PHOTOGRAPHING FOR HIGH DYNAMIC RANGE PHOTOGRAPHS

H D R

USING

P H O T O M A T I X 5

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Introduction

Welcome to this free guide about how to take the pictures needed to make HDRimages.

This guide will take you through some of the most important considerations about HDR and capturing the series of pictures needed. In addition, you might already make a note: I call the input pictures to the process “pictures”, and I call the output images (HDRimages) for “images”. Everytime I write “picture” you will know that it is an input picture.

This guide will introduce you to the Theory about HDRphotography and we will look at some of the common questions about camera and equipment. We will look at some key questions about photographing the pictures series and we will spend some time talking about composion and how to choose motives.

I use Photomatix 5 and I have tried a number of the competing programes. In my opinion, Photomatix is state of the art.

I use Photofiltre Studio X as my ordinary imageeditor. Not because it has the most possibilities, not because it works with the best quality, not because it is the most widely spread program. Simply because the workflow is very intuitive and the program does provide the adjustment possibilities, I need.

All images in the book are HDR – of course. And you might as well get used to my opinion about HDR too: HDR is a combined process in which at least two pictures are taken with at least 0,3 EV step between. The pictures are merged and tonemapped.

You are not able to make HDRimages from one picture. No matter how hard you twist the adjustments on your converter or Photomatix, you will never be able to extract more from one picture, than the camera already is cable to deliver with one picture. The is no thing as “pseudo HDR” or “fake HDR”. Call images what they are. Singel tonemapped pictures are Tonemapped.

Every page in this guide is a section of its own. Each page addresses one particular topic and illustrate the topic/ solution in both text and image.

If you decide to buy Photomatix, you can **save 15%** of the prices. Just type the code “**hdrfoto15**” in the form and you will get **15% discount**.

I hope that you will find this guide useful.

HDRFOTO.DK

John Nyberg is the author of several books about photography.

His first book about HDR photography was released in 2012 and is available as E-pub, on paper and as PDFfile from www.libris.dk.

The book is in Danish.

High Dynamic Range – HDR

High Dynamic Range (HDR) is a relevant technique for you since your camera is not as good to capture details in very high dynamic range scenes as your eyes are. HDR is a way to compensate the technology. There is still a gab between the capacity of your eyes and your camera.

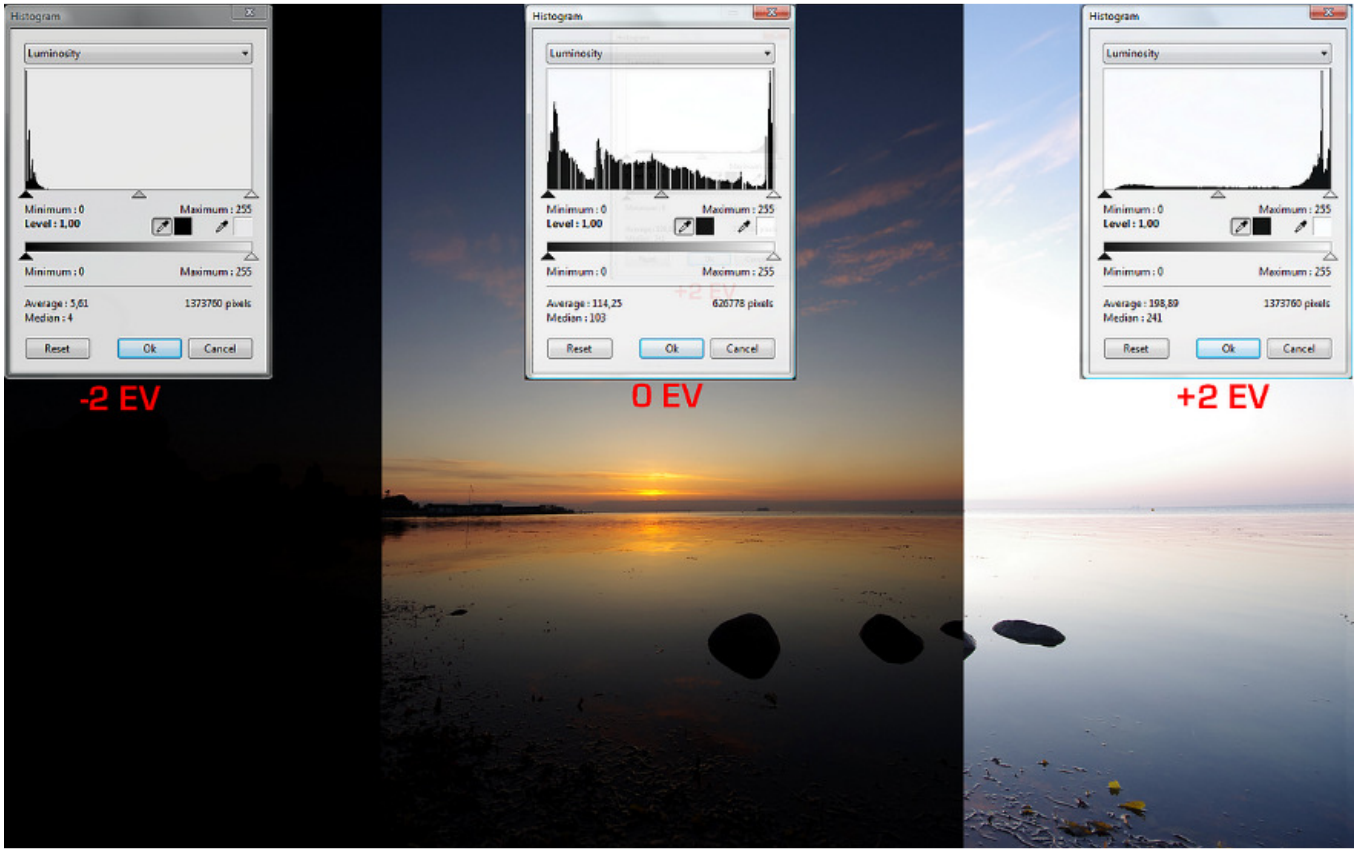
When you look at a landscape on a sunny day, you are challenging your eyes and your brain. Everywhere you look and focus you set new challenges for your eyes – just try to look in the eyes of a person when he/she is looking at a nice, sunny landscape with lots of light and many details in shadow areas.

