

LONGMONT ASTRONOMICAL SOCIETY

NOVEMBER 2023



JUPITER ON OCT 9
BY VERN RABEN

VOLUME 39, No 11, 2023
ISSN 2641-8886 (WEB)
ISSN 2641-8908 (PRINT)

Next LAS Meeting Thursday, November 16 at 7 pm Dark Sky Preservation by Dr. Robert (Bob) Grossman

Dr. Grossman is a Retired Professor of Atmospheric and Oceanic Sciences, University of Colorado Boulder

Bio

After elementary schooling in various towns in the Deep South, Bob graduated with a BS in Electrical Engineering (Duke '61) and spent a year studying meteorology and oceanography as an Air Force Lt. (NYU '62). A Weather Officer assigned to Strategic Air Command (RAF Fairford and Brize Norton, England), he experienced the Cuban Missile Crisis ('62-65) leaving the Air Force as a Captain. He returned to USA and pursued his graduate studies at Colorado State University (MS '67, PhD '73) specializing in air-sea interaction and field science. Bob was a National Center for Atmospheric Research (NCAR) Advanced Study Program Post-Doctoral Fellow ('74) then a member of the scientific staff ('75-'81). He was seconded from NSF/NCAR to the World Meteorological Organization and managed a large international expedition to observe the 1979 monsoon season (WMO FGGE MONEX) based in New Delhi, Mumbai, and Kolkata, India ('77-81). Upon return, he spent a year at NCAR and joined the Cooperative Institute for Research in the Environmental Sciences (CIRES) as a Visiting Fellow then as scientific staff ('83-'87). Bob was invited to join the University of Colorado Astrogeophysics Department as one of five atmospheric scientists who eventually formed the Program in Atmospheric and Oceanic Science, which in turn became the Department of Atmospheric and Ocean Sciences. Bob was part of the department from 1987-2002, after which he retired. He has specified a Mars climate observing system and published articles on air-sea interaction, land-atmosphere interaction, basic atmospheric turbulence, atmospheric waves, instrument technology, parameterization testing, drainage winds, frontogenesis, stratospheric-tropospheric exchange, reservoir evaporation, monsoon dynamics, and monsoon forecasting. His current interest is light pollution monitoring from cloud reflection. He is an AMS Certified Consulting Meteorologist.

Bob lives in Norwood, Colorado and enjoys canyon walking, mountain walking, backcountry skiing, gardening. He is managed by a cat.

The meeting will be at the First Evangelical Lutheran Church, 803 Third Street, Longmont. It will also be available as a Zoom video conference. The speaker will present remotely.

LAS Officers and Board Members in 2023

Vern Raben, President
Hunter Morrison, Vice President
Eileen Hall-McKim, Secretary
Bruce Lamoreaux, Treasurer

Board Members:
David Elmore, Gary Garzone,
Mike Hotka, Brian Kimball, and Tally O'Donnell

Appointed Positions 2023

Sarah Detty, Webmaster; Bruce Lamoreaux, Library Telescope Coordinator; Bill Tschumy, Public Outreach Coordinator;
Vern Raben, Newsletter Editor; Eileen Hall-McKim, Newsletter Archives;



Contents

Front Cover	Jupiter on October 9 by Vern Raben
2	LAS Meeting Thursday, November 16, at 7 pm, "Dark Sky Preservation" by Dr. Robert Grossman
3	Contents
4	Planets, Meteor Showers, and Lunar Phases, by Vern Raben Close Encounter: Comet 29P and 62P on Nov 16
5	Comet C/2023 H2 (Lemmon)
6	Comet C/2020 V2 (ZTF) and 12P Pons-Brooks
7	Navigating the mid-November Night Skies by John Goss
8	Other Suns: Eta Persei by Astronomical League Have you seen M31? by John Goss
9	LAS Newsletter Archive for November 1993 and 2003 by Eileen Hall-McKim
10 - 12	Observational Astronomy: To Be, or Not To Be, Prepared by Mike Hotka
13 -23	Notes for the Thursday, October 19 th Meeting by Vern
24	IC 63 by Martin Butley
26	Pelican Nebula by Martin Butley and Mid Eclipse by Brian Simpson Solar Eclipse by Brian Simpson and Sh 2-93, Sh 2-95 by David Elmore
27	Sh 2-115 by Rolando Garcia
28	IC 63 by Rolando Garcia
29	HB3 by Stephen Garretson
30	NGC 1499 by Stephen Garretson
31	NGC 281 by Gary Garzone and Jupiter and Moons by Shawn Dahl
32	IC 1805 by Eddie Hunnell and Solar Eclipse collage by Paul Robinson
33	Leaf Shadows during Eclipse by Brian Kimball and Eclipse Series by Tally O'Donnell
34	Cocoon Nebula by Jim Pollock and Comet 126P by M. J. Post
35	NGC 6946 by M. J. Post
36	Sh 2-116 by M. J. Post
37	Solar Eclipse and Mid Solar Eclipse by Jim Pollock
38	Solar Eclipse Viewing with Saltine Cracker by Ellen Steiner
39	Solar Scopes with Longmont Astronomical Society at Louisville Public Library by Bill Tschumy Solar Eclipse Watch Party at Louisville Community Park by Bill Tschumy
Back Cover	Solar Eclipse Watch Party at Louisville Community Park by David Elmore

About LAS

The Longmont Astronomical Society Newsletter ISSN 2641-8886 (web) and ISSN 2641-8908 (print) is published monthly by the Longmont Astronomical Society, P. O. Box 806, Longmont, Colorado. Newsletter Editor is Vern Raben. Our website URL is <https://www.longmontastro.org> and the webmaster is Sarah Detty. The Longmont Astronomical Society is a 501 c(3), non-profit corporation which was established in 1987.



The Longmont Astronomical Society is affiliated with the Astronomical League (<https://www.astroleague.org>). The Astronomical League is an umbrella organization of amateur astronomy societies in the United States.



