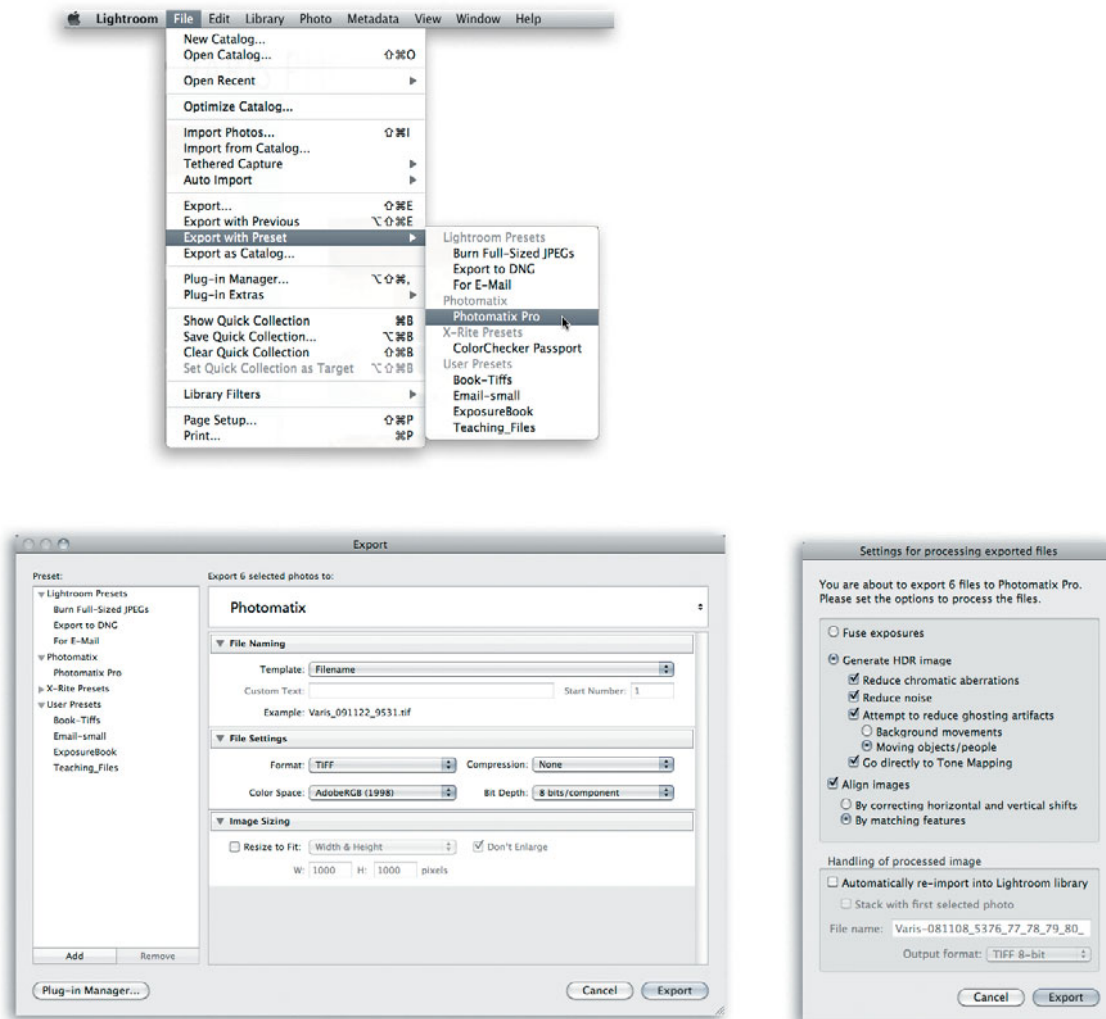


Figure 5.21

The Photomatix export plug-in allows you to export directly into Photomatix from Lightroom.

The Photomatix tone-mapping interface is more complex than Photoshop with many more sliders with less intuitive functions but, despite this, a little experimentation yields good results. Similar to Photoshop, Photomatix can generate conservative naturalistic renderings (Figure 5.22) or extremely textured dimensional renderings (Figure 5.23).

