

# How to Create Panoramic Images with Just a Tripod

Dennis Freeman – 4/25/2019

# Why do Panoramas?

- A panoramic photograph has a wide format. The ratio between height and length of the photo is 1:2+. The field of view is greater than 100°, and frequently exceeds the angle of human vision (~140°).
- Why not do an iPhone Pano?
  - Less control of perspective (straight lines curve)
  - Only 72 dpi. Need more for large prints and good projectors.
  - JPEG: Raw format has more image information: much wider dynamic range and larger color space. Editing can push the images a lot further, bringing out and rescuing hidden detail in the darkest shadows and brightest highlights.
- Why not use a wide angle lens? (and crop)
  - Wide angle lens may not be wide enough
  - Undesirable lens distortion
  - With larger prints – get more pixels from pano than in single shot.
  - Can use general purpose zoom lens

# Wide Angle May Not Be Wide Enough:

50°

86°

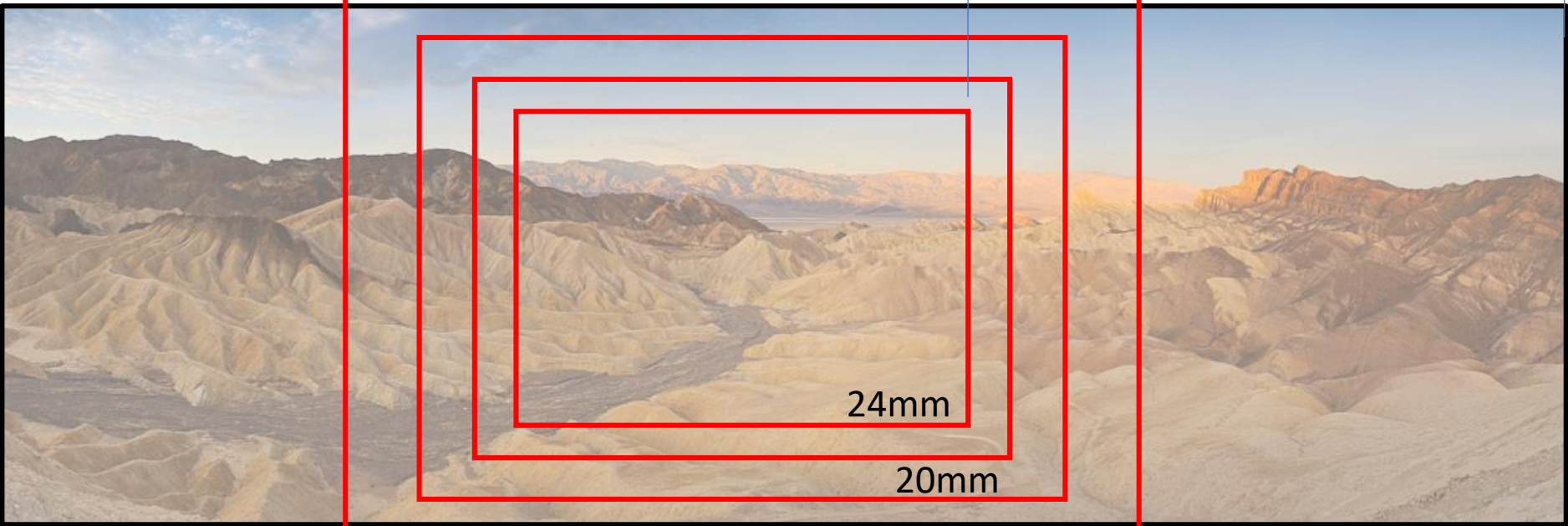
180°

24mm

20mm

16mm

12mm



# Camera Equipment

- **Digital Camera** – Need the exposure (**aperture, shutter speed and ISO**) to be locked. Ideally, want to shoot in full **Manual mode** (preferably a DSLR).
- **Lens** – Zoom lenses are the most useful. Fixed/prime lenses work, but being able to zoom in and out will give you more versatility. Any midrange zoom lens such as a 24-70mm is great.
- **Lens Filters** – Recommend taking filters off your lens. It is OK to keep a clear (e.g. UV) filter on, as long as it is not introducing any vignetting to your images on the wide end. **Remove a circular polarizer** if you have one mounted on your lens, because it will mess up your sky. E.g.:



# Camera Equipment, con't

- **Tripod** – Highly recommended for best results. The head needs to be able to pan from left to right with ease.
- Arrange camera in Portrait orientation (requires camera **L-bracket** when using tripod).



- **Cable Release** – optional, but recommended for capturing shake-free images. 2 sec shutter delay is good too.

