Lens Cast Correction
by Ken

I originally started writing about infrared photography. However as I was doing the article, I noticed that part of my workflow is very dependent on LCCs. Therefore, my first article will be on LCCs.

What is an LCC? I believe it stands for "Lens Cast Correction".
    It is very useful for: Color correction caused by filters.
                            Dust spot removal.
                            Color correcting from horrible light sources or reflected colors.
                            Making pictures that have even exposure for photomerging for panoramic.
                            Making pictures that have even exposure when using tilt or shift lenses.
A picture of the white reference plastic I talk about is located on the bottom right of Page 9.

It is easier to walk through the different parts than to describe it. In Capture One, which is software similar to Lightroom made by Phase One, one can take a picture of a white piece of plastic held up tight against the lens, forming a light tight seal. See image below. Note:
        The darkness in the upper left and also top to bottom.
        This image does show dust spots, the two most obvious are circled in orange.
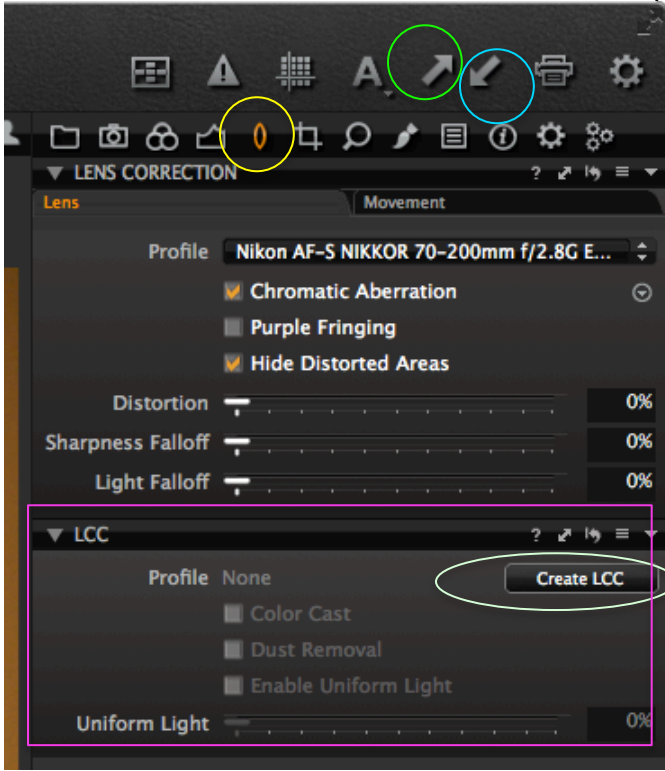   The green color cast of the image. (This cast is from the polarizing filter.)
        The histogram from before the LCC and after the LCC. This is all in the visible spectrum.
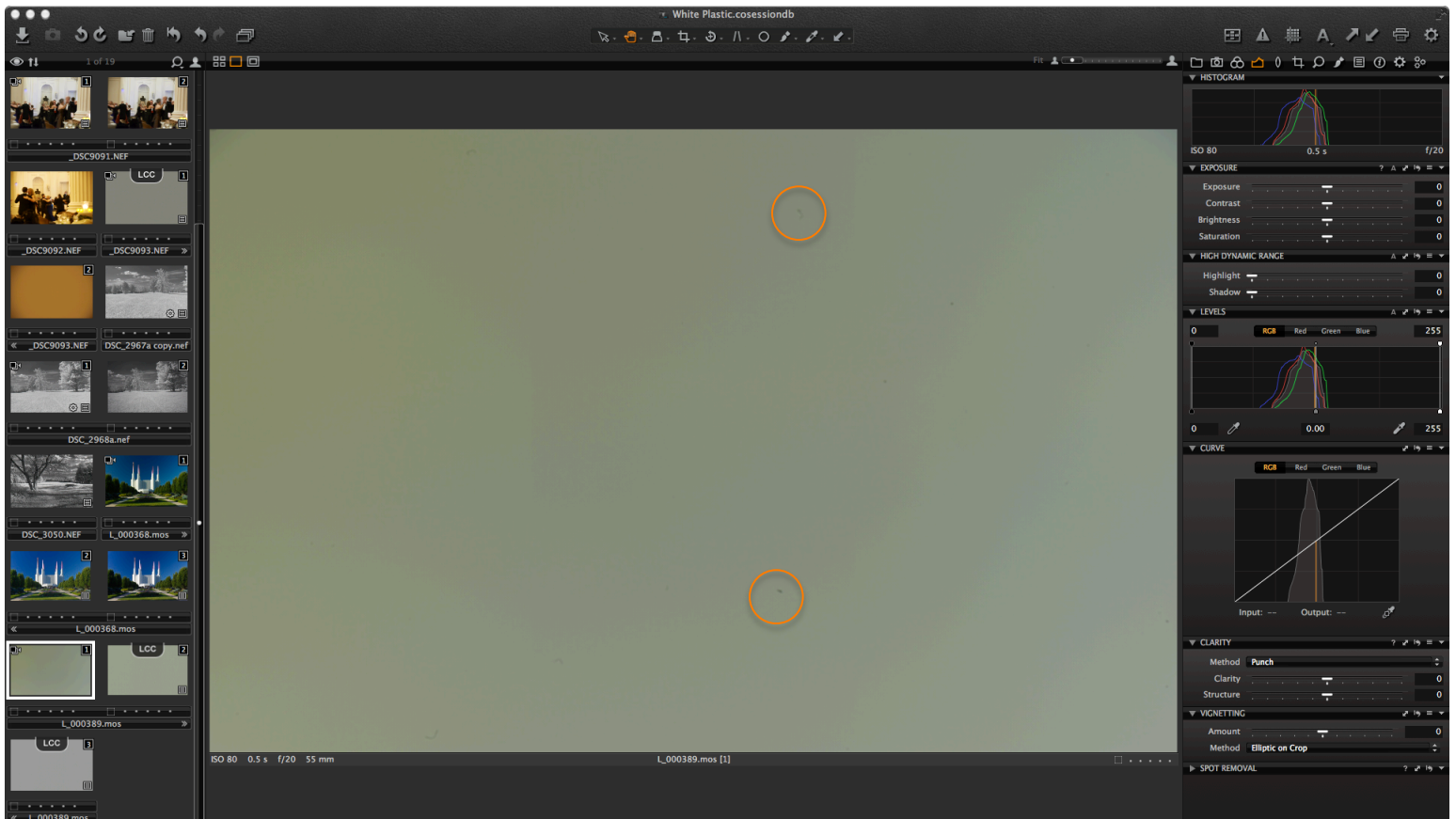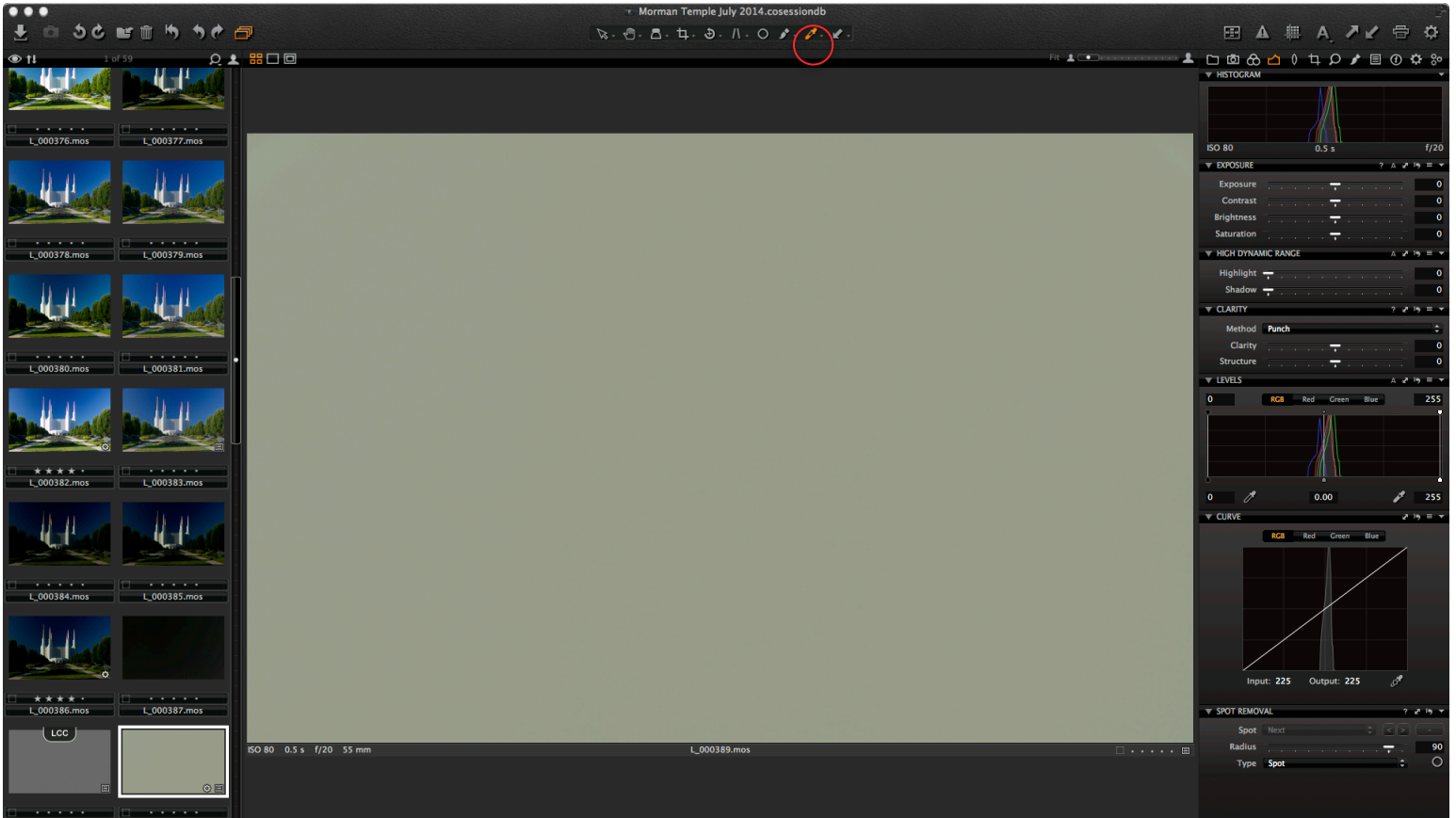

