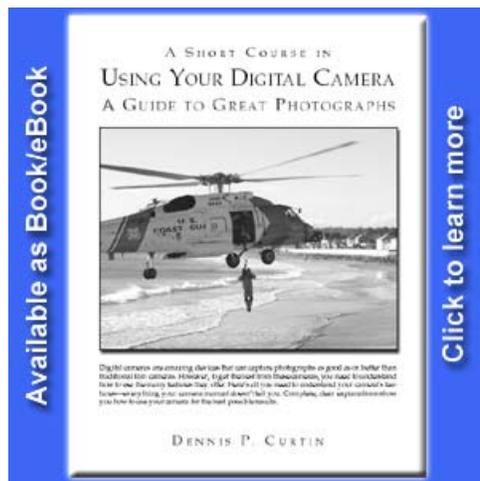


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A Short Course in Using Your Digital Camera

2. Fine Tuning Sharpness



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One of the first things you notice about a photograph is whether or not it is sharp. Extremely sharp photographs reveal a richness of detail, even more than you would normally notice in the original scene. If the entire image isn't sharp, your eye is immediately drawn to the part that is.

When learning to control sharpness, the first goal is to get pictures sharp when you want them sharp. If your photos aren't as sharp as you want them to be, you are probably experiencing one of the following effects:

- **Focus.** If nothing in your image is sharp or if your central subject is not sharp but other parts of the photograph are, your camera was improperly focused.
- **Depth of Field.** If your central subject is sharp but the background or foreground is less so, you probably didn't use a small enough aperture to get the depth of field you wanted.
- **Camera Movement.** If the image is blurred all over, with no part sharp, the camera moved during the exposure. Some dots appear as lines and edges blur as the image is "painted" onto the moving image sensor.
- **Subject Movement.** When some of the picture is sharp but a moving subject appears blurred, the cause is too slow a shutter speed.

Eliminating Camera Movement

Unwanted camera movement during the exposure is probably the major cause of unsharp photographs. You can reduce this problem in bright light and when using flash simply by holding the camera steady and depressing the shutter release smoothly. At slow shutter speeds, such as those you get in dim light, particularly with a lens zoomed in to enlarge a subject, you need a camera support.

As you zoom your lens in on a subject, you are increasing the lens's focal length. As you zoom back out, you're reducing it. The focal length, and the amount the image is magnified,

determines the minimum shutter speed you need to use to hand-hold the camera and avoid blur. The rule of thumb is never to hand-hold the camera at a shutter speed lower than your lens' focal length.

Supporting a camera

When the light is dim, and you aren't using flash, you need to support the camera or you'll get blur in your images. One way to do this is to lean against a wall or tree and brace yourself with your elbows tight to your body. You can also find a branch or railing to rest the camera on. For real stability you need a small tripod or an even easier to carry monopod.



The camera was steady in the left picture and moved in the right one.

Holding the camera correctly, bracing it, and breathing correctly can also reduce camera motion. Use the optical viewfinder to take photos because you can brace the camera against your face instead of holding it out at shaky arms' length. Just before taking a shot, inhale deeply, then exhale and hold your breath while smoothly depressing the shutter-release button. When holding the camera for both horizontal and vertical photographs use your right finger to press the shutter-release button and your left hand to support the camera.

Using the self-timer or remote control

Almost all digital cameras have a self-timer and a few have a remote control. Although often used to give you time to get into the picture, the self-timer is also a great way to reduce blur when photographing in dim light. Just place the camera on a secure surface, compose the image, and use the timer or remote to take the exposure.

Increasing sensitivity

To reduce blur caused by camera movement, some cameras let you increase the image sensor's sensitivity (or ISO) to light although this adds some grain to the image. Increasing the sensitivity means less light is needed for a picture so the shutter speed is higher. Increasing sensitivity is a good way to get pictures without flash in places such as concerts and museums where flash is prohibited.

How To: Reducing Blur

Check your camera manual for a section on the **self-timer**, **remote control**, or **increasing sensitivity**.

