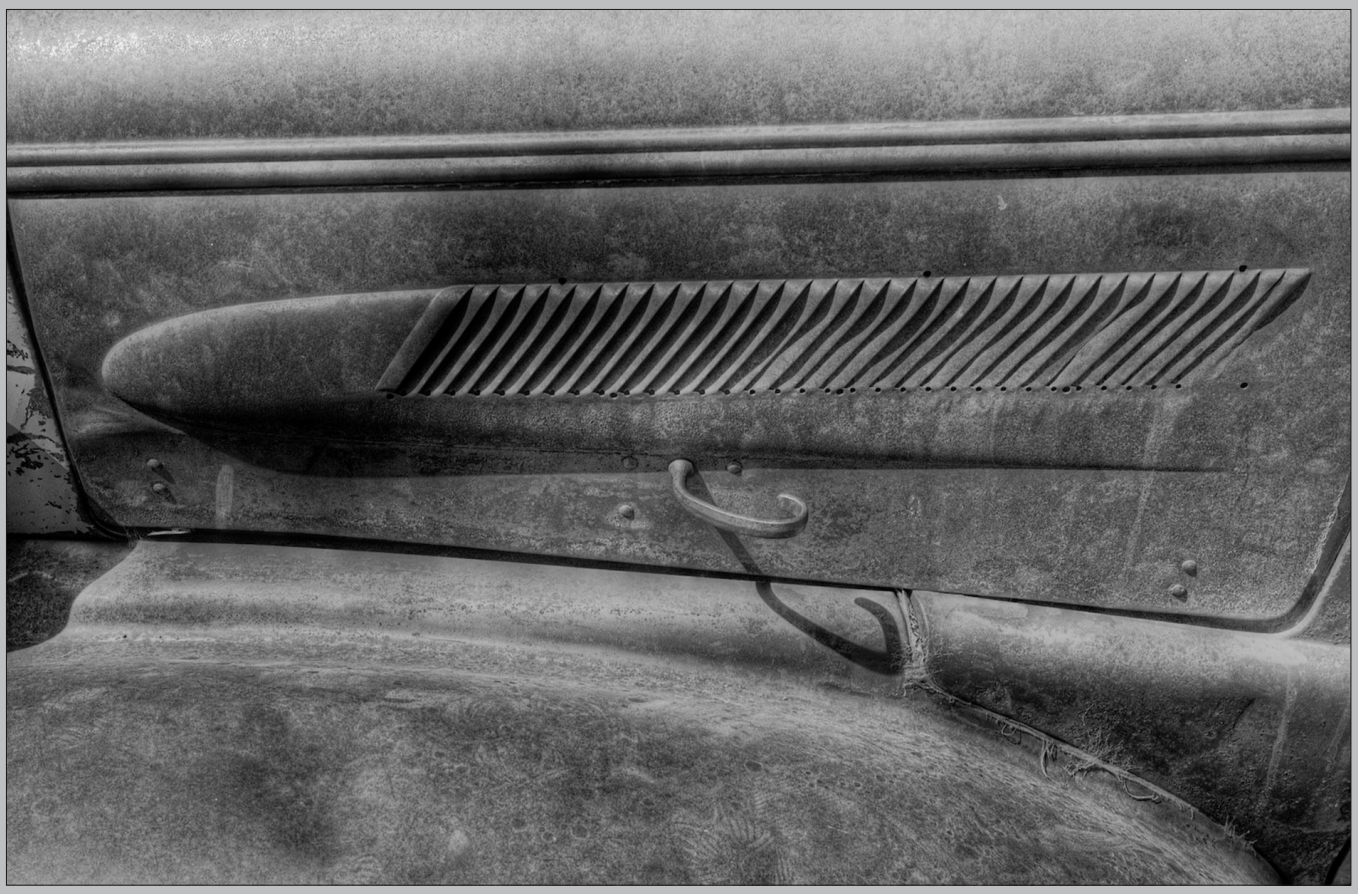


1 The Photographic Workflow

Before we plunge head on into Lightroom, we'll look at a typical photographic workflow. This workflow certainly differs from photographer to photographer. It will depend on how you work, what your purpose is, and what kind of photos you capture.

A good part of these considerations are independent of the software used. In some cases, you will have to fall back on more than just one application, even if this new generation of photo workflow programs claims to cover a broad range of tasks and demands. In reality, the whole spectrum of potential tasks is just too big and too heterogeneous and the software solutions are still new. Nevertheless, Lightroom will take you a long way.

We'll begin by naming the tasks and steps that you have to perform regularly as part of your digital workflow. This chapter is merely a brief overview. Later we'll cover in more detail what Lightroom offers to help complete these tasks.

We will often explain our own personal workflow and share our own practical experiences. Even if your own workflow is different in some details from ours, you will learn how to apply our solutions to your own needs. Many solutions are of a general nature, while others, with some simple modifications, can be adapted to your personal needs and preferences.

In this book, we will stick almost exclusively to the workflow for photos taken with digital cameras. We do acknowledge that shooting film in many cases still makes sense; however, this is not the subject of this book.

Of course, many who now use digital cameras still have a legacy of film-based images. Most will be looking for ways to bring at least some of these images into their computer to manage them together with digital images and to improve them using digital editing software. For those wanting to scan their films, we recommend *Scanning Negatives and Slides [05]*, a book by Sascha Steinhoff.

Once those pictures are scanned and available as TIFF or JPEG files, Lightroom will handle them in very much the same way it would if they were shot digitally. Instead of importing them from a camera memory card, you import them from a folder of scanned images. The same applies to images that were edited with some other software or tools–provided they are in one of file formats supported by Lightroom.*

* *See section 2.2 about file formats supported by Lightroom.*

1.1 Image Preparation in the Camera

The digital photographic workflow starts in the camera. Here, we are not talking about photocomposition but rather about some relevant technical decisions:

- Which image format are you using in the camera?
- How to expose?
- What kind of preprocessing should be done in the camera?

These questions have already been answered in detail in our other books–e.g., on RAW conversion [01], as well as in articles that you will find on Uwe's Digital Outback Photo website and the free FotoEspresso Photo-Newsletter [11].** Therefore, we will give only a brief summery here.

Choosing the Camera Image Format

Depending on your camera, you may select three different image formats for your photos:

- JPEG. This image format is supported by all digital cameras
- TIFF is offered by only a few cameras.
- RAW file format is offered by all DSLRs and some bridge cameras.

DSLR = "Digital Single-Lens Reflex"

Additionally, newer DSLR cameras often allow selecting RAW plus JPEG. Whenever possible, we recommend to use RAW. Actually, there are a number of different RAW formats – almost every camera manufacturer uses his own proprietary RAW format. Even the RAW formats of different models of the same manufacturer will differ slightly. This results in a large number of different RAW formats. However, Lightroom supports most of them.