Planets in November

Mercury

Mercury not visible naked eye or with binoculars this month. It can be seen with a large scope in daytime or with a small scope after the 20th.

Venus

Optimal time to view Venus this month is around 6 to 6:30 am in constellation Virgo. It is around magnitude -4.3 in brightness and the disc decreases from 22 to 17 arc sec across during the month.

Mars

Mars is not visible this month; it will re-appear in the morning sky around mid January in 2024.

Jupiter

Jupiter is at opposition with Earth on November 3. At that time it will be magnitude -2.9 in brightness and 49 arc sec across. The following are good times to view the Great Red Spot (GRS) at mid transit:

- Nov 2 at 2:23 am, alt 58°
- Nov 2 at 10:14 pm, alt 49°
- Nov 4 at 4:01 am, alt 40°
- Nov 4 at 11:52 pm, alt 63°
- Nov 7 at 12:30 am, alt 61°
- Nov 7 at 8:22 pm, alt 44°
- Nov 9 at 2:08 am, alt. 46°
- Nov 9 at 10:00 pm, alt 60°
- Nov 11 at 3:47 am, alt 26°
- Nov 11 at 11:38 pm, alt 64°
- Nov 12 at 7:29 pm, alt 38°
- Nov 14 at 1:16 am, alt 51°
- Nov 14 at 9:07 pm, alt 56°
- Nov 16 at 2:54 am, alt 31°
- Nov 16 at 10:45 pm, alt 64°
- Nov 17 at 6:37 pm, alt 32°
- Nov 19 at 12:24 am, alt 55°
- Nov 19 at 8:15 pm, alt 51°
- Nov 21 at 2:02 am, alt 37°
- Nov 21 at 9:53 pm, alt 64°
- Nov 23 at 11:31 pm, alt 59°
- Nov 24 at 7:23 pm, alt 46°
- Nov 26 at 1:10 am, alt 42°
- Nov 26 at 9:01 pm, alt 61°
- Nov 28 at 2:48 am, alt 22°
- Nov 28 at 10:39 pm, alt 62°
- Nov 29 at 6:30 pm, alt 40°

Saturn

Saturn is visible in the evening sky in constellation Aquarius. It is magnitude +0.7 in brightness and the disc is 17 arc sec across.

Uranus

Uranus is visible in the evening sky in constellation Aries. It is magnitude +5.6 in brightness and the disc is 3.7 arc sec across.

Neptune

Neptune is visible in the early evening sky in constellation Pisces. It is magnitude +7.8 in brightness and the disc is 2.3 arc sec across.

Lunar Phases in November

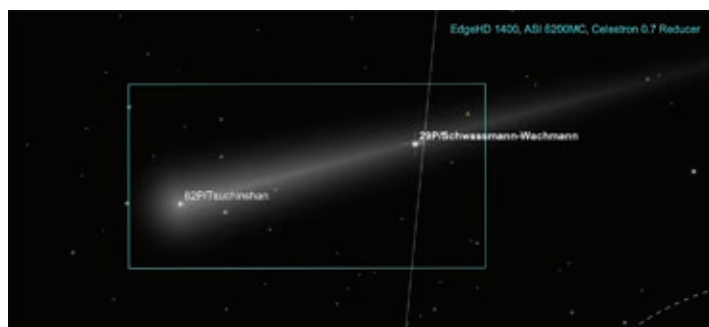
- Third quarter: November 5 at 2:38 am
- New moon: November 13 at 2:29 am
- First quarter: November 20 at 3:51 am
- Full moon: November 27 at 2:17 am

Meteor Showers in November

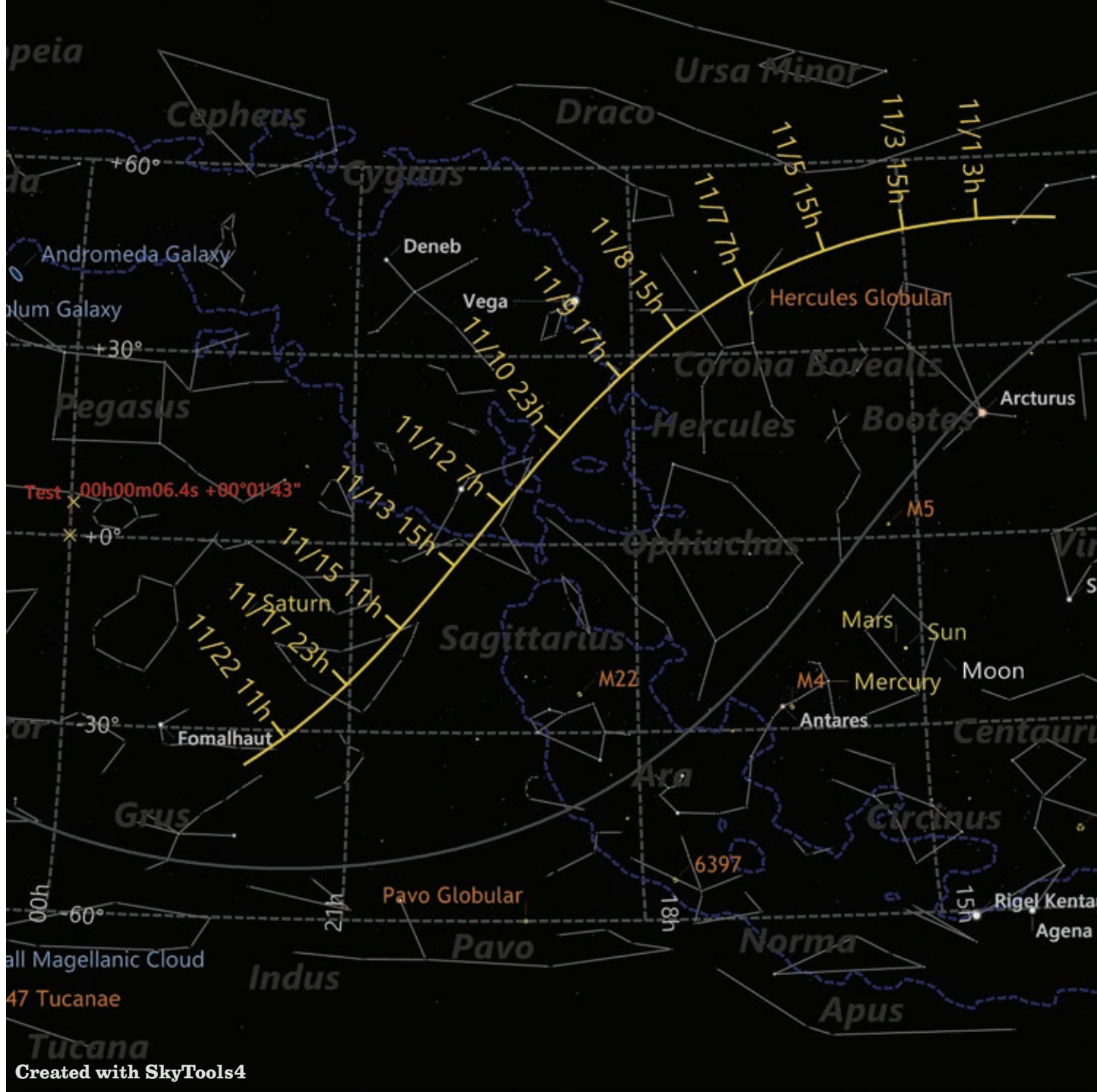
- Leonid's peak on night of Nov 17 - 18 but only about 10 per hour are expected. Moon sets at 8:27 pm so circumstances are good.