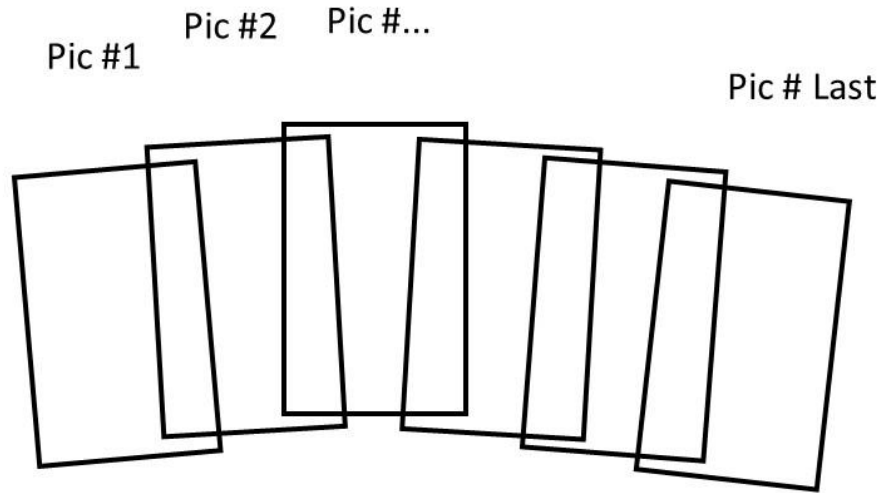
# Settings

- **Shoot in “Manual” mode**
- **ISO** – turn off “Auto ISO”. Set to fixed value, e.g. camera base ISO (either 100 or 200) for sunny day.
- **Aperture and Shutter Speed** – want everything in focus. Set aperture to preferably f/10+ (depending on nearest foreground object). Then set shutter speed based on the meter reading as explained below.
- **Metering** – try to find a “sweet middle” and set your shutter speed based on entire panorama. Take a couple of pictures and make sure that the images are not too overexposed or underexposed for the brightest and darkest parts of the scene.
- **Shoot in raw** – (optional) Lightroom Classic CC provides a raw pano.
- **White Balance** – set to “Sunny”, “Cloudy”, etc - not “Auto WB”.
- **Lens Focal Length** – wide-angle lenses below 24-28mm (full-frame) and 16-18mm (APSC) can have heavy distortion and vignetting issues that can make it difficult to properly align and stitch images.
- **Set your lens to Manual Focus**
- **When using tripod, turn lens Image Stabilization off.**

# Steps

- **Take a Test Shot in “Aperture Priority” Mode**
  - First, to identify the correct exposure settings, switch to Aperture Priority mode, set the aperture to f/11, focus, then take a test shot of the brightest part of the scene.
  - Check that the test shot has enough sharpness in the foreground and the background. If it doesn't, then increase your aperture value, e.g. to f/16, adjust focus, and take another test shot.
  - Double-check that there are no blown highlights in your test image. If you do find blown highlights adjust shutter speed or ISO until you get a good test shot.
- **Select “Manual Mode”**
  - Apply Aperture, Shutter Speed, and ISO settings
  - Set White Balance to fixed value of “Sunny”, “Cloudy”, etc.
- **Make sure that the focus is on manual and set properly.**
  - Image Stabilization is off if using tripod.
- **Cable Release plugged in to camera or shutter release delayed (e.g. 2 sec)**
- **Level the ball head and tripod:**

# You Need to Level The Tripod & Ball Head



Unlevel tripod  
and ball head  
causes stitching  
problems





# Level & Vertical Axis of Rotation



Need the tripod head to be level and need the ball head mounting stem to be vertical.

This ensures that the ball head panning action occurs around the vertical axis.

How do we do this?

# Put Ball Head on Level Table

Center clamp's bubble  
(or use a level) to get  
stem vertical.



- You can get your ball mounting stem perfectly vertical in your house before you go outside. Take the ball head off the tripod and set it on a level counter top.
- Adjust the ball so that the bubble is perfectly centered, then lock it down. (If your clamp doesn't have a built-in bubble, you can balance a small level across the top of the mounting clamp).
- Lock down the ball.
- Reattach ball head to tripod.

Set Just the Ball Head  
on a Level Table

# Level Tripod & Ball Head Pair

Center clamp's bubble  
(or use a level) to get  
Ball head & tripod level

by adjusting the leg  
lengths where the  
tripod is going to be  
while taking the pano  
shots.

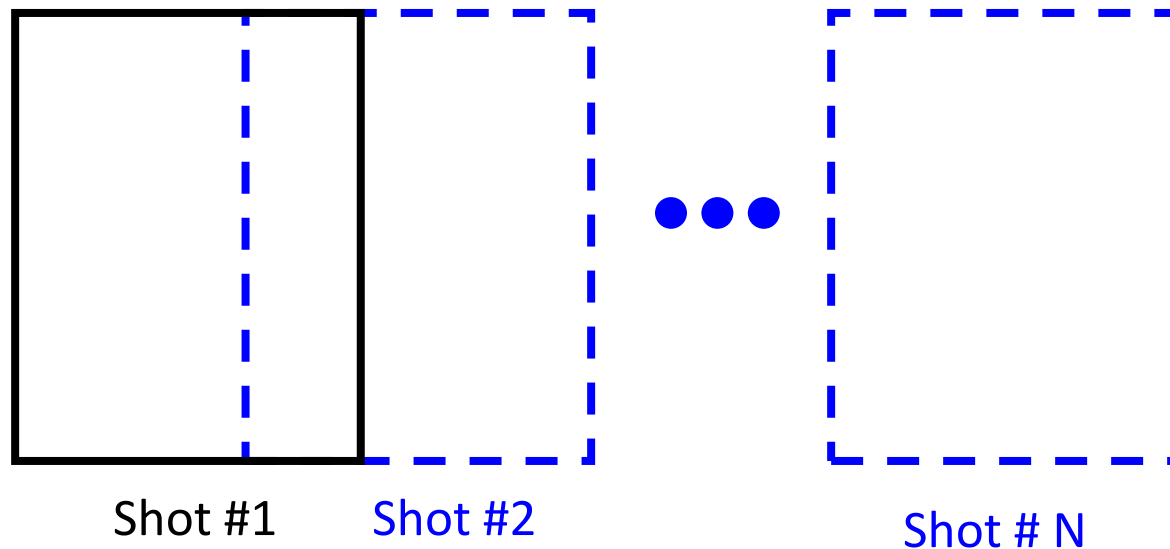


Now attach  
camera, loosen  
panning lock on  
ball head, and  
check camera  
and lens settings

...

