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Recipe for Panoramas
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Making panoramas using digital cameras and stitching software can be daunting to the uninitiated. This is because a number of steps must be performed correctly and in the proper sequence for the panorama to be successful. My goal here is to share with you my experience in making panoramas (or "panos" as I like to call them). I don't claim to have the best method and I won't compare various methods, hardware or software. You only get the benefit of what I've found that works best for me. My goal is to give you tools you can use in the field and on your computer to construct panos that appear as one seamless high quality print. So follow with me step-by-step, and if you choose, view a video that demonstrates these steps.

The Scene

To begin, the scene dictates whether or not a pano should be made. Let's say you are viewing the front range of the Rocky Mountains and would like to capture the grandeur of these mountains along with the colorful sandstone formations in the foreground. You could take one image with your digital camera and crop top and bottom and make a horizontal print, but the reduced file size would limit the resolution and size of print. To make a pano of the front range, several images are overlapped left to right and stitched together electronically into one high resolution print.

A pano can be two or more images stitched together horizontally or vertically in one or more rows or columns. The simplest panorama I have made is from two images stitched together horizontally. I have also constructed panoramas made up of three rows and four columns of images for a total of 12 images.

The Set-Up

Hardware to make panoramas:

Required:

- Tripod
- Rotating head with bubble level
- Mechanism such as Arca Swiss plate for moving lens and camera fore and aft on tripod head.

Optional:

- Bubble level for camera
- Cable release
- LED head lamp to see your equipment and settings early morning and late evening
- Panorama gear such as Really Right Stuff

Critical Elements in Making a Pano

- Make sure your camera is level with the horizon. It is okay to tilt the camera up or down as long as it is level left to right for each image of the pano.
- Overlap wide-angle images by 25 to 50%. Overlap telephoto images by 15 to 25%.
- Watch for parallax (see photo examples below.) When in the field, you can test if you have parallax by viewing a near object, such as a tree, and determining if it moves relative to the background as you rotate your camera left and right or up and down. The reason we are concerned with parallax in panorama images is because the foreground and background must be in the same relative position within the frame of each image that the stitching software uses to compile a final composite image of the whole scene
    - To avoid parallax, position the lens and camera fore and aft such that the nodal point (or optical center) is directly above the rotational axis of the tripod when tilting or rotating the camera and lens.
    - Another method I have discovered is to determine the nodal point or optical center of the lens by turning the lens so you are looking directly into the lens barrel; then set the f-stop at f/11, push the preview button and look for the apparent position of the aperture point. Position this point directly above the axis of rotation of the lens.

With lens not rotating about its optical center, parallax is seen as black pole in foreground moves relative to background

With lens rotating about its optical center, parallax is eliminated as black pole remains fixed relative to background

Step-by-Step

You may want to use this as a checklist to avoid early mistakes of omission as I often have done. Missing one step such as overlap or forgetting to check a level can ruin an otherwise successful panorama.

- Start from the ground and move up by making certain your tripod is firmly set on the ground.

- Use a tripod head that rotates while remaining level. It helps to place a bubble level on your camera to double check that the camera remains level for each of the images making up the pano.

- Now we get to the step that usually loses half the audience - the infamous, but incorrectly referred to "Nodal Point" or optical center. Think about where the light rays enter the aperture of your lens. You want to position this point of entry into the aperture directly above the axis of rotation of your tripod as described above. My pano video may help in demonstrating parallax and how to find the nodal point or optical center in the field.

- Remember, if you are using your telephoto lens and do not have subject matter in the foreground, the positioning of the lens over the tripod is not so important. If you are using a wide-angle lens with lots of subject in the foreground, then positioning the camera and lens properly above the axis of rotation of the tripod is more important.

- Now set your camera on manual focus, manual exposure, turn image stabilization off and shoot RAW images. You can shoot JPEG's while making panos, but white balance adjustments and exposure blending is more difficult.

- Check your meter for the brightest part of the scene and set your exposure no more than 1/2 stop above the brightest part of scene.

- Use an f-stop that gives good depth of field throughout the scene: f/13 is a good rule of thumb for telephoto lenses and f/11 is generally good enough for wide-angle lenses. I have used anything from 17mm to 400mm lenses to make panoramas.

- Use a cable release and mirror lockup if your shutter speed is less than 1/60 of a second.

- For higher quality images turn your camera vertically to capture more pixels top to bottom. If you are shooting several images, say more than 10, left to right, consider shooting a second row (remember to overlap left to right and top to bottom) of images to give more height to your pano.

- While looking through your camera viewer and starting on the left side of the scene, take your first image. Overlap your next image by 15 to 50%. Less overlap is needed for telephoto lenses than wide-angle lenses.

