Photography Badge- Extensive

Photography badge... the *really long version*.

NOTE: This article is extensive and goes far beyond the basics of what you need to get your Photography badge in Scouts. **If you want the article that just helps you get the badge, use the search box on this website and search for "photography".**

Requirements of Photography Badge:

1. Demonstrate and explain the use of your camera, video (camera) or other (ie: Blackberry or cell phone with a built-in camera)
2. Explain how your camera records an image as well as the developing process, if appropriate.
3. Show examples of your work, explaining composition, choice of subject matter and lighting and exposure.

Let's start with a few terms-If you already know them, skip them!

Camera: a device which used an electronic or a photographic process to record an image for later viewing. OK, that was an easy one.

"Digital" camera: A device in which light enters the camera and falls on a "CCD", an electronic chip, sensitive to light, that sends the various patterns, shades and colours to an electronic processor in the camera. The processor interprets the electronic signals as an image and sends them to a screen for viewing at the moment, and/or storage device (like a memory stick) for viewing later.

This link will show you a brief description of how SLR (single lens reflex) cameras work.

Video camera: : A digital camera device which records a series of images that fall on an electronic light sensor and *create the illusion of movement when played back.* Current video cameras record the images in digital form on mini-hard drive, memory sticks or video tapes. earlier video cameras recorded the image on large videotapes in a non-digital ("analogue") electronic signal. For decades the recorder has been part of the camera (often called a camcorder) but the earliest versions had a bulky, separate recorder that a video camera plugged into. The

earliest versions of those used reels of tape that were wound on to a take-up reel by hand; later came Beta and VHS videotapes.

Photographic process; a process in which light strikes material (usually "film") which is "photosensitive" - that is, it reacts, changes, when light hits it, and then through different chemical processes, the photosensitive material gets changed so that the image of the light that hit it is permanently imbedded in the material.

Composition: Composition is the way an image appears in a picture. It involves how the subject is framed- that is, the subject's position - within the picture. It may also involve the use of shadows, colours, backgrounds - or avoiding backgrounds.

Subject matter: What the picture is about! It could be a landscape, a building, a person, an animal.. it could be anything that can be seen. The subject is what's in the picture!

Depth of Field: There is a point in your picture where your subject is in fairly sharp focus. The area behind the focus is called the depth of field. If you have a deep depth of field, then you can see everything or almost everything behind your subject, in sharp focus. If you have a "shallow" depth of field, the most of whatever is behind your subject is not sharply focussed; it is blurry. (Jump to Aperture)

Lighting: Well, obviously, light is important in a picture. Lighting can be brutally harsh, or soft and gentle. There can be shadows as well as light, that make the picture catch your eye. Related, is **colour**. Or "black and white"... no colour. Colours can be soft, muted, almost quiet- or they can be riotously in your face! Black and white photos tend to be simple, stark, powerful. You are not distracted by colours in the frame but see only the subject, often with strong shadows to emphasize the lighted parts. "B &W" photography often works well with people pictures and can be quite dramatic!

1-2-3 Jump *by Cristeen Quezon*

Attribution below

"Esso Black and White" by Linda Rae

Attribution below

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Exposure: Besides the *quality* of light in a photo, (soft, harsh or in between), the *amount* of light in a picture is important. Too much light (called "*over*exposure") makes your subject - or at least the highlights, or main features of your subject, appear "washed out" and pale... you can't see much detail. Occasionally this is the effect you want, but not usually. Too little light ("*under*exposure") results in a dark image caused by too little light in the shadows so, again, you miss out on details. And, again, occasionally, it's the effect you do want.

Why might you *want* to overexpose an image? It's something you may want to try once in a while just to see how it looks; sometimes it works, sometimes not. One nice thing about photography is that there are some rules that can be broken and no-one gets hurt. Let's say you have a picture of someone or something that you want to make look - oh, shiny, or as if they glowed a bit. Overexposing a picture of a person might emphasize the brightness of their skin and it may actually blur out some surrounding items. The person looks unusual but not "wrong" - it could command your attention more than a "perfectly" exposed picture.

