Fluorescent Mineral Photography

A collection of random hints and techniques

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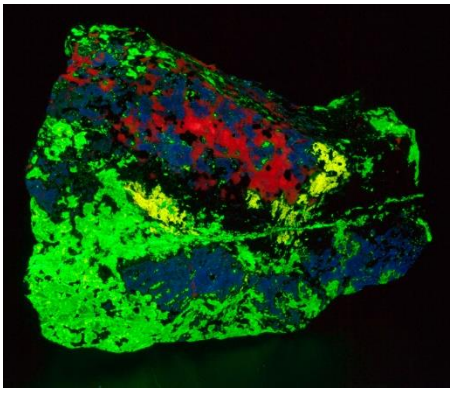
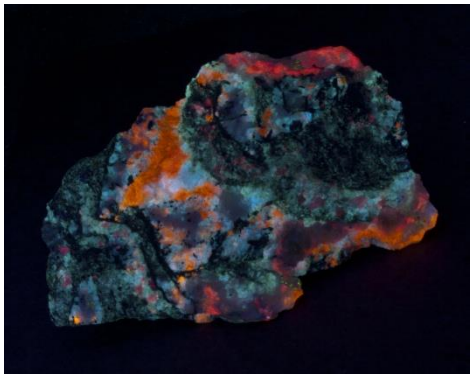
Fluorescent mineral photography is a challenge. People (and cameras) usually take pictures of well-lit scenes and rarely have to worry about overexposing an image. When photographing fluorescent minerals the game is changed dramatically. The camera now has to capture vividly glowing, saturated colors in a dark room. Cameras just aren't designed to do this. Some handle it better than others, but most must be tweaked to produce an acceptable image.



Shooting in the dark usually requires long time-exposures of a widely variable subject. Many specimens have multiple minerals fluorescing different colors - some much brighter than others. For example, one of the hardest pieces to photograph is the classic combination of calcite, willemite, hardystonite, and esperite. The esperite (a bright yellow fluorescing mineral) often appears green, the willemite appears white (a bright green in reality), while the calcite might be captured as its normal orange, and the dark blue/purple fluorescing hardystonite might not even be visible. But with careful attention to camera settings, a few tricks (and lots of hair pulling) an acceptable shot can be taken.

Listed below are some of the most important considerations for successful fluorescent mineral photography, as well as many of the problems people face when first shooting “glow rocks”. This document assumes that the reader has a basic understanding of digital photography and terms, and is not written to be a guide to using a camera for the first time.

Focus and focal length – many cameras, especially point-and-click, have difficulties focusing in low light situations. This can usually be solved by “locking in” the focus in white light, then turning off the lights while maintaining the focus (every camera does this a little different – consult your manual).



An additional problem with focus is the distance from the lens to the subject. It may be tempting to fill the viewfinder/view screen with the image but remember that many cameras/lenses have a minimum focal length of around 12” or more (assuming you’re not using a macro lens). If you move the rock too close to the lens no amount of focus will work and your pics will be blurry. Take the shot at a distance and crop the photo using image editing software.

You can determine the focal length of your camera by using Google to search for the specifications. For example, search for "Canon Sure Shot minimum focus distance" and you'll find that the closest you can get to your subject is 2 feet (0.6m). This means that your rock may appear real small in the image, but at least it will be in focus.

Image Quality – most cameras have a choice of settings for image quality/size. If shooting RAW this will set the camera to the maximum image size, but when shooting jpeg you will have a range of choices. I recommend using the highest (best) setting with maximum file size. This will allow you to take photos of small rocks from the camera's minimum focal distance (see above) and have a picture that is focused. With the large image setting, you will be able to crop the photo in an image editing software application such that the result is a reasonable size image which is in focus. Also, Ebay recommends pictures that are a minimum of 1600 pixels wide; this usually means setting your camera to one of the highest image quality settings.