Understand the RAW File Format

To comprehend what this magic *RAW file format* is, you should understand how the majority of today's digital cameras work.

How the Camera Creates JPEGs

JPEG (*Joint Photographic Experts Group*) is the image format most commonly used by today's digital cameras. It provides a reasonably good image quality, but as you'll see, it has some limitations. The obvious one is that its compression format, although excellent, is lossy; some information is always thrown away when an image is compressed.* And even when the JPEG compression is low, the image still degrades slightly.

A more significant problem is that before the camera converts an image to JPEG format, the image must undergo extensive processing within the camera. This processing includes color and exposure correction, noise reduction, and sharpening. Because these adjustments are made in the camera, your ability to make further post-processing corrections is limited.

The upshot is that JPEG compression works best for images that don't need further substantial post-processing or when such post-processing is prohibited. However, if you demand high quality from your work, you will find that it is the rare image that does not need some post-processing.

* *There are lossless JPEG formats, but they are not used in cameras.*

How In-Camera Conversion Works

All new digital cameras capture color photos, right? Well, not exactly. While you ultimately get color prints 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.)

Figure 1-1: Full colored sample target

For example, say you want to photograph a box of Crayola crayons (Figure 1-1). A grayscale sensor would see the picture as it looks in Figure 1-2; 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 1-3. This configuration is called *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 sensors.)

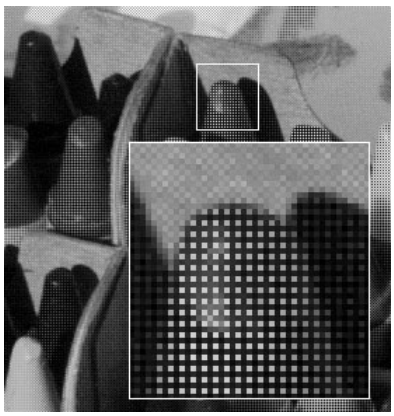


Figure 1–2: Grayscale picture seen by the sensor

The yellow squares in the grid shown in Figure 1-3 are the photoreceptors that make up the sensor; each receptor represents one pixel in the final image. Each receptor sees only the part of the light that passes through the

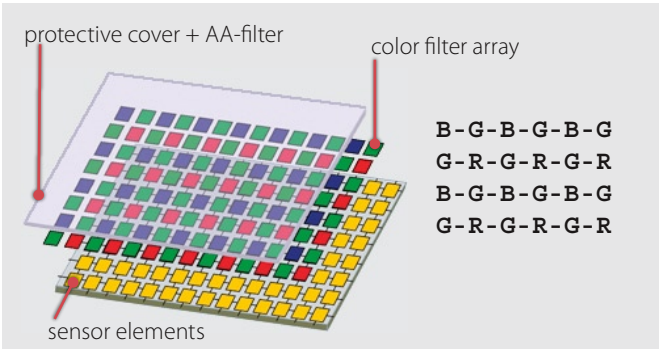


Figure 1-3: Bayer pattern achieved by a matrix of color filters

color filter just above the sensor element – red, green, or blue. Notice that 50 percent of the filter elements (and thus the receptor elements) are green, only 25 percent are red, and 25 percent are blue. This pattern works because the human eye can differentiate between many more shades of green than it can red or blue, which should not be 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 1-4). Each pixel, in turn, contains the information for one color (like a mosaic). However, we want our photo to have full color information (the R, G, and B channels) for every pixel. How does that magic happen? Here's where a software trick comes into play: a process called *Bayer pattern demosaicing,* or *color interpolation,* adds the missing RGB information by estimating information from neighboring pixels.

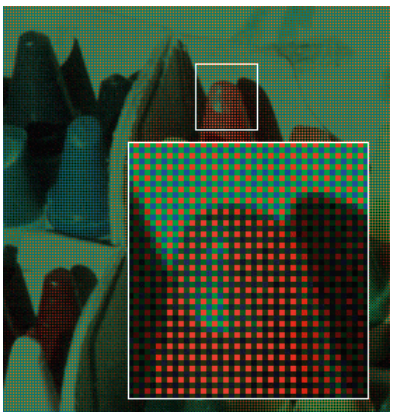


Figure 1-4: Color mosaic seen through the color filters

Demosaicing, then, is the method for turning 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 to resolve detail while at the same time maintaining correct colors. For example, think of capturing an image of a small black-and-white checkered pattern that is small enough to overlay the sensor cells, as in Figure 1-5.

White light consists of red, green, and blue, 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 green-filtered photoreceptors. So for the white square that align with the red photoreceptors, only red light passes through the filter to be recorded as a pixel; the same is true for the blue photoreceptors.

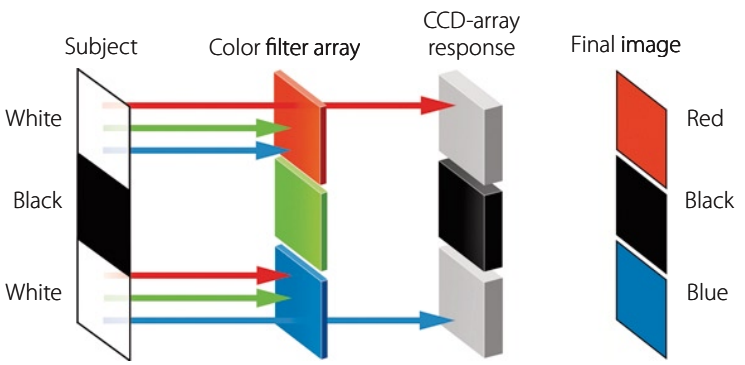


Figure 1-5: CCD/color mosaic sensor with color interpolation problem

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

Contrast this with the Foveon sensor technology illustrated in Figure 9-6. Instead of a Bayer pattern, where individual photoreceptors are filtered to record a single color each, the **Foveon technology uses layers of receptors so that all** three color channels are captured at the same **photo site. This allows the**

Foveon **sensor to capture white and** black correctly without the need for interpolation.

