You, too, can make useful and beautiful astronomical images at Mees: Lesson 5 and Last. LRGB composition and other useful Photoshop features

Useful references, besides Lessons 1-4:

□ Rob Gendler (ed.) 2013, *Lessons from the Masters* (New York: Springer-Verlag), especially the article by Adam Block (p. 159).

Software:

□ Photoshop CC

LRGB

If one is after pretty pictures, one has already invested a lot more time in L than in RGB, according to the prescription promoted in this lesson.

- Even in the same time, L images have much higher S/N than R, G, or B, and so will look much more impressive.
- By the same token one would have to commit prohibitively-large (factors of 3-9 larger) exposure times for R, G or B to catch up in S/N with L.
- Thus ground-based pretty picture are almost always LRGB composites.



So one usually uses the multiple-image-plane and Luminosity features of Photoshop to combine L and RGB images, using the RGB as the background, shining through the L image.

- □ L acts as a transmission mask, thus suppressing noise in the blank sky in the RGB image, and imposing sharp detail on the bright parts.
- Enables use of even more subterfuge on RGB, such as coarser binning (which is already part of our recipe) and further blurring within Photoshop to reduce color noise, without changing the resolution of the final product.
- □ Penalty: total loss of color and surface-brightness accuracy.
 - Colors are smeared over more L PSFs than they deserve to be.
 - If the L image has been deconvolved too, well ... see last lesson.
 - Now it's more a work of art. Which is of course not all bad.

Here's how it's done.

- Ask Photoshop to open (File > Open) the scaled L and RGB TIFF images you want to use. These were generated as we did last time, in CCDStack or FITS Liberator.
- Choose the tab with the L image, select the whole image (Ctrl+A) and copy (Ctrl+C)
- Choose the tab with RGB, and paste (Ctrl+V). This creates a layer containing L, above the RGB background.



- You will see this superposition indicated on the Layers tab at lower right of the Photoshop window.
 - Rename the layers, if you want, by double-clicking the name and typing a new one.
- Select the upper layer (L, Layer 1 if you didn't rename it), click the dropdown box immediately above it, which starts off saying Normal, and choose Luminosity (last choice in the list).
- □ Now the colors are shining through the L image, and you're ready to start tuning the image to look nice.

Tip: take note of the menu items **Edit > Undo, Edit > Step Backward and Edit> Step Forward**, by which you may recover from almost any misstep in Photoshop, or toggle between two steps in the process.



Tuning up the LRGB image

As long as L and RGB are two separate layers, one may – and should – operate on them separately, but one should always be looking through L onto RGB with the Luminosity overlay, as on the last page.

Here are the tools to use, and *roughly* the order in which to use them

- □ View > Zoom In, View > Zoom Out, View > Fit on Screen, invoked from the keyboard with Ctrl+ +, Ctrl+ -, and Ctrl+ 0. You'll use these a lot.
- Select RGB (background) layer and do Filter > Blur > Gaussian Blur. This essentially convolves the RGB layer with a Gaussian, which smooths out the noise in this layer; it also blurs that layer, but not the final image, as the L layer determines the detail.
 - Do this to suppress "color noise" in the Highlight parts of the image: those parts where L is bright.

Tuning up the LRGB image (continued)

□ Several tools under **Image > Adjustments**, still just on the RGB layer:

- **Shadows/Highlights**. Favorite of Adam Block's; I don't find it as useful as he does, but it is a versatile tool for adjusting signal and color of background and highlights with respect to each other. For example: taking color out of the background without affecting the color of the highlights very much.
- Levels. Can adjust the black level (left slider), white level (right) or midtone (middle) of RGB all at once or one color at a time.
 - Note especially that raising the black level of RGB basically cutting off all the signals below the level indicated by the left slider – increases the color saturation of the highlights dramatically.
- **Curves.** Enhance or suppress some ranges of brightness with respect to others, in a smooth and nonlinear fashion

Tuning up the LRGB image (continued)

- Vibrance. Brightness of color, which is somewhat different from color saturation. Often turned up way too far in APOD images; careful of what it does around stars and compact parts of the highlights. Also has a Saturation slider.
- **Hue/saturation**. Allows tweaking of colors in mixed ways, like CYM instead of RGB. Adjusting M (magenta) is often useful in making H II regions in galaxies look a bit more like the real thing.
- **Color balance**. Some of the same features as Hue, but allows adjustment separately for shadows, midtones and highlights, and does so in energy-conserving fashion.
- **Brightness/contrast:** like Levels but cruder. Might not help much if you did all the others first.
- □ After RGB, select the L layer and revisit Levels and Curves. Raise the L black level last.

Tuned-up LRGB image



Flattening and retouching

- □ When you're happy with the tuned-up image superposition, combine the two layers into one by using **Layer > Flatten Image**.
 - Now it's back to being a three-plane RGB image but still bears the L image's transmission; hence LRGB.
- Retouching: necessary to get rid of any remaining flat-field or deconvolution artifacts. This gets into some of the real magic of Photoshop.
 - The **Lasso** tool, _____, and **Edit > Fill > Content-Aware**. Best thing for dust donuts and other flat-fielding flaws. Enclose them with the lasso, erase them with the menu command.
 - The **Brush** tool, _____, is a versatile way to click away tiny blemishes such as deconvolution artifacts. I still find myself using Lasso and content-aware fill for this, but the brush is quicker.

Retouched LRGB image



Final steps

- □ **Save As...,** of course. Don't overwrite your original TIFF images.
- □ Save the full frame before you crop, as a 16-bit TIFF image.
- □ Use the **Crop** tool, □, to prepare a trimmed version of the image for posting on the Web or printing and framing.
 - Save cropped images both as TIFF *and* JPEG (or PNG).
 - Note that the Crop banner has some useful ways to set the cropping frame's aspect ratio precisely.
 - Picture frames frequently have aspect ratios 4:3, 5:4 or square.
 - I'm trying **Fracture** (<u>https://www.fractureme.com/</u>), which prints images directly on glass and ads a stiff backing, for nice frameless hangings in many sizes and 4:3 or square aspect ratio.
 - Printing takes practice: looks different on screen and on paper.

4:3 cropped image



Next steps: go to the telescope.

- We just passed lunar first quarter. No point in trying to take deep sky pictures til roughly third quarter (26 July), but this does not preclude practice, or very bright objects such as planets, planetary nebulae like M57, or the bigger globular clusters like M13 and M15.
- Next two astronomical dark times: 26 July 10 August, 24 August 9 September.
- Available then: northern galaxies (first few hours), galactic-plane H II regions (later). Some recommendations:
 - M 101 (ho hum), NGC 5866 (*V* = 10 edge-on lenticular), Draco Trio (all around *V* = 11), NGC 6946 (*V* = 9).
 - NGC 6543 (the Cat's Eye), everyone's favorite planetary nebula.
 - H II regions: try NGC 7538 or NGC 7635 (the Bubble Nebula) first. Most of the ones in Cygnus are too big.