

The High Desert Observer

September 2020

The Astronomical Society of Las Cruces (ASLC) is dedicated to expanding public awareness and understanding of the wonders of the universe. ASLC holds frequent observing sessions and star parties, providing opportunities to work on Society and public educational projects. Members receive electronic delivery of The High Desert Observer, our monthly newsletter, plus membership in the Astronomical League including their quarterly publication, *Reflector*, available in either paper or digital format. ASLC members are also entitled to a discount on a subscription to Sky and Telescope magazine.

Annual Individual Dues are \$30

Annual Family Dues are \$36

Annual Student (Full Time) Dues are \$24

Annual Dues are payable in January. Prorated dues are available for new members. Dues are payable to ASLC with an application form or note to: Treasurer ASLC, P.O. Box , Las Cruces, NM. Contact our Treasurer, Patricia Conley treasureraslcnm.org for further information.

April Meeting

Our next ASLC meeting will be virtual, to be held on Friday, September 25th at 7 p.m. Future meetings will continue to be virtual until the Covid-19 situation allows us to meet safely in person. Please note that the ASLC will not be holding other meetings, gatherings or public outreach events until it is deemed safe to do so. Please practice proper hygiene, social-distance and wear your mask!



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Coming Events (postponed due to Covid-19)

Typically, ASLC hosts public in-town observing sessions at the Pan Am Plaza on University Ave. and at Tombaugh Observatory on the NMSU campus. All sessions begin at dusk.

At our Leasburg Dam State Park Observatory, we normally hold monthly star parties. Located just 20 miles north of Las Cruces, our 16-inch Meade LX200 telescope at this site is used to observe under rather dark skies.

From the Desk of the ASLC President

Tracy Stuart

An interesting side lite to the LIGO announcement of the first gravity waves detected. As you might expect the press release was translated into several languages but to find it in the Siksika language? It seems that Cory Gray, the lead operator at the Washington LIGO, is half Scot and half Siksika (Blackfoot) and he got his mother to translate the press release into the Siksika language. He doesn't speak the language himself. It is interesting to hear her read the announcement.

The latest Mars rover, Perseverance, was successfully launched on July 30, and scheduled to arrive at the red plant on February 18, 2021. The new thing is that this mission is carrying a helicopter, actually a drone, named Ingenuity. Ingenuity weighs about 1.8 kg (4 pounds) and will be the first attempt for powered flight on another planet. Flying a drone from a few thousand miles away here on Earth is tough enough. Now do it from 225 million km (140 million miles).

Our presentation at this month's meeting will be by Tim Kostecky, giving us an overview of astronomical sketching as well as some of his work. He'll detail some of the techniques he uses at both the eyepiece and digitally at the computer to achieve the final result.

THE ANSWER IS 42.



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Minutes, July 2020 ASLC Meeting

Tracy Stuart, President Astronomical Society of Las Cruces (ASLC), welcomed attendees to tonight's July 2020 meeting via ZOOM. Because of time constraints, it was agreed to begin the meeting with the presentation.

Presentation:

Tonight's presentation was by Tom Field on "You Can Almost Touch the Stars". Even if you wanted to touch a star, they're all impossibly distant. Despite these great distances, astronomers have learned an enormous amount about stars. How? The most common method to study the stars is called spectroscopy, which is the science of analyzing the colorful spectrum produced by a prism-like device.

Until recently, spectroscopy was too expensive and too complicated for all but a handful of amateurs. Today, though, new tools make spectroscopy accessible to almost all of us. You no longer need a PhD, dark skies, long exposures, enormous aperture...or a big budget! With your current telescope and FITS camera (or a simple web cam or even a DSLR without a telescope) you can now easily study the stars yourself. Wouldn't you like to detect the atmosphere on Neptune or the red shift of a quasar right from your own backyard?!