You will see that the eyes are scanning the landscape in small sections, each giving the eyes time to focus and to adjust for different levels of light. Your eyes are in fact running full scale of aperture and focus for each section. The sections are transmitted to your brain and here they are merged and combined into images – perceptions.

Your camera can't do that. For that the camera need a little help. And help is at hand. If you want to increase the depth of field (DOF) you can stack a number of pictures with different points of focus. If you want to increase the range of dynamics you can use Photomatix to merge and tonemap a number of pictures with different exposure (obtained by shifting shuttertimer).

TRICK: Always always always take your pictures in "RAW". From RAWfiles you have the best possibilities to adjust e.g. whitebalance and from RAWfiles you get the best dynamic range from your camera.

HDR 1,2 3



Imagine that you are standing next to me in the water and the seaweed looking at the scenery above. I have cut a slice of three pictures and inserted their histograms. At left you can see the exposure at – 2 EV step and as the picture and the histogram show: All dark areas have gone black and none of the high tones are burned out (have gone all white). In the middle you can see that there are details that have been lost in the dark areas (gone all black) and details that have burned out in the bright areas (gone all white). At right you can see that no details have gone black, but lots of details have burned out.

Merging the information in all the pictures together will secure details in the bright areas. Those are taken from the underexposed picture (-2). Merging will secure details in the middle area. Those are taken from the normal exposed picture (0). Merging will secure details in the dark areas. Those are taken from the overexposed picture (+2). Together the three pictures have captured the full dynamic range.

HDR is no effect and HDR is not something you add to a picture. HDR is created in the moment of photographing the motive.

NOTICE that the above also serves as documentation for the simple fact that HDR cannot be created from a single picture. No matter how you turn yourself or the picture around you will never be able to find more details than already was in the single picture. Only by using more than one picture, you can expand the dynamic range: reaching "high dynamic range".

A little about light

Try to lift the views from the computerscreen (or paper) and look out of a window. Notice all the details in the areas of shadow and notive then all the details in the (very) bright areas. That's the richness of details that HDR is "born" to capture.

If the dynamic range (difference between darkness and light) is huge, you cannot see all the details. The dark areas looks black and the bright areas look all white.

A star shines give you:	0.001 cd/m2
The moon give you:	0.01 cd/m2
Indoor you typically have:	10-100 cd/m2
Outdoor in sunny wheater you get:	1,000.000 cd/m2
The sun shines with:	1,000,000,000 cd/m2

That is very big differences. The difference between the light from a star and the light on a sunny day is 1:100 million. Your eyes can, in the same glance, capture details in about 1: 10.000. That is just about 14 EV steps on your camera. Moreover, each EV-step you can add, you handle double the amount of light. Every won EV-step counts.