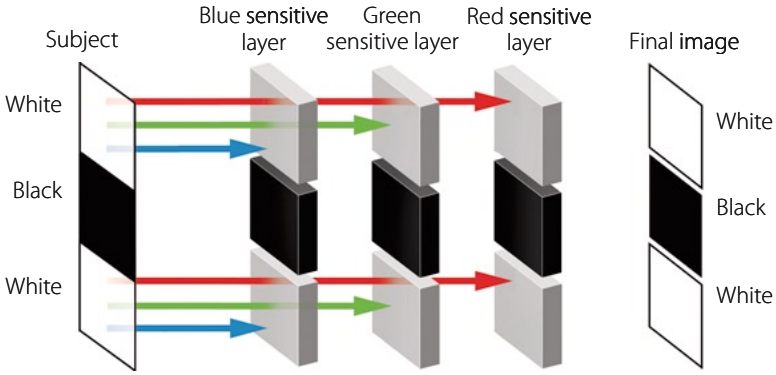
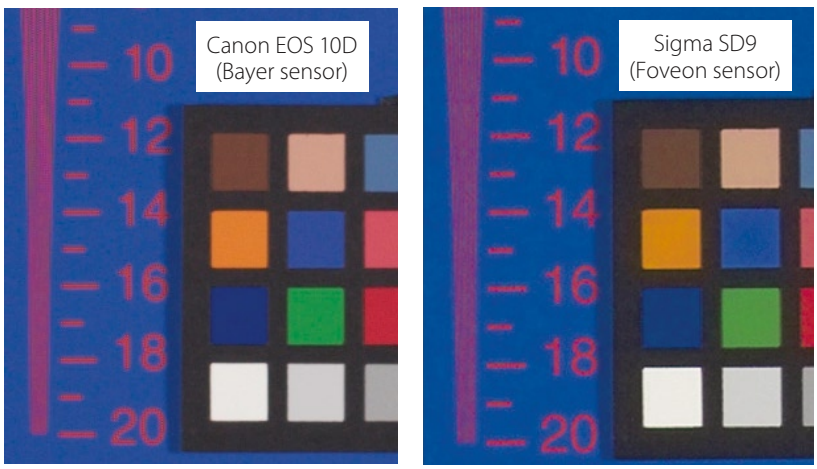


Figure 1-6: X3 sensor with no color interpretation errors

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

The problem in our example with the Bayer sensor is that in order to correctly estimate the color, we need a certain amount of spatial information. If only a single photosite samples the red information, there will be no way to reconstruct the correct color for that particular photosite.

Figure 1-7 illustrates a test we made in a studio to demonstrate the loss of resolution with a Bayer sensor when capturing monochrome colors. Notice how blurry the text in the Canon image is compared to that of 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. While the failure is less dramatic in real-world photographs, it is still visible and definitely not something to be ignored. Increasing the resolution of a sensor naturally helps to diminish this effect.*

Figure 1-7: Fooling a Bayer sensor

Some of the challenges that interpolation algorithms face include image artifacts, like moirés and color aliasing (shown as unrelated green, red, and blue pixels or resulting in discoloration). Most cameras fight the aliasing problem by putting an *Anti-Aliasing* (AA) filter in front of the sensor. This filter actually blurs the image and distributes color information to neighboring photo sites. Of course, blurring and high-quality photography don't usually go together, and finding the right balance between blurring and aliasing is a true challenge for the camera design engineers.

After anti-aliasing, an image needs to have stronger sharpening applied in order to re-create much of the original sharpness. (To some extent, AA-filtering degrades the effective resolution of a sensor; therefore, some strong sharpening is typically needed later, during the RAW workflow.)

The mission 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 in many aspects, digital photography can beat film today because film has its own limitations to contend with.

* *In our experience, some of the high-end Canon DSLR cameras, as well as some of the Nikon models, do this job very well.*

The Limitations of In-Camera Processing

For any given digital camera, the RAW data is all the data for grayscale brightness values captured on a chip. To produce a final image, this RAW data needs to be processed (including demosaicing) by a RAW converter. To produce JPEG images, the camera must have a full RAW converter embedded within its firmware.

You've already seen that one effect of relying on in-camera conversion to JPEG is artifacts caused by lossy compression, but camera-produced JPEGs have other limitations as well:

- Although most sensors capture 10- to 14-bit color (grayscale) information, only 8 bits are used in the final file. (JPEG can't encode more than 8 bits per color channel.)
- The in-camera RAW converter can only use the camera's own, limited computing resources. Good RAW conversion can be very complex and computer intensive. It is much more efficient to have the host computer convert the image than it is to use the onboard ASIC chip commonly used today. Additionally, the in-camera chip can't be upgraded, so as software technology evolves, the difference in efficiency will only increase.
- White balance, color processing, tonal corrections, and in-camera sharpening are all applied to the photo within the camera. This fact limits your post-processing capabilities because a previously corrected image must be corrected again, and the more a photo is processed (especially 8 bit), the more it can degrade.

➜ *Keep in mind that lost detail cannot be recaptured regardless of whatever fancy sharpening methods are used. Sharpening does, however, do quite a good job, and digital cameras work much better than this description of it sounds.*

RAW File Formats

The advantage with working with RAW file formats directly is that they essentially store only RAW data (although they also contain an EXIF section). Fortunately, you can perform all the processing that would be done in the camera to convert a file to JPEG or TIFF (including white balance, color processing, tonal/exposure correction, sharpening, and noise processing) on a more powerful computing platform. This offers several advantages:

- No JPEG compression, resulting in some JPEG artifacts. We are working directly with the RAW data.
- You can take full advantage of the **12-bit to 14-bit color information.** This becomes a significant advantage if you need to make major corrections to the white balance, exposure, or color. When processing an image, you lose bits of image data because of data clipping.* The more bits you begin with, the more data you'll have in your final corrected image.
- You can use sophisticated RAW file converters such as Lightroom, Phase One's Capture One DSLR, or LightZone.
- You may do color correction (white balance) later within your RAW converter without any loss of quality.

* *Which accumulates over multiple steps*

Working with JPEGs created in-camera is like working with images produced by a Polaroid camera (where you simply shoot and receive your processed image immediately). Working with RAW files is more like working with a traditional film negative, which can be developed and enhanced in the dark room. RAW converters mimic the film development process, and because you can always return to your original RAW file and process it again, you aren't limited by the technology built in to today's cameras or even today's software. Over time, improved RAW file converters will appear, which will produce even better results from the same data.** All in all, shooting in RAW gives you much greater control while processing your images.

** *This actually happens all the time.*

The Digital Negative/Slide

The files created on your computer when shooting RAW are often called *digital negatives*. We recommend that you keep these RAW files even after converting them because they hold all the information captured in your shot. You can always revisit these original RAW files when the following occurs:

- You've improved your own digital workflow.
- Better RAW converter software becomes available.
- You lose your derived files.

➜ *We have seen many improvements over the last four years and expect more to come.*

A RAW file is like a latent image and the RAW converter software your preferred magic developer, bringing detail out of over- or underexposed shots. The difference between film and digital is that you can perform multiple kinds of development on your images, returning to them over and over again.

The TIFF Option

What about setting your camera to save images as TIFF files? Saving as TIFF files solves only the lossy compression issue because the images are still converted to 8-bit inside the camera. Also, most TIFF files are larger than RAW files,*** and they don't offer the flexibility and control benefits that RAW does.

➜ *TIFF is hardly supported anymore with new cameras.*

*** *holding only one 12-bit or 14-bit grayscale value per pixel*

An **8-bit in-camera processed** TIFF file is only slightly better than a high-quality/high-resolution JPEG.

