Day 7: Use Shutter Speed to Capture Motion Blur

How motion blur occurs

- If you keep the camera steady during exposure, everything remains crisp except for something moving through the frame. The thing that is moving shows up as blur - either slight or complete. You can work with this feature to create all sorts of different effects.

Additional Exposure controls

- To use a slow shutter speed, you might need a Neutral Density filter. This is a filter that fits over your lens and restricts the amount of light allowed into the camera. It forces the camera to use a longer shutter speed to get a proper exposure.
- Whereas Manual mode only allows a 30 second shutter speed, which is ordinarily plenty, when you need to go longer there is another mode called Bulb mode that holds the shutter open as long as you activate the shutter button.

Stabilization Tips

- Use a remote shutter release or the camera's timer to trip the shutter and avoid shake.
- Use Mirror Lock Up or Live View to control mirror vibrations (DSLRs only)
- Be sure your tripod is stable and the controls are tight to avoid sag or other movement.
- If your lens has Image Stabilization, turn it off when using a tripod.

Practical Application

While every situation is different, here are a few starting points for shutter speeds in different contexts:

- Moving clouds: 20 sec. - a few minutes; depending on speed of clouds
- Light trails: 10 sec. - 20 sec.
- Panning: 1/4 sec. - 1/20th sec. (depends heavily on speed of subject)
- Reflections : 5 sec. - 30 sec.

Moving Water

This chart shows some shutter speeds to consider to achieve different effects with moving water:

Shutter Speed	Effect on The Water In Your Picture
1/4 - 1/2 second	A slight blur; highlights the power of waves
2 - 8 seconds	Mild blur creates a sense of movement
8 - 20 seconds	Moderate blur, which creates trails in the water
30 seconds +	Complete blur smooths the water for a serene look
1 minute +	Will make the water smooth as glass

Additional Commentary

Today we are going to stick with shutter speed, but we will take it in the opposite direction. Instead of using fast shutter speeds to stop the action and make the entire photo as crisp as possible, we are going to purposefully introduce some blur into the picture.

How Motion Blur Occurs

Here's the idea: if you keep the camera still but open up the shutter for a long period of time, then what is in front of the camera may move. If and when it moves, it creates blur. The camera is exposing that thing in different positions and the pixels get confused. While you normally don't want that, you can control it and put it to work for you.

A classic example is moving water. If you use a fast shutter speed (as we did in the lesson yesterday), you capture the water in a split second and it looks very jagged. But watch what happens as you slow down the shutter speed:

Shutter Speed: 1/80th second

Shutter Speed: 1/10th second

Shutter Speed: .4 seconds

Shutter Speed: 3.2 seconds

As you can see, the more you slow down the shutter speed, the more the water blurs. Even slowing it down to 1/10th of a second makes it look much smoother. When you get to .4 seconds, it is a smooth stream. At 3.2 seconds, the water is completely blurred and smooth.

As you'll see in today's lesson, this works in a lot of other contexts as well.

Setting Other Exposure Controls

So how do you go about slowing down the shutter speed? If you just use a really long shutter speed with no offsetting move to your exposure, you are headed for an overexposure. The camera is allowing light in the entire time you have the shutter open. All that light will overexposure your picture unless you do something to restrict the exposure.

The first thing you will do is reduce the ISO value. Whereas previously we had been talking about ISO as something we wanted to raise as much as we can without having digital noise, now we face no such issue here. Just lower it as much as you can. Most cameras have 100 as their lowest native ISO, so you will usually start with that. Some cameras have ISO expansion modes that allow you to set an even lower ISO value (such as 50) so you might be able to go even lower.

Next you will make the aperture smaller. Use aperture values of f/11 - f/22. The small aperture will restrict the amount of light being allowed into the camera during the exposure. Therefore, even though you are holding the shutter open a long time, not as much light is coming into the camera.

The ND Filter

There are times when setting the ISO as low as it will go and using the smallest aperture available on your lens won't restrict light enough to allow you to use the shutter speed you want. In those cases, all is not lost, but you will need an additional item to restrict the light.