Here's an example of deliberately overexposing an image to highlight the subject (the angel) while de-emphasizing the background.

Angel by *Attribution below*

What about **underexposing** a picture? That can be very dramatic! It may send objects around a person (or around the main object) back into the shadows so the subject of your picture is emphasized very strongly. It can make an ordinary photo look mysterious, even menacing. And if that's the look you are going for, try it also in black and white - more dramatic still!

Here's an example of *under*exposure that works:

(Escalator) "Untitled" Martin Teschner Attribution below

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Now how about that first requirement for the badge? "

1. **Demonstrate and explain the use of your camera, video or other** (ie: Blackberry or cell phone with a built-in camera)**"**

That's something you may have to figure out yourself especially if you are using a cell phone. They are pretty simple usually; point and press a button. Read the manual or just goof around. Me, I'm a fan of manuals. Don't read them and you can probably figure out how to get it to work.

DO read the manual and chances are you'll find something extra in there that you didn't know about or ways to make them work better.

How cameras work: Now about actual cameras - those devices made only for taking photographs. They usually take much better pictures than most cell phones. Some tablet computers like the Blackberry Playbook (which has a camera on both sides!) take pretty good pictures but they are kind of big for that use. **Both digital cameras and cameras that use film work much the same until the light hits the recording medium**- the thing in the camera that actually collects the light and either changes the light to electronic impulses (digital camera sensor) or gets changed by the light falling on it (film).

The photographic process:

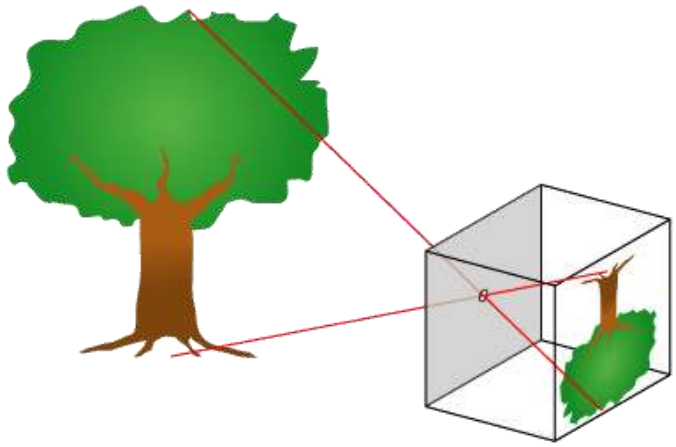
What exactly is "film"? It's a plastic (usually acetate, if anyone asks) strip that is very thin. Most film uses photosensitive silver halide particles with dyes that react when light hits them and then "develops" an image and colours after being treated with certain chemicals. **The light that hits the film must be only a certain amount;** if you pulled a strip of film out of its light-proof little canister, the film would be "flooded" with light and could never give an image even after being developed. Since too much light hit it, the developed film would come out completely white, with no details of any image.

Camera Obscura, (the modern camera's great, great-grandfather):If you are crazy about photography and you also want to learn two words in Latin, (and who does not?) look up "camera obscura". It's a Latin phrase: "Camera" is Latin for "chamber" or "room". "Obscura" is Latin for "dark". So it means a dark room. If you wanted to make one similar to one that artists used as far back as the late 1600's, you could put aluminum foil or some similar, thin, light blocking material over a window that is opposite a light coloured wall, then cut a small hole in the centre of the foil. You will see something odd on the opposite wall if it's a bright day outside. You will see the view from outside displayed on your wall. And it will be upside-down! Light travels in a straight line but when it goes through a small opening in thin material, instead of scattering around, the straight light rays criss-cross and end up reversed on the opposite wall. (You could cheat a bit and let the image hit a mirror first and then it would appear right side up on the wall.)

How a big-room Camera Obscura is like a little box, or "camera".