JPEG

If you shoot JPEG, you should use the highest possible (native) resolution the camera can provide and use the lowest compression rate the camera allows for. If you intend on doing serious picture optimization, we recommend that you either deactivate all other further processing steps in the camera completely or set them to the minimum. This, for instance, applies to sharpening, contrast enhancement, color saturation, and noise reduction. If possible, use Adobe RGB (1998) as your color space (instead of sRGB), as Adobe RGB (1998) allows for a wider color gamut than sRGB.*

* See Figure 8.5 on page 157.

RAW

With cameras that support RAW, **it is in most cases the best choice. The reason** is simple: Images shot in RAW contain the maximum amount of information the camera can provide. With most cameras, there are 12 bits per pixel (and color) instead of 8 bits JPEG provides. Some newer top cameras even deliver 14 bits per pixel. It would be pity to waste the gain in information. These additional 4 to 6 bits of information give us some valuable quality reserves when editing images. Thus, for instance, slightly overexposed photos, whose highlights will already be burned out with JPEG, may still be recoverable in the RAW converter.** Using RAW, you may also recover some shadow detail, which with JPEG would be blocked, by pulling up the shadows in you RAW converter (here in Lightroom).

** In some cases about 0.5 to 1.5 exposure values (EVs) may be recovered.

In addition, selecting RAW as image format allows you to postpone some of the image processing steps (and with them decisions on what the best settings would be) from the time of taking the picture to when you do RAW conversion –when you'll be working on a computer with a lot more processing power than that available in the camera, and you'll have more time for your choices. With RAW files, you may also try several variations to find the best one for your image.

The price you pay when working with RAW lies in the fact that RAW images take up more space on your memory card and will take a bit longer when writing to your card (in the camera). This will reduce the maximum number of pictures you can shoot in a row. In the past, you also had to do an explicit RAW conversion on your computer. With tools like Lightroom, this effort is dramatically reduced.

➜ A fine feature of Lightroom is the ability to process RAW image as well as TIFF, PSD, and JPEG in an almost identical, very transparent way.

Using a combination of RAW plus JPEG makes sense if you want to have a finished image as fast as possible without much post-processing and at the same time want to be able to get the most out of your photos. For the first requirement, you will use the JPEG version. When you need the best quality available in your image, you will work with the RAW version of your images.

Exposure in the Camera

Apart from image composition, the proper exposure is the most important step toward a good photograph. The essential parameters are as follows:

- Exposure
- Aperture
- ISO

There is no general rule for all these settings – photographic scenes and light situations vary too much, and the right exposure will also be influenced by what you have in mind for the picture. The automatic exposure of up-to-date digital cameras will most often get the job done. However, exposure is by no means a cure for every photographic situation, and many professionals prefer to set it manually.

The decision on the ISO setting is relatively easy: as low as possible. The lower the ISO setting is in the camera, the lower the noise in the image. On the other hand, a slightly grainy (noisy) picture is still better than a blurry image. Often, a tripod will allow for a longer exposure and less motion blur due to camera shake.

The histogram, now available with all DSLR cameras, is an invaluable help for a good exposure. Up to now, only a few cameras provided a live histogram, which can be seen before the shot is taken. With the rest, you will have to inspect the histogram after the shot. While an image preview on your camera-back display will (to some extent) show if the image is sharp, the histogram can show if some image areas are over- or underexposed.

If your photographic scene has a contrast that exceeds the contrast range of you camera, with digital cameras it is preferable to slightly underexpose the image rather than overexpose it. With most DSLRs, a blinking in the on-screen preview will indicate overexposed areas when you activate your histogram.*

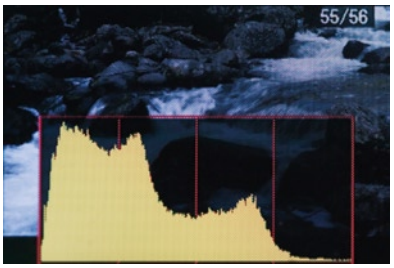


Figure 1-8: Histogram from a Nikon D70. Ideally, the right side of your histogram will stop just short of the right edge.

➜ *Though Lightroom as well as Adobe Camera Raw (starting with version 4) allow to recover some of overexposed highlights (as will be described in Section 4.4 on page 85), this should be no excuse for sloppy exposure!*

* *For more on this, see Uwe's paper "Watch Your Histogram" in FotoEspresso 1/2005* [11].

1.2 From Camera to Computer

You can download your images directly from the camera via USB or FireWire cable to the computer. We never do this, and instead download them from the memory card using a card reader. This is usually much faster and more reliable and comfortable and does not use up the batteries of the camera so fast. If you still have an older card reader with an USB 1.2 interface, you should replace it with a USB 2 reader; the time you save makes up for the expense.

The names of the images coming from the camera are very nondescriptive. Therefore, rename your images when downloading or immediately afterward. This also prevents images from having identical file names, which we avoid at all costs. This is a really important step. The procedure for this in Lightroom and our file-naming scheme are explained in section 3.1.

Figure 1-9: We prefer to copy new camera shots using a USB card reader instead of directly connecting the camera.

A well-thought-out and strictly adhered-to filing structure for the pictures might still be more important than good filenaming. While in the past it may have been too costly to keep all images online, this has changed. Today, disks are big and inexpensive. Therefore, we recommend keeping as much online as possible – or at least the shots of the last few years – and merely keeping multiple backup copies offline.*

* *Be it on DVDs, tapes, or removable magnetic disks*

From this discussion, it is only logical that the next step should be backing up your valuable images. It is imperative to do this before you delete the photos from the memory card. We even recommend having two backup copies – e.g., one on a second disk and one on a DVD. This may sound excessive, but taking pictures takes time and also comes at some cost. Some or even all of your shots may not be repeatable. So, planning and systematically maintaining your backups and archiving is not a waste of time but a task you should not ignore, even if it may be boring.

➜ *A good book on how to set up your system for digital photographic work; how to name, organize, and manage your photos and how to set up your metadata is "The DAM Book. Digital Asset Management for Photographers" by Peter Krogh [06].*

Only after we have completed all the previous steps do we delete the pictures on the memory card – by reformatting in the camera and not using our computer. Reformatting the card in the camera guarantees maximum compatibility with the file system of the camera.

Figure 1-10: To the left you see my filled cards, to the right my freshly formatted cards, ready for use.

After formatting the memory card, we mark the card empty by placing it brand-side upward in the card safe, while we store full memory cards (after use in the camera) backside upward in the card safe (see Figure 1-10).

