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Shooting Raw

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September 3, 2014

1.   Introduction

Out of the box, most digital cameras store images on their memory card as **JPEG** files. This is a file format invented by the **J**oint **P**hotographic **E**xperts **G**roup. It is efficient because it stores a reasonable version of the original image in a small space.

When the JPEG format was invented, memory cards and hard disks were very, very expensive and small file size was important. Small size is still important for sending photos by email.

Unfortunately, this efficiency comes at the price of throwing away some of the information captured by the camera. Whether this loss matters to you, I don't know. I hope that what follows will help you make up your mind.

Many cameras can also just store all the information captured by the camera's sensor: the **raw**, unprocessed data. This is 'shooting raw'.

The rest of this document assumes that your camera can store raw image data. You may have to read the manual to find out if this is so. The setting is usually somewhere on the same camera menu as things like 'image size' and 'image quality'.

2. JPEG

2.1. What JPEG throws away

The camera's sensor (the digital 'film') is a wonderful thing but it cannot cope with all that our eyes can.

Think about a seaside shot. We can see the details in the clouds *and* in the shadow under a beach umbrella. this is simply too great a range of brightness for any camera sensor we can afford.

Using JPEG makes things worse; the ends of the range that the sensor *can* capture get trimmed off. Shadow details become solid black, cloud details become blank white.

Cameras vary in which end of the range gets trimmed most when making the JPEG, but we've all seen holiday shots with burnt out clouds.

Using JPEG throws away some of the shadow and highlight detail that the camera is capable of capturing.

The other thing that JPEG discards is some detail. This time, the reason is much more technical and is connected with the way in which the JPEG scheme compresses a lot of image data into a small file.

Cameras usually offer three JPEG 'qualities': fine, medium and basic. If there is any possibility of your photos ever being printed, 'fine' is the only one to be considered.

2.2. The good bits of JPEG

JPEG files are relatively small, they can be used straight away without any further processing and all the high street photo printers can cope with them. Home photo printers can often print JPEG files straight from the camera's memory card.

3.   Raw files

3.1.   The bad news

Raw image files are large. A 12 megapixel camera might produce fine quality JPEG files of between 4 and 6 megabytes. The same camera would produce raw files of between 12 and 16 megabytes. You need more, or larger, memory cards when using raw files.

Raw files need some processing before you can show them to others or print them. All the raw-capable cameras that I have seen come with software to convert raw files to viewable or printable forms. I only know the Nikon software and that's a bit primitive but perfectly usable. I believe that the Canon version is a bit more sophisticated.

Photographers have a big bone of contention with some camera manufacturers. Each new camera make and model seems to have a new raw file format. This is a futile attempt to force photographers to use the camera manufacturer's own, additional, expensive raw editing software. This is the modern equivalent of the Widget Camera Company insisting that only Widget film could be used in their cameras and that the film had to be sent to Widget for developing. The attempt is doomed but they haven't quite given up yet.

Adobe, a software company, has designed and published a 'standard' raw file format. With a few honourable exceptions, camera makers have ignored the Adobe suggestion.

3.2.   The good news

Every bit of information that the camera captures is recorded in the raw file. It is the digital equivalent of the exposed but unprocessed film of ancient times. The raw file is much, much better than a processed film. When you sent a film off for developing and printing, the decision about how to process it was out of your hands.

Ansel Adams, who was a great landscape photographer of the 20th century, had to decide what he wanted the print to look like *before* he developed the film. (He worked in monochrome.) This was because developing a film is a bit like making a JPEG: you have to decide which end of the brightness range to preserve, whether to develop for high contrast or low contrast and so on.

When you shoot raw, you have full control of the 'development' and you can 'develop' as many different versions for different purposes as you wish, *without altering the original in any way.* This is because, hand in hand with the move to shooting raw, software has appeared which does **non-destructive editing.**

In spite of the restrictive attempts by camera makers (see above), non-destructive raw editors are available from several sources. There are paid-for ones from several companies (Adobe, Corel and Phase One are well-known) and some free ones, of which the best is probably Rawtherapee.

4.   Non-destructive photo editors

4.1.   What they do

The idea of a non-destructive editor is straightforward. The software works like this:

1. On screen it displays a temporary image made by converting the raw file into a form which can be displayed (a 'bitmap image').

2. When you make a change, the change is applied to the image on the screen **and** a record is made of the change you requested. For example, you might ask for the image to be cropped. The size and position of the crop is recorded, the screen image is cropped but the original file is not changed.

3. The changes are all saved in a separate file often called a 'sidecar' file, because it travels alongside the original raw file.