# Steps, con't

- Start from the left side of the pano
- Take a shot and remember a spot in the image that is going to be the left edge of the 2nd image, providing for ~30% - 50% overlap.

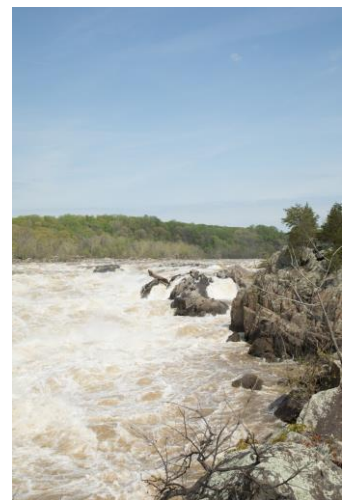
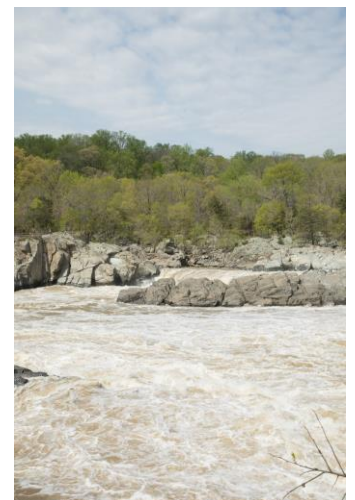
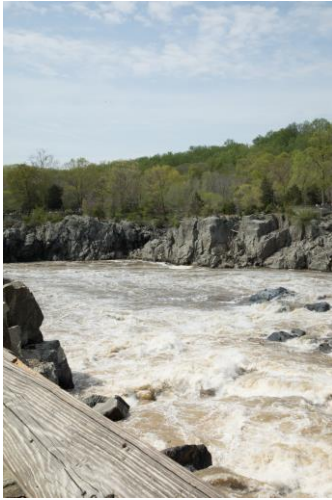


- Rotate camera to right and take 2<sup>nd</sup> shot, remembering a spot in the image that is going to be the left edge of the 3rd image ...

# Example: Great Falls, Olmsted Island, MD

- Canon 5D Mark IV full-frame camera
- Canon 24-105mm f/4L lens at 43mm focal length
- Tripod & Ballhead – no special pano gear
- Portrait orientation with camera L-bracket
- Manual Mode, f/20, 1/160 sec., ISO 400, WB: “Sunny”
- 8 shots, overlapped by ~30%