That item is called a Neutral Density filter, also called an ND filter for short. This is a dark filter that fits on the front of your lens and restricts the amount of light coming in to the camera. How much does it restrict the light? That depends on the strength you purchase. You can choose how strong of a filter you want, measured in stops. Common filters are 3-stop filters, 6-stop filters, and 10-stop filters.

Exposure Settings: Shutter Speed 20 seconds; Aperture f/14; ISO 400 using a 10-stop Neutral Density filter

How do you use neutral density filters? Let's say you have a 6-stop filter. You set up your exposure the way you want it without the filter first. That is because often the camera cannot meter light properly once the filter is attached. You will want to set your focus as well for the same reason. Once everything is set up, attach the filter to the front of the lens. Now, if you do nothing else, any picture you take will be underexposed by 6 stops, which means it would be pure black. But, of course, the whole idea of the of the ND filter is to lengthen the shutter speed. So what you will do now is lengthen the shutter speed by 6 stops.

How do you move those 6 stops? There are two ways, one if you are familiar with counting stops, and one if you are not. Let's start with an example where we count stops. Remember that a stop is a doubling of light. If your exposure was, say, 1/8th of a second, you double it to 1/4 for a 1 stop change. Then doubling it again for the second stop takes you to 1/2. Doubling it again for the third stop takes you to 1 second. The fourth doubling gets you to 2 seconds. The fifth stop takes you to 4 seconds. And, finally, the sixth stop gets you to 8 seconds. Now you have created a proper exposure using a very long shutter speed.

There is another way to do it, which is simply to count “clicks.” Your camera's dial will be set up to change exposure values in 1/3 stop increments. Knowing that, and knowing that you want to change your shutter speed by 6 stops, you could just increase the shutter speed by 18 clicks. That avoids having to count stops and gets you to the proper exposure.

But using long shutter speeds involves more than just getting a proper exposure value. As you've already learned in this course, a long shutter speed means that the camera is subject to movement during that time. That movement will result in blurry pictures.

Using Stabilization Effectively

To avoid any blur in our long exposures, we need to stabilize the camera. That's where tripods come in.

Hopefully you already have a tripod, but if you don't, you'll need to go get one. Don't spend a fortune on one, but don't get something so cheap it won't support your camera either. I recommend starting with a smaller travel tripod. They are fairly inexpensive. It may be all you ever need, but If you decide later that you want a bigger tripod, you the smaller one will still be useful for those occasions when you don't want to lug around a big tripod.

Using a tripod is simple, but there are some additional things to keep in mind when you are using them that will avoid the dreaded blur in your pictures.

- **Use a Remote Shutter Release.** You want to avoid touching the camera during the exposure so that you do not inadvertently move the camera at all. Pressing the shutter button to take the picture can create tiny movements. To avoid that, you should get a remote shutter release. There are models for every camera. You can get wireless models or units with cables that attach the camera, and you can get units with a lot of features (such as intervals). Or you can get a cheap model for under $10 (these work fine and are all you need. If you don't have one of these, you can use the 2 second timer to take the pictures, which will keep you from needing to touch the camera.

- **Use Live View or Mirror Lock-Up.** You also want to minimize any movements caused by the camera itself. In the case of DSLRs, the mirror will flip out of the way when you press the shutter button, and that can cause tiny vibrations that show up as blur in your pictures. To eliminate this possibility, most cameras have a "mirror lock" up mode where the first click of the shutter button flips the mirror out of the way and the second takes the picture. In addition, simply using Live View mode will eliminate the issue because that mode keeps the mirror in the "up" position the entire time.

- **Keep Tripod Stable and Tight.** Finally, take care to avoid any movement in the tripod. Make sure the tripod is on solid footing. Otherwise the tripod could move slightly during the exposure, resulting in blur. In addition, make sure all the tripod controls are tight. If they aren't, there can be a small amount of slippage or sag during the exposure that will cause blur. This problem is particularly acute when using heavier lenses.

- **Turn off Image Stabilization.** The image stabilization on your lens will actually work against you when your camera is on a tripod. The image stabilization works with little motors and these create vibrations. Turn it off to eliminate these vibrations, which could result in a slight blur to your pictures.

