

Introducing the Digital Photo Workflow

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So what is a photo workflow exactly? All we really want to do is take great pictures and reproduce them in the best way possible. But doing so actually involves a whole series of steps, from transferring the image files to a computer, to file naming, file format conversion, image optimization, and finally preparing the images for printing or other forms of presentation.

These steps are the basic components of a digital photo workflow, and will ideally be:

- ▶ *Fast*
- ▶ *Affordable*
- ▶ *Capable of delivering optimum image quality*

A workflow requires knowledge, experience, and planning to function properly. Because different images require different treatment, it needs to be adaptable too. A photographer's equipment, ideas and personal style all influence the choice of steps involved in the workflow. Here, we will show you the basic concepts and specific steps involved, and give you the necessary know-how to adapt the digital photo workflow to your own needs and shooting style. We will begin with a brief description of our aims and follow that with a discussion of how to proceed and which tools to use.

1.1 The Basic Digital Photo Workflow

The workflow includes every step of the photographic process, from the moment you release the shutter to the moment when you hold a print in your hand or save your image to an archive.

Unfortunately, there is no golden rule for achieving consistently great results but what we aim to do in the course of this book is to present you with a proven workflow that will help you to:

- ▶ Improve the quality of your digital images and
- ▶ Save time and costly trial runs

We will use the simplest possible methods to help you achieve these aims. We don't intend to turn you into a Photoshop expert, but we do intend to show you how to use the tools you need to process your images effectively – with a little practice, but without too much experimentation. We will be using our own experience along the way, and we will sometimes make value judgements. You should nevertheless consider whether our judgements are relevant to your own situation and experiences.

The overview that follows will help you to better understand the later chapters. The digital photo workflow has three major creative phases:

- A) Composition and shooting
- B) Digital image processing
- C) Presentation (print, slideshow, Web gallery, etc.)

This book is mainly dedicated to discussing phases B and C, and only addresses phase A when technical aspects of composition and shooting affect our approach to phase B. Alongside creativity, technical aspects are highly relevant to the whole process – although if phase A is not successful, these too become irrelevant, in spite of the fact that they themselves contribute to the overall success of phase A! The emphasis of this book is on the technical aspects of the process, but don't forget to be creative along the way.

You can, of course, leave phase C to others (a photo lab or an online print service), but if you do, you will waste another chance to be creative.

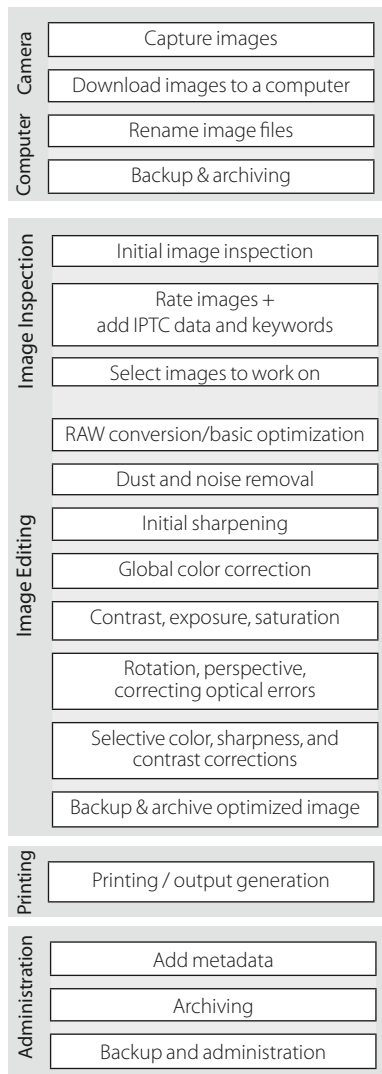


Figure 1-1: The basic workflow steps, i.e., the “What”

The “What”: Basic Steps

Figure 1-1 is an overview of the basic steps involved in our workflow. It lists some of the things you must bear in mind if you want to consistently create high-quality photos. Not all of the steps listed are necessary for every single image, so don't be discouraged. We will introduce you to the entire process step by step. One of the great advantages of the digital photographic medium is that you can continually improve your technique but still produce great images while you are learning.

Important Image Processing Know-how

Once you know *what* you have to do, the next step is learning *how* to do it (figure 1-2).

There are usually several “right” ways to approach your work, and you will have to adapt the way you work to account for the job itself, your aims, the available tools, and your own personal preferences.

Our workflow illustrates the aspects of the process that have helped us to achieve great results. You can use these as a basis for developing your own methods.

New tools and new versions of older tools also require you to adapt your methods. Using new tools and learning from the experiences of others helps to keep your work fresh.

Advanced Image Processing Techniques

There are many techniques that you don’t yet know and which you don’t yet need. We will address these later as part of the iterative learning process. You should learn the workflow step by step (figure 1-3).

Including all currently available image processing techniques would make this book impossibly large and expensive. Once you have learned to use the techniques we do describe, you will be able to use these as a basis for your own experiments with techniques you can pick up from the Web, from other books, and from talking to like-minded people. The www.outbackphoto.com website [1] is also full of new ideas for you to try out.

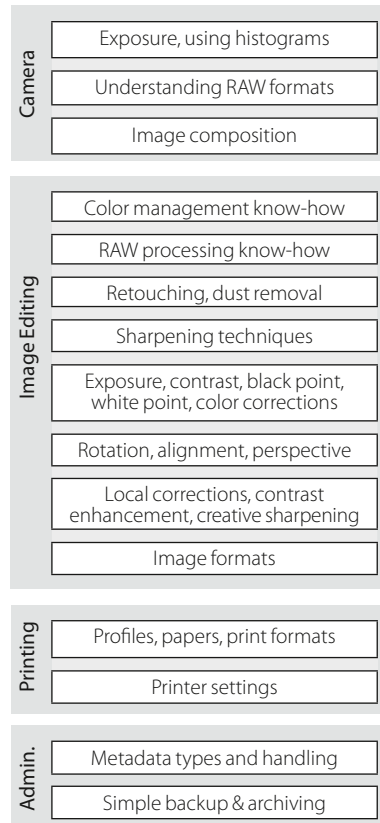


Figure 1-2: Important know-how, i.e., the “How”

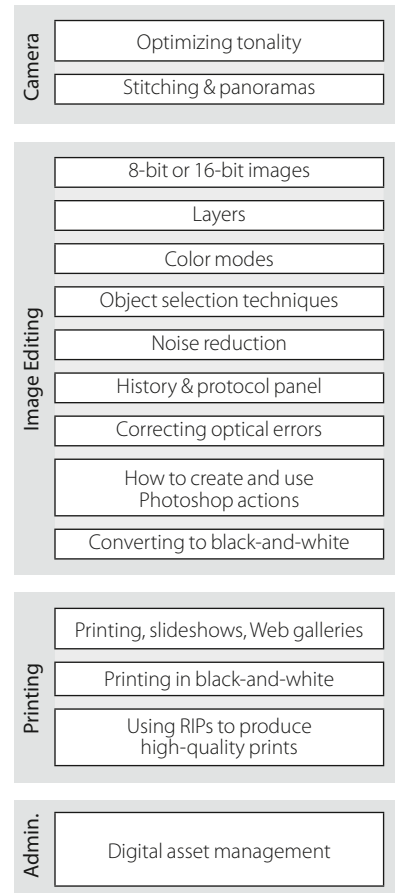


Figure 1-3: Advanced techniques, i.e., “Making things even better”

1.2 Computer Equipment

PC or Mac?

Discussions of whether PCs or Macs are “better” for use with a digital photo workflow are basically a waste of time. We (the authors) currently use Mac desktops and PC notebooks. Fortunately, the current version of Photoshop is, apart from a couple of keystrokes and menu item names, identical for both systems. This means that everything we mention concerning Photoshop

→ We usually describe the appropriate Windows and Mac keystrokes. When in doubt, please use the keystrokes listed on page xiii.

is valid for both systems. Some of the Photoshop plug-ins we discuss are only available for Windows PCs, but there are usually equivalent tools available for Mac.

Processing large and/or high-resolution images makes serious demands on a computer, so we recommend that your system fulfills the following baseline criteria:

→ Even if you are a Mac user, you should purchase a two-button scroll mouse. Many important operations in Photoshop (and other programs) are controlled by using a right-click, making a good multi-button mouse a real time-saver.

→ Mac USB 2.0 interfaces are notoriously slow. FireWire or eSATA (the fastest currently available) connections are much better for Mac users.

NAS means “Network Attached Storage”, which is storage space attached to a computer via a network.

An office printer is a four-color (CMYK) laser or inkjet printer used mostly for printing text or presentations. This type of printer is only moderately useful for printing digital images. High-end printers use between eight and 12 different colored inks and are well suited to photographic applications. Printing documents using a high-end printer is very expensive.

