


Learn the best ways  
to compose your  
pictures!

# Exposure

From Snapshots to Great Shots

Second Edition



Get great detail  
in your subjects!

Jeff Revell

Exposure:  
From  
**Snapshots** to  
**Great Shots**

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Peachpit  
Press

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**Peachpit Press**

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## **Dedication**

For Mom and Dad—thanks for everything!

## Acknowledgments

Most of the books that I write tend to have a shelf life based on the camera that it is based on. The reality is that cameras don't last forever and there will always be a "next big thing" right around the corner. But that's the beauty of this book. Cameras come and go but the principles of photography have remained unchanged for almost 200 years, which means that this book will continue to be relevant for the foreseeable future. That being said, even the sturdiest of houses needs a fresh coat of paint every now and then, which is why I appreciate the good folks at Peachpit allowing me to give it a little bit of a refresh. A big thank you to Peachpit and my editor Ted for seeing the value of this book and allowing me the opportunity to spruce it up and update it to ensure that it remains a valuable resource for years to come.

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# Introduction

I have written quite a few camera-specific books in the *From Snapshot to Great Shots* series. Unfortunately, I can't write one for every camera out there, but what I can and did do is take all of the great information from those other books and place it into this book. If you already own one of my camera-specific books, you might want to take a pass on this one since it will seem very familiar. If, however, you don't have one of the earlier books, then this one is for you.

I have tried my best to give everyone reading this book a good foundation of photographic knowledge and then build on it in order to create better photographs. If you still aren't sure if this book is for you, read the Q&A on the following pages.

**Q: Does the material in this book apply to any camera?**

A: You will probably take away some good stuff no matter what camera you have, but to get the most benefit you need something that will let you take control. The automatic modes are okay but most of the material in this book is geared towards taking control over specific camera functions such as shutter speed and ISO. To really get the most out of the book you will need something like a digital SLR or, at the very least, an advanced point-and-shoot.

**Q: Is every camera feature going to be covered?**

A: Nope, just the ones I felt you need to know about in order to start taking great photos. It would be pretty difficult for me to cover every possible feature in every camera (actually it would be nearly impossible). What I did want to cover was how to harness general camera functions and photographic principles to truly benefit your photography.

There may be times in the book where I mention a camera function that might not have the same name for your specific camera, like the Shutter Priority mode. If you have a Canon, you have the same shooting mode; it's just referred to as Time Value (Tv). The function, however, is the same for all cameras. I tried to be as generic as possible but you may still have to do a little investigating to associate your camera's terminology with that used in the book.

**Q: So if I already own a camera manual, why do I need this book?**

A: The manual does a pretty good job of telling you how to use a feature or turn it on in the menus, but it doesn't necessarily tell you why and when you should use it. If you really want to improve your photography, you need to know the whys and whens to put all of those great camera features to use at the right time. To that extent, the manual just isn't going to cut it. It is, however, a great resource on the camera's specific features. You should use it like a companion to this book.

**Q: What can I expect to learn from this book?**

A: Hopefully, you will learn how to take great photographs. My goal, and the reason the book is laid out the way it is, is to help you understand the basics of photography and all the elements that you need to really start creating great images. From there, you can begin to utilize your knowledge of exposure as it relates to different situations and scenarios. By using the features of your camera and this book, you will learn about aperture, shutter speed, ISO, lens selection, depth of field, and many other photographic concepts. You will also find plenty of large full-page photos that include captions, shooting data, and callouts so you can see how all of the photography fundamentals come together to make great images. All the while, you will be learning how your camera works and how to apply its functions and features to your photography.

**Q: What are the assignments all about?**

A: At the end of most of the chapters, you will find shooting assignments, where I give you some suggestions on how to apply the lessons of the chapter to help reinforce everything you just learned. Let's face it—using the camera is much more fun than reading about it, so the assignments are a way of taking a little break after each chapter and having some fun.

**Q: Should I read the book straight through or can I skip around from chapter to chapter?**

A: Here's the easy answer: yes and no. No, because the first four chapters give you the basic foundation that you need to know for creating proper exposures. These are the building blocks for making photographs with your camera. After that, yes, you can move around the book as you see fit because the later chapters are written to stand on their own as guides to specific types of photography or shooting situations. So you can bounce from portraits to shooting landscapes and then maybe to a little action photography. It's all about your needs and how you want to address them. Or, you can read it straight through. The choice is up to you.

