

# Making the Shot

## getting enough light into your photos



by Mark Favreau

**W**e've all seen that photo above, heck, maybe we've even taken it, right? Take a piece of LEGO, stick it on a white background. . .because the web site says "shoot against a white background". . .point the camera at the object, push the button. Voila! Photo!

Yeah. Pretty crummy photo. But it gets uploaded, and for reasons unknown the site accepts it, and that's what we have to look at as being representative of that part or that minifig or that whatever.

What's the problem here? Why isn't the white background white? Why is it so dark?

This is a single problem with three contributing components. One: the white background. Two: having the camera set to auto instead of using manual settings. Three, and this is the big one: **NOT ENOUGH LIGHT.**

Cameras are set at the factory to expect a neutral gray balance in any shot, because most actual scenes in life have a natural balance of light and dark. When the image we want to shoot is

mostly light or mostly dark, the camera's auto setting adjusts the settings to yield the gray balance it expects. Everything ends up gray. In the case of a white background, the auto settings don't let enough light into the camera and the resulting image is dark, underexposed.

The fix is to put the camera into manual mode. This will allow the photographer to control the amount of light the camera's sensor receives. By increasing the amount of time that the camera's

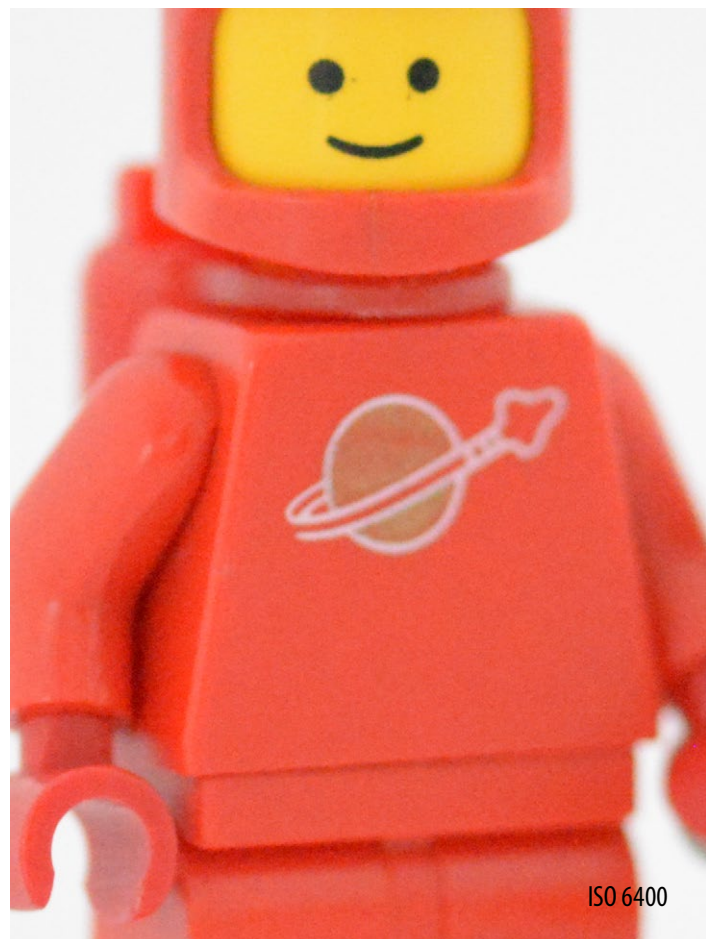
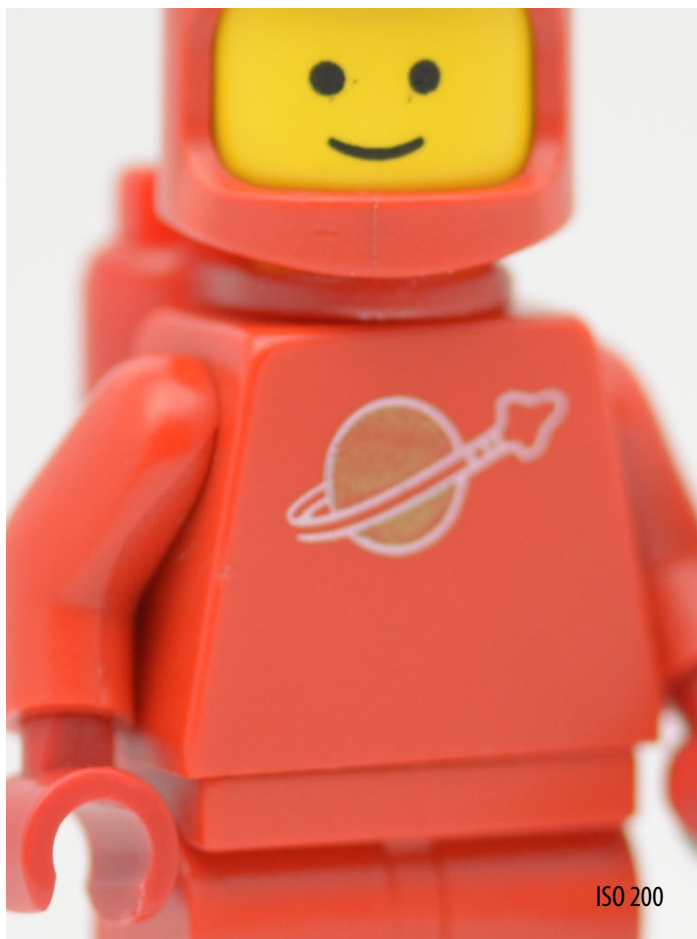
shutter is open, more light is allowed to pass, and the exposure will lighten.