- ▶ 2 GB of memory is the absolute minimum. More is always better. If your machine and your budget allow it, we recommend that you use 4 GB or more. Professionals use 8–32 GB on 64-bit systems.
- ▶ A high-quality monitor with a minimum 1280 × 1024 resolution. Here too, larger monitors and higher resolutions are an advantage. We both use two monitors each: a 24" EIZO with 1920 × 1200 resolution for image processing and an additional 21" monitor for displaying program menus and preview images.
- ▶ USB 2.0, FireWire, or eSATA connections are an advantage but are not strictly necessary. They are a great help for attaching high-speed card readers or external disk or DVD drives to your system.
- ▶ A fast CPU. The faster the better. Some Photoshop functions are capable of using multiple processors and multi-processor systems are also an advantage if you are importing large amounts of data.
- ▶ Hard disk space. We recommend at least:
 - 200 GB for the operating system and programs
 - 100–200 GB for your working environment and temporary memory usage
 - 1–4 Terabytes (TB) for your image archive and working library. This can be an external USB, FireWire, eSATA drive, or a NAS system.
- ▶ An external card reader for CompactFlash or SD/XD memory cards. If you are thinking of purchasing a new reader, make sure it is at least USB 2.0 compatible (the even faster USB 3.0 standard is currently being introduced) or FireWire-based. USB 1.x is much too slow.
- ▶ Monitor calibration equipment (more on this subject later)
- ▶ An office printer and (optionally) a separate high-end printer

More and *faster* are generally better. With better gear, you can work more quickly and complex operations function more smoothly. This makes the entire process more fun. Treat yourself to the best equipment you can afford.

Be especially careful when choosing your monitor if you plan to spend a lot of time processing images. A high-quality monitor will usually outlive a computer, and earlier reservations about questionable color rendition in LCD monitors are nowadays no longer an issue. If you plan to purchase

a new monitor, we recommend that you go for one with a diagonal of at least 19". The larger your monitor, the better it is for your eyes and your general fatigue levels. A large monitor also helps you to retain an overview of your work. We no longer recommend the use of CRT monitors.

64-bit platforms: 64-bit systems are currently not mature enough to be genuinely reliable. The 64-bit versions of Windows Vista and Windows 7 still have problems with the availability and stability of appropriate drivers, and the first 64-bit Mac version of Photoshop (CS5) has only just been released. In spite of these considerations, 64-bit systems will be the better option in the long term.

Although 32-bit Macs have been able to address 4 GB of memory for a while now, Windows can only address no more than 3.2 GB of memory in its 32-bit version. The increasing size of image files and the increasing complexity of the processing steps we apply makes the availability of large amounts of memory essential to the workflow. If you are planning to purchase a new computer, we recommend that you look at a model with a 64-bit processor and the advanced memory capacity described above. Windows is available in separate 32-bit and 64-bit versions, but all newer Mac computers are 64-bit compatible.

Multi-core systems: Lightroom, Photoshop, and, increasingly, other programs mentioned here are capable of addressing multi-core processors and thus accelerating some imaging processes. Again, if you are planning a purchase, a multi-core machine is the way to go.

1.3 What are RAW Files?

Working with analog and digital cameras is similar in many ways, but you need to understand the differences in order to provide yourself with the best possible material for feeding your digital workflow. Good framing and correct exposure are critical to the success of any photo, and the old maxim "garbage in, garbage out" is still relevant in the digital age. This doesn't mean you should trash your snapshots, but it does mean that turning a sloppily-shot photo into a great image will involve a lot of work in the digital darkroom.

JPEG is currently the most commonly used digital image format and produces highly compressed image files. Unfortunately, the JPEG format produces an appreciable loss of image quality, even at lower compression rates.* With JPEGs the camera adjusts white balance, sharpness, noise, and contrast in the camera. This is useful for hobby photographers who want to produce an image as simply as possible, but it robs others of the opportunity to correct their images in a controlled fashion later. These automatic adjustments reduce image quality before we even begin our own processing.

➔ As of version 2, Lightroom is delivered with 32-bit and 64-bit Windows and Mac versions on a single CD or DVD. Windows Photoshop versions have been delivered in 32-bit and 64-bit versions since the release of CS4, and for Mac since the release of CS5. The 64-bit versions are faster when processing large image files if used on a computer with appropriately configured memory.

JPEG stands for the "Joint Photographic Experts Group" that invented the format.

* There is also a "lossless" version of JPEG available, but this is seldom used. "Image quality loss" means that the image data is simplified in order to save memory space. Every time a JPEG image is saved, it loses additional image data that cannot be accurately rescued later.

JPEG is fine for images that are not due for much further processing. This is often the case in the consumer market, but seldom the case for ambitious hobby or professional photographers – although there are situations when even a professional needs to resort to a quick JPEG solution.

Some digital cameras use the alternative TIFF format or a proprietary RAW format in order to produce the best possible image quality. In the course of the book, we will demonstrate how RAW provides the best material for flexible image processing.

If you end up using JPEG or TIFF for your images (e.g., if your camera offers bad or no RAW support), you can still use most of the steps described here to process your images. Only the RAW conversion step is no longer relevant, as this is performed automatically in-camera. All of the remaining steps apply to both JPEG and TIFF image files. Even if you don't shoot RAW images yourself, you should understand the concept of RAW.

What are the Advantages of RAW Format?

In order to understand the advantages of RAW, you need to understand how most modern digital cameras work. All new digital cameras capture color photos, right? Well, not exactly. While you ultimately get color images from a digital camera, most modern digital cameras use sensors that record only grayscale (brightness or luminance) values. (The Foveon X3 sensor, some digital scanning backs, and multishot digital backs are exceptions.)

Let's take a box of Crayola crayons as an example (figure 1-4). A grayscale sensor would see the subject as it looks in figure 1-5; that is, it would see only shades of gray. But how do you use a grayscale sensor to capture color photos? Engineers at Kodak came up with the color filter array configuration illustrated in figure 1-6. This configuration is called the *Bayer pattern* after the scientist who invented it back in the 1980s. (Other pattern variations are used as well, but this is the basic technology used in most CCD and CMOS image sensors.) The yellow squares in the grid shown in figure 1-6 are the photoreceptors that make up the sensor; each receptor represents one pixel in the final image. Each receptor sees only the red, green, or blue part of the light that passes through the color filter just above the sensor element.



Figure 1-4: Full color sample target

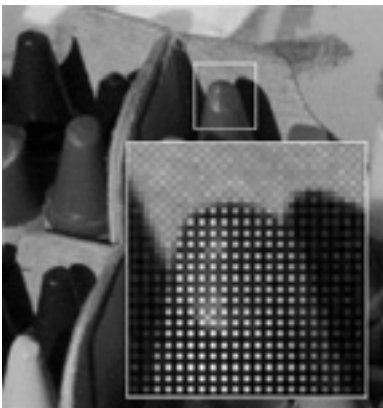


Figure 1-5: A grayscale image, as seen by the camera's image sensor

B-G-B-G-B-G
G-R-G-R-G-R
B-G-B-G-B-G
G-R-G-R-G-R

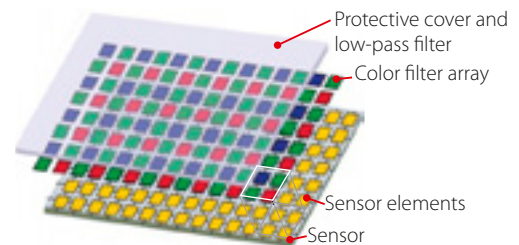


Figure 1-6: The Bayer pattern is produced by using a matrix of colored filters

You will notice that 50 percent of the filter elements (and thus the receptor elements) are green, while half of the remainder (25 percent each) are red and blue. This pattern works because the human eye can differentiate between many more shades of green than it can red or blue, which is not surprising when you consider the number of shades of green in nature. Green also covers the widest part of the visible spectrum. Each receptor in the sensor captures the brightness values of the light passing through its color filter (see figure 1-5), and each pixel therefore contains the information for just one color (like a mosaic). However, we want our photo to have full color information (red, green, and blue) for every pixel. How does that magic happen? A software trick called *Bayer pattern demosaicing*, or *color interpolation*, adds the missing RGB information using estimates garnered from the color information in neighboring pixels.

Demosaicing is the method used to turn RAW data into a full-color image. A good demosaicing algorithm is quite complicated, and there are many proprietary solutions on the market.

The challenge is also to resolve detail while at the same time maintaining correct color rendition. For example, imagine capturing an image of a small black-and-white checkered pattern that is small enough to overlay the sensor cells, as in figure 1-8.

