

# BN News - Lights of the Heavens

The sun is well below the crest and the bats are just beginning their nighttime foraging. In the dusk light they are silhouetted as they dart about, chasing those unfortunate insects to be flying about as well. To the southeast the first star of the night appears. It's not really a star, but rather the planet Venus. On the slight grade of the hill below our cabin a large, wool army blanket is spread out. There are coals in the fire, glowing that perfect red for roasting marshmallows. The graham crackers are laid out and next to them, bars of Hershey chocolate lay unwrapped in their foil and the bent coat hangers are at the ready. The glow in the west is but a rumor as the last S'mores are created and we nestle down on the blanket. At nine thousand feet up in the Sierra on a clear summer night, the heavenly lights are so bright, their twinkles so furious you almost need sunglasses to stare up at them. They are so bright, you can get about easily without a flashlight. Like we'd done so many times before and as I would pass along to my own boys, we settle in for a night of star gazing in Mammoth.

Once upon a time I knew, or could remember all the names for those heavenly bodies. Thanks to my father, an Air Force navigator in WWII/Korea who had to know the stars because that's how they navigated back then, shared all he knew. He would happily pass along his vast knowledge of stars, formations as we laid on the blanket, staring up at the sky. We spent hours on the blanket, watching the stars (making S'mores worked its way in there as well). Back then, satellite watching was a big past time as well, the cold war and the like. We'd even see a U2 on occasion pass overhead.

In high school I backpacked with another

wise gentleman, a native American who passed along a whole other world based on the stars, a very story-rich romantic one. The stars took on a whole other presence with that rich heritage of an earthy culture, echoing in my thoughts as I stare upward at night. I can still get around

by looking at the stars and I remember only a handful of the constellations and stories, but my vast knowledge of the heavens of the past has faded away. But the passion for the stars instilled in me and all of us back then has never faded. Every night when I walk the dogs I look up and in the bright glow of those stars you can see the smile come across my face. I gotta have my stars!

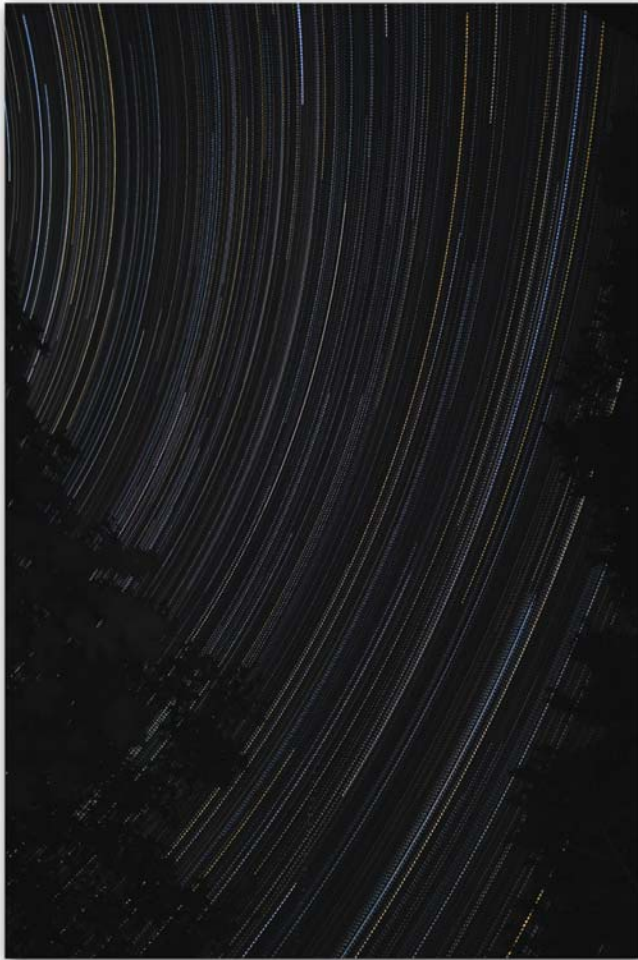
Then came photography and naturally, star trails. I never got into telescopes and true astro photography (but I really love looking at those images). Rather, just throwing a camera out during the night at locales to record the night sky has always worked for me. With film it was really easy, f8 and 4 hours and voila, a photo was created. And for over 20yrs, that worked perfectly. Then came digital and dark current noise. As we all know,