1.3 Image Inspection

After you download your new digital shots to your computer – including renaming them and backing them up – it's time for image inspection. For this, you need large previews to properly evaluate your images. Here are some points to consider about each image:

- Is the picture composition convincing?
- Does the picture have a good exposure?
- Are there enough details – the highlights not burned out and the shadows not blocked?
- Is the picture sharp in its relevant parts?
- Are there annoying parts in the picture?
- Will you probably be able to get rid of them by simple cropping or do you need to digitally retouch them later?
- Is the atmosphere right?
- Which of several similar pictures is the best?

➜ *In order to quickly provide different sized previews, Lightroom generates three different sized preview pictures from the same image. These previews are stored as JPEG images in a special preview library.*

For this process, you will need a good preview – with RAW files this includes a preliminary RAW conversion. Thumbnails are only useful for an overview of you new images; a higher resolution preview is required for a content inspection and a full-sized image for the inspection of the finest details. Seeing several pictures side-by-side can improve the evaluation pro-

cess. Often, you may want to hide some pictures and delete others or prepare them for deletion. Sorting your images and assigning ratings helps to organize your new photographs.

Image Assessment

It makes good sense to assess your images and do some classification and prioritization. This assessment suggests a certain order of treatment, as in general one will work on the pictures with the highest rating first. It also helps to find your best images – we call them *portfolio images* – later on. Combined with further metadata, ratings will also help to recall the images – be it to sort those that are no longer needed or worth keeping or to group images in special topic collections.

Adobe has established a star rating – ranging from no star to five stars.* You have to define your own criteria for the way you rate images. We came up with the following rating schema:

no star Images that are acceptable and that we would like to keep for the time being or leave without assessment for the time being.

* Images we would like to keep that have some future use. Otherwise, they do not really stand out from the mass.

** Shots that are OK and on which we will work after the first inspection. We will probably do some optimizing on these shots and show them to a customer if the shot was done as part of a contract.

*** Good photos with only minor imperfections.

**** High-quality images that we will include in our portfolio or will present to a customer.

***** Absolute top-notch photos (according to our taste and our standards). There will be only very few images that justify a costly reproduction without reservation and that we might also sell.

After some experimenting, your rating scheme should remain stable. The assessment of single images, however, may change over time, be it, because you did some image optimization – perhaps with a new tool – or because you became more critical and down-rated some of them.

The images in these star classes should, so to speak, form a pyramid with a wide base of pictures with no or few stars at the bottom and tapering off toward the top, where few images with high ratings lie.

A negative rating of images also helps – e.g., to mark pictures you would like to delete immediately (as part of your inspection workflow) or to mark them as candidates for a thinning out process at a later time.

Starting with Bridge**, Adobe offers color labels and provides five different colors:  . In Bridge and Lightroom you are free to assign

* *Today, this is common practice also with other DAM software.*

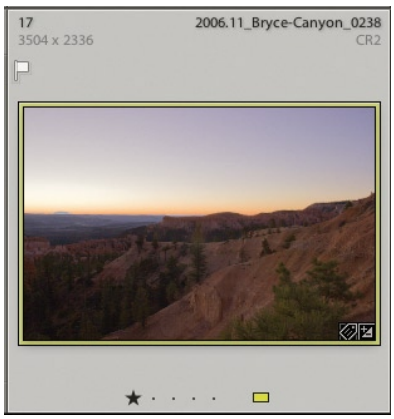


Figure 1-11: Lightroom allows you to mark up your images using star ratings, color labels, and flags. The preliminary markups should be done in your inspection workflow.

** *Bridge is Adobe's image browser and is also available with other components of Adobe's various suites.*

verbal qualifications as text labels to these five colors. We use these labels to mark up certain working states of our images.

Finally, Lightroom provides flags – intended as *Accepted* (or *Pick*) marks (⚐) and *Rejected* marks (⚑). Lightroom provides an operation to delete all images marked with the *Rejected* flag. To make sure you do not delete any image unintentionally, you should stick to the deletion workflow we describe in section 3.3, page 62.

To some of you, this assessment phase after downloading your images may seem superfluous, because you may like to begin optimizing your pictures right away. Nevertheless, experience shows that this effort is well worth it in the long run – when you have a large collection of images and want to call up images for certain purposes, when you want to reduce the number of images in your catalogs some time in the future, or when you have to show photos well sorted and rated to a customer. Also, after importing a new image set, you will often prefer to just deal with your highly rated images and leave the rest to work on at some later time.*

* *or you may never get to them at all.*

Metadata

Metadata is data about data (here, your images). Indeed, the marks described earlier are this type of data. However, these markups are not sufficient. We need much more – e.g., when searching for a particular image in a large catalog. Without further metadata, it would be like searching for a needle in a haystack. Fortunately, digital cameras embed some additional metadata called EXIF data into your images. But you can also add your own information as metadata in an information block called IPTC data.

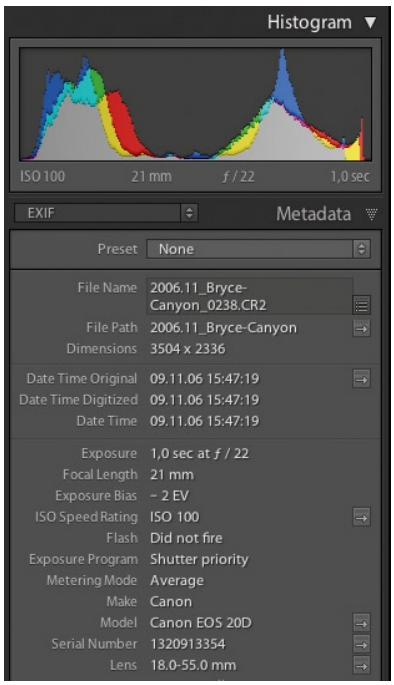


Figure 1-12: EXIF data will tell you quite a bit about your shot – e.g., the focal length, the shutter speed, and the aperture used.

EXIF

EXIF stands for *Image Exchange Format for Digitally Still Cameras*. EXIF data with modern digital cameras (even with all consumer models) are automatically embedded into the image file by the camera. What the camera embeds automatically depends on the manufacturer and model. In EXIF, we find information on the camera (e.g., manufacturer, model, firmware release, and serial number) and – as far as the camera can recognize it – the lens model and the focal length used with the shot. It also includes aperture and shutter speed, ISO speed rating, your metering mode, whether the flash fired or not, the color temperature recorded by the camera, what camera program was used for the shot, and some more information (see Figure 1-5). And it includes the crucial date and time the shot was taken (according to the clock setting of your camera). Today, some cameras even embed GPS (*Global Positioning System*) information. Most of these data can't be edited – at least not using Lightroom. Sometimes, however, you might like to correct the date or time the shoot was done. Lightroom allows for this.

Lightroom will only show nonempty EXIF fields. This makes the representation a little more compact and clear.