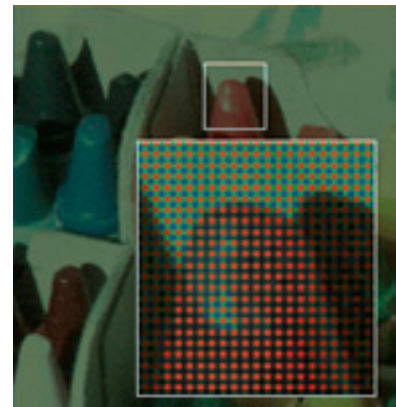


Figure 1-7: Colored mosaic as seen through the color filters

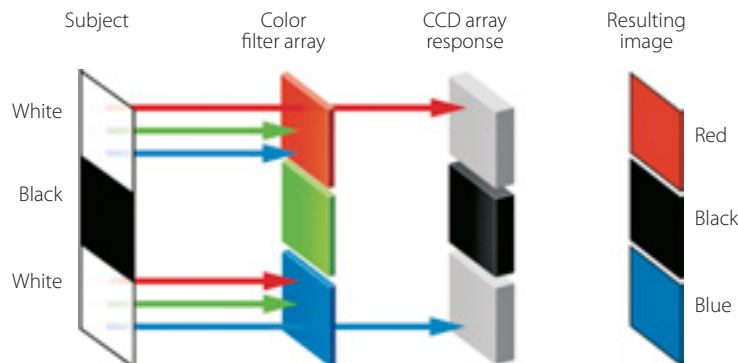


Figure 1-8: A Bayer pattern image sensor with its erroneous color interpretation. An AA filter is positioned in front of the color filter array in order to correct this problem.

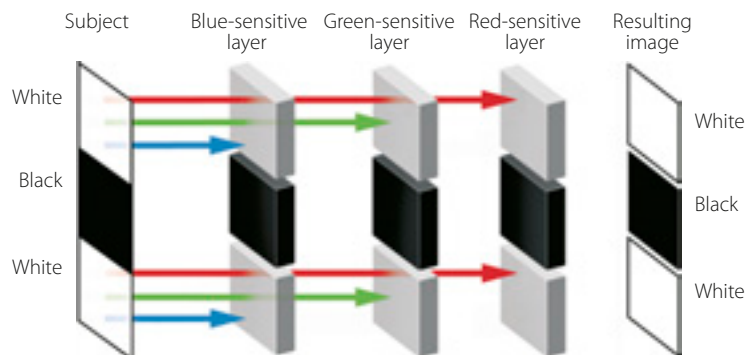


Figure 1-9: A Foveon sensor has no color interpretation problem.

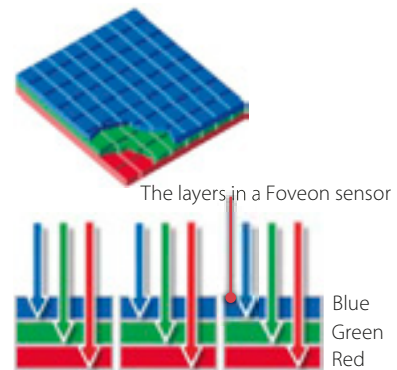


Figure 1-10: A Foveon sensor has three layers

White light consists of red, green, and blue rays, and the white squares in our example correspond exactly to the red- and blue-filtered photoreceptors in the sensor array. The black squares, which have no color information, correspond to the green-filtered photoreceptors. So for the white squares that are aligned with red photoreceptors, only red light passes through the filter to be recorded as a pixel.* The same is true for the blue photoreceptors.**

* Where white light hits the red filter

** Where white light hits the blue filter.

Color interpolation cannot correct these pixels because their neighboring green-filtered photoreceptors do not add any new information. The interpolation algorithm would not know whether what appears to be a red pixel is really some kind of “red” (if white light hits the red filter) or “blue” (if white light hits the blue filter).

Contrast this with the Foveon sensor technology illustrated in figure 1-10. Instead of a Bayer pattern, where individual photoreceptors are filtered to record a single color each, the Foveon technology uses three layers of receptors so that all three color channels are captured at the same photosite. This allows the Foveon sensor to capture white and black correctly without the need for interpolation.

The resolution captured by a Bayer sensor would decrease if the subject consisted of only red and blue tones because the pixels for the green channel could not add any information. In the case of monochromatic red or blue tones (those with very short wavelengths), the green photosites receive absolutely no information. However, such colors are rare in real life, and even when the sensor samples very bright, saturated reds, some information is still recorded in both the green and (to a much lesser extent) the blue channels.

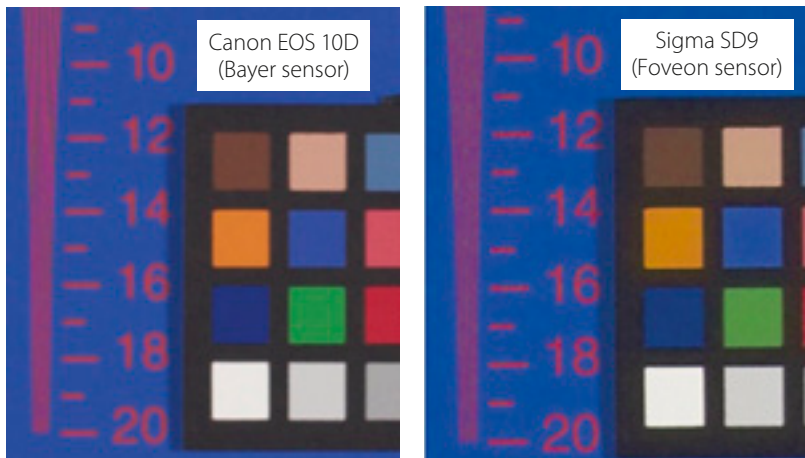


Figure 1-11: Fooling a Bayer pattern sensor (left)

A Bayer pattern sensor needs a certain amount of spatial information in order to correctly estimate a color. If only a single photosite samples red information, there will be no way to reconstruct the correct color for that particular photosite.

Figure 1-11 illustrates a test we made in a studio to demonstrate the loss of resolution that a Bayer sensor causes when capturing monochrome colors. Notice how blurred the text in the Canon image is compared to that in the Sigma image. These test photos show an extreme situation because a Bayer sensor

cannot really capture the transition from blue to red at a pixel level. Although this type of error is less dramatic in real-world situations, it is still visible and cannot be ignored. Increasing sensor resolution helps to diminish the effect.

Some of the challenges that interpolation algorithms face include image artifacts, such as moirés and color aliasing (displayed as unrelated green, red, and blue pixels or discolored image areas). Most camera manufacturers combat aliasing problems by positioning an *anti-aliasing* (AA) filter in front of the sensor. This filter, also called low-pass filter, blurs the image and distributes color information to neighboring photosites. Needless to say, deliberate blurring and high-quality photography are strange bedfellows, and finding the right balance between blurring and aliasing is a true challenge for camera design engineers.

AA filtering reduces the effective resolution of a sensor, so some fairly strong sharpening is often needed during the RAW workflow. Re-sharpening performed after anti-aliasing is known as *compensatory sharpening*.

The task of creating a high-quality image from the data recorded by a sensor is a complicated one, but it works surprisingly well.* Every technology has to struggle with its inherent limitations, and digital photography is nowadays superior to analog photography in some respects due to the fact that analog techniques also have their own limitations.

Now we know that RAW data is the representation of the grayscale values captured by the individual elements in an image sensor**. The data then has to be interpolated and transformed to produce a color image. For JPEG and TIFF images, the conversion of RAW data is performed by the camera's firmware before the image is saved to the memory card.

What are the limitations of shooting in JPEG instead of RAW format?

- ▶ JPEG artifacts caused by data compression
- ▶ Although many high-quality image sensors deliver 12-bit or 14-bit per pixel image data, JPEG image files only record 8-bit data
- ▶ Although RAW data conversion requires a lot of computing power, the power of the camera's CPU is limited. Using a computer is therefore a more powerful and flexible approach to RAW conversion, especially considering that computers are getting faster all the time, while a camera's CPU cannot be enhanced or updated. Conversion algorithms are improving too, and a software update on a computer is easier to perform than a camera firmware update.
- ▶ A great many automatic and manual settings (such as white balance, contrast, tonal value corrections, sharpness, and color interpolation) are automatically built into the image data by the camera. This limits later correction potential because each automatic correction reduces image quality. This is especially true if you are working with 8 bits per color channel.

Various RAW image formats can now be defined. A RAW file saves the raw data from the image sensor as well as the file's EXIF metadata. EXIF data includes information about the camera and lens used to shoot the image, as

* Experience shows that some high-end Canon and Nikon DSLRs do this job very well.

** for a normal sensor with colored filters

Firmware is hard-coded (i.e., non-changeable) software. Most cameras allow you to update their firmware.

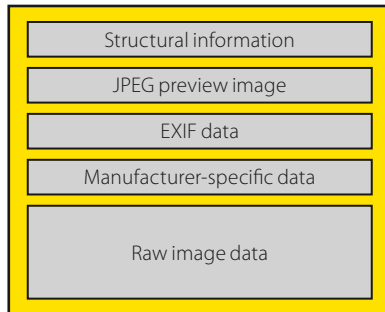


Figure 1-12: Typical structure of a RAW file

→ Overexposure is much more difficult to correct.

Most output devices can only reproduce 8 bits per color channel anyway.

→ Although cameras only capture 10- to 14-bit per pixel image data, within the computer these data are saved and processed as 16-bit values.

well as information about the aperture, the shutter speed, the ISO value, and various other aspects of the camera settings that were used. This information helps us to make adjustments to our image manually that would otherwise be made automatically in the camera.

