Introduction to HDR
(High Dynamic Range) Photography

Bob Grainger

www.bobgraingerphotography.com

info@bobgraingerphotography.com

Tel: 07850 656765

INTRODUCTION: *What is HDR Photography?*

The Human Visual System (HVS) is amazing! For example, when it comes to viewing a scene that contains both brightly-lit and poorly-lit areas, such as a scene containing a bright, blue sky and also a shadowy area under a bridge, our eyes have no problem capturing detail in both of these areas *simultaneously*. The following image is typical of what the eye might see in such a situation.

Notice the detail, not only along the poorly-lit underside of the bridge (and in the other shadowy areas too), but also the detail - the clouds and colour - in the brightly-lit sky. Sadly, no camera on earth is capable of producing, *in a single shot*, an image such as the above. When presented with a scene containing a 'high dynamic range' of light - very brightly-lit areas and very poorly-lit areas - the camera either exposes to capture the detail in the brightly-lit areas (the 'hi-lights'), or instead exposes for the details in the poorly-lit parts (the 'shadows'), but not both. It simply isn't possible, *in a single shot*, for a camera to be able to capture detail in both areas at the same time. The camera, unlike our eyes, simply doesn't have the dynamic-range capability[1]. When presented with such a 'high dynamically-lit' scene, no camera ever made can, *in a single shot*, simultaneously capture the amount of detail that you can see in the image above. The camera either exposes for detail in the poorly-lit areas, but as a result will loose most of the definition in the brightly-lit areas, or it exposes for the detail in the bright parts, but will then loose detail in the shadows, as the following two photographs demonstrate, respectively.

Overexposed, but capturing well the detail in the darker parts of the scene.

Underexposed, but capturing well the detail in the gorgeous bright sky.

Often, what actually happens in fact, is that the camera will compromises and take the middle ground, producing something like the following image.

However, as we can see even with this image, even a compromise is, well, a compromise! So, how was it possible to be able to produce an image such as the very first one at the top of the page, one that is much more akin to what the eyes actually see? The answer is hinted at in the words that I've initialized earlier - *'single shot'* and *'simultaneously'*. HDR Photography (High Dynamic Range photography, not to be confused with High Definition or HD), is a technique whereby we take *multiple shots* (normally an odd number such as three, five, seven, etc.) of the exact same scene but *with the camera set to different exposure settings*. Then, using computer software, we merge the images together to create a single, composite image. That way, by taking several shots, several of which are underexposed to varying degrees (which

[1] For those of you that understand about 'Stops' of light: the file format JPG has a dynamic range capability of around eight Stops of light, Raw format has a range of around twelve, whilst good eyesight has a dynamic range capability of around *twenty-two* Stops of light! Whilst cameras are improving in their dynamic range capability all the time, nothing, absolutely nothing can compare to the human visual system (and probably never will!).

will have captured detail in the hi-lights), and 'stacking' (merging) them with several shots that are overexposed to varying degrees (which will have captured detail in the shadows), along with one 'properly-exposed' shot, we end up with one single composite image displaying much more detail than either of the single shots could provide on their own. The following six images illustrate this.

Two stops underexposed.

Notice the detail in that gorgeous sky! However, notice that there is very, very little detail visible in the shadowy areas, especially along the underside of the bridge.

One stop underexposed.

Notice that there is still a reasonable amount of detail in the sky, and also that some detail is beginning to emerge in the shadowy areas.

'Properly' exposed.

A good balance between showing detail in the brighter parts of the image, as well as the darker parts. Typical of the average photograph.

One stop overexposed.

Detail is now really becoming visible along the underside of the bridge (as well as the other darker areas). Unfortunately, however, we have all but lost that gorgeous sky!

Two stops overexposed.

A great shot for documenting the detail along the underside of the bridge, but such a shame that the sky has now been completely 'blown out' to white.

The HDR composite image.

Who says that you can't have your cake and eat it!