This information is of interest not only to the photographer and may help when searching for particular photos – e.g., all shots taken with a specific zoom lens or a specific camera – but EXIF data are also used by some applications and plug-ins when doing certain optimizations automatically, such as correcting some lens distortion or vignetting.

IPTC

The metadata contained in IPTC – IPTC stands for *International Press and Telecommunication Council* – originally originated from the area of the press (where it is still and heavily in use). Meanwhile, the standard has been extended and adapted to the needs of digital photography. The information in the IPTC fields covers five areas:

1. Copyright information – Originator's data and information on rights of usage (Ⓐ in Figure 1-13)
2. Information on the (image) contents (what, where, who, how …) including Headline, Caption and Title (Ⓑ in Figure 1-13)
3. Categorization (classification) Ⓒ
4. Keywording (with some overlapping with points 2 to 3). Though keywords are part of the IPTC data, Lightroom and other Adobe applications provide a separate section for displaying and entering them.
5. Status information in the image Ⓓ

To those who are not aware of the meaning of the different IPTC fields, we recommend that you read the *IPTC4XMP Core User Guide [23]*. You will find the description of and the conventions for the different IPTC fields – e.g., the maximum field length and which IPTC code should be used for some of these fields. David Rieck's website [26] is also recommended reading, indeed.

With some of the IPTC fields, specific codes should be used, such as for categories, scenes, genres, and the country in which the photo was shot. The country of the shoot, for example, is coded using the two-letter ISO 3266 country code (e.g., *US* for the USA, *UK* for England, and *DE* for Germany). This code corresponds to a great extent to the domain endings of the Internet addresses. You have to make up your mind whether you intend to use these codes. You may find them under [19]. If you prefer to not use these codes – and many of them are not very intuitive – you should at least use a consistent vocabulary in these fields.

There are a number of books on keywording. If you want to plunge into this, again the website of David Rieck [26] will give you a good starting point. Be careful, however, that you don't get lost in the numerous information and discussions there. Therefore, we include a very brief representation of this subject.

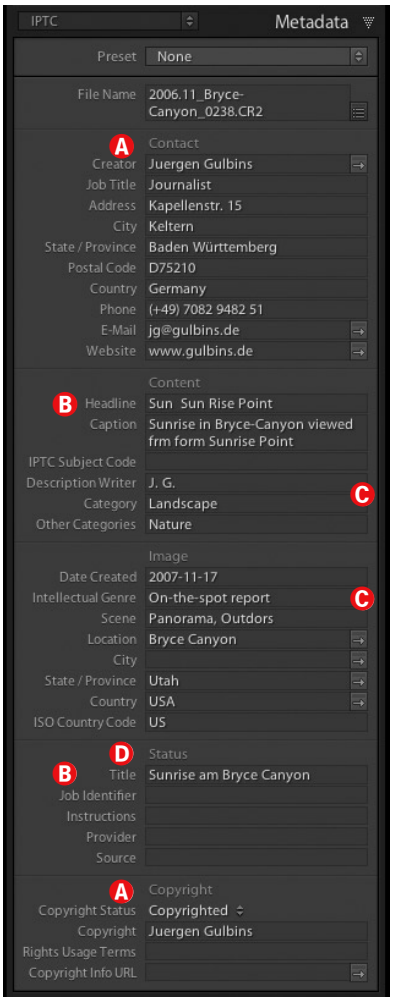


Figure 1-13: This is part of the IPTC data Lightroom may show for your image.

Your keywording should provide answers to six "W" questions (the list was taken from [27], where you will find a more information):*

Who is to be seen in the image?
What do you see in the picture?
Where is the subject located?
When was the photo shot (as long as it is not explained by the EXIF data)?
Why was the photograph taken and why is the content important?
How many persons or objects are seen in the picture?

The IPTC specification applies some rules to the keyword entries:

- The single keyword entry – it may also be a phrase – must not be more than 64 characters. You may, however, use several keywords in every keyword field (there is only one keyword field per image).
- The total keyword entry should not be more than 2,000 characters (the current IPTC standard allows for more, but 2,000 characters provide for backward compatibility with the previous version of the standard).
- Keywords are separated by a comma or semicolon followed by a space.

The questions mentioned above also help when entering a caption into the Caption IPTC field.

A restricted vocabulary is recommended for keywords – preferably a predefined list of keywords. This guarantees a uniform way of spelling and reduces the variety of words used for the same circumstance. This of course only applies to general concepts, not to names and special locations (**e.g., Bryce** Canyon or **Hearst Castle). When keywording an image, think about the way** you will be searching for it. For categories, use the plural – e.g., use *Mountains* instead of *Mountain* or *Cattle* instead of *Cow*.

Don't to be too worried about the keywords. Often, more is better here than less. When searching for images, it helps if a concept is represented by several spellings (which somewhat contradicts what we said before). This, in particular, applies to geographic terms for which there are often several ways of spelling.

Some of the IPTC items might be put into a metadata template that will be used when importing images. Typically, this includes your name and address* and some information on the terms of usage and a copyright notice. These templates can save you a lot of time, because you will not have to assign the data manually.

You may want to use some of the basic IPTC data (caption, title, keywords, file name) in certain forms of image presentation – e.g., the caption in a slide show or Web gallery. Keywords, additionally, are invaluable when searching for and sorting images.

You may also use the metadata for grouping images into collections (kinds of virtual folders). This allows for image grouping that is independent of the physical location of these photos. Collections in Lightroom are

* *For more on this, see [27]: www.controlledvocabulary.com/metalogging/ck_guidelines.html*