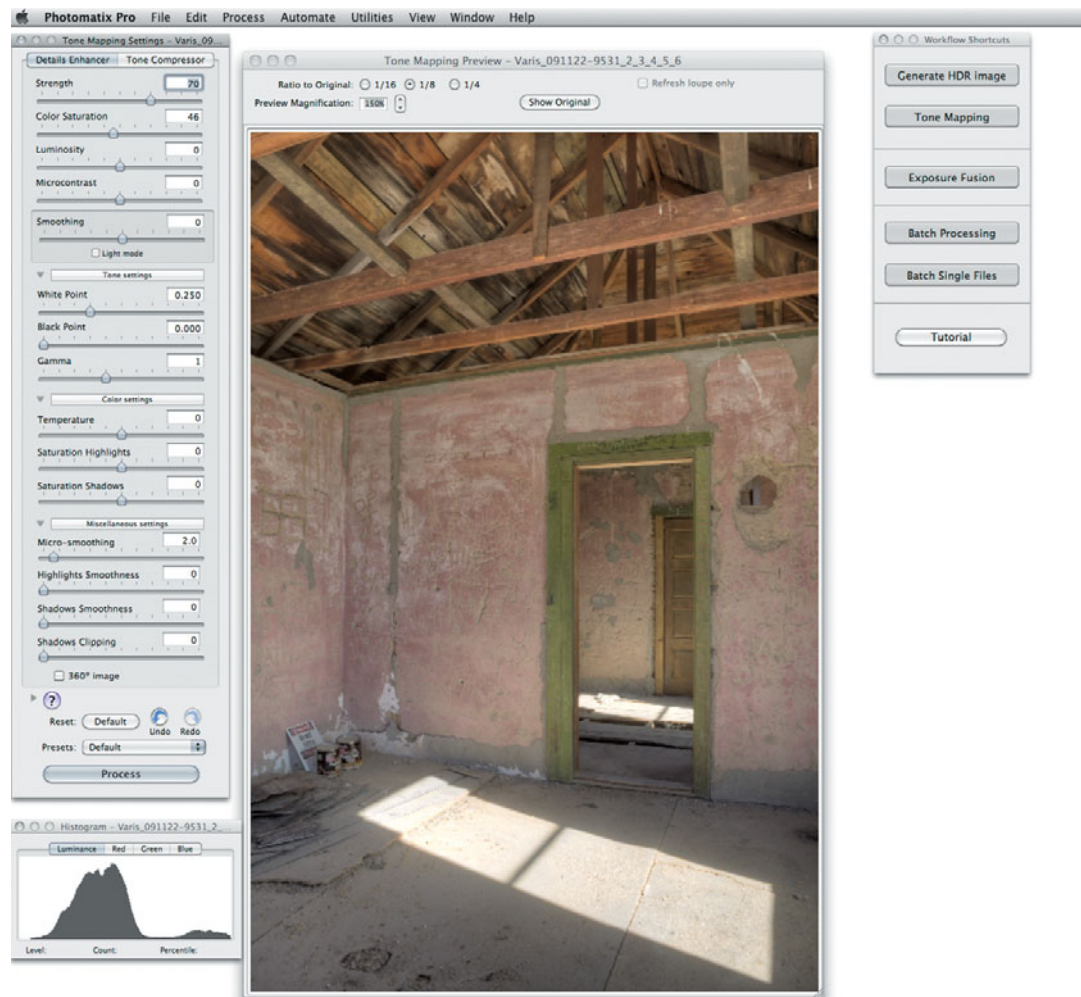


Figure 5.22

Photomatix is capable of naturalistic renderings much as Photoshop is.

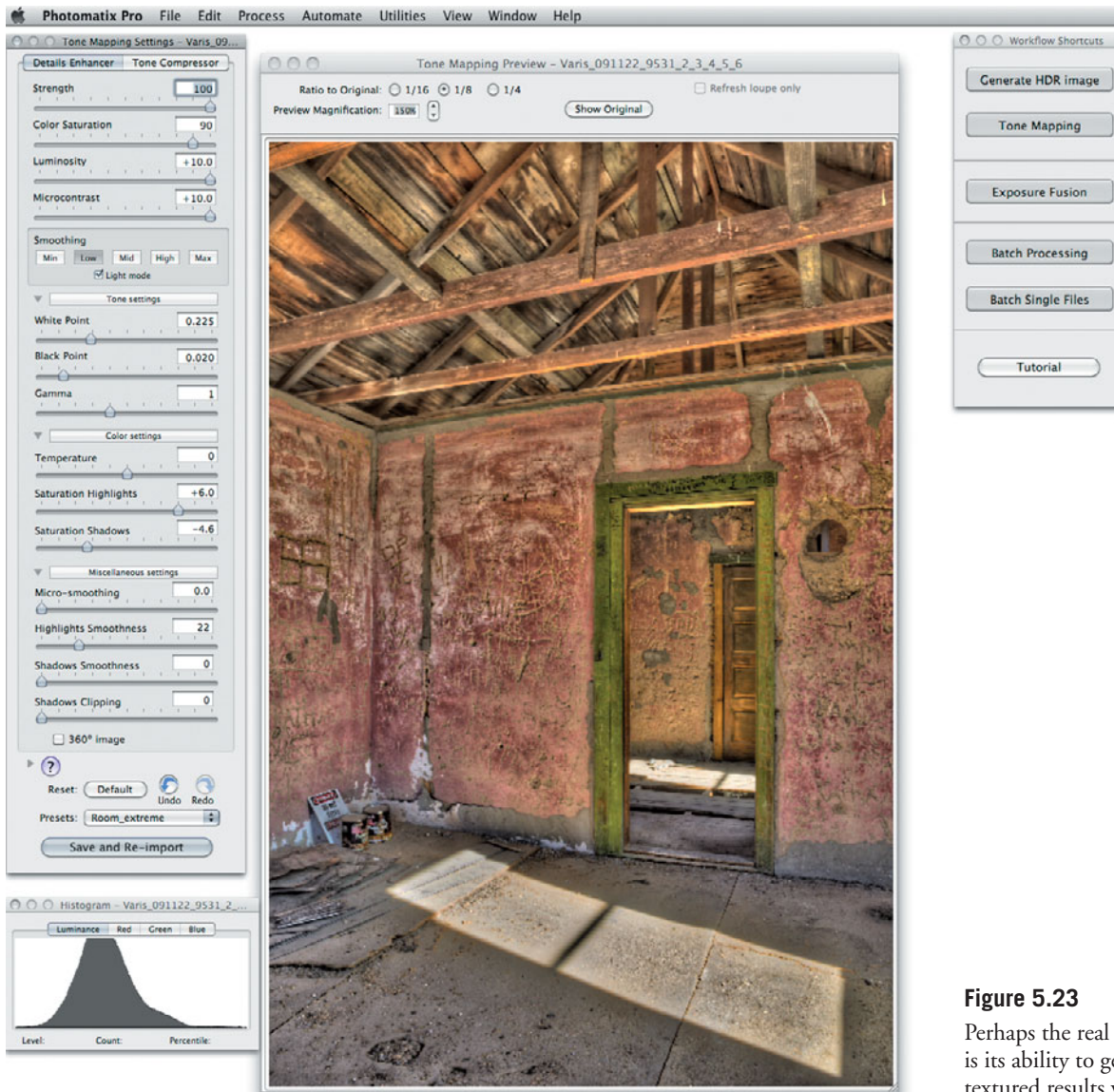


Figure 5.23

Perhaps the real strength of Photomatix is its ability to generate extremely textured results without bad artifacts.

The final image is also a blend between the two versions with some luminosity enhancements in Photoshop (Figure 5.24).



Figure 5.24

The final version is a blend between a conservative version and a more natural rendering yet still revealing lots of texture and detail in all areas.



Extreme Contrast and Detail

A final example of an extreme dynamic range scene with three different renderings starts with these six exposures in a boatyard machine shop (Figure 5.25). Here the interior is very dark; there are no splashes of light, but we look out at a bright sunlight exterior and somehow we have to balance both in a way that makes visual sense and still conveys the quality of light.