CHAPTER ONE: *Requirements for HDR Photography*

Camera

For HDR Photography, you need a digital camera whereby you can manually control Aperture, Shutter Speed and ISO. Although some compact (pocket or 'point-and-shoot') digital cameras allow you to control these aspects of the camera, not all of them do, and so you are advised to use either a DSLR (Digital SLR) or, at least, a bridge camera. For the rest of this training guide, we shall assume that you will be using a DSLR. Any DSLR camera will do, it certainly doesn't have to be a high-end model. Other features of most modern DSLRs which would certainly make our work easier would be: *Continuous Shooting* or 'burst mode', *Auto Exposure Bracketing* (AE Bracketing) mode, and Aperture Priority Mode. By using these three features together, we would be able to take multiple images rapidly and automatically (which would help to reduce the amount of subject movement that is being captured, such as branches blowing in the breeze), and all at different exposure settings (which would eliminate the need to physically touch the camera and manually change settings between shots). However, you may be surprised to learn that this training guide doesn't make use of either of these three features at all! The reason is that, although all DSLRs offer an Aperture Priority mode, and most if not all of them offer a Continuous Shooting mode, some of them either simply a)don't have an Auto Exposure Bracketing feature at all (the Nikon D3000-series, for example) or b)if they do, will only allow for a maximum of three bracketed shots (the vast majority of entry-level, consumer/prosumer DSLRs). Given that much of the HDR Photography that you are likely to be doing will require five shots or more, a bracketed sequence of just three shots would be rather limiting. Therefore, this training guide doesn't make use of either Auto Exposure Bracketing, Continuous Shooting or Aperture Priority modes at all, but instead concentrates on changing the exposure settings *Manually,* something that you will be able to do with any DSLR camera, regardless of make or model.

A feature of all DSLR cameras that we will certainly be making use of however, is their ability to be able to store the images on the memory card in 'Raw' format (as opposed to JPG). Compared to the more popular JPG format, Raw gives us a head-start when it comes to capturing HDR images, due to its greater dynamic-range capability, i.e., its ability of being able to capture a much larger amount of detail in both the shadows and the hi-lights in each shot - which is of course exactly what we are aiming to do.

Lenses

One good thing about HDR Photography, is that you really don't need any fancy, expensive camera gear, and that includes lenses. You don't need to invest in hundreds of pounds in a super-duper telephoto lens, or some other specialist 'piece of glass'. The basic 'kit lens' that came with your camera will certainly do. And in fact, you don't need expensive, wide-aperture lenses costing hundreds of pounds either, as you are unlikely to be doing HDR Photography with wide apertures, for after all, most HDR work is landscape or architecture photography, where due of the shallow depth of field that wide apertures would provide, such apertures wouldn't normally be used anyway. One thing could be said though: because most HDR Photography is *indeed* landscape or architectural work, then wide ***angle*** lenses would be a preference. Don't get bogged down in all of this though - quite simply, your favourite lens will allow you to produce some great HDR images!

Tripod

Because the very nature of HDR Photography means that you will be taking multiple images of exactly the same scene and then merging them into one composite image, it is important that the camera doesn't move between shots. Otherwise, there may be some difficulty involved in aligning the shots up when producing the composite image (although any HDR software worth its salt should be able to carry out some degree of alignment automatically). Although, in theory, it might be possible to hold a camera steady enough to be able to carry out HDR work (providing you are using Continuous Shooting mode,

Auto Exposure Bracketing and Aperture Priority, that is), for the sake of perhaps £10 to £20, a tripod is a great investment (and not just for HDR work, but for general photography too). The tripod doesn't have to be a high-end, expensive one either - just as long as it's capable of supporting the camera well, and that you are confident that you won't knock the whole thing over, then it should do. Tripods are available from around £10 and upwards (and upwards, and upwards!).

Cable/Infrared/Wireless Shutter Release

Although not essential, to help minimize camera movement between shots, an 'old-style' cable release or perhaps a modern-style infrared or wireless shutter release is a great, yet, very inexpensive investment, especially considering that they can often cost less than £10. Take a look on EBay for one for your particular make and model camera.

HDR Software

To be able to merge the individual photos into one composite image, specialist HDR software is required. The market leader in this field is Photomatix Pro from HDRSoft (www.hdrsoft.com), and is available for both Windows-based PCs, and Apple Macs. Other HDR software packages are available, including 'Plug-ins' for Adobe Photoshop, as well as the 'Merge to HDR Pro' feature available in recent versions of Photoshop. In fact, there are some HDR packages that are completely free! In my opinion however, nothing quite matches the results that you will get with Photomatix Pro. Photomatix Pro (not spelt 'mat***r***ix') costs £72 including VAT, and there is also a (very) cut-down version called Photomatix Essentials, for around £31 including VAT. You can download completely free trial versions of both Photomatix Pro and Photomatix Essentials from the www.hdrsoft.com website, and you can try the software out for as long as you like (no time limit), but do bear in mind that every image that you produce will have a watermark embedded in the final, merged image, making it pretty useless for printing and uploading, etc. However, it's a great way to learn how to use the software without spending any money! You can then make the decision to invest in the software by purchasing a non-watermark version of it at a later date, if you so wished.