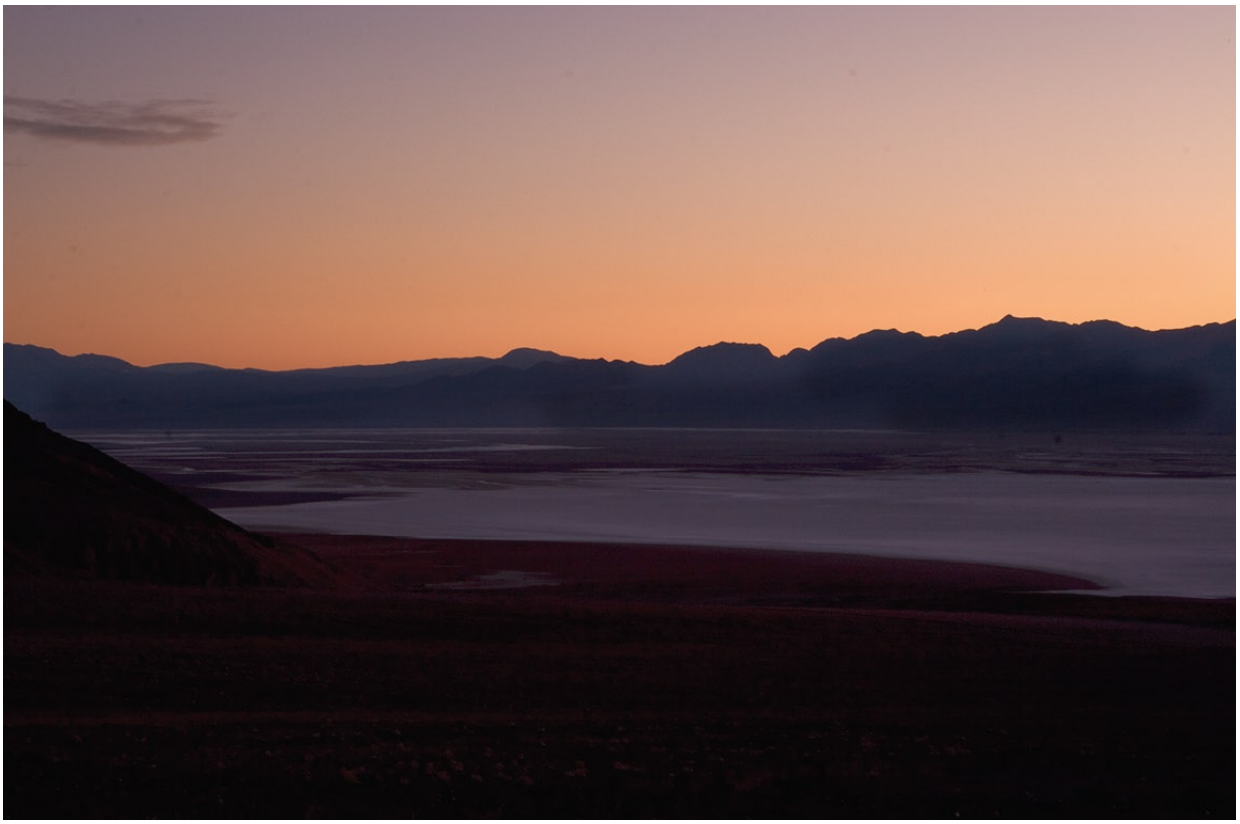


Figure 1-14: Blue Hour in Death Valley. Shot taken looking toward Bad Water. Keywords: Death Valley, Bad Water, Evening, Sunset, Holiday 2006, Landscape.

very cheap in terms of disk space. They are nothing more but simple lists containing references to the actual images. Thus, an individual image may be part of several different collections.

Digital asset management systems like Lightroom store metadata in their database. This allows for quick search and retrieval. Often, however, you may want to make the metadata accessible to external applications as well. Therefore, it is advantageous if there is a possibility to embed the metadata in your images too (provided the format allows for this). Lightroom does offer this. It is either done with every change or done on demand, or, optionally when exporting your images.**

The subject of metadata is not trivial and a professional, intending to sell his pictures, will do more on metadata entry than most amateurs will do. If you hand over pictures to a customer, metadata may increase the value, but watch for hidden metadata that you don't want to pass along.

** *With TIFF, JPEG, and DNG files the metadata is embedded into the image file. With RAW files, an XMP (Extensible Metadata Platform) sidecar file is created that contains this metadata.*

1.4 Image Optimization

With image optimization, in most cases our primary intent is to achieve a pleasing photo and an image that is close to what we had in mind when took the picture. This may not be the same as a truthful representation of the photographic scene we shot – neither the colors nor the tonality.

Of course, there are certain types of photography – **e.g., product photography**, documentary photos, and fashion shoots – where you have to get very close to reality – at least relating to colors. Even then it often is more a matter of getting a pleasing image than mirroring reality.

Image optimization depends on your personal preferences and your vision. Frequently, we produce several different versions of the same original. Some photos need relatively few changes; others need more steps and often several iterations. Therefore, nondestructive editing is a very powerful feature. It allows you to modify all or just one of your corrections without having to start all over again. Nondestructive editing allows you to perform several corrections without degrading your image quality with each step. A quality loss might occur if every correction were immediately rendered into your image. With applications like Lightroom, rendering of all corrections is only done to (temporally) update your preview on-screen or when exporting and converting your image. A single rendering process degrades the image quality less than a number of separate steps does.

For nondestructive editing, Photoshop provides adjustment layers. Certain corrections, however, – e.g., sharpening and most other filters – can't be done using adjustments layers.* The new generation of photo editors, like Lightroom, Apple Aperture, and LightZone, perform image editing nondestructively. Here all corrections are not (immediately) rendered into the original pixel image but stored as a sequence of correction instructions along with the picture. Only when an output is produced (e.g., for the preview on screen or when exporting the images) does rendering take place.

* *Well, since Photoshop CS3, you may use the "Smart Object" technique to overcome this restriction with some filters.*

As all corrections can be undone without any loss of image quality, you may be more courageous during editing. At first, you can do a correction only cautiously and increase it when the result pleases you, or, you may do a strong correction and reduce it if it is too strong. You can experiment and achieve new, hopefully better results. Operations that when overdone can destroy a photo, **e.g., increasing contrast or sharpening, now are less** risky.

This is very elegant, but will cost CPU power and RAM. Additionally, at least with Lightroom and Apple Aperture, there are still some restrictions. They are primarily due to the high demand of computational power. Thus, up to now, for example, Lightroom offers neither perspective corrections nor correction of lens distortions. Also corrections that are restricted to a local image area are not possible in Lightroom yet. This also applies to composing panoramic views from several separate images and to HDRI

HDRI = "High Dynamic Range Imaging"

Figure 1-15: Sunrise in Death Valley, viewed from Zabriskie Point. Keywords: Death Valley, Zabriskie Point, Morning, Sunrise, Landscape, Holiday 2006.

techniques, which blend several individual shots using different exposure settings into a single image.

For such operations, you have to break out of Lightroom and use external tools. Additionally, if you intend to use images with some corrections already done in Lightroom, you will have to export them, do your operation outside of Lightroom, and re-import the results if you want to manage those resulting images in your Lightroom catalog.

If you need an image in a format not supported by Lightroom, you have to use other applications and export your image.* For instance, you could use Photoshop, if you need CMYK images for 4-color offset printing (e.g., for printed books).

*We will discuss exporting in Chapter 8.

The same is true with some special optimizations. In these cases, you export your image and handle the optimization outside of Lightroom. Even Photoshop can't cover all kinds of optimization, and often you need special Photoshop plug-ins. Though Lightroom is a fairly open system, and we probably will see quite a few plug-ins and add-ons in the future, they are not available yet. Therefore, you have to export your images and use an external application for these corrections.

It you plan to optimize a photo outside of Lightroom, we recommend keeping some of the corrections (like tonality and sharpening) minimal in Lightroom.* In these cases in Lightroom, we avoid, for instance, final sharpening and just stick to proper white balance and eventually do some exposure compensation and tonal optimization. In most cases, we pass on the image as a 16-bit TIFF file.

