

# Panorama Photography Program

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Panorama photography – the definition used for this program is the ability to stitch together several photographs to make one larger photograph.

Caveats / Disclaimers / Your Panos May Vary ☺

- I'm no panorama expert, but I have been able to create panoramas and am willing to share my technique.
- Photography is a blend of technical skills and artistic skills, this program primarily addresses technical skills required for creating panoramas.
- Rarely in photography is there one single "correct" answer, the technique described in this program is by no means the only way to shoot panoramas.
- Unfortunately, when creating panoramas there are several opportunities for things to go wrong.
  - If the success rate of taking one photo is 90%
    - The success rate of creating a panorama consisting of two photos is only 81% ( $0.90^2 = 0.81$ )
    - The success rate of creating a panorama consisting of seven photos drops to only 48% ( $0.90^7 = 0.48$ )

The information in this program will attempt to increase your success rate in shooting panoramas.

My Photography Gear (and relevant features for creating panoramas):

- Canon 20D camera, (old, discontinued)
- Epson Stylus Photo R2400 printer, (old, discontinued)
  - allows the use of **roll paper**, 13" x 32.8'
- Tripod
  - Bogen 3021 (Manfrotto 055) tripod
  - Bogen 3047 head, (old, discontinued)
  - Bogen 3502 (Manfrotto 438) Ball Camera Leveler, useful for leveling the **base** of your tripod head
- *Photoshop CC*
  - **Photomerge feature** used for creating panorama photos
- *Photomatix Pro 4.2.7* (not the latest)
  - used for creating HDR photos
  - Batch Bracketed Photos feature is very useful for HDR panoramas

## A. Why Shoot Panoramas?

1. Situations where your wide-angle lens isn't able to capture the whole scene
  - For example, you have a 28 mm lens that can't quite capture the scene, take several photos to stitch them together later
2. Situations where you might want to get more film/sensor on the subject in an attempt to achieve a better quality photograph
  - It would be best to capture at least one good photograph of the scene before attempting the panorama

## B. Panorama Subjects

1. The "traditional" panorama, horizontal, landscape oriented photos
  - Often cover 180 degrees or more
  - Good subjects can be: overlooks at local/state/national parks, scenic locations at a lake/ocean
  - Keep in mind the maximum horizontal size of a print allowed by Tripod for competition is 30 inches
2. Vertical (portrait) panoramas
  - Not as common, but can be interesting
  - Keep in mind the maximum vertical size of a print allowed by Tripod for competition is 20 inches
3. Horizontal **and** vertical panoramas. In addition to just using one "row" of photos to merge for creating a panorama, you can take several "rows" of photos to merge to create larger panoramas (in both the horizontal and vertical dimension). To do this requires overlapping every individual photo both horizontally and vertically. These type of panoramas are more difficult to create. If you have a strong interest in creating these type of panoramas I would suggest you visit this website:  
<http://www.gigapan.com/>.

## C. Photographing Technique

1. Film or digital, it doesn't matter
2. Use a tripod
  - Level the **base** of the tripod
  - The use of a level
    - Bogen / Manfrotto Products:
      - 337 Hot Shoe Two Axis Bubble Level
      - **438 / 3502 Ball Camera Leveler – this is what I use**
      - 338 / 3416 Leveling Base
      - 555B Leveling Center Column
  - In addition to having the camera level horizontally, ideally it is also best to have the camera plumb (vertically level).
3. Rotate your camera/lens on the nodal point to eliminate parallax errors
  - The nodal point is the point inside your camera/lens where the light rays converge as light enters the lens and reaches the sensor/film. Think of the nodal point as a "balance point" or "fulcrum point".
  - When shooting photos for a panorama, the camera should be rotated at the nodal point. Otherwise, parallax errors may occur.
  - Parallax errors are when distant objects seem to "move" relative to near objects in a series of photographs.
  - Depending on your tripod and camera/lens, parallax errors will probably be more of a problem:
    - Panoramas that include objects in the foreground.
    - With portrait (vertical) photos rather than landscape (horizontal) photos.
    - The use of wide angle lenses (e.g. 10mm) can also be a challenge.
  - Experiment with your camera and lenses on your tripod to find the nodal point.

#### 4. Taking the series of photographs

- Stick to a routine
    - Using the same routine for taking the photographs reduces the amount of time for taking the photographs which helps eliminate issues with moving objects in the scene or rapidly changing lighting conditions.
  - Focus the lens on the panoramic subject and lock the focus (e.g. switch the lens from autofocus to manual focus)
  - Use the histogram like a light meter. Take a test photograph of the brightest portion of the scene and check your histogram (if using a digital camera)
    - Determine the best exposure for the scene (e.g. 1/4 second at f11)
    - Manually set that exposure to use for this entire series of panorama photographs
    - Shoot other test photographs of other portions of the panorama scene (e.g. brightest, darkest, most important) with that exposure setting to make sure it will be good for the entire scene.
- Optional (see HDR section below) – Bracketing the exposure can be beneficial for handling difficult lighting conditions. If you bracket the exposure, ***vary the exposure time***, not the aperture.
- I shoot RAW images so I don't manually set the white balance (if needed, the white balance can be set in Adobe Camera Raw (ACR) during post processing). If I shot JPEG images, I would manually set the white balance for the series of photographs.
  - Always shoot left to right.
  - Use your left hand to form an “L” to indicate the beginning of the panorama photographs (this sounds silly and my daughters make fun of me ( LOSER! ) when I do it, but it saves time during editing).
  - Overlap the different photographs approximately 33%.
  - Use your right hand to form a backwards “L” to indicate the end of the panorama photographs.
  - The two “hand” photos are just used as “bookends” for helping find the beginning and end of the panorama photos during the editing process and are not to be used during the actual merging process.