in a very short time, you have enough noise to make up your own, new star constellations in all sorts of shades of red, green and blue (affectionately known as Christmas lights). So for a time, I stopped capturing star trails.

It was about a year ago that my good friend Roger mentioned taking a whole lot of short burst images, combining them to capture star trails in digital. Roger & I weren't the only ones trying to find an answer to this old quest; others too were working on the problem. I'm so happy to report that we've worked out the bugs, solved the problems to where we can take star trails anytime we want, anywhere we want with digital. That old passion

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has a new home in the digital age. Capturing noiseless star trails with digital is more than doable. It might require the stacking of 200 images, but it can be done. Here's how we're doing it.

### Exposing them Pixels – Personal Comfort

In the old days, all you had to do to create a star trail was just throw the camera out there with a mechanical cable release, 1 shot of film on the role, make sure the aperture was set at f8 and the camera at bulb and you were done. Digital does bring a few more chores to the checklist to successfully create a star trail. Heading out cold turkey will net you zip; I speak from experience. I want your first attempt and all following to be successful, so let's start you out on the right foot, right from the start.

The first essential element to take into consideration and make sure all is happy is you! Most great star trails are done away from any creature comforts so you need to be comfortable to make the great shot. Why? When you're not comfortable, you're wiggly, anxious and generally get bored too fast so you shorten the exposure time (great reason to do star trails with a friend). What are the essentials for you?

The first thing I recommend is good shoes. No, not good shoes, warm shoes! Feet getting cold, sitting or standing around waiting for four hours or longer makes a huge difference. If you don't have warm

shoes, then get electric socks or place hand warmers in your socks. Folks tend to dance about when their feet are cold, that's not a good thing.

Once you have your feet warm, next comes the hands. You need your hands working, especially able to push very small buttons, which they can't do if they're cold. Why is this so darn important? The best star trails are in the winter because of the length of the nighttime hours. Yeah, there are star trails to be made during the summer, but winter skies are the most spectacular. Winter nights in the northern hemisphere typically are cold and that's a good thing for star trails, but not for the photographer.

Making sure you're bundled up warm is just as important as keeping feet and hands warm. Dressing in layers, being able to ventilate when you're setting up and all warm and then buttoning up when you're holding still and getting chilled is important. This is essential for you and your camera gear. When dressing, think about how and where you can stash needed items for shooting. For example, you'll more than likely have a spare battery with you. You'll want to keep it warm just to make things work a little faster. (I'll explain the need for the 2<sup>nd</sup> battery in a moment.)

How about taking along a thermos of something warm to drink? That can be a great idea! It can warm up your insides and with the right mug, your hands as well. The trick though is that whatever you take in, you have to be able to let out. Not every locale lends itself to this so take that into consideration before you take along a thermos.

What about staying in your car during the exposure? That's a great thing to do if you can. You can have a blanket around you to stay warm. You can even take a nap if you have an alarm clock to wake you up before the end of the exposure / sunrise. But why is all of this important? When you get cold and you're bored, you wiggle. When you wiggle you either knock your tripod/camera, which messes up your trails or you leave early. This brings us to what's required to make the exposure itself.

### Exposing them Pixels – Camera Gear

Any digital camera can make star trails. Certain cameras though make the process of both capturing the trail and the post processing much easier. Certain accessories as well make it all just that much easier to be successful. You can go as simple or spend as much money as you want and still come back with a star trail. The only real decision is how many hoops you want to jump through and how much fun you're after. Here are some thoughts on gear that I've found makes it all quite rewarding.