Computer and Printer

You will of course need a computer to run the software on. If you are planning on using Photomatix Pro or Photomatix Essentials, then you can use either a Windows-based PC or an Apple Mac, just as long as it's reasonably modern. According to the www.hdrsoft.com website, the following are the system requirements for running Photomatix Pro and Photomatix Essentials under both Windows and Mac OS X.

What are the computer system requirements of Photomatix Pro and Essentials?

On both Windows and Mac platforms:

- 2 GB of RAM minimum, but more is highly recommended
- 1 GB of available hard-disk space (more is recommended)
- 1,024x768 or greater monitor resolution

Windows platform:

- Photomatix Pro: Windows XP, Vista, 7 or 8 (non RT), or Windows 98, 2000 with .NET 2.0 framework or higher (if the .NET framework is not installed, the installation wizard of Photomatix Pro will prompt you to download it from Microsoft's website).
- Photomatix Essentials: Windows XP, Vista, 7 or 8.

Mac OS X platform:

- Photomatix Pro: Mac OS 10.4 or higher
- Photomatix Essentials: Mac OS 10.5 or higher

Of course, you will also need a printer if you intend to print out your work.

Photography Skill Level

HDR Photography is easier than you might at first think! Some basic understanding of camera controls, along with some familiarity of using a computer - opening and saving files, etc., is really all that's required.

CHAPTER TWO: *Preparing for the HDR Photoshoot*

Manual Mode

Put the DSLR into full Manual Mode. To do this, select the 'M' setting on the dial that's on the top of the camera. This will give you, the photographer, full control over the Aperture, Shutting Speed and ISO settings (these terms will be explained in just a moment). However, there is still one thing that you will need to check to make sure that the camera is *indeed* now in full Manual Mode, and that it isn't going to give you some 'assistance' with the ISO setting. The potential problem is that, even when operating the camera in Manual mode, where Aperture, Shutter Speed and ISO should, by definition, be under our full control, if something called *Auto ISO* is enabled, then there is the risk of the camera taking over and automatically cranking up the ISO if the photograph would otherwise be very much underexposed. As photographers working in Manual mode, we resent the camera making *any* exposure decision for us, and so we need to make sure that Auto ISO is *not* enabled; if the photograph does *indeed* turn out to be very underexposed, well, we simply fix the exposure ourselves. To make sure that Auto ISO is not turned on, you typically explore the camera's menu system looking for the ISO Sensitivity Settings, and then choose either 'Auto ISO sensitivity.....Off' (typical for Nikon DSLRs), or simply choose a value (such as ISO 200) other than 'Auto' (typical for Canon DSLRs). Consult you camera manual for the exact procedure required to do this.

With HDR Photography, a number of images are taken of exactly the same scene, but with progressively different exposure values, for example, a *very* dark image, a dark image, a 'properly-exposed' image, a bright image, and a *very* bright image (see the examples in Chapter One). We need to choose the most appropriate way to get the camera to vary the exposure settings to be able to obtain these different exposures. Let's take a look at the options available to us.

A DSLR camera controls exposure (how bright or dark the image is) in three ways: *Shutter Speed, Aperture* and *ISO*. Although this isn't the place to provide a full explanation of just how these three interact (although I do provide courses on this very subject!), a little understanding would be useful.

- **Shutter Speed**. This controls two things: 1)the duration that the camera's sensor is exposed to light, and 2)the capture of motion, i.e., whether objects in the photograph are blurry or not.
- **Aperture**. This controls two things: 1)the volume of light that enters the camera, and 2)(one way of controlling) depth-of-field.
- **ISO**. This controls one thing: how sensitive the camera's digital sensor is to the light that it's being exposed to (through a combination of Aperture and Shutter Speed).

