Shooting the Stars

Photographing Star Trails and the Milky Way

Shooting Stars as Points
Milky Way Photography

Caveat!

- Shooting stars as pinpoints is technically challenging for lens and camera
- Only recently, has the digital equipment become good enough for reasonable star shots (without a telescope or tracker)
- Common settings are
    - ISO 1600, f/2.0, 20 second exposure
    - Think about that for a minute.....

Shooting Stars as Points
Milky Way Photography

Composition

- Composition is still the most important thing! Pretty stars alone won't make a great image
- Smooth water reflects stars and provides a nice composition. Look for lakes and quiet streams
- Look for rocks, trees, buildings, etc that complement the angle of the Milky Way or help tell the story
- Look for streams that can lead the eye to the stars and mountains
- A bright moon will reduce the number of stars in your image, but no moon can make the foreground too dark. Four to eight days before and after the new moon is considered good
- Milky Way looks best when looking toward the South

Click to see Image 1

http://www.flickr.com/photos/jmaltzman/5066638819/

Canon 5DMII, Canon 24mm f/1.4L, 24mm, 20 seconds at f/1.4, ISO 800

Canon 50D, Canon 24mm f/1.4L, 24mm, 10 seconds at f/2.0, ISO 3200

Shooting Stars as Points
Milky Way Photography

Settings

- Rule of Thumb: 500/FL(eff) = Max shutter speed to capture stars as points. 400/FL(eff) is better. Example:
  - 500 / 24mm = 21 seconds max. 17 secs is better
  - On Canon crop sensor, max becomes 13 secs!
- The wider the lens the better (more sky, longer shutter speed)
- The faster the lens the better (more stars during that maximum shutter speed)
- Watch out for Coma Flare (Angel Wings). Stop down 1 stop on very fast lenses. ie, f/2.0 on f/1.4 lens

Coma Flare

Canon 24mm f/1.4L at f/1.4

Shooting Stars as Points
Milky Way Photography

Settings (cont)

- The higher the ISO the better (but watch out for noise. Know your camera's limitations). You will need 800 – 3200 or more
- Turn ON your camera's Noise Reduction (LENR) setting. This will take a second, “dark” frame to reduce noise in the final image
- Shoot in RAW so you can correct White Balance in post-processing
- Use White Balance of 2500 – 3000K if sky looks brown or if you see the yellow glow of sodium lights on the horizon. Can always change later if shooting RAW
- Turn OFF Image Stabilization (IS or VR)
- Manual Focus

Shooting Stars as Points
Milky Way Photography

Technique

- Solid tripod and cable release (or use Timer Delay). Live View gives you Mirror Lock Up as well. Shield tripod from wind if necessary
- Need very dark skies, with few, if any clouds. Use the Dark Sky Finder (link in back)
- Take longer exposure / lower ISO image from same spot to capture your foreground with more light / less noise for blending in PP or use light painting
- Use your histogram to insure your lighter foreground picture is properly exposed. The LCD will fool you at night. Turn brightness down on LCD

Shooting Stars as Points
Milky Way Photography

Technique (cont)

- Focus on infinity or at hyperfocal distance if you have a foreground that is close. Focus during the day, or know where hyperfocal distance and infinity are on your lens at the FL you are using.
- Use your LCD to check focus. You can also use a flashlight on your foreground and check focus using Live View
- Keep spare batteries in your pockets to keep them warm prior to use

Shooting Stars as Points
Milky Way Photography

Post Processing

- Correct for white balance to give blue sky (if desired). Typically, this means lowering the color temperature to 2500-3000K to correct for sodium lights
- Use noise reduction in LR3, ACR, or 3rd party solutions like Noise Ninja to help with high ISO noise
- Lighten up foreground or blend in a low-noise, lighter image in Photoshop to get lighter, low noise foreground. Do this AFTER you use noise reduction on Milky Way

Shooting Stars as Points
Milky Way Photography

Tradeoffs:

- Lens aperture versus ISO: Cost vs Noise
- ISO versus Exposure time: Noise vs “smear”
- Focal Length versus Exposure time: Cost vs “smear” with Compositional considerations

Shooting Star Trails

Composition

- Composition is still the most important thing. Pretty star trails won't save a weak composition
- Smooth water reflects stars and provides a nice composition. Look for lakes and quiet streams
- Stars appear to rotate around Polaris (North Star) which is in the north at approximately the same angle up as your degrees in latitude. Photographs that include Polaris will have circles around it. To the east or west of Polaris the trails will be arcs, and to the south they will be more like horizontal streaks. The further away from Polaris, the longer the trails will be for a particular length of time
- Look for shapes that will complement the circles and arcs

Click to see Image 2

http://www.flickr.com/photos/steventheamusing/3908091692/

Click to see Image 3

http://www.flickr.com/photos/dylanmacmaster/4477702343/

6 shots at 10 minutes each.17mm, f/4.0

Shooting Star Trails

Settings

- Total time can be anywhere from 30 minutes to several hours.
- You can either do 1 long exposure, or combine several shorter exposures in Photoshop or other software
    - Long exposure prone to digital noise and battery fail
    - Stacking multiple, shorter exposures takes time
- Digital noise increases with time and temperature. Stay under 15 minutes if possible. 10 minutes is better. Warm temps may require even shorter times
- Set camera to “Bulb”. Use a timer or intervalometer
- ISO set to 100 or 200 (native ISO)