- Take as many images as you need to complete the scene. Then put your hand in front of the lens and click the shutter. For your convenience, this last blank image indicates to you later the end of the sequence of images. Now check the histogram for each of the images to determine if the exposures are correct and that the highlights have not been blown. Adjust exposure as needed and reshoot the scene. I sometimes shoot 10 sequences of panos depending on the changing light. Occasionally, I bracket each shot 1/2 stop over and under.

- Note this is the end of field work and beginning of stitching.

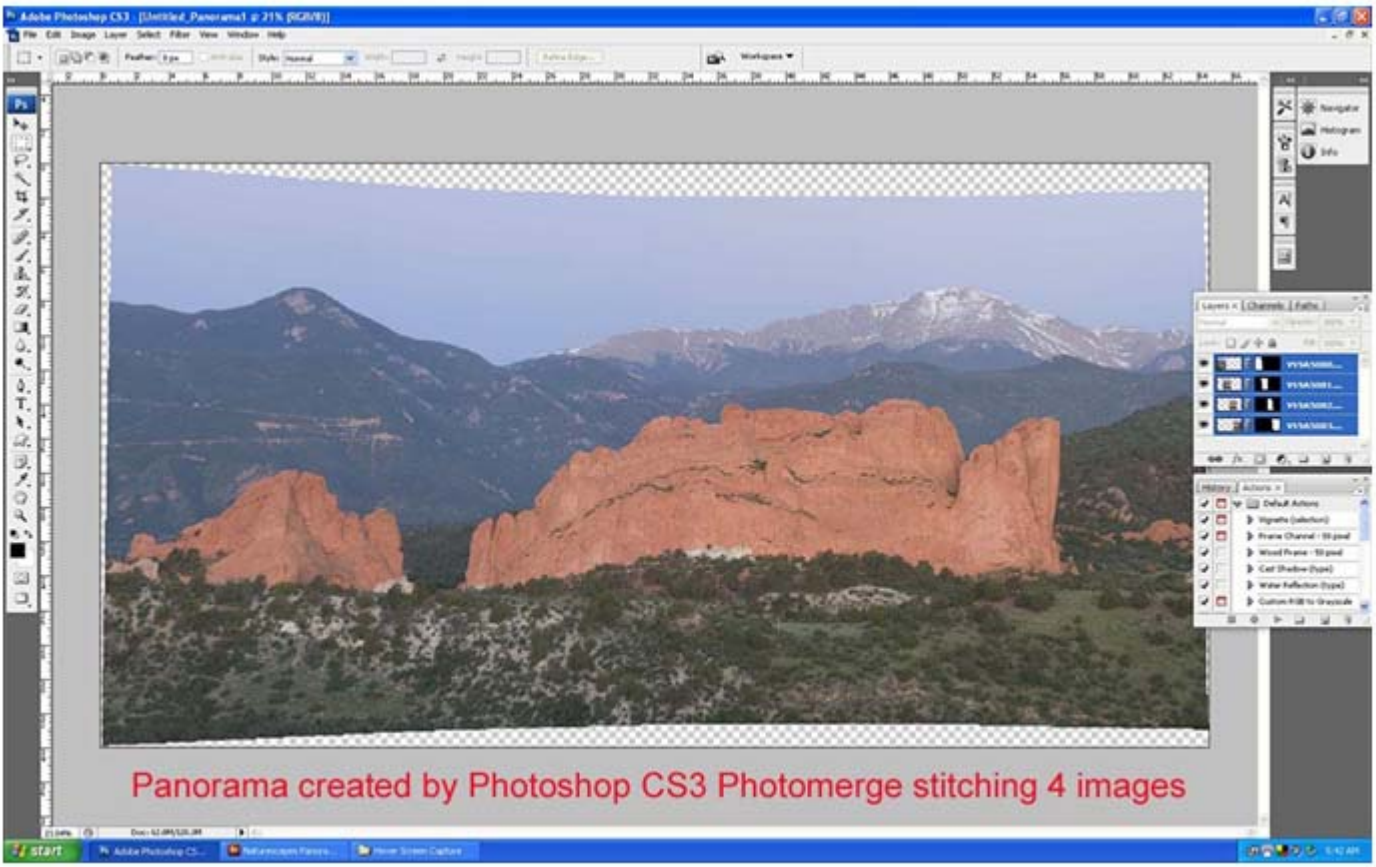
- Select all pano images in your browser and open in a camera raw converter. Select all images and synchronize all images to have the same white balance and exposure as shot. Process and save these images within camera RAW as JPEG or TIFF files.

- Select converted images (JPEG or TIFF) and open files in Photoshop CS3 or other stitching software to begin making your panorama.