Screen shot 1

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In capture one under the lens tool (yellow circle) there is a box that is labeled LCC (magenta rectangle). In it there is a button that will create the LCC (light green oval). Once clicked the entire image will have the same brightness everywhere as can be seen below. There is also a dust removal tool. A click of the white balance tool (red circle in below image) will turn the image grey. There is an up arrow on the toolbar at the top (bright green circle). The LCC along with the color correction adjustments will be loaded into the computer. A click on the down arrow button and the previously uploaded adjustments will be applied to the image selected (light blue).

Note: This LCC panel image is from a different LCC image.

LCC panel under the LENS Tab.

Screen shot 2.

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Look at the histograms of the three screen shots. In the first note how wide the histogram is compared to the second and third screen shots. It is wider because the image has a greater range of darker and lighter areas. The histogram shows this greater span of light and dark areas.

Of the second image screen shot, note how the histogram shows individual lines for blue, red and green representing the relative amount and brightness of each color.

Of the third screen shot, note that first of all, the image is now grey, removing the color cast. Secondly note that the histogram shows the blue, red, and green lines pretty much on top of each other. Red, green, and blue light when balanced correctly will create white light. Grey is formed when the balance is correct but not overpowering the sensor.
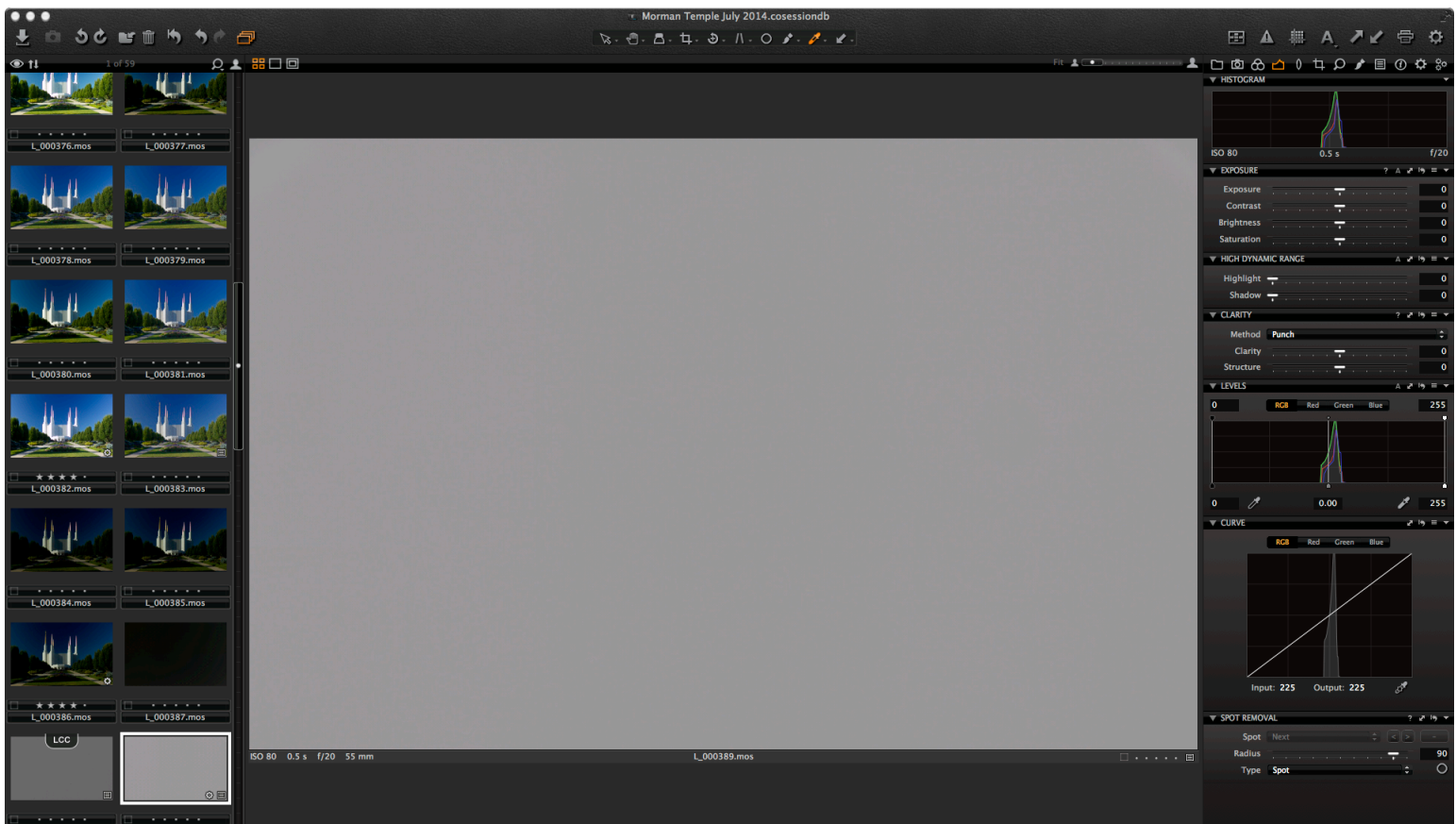
So now that we have walked through the LCC process, how does it make pictures better? Below is an image taken right out of the camera. Note how the white marble being lit by the sun has a greenish tint. The original LCC had a greenish tint too. The sky is not a vibrant blue because it also has a greenish tint to it.
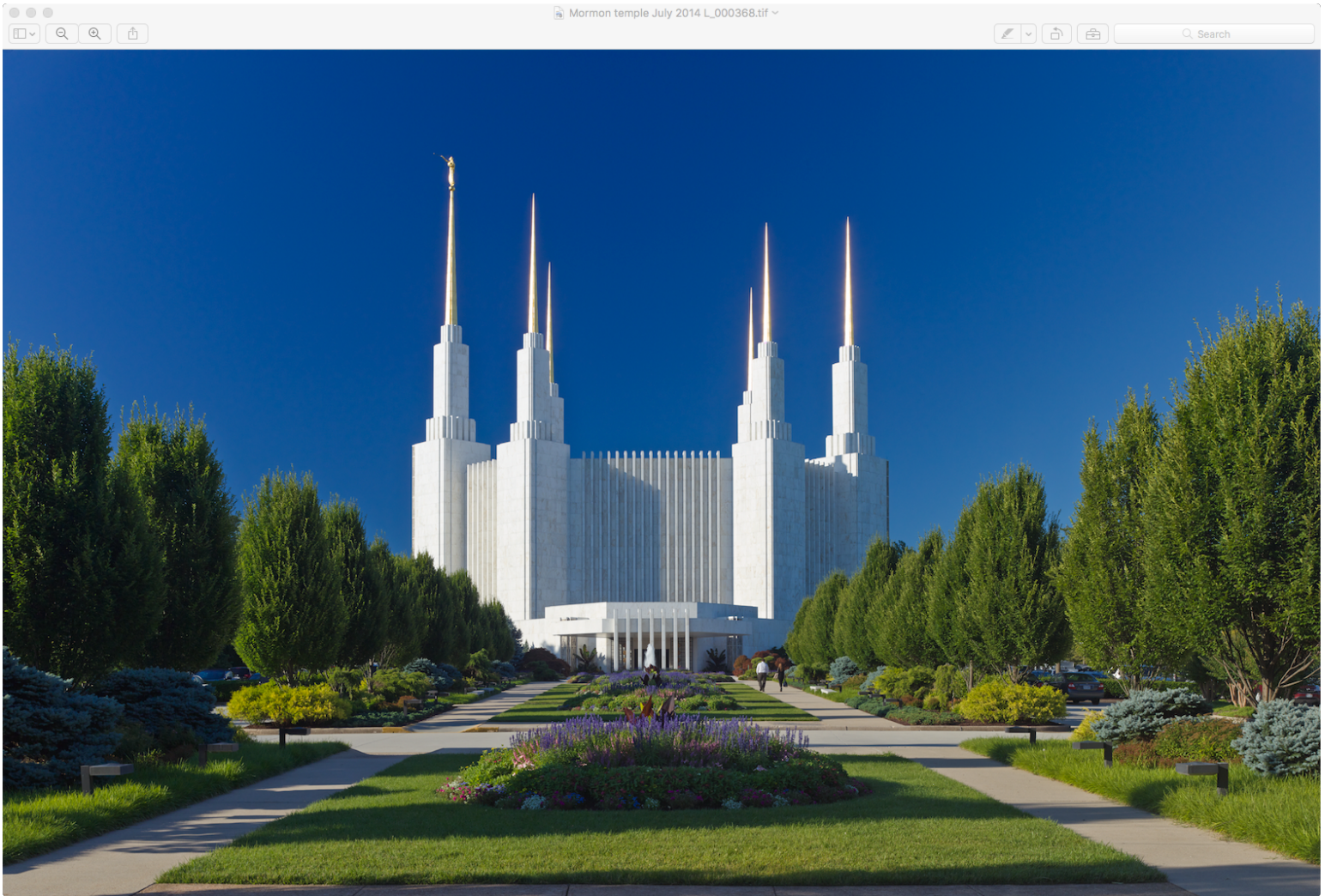
Out of camera.