Working backwards up through the list, let's start with **ISO** first. A brighter exposure can be obtained by increasing the ISO Sensitivity setting, for example, changing up from ISO 200 to ISO 400. However, one problem with increasing the ISO Sensitivity setting (especially if set very high) is that the resulting image can suffer from 'digital noise'. This can appear as red and green artefacts - 'specs' or 'static', as I like to describe it, and photographers try to avoid having these appear in their images. The way to do so is to keep the ISO sensitivity setting down as low as possible - ideally around ISO 200 or ISO 100. Now, with modern DSLR cameras, ISO can normally be set quite comfortable at a value much higher than this, say ISO 800 or ISO 1600, for example, without producing too much in the way of noise. However, we need to take into account the fact that later on when using computer software, we shall be stacking (merging) multiple images together, and therefore any digital noise captured in each of the individual images would be *accumulative*, i.e., any noise appearing in the first image would be added to the noise appearing in the second image, to the third, and so on - something we certainly don't want! In HDR Photography, where multiple images are merged together, any ISO setting in excess of ISO 200 would start to look very messy in the final image. So then, keep the camera set to as low an ISO setting as possible - typically 200 or 100, or even lower, if you have it available.

Whilst we could choose to adjust **Aperture** to vary our exposures between shots, this would present us with a yet another problem. Not only does Aperture control the amount of light that enters the camera, but

it is also one of the ways of controlling something called *Depth of Field*. In a nutshell, Depth of Field is the amount of depth to the scene, i.e., front to back, that is considered 'acceptably sharp'. This depth could be inches, feet, or hundreds of yards. What we certainly don't want to do, is to merge together multiple images of exactly the same scene but with varying Depths of Field - the result would be very messy indeed! Therefore, we choose an Aperture size that suits our requirements (Depth of Field/Light Capture), and then leave it on that setting. So, what Aperture setting should we choose then? This would depend on both how much available light there was, and also how much Depth of Field we desired in our photographs. As mentioned earlier, this isn't the place to go into too much depth concerning, 'uh, Depth of Field, but you might like to start off by choosing an Aperture such as f/8 or f/11.This should achieve a decent enough Depth of Field for most work, and is therefore typical of the Aperture used in a lot of landscape and architectural photography, both HDR and non-HDR.

That leaves us with **Shutter Speed**, and it's indeed this that we adjust between shots when carrying out HDR Photography. By varying the Shutter Speed between our images, and by leaving the ISO Sensitivity setting and the Aperture value alone (and assuming that the light on the scene doesn't change), we can take multiple images with varying exposure values, without any 'side effect' such as high ISO-generated digital noise or variations in Depth of Field caused by changes is Aperture.

Raw Format (not JPG)

As we mentioned earlier, we will be storing the images on the memory card in Raw format (as opposed to JPG). Compared to the more popular JPG format, Raw gives us a head-start when it comes to capturing HDR images, due to its greater dynamic-range capability, i.e., its ability of being able to capture a larger amount of detail in both the shadows and the hi-lights in each shot - which is of course exactly what we are aiming to do. Be aware though, that to be able to view Raw files, you will need software capable of viewing the images. Up-to-date versions of Photomatix Pro (the HDR software that we will be using to process our images), Photoshop, Lightroom, and any propriety software that came bundled with your camera, would all do the job. Of course, you could always view the Raw images on the LCD screen on the back of the camera if you needed to or rather, strictly speaking, a JPG thumbnail of the captured Raw image. To set the camera to Raw format for storage, you would typically choose it from the camera's menu system.

Metering and Focus Modes

Although it is well beyond the scope of this training guide to go into detail about the various Metering and Focusing Modes provided by DSLR cameras (although I do provide further tuition on this!), suffice it to say that with HDR photography, feel free to use any Metering Mode you like, e.g., Spot Metering, Centre-Weighted Metering, etc., along with your choice of either Manual Focus or Auto Focus modes. Feel free! If you don't understand about metering, you could always simply use trial and error, taking lots of test shots (as we shall indeed do shortly), until you recognize the image on the back of the camera as having the exposure that you want.

Continuous Shooting or 'Burst Mode'

This is where the camera is set to take multiple images in rapid succession, typically between 4 and 11 shots per second, depending on the make and model. We would certainly benefit from using this feature if we were to be carrying out HDR Photography with a combination of Auto Exposure Bracketing and Aperture Priority modes, but it would cause us a lot of problems whilst using the camera the way that we are going to be doing throughout this training guide, i.e., in Manual mode. In Manual mode, the last thing that we would want to happen would be for the camera to take lots of rapid shots all at the very same exposure, in between each setting change. Therefore, make sure that the DSLR has been set to take just a single shot each time.