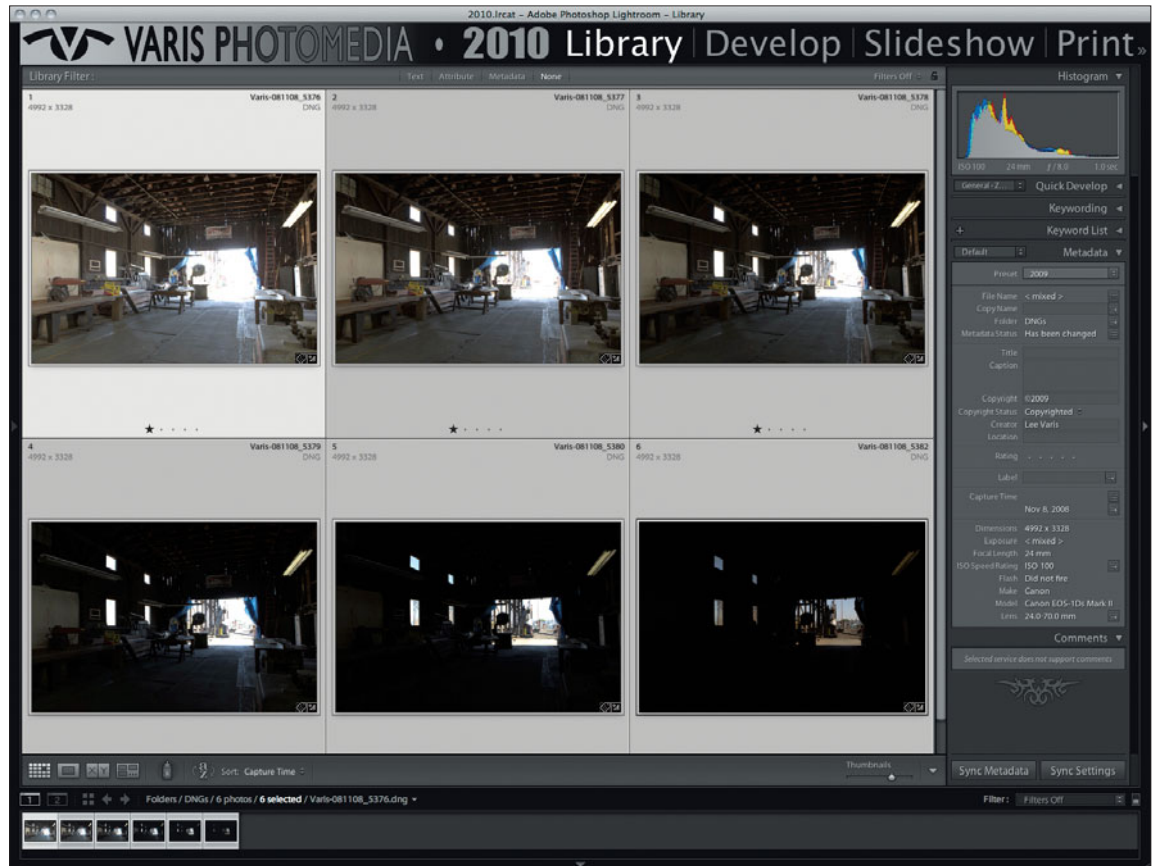


Figure 5.25

The boatyard machine shop scene—the full dynamic range captured with six exposures.

First, Photoshop—my default strategy is to start with a relatively flat rendering (Figure 5.26) and build contrast through luminosity blending, Lab, and other layer tricks (Figure 5.27).

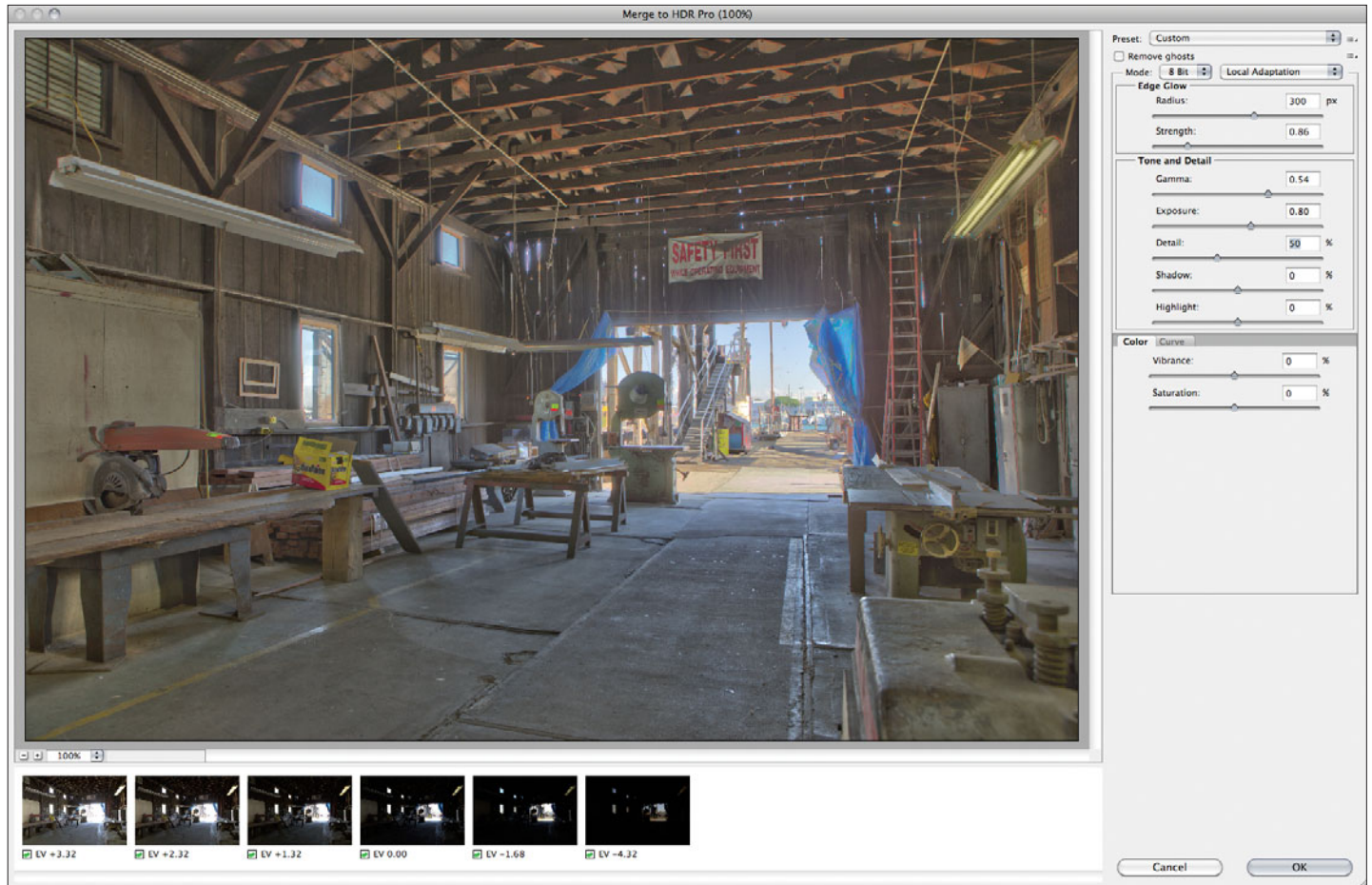


Figure 5.26
Photoshop HDR with conservative settings.