Now, in your mind, shrink that big window and room down to the size of a small box. Below is an image of a mini-camera obscura. More commonly called a "**Pinhole camera**" . No fancy lens, just a light-tight box with a small hole (the aperture) in it to let a little light in. Instead of a camera shutter, the user would put tape over the hole and lift off the tape only long enough to let

light through to where they would have a sheet of film taped to the side where you see the upside-down candle. Light goes in, criss-crosses, hits the film at the back then the tape is put back so too much light does not get in. How must was too much? Well, it was pretty much trial and error!



Pinhole Camera (GNU license)

The light will act the same in a pinhole camera as it does in a camera obscura, a pinhole camera or a modern camera.- it will criss-cross and show the scene upside down on the back of the box. If we use a pinhole camera, instead of foil on a window with a small hole in it, we use a tiny hole at the front of this box...OK, let's call it a camera. In a "**Pinhole Camera**", (see the image above) that little hole is just a little hole. Maybe because "hole" sounds too simple, we call it an aperture. Which is just fancy talk for "hole". Now in most cameras the size of that hole can be made larger or smaller... variable. A variable hole, or aperture, is usually an arrangement of thin material that opens up to a larger hole or closes down to a smaller hole, or aperture. Naturally this will let in more light (wider aperture) or it will let in less light (smaller aperture).

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Lens: So a pinhole camera has a hole - an aperture -that "acts" like a lens. What does a real lens, made of glass or plastic, do? All lens do the same thing, some better than others. A camera lens simply gathers light hitting it and bends it so it lands in a particular spot behind the lens. That is the focal point, and if it lands on film or a camera sensor, the light carries a focussed image. The lenses in your own eyeballs do the same! If your eye's lenses focus in the wrong place, you may need to have the light bent a particular way before your eyeball lens gets it - yes, eyeglasses, or contact lenses. Glass lenses do this better than plastic and some glass works better than other shaped glass, other lenses, that it. Even water bends light like a lens!- Put a spoon in a tall glass of water and look at the side. You will see that the spoon seems to be somewhere else under the

water than it seems to be above the water! The water has acted like a lens and bent the light so you see it in a different place.

Aperture:

Lens apertures from http://commons.wikimedia.org/wiki/User:Mohylek

The *largest hole*, or aperture, (labelled 1) , *has the smallest number*. f/1.4 is the largest aperture so of course it lets in the most light.

The *smallest hole*, or aperture, (labelled 2) , *has the largest number*. In this case, *f/22* is the smallest aperture so of course it lets in the least light.

Remember this part, OK? F/1.4, though it has the lowest number, is the biggest hole, or aperture, so it will let in more light than an small f/8 aperture. The even smaller f/22 aperture lets in even less that f/8. On a lens like this, the aperture size is often controlled by a ring around the outside - as you turn the ring, the aperture geits bigger, or smaller. Some electronic cameras have lenses that look like this but do not have a ring. Aperture control is done inside the camera, in those cases.

So what does a different aperture do to a picture?

If an ideal exposure would actually be at f/8 (small aperture) but we actually used f/1.4, (wider aperture) there would be too much light let into the camera and the picture would be "overexposed" - you would not see a lot of details, you might not see anything at all but light!

So, usually, if our light source (sunlight, for instance) is very bright, we will want to have a smaller aperture, say f5/6 or f/8 . (Some cameras go all the way down to f/22). If we were shooting at dusk though, we'd need all the light we could get so we might "open up" the aperture to f/2 or f/1.4.

Keep in mind that the aperture is only responsible for letting light in, and not how long the light is on the film or the digital camera sensor. How long the light is on the film or the sensor will affect whether it is exposed properly. It's the **shutter** that shuts out light and lets it in for a brief moment, that controls how long the light is on the film or sensor.

Remember that both the aperture size (how **MUCH light**) and the shutter speed (how much **TIME** the light is in the camera) work together! This complicates things a bit but gives you a lot more creative control over your exposures.