# 8 Overlapped Photos (Great Falls, MD)



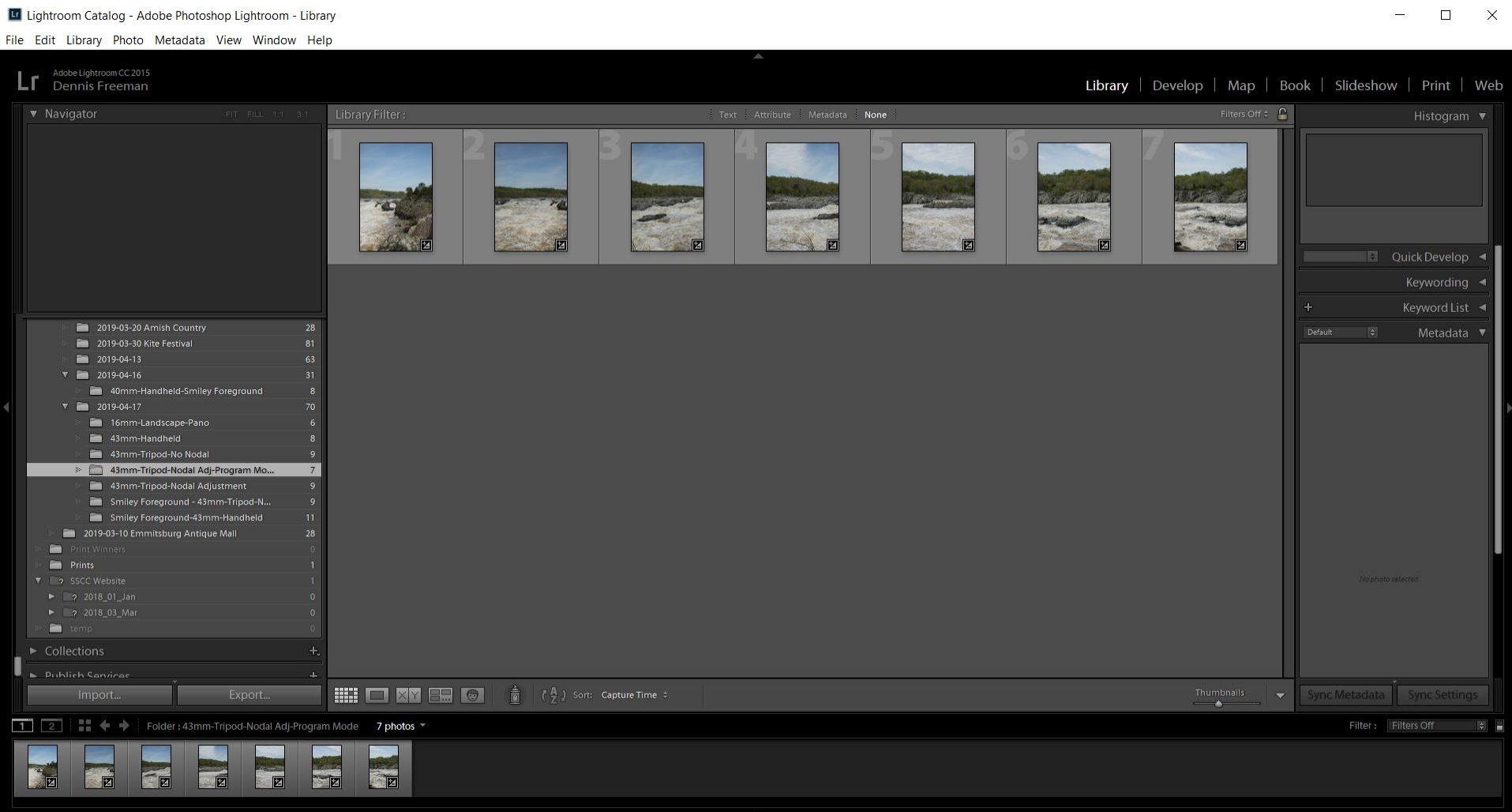
# Apply Panorama Software

- **Photo Stitching Software to Create Panoramas**

- Hugin
- Microsoft Image Composite Editor
- PTGui Pro
- AutoPano Pro
- **Panorama** Stitcher
- iFoto Stitcher
- Adobe Lightroom Classic CC
- Adobe Photoshop CC
- Lightroom Classic
- Me: **Lightroom Classic CC:**
  - In image folder select all images to be used in pano (all will turn light gray when selected)
  - Select **Photo > Photo Merge > Panorama**
  - Select a projection.
  - After preview is displayed, click on “Merge”



# Open Image Folder





# Select All (click on #1, Shift-click on #7): They turn light gray.

Lr Lightroom Catalog - Adobe Photoshop Lightroom - Library

File Edit Library Photo Metadata View Window Help

The screenshot displays the Adobe Photoshop Lightroom Library grid. The interface includes a top menu bar with 'File', 'Edit', 'Library', 'Photo', 'Metadata', 'View', 'Window', and 'Help'. Below the menu is a toolbar with icons for various functions. The main grid shows 7 photos, numbered 1 through 7. Photos 1 through 7 are all selected, indicated by a light gray background. The photo on the left is a landscape with a river and rocks. The photo on the right is a close-up of a river with rocks. The bottom status bar shows 'Folder: 43mm-Tripod-Nodal Adj-Program Mode' and '7 photos / 7 selected / 1K3A4637.CR2'. The right sidebar contains a histogram and various metadata fields.

Adobe Lightroom CC 2015  
Dennis Freeman

Library | Develop | Map | Book | Slideshow | Print | Web

Navigator FIT FILL 1:1 3:1

Library Filters: Text Attribute Metadata None Filters Off

2019-03-20 Amish Country 28  
2019-03-30 Kite Festival 81  
2019-04-13 63  
2019-04-16 31  
40mm-Handheld-Smiley Foreground 8  
2019-04-17 70  
16mm-Landscape-Pano 6  
43mm-Handheld 8  
43mm-Tripod-No Nodal 9  
43mm-Tripod-Nodal Adj-Program Mo... 7  
43mm-Tripod-Nodal Adjustment 9  
Smiley Foreground - 43mm-Tripod-N... 9  
Smiley Foreground-43mm-Handheld 11  
2019-03-10 Emmitsburg Antique Mall 28  
Print Winners 0  
Prints 1  
SSCC Website 1  
2018\_01\_Jan 0  
2018\_03\_Mar 0  
temp 0

Collections +  
Publish Services +

Import... Export...