LCC applied to image. Note removal of green cast off of white marble. The sky is now a decent color blue.

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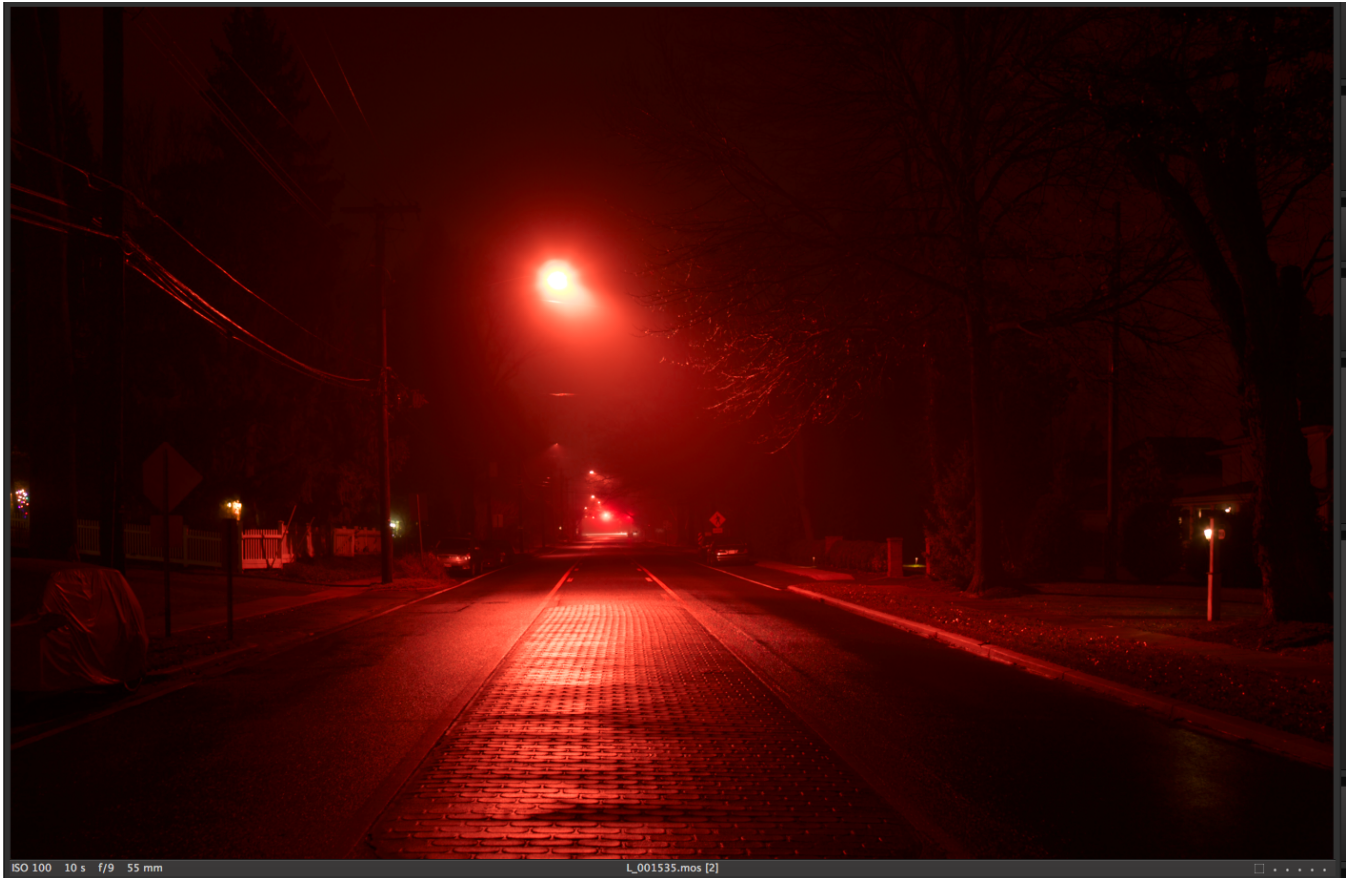And the final image, with highlight and shadow adjustments.

Remember the dust spots in the beginning? (First image with orange circles.) Below left is one of them on the marble. Below right the dust spot is removed by clicking the remove dust spot box. But dust, a small lose particle of something, likes to move around. Jarring of the camera during set up and take down between pictures can move it a tiny bit. When that happens the dust removal tool is not your friend. It will create a very distracting light and dark blob. Light where the dust had been and dark where the dust has moved to (see image below marble for an example). That is the reason it can be very helpful to take a picture through white plastic whenever changing location. Also if one uses a lens that can shift and tilt, it is also very helpful to even out the brightness of the image due to light fall off from shifting and tilting.

Dust moved between LCC and picture being taken.