Characteristics of a picture taken with f/1.4 (a wide, open, aperture) would be that it could be taken in a very short period of time because more light comes through the aperture, and, the depth of field - that is, how sharp the background is - would be short. (more on depth of field below)It is a characteristic of lenses that when you use a wide aperture like f/1.4 the focus in the background (that is *behind* where you focussed on the subject), the image is soft, out of focus. A short depth of field means that while your subject can be in focus, the background may be very much out of focus. You might want that effect is you want the picture to concentrate on the subject only.

What about a picture taken with an f/8 aperture? That is at the opposite end of the scale so we can expect opposite effects. The aperture is smaller so less light can get through. That means that, if the lighting is the same as it was for our picture taken at f/1.4, then the camera needs to leave the shutter open for a longer time to get the same exposure, the same amount of light into the camera. It also has the opposite effect on the depth of field. The image will have most or all of the picture that is behind your subject, in sharp focus.

So, an open lens, say f1.4, equals more light in less time... but short depth of field... that results in a fuzzy background. A "closed down" lens, say f/8 equals the same light in more time but a deeper depth of field.. that is, a sharp background. You can try aperture settings in between to get different depths of field.

Don't forget the other thing that is changing though, when we change depth of field - **the amount of time the shutter is open**, which of course affects how much light lands inside the camera.

An example using wide aperture and short time:

Let's say we are taking a picture of a dog chasing its tail. After you stop laughing at the silly dog you might use your camera at f/1.4 aperture (aperture is "opened up", letting in more light). That means the time the shutter needs to be open is not very long, perhaps 1/250th of a second, depending on how much light there is. And don't forget that because the aperture is open wide, the depth of field will be shallow so we won't get much of the background in focus.

The result? The camera will take a snapshot of time, only 1/250th of a second long. The dog will be in motion but will not move very much in that 1/250th of a second. And we won't see much, if any, of the background in focus. Our picture would look something like this one:

Running Dog (Lakshma. Attribution below)

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Wide aperture (large hole) creates a short depth of field so the background is blurred. The shutter is only letting light through the aperture for a short time so it "freezes" the action of the dog. Here, you can see only a bit of movement in its feet.

What of a"stopped down" (smaller) aperture, which means less light coming into the camera? It will act in the opposite way of a wide open aperture. Time will be increased because we aren't letting as much light in through the aperture. But the depth of field will be deeper- the more we close the aperture the longer the time to take the photo will be - but the more depth of field we will also get.

-And of course there are steps in between f/1.4 and f/8 , or even as much as f/22 in some cameras.

Depth of Field:

Here is an example of a ***deep*** **depth of field**. The camera first focuses on the tulip, near the camera, but also gives us a sharp image far behind the camera, of the Parliament clock tower.

(Used with permission) Peace Tower by .

Note: This photo is not subject to free Creative Commons use. All other photos in this article are free to use under the Creative Commons licence.

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Shutter up!

Now, we have discussed a way to let in more light or less light - the aperture. But photographers need to also control *how much time* the light enters the camera. Some clever people devised something called a **shutter**. It shuts out the light. Except when it is letting in the light. That click you often hear from a camera is the shutter. It has opened up for a short time, letting in light, and then rapidly closed again. How fast was that? Well light travels really, really fast! So often we don't need to leave that shutter open, letting in light, for very long. How long? It depends on a few things. First, how much light are we letting in through the aperture? If we are letting in lots of light (the aperture is open as wide as it will go) then we don't need to let the light in for very long. But if the aperture is not letting very much light in, we will have to let the light keep coming into the camera for a longer time.

Here is a great page to show you the effect of letting the same amount of light (through the aperture, which is at f/8 for all the shots) but leaving the shutter open for less or for more time. You will see that as the time increases, the moon is overexposed a bit and it loses detail. However, you see more detail of the clouds around the moon as the time of exposure (shutter speed) increases.

What's a typical time? That's hard to say, especially with digital cameras. They are a lot smarter than me sometimes - they do a lot of math and sometimes they calculate a slow shutter speed of, say 1/4 of a second. That may sound like it's not much time to you but it is to film or a camera sensor. Remember that light travels really fast. Why might a camera use a slow shutter speed, letting in the light for a relatively long time? Well, it might be a dark scene. Or the aperture that lets the amount of light in, might be small. (Remember, a small aperture is also said to be "closed down".) Or both those conditions exits. Basically, less light going in, means it has to go in for a longer time.