Occasionally, you will find yourself wanting to take a long exposure when you don't have your tripod with you. When this happens, all is not lost. Remember that a tripod is really just a glorified shelf. Find something to place your camera on to take the picture. You can also place the camera on a fence, a bench, or a table. Anything that is stable will work. In addition, if you just need a small degree of stabilization, you can hold the camera up against a door jam or a tree. That will reduce the natural sway and shake we all have then holding cameras.

Finally, in those cases where you have to hand hold, keep yourself as stable as possible. Keep your elbows tucked in to your chest, which will use your body for support (and not just your arms). Keep your legs wide for support. You might also consider taking a knee and using the knee for support. This has its limits, of course, but if you are dealing in fractions of a second (as opposed to whole seconds) it might work in a pinch.

Motion Blur in the Real World: Moving Water

Now let's take a look at using motion blur. There are many different contexts in which you'll use it, but the most common ones involve moving water.

As discussed above, slowing down the shutter speed blurs the water and gives it a more pleasing look. But how much should you slow it down? That depends on the look you are trying to achieve. Here is a chart listing some common effects and the shutter speeds generally used to achieve them:

Shutter Speed	Effect on The Water In Your Picture
1/4 - 1/2 second	A slight blur; highlights the power of waves
2 - 8 seconds	Mild blur creates a sense of movement
8 - 20 seconds	Moderate blur, which creates trails in the water
30 seconds +	Complete blur smooths the water for a serene look
1 minute +	Will make the water smooth as glass

I should stress that every situation is different. If you have very calm water in your scene, a shorter shutter speed may make it look completely serene and glassy.

All this said, let's take a look at some real-world examples. First, here is a shot of the Portland Head Light in Maine:

Exposure Settings: Shutter Speed 20 seconds; Aperture f/11; ISO 100.

As you can see the water is quite blurred. There are still trails visible where the waves were breaking. At the same time, the scene is more serene than it would be with a faster shutter speed. This is what you would expect from a 20 second shutter speed.

As discussed above, using a longer shutter speed makes the water look even more serene and glassy. Take a look at this shot from Okaloosa Island in the Florida panhandle:

Exposure Settings: Shutter Speed 30 seconds; Aperture f/16; ISO 400.

The water here was in a bay and it was a calm day. Therefore, the 30 second shutter speed was sufficient to completely blur the water. Many times you'll need to use shutter speeds in excess of a minute to achieve a similar look.

Another benefit of smoothing out the water in the way we have been talking about is that it accentuates reflections in the water. The jagged nature of moving water would reduce the visibility of reflections, but once you smooth things out they are clearly visible. You can use

clouds of man-made objects to create interest in the foreground of your picture using these reflections.

Exposure Settings: Shutter Speed 5 seconds; Aperture f/5.6; ISO 400.

Bulb Mode

In every camera mode but one, your shutter speed will be limited to 30 seconds. But does that mean that is as long as you can go? No. There is a mode called Bulb mode, which will be designated by a B on your camera's mode dial. When you go into this mode, the shutter will stay open as long as you hold the shutter open. Go into this mode, set the aperture and the ISO as you normally would, and then you can hold your shutter open as long as you want. A remote shutter release will help when you use this mode. First of all, they usually have a lock on them so you don't have to hold the button down. Secondly, often they allow you to set a designated shutter time on the remote itself.

Clouds

Another reason to slow down the shutter speed is to capture movement of clouds. Here is an example of a shot where I did that when photographing the Chicago skyline:

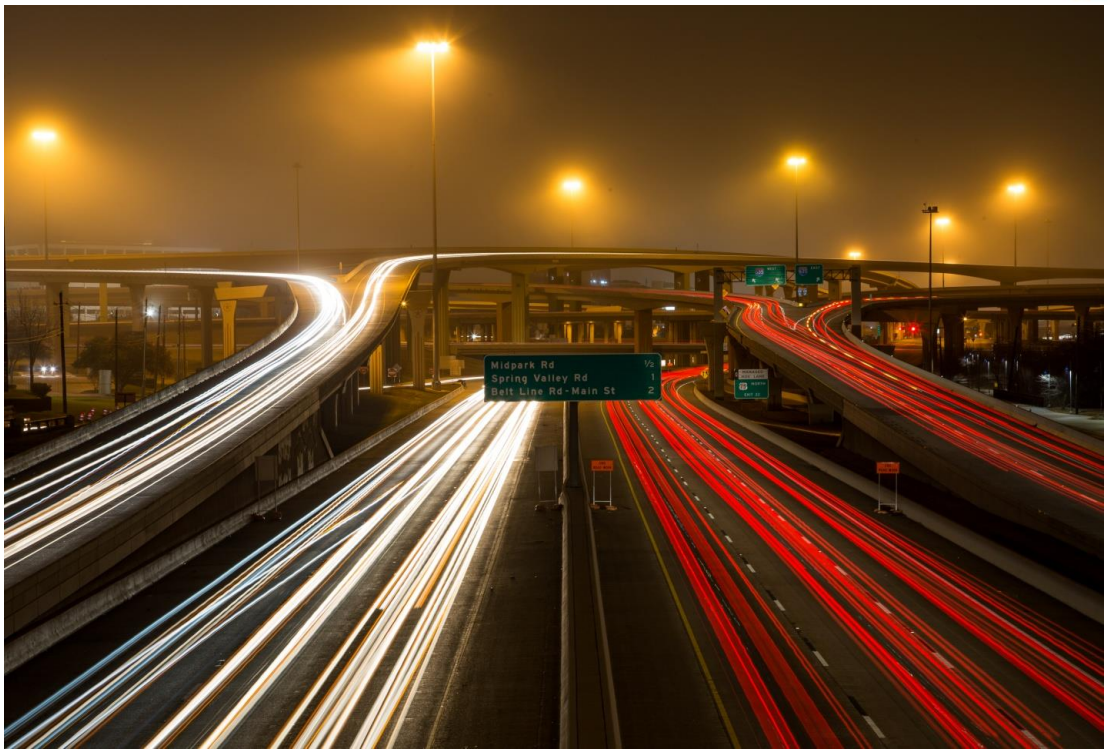
Exposure Settings: Shutter Speed 25 seconds; Aperture f/11; ISO 200.

Keep in mind that these were fast-moving clouds. A shutter speed of 25 seconds was sufficient to capture their movement in this situation. If the clouds are moving much slower where you are, you will have to use a much longer shutter speed. Sometimes the situation will require a shutter speed measured in minutes!

Light Trails

A final effect I want to address is light trails. This is where you open up the shutter and allow traffic to move through the frame. The camera just picks up the headlights and tail light and they appear to streak through the frame.

The shutter speed is quite variable for these. In the picture below, I was photographing over a fast-moving highway, so a shutter speed of only 20 seconds worked fine. It resulted in quite long streaks. If you are photographing a slower moving road, you might have to use something a bit longer if you want streaks this long. Of course, you won't always want the lights streaking all the way through the picture, so you will need to play with the settings until you get the length you want.



Exposure Settings: Shutter Speed 20 seconds; Aperture f/16; ISO 100.

Panning

Another technique you can employ using long shutter speeds is panning. This is where you actually move the camera during the exposure to track a subject. Done correctly, the subject is reasonably sharp (or at least identifiable) while the background is blurred.

Here are some examples of panning of iconic cabs in different cities. The New York cab on the left was captured using a 1/10 second shutter speed, while the London cab on the right used a 1/15 second shutter speed.

You don't want to use too long of a shutter speed or everything will be blurred. I find that shutter speeds between 1/4 and 1/20th of a second work best.

Day 7 Assignment
Create Serene Water

Description:

Use a slow shutter speed to photograph nearby water. Create trails in the water or even a serene, glassy surface. If you live near a coast, head there. Otherwise, find a nearby creek or river to use. If all else fails, use a fountain.

Keys to Success:

Remember: jagged water looks terrible! Use slow shutter speeds.

Experiment with different slow shutter speeds to create different degrees of blur in the water.

Take note of the different effects and moods you can create.

- How does the slow shutter speed affect your other exposure controls?
- How does this give you flexibility with aperture and ISO?
- Are you able to use a slow shutter on a bright, sunny day?
- How do things get easier in dim light?

Try using a Neutral Density filter if you have one.

Upon Completion of this Assignment:

Nothing hammers home how shutter speed works better than capturing slow-moving water. After completing this assignment, you should be well on your way to mastering shutter speed. And hopefully you got a nice picture as part of the deal!