Figure 5.27

The final Photoshop HDR version utilizes luminosity blends from a CMYK black channel as well as Lab color and Overlay contrast layers.

Next, Photomatix—the same approach but different software gives a softer starting place, but it easily builds into Figure 5.28 with Photoshop adjustments. Finally, a more severe Photomatix rendering with minimal Photoshop work ends up as Figure 5.29. Three different looks for the same scene—which one is your favorite?



Figure 5.28

Starting from Photomatix HDR, this version uses multiple Overlay contrast layers as well as a saturation boost in Lab, plus shadow desaturation to create the final effect.



Figure 5.29

This final Photomatix version uses more extreme tone mapping texture with minimal Photoshop work.

While it is beyond the scope of this book to provide detailed tutorials for HDR in Photoshop and Photomatix, I will have PDF tutorials and videos showing the complete HDR process with this image on the website: www.varis.com/masteringexposure.

Experimental HDR

The final example is more of an experimental application of HDR tone mapping with multiple exposures capturing different light sources separately within the same scene. I made this series of exposures while wandering around in my garden at night. The individual shots were illuminated with a flashlight (often waving it around like a madman) using very slow shutter speeds around 8 to 16 seconds long. The resulting files are all pretty seriously underexposed (Figure 5.30). I was originally going to screen these images together in a simple layer stack, but the noise in the shadows ended up being too severe so I was ready to toss them out and start over. Then I thought I'd see what HDR tone mapping would do so I brought them into Photoshop and used Merge to HDR Pro with a Photorealistic preset to get Figure 5.31. There is almost no visible noise in the tone mapped image and brightness and detail is present everywhere even though most areas of the individual shots are very dark!

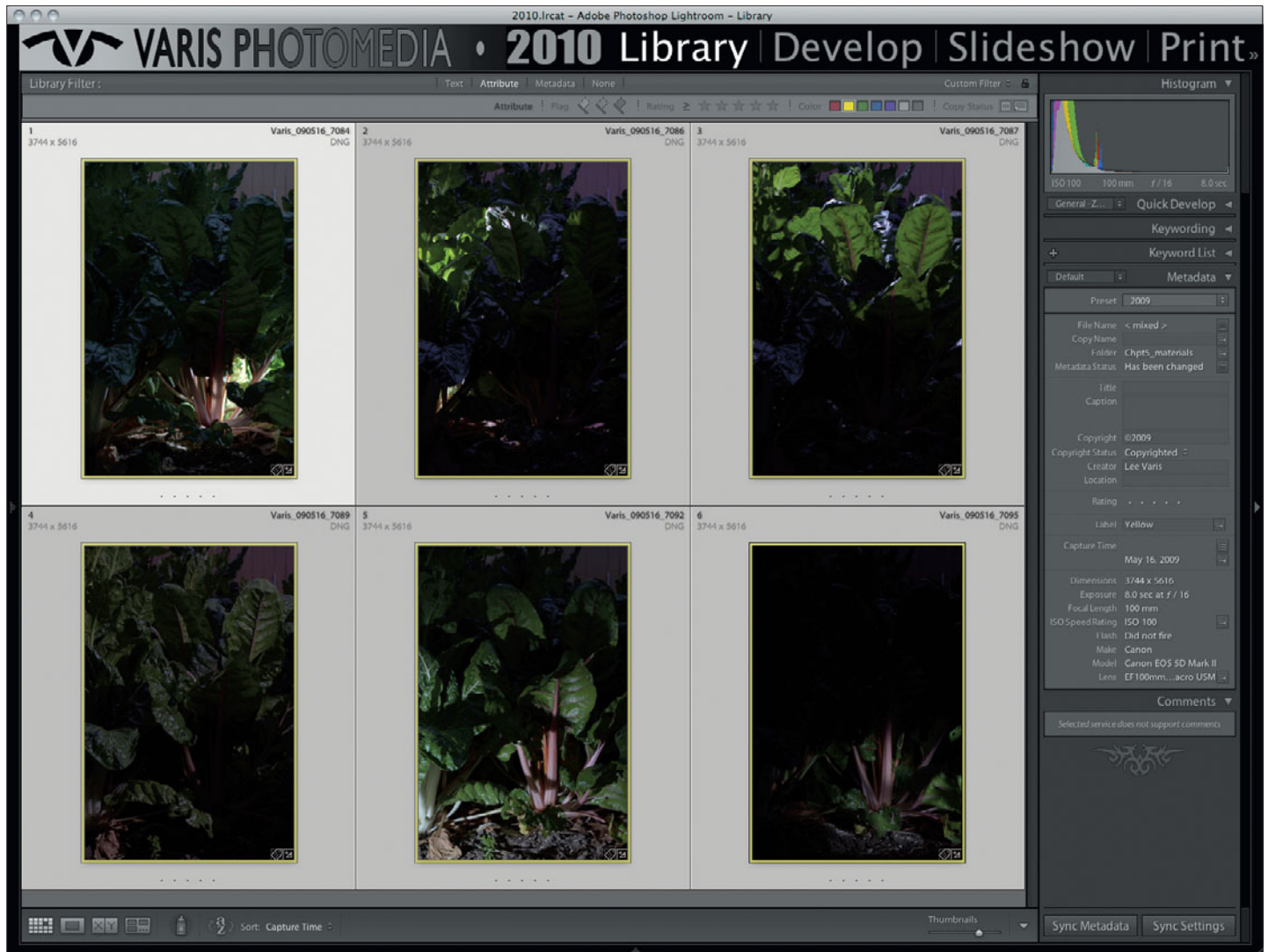


Figure 5.30

These exposures of my garden kale plants are all seriously underexposed.

Now, while this is not the most stunningly artistic image, it does represent an interesting use for HDR tone mapping and it might be worth experimenting with multiple exposures of different lighting even with underexposed or dark subjects.



Figure 5.31

The tone mapped final image exhibits reduced noise and adequate brightness.