This talk, with lots of interesting examples, shows you what it's all about and helps you understand how spectroscopy is used in research. Even if you are an armchair astronomer, understanding this field will enhance your understanding of the things you read and the night sky. Live Q&A followed the presentation.

Tom has been a Contributing Editor for Sky and Telescope Magazine for the past 7 years. He is the author of the RSpec software (www.rspec-astro.com) which received the S&T "Hot Product" award in 2011. Tom has spoken to hundreds of clubs via the web at many conferences, including NEAF, the NEAF Imaging Conference, PATS, the Winter Star Party, the Advanced Imaging Conference, SCAE, and others.

Guests/Visitors:

Bill Godby, staff archeologist at White Sands Missile Range, is attending tonight's meeting as a guest, but is in the process of joining the Society.

New Business:

1. Annual Audit – An audit of the Society's books is required annually in July. This can/should be performed by a member of the Society not currently serving on the Board of Directors. Steve Barks volunteered to perform this year's audit.

2. Nominating Committee – A committee of at least three (3) members of the Society (excluding the current President) must be formed at the July meeting to select a list of officer candidates for next year. The election will be held at the Annual/October meeting. The following members volunteered to form the committee:
 1. Tim Kostelecky
 2. Ed Montes
 3. John Kutney

Treasurer's Report:

Trish Conley, Treasurer, reported a negative \$155 running balance in June primarily due to paying Astronomical League (AL) dues and rental on the Society's Post Office box. The Society is \$494 in the red for the year so far. Tracy brought up the potential need for a member dues increase in the near future. John Kutney suggested a stringent combing of the books and budget to reduce the imbalance between income generated by member dues and outlay.

ZOOM Meetings:

It was suggested that other ways of distributing meeting invites rather than just posting on the groups.io would ensure that all active members would get invites to future meetings. Steve Barkes is now the co-owner/administrator for the group. Multiple links could be provided to future meetings. Presentations may also be linked to Facebook, You Tube, and other venues.

The July 2020 meeting was adjourned at 8:38 pm.

Member Article

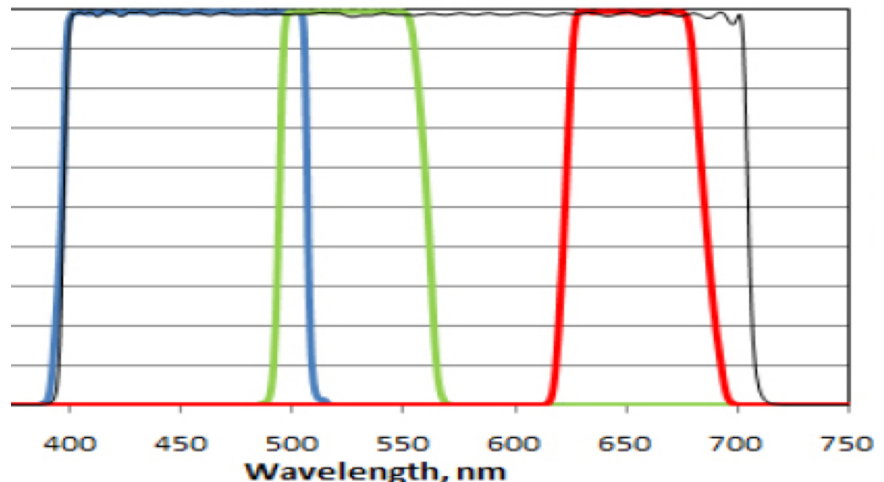
Silver Anniversary of “Pillars of Creation” and the Birth of Narrowband Imaging

By Dave Doctor

The subject of color in the universe is frankly loaded with controversy. Many are convinced we have no idea what the true color of a deep space object is sitting here on Earth. When you look at the Orion Nebula through a telescope, if the conditions are good, you see a greenish glow. You certainly don't see the bright magenta and pink-red colors that just about every image of the Orion Nebula portrays. This is because the eye is pretty useless as a color detector at night. What you can see from a nebula is likely to be green because that is what the eye is most sensitive to. The color receptors in the retina called “cones” are practically inoperative at night. That doesn't mean the colors aren't there. For the most part it seems that over time we have been able to come to kind of a general consensus regarding the “appearance” of certain deep space objects when imaged using standard digital methods. Emission nebulae are a reddish color, reflection nebulae are blue, galaxies have a soft yellow core with rust colored dust lanes and some have areas of active star formation which are reddish pink. This is pretty consistent and is true for what we call standard “broad band” images.