In everyday situations, you do capture much more than 14 EV-steps with your eyes. Your bran hold small sections of the view and put them together letting you perceive the complete scenery as one image.

EV-steps are not from a staircase

When you take a picture using ”Auto” you allow your camera to choose ISO, aperture and shuttertime in order to obtain the best exposure of the motive. Often the camera will measure the light and dynamics of the motive in the center of the motive – you do point the camera exactly at the most interesting element, don’t you?

Those settings will give you the “normal exposure” of the motive. Normal exposure is named “0 EV” meaning: no underexposure and no overexposure. But in order to capture details in the whole range of light you need more than one picture. The Little Mermaid above took seven pictures. Three underexposed, one normal exposed and three overexposed pictures. Between each picture I doubled the shuttertime.

- 3 EV picture:	1/200	sec
- 2 EV picture:	1/100	sec
- 1 EV picture:	1/50	sec
0 EV picture:	1/25	sec
+1 EV picture:	1/12	sec
+2 EV picture:	1/6	sec
+3 EV picture:	1/3	sec

The EV-steps are measurements of light.

NOTICE that it is only shuttertime that you change between each picture. Fix your ISO at the baseISO for the camera (look in the manual) and fix the aperture to fit your desire for depth of field. Never have the camera in “Auto” when using the bracketing function (automatic shifting exposure between pictures). When using bracketing your camera should be in Manual (M) or (A) aperture priority.

Camera & equipment

You will never get any HDR without a camera – of course. And the camera is not always enough. You do need some equipment besides the camera. In the following pages we look a little closely at some of the key points about camera and equipment.

We will talk a little about the camera, your lens(es), your tripod, your remote control, your memorycard(s) and your filters.

The important thing here is to get the best images – not to buy the most expensive camera or the most lenses, tripods etc. You really do not need that much gear to make wonderful HDR images.

Camera

HDR is about photographing series of pictures with individual shutter times. Ypur camera has to be able to do just that. The automatic bracketing function is not necessary. If you can lock the ISO and set your camera to Manual (M), then you can make the needed series for your HDR images.

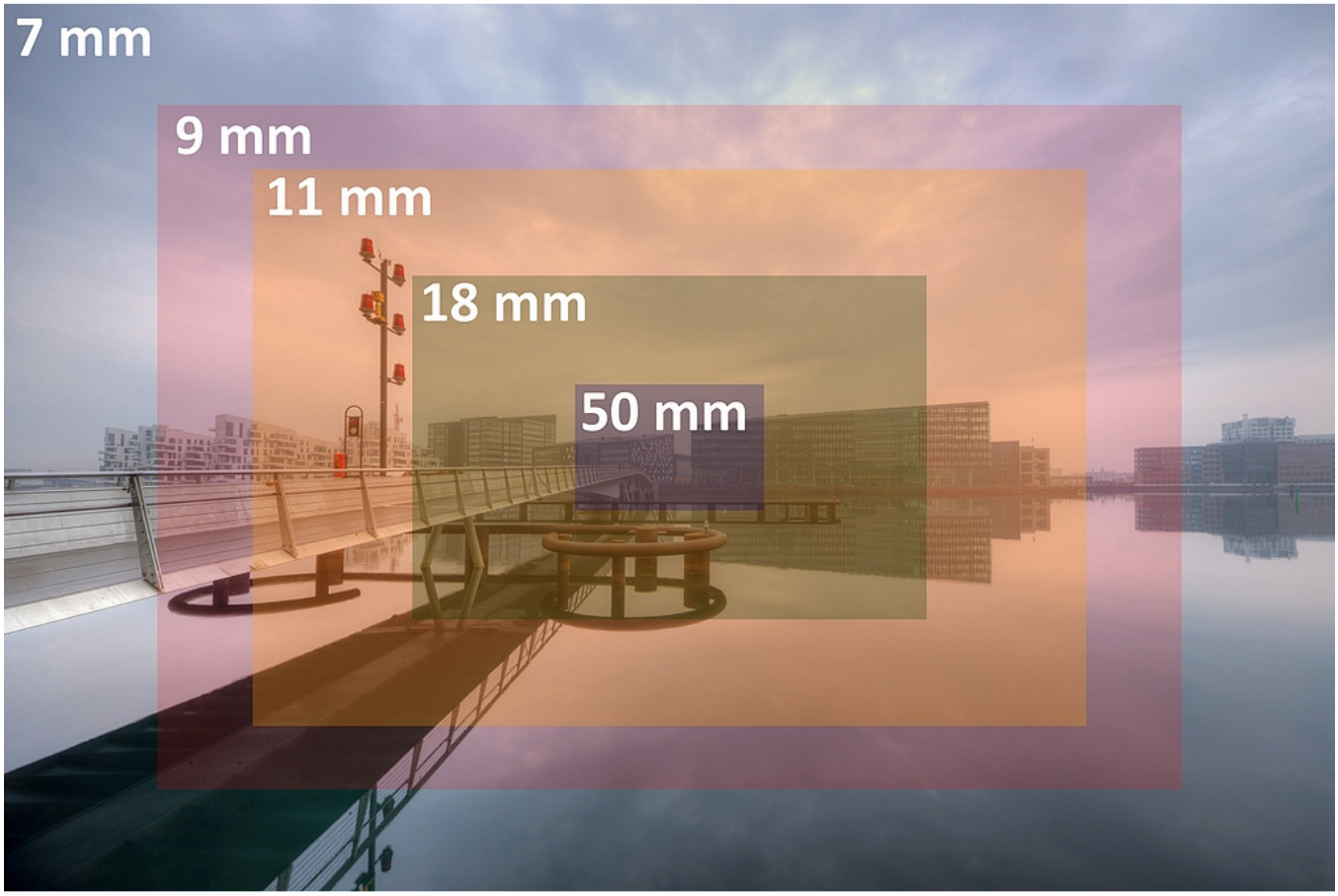
You do net need a DSLR. The mirrorless cameras and the small compact cameras are just fine. Some camera offer the bracketing function (AEB) and that is convenient. You choose the number of pictures and the EV spacing between the pictures. You set your camera in Aperture priority and choose the wanted aperture. You lock the ISO and then you compose and press the release. The series is shoot and the camera changes the shutter time between each picture.