▲ Sharpness Isn't Everything

Your photos don't always have to be sharp to be effective. In many cases, it's better to have part of the scene sharper than the rest. Your pictures can be sharp or unsharp in different ways. The first way concerns motion. Several factors affect the way motion is captured in images. These include your image sensor's speed, the overall brightness of the scene, lens focal length, and subject speed, direction, and distance. Another kind of sharpness concerns depth of field, how much of the scene will be sharp in the image. Even if you are photographing a static scene, your picture may not be sharp if you do not have enough depth of field. However, a shallow depth of field can be used to make a busy background less distracting by having it out of focus in the picture. Several factors affect depth of field, including lens aperture, lens focal length, and subject distance.



Motion in a scene can be frozen or blurred depending on the shutter speed and other factors. Blur can be used creatively to evoke a feeling of motion as in this shot of a waterfall in Yosemite National Park.



Shallow depth of field can focus attention on a foreground subject by making the background less sharp.

How to Photograph Motion Sharply

The sharpness of different parts of an image helps direct the viewer who tends to look first at the most sharply focused part of the picture. In addition, sharpness itself can be part of the message of the photograph. The immobility of a frozen figure can be made more apparent by blurring people moving in the background.

Blur in an image is caused when all or part of a subject focused onto the image sensor moves when the shutter is open. To show a moving subject sharply, the shutter needs to open and close before the image on the sensor moves a significant amount. In other words, you need to use a fast shutter speed. But just how fast is fast enough? The answer depends on several factors. Because several variables are involved, you can't always predict how motion will be portrayed in the final photograph. So take more than one shot if possible. Try shooting from a different angle or perhaps wait for a pause in the action. You are much more likely to get a good shot if you have several to choose from.

Speed of subject

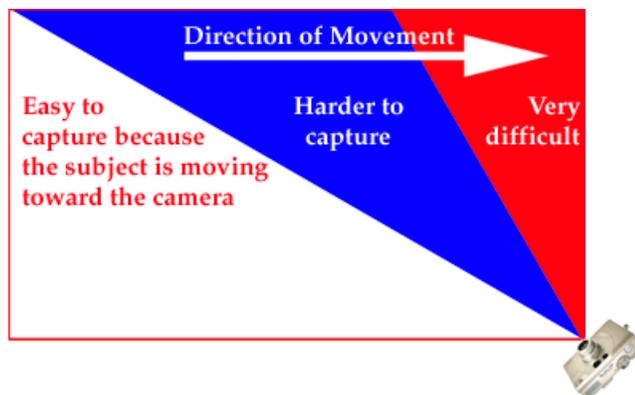
The faster a subject is moving, the faster the shutter speed you need for a sharp image. However, it's not the speed of the subject in the real world that determines blur. It's how far the subject moves on the image sensor while the exposure is being made. This depends not just on the subject's actual speed, but also on the direction of its movement, its distance from the camera, and how far the lens is zoomed.



The shutter speed froze the central dancer but was slow enough to blur the others. This makes the central dancer the most important person in the photograph.

Direction of movement

When the shutter is open, a subject moving parallel to the image sensor will cross more of the pixels on the sensor and be more blurred than a subject moving directly toward or away from the camera. This is why you can use a slower shutter speed to sharply photograph a child who is running toward, or away from you, and not the same child running from one side of the scene to the other.



How sharp a subject appears depends partly on its direction of movement.

Distance to subject and focal length of lens

If a subject is close to the camera, even slight movement is enough to cause blur. A subject—or part of one—far from the camera can move a considerable distance before its image on the image sensor moves very much. The focal length of the lens can also affect the apparent distance to the subject. Increasing the focal length of your lens—for example, zooming in on a subject—has the same effect as moving closer to your subject. The more you are zoomed in on it, the less a subject has to move in order to have its image move on the image sensor and become blurred.

To visualize the effects of distance on blur, look out the side window of a speeding car (but not when you're driving). The objects in the foreground seem to fly by while those on the horizon don't seem to move at all.



On this speeding train, the part closest to the camera looks the most blurred while the farthest part looks sharper. Since all parts of the train are moving at the same speed, this shows how distance affects blur.

How To: Increasing Sharpness of Moving Objects

- Photograph fast moving subjects heading toward or away from you.
- Move farther back from the subject.
- Zoom the lens to a wider angle of view.
- Switch to shutter priority mode and select a fast shutter speed such as 1/500.
- Increase the sensor's sensitivity to light although this adds some grain to the image.