Sort: Capture Time

Thumbnails

Sync Metadata Sync Settings

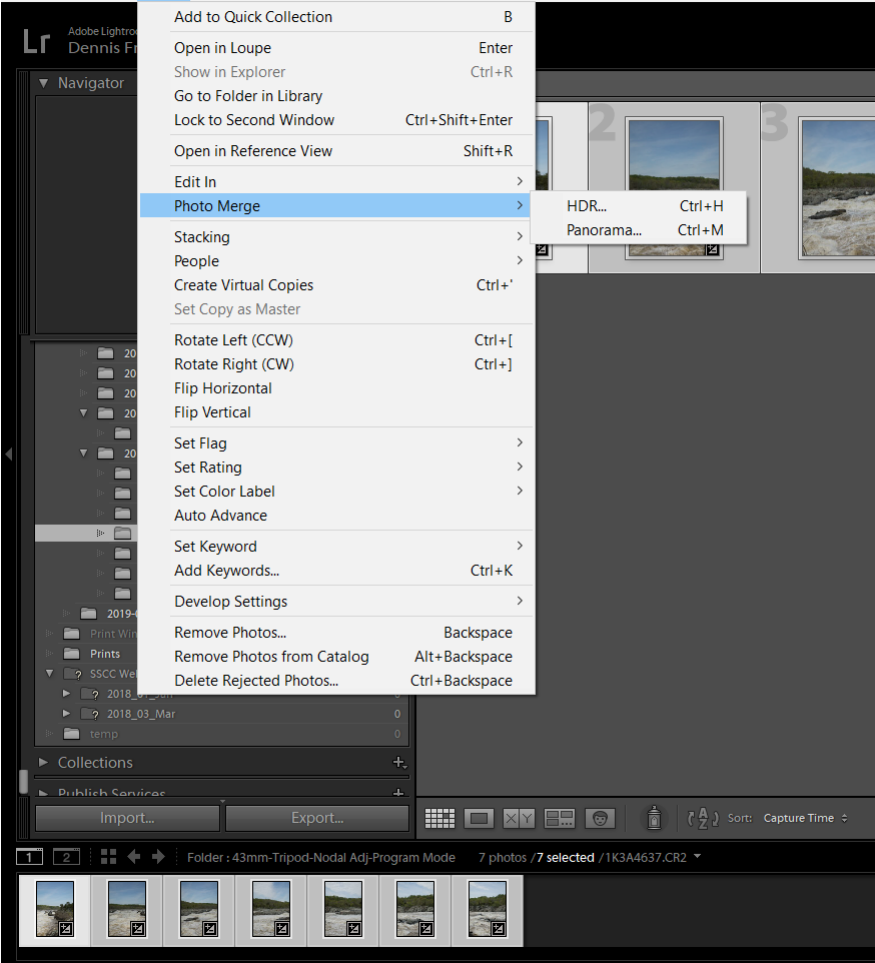
Filter: Filters Off

ISO 100 43 mm 1/9.0 1/250 sec  
7 0 0 0 0 0 0

Custom Quick Develop  
Keywording  
Keyword List  
Metadata  
Preset None  
File Name < mixed >  
Sidecar Files JPG  
Copy Name  
Folder 43mm-Tripod-N...  
Metadata Status Has been changed  
Title  
Caption  
Copyright  
Copyright Status Unknown  
Creator DENNIS FREEMAN  
Sublocation  
Rating  
Label  
Capture Time  
Capture Date April 17, 2019  
Dimensions 4480 x 6720