I prefer the D2X and D200 for star trails. Now your first thought to camera body selection is probably considering potential noise problems. The system we use now to create star trails is designed around not worrying about noise. Attempting to make a star trail with digital in the traditional way of one long exposure will produce tons of noise. We're not going to do this in the traditional way. Is that to say there is no noise in an individual, single capture during a digital star trail capture? Nope, there







is noise. But when you have the finished image as you'll see, the noise has been at the very least minimized if not entirely eliminated. So body consideration for me at least comes down to two factors, ease of use in the dark and battery consumption.

The D2X and the D200 have different native power limits. The D2X can easily make a 4hr exposure with its internal battery. The D200 on the other hand is maxing out with a 90min exposure on its internal battery. There is a direct relationship between the operating time of the camera and the length of the star trail. During the total time of a star trail your camera is on-active, never shutting down, eating up battery power. The total time the camera can stay on, the longer the star trail will be in your final image. So battery power is a huge consideration in camera body selection.

You might be wondering if we've been limited to these short operating times. We've successfully greatly extended these times using the Digital Camera Battery (<http://www.digitalcamerabattery.com>). I've had one since the D1 days and with their DCB6129 cable it works perfectly with the D2X/D2Xs/D2H/D2Hs/D200. The D2X operational time is extended to 7+ hours and the D200 to 4+hours with the 40watt DCB connected to them. Generally I run the D2X off its internal battery and the D200 runs off its internal battery in addition to the DCB. I've been tempted to get the DCB 80watt battery for work during winter solstice when we have over 12hrs of darkness, which in theory should double my operating

time. So my basic setup is the camera body with its own battery with the DCB plugged in. This combo has worked flawlessly from day one. (I highly recommend testing operational time prior to actually going out and shooting. You do that by simply turning the camera on and letting it make all the exposures it can with one battery charge.) Once you have a body in mind and a power source secured, it's time to think about lenses.

Personally I have found that there are three lenses I use over and over again, the 10.5, the 28f1.4 and the 17-55f2.8AF. Lens requirements are not really exacting. You need a lens that is at least f2.8, if not faster. The lens you select (and body for that matter) must be able to manual focus. That's to say, you can turn off the autofocus. That's it. I would suggest you have a lens that has some wide angle view with 50mm being really too narrow for most star trails.

The vast majority of the time I use the 28f1.4AF for trails. My preference comes from the angle of view of the lens and its amazing sharpness at 1.4. You might be wondering how sharpness cannot be a slam dunk when you're focusing at infinity no matter the lens. You're focusing on point light sources, stars, and the sharper the lens wide open the cleaner the star trails. Yeah, we are splitting hairs here, but if you're going to go through the trouble of doing all of this, you might as well get real picky.

The 10.5 and 17-55f2.8 are sharp too, but they don't close down to f1.4 and are wider than





the 28mm. Just like every aspect of photography, lens selection is a personal choice when it comes to star trails. As you'll see star trails are often more than just the stars, streaking across the frame. Those other elements that you incorporate require the proper lens selection just like any other facet of photography. When it comes to just the star trail, any lens that is f2.8 has you at the ready. Add anything else to the image and lens selection gets specific.

The tripod and tripod head are essential gear. That's pretty obvious. What might not be as obvious because it's not how we normally shoot, the tripod/head must be able to be locked down tight, not a smidgen of wiggle. In order for our technique to work, the camera must make a whole bunch of "pin registered exposures. Your normal tripod/tripod head might not meet this criterion so check them out very carefully.

A timer is essential. Yes, you could do it manually with a standard electronic cable release and a stop watch but man, that's brutal! I use the MC-36, which works killer for star trails. The MC-36 permits you to set Delay, Duration (LONG) and Interval (INTVL), which are the three essential settings for digital star trails. You might be saying to yourself that the D2x and D200 have a built-in intervalometer so why buy the expensive MC-36 (and it is pricey)? The D200 is missing the ability to set the Duration part of the intervalometer equation and the D2X

built in intervalometer does not permit timing fine tuning enough for this process. Yeah, you can get started with these, but you'll quickly find that an

external timer is the best way to go.