4. Most software also stores a smaller version of the screen image (a 'thumbnail') for use by the cataloguing part of the software.

It is the use of sidecar files which makes it possible to develop different versions of the same image. Most software allows you to have more than one sidecar file for the same raw one. Different sets of editing instructions gives you different end results.

Sidecar files are very small compared with image files. You can have many different versions of an image without making copies of a large image file.

When you want printable, emailable or viewable versions, you ask the software to **export** the file. Most raw editors allow you to choose JPEG, TIFF or some other format, with a lot more control than cameras permit. The original file is *still* completely unchanged.

4.2.   What you can do

The camera sensor can record a wider range of brightness than will 'fit' into a JPEG file. A good raw editor will enable you to bring out details in the highlights and shadows that would be lost if you had shot a JPEG originally.

All the raw editors I have played with have extensive tools for tweaking the exposure, brightness (not the same as exposure), contrast and colour balance.

Colour balance tweaking is actually a very useful feature. Apparently, after family photos, the next most popular subjects are sunsets.

If you shoot a sunset using JPEG and leave the camera on auto white balance, you'll probably be disappointed. The deep reddish colours will be muted. This is because the camera has tried to average out the colours to grey and the strong red-orange cast in a sunset gets reduced. With JPEG you're lost unless your camera has a 'sunset' mode setting.

With raw, you can change the white balance. For a sunset, all you need to do is change it from 'as shot' (the editor will have read what the camera thought was correct) to 'daylight' or something similar. The sunset colours will be greatly strengthened.

Raw editors can make small local adjustments like removing spots, darkening areas or lightening others.

4.3. What you cannot do

Raw editors mostly do not have a 'layers' facility (one does). This means that anything best done with layers, composing images and so on, needs a separate editor working on an exported version of the raw file.

There is no inherent reason why raw editors cannot have layers (just another sidecar file for each layer). Some things are more difficult, like layering one image over another, but not impossible.

4.4. Some raw editors

Because of the wide range of capabilities, all raw editors take some getting used to. My view is that the effort is well worth while.

I only know of one good completely free raw editor: Rawtherapee. It isn't as fully featured as some of the paid for ones but is being developed quite actively by volunteers and the price is right.

There are other free raw editors but they lack the graphical user interface that most photographers expect. GraphicsMagick is a very capable image manipulation program but is far from easy to use.

In the commercial world, there are various offerings.

- Adobe Lightroom (currently version 5) is probably the most popular amongst photographers. It is very capable, though there are still a number of things on the users' wish list!

  It is also an image cataloguing system which increases its appeal for those who take many pictures.

  It has a very good printing facility.

  Adobe recently took notice of the fact that a lot of amateurs wanted to use Lightroom and halved the price.

- Phase One's Capture One Pro (currently version 7) is a very capable raw editor with organising and printing facilities. It has been around for longer than Lightroom and is an established favourite with users of medium format (pronounced 'very expensive') digital cameras. It is also available as an 'Express' version which is cheaper and has a few fewer features.

  Unlike Lightroom, Capture One Pro has a sort of layers facility for composing images.

- Corel Aftershot Pro (used to be called Bibble) is a raw editor and organiser with print capabilities. Compared with the first two, it has rather less sophisticated facilities with one important exception: dealing with digital noise. Noise appears in shadows and when you have to use high sensitivity (ISO) because of low light.

  Aftershot Pro includes Noise Ninja which is considered to be one of the best bits of software for removing noise without damaging details in the image.

  At the time of writing, Aftershot Pro is a bit flaky on my Windows 7 (64-bit) system although it should not be. I cannot work out why I have problems.

  Corel have only recently acquired this software so development is probably under way.

- ArcSoft PhotoStudio Darkroom (currently version 2) is a raw editor but does not have the sophisticated cataloguing facilities of the other programs. It does have a print layout facility. Most of the adjustment tools are less versatile than those in Lightroom or Capture One.

- One of the most popular commercial photo editors, Adobe Photoshop Elements, includes a raw converter called Adobe Camera Raw. This enables you to do basic, non-destructive adjustments to the raw file before converting it to Photoshop or TIFF format to be edited in Elements.

Current (September 2014) prices are as follows.

Lightroom: £110, Capture One Pro £230, Capture One Express £70, Aftershot Pro £80.

For Yateley & District U3A members, price comparisons are complicated by the availability of Lightroom at a charity price which is about half the normal retail price (£60). I have not been able to find similar charity price deals for the other products. The charity price deal also makes Elements about £48.

All the commercial software mentioned is available in time-limited trial versions. This means that you can try them and see what suits you. Most offer 30 days' trial; some only offer 15 days.