In the usual case you have the red, green and blue filters each selecting a fairly broad region of the visible spectrum, about 1-200 nanometers. This produces your “standard” amateur astronomical image.

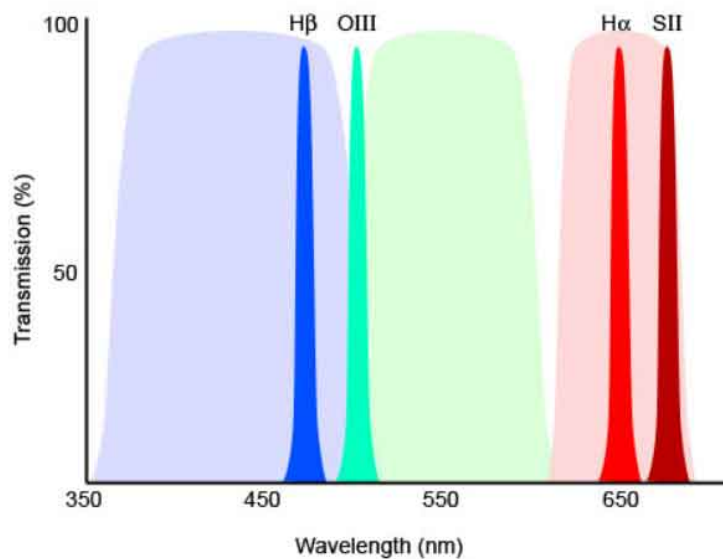
However, while the standard “LRGB” methodology of combining red, green and blue filtered images with an “L” or unfiltered image having better signal to noise properties can work well for our small ground based amateur telescopes, the Hubble and the large professional ground based observatories can't do this with scientific data. The reason is that broad band filtering results in the loss of wavelength specific structural information. They are imaging at very specific wavelengths, most often outside of the visible realm,



with the goal of increasing contrast between areas of energy emission from an object and what is called the “emission continuum” or the background. This process of broadband exclusion results in an image with much better resolution.

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Above: Some of the more common narrowband filters, with RGB filters in the background

Instead of imaging through filters selecting 1-200 nm of spectral bandwidth, narrowband filters only allow a few nanometers of light to pass through. These filters are as a result detecting very specific wavelengths of light which is typically emitted by gases in space. The most common elements that emit this light in the visible realm are hydrogen and oxygen. Sulfur is also fairly abundant. This is why Hydrogen alpha filters which transmit light from atomic hydrogen at 656.3 nanometers, Sulfur II which transmits the deep red light emitted by singly ionized sulfur at around 672 nm and Oxygen III transmitting the green blue wavelength of doubly ionized oxygen at 500.7nm, are the 3 most commonly used filters for narrowband imaging.