Close Encounter: Comets 29P and 62P

Comets 29P and 62P will pass very close to one another on night of November 15/16. Best time for us appears to be shortly after midnight when they above about 30 degrees altitude and still very close together. They will keep moving further apart towards dawn. Even so they should fit the FOV of a C14 Edge HD at F/7 with a 6200MC camera around 5 am and will be much higher up then (70° altitude).

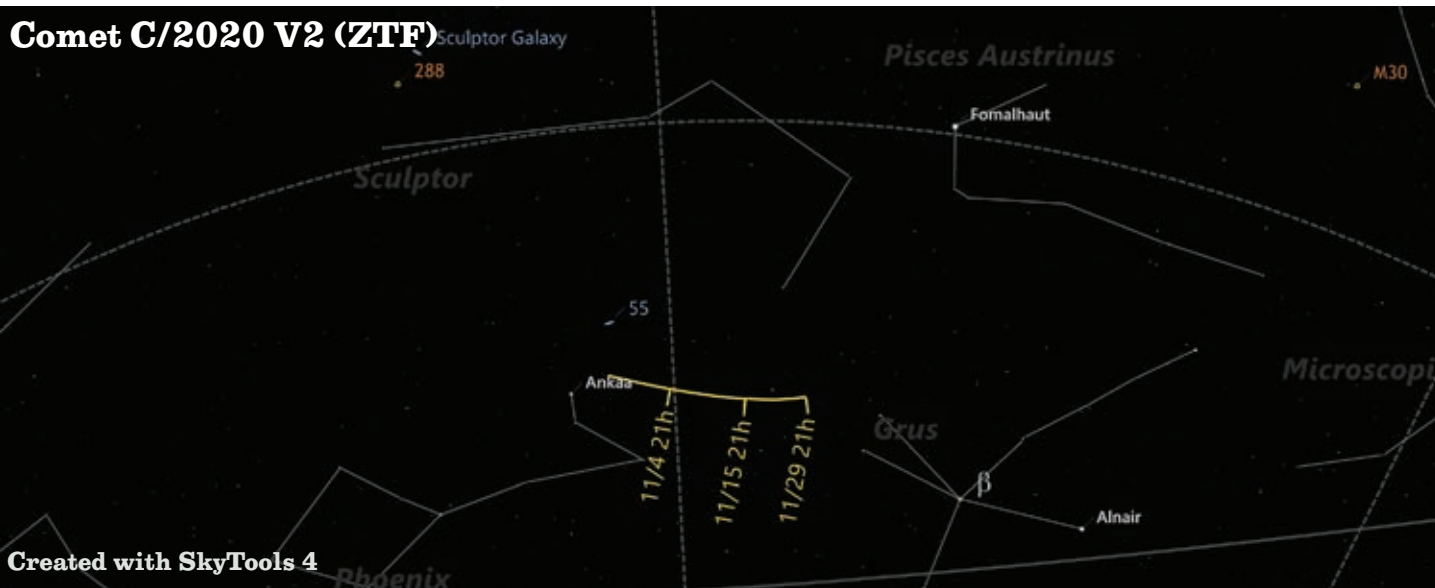


Comet C/2023 H2 (Lemmon)