A level is an essential piece of equipment. Quite often we set up after the sun has gone down so we're looking through the viewfinder and trying to level the camera in total darkness. A level in the hot shoe makes this process a whole lot faster and more accurate.

You'll find a spare battery essential. You won't be changing batteries during the exposure, but rather, you'll need the battery when you're all done for the dark frame. At the same time, you need the lens cap for the lens in use for this same purpose. So don't leave it behind in your camera bag.

The last two things you might need is a flashlight and compass. Both are for finding your way in the dark. After that, it's just a matter of putting it all into use.

### **Making the Exposures**

Here's the goal, make star trails with digital capture. The problem with this is a single, long digital exposure has so much noise that you'll never see the star trails. We need a minimum of an hour exposure to have the beginnings of a decent trail. Get past 30secs with some digital cameras and you have a major noise issue. If that's the case, what's the solution? Lots of short duration exposures that when all combined, create a star trail. While this might sound like an overwhelming photo task, it's not by any stretch. In fact, I'm going to provide you with all the numbers so it's quite simple.

Here it is, ISO 100 or 200, f/stop of 1.4 – 4 and a minimum exposure time of 1 hour total. Set your Mc-36





to Delay=0, LONG=4min, INTVL=1sec and you're all done. The technical side of making the exposures is just that simple. The images you are seeing here were taken with these settings except where noted.

You're probably saying to yourself, "There must be more to it than just this." For making the actual exposures, there isn't. I've already done all the testing so you avoid the Morse code look to your trails. You'll have exposures with this formula that capture the trails as well as the mood of the sky that night. This recipe will garnish you one cool star trail. Will it be great? More than likely it won't be a really cool trail, but rather just a trail.

I highly recommend you start your star trail adventure right at your own home. I realize that most folks don't have the night sky that I enjoy each night because of light pollution. That's OK because you're just testing, getting all the bugs worked out of the system so when you head to that truly special locale, you're good to go. There actually are a couple of other technical things you need to do besides just programming your MC-36 when it comes to making the exposure.

Before I head out the door and have to work in the dark, certain settings are made on the camera. The camera body is set to Bulb. The CF card is cleaned off to hold as many captures as possible. The autofocus is turned off and the lens is focused to infinity. The battery is charged and the MC-36 is connected to the 10pin socket. Once I'm on site, the tripod is set up securely. This means taking the tripod and shaking it so it firmly settles into the dirt. You don't want it perched on a stone that it slides off during the trails, messing up the night's efforts. I hang the DCB from the BH-55 ball head, which adds just a touch of weight to the whole thing. Finally, a level is in the hot shoe.

The quantity of captures you make in a given evening is up to you & the battery. The minimum number is up to you. The maximum is up to your batteries. When you're testing at home, you can actually plug in an AC power supply like the EH-6, which permits limitless operating time (which is what I did in the beginning). The one problem is there are few if any AC outlets out where we traditionally do star trails. The biggest number of captures I've done to date is 463 with the D2X and it produced one heck of a star trail. The minimum I capture is 60, which produces a nice arc.

The basic night's shooting goes like this. You set up your tripod, making sure it's securely set up. You attach the camera, leveling the horizon if it's called for. Double check that the camera is set to Bulb, file format to Raw +Jpeg (Raw at the very least), autofocus is turned off and lens is at infinity, press the button on the MC-36, step back and let the thing rip. Once you have finished the session you take one last frame with the lens cap on the camera. If you have battery power left then just let the MC-36 take one more exposure. If you're out of power, insert the spare battery and then let the MC-36 take the dark frame. You're done!