**Q: Is that it?**

A: One last thought before you dive into the first chapter. My goal in writing this book has been to give you a resource that you can turn to for creating great photographs with your digital SLR. Take some time to learn the basics and then put them to use. Photography, like most things, takes time to master and requires practice. I have been a photographer for more than 25 years and I'm still learning. Always remember, it's not the camera but the person using it who makes beautiful photographs. Have fun, make mistakes, and then learn from them. In no time, I'm sure you will transition from a person who takes snapshots to a photographer who makes great shots.



ISO 800 • 1/30 sec. •  
f/32 • 135mm lens

# 1

## What Is Exposure?

### **Learning the Basics**

It doesn't matter what camera model you own, what brand it is, or even what type of camera it is. They all have a singular purpose: to create a properly exposed photograph. But what exactly does "properly exposed" mean? And how do we know that the camera is getting it right? It all begins with a basic understanding of exposure and how to make adjustments to get the results you want, so that's where we will begin.

## Poring Over the Picture

On a recent trip to Las Vegas, I had some extra time on my hands and decided to take a side trip to the Western Grand Canyon area. Along the way I came across some very cool-looking Joshua trees. These are really unique-looking trees, and I couldn't pass up the opportunity to stop and grab a few shots.

A Cloudy white balance was used due to the overcast skies.

The wide angle lens gave me good depth of field, even with a fairly large aperture.

I used a wide angle lens to capture a larger view of the area.





I underexposed the image to darken things up a little and add saturation.

ISO 400 • 1/800 sec. •  
f/7.1 • 17mm lens

## Poring Over the Picture

This past year I took a road trip down the Blue Ridge Parkway. Along the way I stopped at quite a few scenic overlooks. Some were photo-worthy and some were not. This particular one grabbed my attention because of the stark contrast between the lush green trees and the pale dead timbers mixed in.

To get the proper balance of aperture and shutter speed, I used an ISO setting of 200.

I used a Shady white balance setting to warm up the colors in the scene.



The camera's landscape preset added more saturation to the trees.

The first image I shot was a little light so I underexposed by one stop to darken things up.

ISO 200 • 1/50 sec. •  
f/10 • 70mm lens

## The Basic Definition

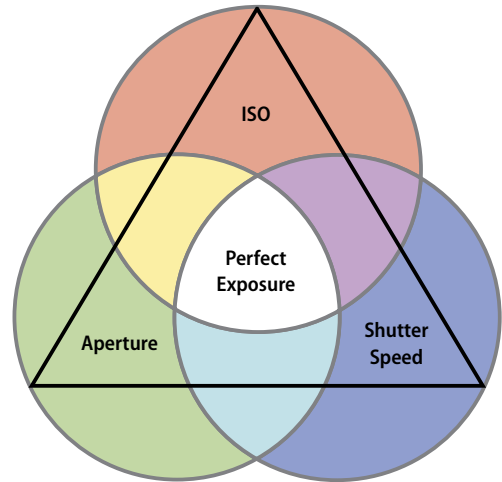
Exposure is the process whereby the light reflecting off of a subject reflects through an opening in the camera lens onto the camera sensor for a defined period of time. Just how large of a lens opening and how long the light is allowed to pass through is determined by the sensitivity of the sensor. The proper combination of shutter speed, lens opening, and sensor sensitivity results in a properly exposed photograph. There is a relationship between these factors that is sometimes referred to as the Exposure Triangle.

At each point of the triangles lies one of the critical components that comprise a correct exposure (**Figure 1.1**):

- **ISO:** This is the numeric value assigned to the sensitivity level of your camera sensor
- **Aperture:** The opening of your lens, which controls the volume of light entering the camera
- **Shutter Speed:** This controls the length of time that light is allowed in through the lens

So you can see that we now have the three points of our triangle. By combining just the right amounts of each one, we can achieve a proper exposure.

Here's how it works. The camera sensor has a level of sensitivity (or how sensitive it is to light) that is called the *ISO*. To get a proper exposure—not too much, not too little—the lens needs to adjust the *aperture* diaphragm to control the volume of light entering the camera. This diaphragm is a circular opening in the lens that can be made large or small, depending on how it is set. Once set, the *shutter* is opened for a short period of time to allow the light to hit the sensor long enough for the light to record an image.



**Figure 1.1** By combining the three primary elements of photography—ISO, aperture, and shutter speed—you can achieve a proper exposure.

A change to any one of these factors will require changing one or more of the other two. This is referred to as “reciprocal change.” If you let more light in the lens by choosing a larger aperture opening, you will need to shorten the amount of time the shutter is open. If the shutter is allowed to stay open for a longer period of time, the aperture needs to be smaller to restrict the amount of light coming in.