Shutter speed's companion setting is aperture size. . .that's the size of the hole in the lens. The aperture is also known as the lens's f-stop. The smaller this f number is, the larger the aperture opening. By increasing the aperture size. . . lowering the f-stop. . . more light is allowed in, and the exposure will lighten.

Available light is a consideration. On a sunny



Above left: lens aperture f-3.5. right: lens aperture f-32. Pretty obvious more light will pass through at 3.5.



**ISO.** Notice the color and values are a close match in the two photos above, but the image on the left with the low ISO value is relatively smooth while the image on the right with the high ISO value has obvious graininess.

day outdoors, it will be common to have a shutter speed of 1/250, 1/500, or even 1/1000 of a second. Contrast that to the available light indoors. With the same f-stop used outdoors, the indoor shutter speed may be only 1/30 or 1/15 of a second or lower. This is because the sun is the equivalent of a gigamegabazillion candle power and indoors we have a lamp with a candle power of 60 or 100. Relative brightness of the environment is a definite factor. This is just to say that indoors, with ambient lighting, there is a whole lot less available light than outdoors.

To get the light levels indoors up to where one needs them to be to get a good exposure one can do the following things:

**Add lights.** Instead of relying on the overhead or other standard room lighting, use specific lamps for photography. These lamps don't have to be fancy or expensive at all. Consider swing arm lamps or small lamps which are easily repositioned. Make sure to get "daylight" bulbs with a neutral color balance. Bulbs with a 5000 kelvin rating give a good "white" light. Also get the brightest bulb that will fit in the lamp. Two lamps would be the suggested minimum. Using three or four will offer more options and more light.

**Use Manual Settings and put the camera on a tripod.** With physical lights accounted for, next up is the camera. The camera will have two issues to deal with: stability and settings.

For exposures under 1/30 of a second, there is likelihood of blur being introduced into the shot because humans can't hold still enough to keep the camera from moving very slightly. Breathing and pulse are enough to shake the camera just a tiny bit when taking the shot. In situations where the exposure will be below 1/30 of a second, and that will be pretty much every shot unless the photographer is a professional with lights and strobes and reflectors and generally no need for this article, a tripod is strongly suggested. If a tripod is not an option the camera can be set down or a cradle can be fashioned from bricks. Using the camera's timer or a remote to trigger the shot will also be of benefit.