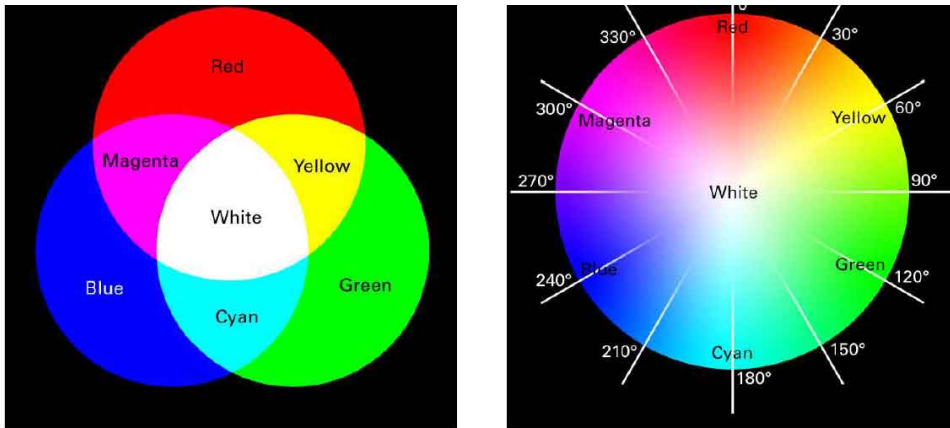
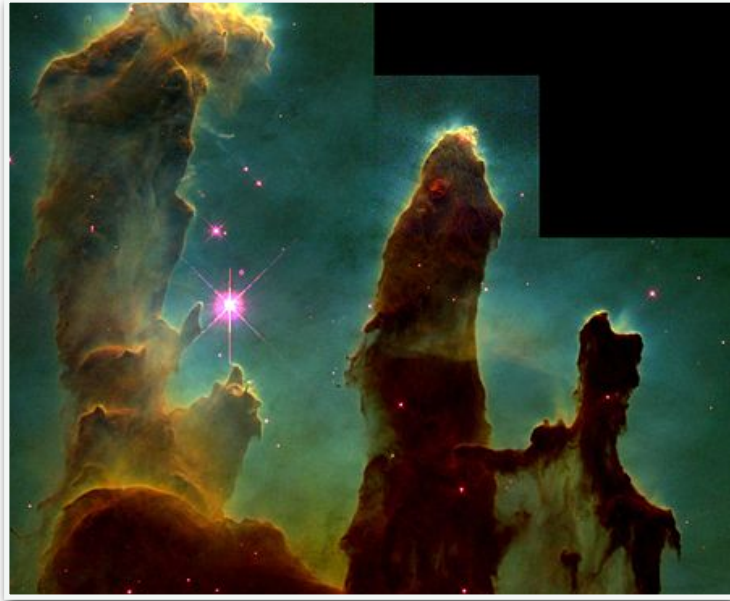


Fig. 5.— The color wheel model based on Newton’s studies. The figure on the left shows the primary colors in two systems of color mixing. The additive primaries of red, green, and blue combine to produce white at the center of the image. The secondary colors in this system, cyan, magenta, and yellow are primaries in the subtractive system that mix to produce dark neutral gray. In the color wheel on the right the angular positions of hue are given on the perimeter. Colors directly opposite of each other on the color wheel are complementary colors. For example, yellow (60°) is the complement of blue (240°) because they are 180° apart.

About 25 years ago now the HST (Hubble Space Telescope) pointed its’ “Wide Field Planetary Camera 2” WFPC2 at a central region in the Eagle Nebula M16 and produced the iconic “Pillars of Creation” image shown above. This was obtained with the narrow band filters SII, H-alpha and OIII. The tremendous public response to the release of this image was so overwhelming, it changed everything from the standpoint of how the space science community would handle the HST data and created a new philosophy toward how to deal with it. It became necessary to understand and explore further how color schemes could be used to enhance and better convey the physical processes occurring in an astronomical object. Furthermore, once it was realized how this image and others like it could inspire the public and create enthusiasm for astronomy in general, resources had to be allocated to processing and presenting these images for the lay public. For that reason, the “Hubble Heritage” project was created. A 2005 paper was published for the *Astrophysical Journal* entitled “Image-Processing Techniques for the Creation of Presentation-Quality Astronomical Images” (Travis A. Rector, et al 2005) for the sole purpose of demonstrating how to generate color images from Hubble’s data. It might be the only professional scientific paper without even a single differential equation in it! This is a fascinating read and for those of you doing any image processing it even goes into some detail how to use Photoshop in its’ early days for combining and enhancing color images, and even how to use “clone and stamp” to remove star blooms! The PDF article can be downloaded at this link: <https://www.adrive.com/public/zd9RDU/Rector2005.pdf>

Of course, with this being a scientific article, the concept of color and how to represent it had to be “scientific” as well, rather than simply concluding “this color looks good” etc. As it turns out Isaac Newton bails them out because of his development of the “color wheel model”.