If your camera does not provide the AEB function, you just set your camera in Manual (M) and lock your ISO. You compose the picture and press the release half way. That will provide a reading of light in the viewfinder. Adjust the shutter time so the reading is e.g. -2 EV. Take the picture. Adjust shuttertime for a new reading: -1 EV. Take a picture and continue until you have the wanted series – here five pictures spacing one EV-step each.

My camera is not a “professional camera”. It is a good DSLR and I have never had critics saying: Ooohhh you rreally should have had a full frame DSLR or medium format. I do just fine with my Pentax K-5.

NOTICE that some cameras and smartphone offer a complete HDR program. Here you just compose in the viewfinder and press the release. The camera take the pictures; merge the pictures and tonemap for a final HDR output. Very smart, very quickly. However, you lose all control of merging and tonemapping – and you cannot use the camera while the process is on. I always merge and tonemap my series in the computer using Photomatix.

Lens



No matter what camera you have; some thoughts about the lens is in order. I am thinking of the key point of focal length.

When you want to take a picture and seeing wide to the sides, you use a “wide lens”. Wide lenses (e.g. 11 mm) will capture a wide angle of the scenery. However, if you are into some details; you will use a “normal lens” (50 mm) and as you can see above; that will give you a much narrower picture.

There are no “correct” lenses for HDR photography. But there are some considerations about lenses that you might want to hear. Look at the image above. If I had used a 50 mm lens here the image would not have a (very) high dynamic range. If I had used the 11 mm lens; I would have had a smaller dynamics range since I would have cut of some of the most dark areas and some of the most bright areas.

By using a 7 mm lens I get all the dynamic range in the scenery. And that is what HDR is all about. Getting the full dynamic range into the camera and showing it again in one finished HDR. I normally photograph my series for HDR using between 8 mm and 22 mm.

Tripod

I know (and I even do it sometimes): Series for HDR *can* be photographed handheld. But I only have two statements about that. The first statement is divided into two points:

Firstly: Use tripod.
Secondly: Use tripod.

Photomatix has a great function to merge your pictures. Really great, in fact; but I can still promise you that the number of failed series is much bigger going handheld than using tripod. Much bigger.

Even if Photomatix does merge the pictures you will often find the sharpness better in “tripod images” than in handheld. Notice that tonemapping also will enhance every little contrast and if a movement of the camera leaves a line in your image; Photomatix will enhance that line.

The second statement?

Use tripod

TIP: Buy a good tripod. A good tripod is a tripod that you will bring on your phototrips. The worst tripod is the one at home.

Remote

If you suffer from Parkinson's disease or "just" shake a lot; you will probably have good use of a remote for your camera. Otherwise: No, you do not need a remote.