Image Stabilisation (Canon) / Vibration Reduction (Nikon)

Image Stabilisation is a feature that is built into many DSLR lenses and/or camera bodies. It is technology that helps to reduce the effects of camera movement ('shake'), and can therefore help prevent blur in our photos - a terrific feature which really should be enabled almost all of the time. However, it can have a detrimental effect when the camera is attached to a tripod (where the technology isn't normally required anyway). Because HDR Photography *is* normally carried out using a tripod, make sure that 'IS' or 'VR' is switched off (don't forget to switch this normally excellent feature back on again afterwards, when you are not using a tripod, e.g., for most other photography).

Flash

You should never take HDR images using camera flash! If the pop-up flash on top of your DSLR ever pops up during a HDR session, close it back down again.

Pen and Paper

It's recommended that you take a small notepad and pen/pencil with you. You might possibly take lots of HDR sequences of photos of the same scene, and it can sometimes be difficult when you take them to your computer, to make head or tail of which individual shots were from which exact sequence. Add to this the fact that you might also take some non-HDR photos on the day of things that have captured your eye ("Look! A squirrel!"), and all of this makes it very messy to sort out what's what when you get home and begin to work with the photos on the computer. Instead, by writing down the actual file names for the sequences of images, this task would be made much easier for you. For example, on the back of my Nikon DSLR, I can see the name of the file such as dsc_1122.nef. That way, you might like to create lists such as:

dsc_1122 - dsc_1126 (5 shots) First attempt of under the bridge looking towards the sky.

dsc_1127 - dsc_1133 (7 shots) Second attempt of under the bridge, this time with 7 shots.

dsc_1134 - dsc_1136 (3 shots) Non-HDR photos of Paddy playing in the river.

dsc_1137 - dsc_1141 (5 shots) Bridge again. Probably no good, as I think the camera moved.

This might seem a little patronizing, but believe me, it really does make life a lot easier!

You might also like to take along a copy of this training manual as a reference.

Preparation Summary

Fit your **favourite lens** (for landscape and architectural photography, consider using a wide-angle lens).

Set the lens and/or camera body to either **Manual Focus** or **Auto Focus**, whichever you prefer.

Turn **Image Stabilisation (IS) / Vibration Reduction (VR)** off, (normally) at the lens.

Choose **Raw** for the file format for saving the images to the camera's memory card (Nikon calls it's Raw format 'NEF', whilst modern Canon DSLRs call the files 'CR2').

Make sure that the DSLR is in **Manual Mode**.

Make sure that **Auto ISO** is not enabled.

Select a very low **ISO**, such as ISO 200, 100, or even lower.

Choose **Single-Shot**, as opposed to Continuous Shooting or Burst Mode.

Choose whatever **Metering Mode** you prefer.

Choose an **Aperture** such as f/8 or f/11.

Never use camera **Flash**.

Make sure that the camera's **battery** is charged.

Make sure you have plenty of room on the camera's **memory card**.

Take the following items along with you: either a **cable**, **infrared or wireless shutter release**, a strong and secure **tripod**, a **notebook** and **pen**, a copy of this **training manual**.

CHAPTER THREE: *Choosing The Scene*

High Contrast

The main purpose of HDR Photography is to get around the problem of cameras having limited dynamic range capability compared, that is, to the incredible dynamic range capability of the Human Visual System. Even when capturing and saving our photos in Raw format, which has a greater dynamic range capability over JPG, there is still a very good chance that many of our photographs will loose detail in scenes where the dynamic range of light is just simply too great, i.e., where there are very bright areas and also very dark areas in the same scene. HDR Photography allows us to create a final product that is, at least in terms of detail, more similar to what the eye sees. Because of this, HDR Photography lends itself well to scenes that have a range of light so dynamic that it would otherwise exceed the capability of a single shot, whether Raw or JPG. This is to say, a scene which, if taken as just a single shot, would turn out to be very much lacking in detail in both the hi-lights and/or the shadows compared to how we see it with our eyes.

Typical scenes include:

- The interior of a building which includes both the dark interior and also the window view to the bright outside;
- The view taken from inside a tunnel, looking towards the bright outside;
- An image of the sky plus the area under shadowy trees;
- City-scapes where the sides of some of the buildings are in shadow, and the rest in sun light;
- Landscape gardens containing contrasting areas of light and dark.