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If one has a light source as given off by the original compact fluorescent bulbs (an orangey-yellow), fluorescent bulbs, mercury vapor, or sodium vapor, a picture taken through the white plastic will give you a good starting point for color correction. Below is a sodium vapor lit street scene.


The LCC frame shot.

And the final image after white balance is applied from the LCC. Note the incandescent bulbs now have a blue green appearance as those colors were missing from the sodium vapor light.

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One can also create a library of LCC images for a given lens at a given aperture. Or for a zoom lens at different focal lengths and apertures. This is what I have done for my IR camera and zoom lens.

Note how the center of the image is bright and the corners are dark. And yes, there are a lot of dust spots.   These images are in the Infrared range. I have a preset white balance which makes the camera sensor approximately equally sensitive to all colors. This is the reason the histogram has the red, blue and green lines on top of one another.
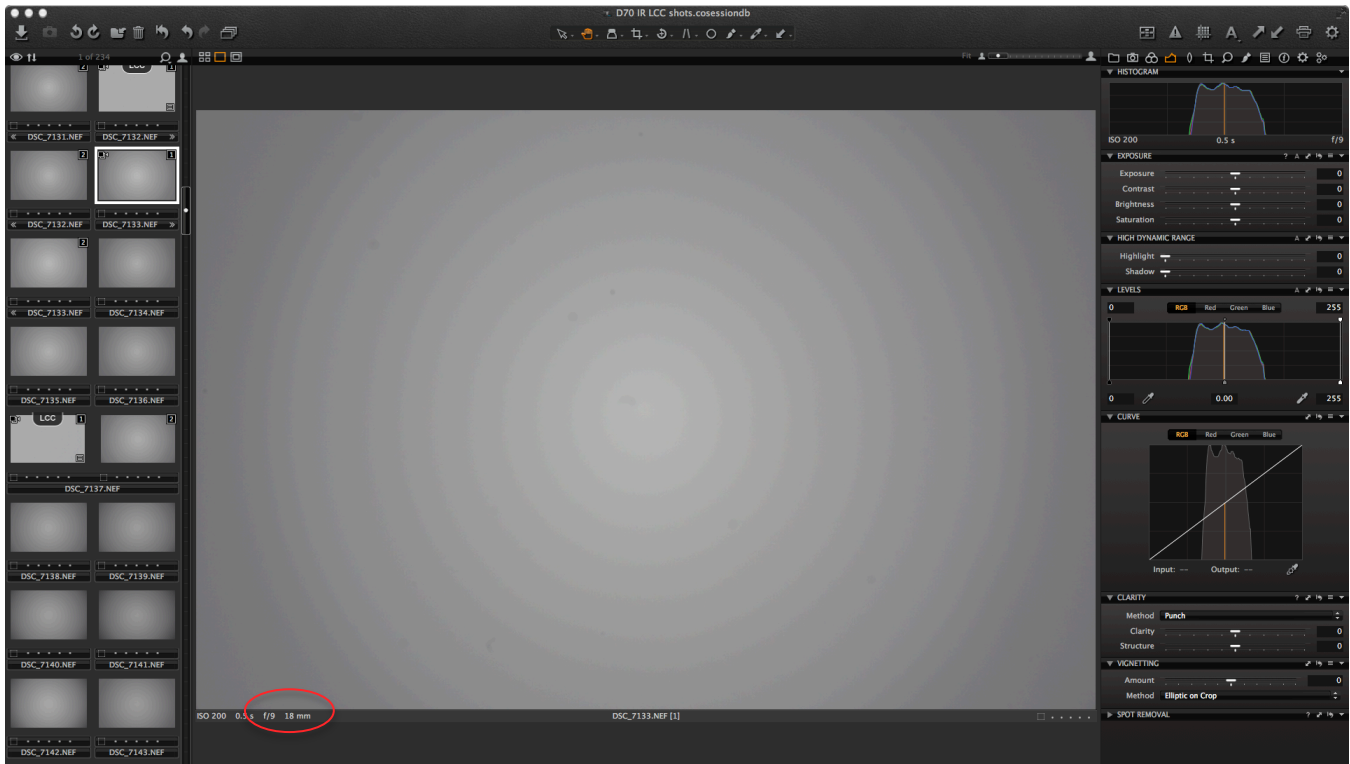
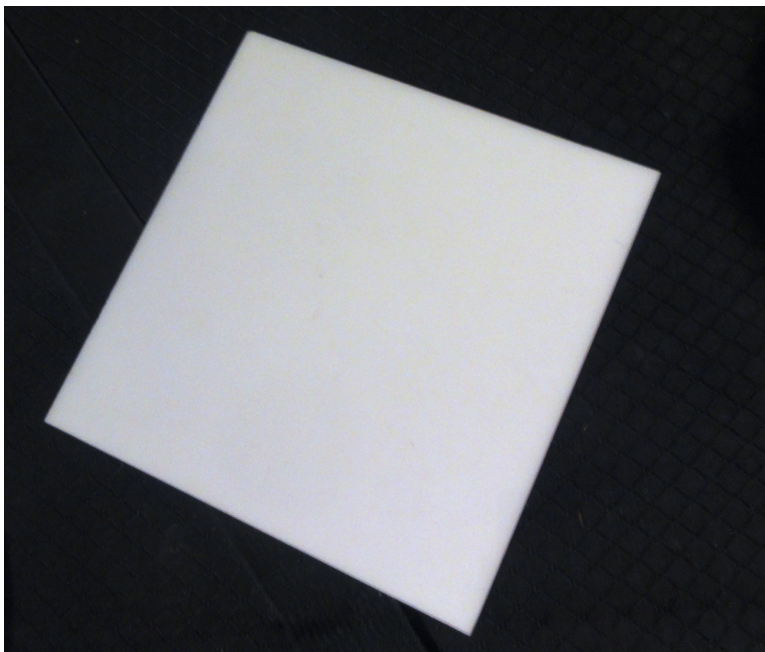Part of my white plastic library images for use to create LCC.

Image of the white plastic used to create library for LCC images.

I hold it flat against the filter edge of the lens. (If the lens is a wide angle lens with a protruding front and no uniform filter ring it can not be used. I do not touch the lens glass.)

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So my work flow using the LCC library starts with picking an image.