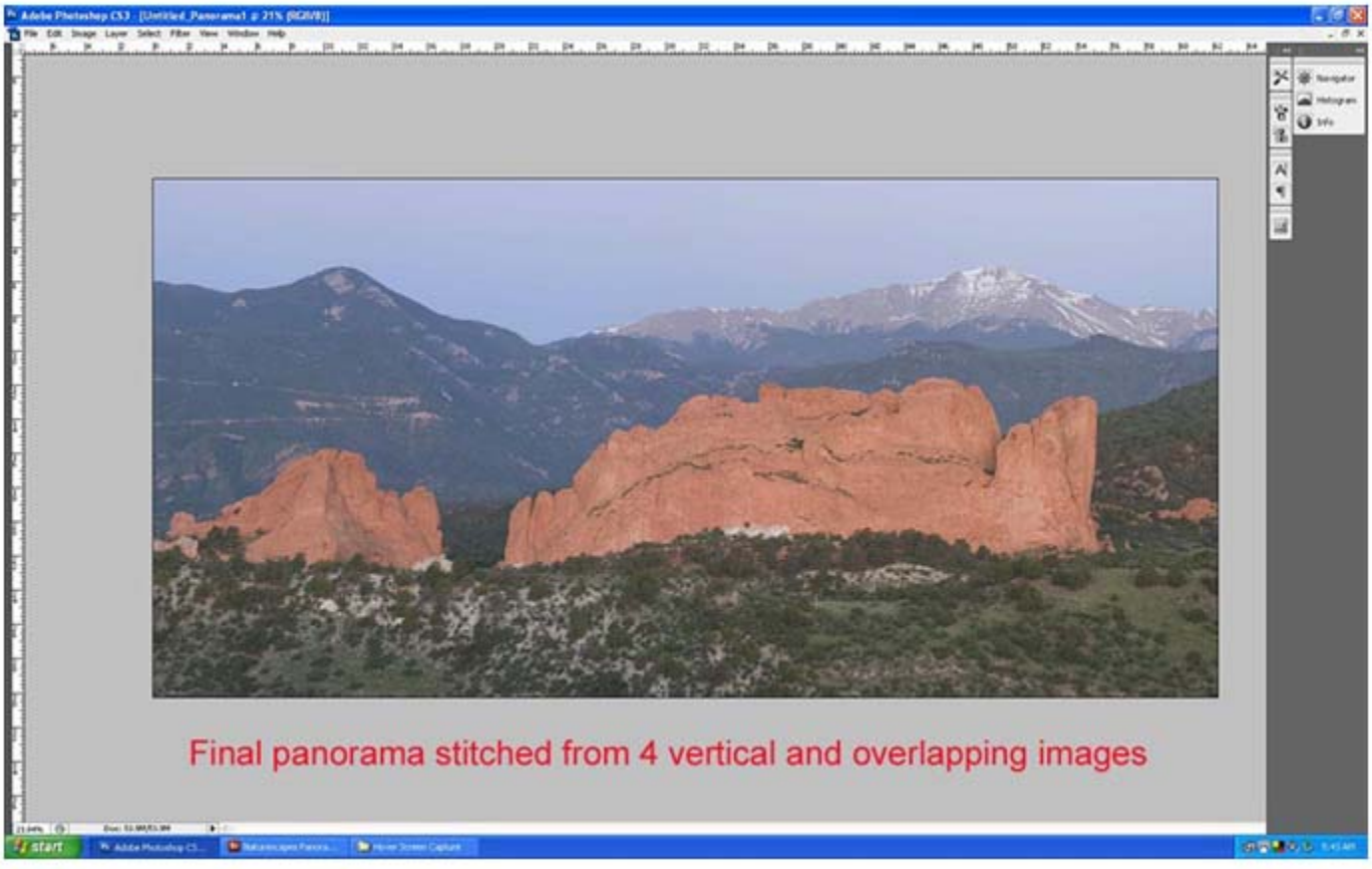
- In Photoshop CS3, go to File, Automate, Photomerge and choose a layout such as Auto. Click on Add Open Files; click the box named Blend images together and press OK. This will begin the process for Photoshop to align and blend individual images to make the panorama.

- When Photoshop finishes making the panorama you will note each image serving as an input to the panorama is

preserved as a layer. You may choose to save the panorama as a Photoshop file or flatten the layers while proceeding with any other traditional Photoshop image editing.



- If your printer accepts roll paper, print your pano. You can also use ProShow Gold to create a self-executing pano file that scrolls left to right or up and down and can be emailed or sent on CD.



The Finale

Steadying the tripod, exposing properly, avoiding parallax, and rotating the camera on the level are all-important in capturing each of the images needed for creating high quality panoramas. However, panorama makers now have it easier than ever with digital cameras and the latest stitching software to create their own recipes for seamless, high resolution, large prints that will captivate audiences.

Al Perry is a nature photographer who enjoys photographing wildlife, particularly birds, along with macros, scenics and panoramas. Al started as a social photographer in 1967, but turned his attention to nature photography 10 years ago. He is a member of the North American Nature Photography Association and the Rocky Mountain Outdoor Writers and Photographers. View Al's photo gallery at: http://public.fotki.com/alperry/

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