Composition – This goes hand-in-hand with the above two subjects – focal distance and image quality. Most mineral specimens will be small subjects – around 3" to 5". Most cameras must be positioned at least 2 feet from the specimen in order to be able to focus properly. The result is often an image with a small rock in the middle. Shoot large size images at the highest quality and you will be able to crop the image to size and end up with a reasonable full-size image. Macro lenses improve this situation if your camera allows it, and zoom lenses will also help you zoom in on the specimen (with a corresponding increase in exposure time, lens shake, etc). All kinds of tradeoffs….

Auto or Manual – I choose manual, always. This allows me to control the exposure time, the aperture settings, and the iso (the three critical settings). Shooting in auto mode may seem a good choice, but remember that your camera is designed to take pictures of well-lit subjects. It is not designed to take pics of glowing rocks. Using manual you have full control of the time exposure, the iso, the aperture, and even the white balance. Invariably, photos taken using auto will have overexposed areas.

If you must shoot in auto mode, learn to use the exposure compensation setting (usually marked by a "+/-" symbol). By decreasing this setting a few "stops" you can control the overexposures (or increase for under-exposures). Other ways to decrease overexposure from bright minerals such as willemite, esperite, scheelite, powellite, hyalite opal, etc. is to move the UV light further away from the specimen.

When shooting in auto mode the camera will often automatically set the iso to a higher number because it "sees" a dark subject/field with only a few bright spots. It assumes you are shooting a night scene – perhaps by candlelight, or fireworks (that's what camera designers target in low-light applications; they probably don't even know fluorescent minerals exist). If the camera lets you, set the iso to a low number manually even though the rest is in auto mode. Then you may have a chance of getting a relatively well-exposed shot (plus you will be much happier not having the noise/graininess so often caused by high iso settings).

AND - just because you are shooting in auto doesn't mean you don't need a tripod! Auto mode will probably set the time exposure to a quarter-second or more. Any time-exposure requires a tripod (see section at the end about tripods for an in-depth explanation).

Time exposures – If your camera allows manual shooting you will be able to select the time the shutter is open. This time will vary depending on the brightness of your subject, the wattage of your UV lamp, and the distance of the lamp from the specimen. Setting the iso will also affect the time-exposure. For my typical shot I set my iso to 100, my aperture to f11. I use bright UV lamps positioned a moderate distance from my subject. My shots vary from 1 second (for very bright sodalite, willemite, esperite) to 8 seconds for most average minerals (calcite, fluorite, etc). The color of the fluorescence will also affect this exposure time; greens and yellows appear much brighter to the camera than blues. Reds tend to saturate more quickly, and blues are often very hard to capture.

ISO – I use iso100. The resulting pic has more detail and minimum graininess. But of course my exposures are much longer (around 2 sec to 8 sec usually), thus requiring a tripod and some method of triggering the camera without shaking it (I use my computer to control the camera – called tethered shooting; Canon and Nikon DSLR cameras both allow this).

You can set your iso higher and take pics with much shorter exposures (if your camera allows it), sometimes even almost (but not quite) getting away without a tripod. But the resulting pic will usually be of poor quality. I only use high iso's when shooting phosphorescent pics.

Shutter control – A tripod is an absolute for blur-free photos when shooting long time-exposures, with minimal iso noise. Some cameras have an optional attachment allowing shutter release without touching the camera. Most have the ability to trigger a shot and the shutter opens a few seconds later (used to allow you time to join the picture in a group shot) – a neat trick to take a fluorescent pic without the camera moving. Most DSLRs have an option that allows the camera's mirror to settle before the shutter is opened, reducing vibration from the mirror movement. If you shoot lots of fluorescent pics, tethered shooting is the only way to go.

Camera stability – Both the specimen being photographed and the camera must be on a vibration-free setting. Often our UV lights will have fans and if mounted on the same table as the camera and rock, you might see a "softness" in you photos from the minute blur cause by the fan vibration. Of course same goes for vibrations from the floor, pets and people walking around.