At the bottom of the image (circled in yellow) is displayed the aperture and the focal length. (ISO and exposure duration are more or less irrelevant to the LCC process except for correctly exposing the initial picture of the white plastic. Higher ISO white plastic images could induce noise, which would then be part of the LCC.) I remember the information in the yellow circle and look for that information in my LCC library. See red circle in "Part of my white plastic library images for use to create LCC" above this image.

Lens Cast Correction
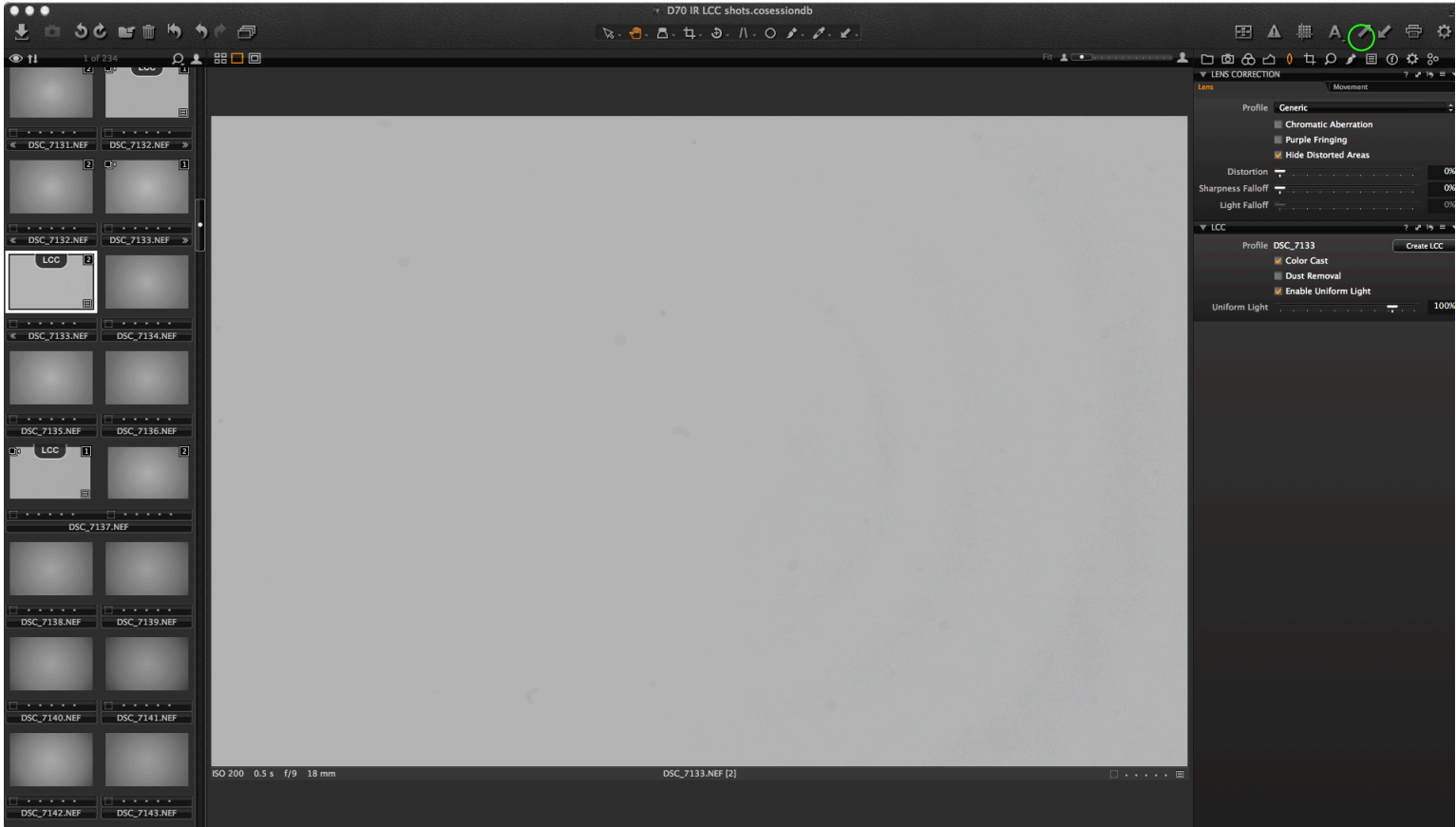
I create the LCC image. I do **NOT** check the "Dust Removal box" as most likely the dust is no longer in the same place when the white plastic image was taken.   I click the up arrow button (green circle). I go back to the screen that has the image I am working on and click the down arrow (blue circle).

<center>LCC applied to image below.</center>

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Note on the **above** image titled "LCC applied to image below" how the image is more evenly lit. The histogram has moved away from the left side which is where the darkness is represented. Brightness is represented on the right side of the histogram.

And finally, the final image with other adjustments applied below.

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If you have a tilt or shift lens you can create a library of images for use in post processing. Since most tilt or shift lenses are a fixed focal length, testing at different focal lengths is not an option.

If I was to create this library for myself, I would set the camera up outside in the shade facing a naturally lit area that did not have anything in close proximity that would create a brighter illuminated spot. I would start at zero degrees of tilt and zero mm of shift and all the apertures along the way and focus distances I wanted, say every five feet. I would start by doing positive shift, followed by negative shift. Put a degree of tilt run through all the previous test again. Repeat for all desired positive degrees of tilt wanted. Then do it again for negative degrees of tilt. If you did not want to spend hours creating the library, then take a picture of white plastic before or after each shot with the desired settings. The advantage of this method is the dust spot removal tool can be used.

Photo Merging:

So you have two or more images you would like to merge into one. If there is any lens vignette of the image, scalloped dark areas will show up on the top and bottom if shooting in portrait orientation. (Been there done that.) Photoshop lens correction will help but will not necessarily get it all. (Tried that too.)

Instead of walking through all the steps, please see, "So my work flow using the LCC library starts with picking an image," above. I did those steps to the images before trying to merge them the second time. The first image was without the process. Below are the results.