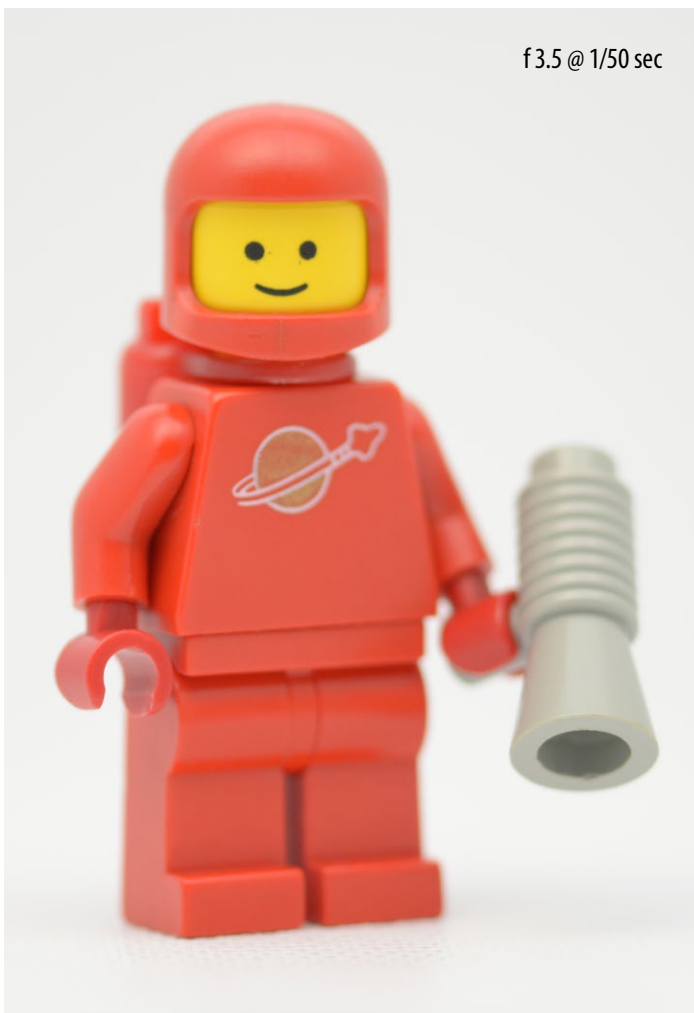
For the camera settings, three things need to be understood: ISO, aperture, and shutter speed.

**ISO.** ISO stands for International Standards Organization and this setting goes back to film days where the ISO (or ANSI) number related to the size of silver particles in film emulsion. A film with an ISO of 25 would have very fine particles

where a film with an ISO of 800 would have large particles. The size of a particle would have relative bearing on the reaction time. As it would be easier for a photon to hit an 800-sized target than for a photon to hit a 25-sized target, the 800 would react faster and need fewer photons (less light) to react. However, the trade-off is that the graininess of the image would be considerably greater with the 800 than the 25. Translating that to LEGO-speak, it's the difference in creating a 400 x 400 mosaic with 8 x 8 plates versus using 1 x 1 plates. Using the 8 x 8 would be much less resource intensive, but also yield a much blockier image.

The digital correlation is that a lower ISO setting should require more light than a higher ISO setting. The higher ISO setting will yield an image with a greater amount of "artifacting" or graininess. . . stray color pixels or graininess in areas which would be expected to be smooth.

An ISO setting of 200 is a good place to start. Image graininess should be expected to increase with the ISO value. Some experimentation with one's own equipment is warranted to find an acceptable setting. Anything over ISO 640 may show obvious differences when compared to an ISO 200 image.



**Equivalent Exposures.** Notice the color and values are a close match in the two photos above, but the image on the left with the small f-stop has only the figure's face and one hand in focus; the image on the right has all of the figure in focus.