If you really want to keep your hands of the camera when trigging the shutter; then use the building option for shutter delay in your camera. Set your the camera to wait one or two seconds before taken the pictures you need for your HDR.

Simple, right?

NOTICE that an image of a remote is much too boring for a guide like this. Enjoy a very early morning at Furesoen in Denmark. The HDR is merged from five pictures spacing one EV-step each.

Memorycard

What you save on remote control should at once be placed in memorycard(s). Trust me. Buy 8, 16 or 32 GB memory cards and buy the fast onces. Buy more than one and keep them in good shape. I format my cards frequently.

Photographing for HDR uses a lot of GB's. Normally you just take one or two pictures of the scenery; with HDR you quickly take five or ten pictures of the scenery. Above I have used nine pictures spacing one EV-step each. And that was not the only series I took of that sunrise. In all I came home with 24 series of the sunrise. Some series with five pictures, some with nine. In all I had 160 pictures of that sunrise. 10 series with nine pictures and 14 series with five pictures.

I only use class 10 cards, and I run cards with 95 MB/sec. Top speed will help my camera getting the pictures into the card as quickly as possible. Every second I wait for the camera to save a serie; is a second wasted. With pictures sizes of more than 20 MB each seconds are ticking away.

TIP: I prefer to have two 8 GB cards in stead of one 16 GB. My theory is that if a card breakes down I only loos 8 GB instead of 16 GB. But to be honest: I have never had a card breakdown (yet).

Filtres

You can find a lot of different filtres. I dont care much for most of them.

UV: Ultra violet protect against UV from the sun. But your sensor is already protected against UV. No you don’t need it. In fact: The UV-filtre is not near as good quality as your lenses are and you only risk more flares and worse contrast using UV. If you think that the filter protects your lens from scratches and such: Use lens hood (and you should always use lens hood anyway).

ND: ND is called ”grey filtre” because the filtre is grey. Grey filtres reduces the amount of light getting into the sensor. Thus providing the possibility of long shuttertimes. If you need that, use the grey filtre.

Graduated: Graduated filtre are ND filtres with a graduated amount of grey. You may reduce light in the top of the picture (sky) and not in the bottom (landscape). Very clever.

POL: POL filtres are two lenses that can be turned. POL can reduce reflections from windows, water, car and so on. The picture above show how. At left the reflections are reduced. At right the reflections are not. Very useful and almost a must when photographing cars.

Photographing for HDR

Photographing for HDR is different from ordinary photography. Of course, I should say. You don't take single pictures, you take series. Moreover, you don't fear getting the sun directly into the camera, you look for it.

But movement is a matter of concern. The movement can be you moving the camera while photographing a series (handheld?) or the motive moving while photographing the motive. Not only due to the number of pictures but also due the fact that overexposure demand longer shuttertime – and longer shuttertime might cause movement.

The image above is merged from five pictures spacing one EV-step each. Photomatix did not manage all the movement in the "remove ghostlines"; but a little clean up did the trick.

In this chapter, we will look at how to decide the number of pictures and the EVspacing between the pictures. You will also find a little about AEB and HDR directly from the camera…

Number of (and EVspacing between the) pictures

You always need to consider the number of pictures needed for a given scenery. Several items have to be evaluated here: How high is the dynamic range; how large increments between each picture do you want and is there any particular risk for ghostlines due to long shuttertimes?

My standard series are five pictures, one EV-step between each. That will take care of most scenes. But sometimes the light is particular strong and the shadows carry details I just must have. Then I might take seven, nine or eleven pictures or increase the spacing from one EV to two EV between each picture.

The more pictures, the more risc for ghostlines due to motive movement. The larger increments between the pictures, the more risk of loosing important details in merging and tonemapping. The longer shuttertimes, the more risk for ghostlines due to motive movement.

My standard series offer me the possibility to use three pictures spacing one EV-step, three pictures spacing two EV-steps and five pictures spacing one EV-step.

NOTICE that HDR images does not get any better the more pictures you use. You need to capture the full dynamic range and you do not need more than that. If you want to have less increment between the pictures, you need to take more pictures.

