Taking Milky Way Pictures

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4/24/17

Overview

- Will cover methods and tips for
  - The challange
  - Equipment needed
  - Planning
  - Photographing
    - Camera settings
  - Examples
  - Post processing

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Challenge of Milky Way Pictures

- Milky Way is visible only on very dark nights in dark places.
- It is challenging to collect enough light to make a photograph.

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Challenge of Milky Way Pictures

- There are ways to collect more light:
  - Increase the length of the exposure
  - Shoot using very large aperture (small f-stop)
  - Increase the camera's sensitivity to light (High ISO)
  - Add light (light painting)
- Each of these have their limitations and drawbacks

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Challenge of Milky Way Pictures

- Limitations to collecting more light:
  - Exposure length
    - Stars move, creating trails if exposure is too long
  - Large Aperture (small f-stop)
    - Expense of lens, usually limited to f/2.8
  - High ISO
    - Noise
    - Reduced dynamic range

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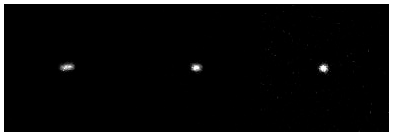
Exposure length

- Stars should look like points, not dashes.
  - Images of stars with 24 mm lens (cropped sensor) @:



- Maximum duration is a function of focal length.

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Exposure length limitation

- Maximum exposure time to avoid streaked stars in seconds:
  - For full frame = 600/mm focal length
  - For cropped sensor = 400/mm focal length
- Examples:
  - Full frame: 600 / 20 mm = 30 sec
  - Cropped: 400 / 13 mm = 31 sec
- Super wide angle lenses are needed for long exposures
  - Wide angle lenses capture more of the expanse of the milky way.

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Aperture limitation

- Use as large an aperture as you can.
  - Wide angle lenses are available with f/2.8 or less
  - Need a lens that is sharp at f/2.8
- Be aware of lens coma (Sagittal astigmatism).

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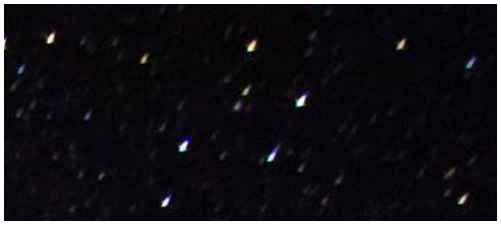
Lenses

- Edge Effects: Coma "Flying Saucers"



- Most wide angle lenses exhibit coma
- To avoid:
  - Stop down
  - Use a Rokin 14 mm or Tamron 15-30mm lens
  - Crop the edges after perspective correction
  - Make a panorama with a normal prime lens

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High ISO limitation

- Noise:
  - More image noise with higher ISO
  - Many cameras today have acceptable noise levels up to ISO 6400.
  - Noise is affected by sensor size
    - Full frame cameras have less noise that cropped sensor cameras.
- Dynamic range reduction
  - Risk blowing out highlights (stars) and losing color.

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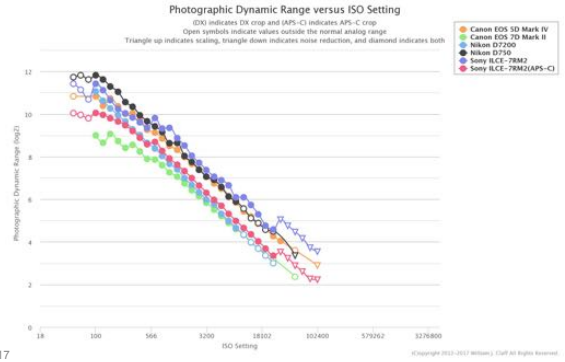
Dynamic Range vs ISO

- Less dynamic range at higher ISO
  - Lose about 1 stop dynamic range per stop ISO



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General equipment for star images:

- Tripod
- Freshly charged battery and spare
- Memory card
- Camera capable of manual exposure settings
- Small flashlight, headlamp
- Larger flashlight for light painting
- Hand warmers
- Warm clothes

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Equipment for Milky Way Images:

- Camera with low noise at high ISO
  - May be shooting at 3200 ISO or greater
- Wide angle lens
  - Allows for longer exposure times
    - Full Frame: 16 – 24 mm
    - Cropped Sensor: 11-16 mm
  - Wide angle for broad sky view
- Fast lens, f/2.8 or better

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Equipment

- Tripod Mount
  - Composition in pitch dark is difficult
  - Composition is often trial and error, making small adjustments based on previous exposure
  - Pan and tilt mount preferable to ball head mount.
    - Makes small adjustments to composition easier.