White Balance – I set mine to "auto". I shoot in RAW format which allows me to adjust the picture ("develop it") and compensate for the "blue bleed" caused by our UV lamps – often non-fluorescent white areas of the specimen (and other areas too) will appear blue/purple from visible light leaking out of our UV lamps. If your camera doesn't have RAW, then set your white balance to the highest setting

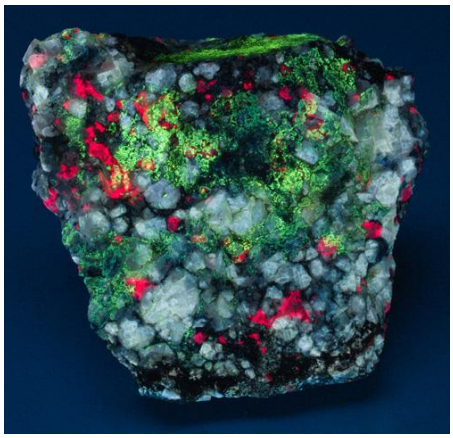
(usually), or “cloudy” (but even better – get a camera that produces RAW files). The white balance is probably the best tool used to get rid of the dreaded “blue bleed” (other than adequate UV lighting).

F-Stop – If you can set this, play around with it. Each lens has a “sweet spot” – mine works best around f11. I prefer to get the most depth of field I can so the whole rock is in focus. Remember, the smaller your aperture, the longer your exposure.

Filters – I use a high quality UV filter. Some camera lenses will fluoresce upon exposure to UV causing foggy/blue cast pictures. A good UV filter prevents this (just make sure the UV filter does not fluoresce – some do).

UV Lighting – Take a look at a white light photographer’s studio; it’s filled with lighting. We need the same thing – the more lights, the brighter your subject. Of course placement matters, and can be difficult. But I generally go for overkill in lighting. I also find the brighter the UV light, the less “blue bleed”. Bright UV causes a bright fluorescence and the camera doesn’t have to leave its shutter open for very long – less visible blue gets in.

Today’s shortwave lights almost all have Hoya U-325c filters; the best in the industry. They transmit the maximum UV while minimizing the visible blue bleed. Longwave lights are a different story – perhaps the most common is the blacklight BLB (the blue fluorescent lights used to light up psychedelic posters). These are not satisfactory for taking LW photos; they simply put out too much blue light. I use 365nm LEDs from Nichia for my LW pics. Others use lighting with Hoya filters or wood’s glass filters.



Some people use a handheld UV lamp to “paint” the rock with light. Often a large rock cannot be illuminated sufficiently with a small hand lamp so the lamp is waved over the rock while the camera shutter is open, painting every nook and cranny with UV light, insuring a full exposure. Obviously this takes a little experimentation and great care to not move/bump the specimen or the camera.

I shoot a lot of rocks for my Ebay postings. I have a light cabinet with UV lights surrounding the specimen, and enclosed on all sides. Thus I don’t have to seal myself inside a dark room. Some folks commandeer bedrooms with darkout curtains, or even bathrooms with no windows. I know one person who uses the toilet seat cover as the base for his specimens; it produces a subtle dark blue background – very pleasing (but I bet he cleans it real good before each photo sesseion).

Shooting RAW – I mentioned this above, but it deserves its own bullet. RAW allows you to “develop” the picture in software by adjusting brightness, saturation, white balance, etc until the resulting image matches your specimen to the best of your ability. Most cameras have special software that allows you to develop their RAW files. Photoshop and Photoshop Elements both support RAW files. If you want total control over your image, and the most exacting match to reality, RAW is the way to go.

Monitor Adjustment – Figure out some way to calibrate the brightness, contrast, and color on your monitor. There are web sites that help you do this (http://www.lagom.nl/lcd-test/) to a degree (not the best way to do it, but better than nothing) and there are hardware solutions for perfect results (I use the Spyder line of products for screen calibration).

If you take pics with a monitor that is adjusted too dim, the resulting pics will be overexposed, and vice versa for monitors set too bright. You have no control how your viewer will adjust his/her monitor, but you can at least make sure yours is adjusted properly. If you intend to print/publish the images, color matching is critical and you should probably invest in some calibration hardware.

Cleanliness – dust and lint are our enemies. White light photographers don't have to worry about tiny hairs and dust, but under UV light they glow bright blue and ruin a photo. Wash your specimen, brush it, or blow it off – but clean it up for a more professional pic. And make sure you have a brush handy to brush away the crumbs from the previous specimen.

