

Module # 2 – Component # 4

Artificial lighting

Introduction

In photography, artificial lighting generally refers to studio lighting, and this has little relevance in the wildlife context. It is not often that one can take studio lights out into the field for a wildlife photograph.

Nevertheless, it is not unusual for photographers to use electronic flash for wildlife, and that is the theme of this component.

Most people assume that flash is used exclusively when natural light is too low for good exposure. This is rarely the case - flash is generally used to supplement natural light or compensate for poor lighting conditions.

Photographing animals in low light using flash can harm them. Large animals, like rhinoceros, which do not rely on their eyesight much, are not worried much by flash. But, small antelope and hares, which rely on good eyesight in the twilight hours when they are vulnerable to predators, are temporarily blinded by the flash. They can panic, and in their attempt to flee, they can injure themselves as they cannot see properly. Furthermore, flash pictures of animals in low light rarely look natural, so they are not worth striving towards.

As a rule:

Do not use bright lights or flash on animals at night, unless you know the particular species of animal well enough to know that you are not endangering them.

Strangely enough, flash is generally most useful in bright sunlight, where it can be used to fill in harsh shadows and where it does not compromise the animal's eyesight. It can also be used to good effect to "spotlight" the subject and isolate it from its background. Some wildlife photographers use flash exclusively in their work, while others never use it. Should you choose to use flash in your photography, use it to enhance the photograph, without its effects being obvious.

The key to the effective use of flash is to understand the principles of exposure.

Understanding normal flash exposure

Although flash photography is regarded as an advanced topic, the proper use of flash is an extremely powerful tool when used appropriately. There are just two things you need to know - **how** to use flash and **when** to use it. I will start with the how which leads into the when.

Knowing how to use flash starts with an understanding of how the camera shutter works. When you know that, you can understand how the flash works in conjunction with the shutter. Just a little bit of understanding goes a long way, so please bear with me through the theory.

When we describe the action of a camera shutter, we casually say things like "The shutter opens for 1/500 of a second", without considering how it opens. At this point, we need to understand the mechanism in more detail.

On a modern DSLR, the shutter is actually made of two curtains - one which exposes the sensor, and one which obscures it. As the first curtain opens, the sensor is exposed, and as the second curtain closes, the sensor is covered again. The second curtain always follows the first, and the delay with which it follows determines the exposure time. In most cameras, the curtains move from top to bottom. The process of "cocking the shutter" involves moving both curtains back to the top, in preparation for the next photograph.

I need you to understand the mechanism where the second curtain follows the first:

For a long camera exposure - say one second, the first curtain - moves from top to bottom, exposing the entire sensor. After a second, the second curtain follows the first but hides the sensor. The problem is that curtains are mechanical devices and are therefore quite slow, so the explanation given above is only truthful for slow shutter speeds - about 1/250 s and slower, although the actual shutter speed varies from camera to camera.

The fastest shutter speed at which the camera shutter operates in this manner is called the "sync speed" or the "flash sync speed". Its actual value varies from camera to camera, but the sync speed is a critical parameter in flash photography.

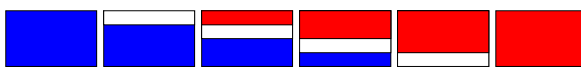
At shutter speeds above the sync speed, the second curtain starts closing before the first curtain is fully open, so there is **never a time when the sensor is not obscured by at least one curtain**. The following diagram shows the shutter operation below the sync speed, and above it. Noting the difference is critical to understanding modern flash photography.

Diagram Showing the Movement of the Shutter Curtains During Exposure

Shutter curtain movement at speeds below sync speed



Shutter curtain movement at speeds above sync speed



Blue shows first curtain
Red shows second curtain
White shows exposed sensor

Now that we understand the exposure mechanism without flash, we can move on to how the flash interacts with the shutter. Electronic flashes are not mechanical devices - the flash is caused by a high-intensity spark of light of a short duration. The duration of a typical electronic flash is between 1/1000 second and 1/50000 s. In other words, flashes are fast, even when compared to camera shutters.

Using a flash at the camera sync speed, or below, is easy - as soon as the first curtain is fully open and the sensor is completely exposed, fire the flash. The flash is so fast that it will expose the sensor before the second curtain starts to close. Above the camera sync speed, there is no moment when the sensor is not obscured by a curtain, so you cannot use electronic flash in its normal mode of operation. If you do so, the curtain will obscure part of the sensor.

For this reason, when you attach a flash to a modern DSLR (or when you activate its built-in flash) the shutter is automatically set to the sync speed, as this is the highest speed at which the flash will work properly. You can adjust the shutter to a slower speed, but not to a higher one. A misunderstanding of this mechanism frequently results in exposure errors when using flash.

Understanding the timing relationship between the shutter and electronic flash is crucial to understanding flash photography, so I am going to describe three cases of a scenario which reinforce the explanation above.