* *In order to avoid overcorrecting and some image quality loss due to repeated rendering*

1.5 Image Presentation

All our work on images only serves one purpose in the end: to achieve a good-looking image that may be presented as a print, in a slide show, or in a Web gallery (or be passed on to a customer).

Therefore, preparing an image for a specific presentation should, in most cases, be viewed as a separate step in our workflow. It turns out that different presentation forms (a fine art print, a slide show, a web gallery) will require different processing. Images have to be scaled to a different size or resolution, for instance, and sharpening has to take into account the output method as well as the output size.

While in the past we used different applications to produce different output formats – e.g., Adobe ImageReady for Web images and Apple iPhoto for slideshows –, the new generation of all-in-one applications like Lightroom claim to cover a broad range of output formats – something entry-level photo editors like Photoshop Elements or Apples iPhoto already have been doing for a while, but at a lower level of sophistication.

To cover these different output formats, Lightroom, in addition to basic administration and photoediting, provides different modules (equivalent to modes), one each for printing, slideshows and Web galleries, as Figure 1-10 illustrates schematically.

1.6 Mapping the Digital Photographic Workflow into Lightroom

Lightroom covers all tasks described earlier using different means:

- First, it imports the images of a shoot (this is done in Library mode). With Lightroom, similar to other digital asset management systems, you can only work on imported images.
- It generates preview images (icons) and stores them in a separate library. With RAW files, a preliminary RAW conversion is done.
- It provides a number of different views on your (imported) image files, allowing you to browse and sort your files and to search for images using different criteria. Lightroom also allows grouping images into collections and stacks.
- Lightroom provides very flexible and powerful metadata handling. All metadata are stored in the central Lightroom database (the catalog).
- Lightroom provides a very efficient and powerful image editor that can edit all supported file formats* in a very transparent and nondestructive way.
- Using three dedicated modules (*Slideshow*, *Print,* and *Web*), Lightroom allows you to prepare images for different output/presentations methods.

* *JPEG, TIFF, PSD, DNG, and about 150 different RAW formats.*

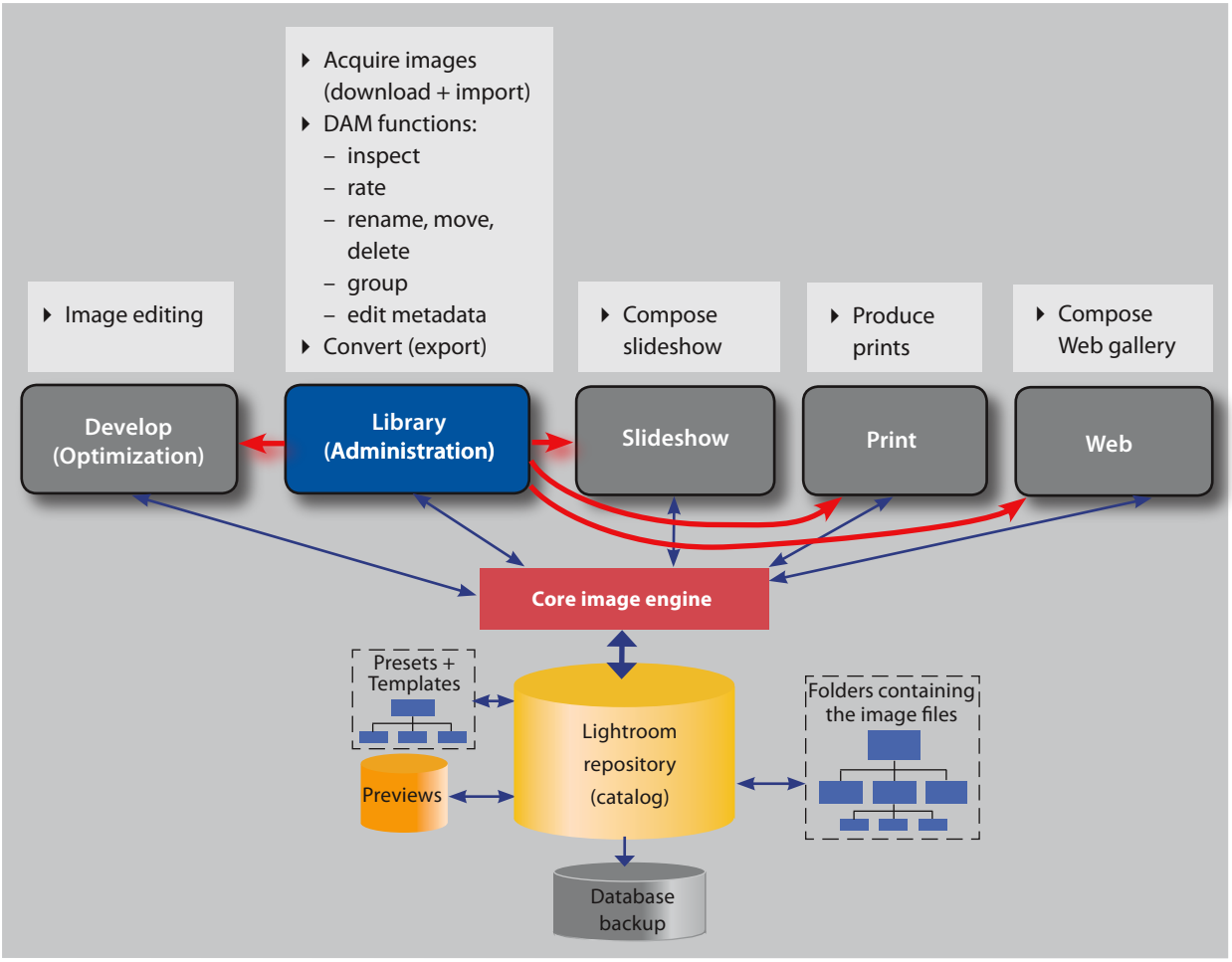


Figure 1-16: Lightroom's 5 basic modules and their functions. At the heart of this all is an image core engine and database.

- For all this, it makes use of five modules that are shown in Figure 1-16. These five modules at the same time are five Lightroom modes and the user may freely switch from any mode (module) to any other. Each mode has its own panels, controls, specific menus, and tools.

In visual terms, the connecting link for all these modules and functions is the filmstrip with its preview icons. Technically, the connecting element is a database where all metadata and administrative data are stored. The metadata contains references to the actual physical image files outside the database in a file/folder structure which the user passes on to Lightroom when importing images. The core image engine does all the image processing. This engine uses the same core engine as Adobe Camera Raw* (that is part of Adobe Photoshop CS3).

* *The version corresponding to Lightroom 1.2 is Adobe Camera Raw 4.2.*