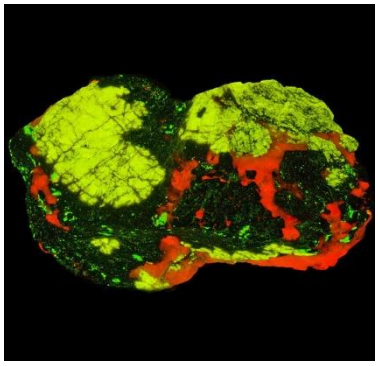
Phosphorescent pics – not as hard as it seems. I set my f-stop to f3.5, my iso to 800, and work out the timing of clicking the shutter and turning off my UV lights. The resulting pic is usually grainy, but gives a good representation of the phosphorescence. A DSLR usually has a delayed shutter/mirror lockup that allows you to adjust your timing based on the noises coming from the camera – play around with it; not really as hard as you might think.

Backgrounds – I prefer a black background. I have seen folks use bright fluorescent backgrounds (hate 'em) and dimly fluorescent backgrounds (can be very nice). Some black construction paper will have a dull fluorescence and can make an interesting background. I have shot on brushed aluminum to get a reflection of the piece with interesting results. But in the end, I always come back to the solid black background.

HDR – High Dynamic Range – Some newer cameras (and even phones) have HDR where the camera will take several images and average them together to even out the over-exposed spots and the dim spots. Very helpful, but I prefer doing this manually for best results (I take several photos at different exposures and merge them together in Photoshop – the only way to accurately show esperite mixed with willemite/calcite). Obviously requires some Photoshop skills.

Photoshop – This bears mentioning. PS is a tool to help you match your picture to reality as best you can. You must be very careful not to exaggerate or change the image. Just make sure it's real.

Hard rocks – not the café! Some specimens are a lot harder than others. The classic "hard piece" is calcite/willemite/esperite/hardystonite as already mentioned – but any piece that has a couple of bright minerals along with a dim one will be difficult. Usually the best approach is to shoot a couple of images – one exposed for the bright minerals and the other exposed for the dim minerals (HDR or manual HDR). But you may not have photoshop, or a camera that takes HDR pics. In that case your best bet is to expose the bright minerals properly and "explain" the dimmer minerals. Note that many of the newer smartphones have built in HDR and with a little work can be prodded into taking a half-way decent pic.



There are many more things to worry about with fluorescent mineral photography – beyond the scope of this quick and dirty "how to". Thermal considerations for your camera, CCD noise, iso and highlight recovery, many different software packages that will make your job easier. Dig in and do some Googling – you never know what you might learn!

Common Fluorescent Mineral Photography Problems

I scanned Ebay recently to get an idea of the current "state-of-the-art" for fluorescent photography. Ebay is perhaps the biggest showcase for our minerals and has an ever changing photo gallery attempting to peddle these rocks. Images have slowly improved over the years as people learn how to use their cameras, and camera design has improved. Many folks have invested in higher-end cameras capable of capturing our complex subject material somewhat automatically.

But there are still many folks out there who have point-and-click cameras which might be better to "point-and-dump", or folks who just don't have the knowledge to take a reasonable photo. I'm not talking about a good photo – that's a skill which needs to be worked on, probably requires a higher-end camera than most will have. I'm talking about reasonable; taking a photo which is in focus, exposed properly, and somewhat suggestive of the real world. My goal here is to show photos with problems that can probably be addressed if the photographer follows some of the advice in this document.

For starters: ***Compare your photograph to the actual specimen***. Once you take a photo, look at it. Does it really look like the rock under your UV light? If not, adjust your camera settings and take another picture! I know it's probably difficult to see the details on the little viewscreen on the camera but most have the ability to zoom in to particular areas on the photo. Or – take the time to load the image into your computer and view it on your monitor. Then go back and adjust the exposure to get a better image. Do this a few times and you'll get a feel for the proper settings. I am continuously amazed at the number of folks who post a picture on Ebay that looks nothing like the rock they are trying to sell.