Lightroom Catalog - Adobe Photoshop Lightroom - Library

File Edit Library **Photo** Metadata View Window Help

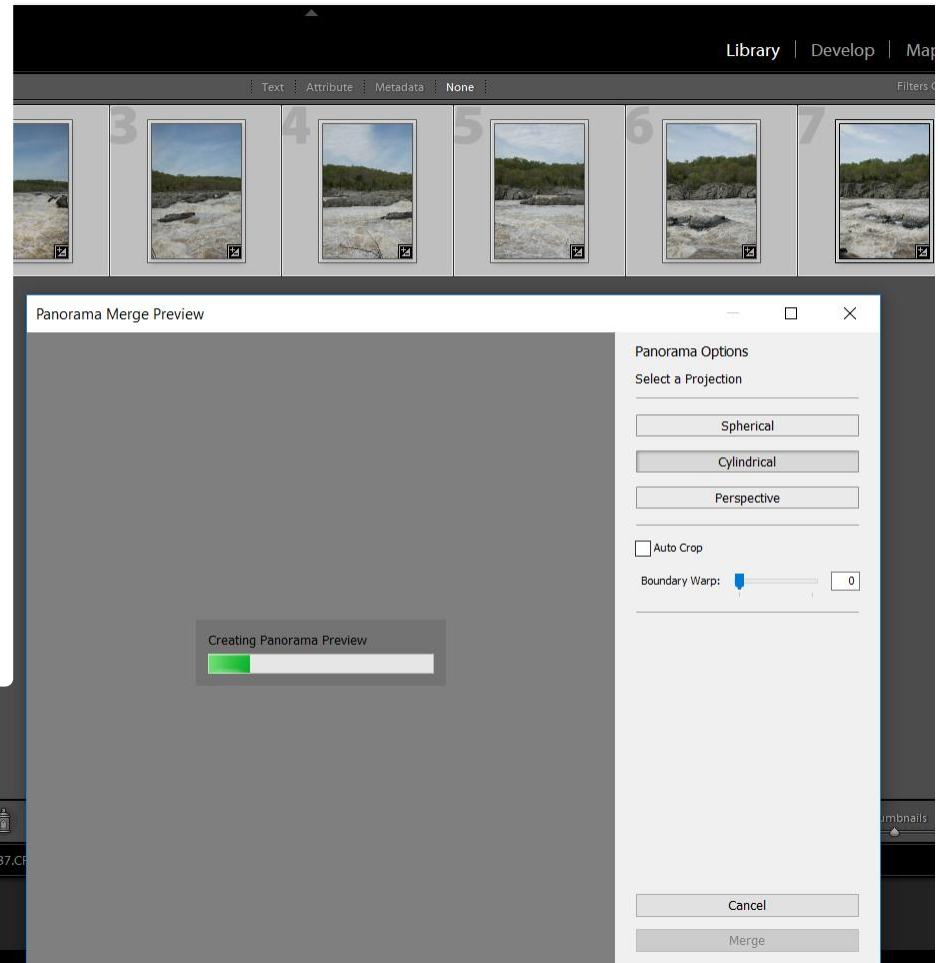


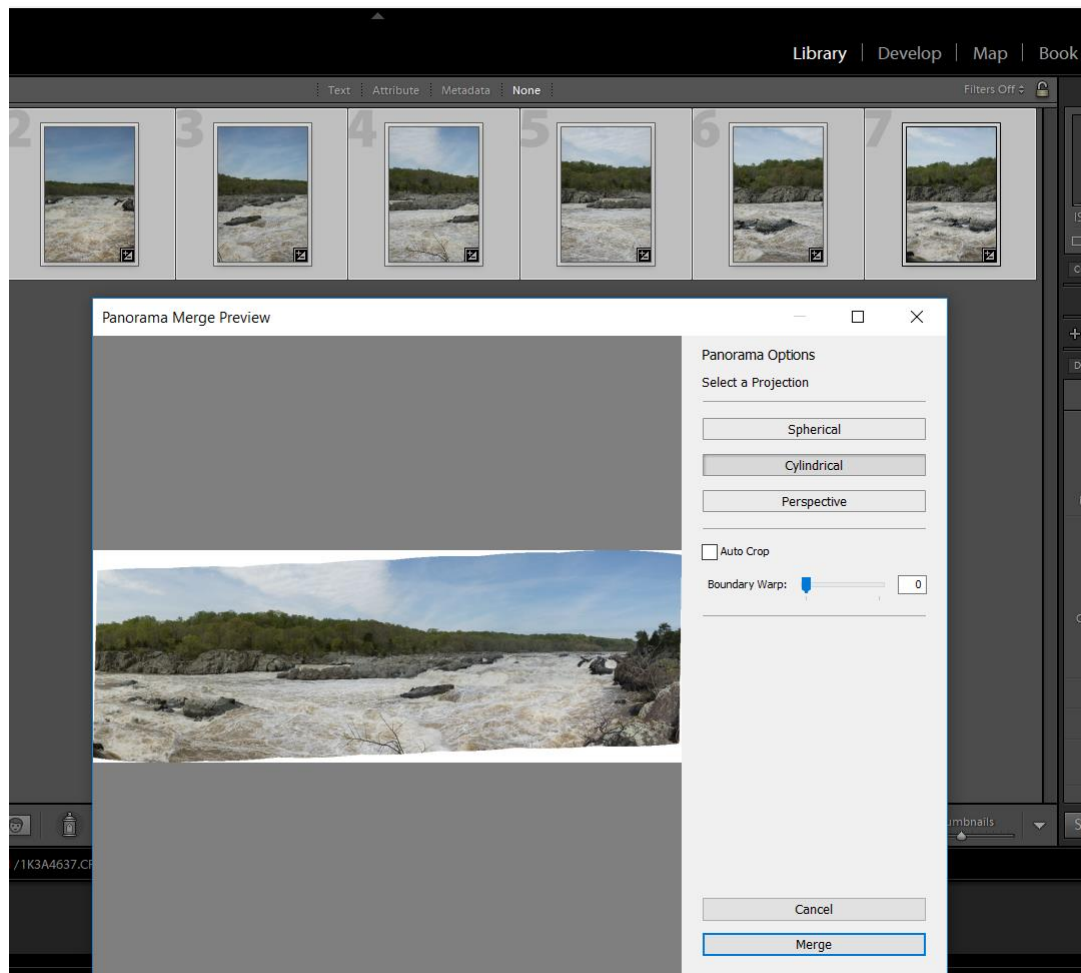
Click on

> Photo > Photo Merge > Panorama

Select “Cylindrical” or “Perspective”

Wait for preview ...



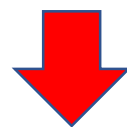
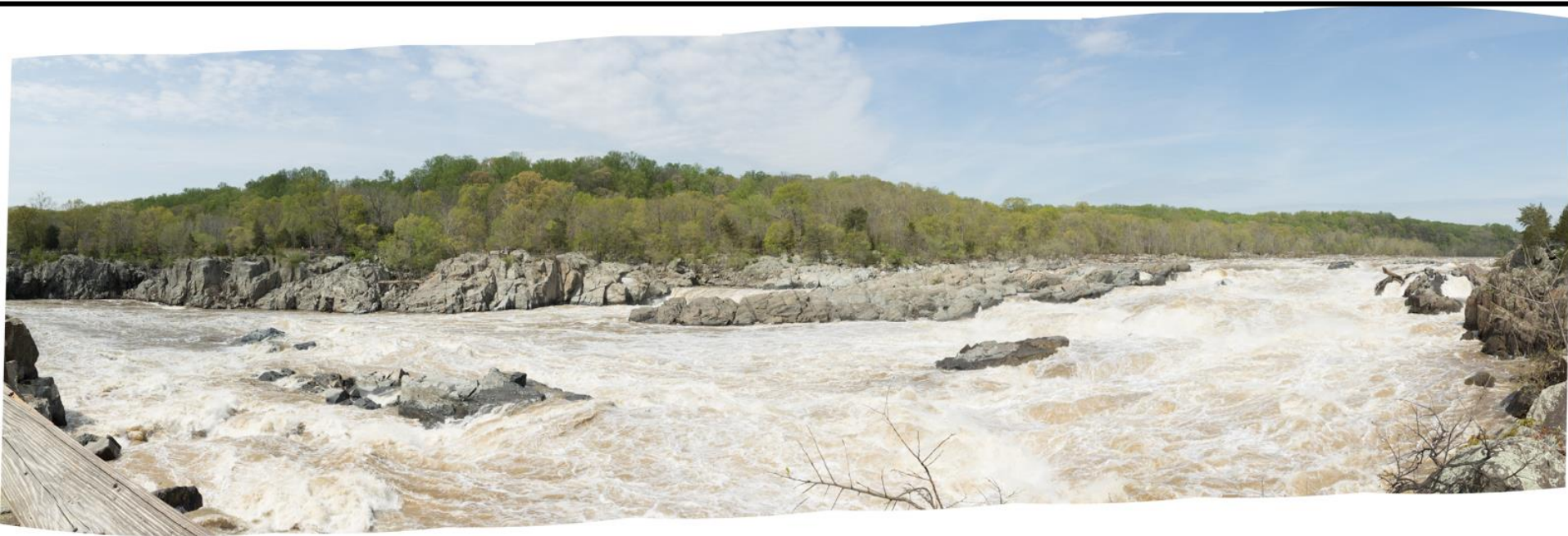