The advantages of shooting in RAW format are:

- ▶ No loss of image quality due to JPEG compression
- ▶ Full use of the 12-bit or 14-bit image data captured by the camera's sensor
- ▶ Potentially much more sophisticated RAW conversion (for example, using Adobe Camera Raw, Lightroom, or other specialized software)
- ▶ Corrections to white balance, color rendition, sharpness, noise, and dynamic range can be made later in a controlled, computer-based environment

A RAW file is largely equivalent to an undeveloped analog negative and can be similarly *pushed* at the “development” stage in order to compensate for exposure errors. RAW conversion software is continually improving, helping us to improve our results.

A JPEG image produced in a camera is like a Polaroid photo – you can see the results immediately but you can't change anything. High-quality RAW editors, such as Capture One Pro, Lightroom, Adobe Camera Raw, or RAW Developer can be configured to work something like your own secret chemical recipe for developing analog film.

What are the advantages of 14-bit color depth? When you perform major corrections to white balance, color, contrast, or perspective, every operation causes a loss of data bits due to rounding errors. These errors are additive, so the more image data you have in the first place, the better you can compensate for data loss during processing.

What happens if you shoot your images in TIFF format? TIFF image files behave basically just like JPEG files, but are not subject to the image quality loss caused by JPEG compression. Image data is reduced to 8-bit, but the image files are nevertheless larger than equivalent RAW files because RAW saves 12-14 bit grayscale pixel data, whereas TIFF saves 24 (3×8) bits of color data per pixel. The other advantages of RAW don't apply to TIFF images. We are of the opinion that an 8-bit TIFF file produced in-camera offers no advantages over a mildly compressed JPEG file.

Digital Artifacts

Today's image sensors usually interpolate color information using a Bayer pattern sensor and do not capture full RGB image data for every pixel. This results in a slight loss of image sharpness. The Foveon X3 sensor described above shows that other solutions are possible.

Color Anti-aliasing/Moiré Artifacts

What happens when a fine red line passes through a green image area and doesn't touch any of the neighboring sensor photosites? The line wouldn't appear at all in a RAW image file. Most digital cameras combat this type of phenomenon by using an AA filter placed in front of the image sensor. An AA filter diverts the light reaching the sensor slightly so that it is also registered by neighboring photosites. In our case, neighboring photosites would then see parts of the red line.

An AA filter therefore cures one problem and creates another in the form of reduced image sharpness. Such images have to be more strongly sharpened in the course of the RAW workflow.* Detail that is lost due to an AA filter cannot be reconstructed later, regardless of how clever your sharpening tool is. AA techniques nevertheless deliver results that are generally better than our description of the problem might lead you to believe.

* This effect is also just as evident if you shoot in JPEG or TIFF formats.

1.4 JPEG Instead of RAW?

There are still situations in which JPEG is a useful format, in spite of all the advantages that RAW offers. For example:

- ▶ Your camera offers limited or no RAW support
- ▶ You need ready-processed images direct from the camera
- ▶ RAW processing is too complex and time-consuming for you
- ▶ RAW files use too much camera and computer memory capacity

Although we generally advocate the use of RAW, you can still produce great images using JPEG. You can simply use the automatic RAW conversion software built into the camera rather than performing the processing yourself. Apart from the actual RAW conversion stage, all of the other steps in our workflow are just as applicable to JPEG or TIFF images. Because adjusting white balance and exposure later cause appreciable image quality loss, you will need to watch out for the following points while shooting JPEG or TIFF images:

- ▶ Try to use the most appropriate white balance setting while shooting. Many cameras produce more than adequate results if white balance is set to Auto (at least when shooting in natural light).
- ▶ Avoid overexposing your image with the help of the camera's histogram display. Some cameras even have a live histogram display that shows the distribution of tonal values within the frame before you press the shutter release.

Many cameras allow you to use a custom white balance setting based on a photo of a white or neutrally colored object in your image. This photo is then used for the white balance of the photos that follow.

Some camera settings have a greater effect on JPEG images than they do on RAW images, so you should, if possible:

- ▶ Deactivate automatic sharpening or select a low sharpening value
- ▶ Set contrast correction to *low* or *normal*
- ▶ Set color to *neutral* and saturation to *low*. Saturation can be corrected later anyway.
- ▶ Use the Adobe RGB (1998) rather than the sRGB color space
- ▶ Use the highest possible resolution and lowest possible compression settings

Your first step in processing a JPEG image should be to convert it to TIFF so that the following steps don't cause exponential image quality loss due to the additive JPEG quantization process*.

* Quantization is part of the JPEG compression process.

Our tip: Use RAW once you are familiar with it and whenever you want to squeeze the last drop of image quality from your camera. You can, however, still produce great JPEG and TIFF images if you concentrate on your exposure while shooting and follow the rest of the workflow diligently.

Most cameras produced since 2007 support simultaneous saving of JPEG and RAW files for each image. This gives you the freedom to choose between “ready-made” JPEG images and RAW images for later processing.

1.5 Camera Settings

Select either RAW mode (check your camera manual to see how) or JPEG with the highest possible resolution and the lowest possible compression rate. RAW files use much more memory than JPEG files, regardless of whether your camera uses CF, SD, xD, or Memory Stick cards.

CF = CompactFlash, SD = Secure Digital,
SDHC = Secure Digital High Capacity.
These are the most common memory card
technologies in current use.

1.5.1 Using Histograms as an Exposure Aid

→ Digital image sensors are more sensitive to overexposure than film and clip highlights much more drastically.

Correct exposure is the key to great photos. Overexposure should be avoided at all costs, as washed-out highlight detail cannot be recovered at any stage during the workflow.

In order to help you judge exposure, digital cameras allow you to check your exposure visually on the monitor immediately after shooting. Nearly all digital cameras – at least all DSLR cameras – have a histogram display that shows the distribution of tonal values within the image from 0 (black, on the left) to 255 (white, on the right).

On the next page are four sample histograms produced using Photoshop that show three typical curves.

The histogram in figure 1-13 shows an overexposed image with obviously clipped highlights at the right end of the graph. This image will lack highlight detail. Images that display a histogram like this are generally only good for deletion. Some photographers recommend using the Photoshop Burn tool to darken images like this, but the tool only simulates detail that wasn't actually present in the original image.

The histogram in figure 1-14 shows only a small overexposed peak on the far right. The actual subject will dictate whether this amount of highlight clipping is acceptable or not. If the clipped highlight is pure white or represents a less important image detail, the photo might be OK. Otherwise, it may be safer to ditch it and re-shoot.

The histogram in figure 1-15 is of a balanced exposure. The missing tonal values at the white end of the scale can be reconstructed using Photoshop. You should always aim to produce images with histograms that look similar to this one – i.e., with an even, unclipped grayscale “mountain” as far towards the right-hand end of the graph as possible. This approach is often described as “exposure to the right”.

The next section will clarify why it is better to underexpose than to risk losing highlight detail, especially as it is often difficult to view and judge a histogram correctly in bright light or on the road.

➔ Remember that the monitor image and the image represented by the camera histogram are in JPEG quality and have already been subjected to a RAW-to-JPEG conversion by the camera's firmware. If you are shooting in RAW mode, your computer-generated histograms and the resulting images (e.g., in a RAW editor) will often look different from the ones the camera displays while shooting.

1.5.2 Clipping in Individual Color Channels

A good luminance histogram displays only the distribution of brightness values and can belie detail clipping for individual colors. Histograms for the separate color channels help in such situations – a feature offered only by a few high-end cameras.

The histogram in figure 1-17 is of an image shot using a Canon EOS 10D and shows the typical color saturation problems associated with yellow, orange, or blue flowers. Such subjects will generally not use the entire range of tonal values in a luminance histogram. The color histogram in figure 1-17 (produced using Adobe Camera Raw) clearly shows the clipping that occurs at the right end of the blue curve.

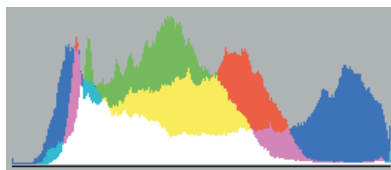


Figure 1-17: Histogram for figure 1-18



Figure 1-13: Histogram showing distinct overexposure



Figure 1-14: Histogram showing potential overexposure (red circle)



Figure 1-15: Histogram of a well-exposed shot



Figure 1-16: Histogram of an underexposed shot

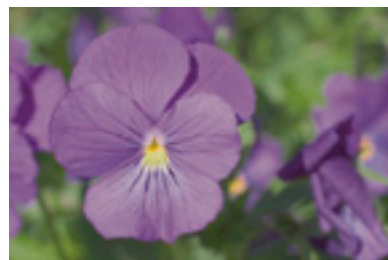


Figure 1-18: An image that will be prone to blue channel clipping

The Capture One multi-channel histogram in figure 1-19 also indicates clipped colors. The blue clipping was not visible in the camera histogram

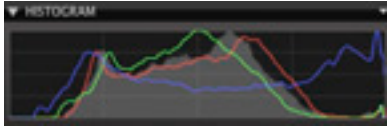


Figure 1-19: Histogram for the image in figure 1-18, produced using Capture One

EV = Exposure Value

because it only shows the average (luminance) values for all three color channels.