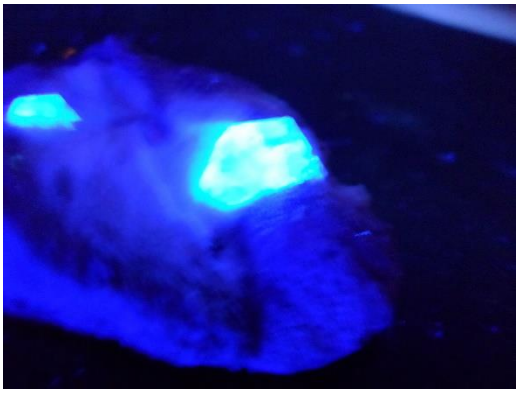
Problem Photos

These are examples of common problems. They are not listed to criticize, but to educate.

Manganocalcite – China

Dirty, fluorescent background - In this image the photographer has captured a beautiful piece of manganocalcite. If anything, it may be slightly under-exposed – or possibly shot with a longwave light (manganocalcite fluoresces best under MW but folks from China (the seller here) often only have LW). But look at the background! Not sure if that's a piece of fluorescent rug, or just lint and dust. Solution: A simple brush would help this picture immensely. Better yet, a piece of black construction paper as a background which can be picked up and dusted off occasionally. I would also recommend shooting many calcites such as this using MW lamps.

Benetoite Crystal - California

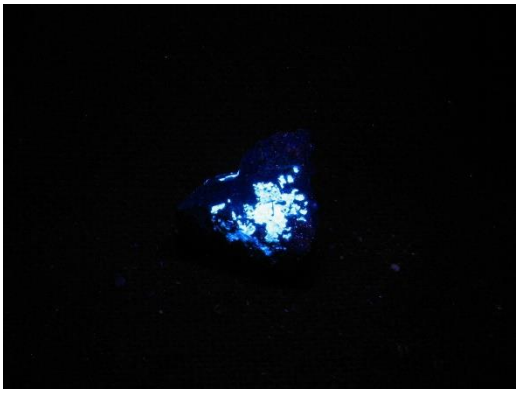


Blur, focus, blue bleed – You can hardly tell that this is a beautiful benetoite crystal. Benetoite is a brightly fluorescing mineral, usually on a white non-fluorescent matrix. In this picture it appears to me that the photographer committed at least two cardinal sins: the camera moved during the long time-exposure causing blur, and the picture is very over-exposed, turning the crystal to a white/light blue blob (most likely the camera was set to auto for this shot). The non-fluorescent matrix seems to fluoresce blue due to this overexposure. Solution(s): #1 - use a tripod, #2 - see sections on auto and time exposures, #3 - the focus may be off but too hard to tell given the poor photo. The blue haze will become significantly less objectionable with a proper exposure, and adjusting the white balance will further reduce it.

Manganocalcite – China

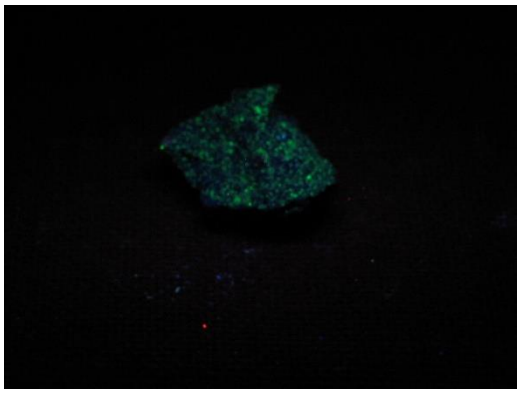
Overexposed – On this calcite the texture in the photo is non-existent. It is just a pink blob with a few areas starting to turn white from the overexposure. Dial down the exposure seconds, or adjust the auto-exposure ("+/-") down several notches. The blue background looks interesting to me – wonder how they did that? It's possible that this was an LED flashlight given the shadow and just a hugely overexposed photo.

Scheelite – Trumbell, CT



Composition, exposure – The photographer here apparently understood that he had to be a couple of feet away from the subject for his camera to properly focus. But he either didn't, or was not able to, zoom into the subject so that it filled the viewfinder. If the camera was set to take a large, high quality image, the photo could have been cropped to show only the specimen at a reasonable size. Additionally, scheelite is a very bright mineral and is overexposed in this photo, with areas simply a blob of white with no texture at all. Lower exposure times, decrease exposure compensation, or move the UV light further away to get a better exposure.