Detail

By taking a sequence of photographs of the exact same scene but at various different exposures, HDR Photography not only allows us to capture much more detail across a greater dynamic range of light, compared to with just a single photo, but it also allows us to create a final composite image that contains far more detail *generally*, compared to either of the single shots on their own. We call this feature of HDR Photography, *detail enhancement*. In a nutshell: using multiple images, HDR Photography allows us to produce one final composite image that contains a greater amount of detail, not only from the hi-lights and from the shadows, but also from the *overall scene in general*, compared to what is offered in a single shot.

Areas containing lots of texture can look wonderful when the detail is enhanced using HDR Photography. The following are just a few of the textured scenes that make for great HDR images:

- Clouds
- Rust
- Tree Bark
- Old wood
- Soil
- Brickwork
- Fabrics

Eye Catching

'Old world', run-down, urban decay and graffiti scenes lend themselves particularly well to HDR Photography. Look for derelict buildings and sheds, buildings cluttered with fallen masonry and with walls covered in graffiti, old churches and chapels, trains, ships, and construction sites. Obviously, great personal care is needed when carrying out photography at many of these locations.

Good Light

Just like with other forms of photography, good light is important to HDR Photography too, and often the best time of day is during the Golden Hour - late in the afternoon/evening.

Avoid Photographing Moving Objects

With HDR Photography, multiple images are taken of the exact same scene, and with the camera rock-steady on a tripod. If any object in the scene was to move significantly between each shot, for example, people walking, water flowing, cars being driven, branches blowing, etc., then this movement would very likely appear as 'ghosting' in the final, composite image. Photomatix Pro and Photomatix Essentials are both able to remove some of this ghosting automatically, to an extent, but the results can never be as good as never having the ghosting there in the first place. It's recommended therefore, that you avoid carrying out HDR Photography of scenes where there is likely to be a lot of noticeable movement between shots unless, that is, you want to include this movement as an artistic element, for example moving water, gently-moving leaves, slow-moving clouds, etc. Indeed, the first composite image shown at the very beginning of this training guide shows just that - the Upper Tawe River flowing.

CHAPTER FOUR: *The HDR Photoshoot*

Setting Up

After choosing a suitable scene (see Chapter Three for suggestions), unpack your equipment and stand the tripod on a safe, stable and level ground - you do not want your valuable camera and lens falling over! Next, follow the instructions outlined in Chapter Two for setting up the camera. The most important things are that the camera.....

- is in Manual Mode;
- is set to store images on the memory card in Raw format;
- has an Aperture of around f/8 or f/11;
- has a low ISO setting, e.g., ISO 200, 100 or even lower;
- is set to single-shot mode, and not Continuous Shooting or 'Burst' Mode.

Next, attach the camera to the tripod. Now attach the cable shutter release if you are going to be using one, or have handy the infrared or wireless version. If you don't have such an item, then when you get around to actually taking the sequence of images, you could resort to the usual practice of carefully pressing the Shutter Release Button on the top of the camera (taking care not to disturb the camera), or you could even use the camera's count-down timer (really not recommended due to the additional duration between shots - objects may have moved significantly during this time). Quite clearly then, an inexpensive cable, infrared or wireless shutter release would be a useful investment!

Test Photos

Follow the normal photography procedures for lining up the camera with the scene, zooming, focusing, etc., to suit your requirements. Because the camera is in Manual Mode, either take a light meter reading with the camera's internal light meter if you know how to do so, or use a mixture of trial and error, along with good-old intuition, ***and keep adjusting the Shutter Speed*** (don't adjust Aperture or ISO) until you produce what you would consider to be a properly exposed image of the scene. With HDR Photography, what you are looking for initially is for a single photo that represents a "properly exposed", all-round good image of the scene in general, the sort of photo that you would take and then show to others. In addition to this though, for HDR you also need certain parts of the scene to be somewhat underexposed, and other parts to be somewhat overexposed. If you don't have both underexposed and overexposed parts in the same image, then this suggests that the choice of scene was not ideal for HDR Photography - a great photo of a scene perhaps, but not one that would benefit from the HDR process!

If you need to, keep taking more photos whilst adjusting the Shutter Speed until you are satisfied that the overall look and feel of the photo typically represents a 'properly-exposed', 'OK', 'normal' photograph (but with some underexposed and overexposed areas). Ideally, you should be concentrating on getting the mid-tones (the 'greys'), as they are called - dry tarmac, grass, dry brickwork, etc. - exposed correctly. Keep adjusting the Shutter Speed between these test shots until you produce a good-looking photo, but one where there is a good amount of underexposed areas, for example underexposed shadowy areas under trees, as well as a fair share of overexposed areas, such as an over exposed sky, white-painted walls, etc.