Once you have the basics done, equipment and operator all up to speed, testing at home accomplished, it's time to put the fine touches on your trails. Here's some

aspects of star trails to take into consideration when you head out from home.

### **The Aesthetics of Star Trails**

While you can take what I've provided, place the camera anywhere and point it anywhere and come back with star trails, you can be more creative. Being creative takes a little planning, which requires some basic knowledge of the heavens. There are two predominant natural features you should take into consideration, the stars and the moon.

The stars, what is there to take into consideration there? Having them of course is one of them, but more importantly, is where they are in the sky. The most common star trail is the circular paths in the sky. That is accomplished by pointing your camera towards the North Star. Where is the North Star? The most obvious answer is in the north, but that might not help you find it. Many say it's the brightest star in the sky, but I don't think you can make that distinction if you're in a middle of the desert with the heavens ablaze.

A simple compass is a simple and effective start to finding north and the North Star. Once you're pointing in the right direction then you want to find the Big Dipper (which isn't always up) and locate the two stars that make up the end of the "cup." You're going to take those two stars and make a line with them and extend that line up into the heavens to the north where you'll find the North Star.

There are lots and lots of ways of navigating the heavens. One of the coolest and handiest is a program called Planetarium (<http://www.aho.ch/pilotplanets/>) which works in your Palm. You can take this right out in the field and hold it overhead and see on the display the star and constellations you're seeing in the sky. Doing a simple Google search Star Maps will bring up a lot more options so you can find the one that works best for you. As you'll see in a moment, I use Planetarium a lot so it's my favorite because it will work anywhere in the world. Since the iQue (Palm) is always with me, I always have the info I need.

Ok, so you know where the North Star is, do you always need to point at the North Star? Heck no, you can point anywhere you want. What changes when you do that are the arcs of the star trails. If you want circular trails then the North Star (in the northern hemisphere) is your only option. As you move away from a northern direction towards the south, you change the arc of the trails. Depending on the direction you point the lens and the time of year (the earth's tilt changes from winter to summer) you will capture different trails. It's kinda cool to do a trail in the dead of winter and then the same locale the dead of summer and visually see how our path of travel has changed visually in the stars. Because based on what other elements you want to include in your star trail might affect where you point the camera.

A good example is the photo taken at the Alabama Hills. I wanted to include the "hills" so I first framed the photo accordingly and then light painted the hills with 10mil candlelight. Inclusion of the sky in the photo was pretty much predetermined by where I





stood and where the hills were located. Using a 10.5 lens I was able to bring in a little of the northern arc.

In this example I introduced an additional light to the scene, a flashlight on steroids. This is a very cool and fun thing to do. The way I do it is to do the light painting frames first. I do this because I want to preview the lighting on the camera's monitor. Pushing the monitor button is enough camera movement to jar the camera and therefore mess up star trails. By doing all your testing first, the first frame or two of the trail are the light painting so the rest of the captures can be done without touching the camera.

When it comes to adding additional light to the image, don't forget that giant reflector, the moon! The moon can work magic when it comes to lighting the scene. At the same time, the moon is the monster of all light pollution for recording stars. Look at the two photos here of the same scene, one taken at new moon and the other taken at full moon. There's a huge difference in the amount of trails you see. At the same time, the pines in the full moon photo look like they were taken in daylight except they have no shadows. Take a look at the photo captured at Mono Lake. The moon, which is rising in the east actually looks like the sun. It kinda plays mind tricks if included like I did. That's the fun of it all, there really are no rules. You just go for it!

How do you know the phases of the moon? Planetarium tells and shows you the time and place the moon will rise. I like the program Moonrise (<http://www.iserv.net/~bsidell/moonrise.htm>) which I have on my notebook. What I like about Moonrise is that I can quickly and easily determine when and where and how big the moon will be anywhere for any date. It makes planning the nights to go out shooting real simple. Moon phases and the rise and set of the moon is a very important aspect of star trails.