Click on Merge if it looks good

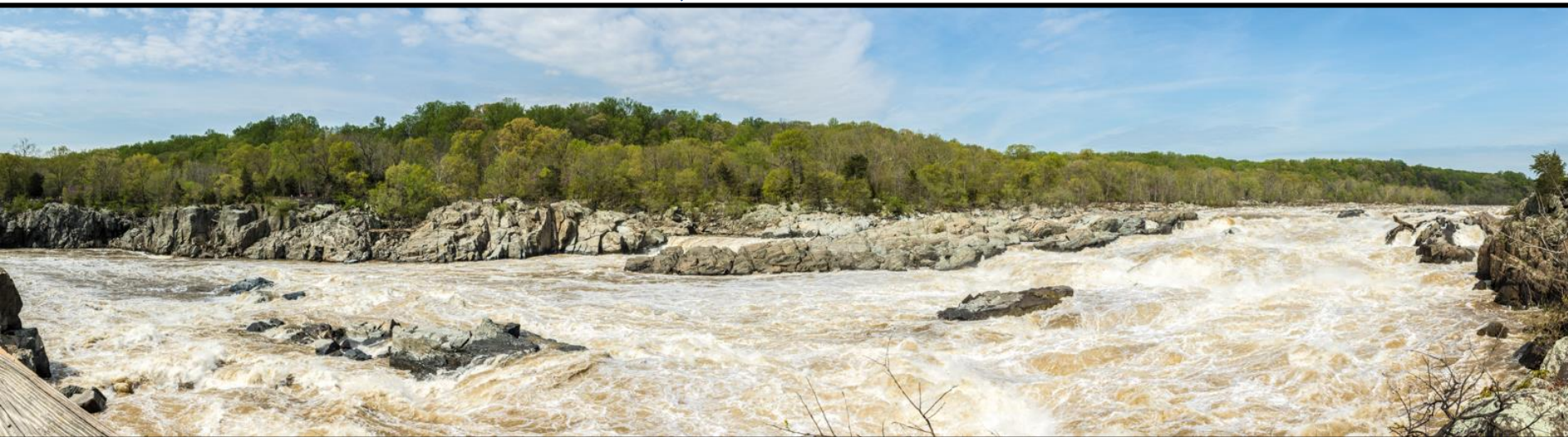
# Lightroom: Select a Projection

- **Spherical:** Aligns and transforms the images as if they were mapped to the inside of a sphere. This projection mode is great for really wide or multirow panoramas.
- **Perspective:** Projects the panorama as if it were mapped to a flat surface. Since this mode **keeps straight lines straight**, it is great for architectural photography. Really wide panoramas may not work well due to excessive distortion near the edges of the resulting panorama.
- **Cylindrical:** Projects the panorama as if it were mapped to the inside of a cylinder. This projection mode works really well for wide panoramas, but it also keeps vertical lines straight. **(Selected in example)**





**Post-processing: crop, clarity, vibrance**



**Lesson: Allow for extra vertical coverage!**

# Example #2: Great Falls, Olmsted Island, MD

- Canon 5D Mark IV full-frame camera
- Canon 16-35mm f/2.8L lens at **16mm focal length**
- Tripod & Ballhead – no special pano gear
- Regular Landscape orientation
- Manual Mode, f/20, 1/160 sec., ISO 400, WB: “Sunny”
- 4 shots, overlapped by ~30%

# 16mm Wide Angle Pano

16-35mm Canon f/2.8 L at 16mm. Tripod.

Manual Focus, "Sunny" WB. Manual Mode: f/20, 1/160 sec, ISO 400



Lightroom Panorama



**ERROR**



16mm lens distortion prevents stitching.  
But Lightroom can fix that!



# 16mm Wide Angle Pano, con't



Each image

Lightroom Profile Lens Correction



All 4 images

Lightroom Panorama



Lens distortion artifacts





# 16mm Landscape Pano - Final



Post-Processing: Cropped, Clarity, Vibrance

# Example #4: Great Falls, Olmsted Island, MD

- Canon 5D Mark IV full-frame camera
- Canon 24-105mm f/4L lens at 43mm focal length
- Handheld – but same thing happens with tripod
- Portrait orientation
- Manual Mode, f/20, 1/160 sec., ISO 400, WB: “Sunny”
- **My buddy “Smiley” joined for his portrait.**
- 7 shots, overlapped by ~30%
  - Group of people on left avoided

# Handheld – Object in foreground

Foreground Smiley OK, but wooden bannister warped.