So what? Let's think about what you are taking a picture of if the shutter speed is slow. If it's a building, well, they don't tend to move much. If it's a person, they tend to move. Or you, holding the camera, moves, even if it's just to breathe or keep your balance. Even a tiny bit of movement when the shutter is open for a fairly long time means that the picture will be blurry. Why? Let's say the picture is of your friend. Even if she stands as still as she can, she'll still breathe (we hope!) and her eyes will move and she'll shift her balance just a tiny bit. It's all movement. So the camera which has the shutter, (which allows light through the aperture) open for a relatively long time ends up taking a picture of where she started out being, ends with a picture of where she ended up being plus everything in between! All in one image. Even if the movement is small, it's still there and it still gets recorded in the image.

Now go back to that building. A slow shutter speed is going to be OK to take a picture of the building. What about if a bird flies by? It's moving while the shutter is open and it will look like a blur. And cars? They drive past the building. People walk past too. All blurry. Is that bad? Maybe - if you want a nice crisp picture of the building and anything that is going by at the moment the shutter is open for 1/4 second then the moving things will blur. But on the other hand,sometimes you *want the illusion of movement* in a picture and a still building, with people moving past it in cars or walking, will give us the illusion that those people are moving. That might be the effect you want.

If you want the picture to be clean and crisp and have no blur, just people and cars and birds "frozen" in the image, then you don't want to let the light in through the shutter for very long. But if we can't let it in for a long time, how will we get enough light in so we get a well exposed picture? There are two things we can change but I've kept one a secret from you. Already you know about the aperture - the hole - that controls how *much* light goes in, regardless of how long it is getting in. So we can "open up" the aperture, making the hole bigger, thereby letting in more light. That will often work. (We assume the speed must be fast because we do not want "movement" in our picture this time. For this picture, we can't do anything about the time the shutter is open - it must be fast.)

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Being the sensitive type:

What's the other thing that I haven't mentioned yet? Well, if you are using a film camera, we call it the film speed, or "**sensitivity**". Basically how fast the film reacts to the light. The higher the number, called the ISO (may be ASA) number, marked on the film container, the less light has to reach the film in order to create an image. It just gathers light faster than "slower" films. Some older films had speeds as little as "25" but it's not even made anymore. You can get film with a speed of "100", and "400" and even higher. The higher the number, remember, the less light you need to make an image on the film and/or the less time it has to stay on the film. But there is a trade-off. Higher ISO rated film will take a decent picture in low light, where a low ISO rated film may not show anything, but the higher ISO rated film will also look "grainy", with little flecks here and there.

And digital cameras are also sensitive! They will also have sensitivity settings rated with "ISO" numbers. And like film cameras, the higher the ISO, the sensitivity, number is, less light is needed to create an image. But also like film, a picture taken at a high ISO rating will give you a picture that looks sort of grainy, but in the case of a digital camera, the picture has electronic "noise".

Nifty little website here! A camera simulator, once you are starting to get the idea of how aperture, shutter speed and ISO (sensitivity to light) work together , this site lets you play with the settings and "take" a pretend photo that then shows you the likely results.

2: Explain how your camera records an image as well as the developing process, if appropriate.

Developing film to create a printed picture:

The light enters the camera through a lens which focuses the image on a small part of the strip of film in the back of the camera. The opening through which the light travels is called the aperture and often you - or the camera, automatically, will make the aperture (a fancy name for a hole) open wider or close down smaller to let in more light or let in less light. Before it reaches the film there is a barrier that keeps the light off the film until the barrier - we call it a shutter - opens for what is usually a really short time. While it is open, the light hits the dyes on the film. Then the shutter closes again and the film is shut off from the light. You then move the film to the next "frame", or bit of film. All that takes place in thousands of a second up to nearly a full second. Special circumstances mean you can keep the shutter open as long as you want (if your camera has that function) but usually a picture taken on a bright day will be taken - that is the shutter is open - in about 1/500th or one second.