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Supplementary Equipment

- Equatorial Mount and star trackers for very long exposures

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Preparation

- Know how to operate your camera in the dark.
  - Know the location of all controls by feel.
- Scout your locations and compositions in the daylight.

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Camera Settings

- Auto focus turned off.
- Set exposure to manual mode.
  - Exact settings depend on star picture type, desired appearance, and conditions.
    - ISO at 1600 to 6400 for Milky Way
      - Greater dynamic range at lower ISO
    - Aperture set to widest opening for Milky Way

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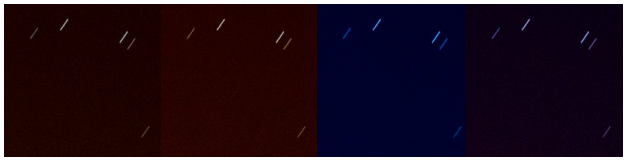
General Considerations

- Camera Settings
  - White Balance
    - NA if shooting RAW, adjust in post processing.
    - When shooting jpg, after nautical twilight, approximate sky color will be from black to:



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Camera Settings

- File Format
  - Shooting in RAW:
    - Advantages:
      - Can adjust WB, exposure, etc in RAW processor
      - Greater file depth to provide info for increasing contrast.
    - Disadvantages
      - None

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General Considerations

- Focusing
  - Focus at infinity or use hyperfocal distance.
  - Focusing after dark is difficult.
  - Focusing in approaches:
    - Set up before dark and focus
    - Focus on bright objects such as distant lights.
      - Use manual focus with live view.
    - Bring a powerful light to temporarily light your mid-ground subject.
    - Pre-focus and mark
    - Trial and error correction

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Milky Way

- Shooting Conditions
  - Very clear cloudless skies
    - Best available at high altitudes and east of cascades.
  - Absolute dark skies
    - Take pictures after astronomical twilight
    - No moon
    - Far away from urban areas
  - Colder temperatures = less noise
    - Camera noise doubles with each 10°F

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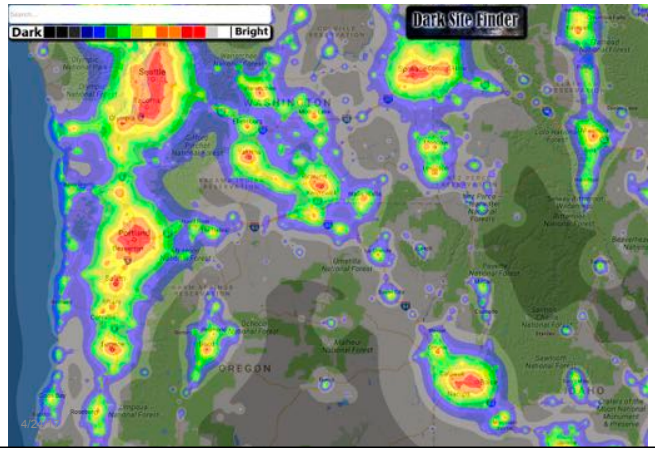
Where to Go



Milky Way

- Start milky way shots after Astronomical Twilight
  - Varies by time of year and location
  -

Event	Winter Solstice:	Summer Solstice:
Sundown	4:22	9:08
Civil Twilight	4:58	9:48
Nautical Twilight	5:37	10:43
Astronomical Twilight	6:14	12:08

  - Use The Photographer's Ephemeris or PhotoPills for exact times

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Planning

- When:
  - Time of year
  - Time of month (No moon)
  - Time of night
  - Position of MW in night sky
    - point of intersection with horizion
    - slant, arch, vertical

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When: Milky Way Orientation

- Spring
  - Horizontal arch to vertical From 12:00 to 5:00AM
  - Core above horizon
- Early Summer
  - Left slant From 12:00 to 2:00 AM
  - Core above horizon
- Late Summer:
  - vertical From 10:00 PM to 4:20 AM
- Fall
  - Vertical to right slant From 9:00 PM to 5:10 AM
  - Core below horizon