“Color is parameterized ... in an “HSV” colorspace wherein a specific color is defined by its hue, saturation and value. “Hue” describes the actual color, e.g., yellow or yellow-green. “Saturation,” also often referred to



as intensity, is a measure of a color’s purity. A purely desaturated color is mixed with an equal amount of its “complementary” color. Drawing a line across the color wheel from a color, through the center of the wheel, to the color on the direct opposite side of the wheel defines a color’s complement. For example, purple is the complement of yellow. A purely saturated color contains none of its complement. “Value” is a measure of the lightness of a color, i.e., the amount of white or black added. Other terms used to modify color are “tint” and “tone.” A “tint” is a color with added white; e.g., pink is a tint of red. A “tone” is a color with added gray and a “shade” is a color with added black.”(Rector et al 2005)

Furthermore “In general a good starting strategy when assigning color is to space the color assignments evenly around the color wheel; e.g., if creating an image with three datasets, assign undiluted colors that are 120 degrees apart on the color wheel. This is known as a triadic color scheme and is the simplest example of hue contrast”.(Rector et al 2005)

The challenge was to come up with a scheme or approach to the situation where color is not obtained through the usual optical broadband red, green, blue filters to produce a “natural” color image. This resulted in the term “false color” or “representative color” being used.

The best explanation of the “scientific approach” to narrowband color representation cannot be better stated than in this excerpt from the Rector article:

“An example of an image produced using the chromatic ordering scheme is the Hester & Scowen (1995) HST image of M16. The data (Hester & Scowen 1995) were obtained with the HST WFPC2 camera with the F502N ([OIII]_5012_A), F656N (Halpha_6564_A) and F673N ([SII]_6732_A) narrowband filters. To generate the image, the three datasets were colorized blue, green and red respectively. Filter F502N was assigned blue because it has the shortest wavelength passband, filter F673N was assigned red because it has the longest wavelength passband, and filter F656N was assigned green because its passband is of intermediate wave-length compared to the other two. The chromatic ordering for the