▲ Focus and Depth of Field

If you look around you—the book in your hand, the chair across the room, the far wall—everything seems to be sharp. That is because your eyes refocus every time you look at an object at a different distance. But the sharpness you see when you glance at a scene is not always what you get in a photograph of that scene. To understand why not, you have to understand focus and depth of field.

Focus

Focus is only one of the factors affecting the apparent sharpness of your photographs, but it is a critical one because it determines which parts of the picture will be sharpest—called the **plane of critical focus**. The plane of critical focus in your image will be the area that falls within the focus area in the center of the viewfinder when you press the shutter-release button halfway down. You will have much more control over the final image if you understand how focus relates to the overall sharpness of a scene.



Imagine the part of the scene on which you focus as a flat plane (much like a pane of glass) superimposed from one side to the other of a scene, so that the plane is parallel to the back of the camera or the image sensor. Objects falling exactly on this imaginary plane will be in critical focus, the sharpest part of your picture. This plane of critical focus is a very shallow band and includes only those parts of the scene located at identical distances from the

camera. As you point an autofocus camera at objects nearer or farther away in the scene, the plane of critical focus moves closer to or farther from the camera. As the plane moves, various objects at different distances from the camera come into or go out of critical focus.

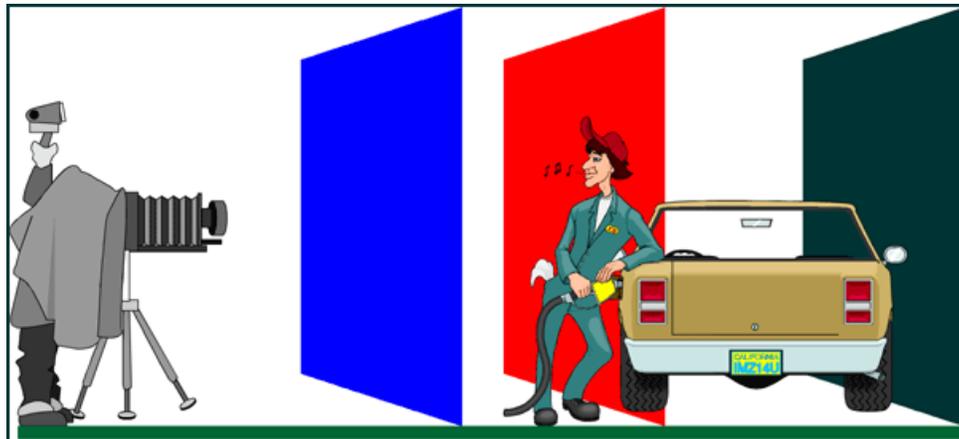
Depth of field

A lens can only bring objects at a single distance from the camera into critically sharp focus. But if you look at photographs, you can see a considerable area of the scene from near to far that appears sharp. Even though theoretically only one narrow plane is critically sharp, other parts of the scene in front of and behind the most sharply focused plane appear acceptably sharp. This area in which everything looks sharp is called depth of field. Objects within the depth of field become less and less sharp the farther they are from the plane of critical focus. Eventually they become so out of focus that they no longer appear sharp at all.

Often it doesn't matter so much exactly what you are focused on. What does matter is whether or not all of the objects you want to be sharp are within the depth of field so they appear sharp. If you want a large part of the scene to be sharp, you can increase the depth of field. You can decrease it if you want less of the scene sharp. In some scenes, you can significantly increase or decrease the depth of field simply by shifting the point on which you are focused or by changing the aperture setting.

Tip

To control depth of field, switch to aperture preferred mode and select a small aperture for great depth of field or a large aperture for shallow depth of field.



The near and far limits of depth of field are shown here as two planes (blue and black), parallel to the plane of critical focus (red). Actually, they are usually not visible as exactly defined boundaries. Nor can you usually find the plane of critical focus by looking at a picture. Instead, sharp areas imperceptibly merge into unsharp ones. Notice that in the diagram the depth of field is not evenly divided. At normal shooting distances, about one-third of the depth of field is in front of the plane of critical focus (toward the camera), and two-thirds is behind it (away from the camera). When the camera is focused very close to an object, the depth of field becomes more evenly divided.