→ Always make sure the colors in your image aren't clipped in one or more color channels.

A color histogram only helps if you are in a position to re-shoot your image using different exposure values. This is often possible for nature photos (with the exception of birds or other animals). Unfortunately, even the most sophisticated automatic exposure systems cannot guarantee optimum exposures. Histograms offer a more reliable way to judge exposure, even for experienced “old-school” photographers who are used to using light meters. You can compensate for overexposure by adjusting your exposure value (EV) setting and repeating your shot. You should always keep an eye on the histogram, and we strongly recommend that you set your camera to display a histogram automatically after each exposure.

If you use a tripod, it is easier to use your own manual exposure settings than the camera's exposure compensation dial. The correct settings for a particular scene don't usually change that often, and automatic exposure metering systems often adjust exposure randomly for differently lit objects within a single frame.

1.5.3 Using White Balance Settings to Produce Optimum Color Quality

White balance (WB) settings are the key to correct color reproduction. They have to allow for direct and indirect (reflected) light sources.

Analog photographers adjust white balance either by changing the film they use or by attaching colored filters to the camera lens. This compensates for differing lighting conditions (indoors, outdoors, cloudy sky, flash, etc.).

If you shoot in RAW format, you can adjust white balance later during processing. Fine art photographers are not necessarily interested in absolute color reproduction anyway (why else would you want to use Velvia slide film, with its over-the-top candy colors?), but most of us are interested in the subjective mood of a photo, which is often carried by the colors.

DSLRs allow you to select your preferred white balance setting while shooting.* This is a great feature, but it is not always practical to use in real-life situations. We recommend that you set white balance to automatic and correct it later (if necessary) during the workflow.

An alternative method of ensuring consistent white balance is to photograph a gray card** in the same light as your subject and use the resulting image as a reference for your white balance setting.

Getting white balance right is a tricky and largely subjective process, but you will get better at judging color and color settings with increasing experience.

* Using automatic or manual white balance settings

** A color card (such as the X-Rite ColorChecker) with neutral gray color fields is even better.

Color value judgements depend on the overall mood of an image. Images that show too many cold (blue) tones can benefit from additional warm (yellow or red) tones, although you may find yourself wishing that a warm image includes more neutral (blue or green) tones. Color experiments and corrections involve time and effort during the image optimization process.

1.5.4 Objective and Subjective White Balance

There is a big difference between correct colors and pleasing colors. There are only few situations in which we want to reproduce colors completely faithfully – for example, if we are photographing textiles or products for publication in catalogs. In most other cases, we aim to produce a pleasing color composition. The most frequently discussed (and culturally influenced) aspect of color is skin tone. In Europe and the USA, people generally prefer skin tones that have been shifted slightly towards brown, whereas Asian photographers tend to prefer paler skin tones.

Select a white balance setting that you like and correct contrast and color selectively and only where genuinely necessary. This might involve correcting skin tones, but can also mean changing the dull blue of a sky or the blue tones in shadows that are often produced when you shoot in bright sun.

Color perception is subjective and depends to a great extent on personal taste. The default settings in different RAW editors produce different results from the same source image, which is why some people prefer one particular software package over another. These types of differences are also evident in JPEG images produced by the camera, as they too are subject to the manufacturer's proprietary, firmware-based RAW conversion.

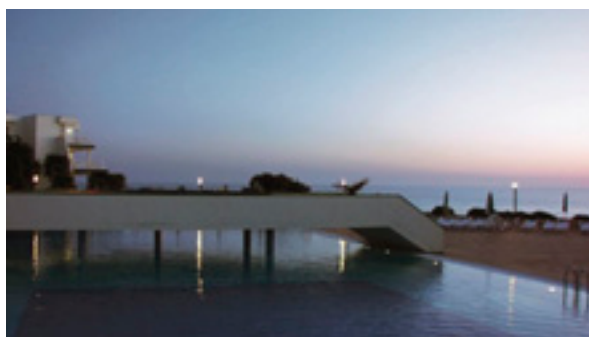
This is why many newer RAW editing programs offer multiple camera color profiles,* so that every user can select his/her favorite (with stronger or weaker or more neutral colors) as the default. These profiles nevertheless only form the basis for subsequent optimization.

1.5.5 Choosing the Right ISO Sensitivity Setting

Modern digital cameras allow you to select the ISO value for each situation using a dial or a button. This is a great advantage over analog photography, which requires either a film change or special development in order to alter the sensitivity base.



Figure 1-20: Neutralizing the color effect (below) spoils the mood of this image (above).



* For example, Adobe Camera Raw from version 5 and Lightroom from version 2 onwards.

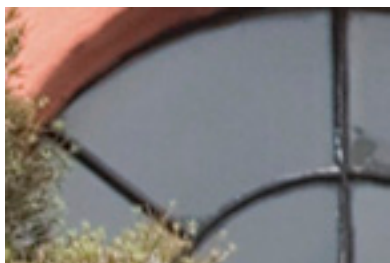


Figure 1-21: Detail of an image shot at ISO 200



Figure 1-22: Detail of the same subject shot at ISO 6400

→ Always select the lowest possible ISO setting and use a tripod whenever you can.

Generally, the lower your ISO value, the less noise your photos will display, resulting in better image quality. Higher ISO values always produce more noise, which takes on various forms and is usually more evident in darker image areas. Image noise is caused by charge differences between the individual elements of the image sensor that result from static, manufacturing tolerances, signal amplification, and other, similar factors.

High sensor temperatures also increase noise. If you are shooting in high ambient temperatures, keep your camera cool and don't leave it switched on for longer than absolutely necessary. The levels of noise a camera produces also depend on the type of sensor it uses. Small image sensors produce more noise than larger sensors, and CCD sensors produce more noise than their CMOS counterparts because they use more power and therefore have higher operating temperatures. Greater sensor resolution for a similar sized sensor reduces the per pixel sensor area, which also leads to increased noise – technical advances in recent years have helped to keep noise levels down in spite of increasing sensor resolution.

Grainy, “salt and pepper” noise effects are generally more acceptable to us because they look similar to the grain effects we know from analog film material.

If you find yourself needing to use higher ISO values (for instance, in low light or for fast-moving subjects) we advise you to use the best possible noise reduction tools during processing. (See also section 12.3, page 475 onwards.) We usually deactivate in-camera noise reduction, as it not only slows down in-camera image processing but also tends to blot out fine image detail. If noise reduction is really necessary, you can perform it in a much more selective and controlled fashion by using a RAW editor or Photoshop plug-ins.

We also nearly always deactivate Auto ISO. This feature allows the camera to automatically increase the ISO value if it thinks the situation demands it. This can be useful for sports photography or other fast-moving subjects, but it often produces unexpected, unwanted noise effects.

1.6 From the Camera to the Computer

Here, we are going to address part of chapter 2's second phase (P2) step of image data transfer and organization. This will help us to clarify the background and incentives behind some of the topics that we will be discussing later in this chapter.

Transferring the data from a full memory card to your computer after a long session often uses a large amount of disk space, especially if you convert some of your images to 16-bit TIFF format. You will quickly learn to think in gigabytes (GB) or terabytes (TB). Our network already has more than 6,000 GB (6 TB) of disk space attached to it in various forms. Such large amounts of data require serious organization if we are to be able to find specific images, and if we want to avoid duplicating data and retain an

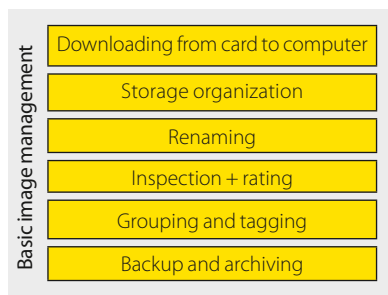


Figure 1-23: Our first workflow steps on the computer: image transfer and management

overview of the current versions of the images we have. A good basic setup includes a 300 GB hard disk in your notebook and 750 GB – 2 TB in your desktop. You will also need a similar amount of disk space on external drives for your backups.*

* Nowadays, external drives are connected to computers via FireWire, USB 2.0, eSATA, or high-speed NAS systems.

1.6.1 Downloading and Organizing Your Images

Most modern digital cameras have either a USB or a FireWire interface. Wireless interfaces are either optional or expensive (or both). Many systems automatically download images as soon as a camera or a card in a card reader are attached to a computer. We don't use this option because we use multiple memory cards, and because most cameras don't make very effective card readers. Direct downloads also quickly exhaust your camera's batteries. We use a card reader attached to one of our laptops or workstations to download the day's images to a new, dated folder. We use several different cameras, so we try to name our image files in such a way that they are all easily attributable to a particular camera, even if we are using more than one camera of the same type.

At this point it is important to keep control of how your saved images are organized and how you name your individual image files.