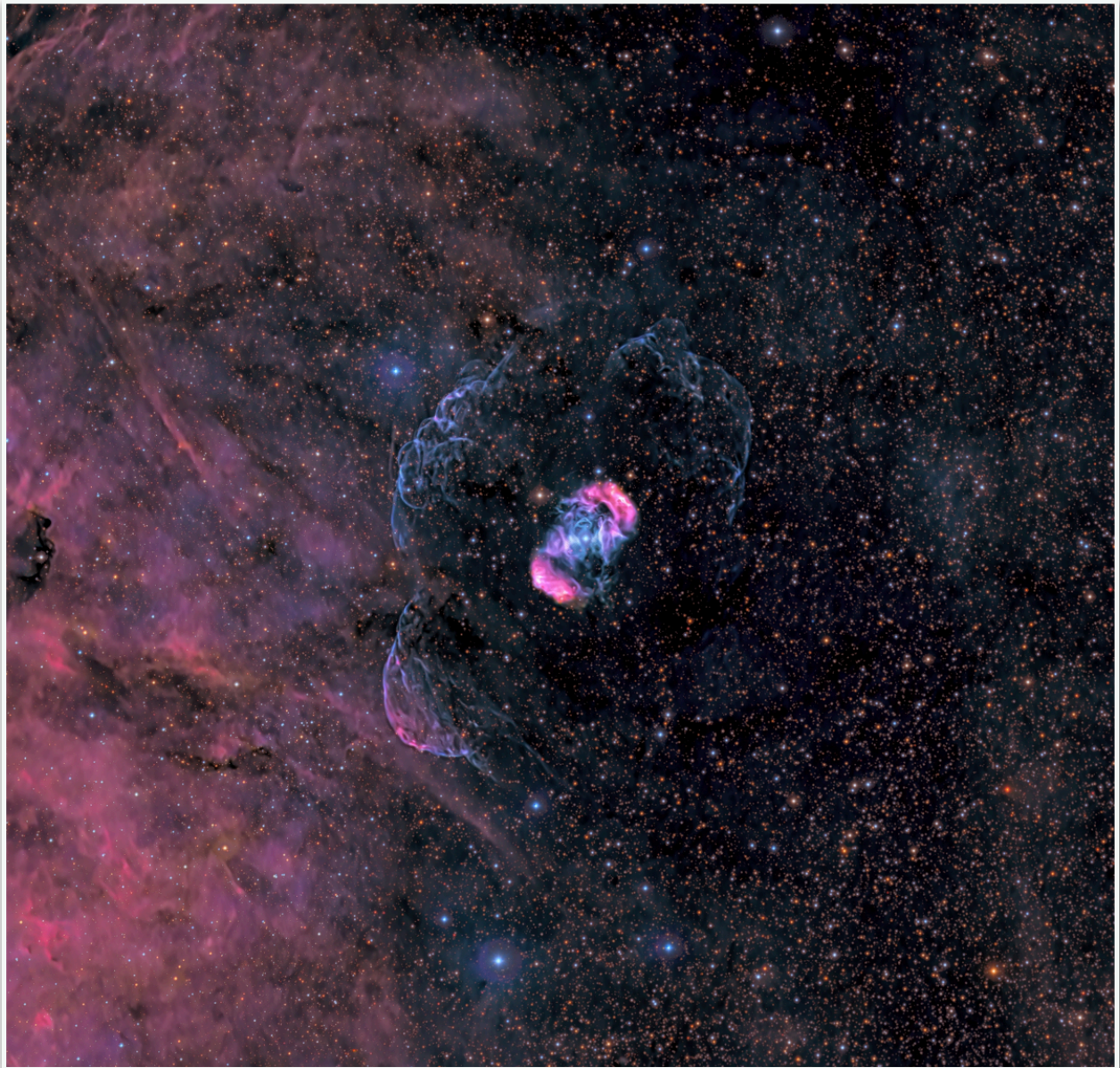
HST M16 image is not a natural color scheme because the filters were not assigned their visible colors. That is, when viewed against a bright, white light, the F502N filter appears to be green, not blue, to the human eye. Similarly, the F656N filter looks a deep red, not green. Only the F673N filter is assigned its perceived color, red. It is also not a natural color scheme because it uses narrow-band filters that pass only a very small fraction of the visible spectrum. Furthermore, rather than photometrically calibrating the projected images they are balanced so that the H-alpha data doesn't dominate and turn the image completely green. In comparison, a natural color image of M16 (Shoenig 1973) shows the nebula as deep red, again because of the strong H_alpha emission from the nebula. The color assignment chosen is an extreme version of the hue contrast. The image is also an example of a split complementary color scheme. The blue (from the [OIII] filter) and the green (from the H_alpha filter) combine to generate a background of greenish-cyan, whose complement is a slightly-red orange. Areas of the pillars are yellow-orange and orange-red which are on either side of this orange on the color wheel, hence the complement is split. Also the RGB assignment to each layer, along with the intensity stretches, ensured that the combined datasets produced cyan, magenta and yellow, resulting in a strong contrast of hue in the undiluted primaries of the subtractive system. Where the intensity of [OIII] (blue) and H_ (green) are balanced, cyan appears in the background. The H_ (green) and [SII] (red) images combine to produce yellow along the edge of the pillars. And, while the center of the stars are white due to the equal combination of RGB, their halos are magenta because the F673N filter broadens the point-spread function. Itten (1990), in his section on this contrast of hue states, the undiluted primaries and secondaries always have a character of aboriginal cosmic splendor as well as of concrete actuality," a statement that applies to the HST image of M16. The two supporting contrasts, (split) complementary and light-dark further boost this image's appeal."