There is one rule that might be of assistance to you at some time. For anything to "appear" in a photograph, it must be present for at least 25% of the exposure time. If you have a 4sec exposure and the subject is in the frame for 1sec, it will start to register. It will look like a ghost. So, if you have a 4min exposure and you walk through the frame, unless you walk really slowly, you won't register. If you have something fly through your exposure like a bird or bat, it won't register. The photograph of moonrise over Mono Lake, a B2 bomber flew through the photo at 1000 feet off the deck. I wish it had registered! This brings up another aspect of star trails you might not think about.

One thing you might want to be aware of are commercial flights. At Mono Lake, if the planes are landing to the south in San



Francisco, you can shoot pointing to the north and not have the flights' blinking lights in your photograph. If on the other hand the flights are landing to the north, you'll have a highway of planes with their navigational lights in your photo. The only thing you can do about the problem is point your camera another direction.

What about satellites? Well, there's a darn good question to be honest with you. Yeah, you'll see lots of satellites going overhead while you make your exposures. The vast majority of them will never register. On the other hand, there are times when you get your final photo up on the monitor when there will be, to put it bluntly UFOs in your photo. I have a number of images where bright objects appear for 3-7 frames and then are gone. No, I don't think they are craft piloted by little green men, but I do know they are UFOs because to me they are unidentified flying objects. What they actually are I can't say, but I do have fun trying to figure it out!

With all of this, you have your images captured, how do you make them into a single photo star trail?







### Creating the Final Image

The idea of compiling 400 captures into one must be scaring the heck out of you. I have to admit, when I started this venture, I was wondering how I was going to make an action in Photoshop to deal with the task. Doing a little research and reading I was very happy to find that some folks have already done all the work for us. Really, the final step is a no-brainer.

There are three programs you can buy off the web that I can recommend to you. The most powerful, flexible, versatile and expensive one is Images Plus (<http://www.mlunsold.com>) \$149. This is really one powerful program that is on the scale of big time astrophotography and in fact, can take on that challenge. You will have to watch their tutorial videos to make the whole thing work. With some practice you will master the program and be able to incorporate it into your workflow. The one benefit of this program is you can work directly with your Raw files. No other program works directly from your Raw files.

The next program I can recommend to you is Image Stacker (<http://www.tawbaware.com/imgstack.htm>) \$17. This is a pretty cool program. You select all the images for a particular star trail, tell the program where to save the final image, select Image Blending Option (I prefer Stack most of the time) and then just click. When the program is done it will launch Photoshop and display the final image. Image Stacker works with just Tif or Jpeg files.

The program I use all the time is Startrails (<http://www.startrails.de/html/software.html>) and it's

FREE! Startrails is as simple and fast as you want while producing killer results. Typically, I'll tell Startrails to make a final image from the Jpegs just to see if I like the image. If I do, I then go into Capture NX, batch process the Nefs and save those to a file. I then point Startrails to that file and bang, I got an image. What is really cool about Startrails is it does the dark frame work for you. That final image you take with the lens cap attached is your dark frame. You simply tell Startrails what frame that is and then it subtracts out the NOISE captured on that dark frame from your star trails. That's how we eliminate the noise. It's so darn simple, it's hot!

And there you have it, how you create star trails with a digital camera. If you really get into this, because it is contagious, I recommend *A Guide to Astrophotography with digital SLR cameras* by Jerry Lodriguss (an eBook). It has a short section on "basic" star trails and a whole lot more about astrophotography. The point is, he's doing it all with a digital camera and making some spectacular images. For a long time, the one thing I said I really missed about switching to digital was the ability to do star trails. I'm so glad that the one thing I thought I had lost when I switched from conventional film is now back in my bag. There's many a night you'll find me with both the D2x and D200 on separate tripods with different lenses simultaneously working their magic. Their shutters will be opening and closing, the earth will spin and in the morning, I'll have two more images of the lights of the heavens.