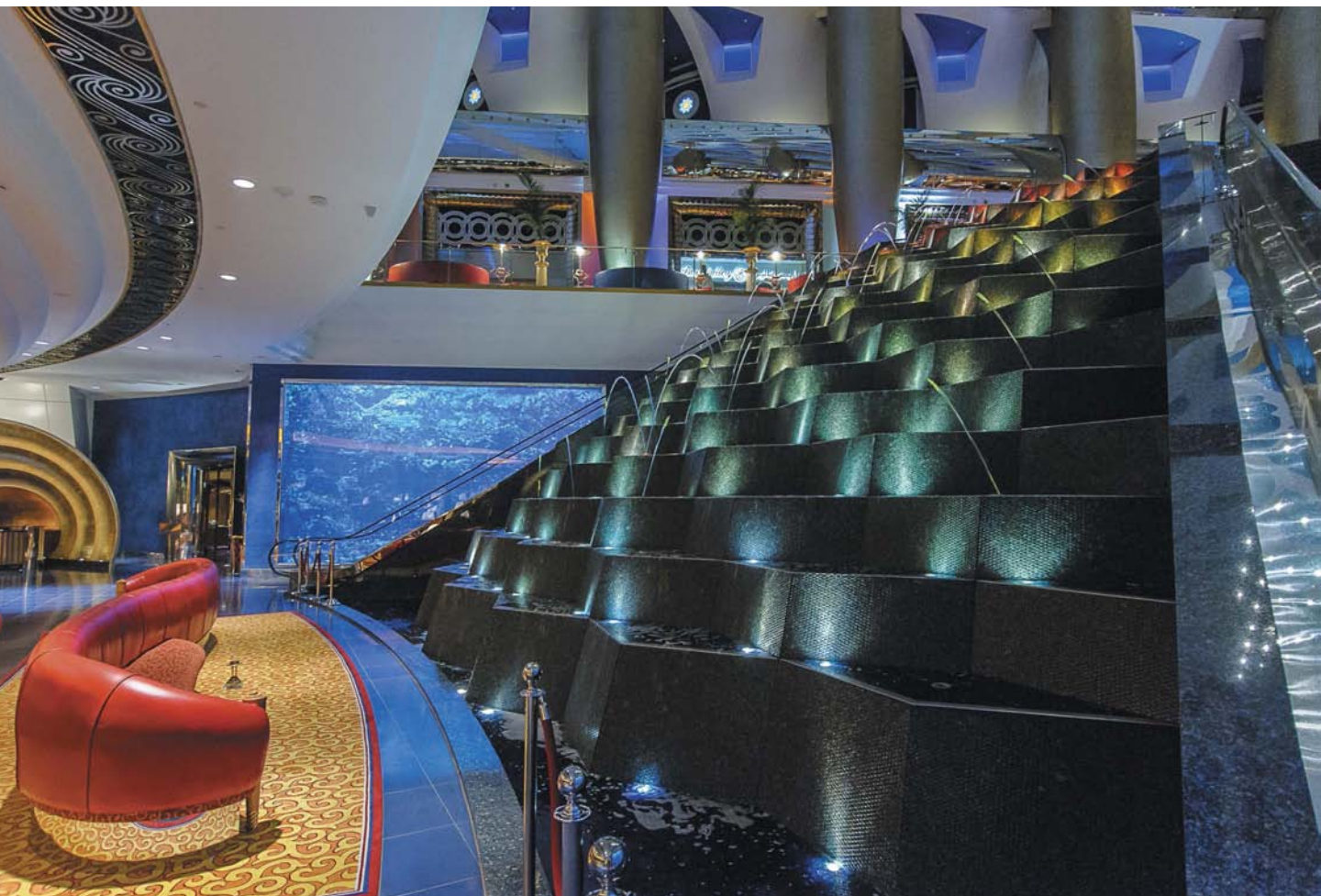
In order to better understand each of these key exposure components, let's dive in a little deeper.

## ISO

We already covered a brief definition of the term ISO, but what exactly does it mean to you? Basically, it's the starting point for defining how much exposure will be necessary for you to get a good picture. The term ISO stands for International Standards Organization and dates back to the days of film cameras. At one point there was more than one way to determine how sensitive film was, by using either the ASA (American Standards Association) scale, which was based on an arithmetic scale, or DIN (German Institute for Standardization), which used a logarithmic scale. In order to make things easier for the international photography market, most film manufacturers switched to the ISO scale.