Happy 25th to the iconic HST image that brought us the "Hubble Palette"! Who said that astro-imaging is not science?

Thanks for reading!

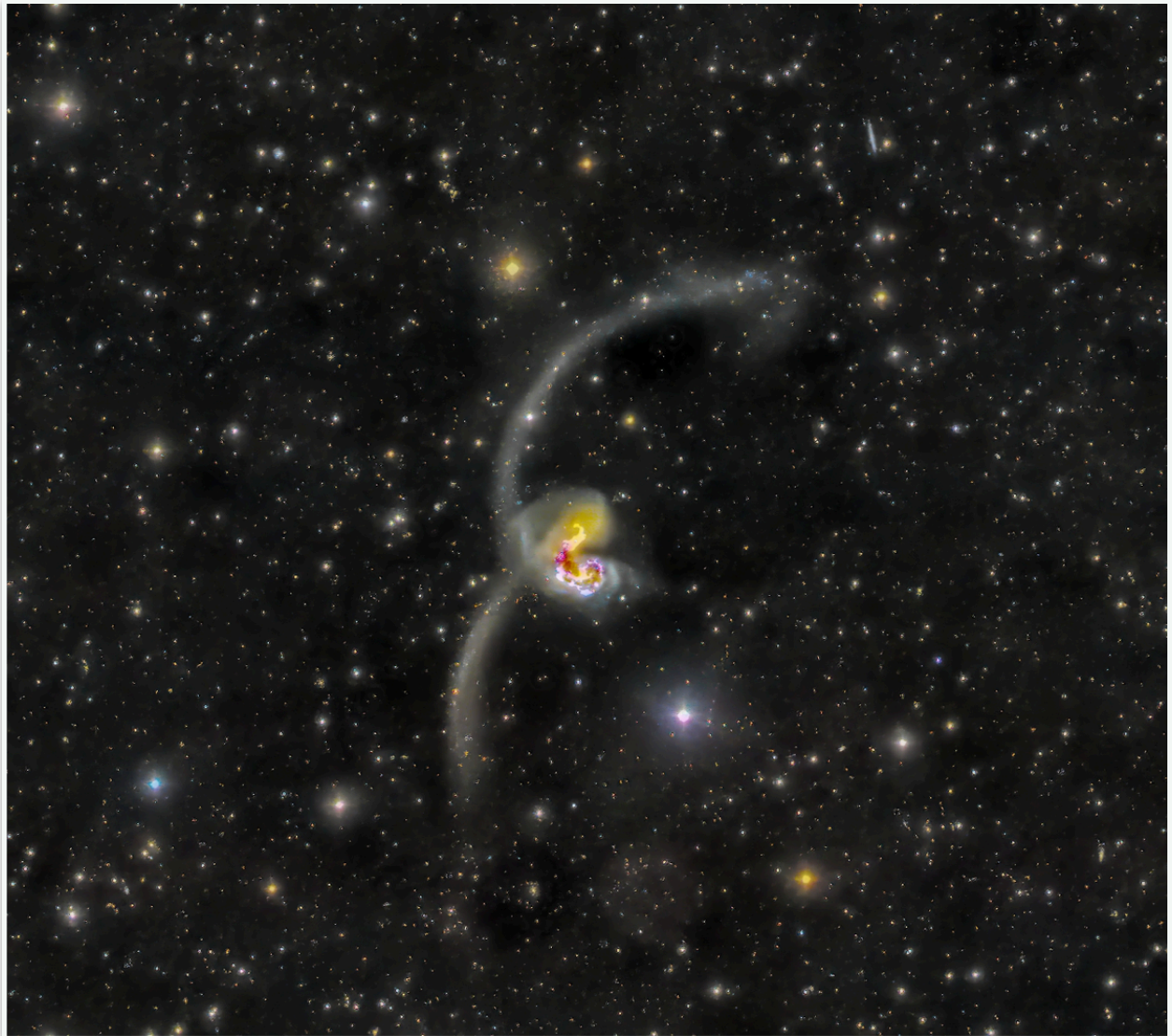
Dave Doctor

Member Images



**NGC 6164 AND NGC 6165
PROCESSED BY ALEX WORONOW (2020) USING PIXINSIGHT, SKYLUM, TOPAZ, SWT**

NGC 6164 AND NGC 6165 ARE THE TWO BRIGHT LOBES OF THE SINGLE NEBULA AT THE IMAGE'S CENTER. THIS NEBULA WAS ONCE THOUGHT TO BE A PLANETARY NEBULA, BUT IT IS NOT. IT APPEARS TO HAVE RESULTED FROM A SPORADIC (OR SINGULAR) ERUPTION(S) FROM THE BRIGHT BLUE STAR AT ITS CENTER. THIS STAR (HD 148937) IS AN OF?p-TYPE STAR--ONLY A FEW SUCH STARS ARE KNOWN. HD 148937 PRODUCES A STRONG MAGNETIC FIELD, AND THE NEBULA MAY OWE IT SHAPE TO THE INTERACTION OF THE OUT-FLOWING IONIZED GASES AND THIS MAGNETIC FIELD.



NGC 4048 (ANTENNA GALAXIES)

PROCESSED BY ALEX WORONOW (2020) USING PIXINSIGHT, SKYLUM, TOPAZ, SWT