Willemite – Balmat, NY



Composition, exposure, monitor adjustment? – Aside from composition and exposure issues as discussed in the prior examples, this photo exhibits what I believe could be the result of a misadjusted computer monitor. All of the photos from this seller are underexposed – to a point where some of them are hardly visible. It's possible that he looked at them locally on his computer and because the brightness on his monitor was cranked way up they looked just fine. But when viewed on a monitor that is set normally they are way too dim. (Interesting note: if you're reading this and the specimen above looks normally bright to you and all the other specimens in this document look too bright, then maybe your monitor is set too bright! Mine is calibrated using a special piece of hardware (https://www.youtube.com/watch?v=H5pDyKsDPUA) so I know the settings are correct.)

Sodalite – Greenland

Slightly overexposed – This is subject material I know too well. I only include it here to show some fine points. Sodalite is not bright yellow as this photo shows; it is a yellow/orange. Note how the overexposed yellow spots lack any definition; this is simply due to a small amount of overexposure. If the photographer had reduced the time exposure just a little (or the exposure compensation) this would have been an almost perfect shot. Don't accept photos which have spots with no "intelligence" in them – spots that are just a solid color; things like that rarely occur in nature.

Why You *Need* A Tripod!

9 Great Reasons For Putting 3 Legs Under Your Camera

(Courtesy of Tiffen: http://www.tiffen.com/tripod_why_buy.html)

The tripod has been hailed as the greatest photographic accessory ever invented, and with good reason. Of course, the basic concept of the tripod predates the invention of photography by at least a few thousand years, and artists, soldiers, seamen, astronomers, surveyors, and many others have employed tripods for a variety of purposes over the ages. The photographic tripod dates back to the dawn of the photographic era around 1840, when wooden versions of the artist's tripod used with the *camera obscura* were pressed into service with the ponderous Daguerreotype cameras of the day. Up until the 1880s, with the invention of more sensitive silver-halide plates and flexible roll film, hardly any pictures were ever taken *without* using a tripod—given the low sensitivity (ISO 1-3) of the older glass plates, taking sharp pictures handheld was virtually impossible.

Obviously, photography has come a long way since the first photographic tripod with a standard 1/4x20 mounting screw was introduced around 1880, but the tripod is as essential today as it was back then. Indeed, virtually any professional photographer worth his or her salt owns and uses a number of tripods, and many leading pros shoot the vast majority of their images with a tripod-mounted camera. The reason is simple: Keeping the camera as steady as possible during the exposure is still the simplest, surest, and most direct way to ensure outstanding picture quality.

While everybody knows that a sturdy tripod will help you get sharp pictures when you have to (or want to) shoot at slow shutter speeds, and provides a handy perch for composing landscapes or portraits, the extreme versatility of these not-so-simple three-legged devices is vastly underappreciated by most photographers. To give you a better idea of what a tripod can do for you, and why no serious photographer should have fewer than two, here's a handy compendium of tripod capabilities and uses. It's guaranteed to give you a better appreciation of why good tripod can play a lot more than a supporting role in your photography.

1. **Enhancing sharpness**: A sturdy, stable tripod that's properly set up will get you sharper pictures every time. Comparison tests prove that even at fast shutter speeds in the 1/250-1/1000 sec range, images shot using a tripod are measurably sharper than those taken handheld. The rule of thumb, based on 35mm-equivalent focal lengths, is that the slowest hand-holdable shutter speed is one over the focal length of the lens—that is, 1/200 sec with a 200mm lens. However this rule only works up to a given print size—approximately 8x10 inches. If you make larger prints, you'll need to use a faster shutter speed, or, better yet, a tripod. The optical image stabilization systems built into many late model digital cameras yield sharper handheld images at slower shutter speeds than the rule recommends, but when you're shooting at long telephoto focal lengths and/or making prints of 11x14 and larger, there's still no substitute for a good tripod.