So why the history lesson? Because the scale that we use in today's digital cameras is based on this definition of sensitivity. The actual method of determining this number is calculated differently because we are using digital image sensors rather than film, but the actual ISO numbers and the way they are used are such that you would obtain similar exposure results. The ISO scale uses an arithmetic progression to change the sensitivity of your camera, based on the lowest determined ISO level achievable. Every time the number doubles, so does the sensitivity of the sensor. Most digital cameras today have ISO settings that range from anywhere from 50 to 126,000 (although most cameras top out around 6400). The ability to actually change that sensitivity level has given the photographer great flexibility in achieving a wider range of exposures.

Just as it was with film, the greatest level of image quality will come from using the lowest ISO number. This is also the setting that takes the most amount of light to produce a good image. As you raise the ISO level on your camera, you decrease the amount of light necessary to make a good exposure; however, your image quality might decrease slightly with each rise in ISO (**Figure 1.2** on the next page). This is due to the process of amplifying the signal from your sensor. It is this amplification that decreases the signal-to-noise ratio. So, the higher you set the number, the more digital noise you will have in your image. This image noise is less of a problem in today's cameras due to advances in signal processing and noise reduction, but it can still be an issue.



**Figure 1.2** The high ISO setting was necessary to enable handholding the camera during exposure. The downside is that there is a lot of digital noise in the image.

ISO 1600 • 1/25 sec. • f/4 • 12mm lens

The bottom line here is that the ISO gives you a starting point for determining how much light you will need for a proper exposure. Pick a lower number and you have better quality and the need for more light. A higher number lets you work with less light but can diminish the quality of your image.

## Turning off the Auto ISO setting

The ISO setting in your camera allows you to choose the level of sensitivity of the camera's sensor to light. The ability to change this sensitivity is one of the biggest advantages of using a digital camera. In the days of film cameras, you had to choose the ISO by film type. This meant that if you wanted to shoot in lower light, you had to replace the film in the camera with one that had a higher ISO. Not only did you have to carry different types of film, you also had to remove one roll from the camera to replace it with another, even if you hadn't used up the current roll. Now all we have to do is go to our menu and select the appropriate ISO.

Having this flexibility is a powerful option, but it's important to remember that the ISO setting has a direct bearing on the quality of the final image. The higher the ISO, the more digital noise the image will contain. Since your goal is to produce high-quality photographs, it is important that you get control over all of the camera controls and bend them to your will. When you turn your camera on for the first time, the ISO will probably be set to Auto. This means that the camera is determining how much light is available and will choose what it believes is the correct ISO setting. Since you want to use the lowest ISO possible, you will need to turn this setting off and manually select the appropriate ISO.

Which ISO you choose depends on your level of available or ambient light. For sunny days or very bright scenes, use a low ISO such as 100 or 200. As the level of light is reduced, raise the ISO level. Cloudy days or indoor scenes might require you to use ISO 400. Low-light scenes, such as when you are shooting at night, will mean you need to bump up that ISO to 1600...or more. The thing to remember is to shoot with the lowest setting possible for maximum quality.

## Aperture

The aperture of the lens allows you to control the volume of light coming into the camera. Through the use of a diaphragm of movable leaves, the opening in the lens (or aperture), which light passes through, can be changed. The largest opening possible for a given lens is called the "maximum aperture," and it is determined by dividing the focal length of the lens by the diameter of the aperture. The result is known as an f-number, or f-stop. As the aperture gets smaller, the f-stop will actually go up. This can be confusing, but know that each f-stop is a fraction—though it is expressed without the numerator. Also, as the number gets larger, the amount of light it lets through is about half that of the preceding larger opening.

Sounds confusing, right? Well, it can be if you think of it in terms of a math problem. Think of it like this: you are outside watering your plants with a 1" garden hose. Let's say the hose breaks and now you need to use a ½" hose. It's going to take you longer to get the same volume of water on your plants. If they were lenses, you would be switching from an f/1 lens to an f/2 lens.

You might also be wondering why, if everything is doubling or halving, there are numbers like  $f/2.8$ ,  $f/5.6$ , and  $f/11$ . It's because the numbers are fractions based on the area of the hole in the diaphragm. Just remember that when you increase the number, you're actually allowing less light in because the diaphragm is getting smaller.

### Where did the term “stop” come from?

Before the time when photographers had adjustable diaphragms, they inserted metal plates with pre-cut holes into their lenses. By using a plate with a smaller hole, the photographer was able to “stop” some of the light from reaching their film. Each plate had a numeric value, which was determined by dividing the lens focal length by the diameter of the hole in the plate. This term moved from plates to the click-stops on a lens ring as camera lenses became more evolved. If the photographer needed to add another stop of exposure, they just moved the aperture ring one click, or f-stop, to the larger aperture setting. Nowadays, photographers use the term any time they are talking about halving or doubling the exposure—not only for aperture, but also for shutter speed and ISO. So you might hear a photographer say, “My lens was wide open and I needed to get a couple more stops so I increased the ISO by a stop and slowed down one stop with the shutter speed.” This might sound a little confusing right now, but you will soon get the hang of it.