HDR Gallery

Before closing I want to share with you some work by Gary Coyne, a true HDR pioneer who has been involved with HDR for quite some time now and has contributed to the development of Photomatix. The following images, as well as the chapter opener, were shot by Gary and processed using Photomatix.



Figure 5.32

Cotton looms: Taken at the Cotton Looms of Lowell, MA, these still-operating looms, now in a museum, fill the room in perfect rows. Three shots were taken hand-held using auto bracket with a Canon 30D. HDR tone mapping brought out details in the deep shadows of the machinery.



Figure 5.33

Snow: HDR tone mapping tends to make dark things lighter and light things darker with the result that snow tends to look “dirty”. Gary blended back his middle exposure in a layer over the tone mapped image to brighten up the areas of snow and still retain the subtle texture and shading.



Figure 5.34

Table Spread: At the historic “Castle in the Clouds” in New Hampshire, a simple breakfast room made for a wonderful HDR opportunity. Four exposures were blended to capture the subtle lighting in the room and the outside garden.



Figure 5.35

Church: A classic HDR situation—a dim interior with dark wood and brick everywhere with a very bright stained glass window in the Church of the Angels in Pasadena, California. Six images combine to make up this lovely scene—impossible to capture any other way!

Conclusion

High Dynamic Range imaging has been used extensively in 3D cgi and motion picture special effects. The original purpose of HDR encoding was to re-create real-world illumination for rendering artificial, computer-generated objects into photographic environments. It is only recently that this sophisticated technology has been accessible to the average photographer. Applications like Photoshop and Photomatix can “re-map” the wide range of real-world brightness into the much more limited range of a paper print in a number of creative ways, long after the original scene has been photographed. This would appear to solve a number of issues that the Zone System was meant to address. In essence, the photographer employing HDR techniques can now concentrate on composition without really considering the effect of exposure decisions on the final outcome—tonal manipulation becomes a creative process that occurs well after the image is captured. Of course, at the moment, this is only possible when the subject (or the camera) is not moving rapidly.

Even given these constraints, there is a certain creative difference in approach that informs the vision of the photographer. For many people, a photograph is simply not a photograph if it does not exhibit the normal photographic limitations in some creative way. The great traditional photo printer Michel Karman, who made prints for many of the giants of photography in the 20th century, has said that, “photography is more about what is not shown than what is.” Certainly, many of the greatest photographs of the past had black impenetrable shadows and/or white blown-out highlights—these were creative choices that became the hallmarks of a personal style!

Imaging technology today has stripped away a lot of the limitations that informed photographic art over that past 150 years. How this will affect the photographic aesthetic in the years to come remains to be seen. Certainly, all this new imaging technology will have an impact on new generations of photographers and we should expect a new aesthetic to emerge, but I don’t think this will de-value the traditional methods that have produced the great works of the past. In fact, I see the reemergence of antique techniques like wet-plate collodion, gum bichromate, and other primitive processes in combination with digital printing technology having a huge impact on the fine art scene.

Simpler, direct capture photography will always have a place as a more raw, personal, and immediate interaction between the artist and subject even when utilizing digital techniques. Technologies like HDR provide new ways of seeing and can be used as a new tool in the artist’s arsenal, but these techniques should not be thought of as “replacing” traditional photographic techniques. Rather, they are enhancing a way of seeing that has evolved over time and will continue to evolve but will always be indebted to the vision of artists who have gone before.



“Temporal Displacement”

f11@1/60, ISO 100, studio flash plus Photoshop

6

Emerging Technologies

In many ways photography as a whole is an emerging technology, and more than any other art form it has been changing more or less continuously over its short history. When an artist picks up a paintbrush and applies color to canvas she is using a technology that has been fairly stable for the last several hundred years. It is easy to see that photography does not enjoy this sort of tradition. The light-sensitive medium has changed considerably as have the cameras and lenses. Still, for the last 100 years or so the fundamentals of image capture have remained conceptually consistent even as the technology has changed. This is about to change dramatically in the next several years!

Today we stand at the threshold of a whole new way of capturing and experiencing images. The progress of photographic technology has been steadily marching forward since the earliest experiments with light-sensitive materials, but this progress is about to be abruptly jolted into a completely new direction.

The signs have been there since the introduction of the computer but, for the most part, all of the advancements of digital imaging technology have been based on the foundation established by the imaging pioneers of the past. This modest volume is really a testament to the enduring value of traditional film-based photographic technology, and the strategies for testing and calibrating for optimal exposure are firmly rooted in the familiar ground first plowed by Ansel Adams. Yes, our current “digital” technology has some differences, but one only has to look at the form factor of the DSLR to see that we are clinging to the past in many ways.

For almost the whole of photographic history up to the current moment, the character of the captured images has been intrinsically connected to the medium used to record the image. Wet plate collodion photographs look different from silver gelatin photographs as much as gum bichromate prints look different from platinum prints. Artists and collectors alike embrace these differences.

Today the different looks associated with different mediums are gradually being replaced by image manipulations carried out by computers working on the captured data directly. The process of photography is being separated from the medium of capture and now it is the pure data that is more important than the expressions of that data in the tangible form of the print. The “file” now replaces the negative, and the tangible realization of that file is often represented in multiple different outputs with some consistency.

The significance of the primary importance of the image “data” is only now beginning to affect how we approach image making with a camera. I’ve demonstrated how exposure decisions are now based only on determining the value limits at the extremes of highlights and shadows—we are no longer concerned about tones in the midrange because of the flexibility of rendering inherent in digital manipulation. HDR photography removes even this consideration because we can determine the complete rendering after the fact of the capture as long as we capture enough information—there is almost no decision process in the exposure, just the act of exposure by itself. It’s all about the information as pure data that can be manipulated in any number of ways.

Current New Capture Technology

We are already starting to see the implementation of some new ideas in capture technology based on HDR photography. In many cases, innovations show up first in consumer point-and-shoot cameras—face recognition, for instance, is becoming pretty standard on point-and-shoot cameras. There are many other technologies that first find simplified expression in consumer level cameras before being incorporated into professional cameras including: video, GPS tagging, WiFi connectivity, audio annotation, auto-scene recognition, and more. The Sony Cybershot WX1/B incorporates a wide range of sophisticated features into a credit card sized point-and-shoot camera—some of these features read like something from a science-fiction novel:

Anti-Blur Mode

When set in Anti Motion Blur mode, the camera captures six images in a fraction of a second with higher shutter speed, and it combines the data from all six to create a single image and eliminate subject blur.