Now look at the image on the back of the camera and try to gauge just how dynamic the range of light that has been captured is. When we take photos for HDR sequences, a larger number of shots will need to be taken where the dynamic range of light is great; whilst fewer shots will need to be taken where the dynamic range of light is less. For example, if the photo that you've just taken shows *very* overexposed white areas, and *very* dark shadowy areas, then a sequence of perhaps five to seven shots might be required, whilst a small sequence of shots, perhaps three to five, might be all that's required if the dynamic range is not so great, for example, where your 'perfect-exposure' shows just *some* over-exposure in the hi-lights, and just *some* darkness in the shadows. One scene that presents the most dynamic range

of light is when photographing the inside of a room and including the view through the window or doorway to a bright outside. Such a scene typically requires around nine shots, taken one Stop of light apart, or five shots, two Stops apart. For the rest of this training guide, we shall assume that the light on the scene is not *too* dynamic, and that therefore a sequence of five shots is required, and that these will be taken one Stop apart.

Very importantly: always take an odd-number of shots for the sequence, such as three, five, seven, etc., and never an even number, such as four, six, or eight. The simple reason for this is that we need to have an equal number of shots underexposed compared to the 'perfectly-exposed' image, as we do the number of shots that are overexposed. For example, in the example sequence of five shots that follows below, we have the 'perfectly-exposed' shot, one shot two Stops underexposed, one shot one Stop underexposed, one shot one Stop overexposed, and one shot two Stops overexposed (Stops are explained in a little more detail below).

Next, carefully delete all of the test images that you've just taken of the scene! The reason for this is that you are now going to take a fresh new set (sequence) of images, five in our case, including a replacement for the 'perfectly-exposed' shot. What you don't want to do is to now go on and produce a great sequence of five photos, all stored on the camera's memory card, along with all the test versions, as it would get very messy indeed later on when sorting out what's what on the computer. Take care though when deleting the test images, as you don't want to accidently delete some of the images from any perfect sequence that you had taken earlier!

Taking The Sequence of Photos

Decide on the total number of shots that you are going to take - three, five, seven, etc. (we shall take five), and the exposure value difference between them, e.g., one Stop, two Stops, etc (we shall use one Stop). If you are not familiar with the term Stops (of light), here's a brief explanation. If we were to adjust the Shutter Speed (or the Aperture for that matter) of a DSLR camera in such a way that it now produces an image that is exactly twice as bright as the previous one, then we are said to have increased the exposure value by one Stop. Similarly, by adjusting the Shutter Speed of the camera so that it now produces an image that is exactly half as bright ("twice as dark", so to speak), then we are said to have decreased the exposure value by one Stop. Furthermore, almost all DSLR cameras are set up so that *exactly three clicks* of the Shutter Speed (or Aperture) dial equates to one Stop difference in exposure value. So, it's quite simple then: by adjusting the Shutter Speed dial by three, six or nine clicks, for example, we would have either increased or decreased the exposure value of the image by one, two or three Stops, respectively. Furthermore, we don't even have to increase or decrease the exposure by a full one Stop each time: if we wanted to increase or decrease by just one third of a Stop of light, then rotate the dial by just one click. Two thirds? - two clicks.

Right then, back to our camera on the tripod. After having taken our test shots, and at various different Shutter Speeds, we've now managed to produce a 'perfectly-exposed', 'normal', 'OK' image. Let's say, for example, that the Shutter Speed for this 'perfect' exposure is 1/100th of a second, and that we haven't touched the Shutter Speed dial or any other exposure settings on the camera since (we did however go on to carefully delete all of the test photos, including the 'perfectly-exposed' image). Let's also say that we have decided that a total of five shots at one Stop apart is what's required to capture the dynamic range of light in the scene. Next then, rotate the Shutter Speed dial away from our perfect exposure value, ***by six clicks*** in the direction of a faster Shutter Speed - for our example, we would change from 1/100th of a second to 1/400th of a second (two stops darker). Take a shot. Next, rotate the dial ***back to a slower shutter speed*** by just three clicks - for our example that would mean changing from the current 1/400th of a second to a 1/200th of a second. Take a shot. Repeat by three more clicks in the same direction which will put us at the Shutter Speed that gives us the 'perfect' exposure once more - with our example that would be a 1/100th of a second. Take a shot. Then three more clicks to a slower Shutter Speed again - for our example, to a 1/50th of a second. Take a shot. Finally, rotate the dial by three clicks further to an even slower Shutter Speed - for our example that's a 1/25th of a second. Take a shot. We have now taken a sequence of five shots, at one Stop exposure difference.