Shooting Star Trails

Settings (cont)

- Aperture set between f/2.8 and f/8, depending on what is needed to focus foreground and infinity. Faster is better.
- Use an intervalometer for controlling the camera. For long exposure, set it up for the time you want. For stacking, set it up to take a set number of shots at a set duration with minimum interval between (try for 1 second) to avoid gaps. Test what works on your camera **before** you get into the field. Intervalometers available for Canon and Nikon and from eBay
- Shoot in RAW so you can correct White Balance in post-processing

Shooting Star Trails

Settings (cont):

- Use White Balance of 2500 – 3000K if sky looks brown or if you see the yellow glow of sodium lights on the horizon. Can always change later if shooting RAW. Do NOT use Automatic White Balance (AWB). You don't want it changing between shots
- Turn OFF your camera's Noise Reduction (LENR) setting. There is no time to do a “dark” frame between shots
- Turn OFF Image Stabilization
- Turn OFF Mirror Lockup
- Manual Focus

Shooting Star Trails

Technique

- Solid tripod and intervalometer
- Start with a fresh battery
- Need very dark skies, with no clouds. Use the Dark Sky Finder (link included)
- Do the exposures after midnight if possible to reduce number of airplanes captured in your frame
- For more stars, time your trip for a new moon (best), 1.5 hours after moonset, or with only a ¼ moon or less. If you have a bright moon, use shorter exposure lengths and take more images to avoid overexposing the landscape

Shooting Star Trails

Technique (cont):

- Focus on infinity or at hyperfocal distance if you have a foreground that is close. Focus during the day, or know where hyperfocal distance and infinity are on your lens at the FL you are using. Use your LCD to check focus. You can also use a flashlight on your foreground and check focus using Live View
- Take high ISO “test shots” to check composition. Then, reset ISO to native and take longer exposure to check that the arcs are where you want them
- Take higher ISO image from same spot to capture your foreground with more light for blending in PP. Reset ISO!

Shooting Star Trails

Technique (cont):

- Use your histogram to insure your images are properly exposed. Try not to have any shadow clipping. The LCD will fool you at night. Turn down brightness on LCD
- Keep spare batteries in your pockets to keep them warm prior to use. Switch to a fresh, warm battery at start of sequence
- Shoot a “Dark Frame” at same settings as real frames after your timed sequence. Use your lens cap. These can be used in Post if needed for noise reduction
- Set up intervalometer and start sequence
- Use lens cloth if needed to keep lens from fogging

Shooting Star Trails

Post Processing

- Correct for white balance to give blue sky (if desired)
- Use noise reduction in LR3, CR, or 3rd party solutions like Noise Ninja if you took one long exposure. Use Dark Frames if required (see article in References)
- Lighten up foreground or blend in low-noise, lighter image to get lighter, low noise foreground
- Stack images if you are using the stacking method
    - Blend images using the “Lighten” blend mode
- Use spot healing brush to get rid of airplane trails and gaps
- Adjust overall exposure and dodge and burn as needed

Precautions

- Have a flashlight or headlamp with fresh batteries and spare batteries handy. Use a dim red flashlight to avoid ruining your night vision
- Wear warm clothing in layers. Gloves and hat
- Handwarmers
- Bug spray
- Water and snacks
- Have maps and a GPS if hiking. Tell someone EXACTLY where you will be and when. Take a friend
- Take something to do while exposures are being captured. It can get pretty boring

Resource Links

- Great article on Star Photography: The Art of Available Light
- The Photographer's Ephemeris (TPE) for desktop and iPhone
- iPhone Apps: Darkness, DOF Calc, Compass Go, Star Map
- Know before you go: Dark Sky Finder, Clear Sky Chart
- Lance Kiemig's Night Photography book; Night Photography: Finding Your Way in the Dark
- Star Circle Academy, Long Exposure Issues
- Free Windows based program for stacking: Startrails
- Flickr Groups: Star Trails, Best of Star Trails, Milky Way

Field Guides

Milky Way

- RAW
- Aperture: 1 stop less than wide open
- Exposure: 500 / FL(eff) Maximum
- ISO: 800 – 3200 (as needed)
- LENR: ON
- Focus: Manual
- White Balance: Daylight or Incandescent
- IS or VR: OFF
- Mirror lockup: OK
- Use remote shutter release or timer

Star Trails

RAW

Aperture: f/2.8 – f/8 as needed for DOF

Exposure: BULB mode, 5 – 15 minutes depending on temperature and moonlight

ISO: 100 - 200 (native to your camera)

LENR: OFF

Focus: Manual

White Balance: Daylight or Incandescent, NOT Auto

IS or VR: OFF

Mirror lockup: OFF

Use intervalometer with min delay

Meteors

- Mostly same stuff as for Milky Way shots
- Set intervalometer up to take as many shots as fast as possible
- Wide, fast lens
- Pray

Light Painting

- Can be used with both Star Trails and Milky Way images
- For Milky Way shots, use last 5-10 seconds of exposure to paint the foreground with light
- For Star Trails, do the light painting in the first image and again after the last to insure success and give you two options
- You may need to use light filtered to “yellow” to match the low 2500-3500K white balance. Take test shots
- You may walk into a long exposure, but keep moving