The scenario is this: You are in a room that is totally dark and wish to use a flash to photograph a vase of flowers. Your camera is on a tripod, correctly focused on the flowers. You are told (by me) that f/8 is the correct aperture to use.

- **In case 1**, you select a shutter speed of 1 second. This is the sequence of events: Curtain one opens rapidly, the flash fires and the shutter remains open for the rest of the second, before curtain two closes. You get a perfect shot.
- **In case 2**, you select your camera's sync speed, which happens to be 1/200 second. The sequence of events is the same as in case 1, and your final photograph is identical. Despite the fact that you now have a much higher shutter speed, your two photographs are identically exposed, because in both cases, the full intensity of the flash is recorded by the sensor.
- **In case 3**, you select a shutter speed of 1/2000 second – well above your camera's sync speed. Again, your photograph is correctly exposed, but you do not see the full photograph - just a slit of it. The bottom of the photograph is black, as curtain one had not fully opened when the flash fired. Similarly, the top is black, as curtain two had started to close already.

From this scenario, you can see that any shutter speed below the sync speed gives an identical result, while shutter speeds above the sync speed result in uneven illumination because the sensor will be partly obscured by at least one curtain.

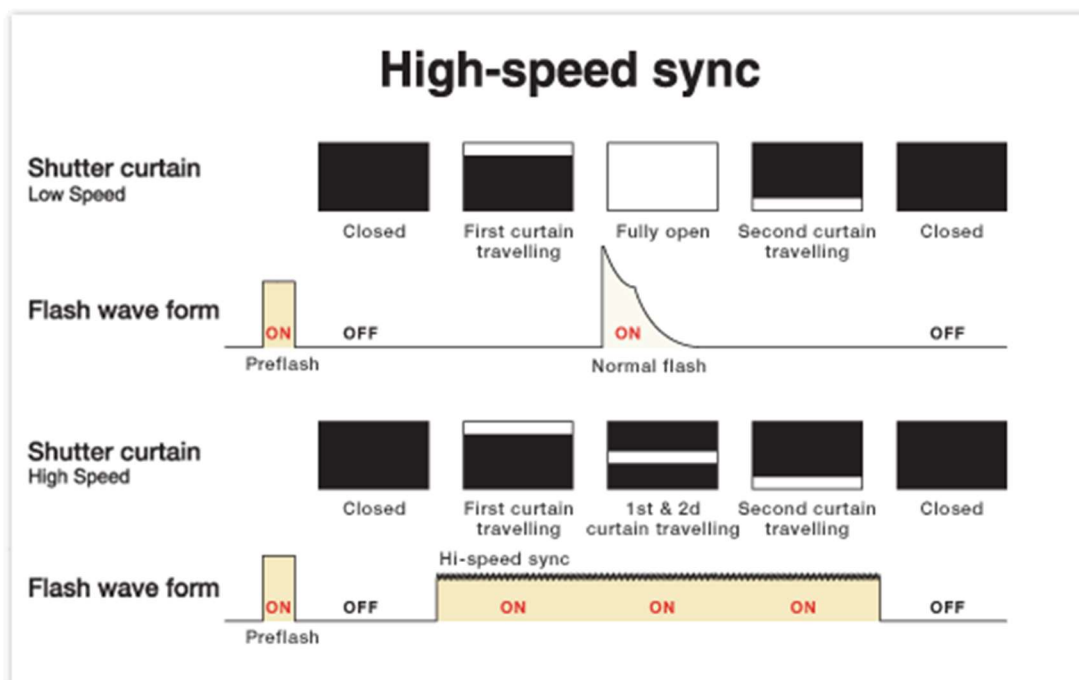
Now, repeat the scenario in a well-lit room. The exposure is determined by two factors - the flash itself (like before) and the ambient light in the room. The long exposure of case 1 will result in a much brighter image than in case 2. In case 3, the "slit" will still be visible, but unlike before, the entire picture will get some illumination, so the parts which were totally black in the first scenario will now have some detail in them.

The second scenario - where exposure is made up of both ambient light and flashlight - is the one that is important in the field, because generally, you will be photographing in daylight, not total darkness. A longer shutter speed exposes the sensor to more ambient light, but an identical amount of flashlight.

Remember what I said before - when you attach your flash to the camera (assuming that the flash is communicating properly with the camera), the camera automatically sets itself to its sync speed - being the highest speed at which the flash can operate effectively. You can select a slower shutter speed, but not a faster one, because a faster speed will result in curtain interference.