2. **Enhancing depth of field**: To achieve maximum depth of field—an image that's critically sharp from foreground to background—you must shoot at a relatively small aperture, generally in the f/11 to f/32 range. And to maintain high image quality, it's best to shoot at ISO 100 to 400. In most cases, unless you're shooting in brilliant sunshine, this means that you or your camera will select a relatively slow shutter speed in order to provide a proper exposure. The inevitable conclusion: If you require extreme depth of field for pictorial or artistic effects, set your camera on Manual or A (aperture-priority) mode, select a small aperture, and use a tripod.

3. **Enhancing capture quality**: For reasons alluded to above, a tripod will allow you to set a lower ISO when taking picture under any lighting conditions because you can shoot sharp pictures at slower shutter speeds. Most digital cameras deliver optimum image quality with less "digital grain," aliasing, artifacts, etc. when you set the ISO to 100 or 200.

4. **Enhancing framing precision**: A tripod is the supreme image-control device, allowing you to compose the picture perfectly using its panning (lateral rotation) tilting (vertical swing) and center post height adjustments. Many tripods also provide grounder capability for extreme low-angle shooting, and levels on the yoke and/or head platform to aid precise composition and minimize keystoning and other types of linear distortion. Using a tripod is also the only convenient way of shooting multiple frames exactly the same picture at different exposure settings, allowing you to choose the rendition you prefer in terms of tonal range, depth of field, etc.

5. **Extending your focal-length range**: The longer the focal length of your lens or the focal length setting of your zoom lens, the higher the magnification of the image on the sensor or film. That's why the image-blurring effects of even a slight amount of camera shake will be amplified at longer focal lengths. Yes, enabling your camera's image-stabilization systems and shooting at higher shutter speeds can certainly help, but if you often shoot at equivalent focal lengths of 300mm and above, you should be using a sturdy medium-sized or larger tripod, preferably with the center post in its lowest position or extended only minimally for maximum stability. Candidates for hefty tripods used with long lenses include nature photographers, bird photographers, sports photographers and surveillance photographers.

6. **Extending your photographic range**: The number of subject types and situations where a tripod is essential or highly beneficial is virtually limitless, but here are a few you might consider: Night photography, shooting time exposures, getting yourself into the picture using the self-timer, remote photography of a pre-planned subject, view, or location, macro photography at high magnifications, architectural and astrophotography, scientific, testing, nature, and identification photography where repeatability is required, time-lapse photography, panoramic photography and of course action photography when you want to blur the background by panning the camera.

7. **Enhancing your videos and movies**: There's no substitute for a tripod with a fluid head in achieving smooth panning and tilting when shooting videos and movies. Even moderately priced video tripods with fluid-effect heads instead of true fluid heads are a big help in achieving smooth looking pans that give your videos a professional touch. Serious amateurs and pros will opt for true fluid heads that can actually adjust the degree of damping action, not just the amount of friction on the movement. Even if you don't use a tripod with a fluid head, it's a good idea to mount your digital camera or camcorder on a tripod whenever you can—your results will look far less jerky than using a handheld camera, and you can even mount your tripod on a dolly to achieve true Hollywood-effect dolly shots, which often look a lot more realistic than zooming in or out with your lens.

8. **Enhancing your creative expression**: How can a tripod possibly enhance your creativity? Basically by forcing you to slow down, giving you time to think about creating a photograph and expressing your ideas, as opposed to grabbing snapshots of the passing scene. This is not to denigrate either snapshooters or photojournalists who have certainly produced timeless images of life on the move, but there is also something to be said for taking the contemplative approach, carefully considering everything in the frame before pressing the shutter release. Yes, there are some geniuses that can consistently capture decisive moments on the fly, but most shooters find their photography improves both technically and esthetically when they use a tripod. Try it—we guarantee you'll be pleasantly surprised.

9. Extending shooting flexibility: Tripods have many uses besides holding a camera. They can be pressed into service as light stands, to hold flash units, slaves, and reflectors, or (when fitted with suitable hooks, platforms, or baskets) to hold and protect delicate equipment. We've even heard of one intrepid wildlife photographer who used his heavy-duty tripod with spiked leg tips to fend off a bear!