Smile Shutter

An option that recognizes a smiling face and activates the shutter when it happens.

Sweep Panorama Mode

Press the shutter button and sweep the camera in the desired direction and the camera continuously shoots at a high speed, then seamlessly stitches the images together with automatic position adjustment to create one panoramic image.

Hand-Held Twilight Mode

When set to Hand-held Twilight Mode, the camera captures six images in a fraction of a second with one press of the shutter, and combines the data from all six to create a single image of high detail and low noise.

Motion Detection

Motion Detection, along with Face Motion Detection adjusts ISO sensitivity and increases the shutter speed when movement is detected, reducing blur in moving subjects and faces.

The concept of HDR is clearly being incorporated into these simple cameras and it's only a matter time before a more serious implementation of these features finds its way into professional quality cameras. New technology is often introduced as a feature that can be marketed to unsophisticated users to provide them with sophisticated results!

Even the moment of capture can now be re-imagined with some flexibility. The Casio EXILM High-Speed cameras offer a “Best Shot” mode whereby the camera is put into high speed continuous shooting before the decisive moment, allowing the photographer to select the ideal “moment” after the shot—never miss a shot again as long as you’ve got the camera pointing in the right direction!

Computational Photography

These examples are baby stuff compared to the new technology offered by the field of computational photography. This area of research refers to computational imaging techniques that enhance or extend the capabilities of digital photography beyond what is possible with a traditional camera. The key difference here is the way that image information is collected to leverage the calculating capabilities of the computer rather than simply applying image processing to a traditionally captured image. Some exciting technologies are right around the corner, including:

Light Field Photograph

Researchers at Stanford have developed a hand-held “plenoptic” camera that incorporates multiple micro-lenses at the surface of a regular digital camera sensor. The camera looks and behaves much like a normal digital camera, but the information it captures can be used to synthesize a photo image that has a much-enhanced depth of field (focus) at much larger apertures and much lower noise. Additionally, images can be “re-focused” at different depths after the fact. Macro photos can offer multiple vantage points such that the image can be “re-composed” or shifted slightly, again, after the exposure is made!

Adobe Systems has shown a prototype camera optic, which looks like a honeycomb insect eye, for delivering similar, infinite focus or re-focused images. This system offers multiple vantage points for regular distances so that you can re-compose a shot to move the pole coming out of uncle Bob's head, for instance—after the exposure.

Coded Aperture Photography

Similar “all-in-focus” results have been demonstrated with another system that uses a conventional lens with a special “coded” aperture that has a pattern of multiple smaller apertures in place of the standard single iris. This system can be used to recover depth information from a single exposure and images can be re-focused. Both Light Field and Coded Aperture systems utilize an optical element that alters the incident light entering the camera so that the image captured by the sensor is not the final desired image but is “encoded” to facilitate the extraction of information. The final image is rendered from calculations on the extracted information.

Coded Exposure Photography

This approach uses a “Flutter Shutter” that breaks up the image into multiple overlapping images rather than one continuously motion blurred image. The system can resolve incredible detail from images that would normally be totally obscured by motion blur. The result is that sharp images can be captured of moving subjects with much slower shutter speeds, and that means that images can be captured with lower ISO and thus lower noise and better detail. Again, captured images are analyzed based on knowledge about the spatial displacement resulting from the multiple shutter openings—the final image is re-rendered from this information.

You probably recognize a common theme here—multiple images, in one form or another, are being used to extract information about a scene and the final image is reconstructed from information gleaned from a combination of images and data about how the images are captured. The concept embodied in HDR photography can be extended to enhance a broader range of imaging problems and this approach will be incorporated into new camera/computer systems. This new class of image capture device will not look like the cameras we are used to and it will not be subject to the same constraints as our familiar cameras.

It remains to be seen how all this will play out as far as the “art” of photography goes, even if the technology of photography solves all imaging problems! Certainly the images captured with the new technology will influence the way that we “see.” Look at how perspective changed paintings in the Renaissance and how the camera altered painting during the Impressionistic period! However, photographic art is often defined as much by what is not shown as by what is shown in the image. The role of the artist has been to present an internal vision of the world in an external way in order to share a personal experience with a wider audience. The limitations of a particular medium inform the art produced with that medium—what happens if all limitations are stripped away?

Artists thrive on the limitations of their chosen medium. We rise to the challenge to present new ways of envisioning the world around us and inside of us. Imaging limitations have informed photography since its beginnings and today we marvel at the works of art from the early pioneers because these images have a certain quality that cannot easily be imitated with modern techniques. We currently find a renewed interest in antique

imaging technologies and this will continue into the foreseeable future. Future technology offers many solutions to problems that have plagued photography from the beginning, but this will only reveal new limitations that have remained hidden by our narrow understanding of the mysteries of our existence. As technology expands our world, new frontiers will present themselves and demand to be conquered!

Look for links to the latest information on computational photography on the book's website:

www.varis.com/masteringexposure

Where Do We Go from Here?

Throughout this volume I have built an imaging strategy based on the standards of visual quality established in the last fifty years. Today, those standards are changing, not for better or worse but just different in a way that reflects the impact that the computer is having on how we perceive the world. We are becoming used to seeing the world without the veil of film grain and with greater sharpness and cleaner color. Certain principles of composition, light, and space remain but now modern audiences expect higher information content in the image—we still like our eye to be guided but desire more detail, texture, and sharpness when we arrive at a place of rest in the image. My grandchildren are not going to ascribe some mystical quality to film-based images but will only wonder why they look so fuzzy and dirty! The average person will have less and less exposure to paper prints and will mostly be viewing images on computer screens of one type or another. The quality of the newer high definition displays will exceed anything that has been available before. This will ultimately mean that, in order to be competitive, the photographer will need to deliver image quality that goes well beyond what would be considered adequate today.

The tools will always be available to craft exceptional images but certainly the average consumer will be able to capture higher quality images more easily than most photographers struggling with color film in the mid 20th century! This just means that the serious photographer of the 21st century must strive for a pinnacle of perfection in every aspect of the craft, with no compromises, to make images that stand apart from the vast multitude of images assailing people every day! Image making has become so easy that we must work even harder to earn the title of artist.