## D. Merging and Editing the Photographs

1. Use Adobe *Bridge* and look for the two bookend “hand” photos
2. Highlight all the individual photos to open them in Adobe Camera Raw (ACR). Select the photo containing the most important portion of the panoramic scene and edit it. When finished editing that photo, select all the photos and synchronize the ACR changes you made so they apply to all the photos. Verify the ACR changes look good on all the photos then select Done.
3. Highlight the panorama photos to merge
4. Choose *Bridge* Tools->Photoshop->Photomerge
  - Select "Auto" and "Blend Images Together"
  - If using a wide angle lens, sometimes the "Geometric Distortion Correction" option can improve the merging process.
5. Photomerge is a script that takes a long time to process so now would be a good time to take a break. ☺
6. (If using CS3 or later this step probably isn't necessary) When Photomerge is finished it will put each photo in a separate layer. Turn off/on the visibility of the layers to check the accuracy or the mergers.
7. Flatten the layers, *Photoshop* Layer->Flatten Image (or merge the visible layers, *Photoshop* Layer->Merge Visible).
8. If you need to straighten lines due to distortion, if using CS6 or later, (*Photoshop* Filter->Adaptive Wide Angle) can work some magic. Crop the image. NOTE: If using CS5 or later, Content Aware Fill (*Photoshop* Edit->Fill-Content Aware) can be useful for filling in areas around the edges of a panorama.
9. Save the image.
  - NOTE: It is useful to add a metadata “panorama” keyword to the merged panorama photo and to each of the individual photos that make up the panorama. This helps locate panorama photos on your hard drive in the future.
  - NOTE: It is also useful to add the sequence numbers of the individual photos to the merged panorama photo filename (e.g. BigRiver-Pano-0019-0025.psd). This helps identify the source files for the panorama file.
10. Edit the image as you would any image in *Photoshop*.

NOTE: If your panorama photo fails to open in *Bridge*, you may need to increase the file size preference setting (e.g. *Bridge* Edit->Preferences-Thumbnail->Do Not Process Files Larger Than NN MB).

## HDR Panoramas – Exposure Bracketing While Taking the Photos

This section is optional. You can get good panoramic photos without the use of exposure bracketing and HDR (High Dynamic Range). Bracketing exposures allows you some flexibility during the editing process. It's also more work!

1. Example With No Exposure Bracketing. A landscape panoramic photo that consists of three landscape oriented photos: Left Image, Center Image, Right Image. Without the use of exposure bracketing it would result in these three photos:

Exposure	<b>EV 0</b>	<b>EV 0</b>	<b>EV 0</b>
Image	<b>Left</b>	<b>Center</b>	<b>Right</b>
Photo #	<b>1</b>	<b>2</b>	<b>3</b>

Those three photos would be merged and edited as described in section D above to create the panorama photo.

2. Exposure Bracketing.

- Bracketing the exposures for each image [EV 0 (Normal), EV -2 (underexposed 2 stops), and EV +2 (overexposed 2 stops)] in the panoramic scene above would result in these nine photos:

Exposure	<b>EV 0</b>	EV -2	EV +2	<b>EV 0</b>	EV -2	EV +2	<b>EV 0</b>	EV -2	EV +2
Image	<b>Left</b>	Left	Left	<b>Center</b>	Center	Center	<b>Right</b>	Right	Right
Photo #	<b>1</b>	2	3	<b>4</b>	5	6	<b>7</b>	8	9

- This is the optional section of step C4 above used when you take the photographs.
  - Auto exposure bracketing with the camera. When bracketing the exposure, *vary the exposure time*, not the aperture.
  - Your camera probably has an auto exposure bracketing feature, learn to use it so you take photos quickly.
  - Canon 20D example:
    - From the camera menu choose AEB (Auto Exposure Bracketing) and set the bracketing amount (I normally choose 2 stops)
    - I also change the drive mode to continuous shooting. This way you can just press and hold the shutter button and all three photos will be taken in succession.

- This is the only additional step required while taking the photographs, the rest is done in post processing.
- Use HDR software (I use *Photomatix Pro*) to tone map the three exposure bracketed photos from the most important part of the panorama image you are creating. In the above example, if the center part of the panorama is most important, tone map the three center photos. Save the tone map setting to use consistently on all the other bracketed photos.
- Use *Photomatix Pro* to create a tone mapped TIF file for each set of bracketed photos in the panorama. Three tone mapped TIF files would be created in the above example. *Photomatix Pro* has a batch processing feature that is extremely useful.
- Stitching together the tone mapped TIF files to create the panorama would be done using *Photoshop* as described in Steps D above.