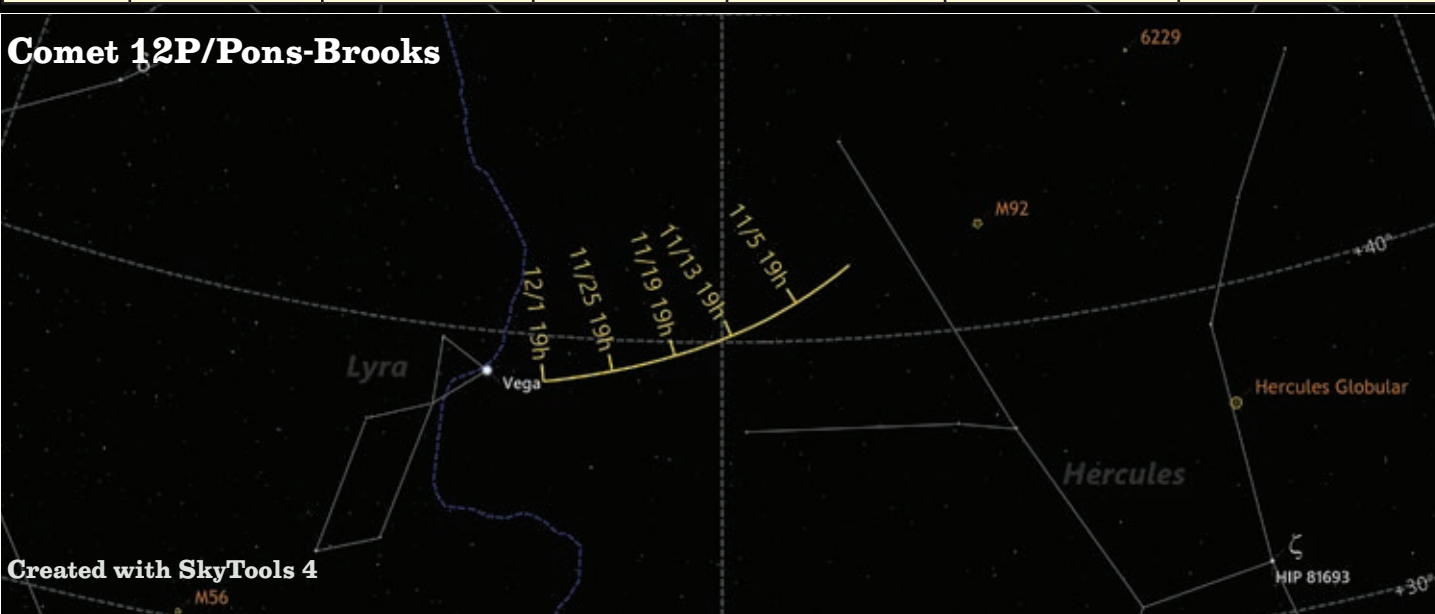
Date	Optimal time	RA	Dec	Constellation	Magnitude	Size (arc min)
Nov 1	7:24 pm	14h23m24.9s	+49°52'26"	Bootes	9.0	11.0
Nov 7	7:22pm	17h03m26.2s	+38°24'37"	Hercules	7.9	18.7
Nov 13	7:19 pm	19h59m43.9s	-04°19'45"	Aquila	8.1	18.6
Nov 19	7:16 pm	21h21m35.0s	-26°44'48"	Capricornus	9.4	10.9
Nov 24	7:11 pm	21h54m29.6s	-33°30'38"	Piscus Astrinus	10.3	7.7

Comet C/2020 V2 (ZTF)



Date	Optimal time	RA	Dec	Constellation	Magnitude	Size (arc min)
Nov 1	10:23 pm	00h08m28.9s	-42°04'26"	Phoenix	11.0	2.7
Nov 7	9:48 pm	23h56m26.5s	-42°37'09"	Phoenix	11.1	2.6
Nov 13	9:34 pm	23h46m15.4s	-42°53'49"	Phoenix	11.3	2.4
Nov 19	9:04 pm	23h37m55.5	-42°58'15"	Phoenix	11.5	2.3
Nov 25	8:24 pm	23h31m18.3s	-42°53'50"	Phoenix	11.6	2.2
Nov 30	7:49 pm	23h26m58.6s	-42°45'17"	Grus	11.8	2.1

