



Widefield and Nebula Imaging

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Topics

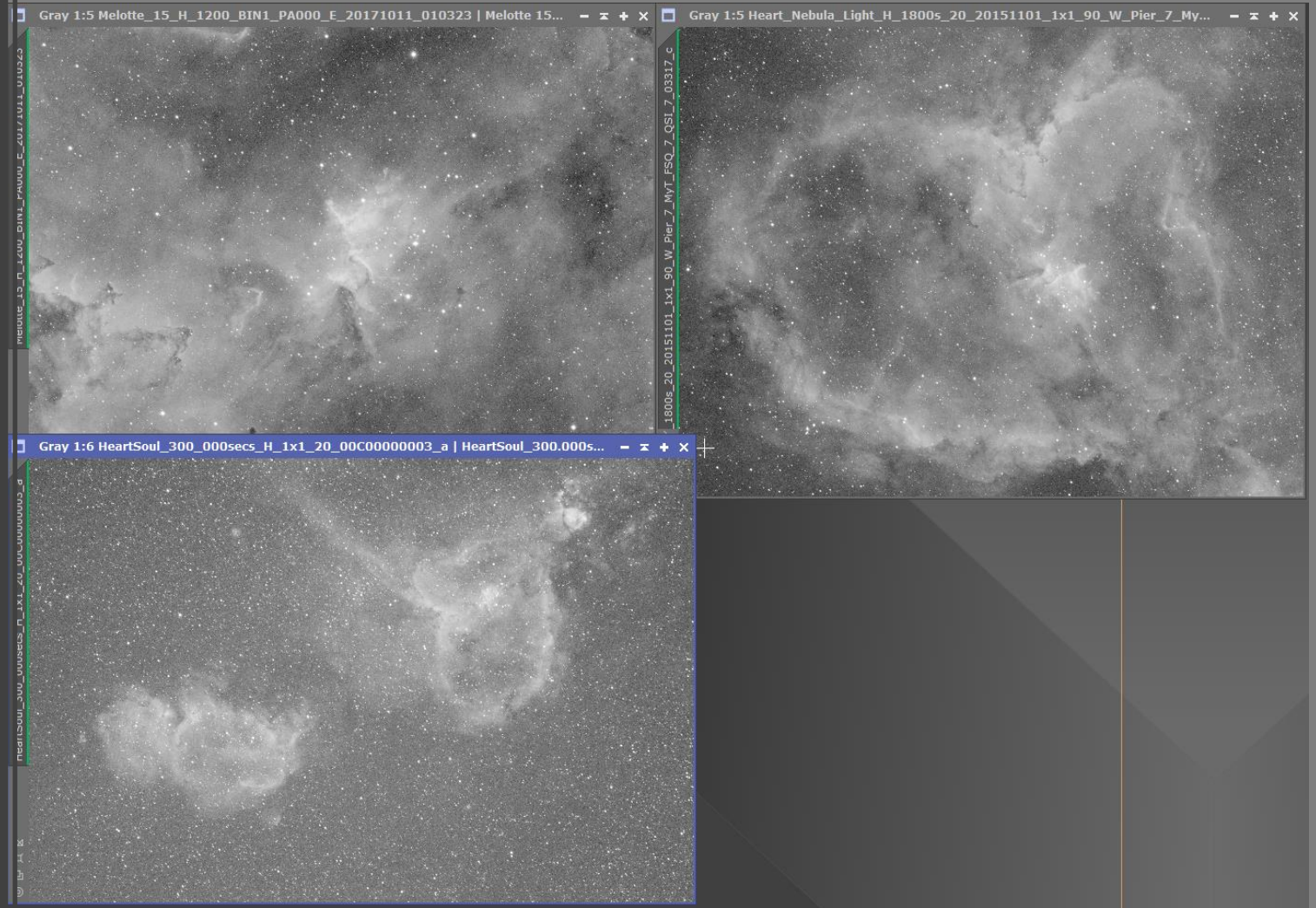
- Widefield composition
- Improving nebulas with narrow band data
- Processing – some new tricks (for me)
- Hardware considerations

A wide-field astronomical image showing the cosmic web, a network of filaments and voids of dark matter and gas. The filaments are highlighted in red and blue, set against a black background filled with numerous small, distant stars.