## Shutter Speed

We've just determined that the ISO sensitivity will dictate how sensitive the camera is to light and that the aperture will control the volume of light. Now we need to explore the final factor in achieving our exposure, which deals with controlling how long the light is allowed to strike the sensor. Controlling the shutter speed does this. Every camera has a shutter whose purpose it is to control the flow of light. Most shutters are actually made of two separate curtains that travel vertically across the camera sensor. As the shutter release button is depressed, the first curtain will begin to travel across the surface of the frame, allowing the sensor to be exposed. After a predetermined amount of time, a second curtain will begin to close over the sensor, terminating the exposure process. It is the predetermined time that is referred to as shutter speed.

The speeds that you will be working with are typically going to be just fractions of a second, and they are a little easier to figure out than aperture settings. Most cameras have the ability to select shutter speeds ranging from as long as 30 seconds to as fast as  $1/8000$  of a second. Each time you change from one shutter speed to the next, you are going to be effectively doubling or halving the duration of the shutter. This means that if you change your setting from  $1/125$  to  $1/250$  you will be getting half the amount of exposure. But, if you go from  $1/60$  to  $1/30$ , you will double your exposure time.

## How Is Exposure Calculated?

We now know about ISO and shutter speeds and f-stops, so it's time to put all three together to see how they relate to each other and how you can change them as needed. But before we do that, I should tell you how the exposure is actually calculated. Don't worry; this won't be overly complicated, but it is important.

When you point your camera at a scene, the light reflecting off your subject enters the lens and is allowed to pass through to the sensor for a period of time as dictated by the shutter speed. The amount and duration of the light needed for a proper exposure is dependent upon how much light is being reflected and how sensitive the sensor is. To figure this out, your camera utilizes a built-in light meter that looks through the lens and measures the amount of light. That level is then calculated against the sensitivity of the ISO value and an exposure value is rendered. So here is the tricky part: there is not just one perfect exposure because the f-stop and shutter speeds can be combined to allow the same amount of exposure using different settings. I told you it was a little tricky.

Here is a list of reciprocal settings that would all produce the same exposure result. Let's use the Sunny 16 Rule, which states that on a sunny day, you can use a shutter speed that is roughly equal to the ISO at f/16 and achieve a proper exposure.

For simplification purposes, we will use an ISO of 100.

### Reciprocal Exposures: ISO 100

F-STOP	2	2.8	4	5.6	8	11	16	22
SHUTTER SPEED	1/8000	1/4000	1/2000	1/1000	1/500	1/250	1/125	1/60

If you were to use any one of these combinations of aperture and shutter speed, they would each have the same result in terms of the exposure. Also take note that every time we cut the f-stop in half, we reciprocated by doubling our shutter speed.

Now that we know this, we can start using this information to make intelligent choices in terms of shutter speed and f-stop. Let's bring the third element into this by changing our ISO by one stop, from 100 to 200.

### Reciprocal Exposures: ISO 200

F-STOP	2	2.8	4	5.6	8	11	16	22
SHUTTER SPEED	–	1/8000	1/4000	1/2000	1/1000	1/500	1/250	1/125

Notice now that we doubled the sensitivity of the sensor so now we require half as much exposure as before. We have also reduced our maximum aperture from  $f/2$  to  $f/2.8$  because, depending on your camera, you probably can't use a shutter speed that is faster than  $1/8000$  of a second.

So why not just use the exposure setting of  $f/16$  at  $1/250$  of a second? Why bother with all of these reciprocal values when this one setting will give us a properly exposed image? The answer is that the f-stop and shutter speed also control other aspects of our image that we may want to adjust so that our images look how we want them to look.

## Over- and Underexposure

Typically, since there is a proper exposure, you can also guess that there are improper exposures, as well. These are called overexposed and underexposed images. Overexposure is when too much light is allowed to fall on the sensor. This could be due to too large of an opening in the lens aperture setting or too slow of a shutter speed. The resulting image is one that looks too bright and tends to have blown-out highlight areas (**Figure 1.3**).

**Figure 1.3**  
The figure on the left is overexposed, has blown-out highlights, and is too light overall. By adjusting the exposure by two stops, the image is darkened and there is now more detailed information in the highlight areas.



ISO 400 •  $1/200$  sec. •  $f/7.1$  • 17mm lens



ISO 400 •  $1/800$  sec. •  $f/7.1$  • 17mm lens