The full sequence, including taking the test shots, is as follows:

1. Take several test shots, adjusting the Shutter Speed accordingly, until you arrive at the 'perfect' or 'normal' exposure, upon which do not adjust the Shutter Speed further.
2. Delete all of these test shots, *including* the 'perfect' exposure one.
3. Rotate the Shutter Speed dial six clicks to a faster Shutter Speed (two Stops darker than the 'perfect' exposure).
4. Take a shot.
5. Rotate the Shutter Speed dial ***three clicks to a slower Shutter Speed*** (one Stop darker than the 'perfect' exposure).
6. Take a shot.
7. Rotate the Shutter Speed dial three clicks to a slower Shutter Speed (back to the 'perfect' exposure).
8. Take a shot.
9. Rotate the Shutter Speed dial three clicks to a slower Shutter Speed (one Stop brighter than the 'perfect' exposure).
10. Take a shot.
11. Rotate the Shutter Speed dial three clicks to a slower Shutter Speed (two Stops brighter than the 'perfect' exposure).
12. Take a shot.

Reviewing the information on the back of the camera, you are now advised to make written notes of the actual file numbers for the sequence of the images, for example dsc_1122, dsc_1123, etc., as explained in Chapter Two. NB. These are not the numbers that you see such as 57, 58, 59, etc., but the actual file name, such as dsc_1122, dsc_1123.

Next, run through the sequence of images that you just taken, inspecting them carefully to get a feel for whether you've captured the dynamic range of light fully, as it's very important that you capture the whole dynamic range of light on the scene. Pay particular attention to both the brightest and darkest parts of the images, especially with the darkest and the brightest two shots. In the darkest shot, for example, is the sky a gorgeous blue, or is it still too bright? With the brightest shot on the other hand, can you see detail adequately in the shadowy areas, or are these areas still too dark? If, instead, in the darkest shot, the hi-lights are still too bright, or in the brightest shot the shadows are still too dark, then unfortunately you haven't managed to capture the dynamic range of light fully. If this is the case, then you will need to repeat the sequence from scratch, probably by using either a greater number of shots, or by adjusting the Shutter Speed a larger increment between shots - for example, try four clicks on the Shutter Speed dial - a 1.3 Stop adjustment. If you haven't captured quite what's needed, then take a look at the 'trouble-shooting guide' below. Remember though: for each Solution below, you will need to retake the entire sequence all over again!

If everything looks OK however, then we can now move on to the final stage in HDR Photography, and that is sitting down at the computer and loading them in to Photomatix Pro or Photomatix Essentials.

The problem	The cause	The solution
Despite good tonal *balance* between the hi-lights and the shadows, the hi-lights are still too bright, and the shadows are still too dark.	The dynamic range of light in the scene is greater than what's been captured.	Either: a)Increase the number of shots in the sequence; and/or b)Increase the exposure

		difference between shots, e.g., take each shot at 1.3 Stops apart, instead of 1.0 stop, i.e., four clicks of the Shutter Speed dial, instead of three clicks.
Despite good tonal *balance* between the hi-lights and the shadows, the hi-lights are much too dark and the shadows are much too bright.	The dynamic range of light in the scene is not as great as what's been captured.	Either: a)Decrease the number of shots in the sequence; and/or b)Decrease the exposure difference between shots, e.g., take each shot at 0.7 Stop apart, instead of 1.0 Stop, i.e., two clicks of the Shutter Speed dial, instead of three clicks.
The overall sequence of images is biased towards capturing the detail in the hi-lights, but the hi-lights are also too dark, e.g., the blue sky is too deep and dark a blue. Additionally, the shadows are much too dark.	The entire sequence of images is underexposed.	Retake the sequence, this time starting with a slightly slower initial shutter speed.
The overall sequence of images is biased towards capturing the detail in the shadows, but the shadows are also too bright, e.g., the darker areas appear a bit washed out. Additionally, the hi-lights are much too bright.	The entire sequence of images is overexposed.	Retake the sequence, this time starting with a slightly faster initial shutter speed.