Widfield composition

Variety of Perspectives

Melotte 15 within Heart Nebula
adjacent to Soul/Fetus Nebula

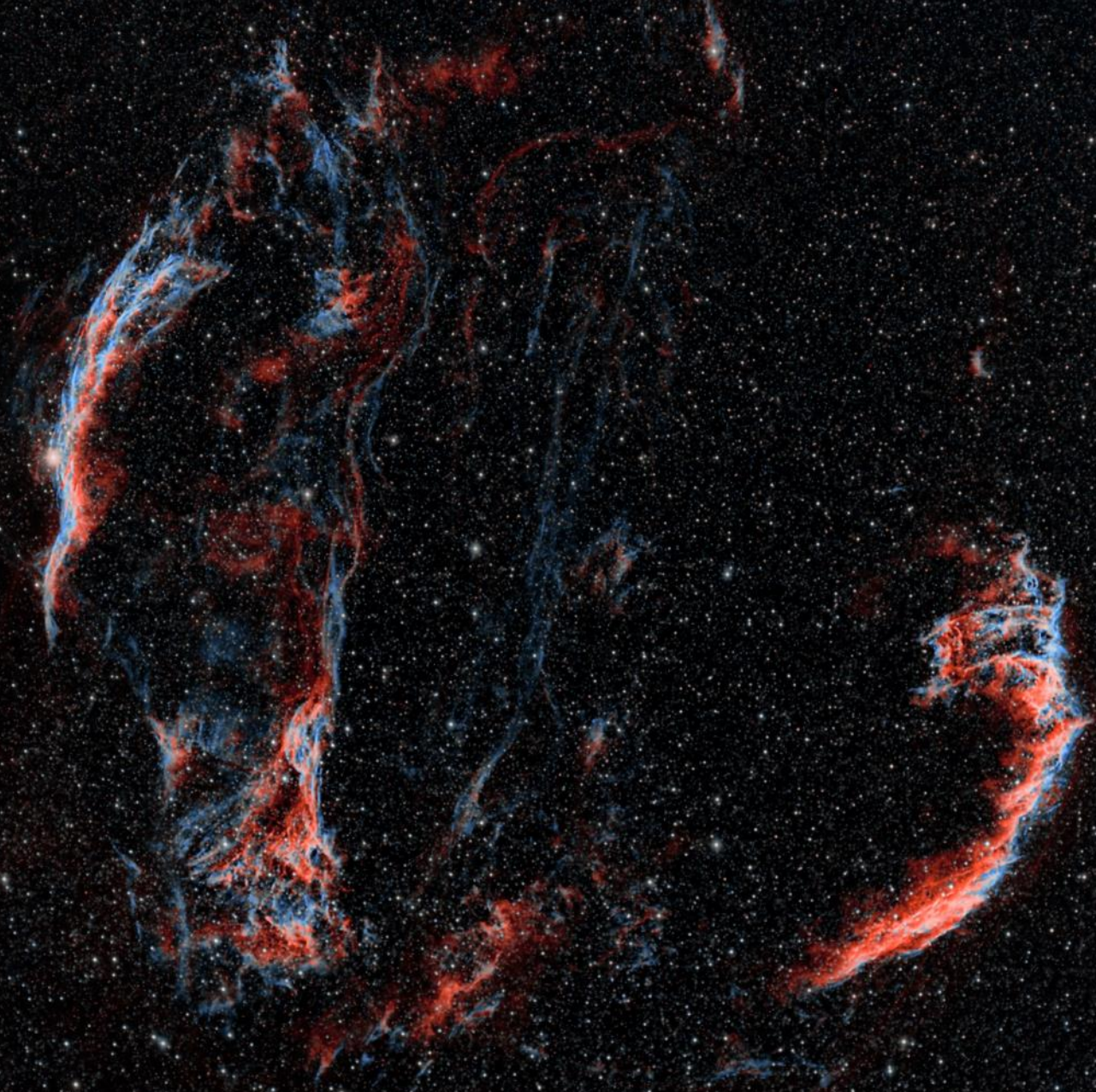


Display relative
position of
familiar targets to
each other

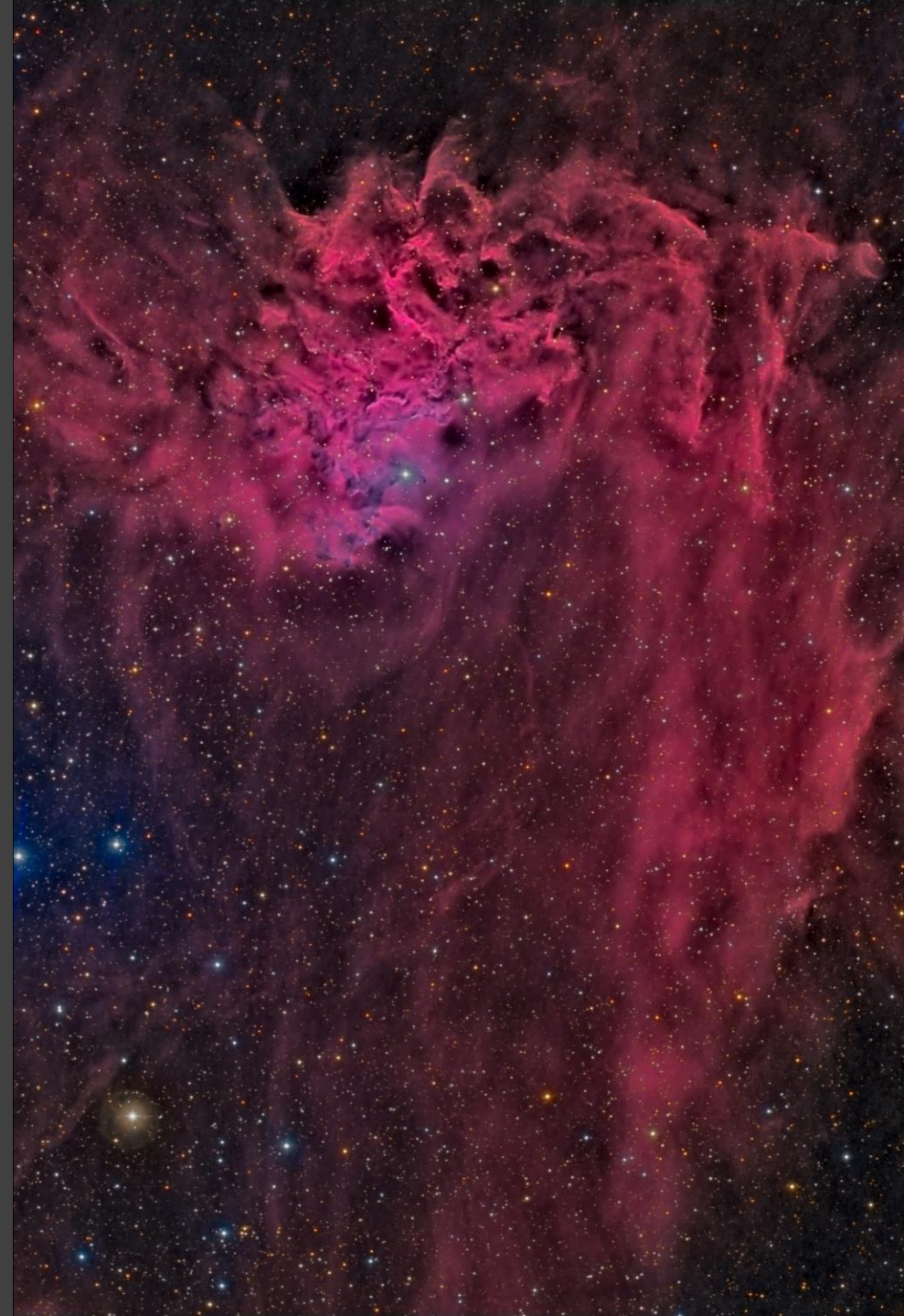
The background of the slide is a deep space image showing a complex network of red and blue filaments, representing the cosmic web or intergalactic medium, set against a dark field of distant stars.

Show the “bigger picture”

Veil Nebula
Complex




Flaming Star Nebula



This is a deep-sky photograph showing the Flaming Star and Tadpoles nebulae. The background is a dense field of stars, with many appearing as blue-white points of light. Three prominent nebulae are visible, glowing with a reddish-pink hue. One is located in the lower-left quadrant, another in the upper-left, and a larger, more complex one in the right half of the frame. The nebulae have irregular, wispy shapes with some darker, more concentrated regions.