**Aperture and Shutter Speed** are the yin-yang of a good exposure. There will be a particular amount of light needed for any good exposure. What is important to understand is that Aperture and Shutter Speed "pairs" yield what are known as equivalent exposures. Similar to travelling at one mile an hour for five minutes ends one at the same distance from start as travelling five miles an hour for one minute, an f4 exposure at 1/60 second may be the same thing as an f22 exposure at 1/2 second. Actual settings will be relative to the lighting situation.

Bearing the above in mind, there can be a marked difference in the resulting image. Photos shot with a small f-stop will have a shallow depth-of-field. That is to say that only a small area of the photo will be in tight focus. A large f-stop will have more of the image in focus. Manual control of the camera, manipulating the aperture and shutter settings, allow the photographer to be in control of the resulting image.

**So what about flash?** That will put more light in my image, won't it? Yes it will. Right where it isn't wanted. Don't do it. Avoid the flash, disable

it, and don't shoot in automatic mode. This point can't be made strongly enough. The native flash on most cameras is positioned pretty much dead center and points pretty much dead center. The light leaves the camera and is reflected straight back into the lens. Flash will flatten the image, lead to areas of blowout, overexposure, glare, and can create very unsightly shadows. It is very very much better to put the camera on a tripod and use a long exposure than to use a flash.

The caveat here is that if you are a pro and have that \$20,000 setup with strobes and all the cool kit, a professional studio, and years of experience, then, sure, flash for you isn't likely to be a problem. For Average AFOL, though, phone-cam flash directly into the minifig's torso isn't going to give you that juicy shot you really want.

**But all I have is a phone cam!** Okay. Let's quickly discuss hardware. A phone cam is the Swiss Army Knife of the modern digital lifestyle. It does a great many things. It does not necessarily do all of them very well, though. The phone camera is not made for professional studio photography. It is made for lifestyle photos,

snapshots, and convenience. While there are third party apps that will provide access to the phone's camera settings: f-stop, ISO, and shutter speed, the camera is limited by a fixed lens and a tiny sensor. Comparatively, a phone cam might have a sensor that is somewhere around 3 to 5 millimeters where a good SLR camera will have a sensor that is somewhere around 35 millimeters. This isn't to say that one can't get an acceptable image off a phone camera, but there are without question some quality limitations due to the phone cam's very small form factor. Generally speaking, there will be more inherent "noise" or graininess in a photo made with a phone cam. And if anyone is wondering, a point-and-shoot camera is going to have a sensor more similar to that of the phone camera in terms of quality. There may be some variance depending on age and manufacturer, but still expect lesser than SLR quality with a point-and-shoot.

Colloquially, the difference between a phone cam and a dedicated SLR camera is like the difference between MegaBlocs and LEGO; one can still build some nice things with MegaBlocs, but there's a fundamental quality difference.



# Some things to avoid



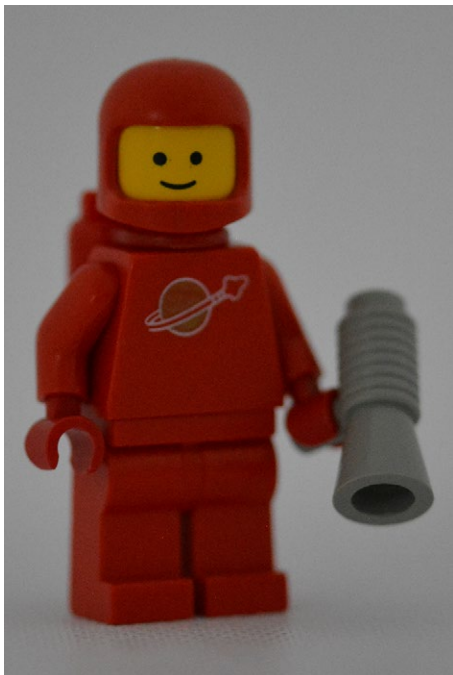
**Phone-cam flash faux pas.** Here is a typical phone-cam flash shot. There is a white stripe of glare down the middle of the figure's face and harsh dark shadows fall directly behind the figure. The flash turns the white background (this is the same white background used in all the Red Spaceman shots in this article) to dark gray. Auto settings are F-2.2, 1/256 second, ISO 25. Quite possibly the *only* f-stop on the cam is f-2.2.