AEB

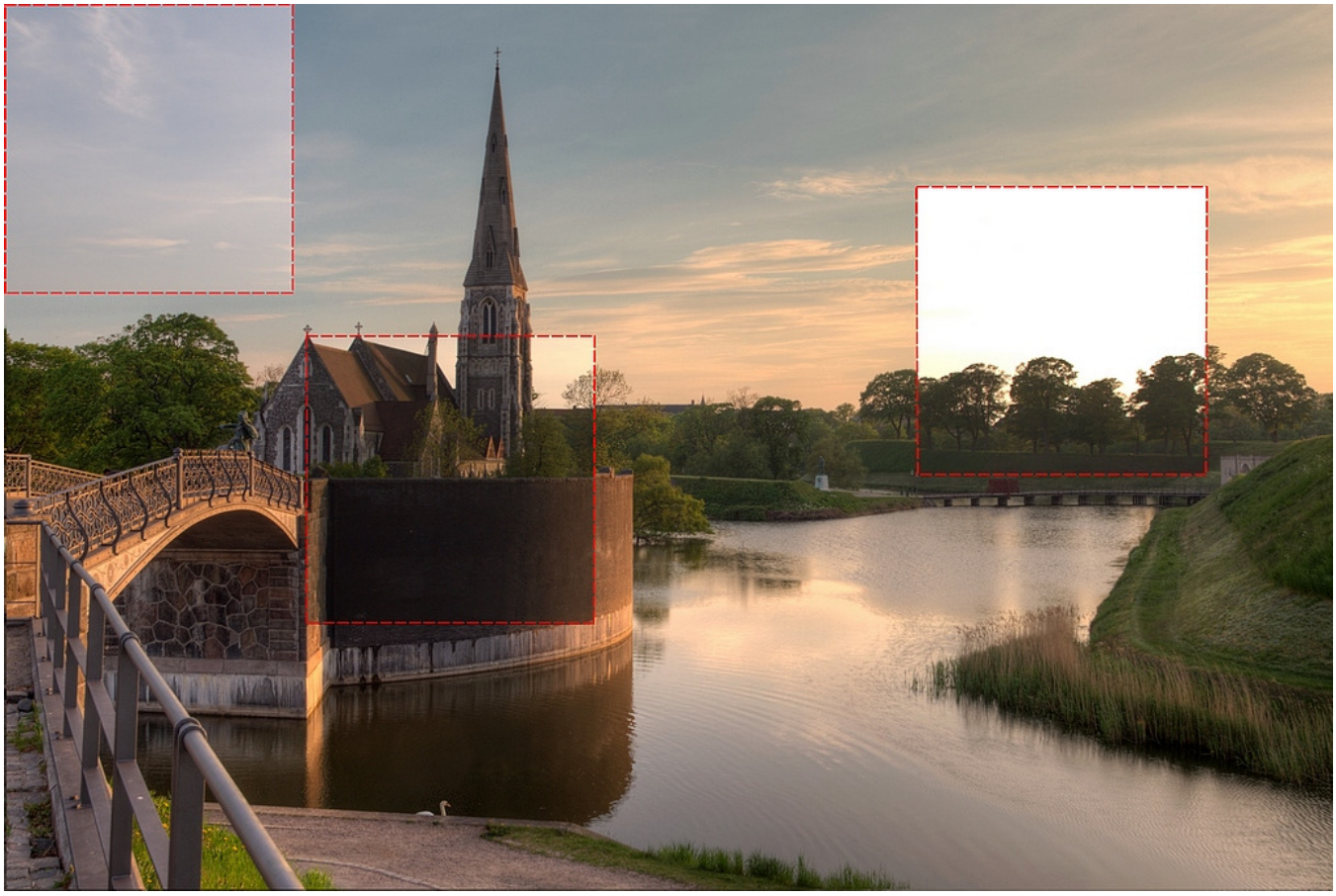
Automatic Exposure Bracketing (AEB) is a clever function in your camera (most cameras that is). With AEB you choose the number of pictures you want in your series and you choose the EV-step between the pictures. Then your camera will take the series for you.

But never use AEB if your camera is set to “Auto”. In Auto you allow the camera to change both shutter and aperture in order to obtain the changes. When using AEB you must set your camera in Aperture priority (A) or Manual (M). If you use M; you have to set the shuttertime to match the starting point of the series – normally at 0 exposure.

Some cameras can take three pictures in the series. Some can take up to five pictures and some seven or nine pictures. Some cameras allow one EV-step between each picture, some cameras allow up to two EV-steps and some cameras allow up to three EV-steps between each picture.

NOTICE that when you use AEB, you must lock the ISO setting in the camera. Lock the setting at the ISO base. The ISO base is normally at ISO 100 or ISO 200. Here your camera produces little noise and provides the best capture of dynamic range.

HDR build into the camera



Many cameras provide a build-in HDR function. When you uset his function your camera will (typically) take three pictures spacing one EV-step and both merge and tonemap the pictures into a HDR image. It is very clever and it is very fast.