Comet 12P/Pons-Brooks

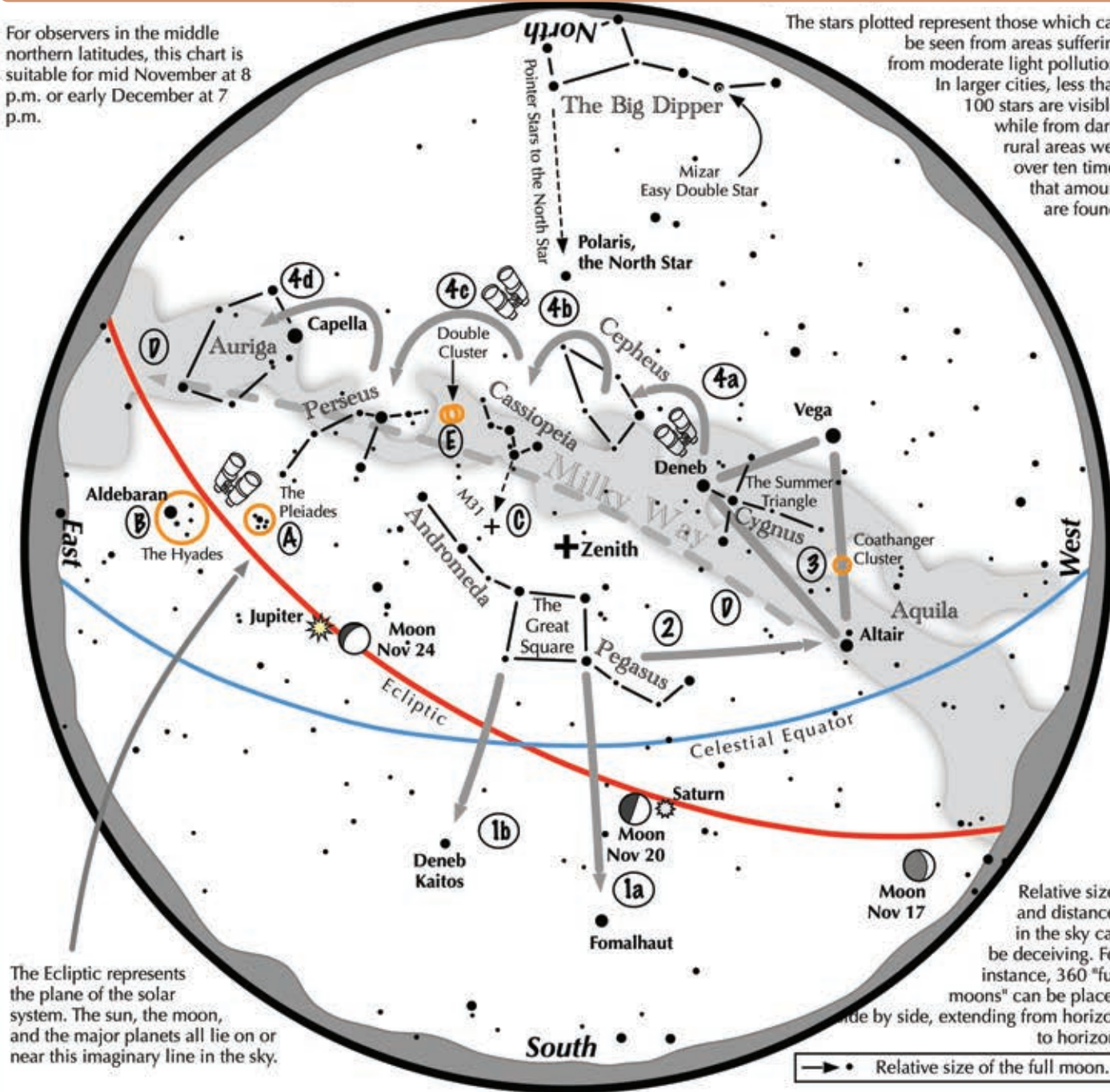


Date	Optimal time	RA	Dec	Constellation	Magnitude	Size (arc min)
Nov 1	7:26 pm	17h44m01.3s	+41°40'16"	Hercules	10.7	3.3
Nov 7	7:19 pm	17h51m13.5s	+40°53'31"	Hercules	10.5	3.3
Nov 13	7:13 pm	17h59m17.5s	+40°11'28"	Hercules	10.4	3.4
Nov 19	7:09 pm	18h08m13.8s	+39°34'30"	Hercules	10.2	3.5
Nov 25	7:03 pm	18h18m02.4s	+39°02'52"	Lyra	10.0	3.5
Nov 30	7:04 pm	18h26m54.5s	+38°40'39"	Lyra	9.9	3.6

Navigating the mid November Night Sky by John Goss

For observers in the middle northern latitudes, this chart is suitable for mid November at 8 p.m. or early December at 7 p.m.

The stars plotted represent those which can be seen from areas suffering from moderate light pollution. In larger cities, less than 100 stars are visible, while from dark, rural areas well over ten times that amount are found.



The Ecliptic represents the plane of the solar system. The sun, the moon, and the major planets all lie on or near this imaginary line in the sky.

Relative sizes and distances in the sky can be deceiving. For instance, 360 "full moons" can be placed side by side, extending from horizon to horizon.

→ • Relative size of the full moon.

Navigating the November night sky: Simply start with what you know or with what you can easily find.

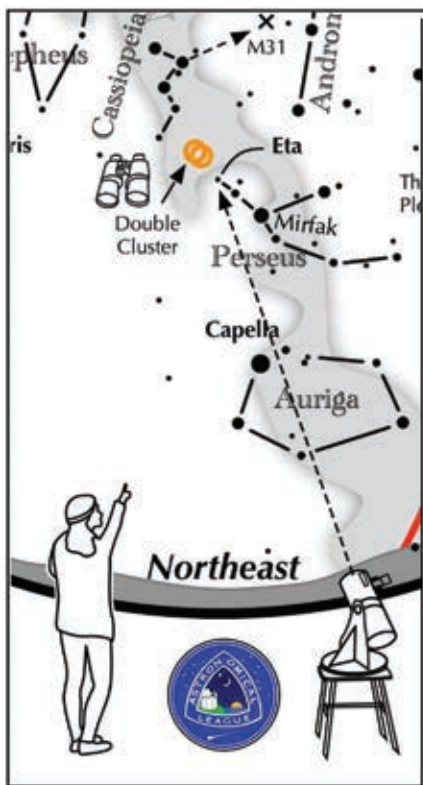
- 1 Face south. Almost overhead lies the "Great Square" with four stars about the same brightness as those of the Big Dipper. Extend a line southward following the Square's two westernmost stars. The line strikes Fomalhaut, the brightest star in the south. A line extending southward from the two easternmost stars, passes Deneb Kaitos, the second brightest star in the south.
- 2 Draw a line westward following the southern edge of the Square until it strikes Altair, part of the "Summer Triangle."
- 3 Locate Vega and Deneb, the other two stars of the Summer Triangle. Vega is its brightest member, while Deneb sits in the middle of the Milky Way.
- 4 Jump along the Milky Way from Deneb to Cepheus, which resembles the outline of a house. Continue jumping to the "W" of Cassiopeia, then to Perseus, and finally to Auriga with its bright star Capella.

Binocular Highlights

A and B: Examine the stars of the Pleiades and Hyades, two naked eye star clusters. **C:** The three westernmost stars of Cassiopeia's "W" point south to M31, the Andromeda Galaxy, a "fuzzy" oval. **D:** Sweep along the Milky Way from Altair, past Deneb, through Cepheus, Cassiopeia and Perseus, then to Auriga for many intriguing star clusters and nebulous areas. **E:** The Double Cluster.



Astronomical League www.astroleague.org/outreach; duplication is allowed and encouraged for all free distribution.



Other Suns: Eta Persei

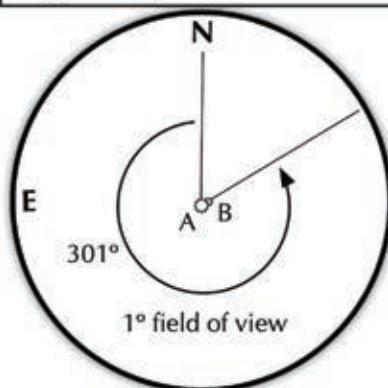
How to find Eta Persei on a November evening

Face northeast. Between bright Capella and the "W" of Cassiopeia, is the constellation Perseus. Eta Persei is not quite mid way between Mirfak, the brightest star in Perseus, and the eastern edge of the "W." It lies close to the Double Cluster.