I have tried to demonstrate an approach to testing and calibrating digital cameras to improve the odds of getting the highest possible quality image. Newer image capture technology will make some of these procedures obsolete, but the basic concept should still apply—test your equipment in a controlled way and analyze the results with an eye towards maximizing the quality of the image data. Post processing will always be available for creative interpretation. But you always want to be in the position of being able to throw away information to arrive at a desired rendering rather than having to make up for missing or inadequate image detail.

This book is meant to be a catalyst for continued exploration of the technical side of digital imaging. I have tried to examine some old photographic concepts in the context of the new digital capture technology as well as introduce some new methods of image enhancement that are completely dependent on digital technology for their implementation. The constraints, both physical and financial, of the paper book prevent me from including everything that I could in the current volume. This work is in fact a work in progress, continuously evolving with my experience as a photographer and teacher. Hopefully this material has been of value to you.

In an effort to expand on the relationship I've formed with you, the reader, I have set up a website devoted to the further development of the ideas in this book.

www.varis.com/masteringexposure

Here you will find example files, additional tutorials, videos, and other materials collected to enhance your experience of the book. This is where I can correct mistakes and share new ideas that relate to the topic, and where we can come together to build on the knowledge I will continue to share. My hands are shaking even as I write this because this is a huge commitment that I am making right now—I do not know what exactly I will be doing with this at this moment, but I'm throwing all caution to the wind and diving into a new venture here with a promise to support you in your future development as a photographer.

Thank you.



A

Exposure Estimations

Occasionally even the most reliable equipment malfunctions—this can also happen with even the best digital cameras, and it seems to be a particularly prominent correlate of Murphy’s Law that this should apply to the light metering component of the system. Therefore, it is a good idea to familiarize oneself with the very old-school system of exposure estimation. This system of guesstimates is based on empirical data collected throughout the history of photography and can be a good “heads up” to determine if your light meter is acting “wonky”!

The most common exposure estimate is the sunny 16 rule whereby a correct exposure can be had on a sunny day, in middle geographic latitudes (like North America), by setting the camera to f16 with the ISO as the shutter speed (i.e., f16 @1/100 for ISO 100). The following table expands on this rule.

The Sunny 16 Rule

Lighting Condition

Full Sun

Hazy Sun

Cloudy Bright

Open Shade or Heavy Overcast

Bright Sun on Sand or Snow

Exposure Time (shutter speed)

Equal to ISO (1/ISO)

Increase by one stop (1/ .5xISO)

Increase by two stops (1/ .25xISO)

Increase by three stops (1/ .125xISO)

Decrease by one stop (1/ 2xISO)



f5.6 @ 1/200, ISO 50

Of course, there are many mitigating factors, so try to use some common sense here. If the subject is right next to a white wall in open shade, the bounce fill from the wall will change the light level and alter the exposure. Also, check the ISO setting on the camera—if the meter is telling you something that doesn't make sense, maybe the ISO is not set where you think it is.

The following situations are often difficult to meter effectively (as well as being difficult to judge on the LCD at the back of the camera) so sometimes you just need to bracket around a starting point.

The above estimates are aiming for a daylight appearance with the knowledge that, if you want a moonlit look, it is easy to darken the image in Photoshop to get the exact feeling you're looking for. If you expose for a nighttime look, you will end up with more noise in the shadows.

Landscapes at Night—illuminated by the full moon

ISO	Exposure Time (in seconds)	<i>f</i> -stop
400	2	<i>f</i> 8
1600	1/2	<i>f</i> 8



*f*4 @ 1/100, ISO 200, Lensbaby

Photos of the Moon (as a starting point for bracketing)—moon above 40° elevation—add 1/3 stop exposure if it is below 40°.

You will notice here that the sun is illuminating the moon so we would expect that the sunny 16 rule would apply to get some detail in the disk of the moon!

Phases of the Moon

Lunar Phase	ISO	Exposure Time (in seconds)	<i>f</i> -stop
Total Eclipse	1600	1/4	<i>f</i> 4
Crescent Moon	100	1/30	<i>f</i> 8
Half Moon	100	1/60	<i>f</i> 11
Gibbous Moon	100	1/100	<i>f</i> 11
Full Moon	100	1/100	<i>f</i> 16



*f*16 @ 1/100, ISO 100

Shots of Lightning (at night)—leave the shutter open and hope to catch a flash—close the shutter after the flash.

This is a very rough guess as brightness varies greatly but hopefully groups of flashes will be similar so you might be able to adjust after the first one. Lightning is very bright, but part of the effect is how it might light up the clouds or part of the landscape so expect to “clip out” or bloom the white-hot spark of the flash in order to pick up detail elsewhere.

Shots of fireworks are similar but are much easier to judge because they will have some color if properly exposed—start with double the exposure from the chart above (open up one stop). You can also anticipate the “bloom” of the fireworks so a reasonably short shutter speed is workable, say 1/15 to even 1/30 if you want a sharper more colorful look.

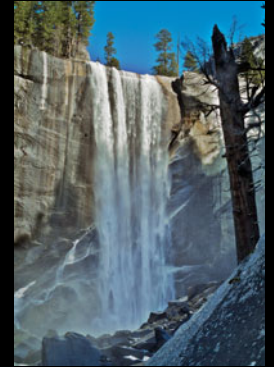
Shots of Lightning (at night)

