

Creating Colored Astronomical Images

To setup this lab you will first need to install SalsaJ, which is a free program that can read FITS files. It can be downloaded here:

<http://www.euhou.net/index.php/salsaj-software-mainmenu-9/download-mainmenu-10>

Secondly, you'll need images. Here is where you can get Hubble's Eagle Nebula FITS files used in the following example lab plus other images "for educators":

http://spacetelescope.org/projects/fits_liberator/datasets/

Lastly, here is a power point "Chromatic Cosmos" that can be used to introduce CCDs, FITS files, how basic photometry works, and then how colored images can be created:

<https://docs.google.com/file/d/0B-9-PLQ22kYVbmJia2JmYlBnQ3M/edit?usp=sharing>

Optional Items to Consider:

Here is a terrific write-up about 'The Frightful Fallacy of "False Color"':

<http://astronomyviz.wordpress.com/2013/07/23/the-frightful-fallacy-of-false-color/>

If you download and install the SalsaJ version with macros and associated images there are other prepared labs "built" into the program. The write-ups can be found here:


<http://www.euhou.net/index.php/exercises-mainmenu-13/astronomy-with-salsaj-mainmenu-185?task=blogcategory&id=49>

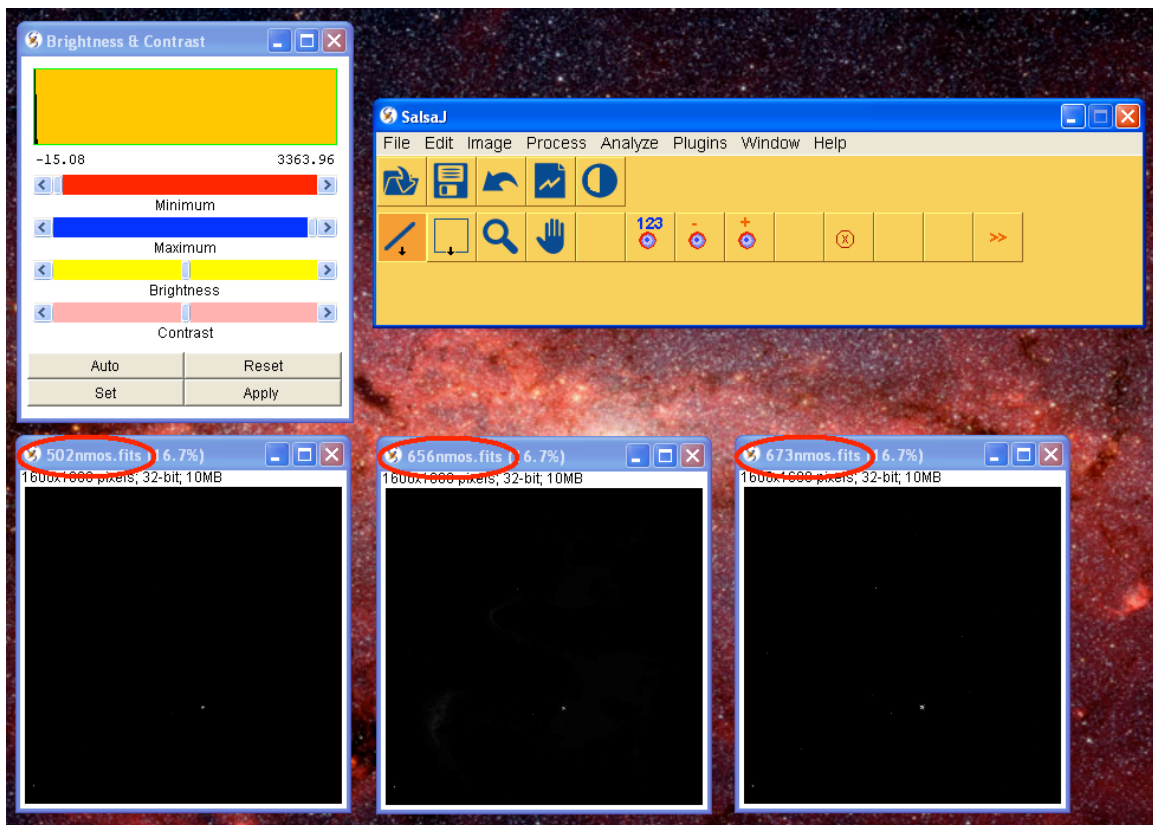
If you're feeling adventurous and want to find more Hubble images of other objects taken by more modern instruments visit the Discovery Portal MAST database here:

<http://mast.stsci.edu/portal/Mashup/Clients/Mast/Portal.html>

Have fun!