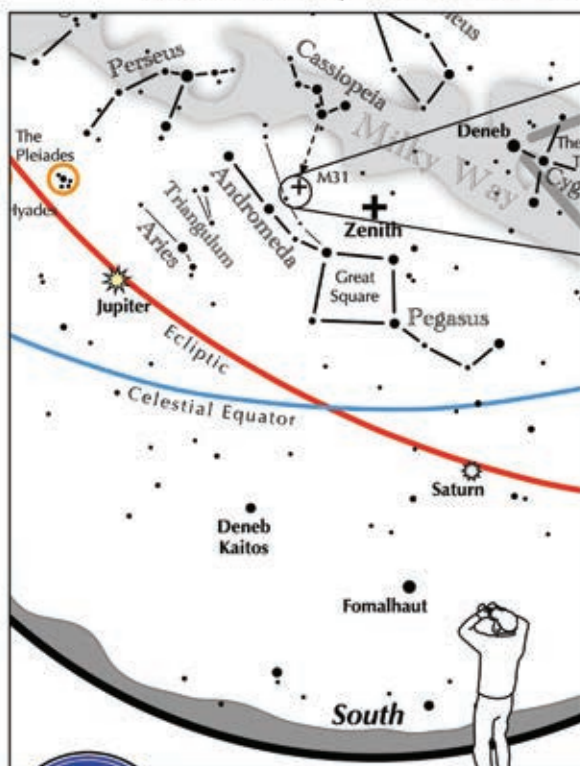
Suggested magnification: 40x
Suggested aperture: >3 inches

Eta Persei

A-B separation: 28 sec
A magnitude: 3.8
B magnitude: 8.5
Position Angle: 301°
A & B colors:
yellow, blue

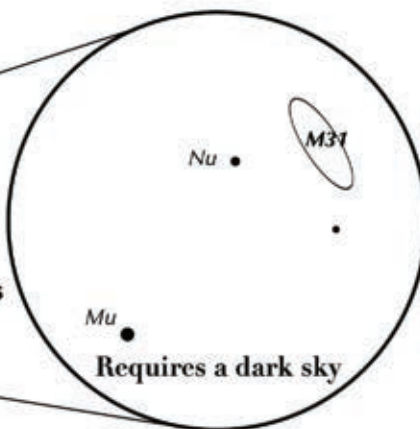


If you can observe only one celestial event this month, consider this one:



South
90 minutes after sunset

View
through
10x50 binoculars



Have you seen M31, the Andromeda Galaxy?

Look high in the south 90 minutes after sunset in November.

- Find the Great Square nearly at the zenith.
- Identify the line of four stars beginning at the northeast corner of the Great Square and extending northeast.
- Identify a second but dimmer line extending more northeasterly than the first line. These two lines represent Andromeda.
- Identify the third star on each line.
- A line passing through those two stars and extending northwest for the same length lands on M31.

OR ...

- Draw an arrow pointing southward through the three westernmost stars of Cassiopeia's "W."
- Extend that line for the same length as Cassiopeia is wide.
- It ends on M31.

Newsletter Archive by Eileen Hall-McKim

30 years ago November 1993

From the President, Bob Spohn:

“Which is worse, observing with mosquitoes or with icicles? All I know is, it was sure nice having access to the control room at the DSES star party! The next time we go there, Jim Sharpe would like to observe the same object both visually and with the radio dish at the same time – pretty neat stuff: We had a fairly good turnout, and observed comet Mueller (1993p), among other things.”

Dr. Bob Stencel gave an excellent presentation titled “Astronomy in Colorado”. His presentation covered a historical perspective of astronomy in Colorado, the upcoming Jupiter event, Mt. Evans today and future, the upcoming Chamberlin Observatory celebration, and the FRASC meeting. Thanks to Dr. Bob for his presentation and contribution to the science of astronomy.

The L.A.S. will be conducting a public observing session for the citizens of Lyons on the night of November 20th. The observing site is located at Meadow Park in the town of Lyons. Members are encouraged to bring their telescopes and make this an enjoyable and educational experience for the people of Lyons.

20 years ago November 2003

From the President, Bob Spohn:

“Well, it’s a little past 9pm Tuesday night as I write this, and I just stepped outside hoping to catch sight of an early Leonid. What a beautiful night- even from the middle of town! The Summer Triangle is hanging above the western horizon in all its defiant splendor, Mars is still aggressively staking out his territory, Andromeda galaxy is naked-eye at zenith, the Milky Way is gently flowing across the vault of heaven, and the mighty winter king Orion is dominating the eastern sky. Wow! I love it!”

Leonid Report by Gary Garzone:

“The skies were very clear with no clouds at all, full sky views in every direction but seeing in early evening was totally bad as Saturn boiled in eyepiece. The Front Range community college astronomy class showed up for what turned out to be mostly just a good star party night and not such a great meteor shower event that I was hoping for. Terry Frazier asked where is the beef?? remember that old lady in the Burger King commercial? But anyway there

seemed to be not much beef in meteors coming in. I saw maybe 30 thru the night, no great fireballs or bolides and not the 30 per hour I was looking for. The moon came up around 2:30 am so we got pretty good dark sky views in for awhile. I stayed up till 4 am before I finally went to bed.

Mike Hotka also showed up and stayed until 2:30 to 3 am I think it was. I must say I enjoyed the college teacher Clara who was explaining things to the kids as I would find objects in 30” scope to view. We looked at double stars when seeing got better late after midnight. Orion and Saturn were the highlights but we did at least 25 objects throughout the night. We saw Jupiter but still low in horizon for not so good views but its first I have seen of Jupiter since last year. I thank all you people who showed up for braving the cold. I had fun once again for a very enjoyable night with my astronomy friends,” bye, Gary.



10 years ago November 2013

No newsletter was published for November 2013.