ISO	<i>f</i> -stop
100	<i>f</i> 8
400	<i>f</i> 16





Image Gallery

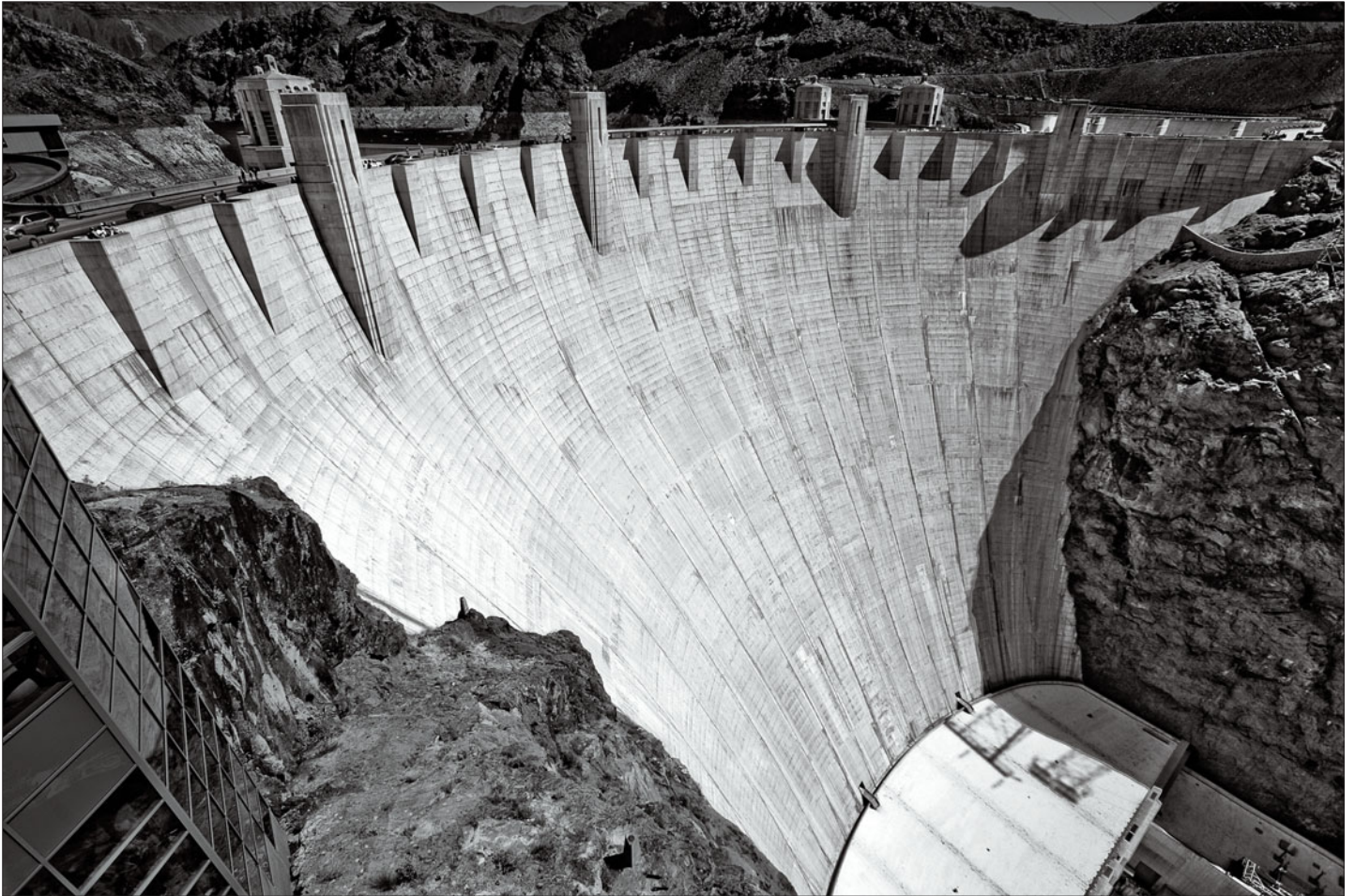




Greece Lighthouse f9.5 @ 1/250, ISO 100



Acropolis in Athens f11 @ 1/125, ISO 50



Hoover Dam f11 @ 1/100, ISO 50



Death Valley Dunes f13 @ 1/125, ISO 200



Red Church f16 @ 1/100, ISO 100



Warehouse Shadows f5.0 @ 1/200, ISO 50



Graffiti f7.1 @ 1/320, ISO 100



Vase, Rocks, Flowers f11 @ 1/60, studio flash exposure, ISO 100



Flower f32 @ 1/125, ISO 6400, Lensbaby



Exhibit Workers f4 @ 1/60, ISO 1600



Night Clouds, DustWitch by John Eakin

f10 @ 30 seconds, ISO 400



Neena f11 @ 1/100, ISO 100, studio flash



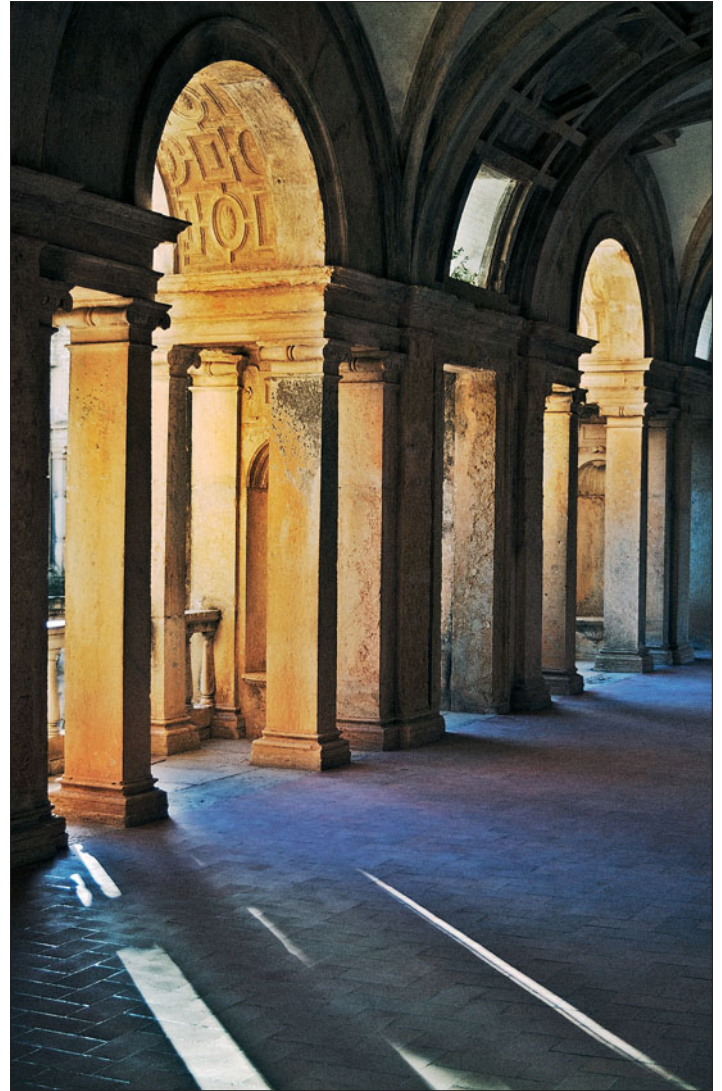
Oudi f11 @ 1/100, ISO 100, studio flash



Blue Nile Café f2.8 @ 1/100, ISO 1600



Silhouette f22 @ 1/250, ISO 200



Castle f3.5 @ 1/90, ISO 100

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