Film cameras, though pretty easy to use, have a complex way of recording your image. Light enters your camera through a lens but not until a shutter opens up for a brief time. The lens "inverts" the light rays so that they fall on the film or on the digital camera's sensor *upside down*. (When you get the pictures printed, we use a highly technical process with the paper prints to make sure that we see them right-side-up. We turn them around!)

If you are using film, when the light hits the film inside the camera, (which is in total darkness except for the short time the shutter is open) the light changes some photosensitive dyes (meaning they react when light falls on them) which are included with tiny particles of "silver halides". These dyes and silver layers are in ultra-thin layers on the surface of the "film" which

is really just a long strip of thin plastic. There is no picture on the film at this point. (There really is one, after light has passed through the lens and landed on the film but no-one can see it yet - it's called a "latent image".) Later, the photofinishing lab sends the film through certain chemicals that develop that latent image into an image you can see- though it's not what you might expect to see. The exact chemicals used depend on the kind of film but the basic steps are: **Developer**, which turns the latent image into a "negative" image. Then a "**Stop bath"**, a chemical that stops the development so the image is the way we want to see it. With no stop bath, the latent image would continue to develop until it was all black! It's kind of like baking cookies- you bake them until they are just right and then stop the baking process. Finally, there is the "**Fixer**". Fixing in this case, means that it is "fixed" in place (like a "fixture" that doesn't move - it's "fixed"). The fixer chemical makes sure that the image will not deteriorate for a very long time.

So, at this point, we have an image on the film. Let's deal with one particular "frame" or image. If you look at it now, everything is backwards! Light areas of the picture are dark and dark areas are light! It is a negative image- everything is the opposite of what it should look like. How do we get a picture of everything the way it should be - a "positive" picture? By shining a light through that negative image on the film so the light hits photosensitive (just like the film was) paper... which also produces a "negative" image. But since it's producing a negative image ***of*** a negative image, it comes out as a positive image! A double negative (negative film plus negative photo paper) produces a positive image.

And, yes, the photosensitive paper also goes through a developer, stop bath and fixer.

How a digital camera records an image:

Digital Camera: Light enters your camera through a lens. The lens "inverts" the light rays so that they fall on the film or on the digital camera's sensor *upside dow*n. A digital sensor will send the image it has captured to be electronically processed into an electronic file. This file is further processed so when it is sent to a screen in the camera, or to a computer and printer, it looks like the picture we took, including being right side up.

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3: Show examples of your work, explaining composition, choice of subject matter and lighting and exposure.

That's the easy and most fun part! Simply bring in your images, on paper, or a computer screen or a data (video) projector. **Explain to a Leader how and why you made the images the way you did, and tell us why the pictures was "composed" the way it is.** For instance if you have a picture of a friend but 90 percent of the picture shows the field of hay behind him, did you want all that hay in the picture of did you want it to be mostly your friend? Did you have your friend face into the sun so your camera did not have to face the sun? Are you able to explain the exposure time and "F stop" (how wide or closed the aperture, the opening behind the lens) was? Digital cameras may make that information available - they often also give you no choice in the exposure.

How about on-line albums?

These are easy to use once you try them and easy to share photos with people around the world or in the next room. However, there are serious privacy and ownership concerns when you deal with some social networking sites and perhaps with some on-line photo albums. I strongly recommend that you have a parent scrutinize the user agreement of any place you are going to place your photos. You may find that you are also signing over ownership of the pictures - your pictures - to the site. As well, it is really important to learn how to restrict who can see certain photos. You can often see someone's name on a photo on the internet. This is not a good idea unless the pictures are only available to people you know.

Scouter Derek Madge

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Overexposed Angel by , attribution required. Underexposed(Escalator) "Untitled" Martin Teschner a . 1-2-3 Jump by Cristeen Quezon . Esso B&W by Linda Rae