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When: Milky Way Orientation

- Spring (4/25) 2:00 AM

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Image from Sky Guide

When: Milky Way Orientation

- Early summer (6/25) 12:00 AM

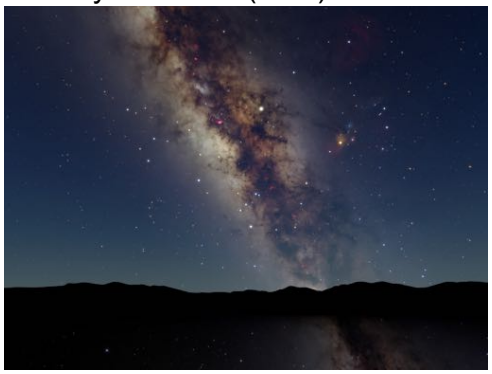

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Image from Sky Guide

When: Milky Way Orientation

- Late summer (8/23) 12:00 AM

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Image from Sky Guide

Planning Apps

- Sky Guide
  - See what the milky way will look like
- PhotoPills
  - Location maps
  - Twilight & moon phase info
  - Position of milky way

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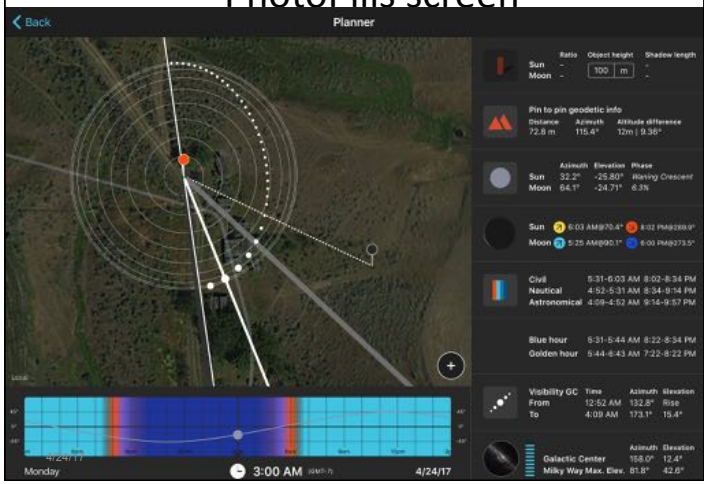
PhotoPills screen



Composition

- Provide an interesting foreground!
  - The milky way looks always much the same except for:
    - Slant
    - Contact with the hoizion
  - Look for interesting landscapes in which to place the Milky Way
  - Grand scale landscapes

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Examples

Silhouette foreground

4/24/17 Balance Rock at Night 30 sec f/4 25,600 ISO 16 mm focal length full frame

Examples

Natural light foreground

4/24/17 Climbing by Starlight 30 sec f/2.8 3200 ISO 11 mm focal length cropped sensor

Examples

Natural light foreground

4/24/17 Todd Lake and Milky Way 30 sec f/2.8 6400 ISO 16 mm focal length full frame

HDR and the Milky Way

- For a brighter foreground using natural light
- Expose for the foreground for several minutes
- Combine with Milky Way image in post processing
- Foreground may have flat lighting
  - Hint: Take foreground image before astronomical twilight.

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Examples

HDR

4/24/17 Little Crater Lake 20 sec f/2.8 3200 ISO 12 mm focal length cropped sensor

Examples

Lighted foreground

4/24/17 Paradise Lodge at Night 30 sec f/2.8 3200 ISO 16 mm focal length cropped sensor

Examples

Light painted foreground

4/24/17 Double Arch & Night Sky 30 sec f/4 25,600 ISO 16 mm focal length full frame

Light Painting

- Shine a light on your foreground.
- Incandescent bulb for warmth, led for cooler.
- Duration of light is trial and error.
- Move the light around to avoid hot spots.
- Light from the side to build form.

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Examples

Light painted foreground

4/24/17 Central Oregon Night 30 sec f/2.8 3200 ISO 16 mm focal length full frame

Examples

Light painted foreground

4/24/17 Little Crater Lake 20 sec f/2.8 3200 ISO 12 mm focal length cropped sensor

Post Processing

- Increase contrast
  - Best done in RAW processing
  - Using the curves tool is most effective
    - Avoids blowing out brights
    - Set so the curve crosses the histogram at the 45 degree line as a good starting point
    - May need to adjust the exposure for improved results
- Set white balance
  - Use eyedropper tool to get neutral grey
  - Adjust temperature and tent to get preferred sky color
- Brighten/darken foreground separately as a layer in Photoshop

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More Information

- Recommend:
  - Milky Way NightScapes eBook by Royce Bair
- Questions
  - Victor Dallons: dallons@oz.net

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