- A) Make sure you know where to find your new images and where they are to be stored if the download location is not their final destination. Original images and processed versions of the same image don't always end up being stored in the same place.
- B) Make sure you organize your images clearly and simply so that you can always quickly find any originals or copies.
- C) Your personal system should be compatible with your image management software.
- D) All images and additional data should be backed up regularly and should be easy to reproduce should a system failure occur.
- E) Make sure that your image files and your backups are easily identifiable.

The way you order your images is fundamental to the way you store all of your future work. The two most obvious ways to sort images are either chronologically or according to individual topics or jobs. We recommend the chronological approach. Images sorted by topic quickly become unmanageable.

Filenames should be chosen according to the following rules:

- A) A filename should only occur once in your entire database (apart from backups, of course).
- B) A filename should give some clues as to its contents (date, image type, subject, or job number).

A note about our use of the term "RAW":

The term "RAW" (in capitals) refers to images shot in one of the many available RAW formats, whereas the term "raw" refers to unprocessed image data in any format (RAW, JPEG, or TIFF).

→ Our tip: only arrange your images according to themes in virtual folders or collections based on image metadata and not on the location of the original image file.

→ Resist the temptation to include too much information in your file names. This quickly leads to complications and naming system breakdowns.

C) A filename should be short and must be compatible with your database and/or image management software. Don't use special characters. We recommend that you use the following guidelines when naming your files:

- Maximum 31-character length (plus a 3-character file extension separated from the filename by a dot). Remember that filenames often get longer (for example, with the addition of a version number).
- The only special characters should be underscores, hyphens, and the dot that separates the extension from the filename.*
- Don't use unusual language-based characters (such as é, ë, or â). Although most modern systems can decipher these types of characters, they still often cause problems, especially if you change systems or programs.

* It is safest to use dots exclusively for separating the filename and the file extension.

D) The file extension should make it obvious what type of file it is describing. References to the processing steps you used or other characteristics of a file can be included in the filename.**

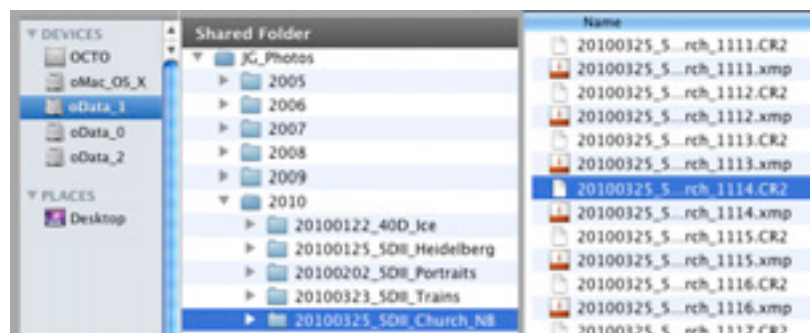
** For example, "BW" for a black-and-white conversion

You can apply most of these criteria to your folder names, too – especially avoiding folder names that are too long or use special characters. It is important to consider what information is really relevant and what is better to leave out when naming files and folders.

Our File and Folder Naming Conventions

Figure 1-24 illustrates the system we use for naming files and folders. This system is chronological and is built on two or three levels. We use one folder for each year, and the folder's name always includes the year. The year folders contain subfolders organized according to shoots. If we use only one camera, all the images from a shoot are stored in a single subfolder. If we use multiple cameras for a shoot, the images from each camera are stored in a separate subfolder.

Figure 1-24:
Our system for storing original images
downloaded from the camera



- ▶ **2010:** All source images shot with all of our cameras in the year 2010 are stored here in appropriate subfolders.

- ▶ **20100325_5DII_Church_NB**: This folder contains the images we shot at the church in Niebelsbach on March 25, 2010.

The individual image files are named as follows:

Date_Camera_#_Shoot_image#:

- The date format is *jjjjmdd*,* to make sorting easier
- 5DII stands for the *Canon 5D Mark II* camera
- Options “_01”, “_02”, . . . , are used if we shot and saved images using more than one memory card (not shown in figure 1-24).
- The name of the shoot or the broad subject (here “church”) or a customer or job number.
- The image number that the image receives on the memory card (usually between 0000 and 9999)

* The standard international date format is jjjj for the year, mm for the month, and dd for the day. If you need to save space or characters, you can also use a two-digit number for the year.

We rename all of the downloaded images according to these rules immediately after downloading. Ideally, the renaming process takes place during downloading.

If you have more than one camera of a particular type, you still need to uniquely identify each image. Once it has reached 9999, the camera starts numbering again at 0000. The *jjjjmdd* suffix nevertheless allows you to create unique filenames.

We save the images we process in Photoshop as TIFF files. These files contain the original *Date_Camera_Shoot_mmm* data in their filenames and also receive an additional sequential number and possibly a code that identifies the processing involved, for example:

Original: 20100325_5DII_Church_1114.CR2
Processed image: 20100325_5DII_Church_1114#02BW.tif

* We will call all processed and converted RAW images “processed images” or “derivative images”.

This way, we can always find the original image based on the information contained in the name of the processed image*. Lightroom automatically saves a RAW image and its derivatives as a stack.

1.6.2 Renaming Your Files

Once we have downloaded our images to a hard disk, we rename them according to the system we have just described and thereby ensure that every image is uniquely named. We use the Adobe Bridge Photo Downloader or the (even better) Lightroom Import tools, both of which are capable of renaming files during download and which can also be programmed to save a backup copy of each (already renamed) file to a separate location. You can also use these tools to apply metadata to files, which, in the case of RAW images, is saved in a separate XMP file.

➔ This step is only necessary if you haven’t already renamed your files during the download process. This section demonstrates the system, regardless of when it is applied.

The Bridge Downloader is opened using the **File ▶ Get Photos from** command, and the dialog in figure 1-25 then appears. Select the image source **A**, the target folder **B**, and, optionally, the backup location **C**.

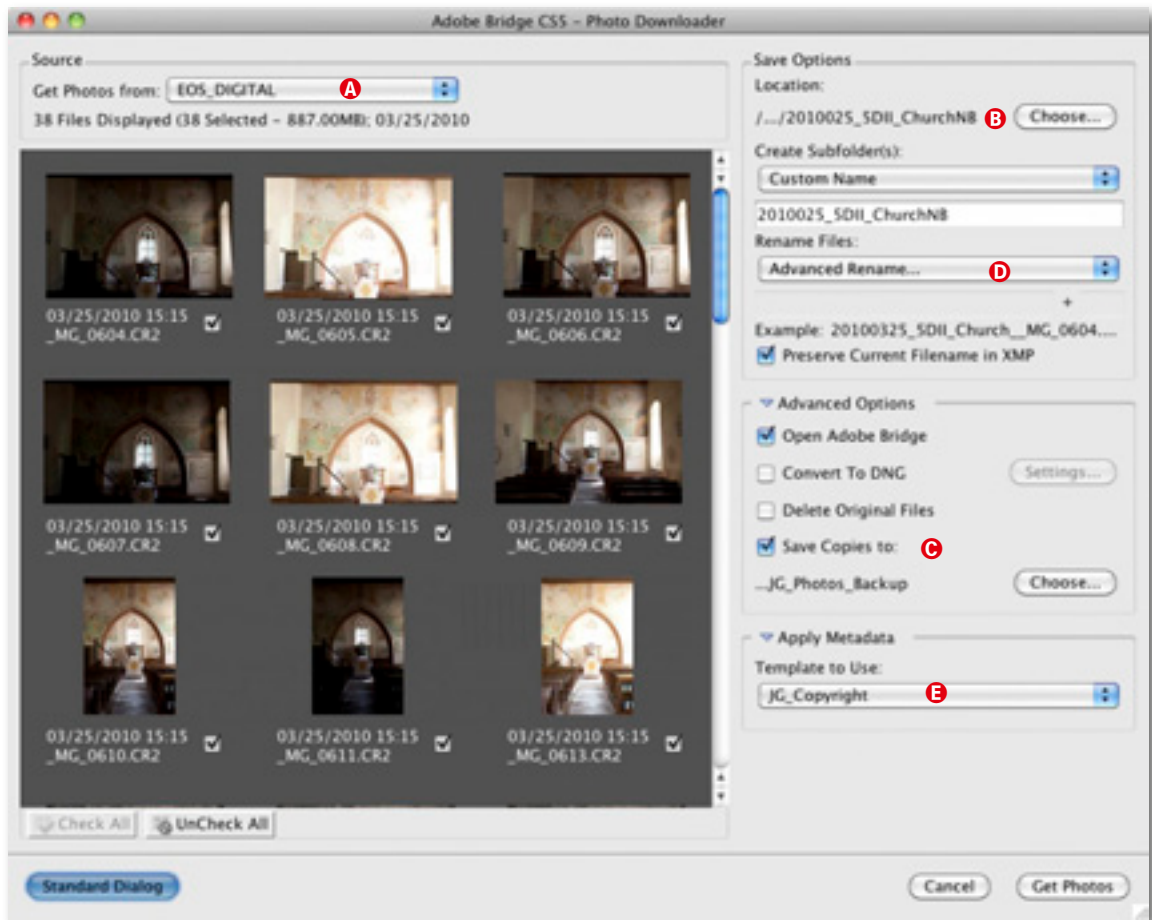


Figure 1-25: Adobe Bridge CS5 Photo Downloader showing the extended dialog options

You can then use the Rename menu ④ to define your renaming system. The settings shown in figure 1-25 produce images named using the system we described above.