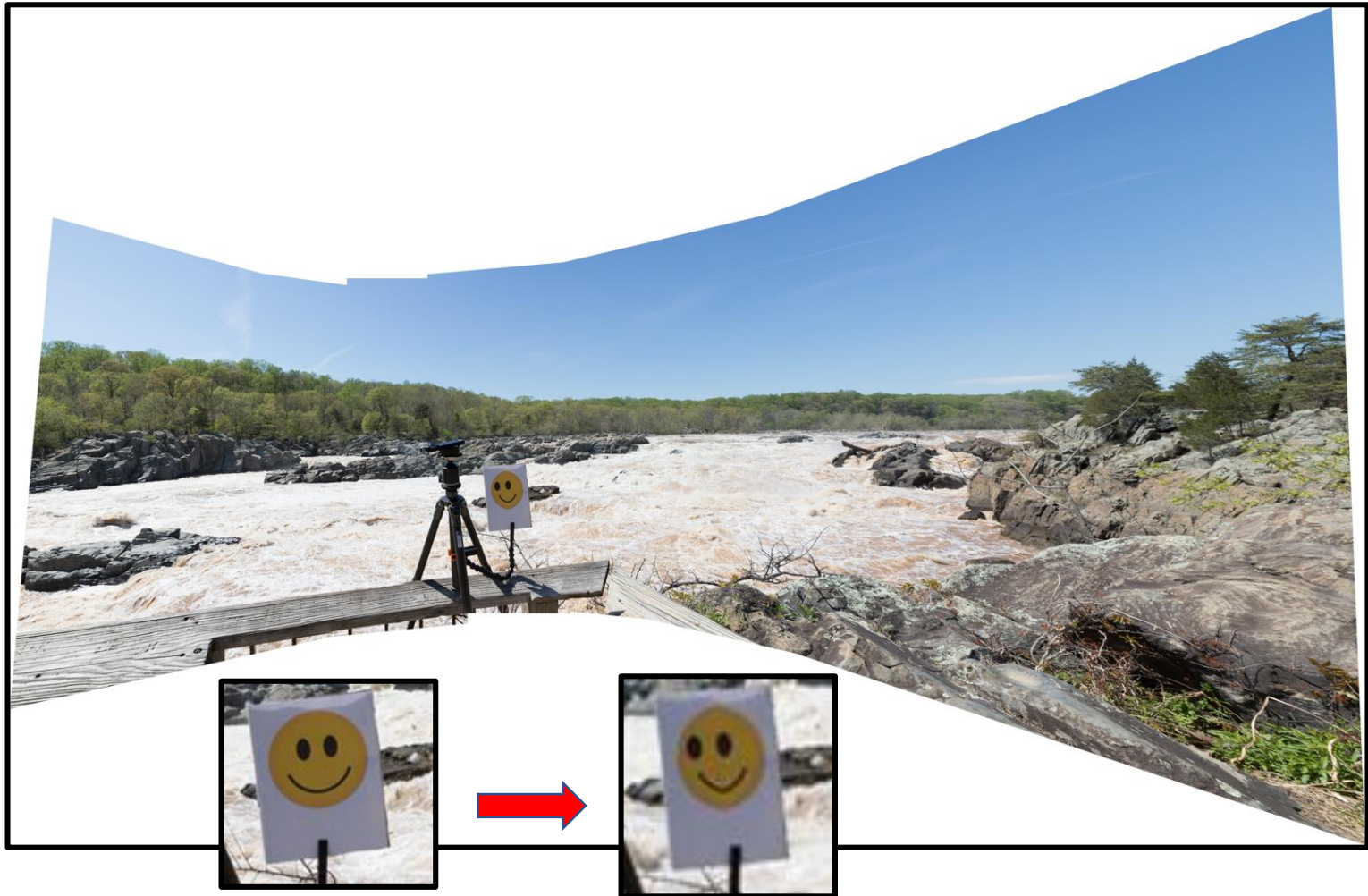


Lightroom – Pano with **“Cylindrical”** Projection



# Handheld – Object in foreground

Straightens wooden bannister, but Smiley is upset.

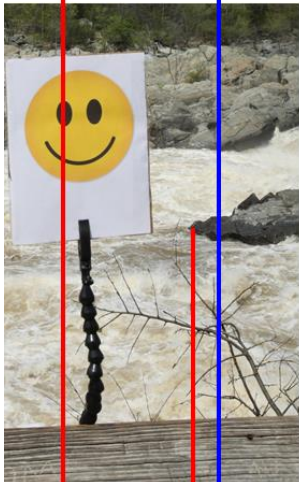


Lightroom – Pano with **“Perspective”** Projection

# Why is Smiley messed up?



- Camera parallax during rotation has moved foreground objects against their backgrounds between individual images.
- Smiley is shifted closer to rock in 2<sup>nd</sup> image.
- Stitching software having trouble identifying tie points between images.



- Shifting and warping isn't right.
- Some subjects aren't the best when doing handheld panoramas. Try avoiding foreground objects. The following example does this:

# Panorama at Lake Artemesia



You needn't go far for a handheld panorama subject. Here is a ten image panorama from Lake Artemesia in College Park - actually Berwyn Heights. ( [Lake Artemesia Map](#) ) Note that there aren't any foreground objects that span multiple images. Just a bush in the right image, and a bit of a bush in the left image. They aren't involved in the overlap stitching, and this scene would be fine with just a tripod and ball head.



# How to Fix Parallax



- If you really want to be able to do panoramas without cherry picking your venue to avoid foreground objects then you have to bite the bullet and remove parallax.
- Gearing up can solve this. The details are covered in another presentation.