Focus Settings

Most digital cameras have an autofocus system that automatically adjusts the focus to make the subject in the center of the viewfinder appear critically sharp. However, some cameras provide other ways to focus and this is a good thing. Autofocus often has trouble focusing in scenes with little contrast, when the object in the focus point is brighter than the rest of the scene, when the subject is poorly illuminated, when both near and distant objects fall within the focus point, or when the subject is moving quickly. If the camera can't focus, some cameras beep or blink a lamp. If this happens, use focus lock to focus on a subject at the same distance. Some cameras also let you switch to manual focus.

How To: Changing the Focus Method

Look in your camera manual for a section on **focus-lock**, **manual focus**, or **focus controls**.

Using focus lock

To change the position of the plane of critical focus, you can use a procedure called focus lock. Most digital cameras have a two-stage shutter-release button. When you press it down halfway, it sets focus, exposure and white balance. Some cameras beep and illuminate a lamp when these readings are locked in. If you don't release the shutter-release button you can then point the camera anywhere else in the scene and the settings remain unchanged. This lets you set the focus at any distance from the camera to control both focus and depth of field.

How To: Using Focus Lock

1. In record mode, point the camera so the item you want to lock on is in the focus area in the center of the viewfinder.
2. Press the shutter-release button down halfway and hold it there to lock in the focus.
3. Without releasing the shutter-release button, recompose the scene and press the shutter-release button the rest of the way to take the picture.



A small aperture gave enough depth of field to keep both foreground and background figures sharp.

▲ Controlling Depth of Field

Sharpness—or the lack of it—is immediately noticeable when you look at a photograph. If you are making a portrait, you want only the person to be sharply focused, but not a distracting background. In a landscape, on the other hand, often you will want everything sharp from close-up rock to far away mountain. Once you understand how to control depth of field, you will feel much more confident when you want to make sure something is—or isn't—sharp.



Here the greatest possible depth of field was used to keep everything sharp from the fighter's needle nose to the background.

To control how deep or shallow depth of field is, you have three factors to work with.

- **Aperture size.** The smaller the size of the lens aperture (the larger the f-number), the greater the depth of field. The larger the aperture, the shallower the depth of field.
- **Camera-to-subject distance.** As you move farther from the subject you are focused on, you increase depth of field. As you move closer, you decrease it.
- **Lens focal length.** Zooming out to a wider angle of view increases depth of field. Zooming in decreases it.

Each of these three factors affects depth of field by itself, but even more so in combination. You can get the shallowest depth of field with a lens zoomed in on a nearby subject using a large aperture. You get the deepest depth of field when you are far from a subject, with the lens zoomed to a wide angle, and using a small aperture.

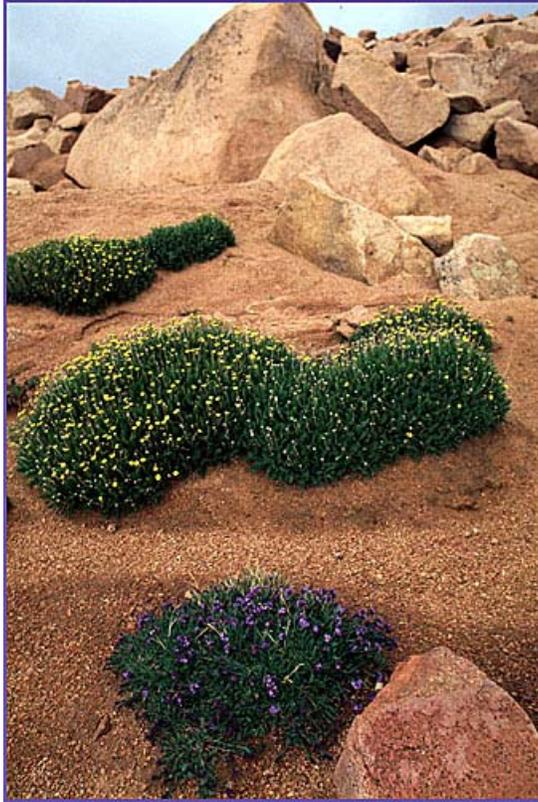


Here the camera's depth of field was just deep enough to keep the legs in focus. Parts of the image closer to the camera and further away become increasingly less sharp.

Capturing Maximum Depth of Field

Many times when you are photographing you will want to get as much depth of field as possible because important parts of a scene are both near to and far from the camera, and you'll want all of them to be sharp. Maximum depth of field seems particularly important for photographs of landscapes and other scenes where a distant horizon is a part of the picture.