To Be, Or Not To Be, Prepared

by Mike Hotka

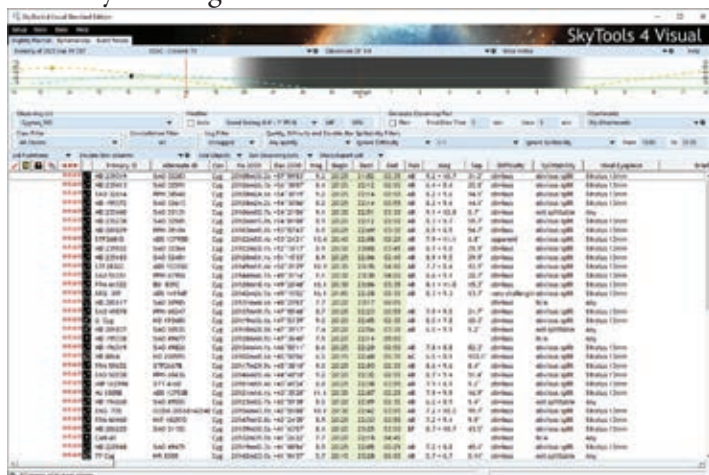
Have you ever driven to the middle of no-where, setup your equipment, and only then, wondered what you were going to look at that night? That described my early observing outings many years ago. With a young family at home, when I would get out to observe, I wanted to maximize my observing efforts. What became apparent to me was that I needed a plan for each observing outing to achieve this.

How many of you have driven to your planned observing location, just to realize you left some important items at home? Hopefully, it was not that one item you needed to salvage any chance to observe that night.

If you chose to do Astronomical League Observing Programs (ALOP), the what you will observe on your next outing is answered. There is so much more that goes into planning your next observing outing than just what you will observe.

The process I use to plan my next observing outing has evolved over many years. At the heart of this process is the use of an astronomy database program. In 1999, I used Steve Tuma's Deepsky Astronomy Software (Deepsky Astronomy Software - The best deep sky astronomy software (mikehotka.com)) program on my PC. Today, I use the Greg Crinklaw's Standard Edition of SkyTools 4 (ST4) (SkyTools 4 Standard Edition (skyhound.com)).

All I need are two, of the many features of these programs to plan my next observing outing. One feature allows me to create a log entry for each object I have observed. The other feature generates observing lists. These observing lists contain the object designations for the ALOP I am currently working on.



Managing observing lists is what ST4 does very well. ST4 can import a list of object designations defined in a text file into a named observing list, add objects one at a time using a search feature to an observing list, or download popular observing lists from the skyhound website with a built-in download feature.

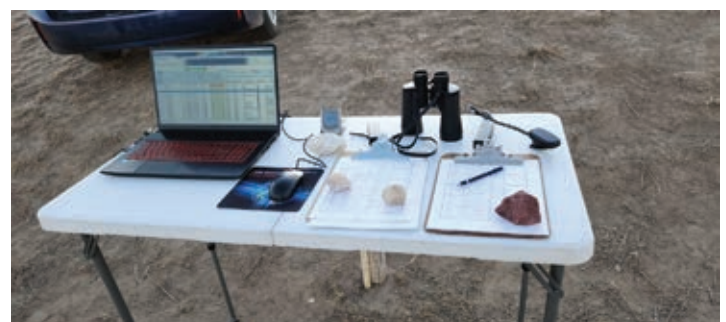
ST4 can store many different observing lists. I have an observing list for each ALOP I am working on, a few double star lists, and other lists for objects I want to observe from sources I found on the Internet.

As seen in the above image, ST4 manages only one observing list in its active observing mode at a time. In this example, it is one of my double star observing lists. One of the many sort features for the active list allows me to display those objects I have not observed before, i.e., those object designations that do not have a log entry record in the ST4 database. ST4 will then sort the filtered objects by their best time they can be observed.

Primary ID	Alternate ID	Con	RA 2000	Dec 2000	Mag	Begin	Best	End	P
HD 239319	SAO 32283	Cyg	20h05m30.2s	+57°59'53"	9.2	20:25	21:52	02:35	A
HD 239413	SAO 32591	Cyg	20h26m26.3s	+56°38'07"	8.4	20:25	22:12	02:55	A
SAO 32614	PPM 38548	Cyg	20h28m24.6s	+54°30'19"	9.2	20:25	22:14	02:50	A
HD 195372	SAO 32613	Cyg	20h28m24.2s	+54°30'06"	8.2	20:25	22:14	02:55	A
HD 235440	SAO 33131	Cyg	21h06m00.7s	+54°21'56"	9.1	20:30	22:51	03:30	A
HD 235238	SAO 32581	Cyg	20h26m15.8s	+54°01'00"	8.9	20:25	22:12	02:50	A
HD 200829	PPM 39104	Cyg	21h03m45.0s	+53°57'43"	8.9	20:25	22:49	03:30	A
ST426810	ADS 137950	Cyg	20h22m50.4s	+53°24'21"	13.4	20:40	22:08	02:20	A
HD 235502	SAO 33364	Cyg	21h22m28.1s	+52°18'17"	8.9	20:30	23:08	03:45	A
HD 235183	SAO 32481	Cyg	20h20m01.1s	+51°15'33"	8.9	20:25	22:06	02:40	A
ST42832C	ADS 15355C	Cyg	21h49m11.4s	+50°31'29"	10.9	20:35	23:35	04:00	A
SAO 51251	PPM 61958	Cyg	21h44m46.1s	+49°31'14"	9.1	20:30	23:30	04:00	A
PPM 61302	BU 839C	Cyg	21h20m18.1s	+49°20'48"	10.1	20:30	23:06	03:35	A

With this best time to observe an object list, the order I will observe each object on my next outing is complete.

At home, I manage my ST4 observing lists using my Tower PC. It is the master ST4 database repository for all the items ST4 manages for me. In the field, I run ST4 on my laptop next to my telescope. I use a thumb drive to transfer the complete exported ST4 database from the Tower PC to the laptop. I use the ST4 database import function on the laptop to update all the ST4 information managed on the Tower PC.