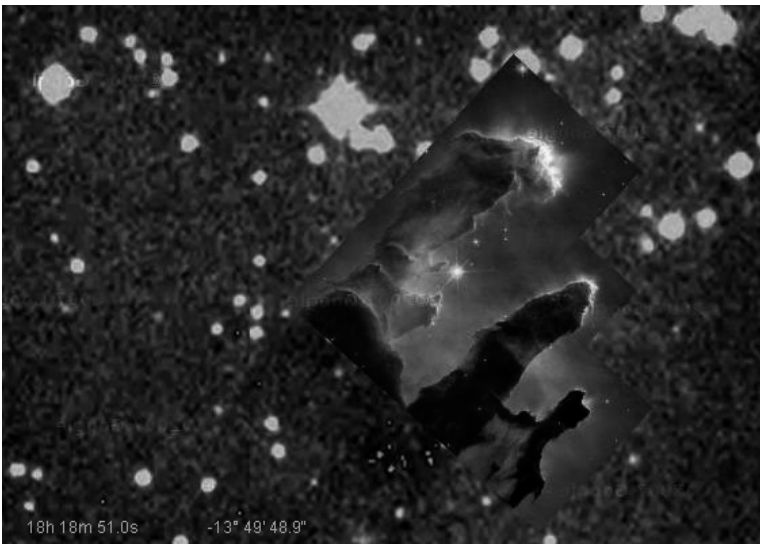
Creating Colored Astronomical Images

1. Open the SalsaJ program 
2. Go to File, then click **Open** – a new window will appear:
 - a. Find and open the folder containing the Eagle Nebula FITS images
 - b. Hold down the **Ctrl** key and select the three FITS files (502nmos.fits, 656nmos.fits, 673nmos.fits)
 - c. Click **Open** in the lower right hand corner
3. After all three FITS images have opened arrange them from shortest wavelength to longest wavelength similar to the screen capture below:
4. Go to Image, highlight Adjust, then click “**Brightness/Contrast...**” to open up the Brightness & Contrast box



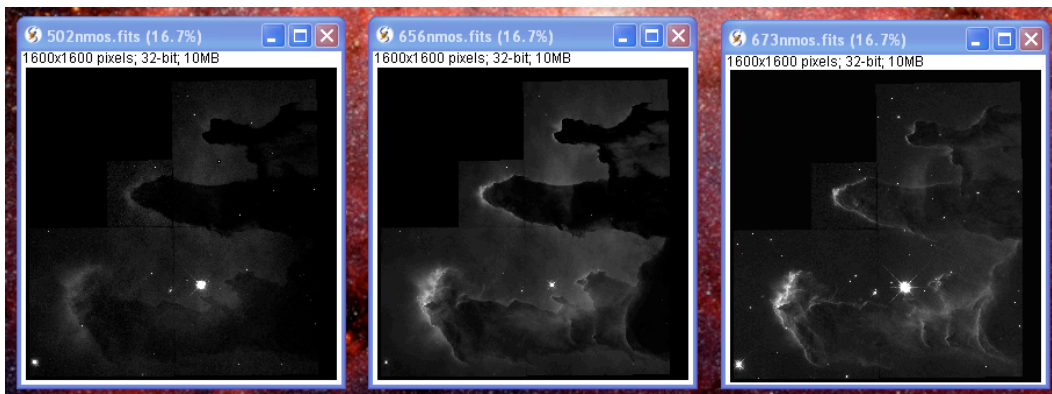
The next section will give you an idea of how professionals have chosen to color this object – (jump to #10 if you choose to skip):

5. Click on one of the opened FITS images then hold down Ctrl and type “I”
6. Look through the header file for the **Right Ascension & Declination** coordinates
7. Launch an internet browser and visit: <http://www.google.com/sky/>
8. Use the cursor to hover over the sky (notice the coordinates in the lower left change as the cursor moves)
9. Zoom out using the scroll bar on the left side, click and drag the sky to find the **RA hour and Dec degree**, then zoom in while adjusting the field of view to match the **RA minutes & seconds plus the Dec arcminutes & archseconds**



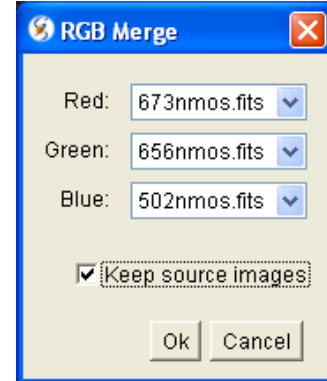
(Image here in lab intentionally made black & white – use Google Sky [steps #5 – #9] to experience the Eagle Nebula in color)

10. Looking at the SalsaJ software, one-by-one click on the title bar of each image and adjust the pixel minimum, maximum, brightness, and/or contrast so that each filtered image shows significant detail without making it look over exposed



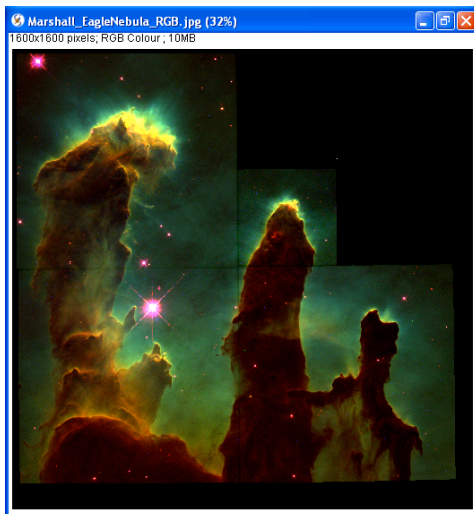
11. Next, click on Image, highlight Color, and click **“RGB Merge...”**

12. Assign the longest wavelength FITS file to Red, the shortest wavelength to Blue, and the last wavelength to Green – make sure to click on the **“Keep source images”** check box – then click **Ok**



13. If one color (R, G or B) is too strong or lacking in the composite image, highlight that respective filtered source image and make proper adjustments to either lessen or boost the brightness – then jump back up to step #11 to recreate the color composite image

14. Once happy with the color balance (comparing your image to Google Sky), click on Process, highlight Rotate, click on **“Rotate 90 Degrees Right”** – then feel free to adjust the pixel minimum, maximum, brightness, and/or contrast on this new color composite image



15. Click File, highlight Save As, and click **“Jpeg...”** – a new window will appear:

- a. On the left hand side click the **“Desktop”** icon
- b. Type your last name(s) and the name of the object in front of **“RGB.jpg”** (example: Marshall_EagleNebula_RGB.jpg)
- c. Click **Save** in the lower right hand corner

16. You can either e-mail this file to yourself and/or ask that it be printed

17. Try colorizing other celestial objects!