Flaming Star and Tadpoles



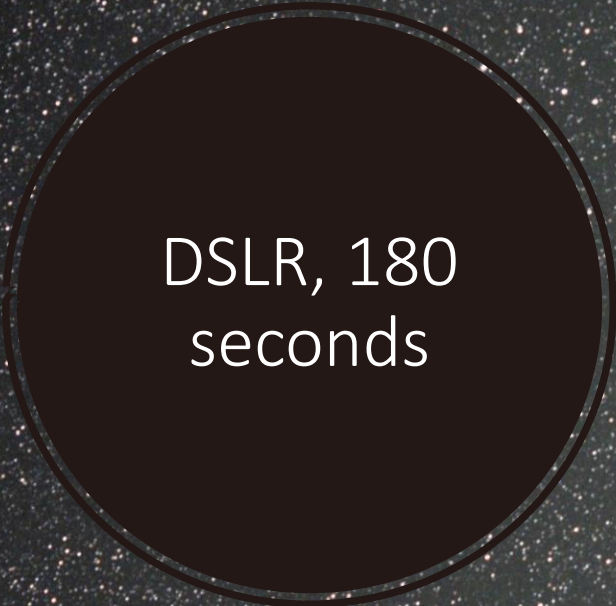
Heart and
Soul Wide

Or capture a
very large
target



Comparison of
single frames in
Auriga


Improving nebula contrast with narrow band data



DSLR, 180
seconds



Red filter,
monochrome
camera, 180 s



H-alpha
narrow
band, 300s

What to do with narrowband data

- Combining LRGB with Narrowband: <http://www.lightvortexastronomy.com/tutorial-combining-lrgb-with-narrowband.html>
- Bicolor narrowband: <http://www.lightvortexastronomy.com/tutorial-narrowband-bicolour-palette-combinations.html>



Processing – some new tricks
(for me)

Small, medium star reduction

- Many nebula in dense star fields
 - Overwhelm faint nebula
- Target reduction of small to medium sized stars
- Poor masks create artifacts such as tiny barbells
- Aggressive manual or softer automated star reduction

Aggressive

- Rogelio Bernal Andreo (reknowned widefield astrophotographer) method
 - More control of process
 - Apply HDRMT to image copy for better star detection
 - Select “Contours” to create mask that targets outer edge of stars
 - <http://www.deepskycolors.com/archive/2011/09/08/star-size-reduction-via-Morphological-.html>

Automated

- Star reduction script (free)
- Can be applied two or three times
- Easier to avoid artifacts
- Less aggressive results
- Used on linear image just after background extraction (but I've broken this rule with some success)
- QDigital Astrophotography by Dave Watson
 - <http://www.qdigital-astro.com/pixinsight-star-reduction>

A visualization of the cosmic web, showing a complex network of red and blue filaments and clusters of matter against a dark, star-filled background. The filaments are interconnected, forming a web-like structure that spans the entire frame. The red and blue colors likely represent different components or temperatures of the matter.

Hardware considerations

How to get a wide field of view

- Really big camera chip
 - SBIG STX-16803 - \$10K (expensive)
- Shorter focal length (possibly cheaper)
 - DSLR lens or very short focal length scope
 - Less resolution
 - Permits mid to small camera chips
 - Ultra fast lenses, $f/1.4$ – $f/2.8$ allow shorter exposures

Matching cameras and telescopes/ lens

- Camera pixel size determines resolution in arc-seconds per pixel
 - Local seeing rarely better than 2 arc – seconds
 - Larger scales still represent large fields well
 - Easier tracking/guiding
- Chip dimensions (width/height) determine field of view for given focal length
 - Many planetarium programs will compute and display
 - 135 mm lens with small Sony chip yields field of view in earlier examples
 - 4.9 arc-seconds per pixel

A visualization of the cosmic web, showing a complex network of red and blue filaments and clusters against a dark background filled with numerous small white stars. The filaments are composed of interconnected nodes and lines, representing the large-scale structure of the universe.

Questions?