I have not yet seen build-in HDR functions that doesn't add to the dynamic range of the images. I have placed three squares in the HDR image above from Pentax K-5's build-in HDR function. Each square show what the normal exposure looks like. In other words: It really works.

But on the other hand: I have yet to see build-in functions working near as good as computerbased software to merge and tonemap HDR images.

Motive

When realestat brookers talk about what will sell a house, they say that there are three factors: Location, Location and Location. It is nothing like that in photography. Even though the key to every good photo also divides into three factors:

1) Motive
2) Motive
3) Motive

Without a good motive, you have no image. Technique; equipment; processing or what have you, will not rescue a photo without a motive. HDR photography give you some advantages compared to ordinary photography. The most prominent advantage is that HDR allow you to photograph directly into the sun and *still* keep details in shadows. That is what you have to make use of – that is what is a central part of your motive.

In addition HDR photography is able of providing a sence of 3D-effect into your images. In fact, HDR has roots from the 3D technology.

The front of the boast above would be all black if I didn't use five pictures spacing two EV-steps between each picture.

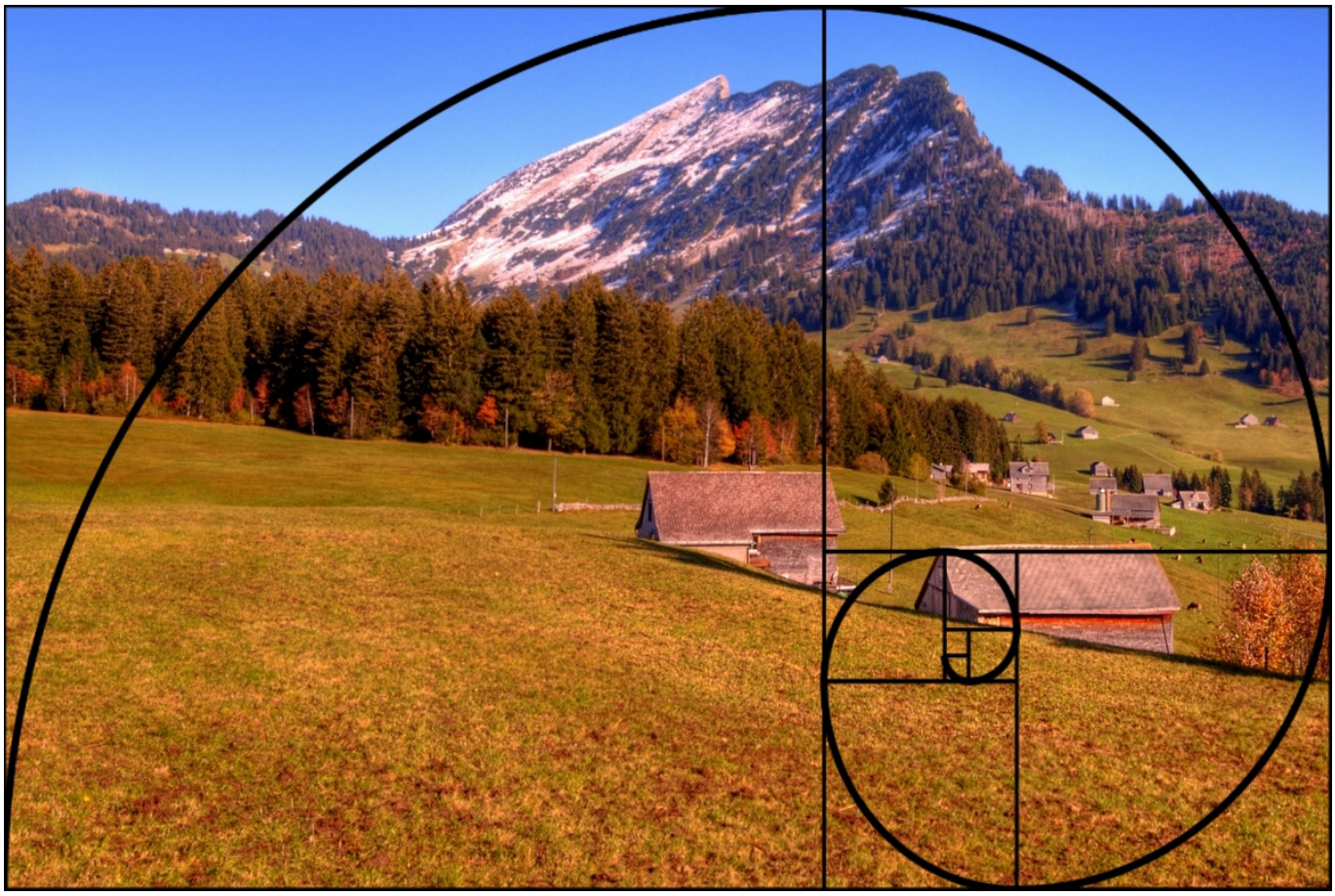
Composing

Composing your images is what you do when you choose how you present your motive. My motive is the Royal Castle of Rosenborg in the heart of Copenhagen. I compose to have the castle in the frame, to have a little bit of the bridge in the frame, to show the moat, the sky and some of the military barracks in the frame.

Those things are choosen to frame my motive. I want you to see that the castle has lots of space around (to the right you will find a very nice park (The Kings Garden) and I want you to see that the castle is a part of a structure with a military garrison placed just beside the castle. Today the barracks are the home base for the Queens guards. Every day they march from Rosenborg Castle to the Queens Palace.

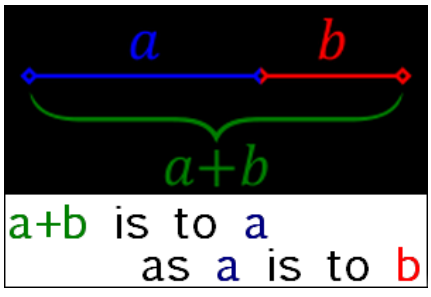
When you compose your image you should consider if some of the old “rules” about composition is useful to comply. In the following pages you will find some of those rules – hints, if you like.

Divine Proportion – Golden Ratio



My favorit rule of composition is the Divine Proportion. You might remember it from David Browns book about Da Vinci, but in fact, the Divine Proportion has been spoken and written of, for more than 2,000 years. Above you have the Fibonacci spiral in a scenery from Switzerland and you notice how the roof of the shed in front lines up with the line in the spiral. The "eye" of the spiral is the Divine spot. Notice also how the spiral and the top of the mountain Liestkamm corresponds to each other.