Understanding flash exposure with high-speed sync

All well and good, but the sync speed is usually too low for the effective use of flash in wildlife photography. So, modern flash units offer a mode known as "**high-speed sync**" (Note the spelling - sync, not synch). In this mode, the flash does not produce its "normal" flash of light at 1/1000 s. Instead, it pulses to produce a lower intensity of light, but over a longer period of time. The pulse is calculated to be long enough to offer even illumination even above the sync speed, where the shutter is a slit, and never fully open. The following diagram illustrates this:



High-speed sync is a gift to the wildlife photographer, as it allows effective use of flash above the camera sync speed - all the way up to the maximum shutter speed of the camera. It does have some disadvantages - in particular, the power of the flash is greatly reduced in this mode.

Secondly, note that HSS needs to be explicitly set on the flash - if it is not, the default mode of flash operation is for the camera to operate at its sync speed.

Thirdly, the entire discussion above assumes that the camera and flash understand each other. This will be the case if you use a flash that is designed for your camera (i.e. you use a Nikon flash on a compatible Nikon camera) but will not necessarily be the case between dissimilar products. Refer to your equipment documentation for specific details of operation.

Finally, I want to cover two aspects of theory before tying this all together practically. When shooting below your camera sync speed, at what point of your curtain movement does your flash trigger? Does it trigger as soon as the first curtain opens (termed: first-curtain sync) or does it trigger just before the second curtain closes (second-curtain sync)? The default is first-curtain sync. On most cameras, you can set second-curtain sync as a custom option in your camera settings. In wildlife, we prefer second-curtain sync, so you should change your camera accordingly.

In most situations, there is no difference between the two, but when there is a little motion blur, second-curtain sync gives a more natural appearance to the blur. This is important in wildlife, where there is often a portion of the picture that is blurred.



The flash photograph above illustrates the relevance of second-curtain sync well.

I have made a crop of the bird's head to illustrate my point:



This photograph clearly shows that the image is made up of two components: the natural light component (1/160s at f/9, ISO 200) is slightly blurred - 1/160s is a bit slow when a bird launches itself into the air. Because we are below the sync speed, the flash duration is very short, and the flash freezes the bird. The camera was set to its default of first curtain-sync, so the flash fires first, and then the "natural-light" exposure happens, causing the blur to be in front of the subject. With second curtain-sync, the blur would be behind the bird, creating a more pleasing effect.

Another aspect to note is that HSS reduces the effective power of the flash significantly. This is a huge disadvantage in wildlife when photographers are forced to work at great distances from their subject anyway. A fine accessory in these situations is a "flash extender" - this is a mechanical magnifying lens that fits in front of the flash, manufactured by specialist firms like Better Beamer. I have covered this accessory under the section on equipment, so look there for more detail.

Flash in the field

If you have a good understanding of what the sync speed is, you are ready to try using flash in the field.

There are two situations where flash is particularly helpful:

1. Filling in shadow areas
2. Adding sparkle to the subject in dull lighting conditions.

Many cameras have a built-in, or pop-up flash. It can be quite effective when you are close to your subject but is usually not powerful enough for the greater distances that are typical in wildlife work. Pop-ups normally do not support high-speed sync. – they are not powerful enough. Consequently, most wildlife photographers use an external flash. Get one that is built to integrate properly with your camera and get one with high-speed sync. For details of how your particular flash works, refer to the manufacturer's documentation – each unit is configured differently, although modern flashes all provide the same basic functionality.

Remember, when you attach your flash to the camera, you need to decide if you will work in *normal flash mode*, in which case you get the full power of your flash but are restricted to a maximum shutter speed of your sync speed, or *high-speed sync* (HSS) mode, in which case you can use any shutter speed that you want, but you lose flash power.

For me, the decision is easy - **I ALWAYS use HSS**. I use a modern Canon camera, and when I set the flash to HSS, it uses HSS above the sync speed and normal operation below, so I get the best of both worlds - *there is never any need for me to move off HSS*. I imagine that most modern cameras are the same - check the documentation on yours.

I now select the shutter speed that I want to use. If the light is dim, I tend to use the sync speed. That gives me maximum flash power and also (strangely enough) the fastest speed because the flash is not "stretching" its flash pulse, which slows it down. If it is bright light, I tend to use HSS. For every stop above the sync speed of the shutter, the flash halves its power, so I rarely set a very high shutter speed when using HSS - I generally use between 1/500s and 1/4000 s.

The next thing to set is exposure - and you now have to do that in two places - on the camera and on the flash. You already know how to set exposure on the camera, usually by using aperture priority, or shutter priority. The camera assumes that you do not have a flash fitted and will adjust the exposure as if there was no flash.

You then have a setting on the flash, and if you set it to E TTL, it will adjust the camera settings assuming that you are using the flash in total darkness. Your job is now to balance the two exposures so that they combine together to give a correct value, and there are many ways of doing this. I favour the simple approach:

In bright sunshine, I let both the camera and the flash calculate their own settings. My camera is already set to calculate exposure properly for daylight – in bright light, I normally use aperture priority. If I want flash, I set my flash to E TTL, so it calculates its own exposure and checks that it is set to HSS. That is all I do. The flash does not add enough light to the photo to over-expose it - all that happens is that the flash fills in the shadows.