No LCC applied. Note center third is brighter than left and right sides.
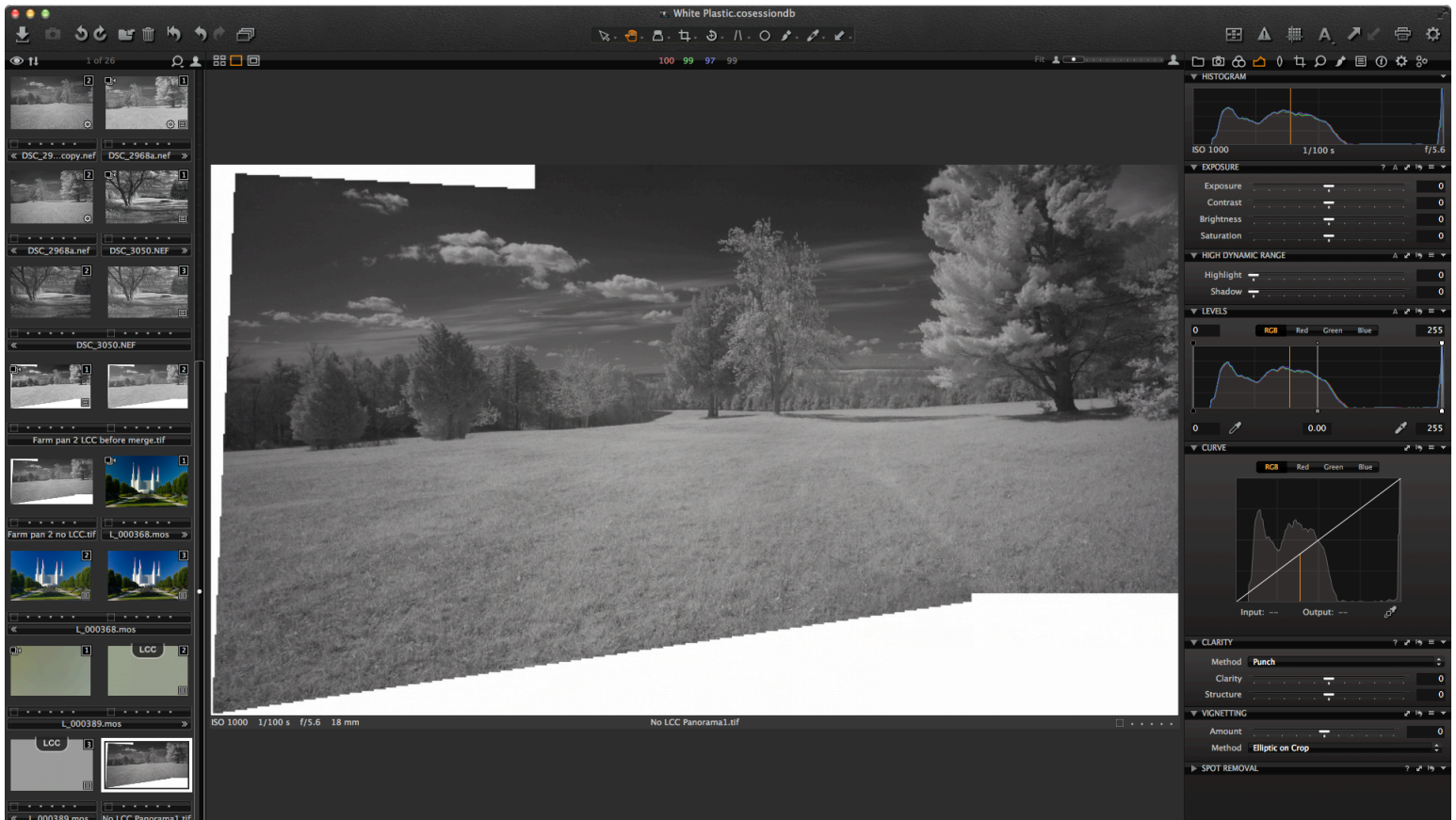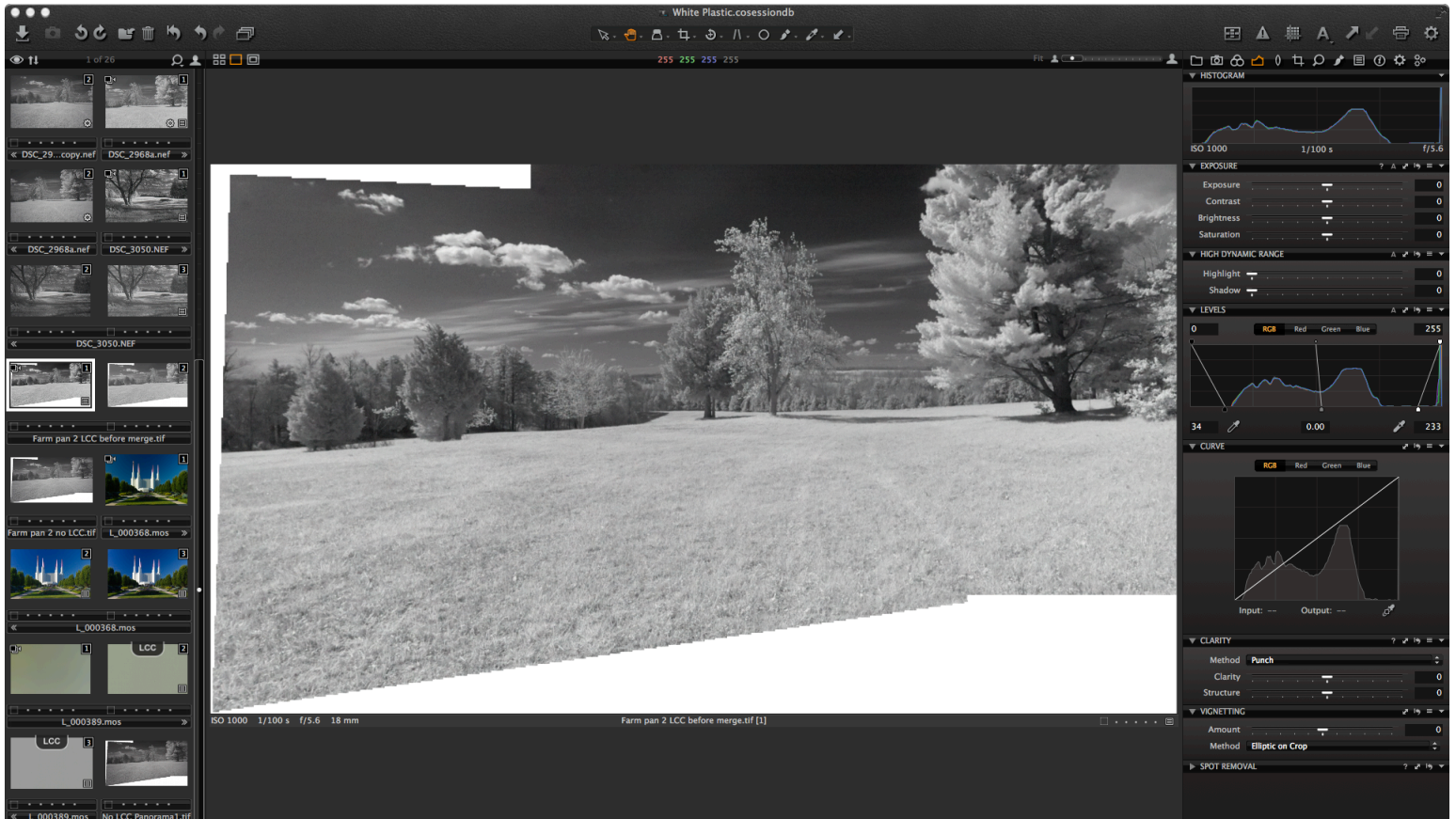
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LCC applied to images before merging. Note the brightness increase on the left and especially the right side.
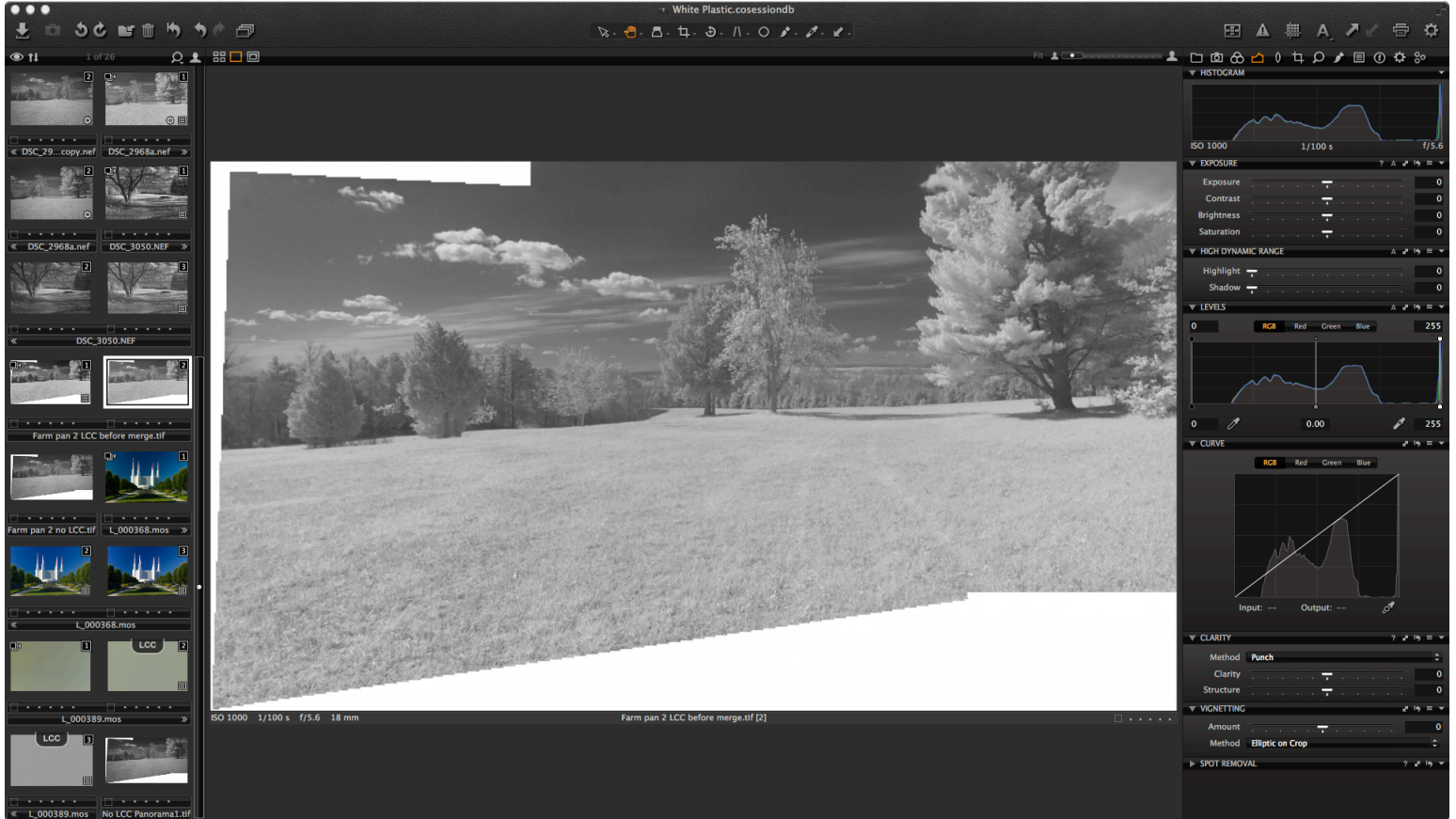
And the final image with adjustments.

I hope this has been informative, helpful explanation of an LCC.   Any questions please feel free to ask. In the new year a demonstration can be arranged for one of the meetings.

If you shoot a Sony camera, from my understanding, Capture One software comes with it. Fuji might include the software with some of their cameras as well.

(Word is a wonderful program for text. However, when including pictures and symbols it can become very frustrating, as in adding another line can cause the program to do weird stuff and all organization of multiple objects (picture, circles, page, page placement) goes out the window. This is the reason I used the header function for the title. I also saved it in PDF for that reason as well. My apologies.)