The Bridge downloader also includes an option ⑤ for applying an IPTC metadata template to the images you are downloading. The menu ⑤ also includes an option for creating or editing the template before you apply it.

1.6.3 Backup

Once you have downloaded your images, you should back them up immediately to either a separate hard disk, a DVD, or a Blu-ray disc. The Bridge and Lightroom import tools both have an automatic backup option that we always use if possible. Once you have backed up your images, you can delete them from the memory card or, preferably, format your memory card using the camera's built-in format command. We don't recommend that you format memory cards using your computer!

Don't Forget: Backup – Backup – Archive

We can't repeat it often enough. Always backup your image files:

- ▶ As soon as possible, i.e., during or immediately after download.
- ▶ Additionally to DVD, Blu-ray, or an external hard disk. Don't back up your files to the same hard disk as your originals and don't back them up to a partition on the same disk.
- ▶ Make multiple DVD backup copies using different brands of disc. If a disc from a particular batch or manufacturer is defective, the chances are that other similar discs will also be defective.
- ▶ Store your backup copies in different locations. This way, you minimize the risk of a total loss of your images due to fire, water damage or theft.

Once you have saved your originals and backup copies of your images, you can at last start work in the digital darkroom.

- ➔ If the file system on your memory card should become corrupted, don't panic!* There are a range of recovery programs available (such as Photo-Rescue) that are generally capable of reconstructing and saving your files.

➔ Some download tools (e.g., Photo Mechanic, Adobe Bridge, or Lightroom, for example) allow you to create a backup copy of your image files automatically during download.

➔ There are also tools available (such as Apple's Time Machine) that constantly check your system for new or updated files and automatically back them up to an external storage location. This is an effective backup method, but it is not sufficiently safe on its own. You can find more information on backup and data security in section 13.2.

* This can easily happen if your camera battery dies while it is writing a file, or if you open the memory card door of your camera too soon.

1.6.4 Handling Your Digital Originals

The source image that is now saved on your computer is also sometimes referred to as a *digital negative*. We recommend that you save a copy of this file in its current, renamed form (be it RAW, TIFF, or JPEG). This file contains all the available image data without any loss due to processing and including all the metadata recorded by the camera. You will often need to refer back to your original file, for example if:

- ▶ You have improved your technique and want to have another try at perfecting a particular image.
- ▶ Better RAW editors hit the market. We have seen radical improvements in image processing software in recent years, and we expect these to continue.
- ▶ Your processed images become lost or damaged due to disk failure, virus action, or accidental deletion.

A source image is a type of latent image, and the processing steps you make are equivalent to your own special analog darkroom development formula. The major difference between analog and digital images is that you can develop the same negative (i.e., the RAW image) multiple times. If you use JPEG or TIFF files as your source, you should be working exclusively with copies of the originals. RAW editing software doesn't alter the RAW file itself, but instead saves the changes you make as a separate data set or file.

1.7 The Digital Light Box

Sorting your images is an important and often unpopular task, especially if you are itching to get to work on your latest images.

The thumbnails displayed in many file browsers are usually not of high enough quality to be used for judging overall image quality. The fact that we will be working (mostly) with RAW files means that our digital light box has to have an associated or built-in RAW editor that can display the full, high-resolution image contained in the RAW data. When you are sorting your images, you should check:

- ▶ Composition
- ▶ Sharpness
- ▶ Exposure (histograms are very useful here)
- ▶ Color quality (which often depends on selecting the right white balance setting)
- ▶ Which image of a series or a bracketing sequence* is the best

* A series of images of the same subject but taken with differing exposure settings.

→ You can, of course, change your rankings at any time.

Based on this first inspection, we label our images either as *keepers* or as trash that should be deleted immediately. We then give our keepers a rating from 1–5 stars. Five-star images are potential portfolio material, while images with no star are ones that we will keep for now, but possibly delete later after a second sorting.

A good early sort saves disk space and makes working with the rest of our material easier and more efficient. Once we have sorted our images, we set up our image browser to display only those with one or more stars. Then we can start work.

There are a great many tools available for the universal task of image browsing. The file managers built into the two most popular operating systems (the Windows Explorer and the Mac OS Finder) are becoming increasingly powerful and are nowadays capable of displaying thumbnail previews of various file types as well as some metadata. But a purpose-built image browser is still faster and more accurate when it comes to making image selection decisions, especially if you are viewing RAW images.

Every RAW editor and quality image processing program has its own built-in image browser, but there are also a number of standalone products available, such as the freeware IrfanView. Some digital asset management programs, such as Extensis Portfolio [71] or Microsoft's Expression Media [90] also have their own image browsers. Photoshop also has a fairly powerful browser that forms a bridge between the individual components of the Adobe Creative Suite and gives it its name, Adobe Bridge.

The three basic phases of image browsing and selection are:

1. **Initial inspection** of new photos recently downloaded to the computer. Here, we determine which images can be deleted immediately and which deserve a second look. We also rank our images and add basic metadata

(such as the name of the shoot, copyright information, keywords, etc.). This basic sorting is an important part of the overall workflow and shouldn't be taken lightly. Scrimping on initial sorting often makes effective image processing much more difficult later on.

The end of this first phase involves displaying the images marked for deletion once again and confirming that your initial decision was the right one before deleting them forever.

2. **Transferring individual images to your image processing program.** Although some image browsers also include basic image editing tools, purpose-built image processors are still the better option when it comes to the range and functionality of the tools they offer. Only some of the newer all-in-one programs mentioned earlier have integrated, high-quality image editors.
3. **Image search**, in order to find and process a particular image, for example, a RAW-to-TIFF conversion; print preparation; or image export to another application. This phase is much easier if phase 1 (above) is conducted in a comprehensive and orderly fashion. Along with a clear storage structure, meaningful metadata are also important, as it's the basis for future searches and selection processes.

We will explain the browsing process using Adobe Bridge, the sister program of our main tool, Photoshop. Most contemporary image browsers have very similar functionality.

1.8 Adobe Bridge

Adobe Bridge has been part of Photoshop since CS1 was released and is continually being improved. Bridge is basically “image management lite” and forms (appropriately) a bridge between various Adobe applications. Used in combination with the current version of Adobe Camera Raw, Bridge behaves like a kind of mini Lightroom. Bridge can recognize and handle more image and multimedia formats than Lightroom, but it uses an extended cache structure rather than a real database of its own. This makes it more difficult to search through large amounts of data and can lead to long-term data consistency problems.

Bridge is, however, extremely flexible and highly configurable with respect to its Views and the information they contain. Once you are used to using Bridge, you can define different Workspaces for use with different tasks. You can organize various Views and information panels into Collections that can be viewed and manipulated in other Adobe applications. Bridge includes a number of preset Collections that you can change to suit your own needs. Bridge also includes other filtered views that can be accessed via the Views menu.

→ A useful feature offered by Photo Mechanic, Apple Aperture, and Photoshop Lightroom is the ability to compare several (often similar) images next to or above one another in a single preview screen.

→ Adobe has, sensibly, moved some Photoshop tools to Bridge in the CS4 version of the program. This new arrangement concerns functionality that (potentially) deals with multiple images, such as the contact sheet and web gallery tools.

* The Folders window also contains a Favorites tab, where you can put folders that you use regularly for fast retrieval.

➔ EXIF metadata are written to the image file by all modern digital cameras. These include information regarding the camera model and the lens used, as well as the shutter speed and the aperture. This information is very useful when it comes to selecting and processing images later.

The default Bridge workspace is divided into four main panels (figure 1-26):

- Ⓐ **Folders:** This is where you select the folder for the images you want to view or manage, depending on which mode you are using.*
- Ⓑ **Content:** This is usually shown as thumbnail previews, whose size is adjustable using a slider at the bottom of the panel. You can also view your content as a list (showing some file details) or as a detail view (showing all file details). The default settings highlight the currently selected item.
- Ⓒ **Enlarged preview:** This helps when making selections, especially if the list icon is too small to judge adequately. The size of the preview image can be adjusted.
- Ⓓ **Metadata:** This includes the filename, the shooting and last processing dates, and EXIF and IPTC data (we will describe these in detail later). EXIF data cannot usually be edited, whereas most image browsers include IPTC editing functionality.

Bridge has a very flexible user interface. You can show or hide most of the individual panels, providing more desktop space and a clear overview of the work you are doing.