When a subject extends to the far distance, many photographers unthinkingly focus on that part of the scene—or on infinity. Infinity in photographic terms, is an inclusive term that designates everything from about 40 ft. to as far as you—or the lens—can see. So when you are focused on infinity everything from that point and beyond will be sharp. But since one-third of the available depth of field falls in front of the point on which you are focused and two-thirds behind it, focusing on infinity wastes two-thirds of your depth of field because everything from the infinity point and beyond is going to be sharp anyway. That may mean that some other part of the scene in the foreground will not be included in the one-third remaining depth of field and consequently will not be sharp.



Here a wide-angle lens was used with a small aperture to keep everything in the foreground and background in focus. The flowers are on Pike's Peak, over 14,000 feet up in the Rocky Mountains of Colorado.

Instead of focusing on infinity, if you focus on some object one-third of the way between you and the horizon, you will have brought forward the point on which you are focused and so increased the depth of field in the foreground of your picture. This new point of focus is called the hyperfocal distance.

How To: Increasing Depth of Field

- Photograph in bright sun so the aperture closes down.
- Zoom the lens out to a wider angle of view.
- Move farther away from the subject.
- Switch to aperture priority mode and select a small aperture such as f/11.

How To: Using Focus Lock for Maximum Depth of Field

1. Point the camera so the area you want to focus on is in the focus area in the center of the viewfinder. In a landscape, pick something about one-third of the way between you and the horizon. For other scenes, pick something to focus on that's one-third of the way back from the nearest point you want to be sharp.
2. Press the shutter-release button down halfway and hold it there to lock in the focus.
3. Recompose the scene and press the shutter-release button the rest of the way to take the picture.

▲ Using Selective Focus

Imagine you are photographing a scene something like the one below. Which part of the scene are you most interested in? Chances are it's the cattails and not the objects in the background. One way to make something stand out is to photograph it so it will be sharper than its

surroundings. When everything in a picture is equally sharp, the viewer tends to give equal attention to all parts of the scene. But if some parts are sharp and others are not, the eye tends to look first at the sharpest part of the image.



Here a small aperture kept both the foreground and background sharp.



Here a large aperture kept the foreground sharp but softened the background.

You can selectively focus the camera and your viewer's attention on the most important part of the scene if you restrict the depth of field so that the significant elements are sharp while the foreground and background are less so.

How To: Using Focus Lock for Minimum Depth of Field

1. Zoom the lens in to magnify the subject or move close to it and focus the camera on, or slightly in front of, the subject you want sharpest.
2. Press the shutter-release button down halfway and hold it there to lock in the focus.
3. Recompose the scene and press the shutter-release button the rest of the way to take the picture.

How To: Decreasing Depth of Field

- Photograph in dim light to open up the aperture.
- Zoom the lens in to enlarge the subject.
- Move closer to the subject.
- Switch to aperture priority mode and select a large aperture such as $f/4$.

Conveying the Feeling of Motion

Blur can contribute a feeling of motion in the image that may be missing from a more static shot. A slow shutter speed or one of the other techniques described here causes a moving subject to move across the image sensor during the exposure causing a blur can clearly say: Motion! These techniques often work best with a long lens or a big subject so the subject doesn't look too small in the image. One place to begin is to shift to shutter-preferred mode and pick a slow shutter speed. You can use this setting to deliberately blur moving objects such as running water.



Panning the camera as this young great blue heron took off blurred the background.

Panning the camera in the same direction as a moving subject produces an image where the subject is relatively sharp against a blurred background. Your movement should be smooth and controlled to get a good pan, so begin to pan the camera before the subject enters your viewfinder. Smoothly depress the shutter release as you follow the motion of the subject, keeping it in the same position in the viewfinder. Follow through as you would in golf or tennis. Panning takes practice so take as many images as you can and erase those that don't work. Results are quite unpredictable here because your body motion adds yet another variable to the final picture.



Panning the camera as this barred owl took off blurred the background.

How To: Conveying Motion

- Try blurring images in low-light situations. In bright light, the shutter will open and close too fast.
- Switch to shutter priority mode and select a slow shutter speed.

- In some situations, you may want to turn the flash off when trying to blur nearby subjects.

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