On cloudy days, this approach can cause over-exposure, as the brightness of the flash is significant compared with ambient light. So I set the flash to an "exposure compensation" (refer to your flash manual) of -1 stop to reduce its brightness. On dim cloudy days, I might change that to -2 or -3 stops, but only if the subject appears excessively bright when I review a picture.

As far as camera settings are concerned, I tend to use aperture priority (Av) in bright light, and shutter priority (Tv) in low light.

The point is, that once the setting is made, and you are happy with the sample shot you have made, then keep the setting for the duration of your shoot session.

To round this component off, I have chosen a few flash photographs to illustrate my points:

The following two photographs demonstrate the effective use of flash.



The first photograph was taken with flash, and the second was taken immediately thereafter, without flash.



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Both were taken at 1/1250s at f/4.5 and an ISO setting of 640. In the first photo, the flash added a puff of light, which added detail to the bird and plant, as well as an attractive highlight in the bird's eye. It has turned a somewhat dull photograph into something rather attractive, and because the flash was used sparingly, its effect is barely noticeable.

Beware of using a flash when there is something between you and the subject, as it tends to become over-exposed and draw attention to it. That is clearly demonstrated here - there is a sprig of foliage to the right of the photo, and a pod to the left, which is hardly visible without flash, but quite obvious with the flash. In this case, the foliage is far enough to one side to not be overly disturbing. **Note the principle, however - watch your foreground when using flash.**



The two previous shots were really practice for this one.

I loved the way that the backlighting from the sun shone through the wings of this female sunbird, but her body was in deep shadow, with no interest in the eye, so I used a flash to add a little front light. This was shot at 1/800s at f/4.5 and ISO 400, using a 400mm lens.

At 1/800s, I was obviously using HSS, and you can see that the flash preserved the wing blur nicely. Had I used my camera's sync speed of 1/250s, the flash would have been shorter and faster, and there would have been less wing blur. Look back to the photograph of the green pigeon and look at the wing blur there – HSS has given a more natural blur in this photograph.



It had just stopped raining and the lighting was drab and dim. I added a touch of flash to this picture to highlight the raindrops on the bird, and to add sparkle to the plumage. If I had added any more flash, the bird's eye would have been overdone.

Notice that I waited for the rain to stop completely - rain drops do not look pleasant with flash; they appear as unnatural, streaky blurs.

You will know the phenomenon of "red-eye" when photographing people. Sometimes, the flash hits the retina of their eye, and their pupils appear red, not black in the picture. This occurs when the flash is mounted very close to the camera. Many animals also exhibit red eye in flash photos, but birds do not – they are susceptible to an effect known as "**steely eye**", where the pupil gets a steel-silver sheen. Like red eye, this is an unnatural effect and should be avoided. The best way to avoid it is to use the flash for fill-in, and not as the dominant light source.



I used a similar technique in this photograph, adding just enough flash to give the droplets a sparkle and to lift the shadow detail. The flash gives the plumage a nice sheen and also puts some detail under the wing.



These effects are subtle, but give a very pleasing improvement to the photograph, particularly when it is viewed large, as the enlarged portion shows - notice the sparkle on the water droplets, particularly those in good focus, and notice the good under-wing detail which would have been totally absent without flash.

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Here is another photograph taken on the same trip. Once again, the flash adds sparkle to both the flower and the bird.

Note, however, that the rain had not stopped completely, and that the odd droplet of rain is very visible. As none of these droplets obscures important detail, they can be easily cloned out in Photoshop, but notice that flash makes raindrops more obvious.

Flash always darkens the background in a photograph – in the previous sunbird photo, which stopped the sky from overpowering the photo. In this shot, it lifts the illumination of the foreground, giving a "studio quality" to the shot. That quality suits "chocolate box" photos like this one but be careful not to overdo it – dark backgrounds are much more attractive than black ones.



This photograph was taken at dawn, in dim light. Normally, I would not use a flash this close to nesting birds, in fear of them abandoning their young, but this bird was habituated, having built its nest merely 1 metre away from the verandah tables in a popular pub!

I used 1/1600s at f/5 and ISO 2000. Note the very high ISO setting. I was close enough to the bird to have got away with a lower ISO, but I wanted enough natural light to bleed through in order to put some colour into the background, and the high ISO did the trick. At a lower ISO, the background was too dark, giving an unnatural look to the photograph.



The photographer working next to me was using a far lower ISO setting (640). This shot was taken at 1/800s and f/11. In this photograph, the flash is more dominant than the available light - this can be seen by the brighter lighting on the bark of the tree and the darker background. The use of flash here is more obvious than in the previous photograph – notice how the foreground dominates the picture more.

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