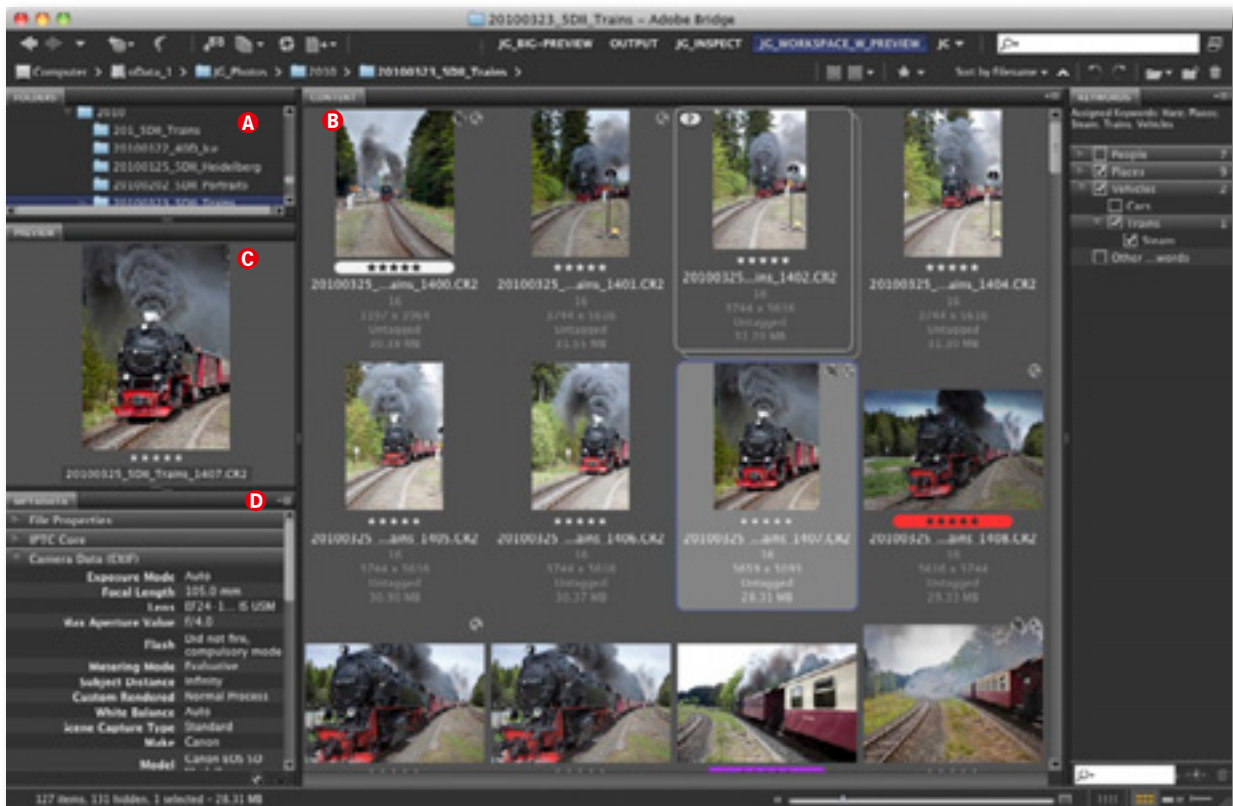



Figure 1-26: Using Adobe Bridge as an image browser. Here you can see the various configurable panels.

The first time you open a folder in Bridge (or most other image browsers), the program will use generic icons (like , or similar) as placeholders for your images while it generates thumbnails. Bridge uses the Adobe Camera Raw (ACR) module to produce thumbnails of RAW images and saves them in a separate cache so they don't have to be regenerated the next time you look in that folder.

Images are opened using a double click, and you can usually select which application your browser uses to open and process your images in the program preferences. Bridge automatically opens ACR to process RAW images and Photoshop to process all other compatible image formats.* Most image browsers also offer a choice of programs via a context menu (usually accessed via a right click).

You can also drag images directly from your browser into your image processing program. In Mac OS X, you can drag images to applications that are open in the Dock, such as a RAW editor other than ACR.

* You can configure ACR/Bridge to open TIFFs and JPEGs using ACR. This is done in ACR Preferences.

1.8.1 The Bridge “Review” Mode

The new (as of CS4) Review mode is designed with photographers in mind and is ideal for initial selection and later, more detailed selection processes.

First, select the images you want to preview in the content window, then activate Review mode.** Bridge then switches to full-screen, virtual light



** This mode can also be activated using  or .



Figure 1-27: Review mode offers a fast and efficient way to view, select, and mark your images for processing.

box mode and displays the first selected image in large format with the others arranged as thumbnails around it.

You can then navigate from image to image using the arrow keys (→ and ←) or you can select an image directly by clicking on it. The ↓ key removes the active image from the current view^{*} and clicking on the active image activates the loupe, which you can then drag around the image using the mouse. U rotates the image to the right and ⇧-U to the left.

You can then use the 1 to 5 keys to rate the active image with an appropriate number of stars, while 0 removes any stars you have already applied. You can also use the 6 to 9 keys to apply color coded toggle labels to the image (as described on page 29 in figure 1-33). Pressing the delete key marks the active image for deletion.

0 opens the active image in Photoshop, R opens it in ACR, and Alt/⌘-0 opens all images in Photoshop (or Alt/⌘-R all images in ACR).^{**}

Pressing Esc closes Review mode and returns you to the previous Bridge view.

Review mode offers a fast and efficient way to view, select, and process your images. Pressing the Space key activates Full Screen Preview mode, which then displays the active image in a larger format than Review mode. The same keystrokes apply here as in Review mode. Slideshow mode is activated using Ctrl-L and displays the currently selected images one after another. You can apply stars, toggle labels, and delete flags here too.

RAW Preview Generation

As with most image browsers, you don't have to import images into Bridge to work on them – you simply have to navigate to the appropriate folder. Once preview images are generated, each file is represented by three separate objects:

- A) The image (or data) file itself
- B) The preview image (RAW files are displayed as JPEG previews)
- C) A separate metadata file where ACR stores information regarding processing steps that have been applied to the image or IPTC metadata. This file can also be used by other programs to save other information relating to the main file.

The image data file is always present, whereas the other components are optional (or can be hidden). IPTC data can be embedded in the image file itself or in the Bridge database, along with RAW editing settings. The Bridge “database” is not a real database, but is rather a large file containing file structure information for the images concerned.

If you use Bridge to apply IPTC data to a RAW file, Bridge creates an additional data file to store this information. If you then make adjustments to your image using ACR, the corrections you make are stored in the sep-

* The image is only removed from the current view, not deleted.

→ Pressing the H key shows a menu that lists all the available keystrokes and their effects.

** The program that is activated also depends on the type of file you are opening and on the way ACR is currently configured.

Bridge preview images are stored in the same cache file that ACR uses.

* Bridge only does this for RAW files saved in DNG format.

arate file. All Adobe applications use the XMP format for these files, which are saved using the name of the image file and the .xmp extension.

If you try to open a RAW file directly in Photoshop or from Bridge, ACR checks to see whether the file has an associated XMP file. If this is the case, it loads the presets and corrections contained therein and saves any additional settings back to the XMP file when the RAW file is closed. If this data is not present, ACR uses its default settings to open the image file.

Name	Date Modified	Size
20100325_5DII_Trains_1400.CR2	25. March 2010, 10:28	31.9 MB
20100325_5DII_Trains_1400.xmp	25. March 2010, 10:28	66 KB
20100325_5DII_Trains_1401.CR2	25. March 2010, 10:28	33.1 MB
20100325_5DII_Trains_1401.xmp	25. March 2010, 10:28	20 KB
20100325_5DII_Trains_1402.CR2	25. March 2010, 10:28	32.7 MB
20100325_5DII_Trains_1402.xmp	25. March 2010, 10:28	16 KB

Figure 1-28:

XMP files are very small. These are the sidecar files for our “CR2” RAW files.

XMP files can contain large amounts of varied data, including proprietary processing data from other, non-Adobe programs. Some RAW editing programs simply ignore the Adobe ACR or Lightroom sections of an XMP file and create their own segment for storing image processing information. Lightroom stores image processing information primarily in its own database, but optionally it can be set to store the same information in an XMP file. If you open a RAW image in Lightroom, the program checks to see if an XMP file is present; if that is the case, it transfers the XMP data to the Lightroom database.

Bridge creates image preview thumbnails using ACR and stores them in its own Cache file.** Bridge can be set to save cache data to a central cache file, or to separate cache files in each image folder. We always use the latter method.

The Cache label indicates that the information stored there is of a temporary nature and serves to speed up various image processing tasks. The cached preview images simply help the program to create and display them more quickly without having to first open and read the full image file. This greatly accelerates the viewing process for full image folders, and Bridge automatically regenerates any missing thumbnails.

If the cache file should become corrupted, it is a good idea to delete it, using either your computer’s operating system (Finder or Explorer), or the Purge command in the Cache section of the Bridge Preferences dialog. In order to preserve the integrity of the images managed by Bridge, it is important that you only change image filenames using the Bridge **Tools** ▶ **Batch Rename ...** command (or a single image by renaming the image icon in Bridge) and not using Finder or Explorer.

** Bridge preview images are not saved separately, but as data sets in a single Bridge Cache (.bc) file.