The divine proportion is actually quite simple, as show in the figure to the right. Ou spilt a line into two. The total corresponds to the first part, as the first part corresponds to the second.



Many thing in nature have proportions as the divine proportion.

Sometimes it might be a little hard to recall the Divine spiral when composing in the field. Then just use the thumb rule: "two thirds". Two thirds tell you e.g. to keep the horizon away from the centerline of an image.

Place the horizon one third from the top or one third from the bottom of the image. That will give you a much more pleasant image – and the fine cutting of the image is much more easy if you have composed with the rule in mind.

Front, middle and background

One traditional way of composing images is the old formula: Front, middle and background. You compose the image to present the motive in the front, you introduce an area in the middle and you make sure to have a background.

The lamppost above is my motive. It is placed in the front (and about one third from the left) holding the lamp close to the divine spot. The harbor area and the two red buildings make the middle of the image and the background is the harbor front of Copenhagen and the clouds above the city.

The image is show the old Trekroner Fortress. A fortification in Copenhagen Harbour. The image is merged and tonemapped from five pictures spacing two Ev-steps each.

Diagonal

No matter how you look at your image, your eyes will often work overtime to find lines in order to bring som system into the experience. Why not use that?

The image above is composed to make use of the diagonals from the road. The image is merged and tonemapped from five pictures, thus preserving the details in the clouds, and avoiding the shadows in the trees in the background going all black.

Furthermore, the horizon is kept one third from the bottom of the image and not in the centerline.

TIP: You do not need lines that goes all the way out of the corners. Even broken part of lines will make your brain "see" the diagonals and whenever the brain find some "order" in a motive, the brain is pleased.

Respect movement

Movement is a challange when photographing for HDR. HDR uses several pictures and merge them. If there has been movement in the scenery between the individual pictures, you risk ghostlines. It is only lines you get and that is why we call them ghostlines.

Photomatix has an effective function to remove ghostlines. But it doesn't always cut the mustard. And some respect for movement is advised. I have three rules for assisting Photomatix to remove the ghhostlines even better.

Firstly: Make sure that the moving object has a good contrast against the background.
Secondly: Make sure the moving object as a certain amount of mass (pixels) to be spottet by Photomatix.
Thirdly: Make sure the moving objects move in same direction.

The image above is merged from three pictures spacing two EV-steps between each. The people in front of the entrance to Tivoli in Copenhagen did *not* stand still