3 Color Composites – a js9 activity

Purpose: To produce three color composite pictures of supernova remnants from Chandra X-ray Observatory data showing the areas of low, medium and high energies.

Background:

The process of making the computer-generated images from X-ray data collected by Chandra involves the use of "false color." X-rays cannot be seen by human eyes, and therefore, have no "color." Visual representation of X-ray data, as well as radio, infrared, ultraviolet, and gamma rays, involves the use of "false color" techniques, where colors in the image represent intensity, energy, temperature, or another property of the radiation. Scientists use different "false colors" to highlight different properties of the astronomical object being studied. Find out more at:
 https://chandra.harvard.edu/graphics/edu/earth_scientist_decoding.pdf

Each color in the image below of Kepler's SNR represents a different region of the electromagnetic spectrum, from X-rays to infrared light. These diverse colors are shown in the panel of photographs below the composite image. The X-ray and infrared data cannot be seen with the human eye. By color-coding those data and combining them with Hubble's visible-light view, astronomers can study a more complete picture of the supernova remnant.
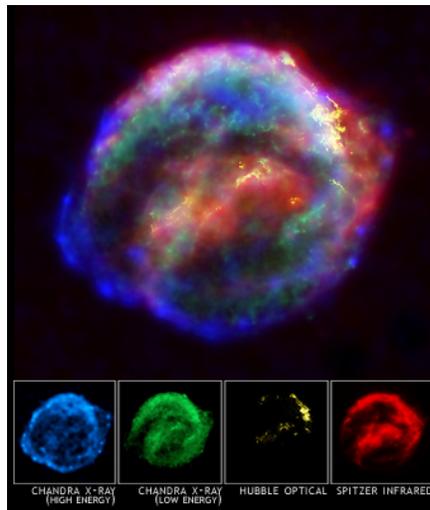
In this activity, you will use js9 software to make a three color composite image of Cas A. The red, green, and blue regions in the composite will show where the intensity of low, medium, and high-energy X-rays is greatest.

js9 software is available on the web at https://js9.si.edu. It allows educators, students, amateur astronomers and the general public to perform X-ray astronomy data analysis using data sets from the Chandra X-ray Observatory.

Procedure:

1. Go to https://js9.si.edu. The image of Cas-A is already displayed.
2. Produce an image showing only the photons from 600 to 1650 eV. Go to **Analysis>event filter**. In the window that pops up, type "energy=600:1650" in the box next to "Event Filter" and then click "Run." Go **to Color>Red**.
3. Go to **File>casa.fits** to reload your original file "casa.fits." Repeat step #2 for the medium (1650-2250 eV) with **Color>green** and the hard (2250-7500 eV) bands with **Color>blue**. It is important that you go back to your original file before using the event filter.
4. Now go to **Color>rgb mode** to make your 3-color composite. If you wish to adjust how much of each color appears in the composite, you can go back under **File** and choose either of the three files you made and adjust the contrast and bias by left clicking the mouse and dragging it horizontally or vertically on the screen. To reset this, go to **Color>reset contrast/bias**. Note that these adjustments are only for the file you have open at this time and not the whole composite together.
5. If you would like to save this file as a picture for a presentation, go to **File>Save** and choose **JPEG** or **PNG**. From here you can import this image into other programs such as Photoshop to modify it further.