**Phone-cam flash faux pas deux.** Here's another classic hand-held phone cam flash shot. The figure is laid down on a white background, the camera is positioned straight on top of the image and shot. The results? A gray background, glare on the torso and hard shadow. The phone cam sets absolutely kooky settings: F-2.2, 1/1923 second, ISO 25. Stand the figure up and position it as far away from the background as possible to avoid this disaster.



**SLR built-in flash.** This shot is made with the SLR's auto setting and the built-in flash on. Note the highlights centered on the helmet and loudhailer. The white background is not white, the red is oversaturated and flat. Shadows are directly behind the figure, but the camera is farther away from the figure (compared to the phone-cam shots) resulting in a softer shadow. Auto settings for this shot are f-3.5, 1/60 second, ISO 320.



**SLR auto no flash.** This is a shot made with the SLR's auto setting and no flash. The camera cranked the ISO up to 3200, the f-stop is opened all the way to 3.5 and shutter speed set at 1/100. The shutter and aperture would be acceptable for a hand-held bias, but that 3200 ISO is nuts. If you are attempting to shoot hand-held with these settings, good luck getting anything in focus.



**Backlighting.** A lighting situation to absolutely avoid is backlighting. While this does to a degree provide the oft-desired pure white background it does so at a steep cost. Details are lost, edges are blown out, color is desaturated, and the form is flattened. So, yeah. Don't place the figure in front of the window "because that's where the light is" and expect much of a picture.



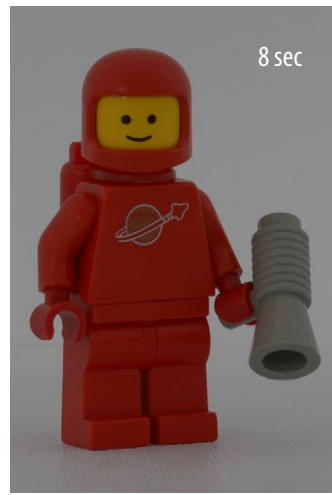
**Rake lighting.** Another setup to avoid is rake lighting, another classic "window" setup. This is where there is one light source directly to one side of the object. Rake light may emphasize contours, but it also may lead to hot spots and glare as seen on the face and chest. Place the lights overhead at a 45° angle to the object and between the camera and the object to get even, balanced lighting.

# No flash, no problem

The exercise demonstrated on this page is to show that even with low lighting conditions an acceptable image can be obtained if the exposure is of sufficient duration.

The first ten images on this page were shot with ISO 200, f-29 and the shutter speed shown on the shot. There was no direct lighting whatsoever. There was only ambient light from a midday window on an overcast day. The camera was set on a tripod and triggered remotely. The actual lighting level in the room is fairly represented by the picture at 13 seconds.

Acceptable exposure comes in at around the 36 second mark. At 30 the image is still slightly dark and at 44 the red is starting to become decidedly light. An exposure somewhere between 36 and 44 might result in a marginally better image. The 36-second image with only slight levels adjustment in an image program will yield the last image on the page.



The absence of any directional light does result in a flattened image. The two images at right compare equivalent exposures; the left is shot with studio lighting and the right is the non-lit shot from above. Note additional dimensionality in the lit shot: highlights on the crown and chinstrap of the helmet, air tanks, right shoulder and left forearm. There is shadow emphasis under the helmet, wrist, and legs. Ribbing on the loudhailer is emphasized.