AS YOU'D UNDOUBTEDLY SURMISE, THIS IMAGE SHOWS TWO GALAXIES UNDERGOING COLLISION AND AMALGAMATION. MAYBE MOST INTERESTINGLY, BOTH GALAXIES HOST MANY YOUNG GLOBULAR CLUSTERS. THIS IS SOMEWHAT RARE, AS OLDER STARS MOST GLOBULAR CLUSTERS, IMPLYING THE CLUSTERS HAVE CONSIDERABLE AGE. THE ORIGIN OF GLOBULAR CLUSTERS HAS OFTEN BE DEBATED, BUT THESE YOUNG ONES MAY INDICATE THAT AT LEAST SOME FORM DURING GALACTIC COLLISIONS WHEN DUST CLOUD-ON-DUST CLOUD COLLISIONS GENERATE SHOCKWAVES COMPRESSING THE CLOUDS AND INITIATING STAR FORMATION.

OTA:.....TAO 150 (F/7.3)

CAMERA:.....FLI - ML16200 (1.13 ARCSECONDS/PIXEL)

OBSERVATORY:.....DEEP SKY WEST, CHILE

TOTAL EXPOSURE:.... 11 HOURS



THESE WERE SHOT BY CHUCK STERLING FROM HIS BACK YARD USING A CANON 60DA ON AN ASTRO TECH 8" F/4 NEWTONIAN MOUNTED ON A CELESTRON CGE. NGC 5353 USED THIRTY 60 SECOND SUBFRAMES; NGC USED THIRTY 45 SECOND SUBFRAMES SHOT, ALL SHOT AT ISO1600.

NGC 5353 IS THE GALAXY TO THE BOTTOM OF THE RIGHT CLUSTER OF GALAXIES, AND WITH SIX OTHER GALAXIES SHOWN IN THIS IMAGE, HAS A LOT OF COMPANY. THE SECOND IMAGE IN THIS GROUP SHOWS THEIR RELATIVE POSITIONS IN THE FIELD OF VIEW, ACCORDING TO ASTROMETRY.NET.