I use a Sky Commander (SC) Digital Setting Circles with my telescopes. If the objects on my next outing's observing list are not in the SC's database of objects, I program the 100 user defined objects with the Right Ascension and Declination of these objects. The SC uses a SXX designation for these objects, starting with index S00 through index S99. As I program each object into my SC, I add a note to that object in ST4 with the SXX index I used. When I am ready to observe this object in the field, I can see the note and set the SC accordingly to locate the object.

I always am considering having additional resources with me if my technology refuses to work in the field. I always print a paper copy of the ST4 best time to observe the objects, from the display for my next outing's observing list. I use my PC's screen capture function and capture an image of each section of the observing list as displayed. Once printed, I can use this printout as a backup, if needed.

When my observing location has 120v electricity, I don't worry about my laptop batteries dying before I am done observing. If something happens and they do expire, I have the SkySafari app (SkySafari 7 | Professional Astronomy Telescope Control Software for iOS (skysafariastromy.com)) loaded on my Android phone. This is where my backup star charts are if I need to star-hop to the objects on my observing list.

It is rare, but I've had my SC fail to find objects on a few occasions. In almost all cases, the encoder for one axis was slipping. The other culprit is a bad cable connection between the encoders and the SC computer. Both issues would be difficult to diagnose at night using a red light.

I drive to the observing location to observe, not to fix technology in the dark. If I align my SC twice and it still fails to find objects, I turn off the SC and star-hop the rest of the night. The SkySafari interface provides me with enough reference stars to allow me to do this.

The next thing to consider is where you are going to go to observe on your next outing. For me, it all depends on which of my favorite observing locations will have the best viewing forecast. I watch the forecasts for each of these locations in the days leading up to the night I chose to observe. Sometimes, I make my decision of which site to drive too at the very last moment. On my website, I have many links I can click and quickly determine which observing location will be the best.

Weather at My Observing Locations	
My Backyard Broomfield, CO Local Forecast Hourly Key Weather Indicators Broomfield Clear Sky Clock	Denver DSS Deer Trail, CO Local Forecast Hourly Key Weather Indicators DSS Clear Sky Clock
Berthoud LTO Berthoud, CO Local Forecast Hourly Key Weather Indicators Berthoud Clear Sky Clock	Pawnee Grandlands Keets, CO Local Forecast Hourly Key Weather Indicators Pawnee Clear Sky Clock
IRF Crumell, TX Local Forecast Hourly Key Weather Indicators IRF Clear Sky Clock	Iowa City, IA Iowa City, IA Local Forecast Preston Webcam Iowa River Webcam
Okie-Tex Star Party Keeton, OK Local Forecast Hourly Key Weather Indicators Okie-Tex Clear Sky Clock	Texas Star Party Fort Davis, TX Local Forecast Hourly Key Weather Indicators TSP Clear Sky Clock

At this point, I am ready for my next outing. All I need to do is to load my vehicle and off I go. To ensure I have everything I need for observing, I have made two lists of things I take with me to make my observing outings successful. One list is for an overnight outing and the other list is for a multi-night outing. Below is the overnight list I use to pack my car. This is an all-inclusive list and there are seasonal items listed that I might not take with me in the summer.

Overnight List of Items to Pack			
12.5" Base/Poles/Upper Cage/ Finder Platform	Alieve	Winter Boots	Chart Box(es)
Little Giant ladder	Tums	Wool Socks	Night Sky Guides
Black 12.5" Equipment Case	Bug Spray	Ski Pants	Double Star Charts
8" Scope/Base	Hand Sanitizer	Long Johns	2 Seasonal Notebooks
Teirad for 8" Scope	Sun Screen	Thermal Wools	Pgm Notebook(s)
Sky Commander/Pedestal/Alt Arm	Water	Sweat Shirt	Spiral Notes Book
Weights (2 small clamps)	Snacks	Gloves	Double Star List
Rock Weights	Dinner	Ski Hat	Pencils
Table	Sleeping Bags/Foam	Ear Muff Hat	Blue Tape
Chair	My Pillow	Neck Gator	Duct Tape
8x50 Binoculars	Camera/Tripod	Jacket	Needle Nose Pliers
3 Eyepiece Cases	4 - AA Batteries	Winter Coat	Leveling Blocks
20x80 Binoculars/Mount/Weights	1 - 9V Battery	Coveralls	Toilet Set/Enclosure
Multi-Band Radio		Eye Shade	Table Top Dew Guard
Scope Cover	Hat	Ear Plugs	Back Brace
Ground Tarp	Shovel	Noise Maker	
12V Deep Cycle Battery	Toilet Paper		
Extension Cord/3 way connector	Paper Towels		
DC/AC Power Converter	Fly Swatter		
Window Net/Magnets	Electric Fan		
Phone Red Screen	Electric Heater		
Phone Charger	Window Net/Magnets		
PC/Red Screen/Box	Observing Chair		

When I am ready to load my car, I print out the appropriate list. I check an item off the list only when I physically load it into my vehicle.

If I am in the field and find I wished that I had a certain item or tool with me, I add a note to my observing log and when I get home, add it to both my packing lists so I will have the item the next time I go out.

My vehicle is a Toyota Prius V. Below are pictures of how I packed the Prius with all the items, including my 12.5", f/8 telescope, I needed when I attended the 2019 Texas Star Party.



There is much more to planning your next observing outing that I will expand upon in future articles. The additional resources you will need are important to gather during the planning process. For instance, if you are going to do the Open Cluster Observing Program, you need pictures of the open clusters. The Messier open clusters are obvious knots of many stars. But the Berkeley or Harvard open clusters are often just a few stars, sometimes located in a star rich area of the sky. To identify which stars are part of the open cluster, you need an image. More on this in later articles.

Meeting Notes Thursday, October 19, 2023

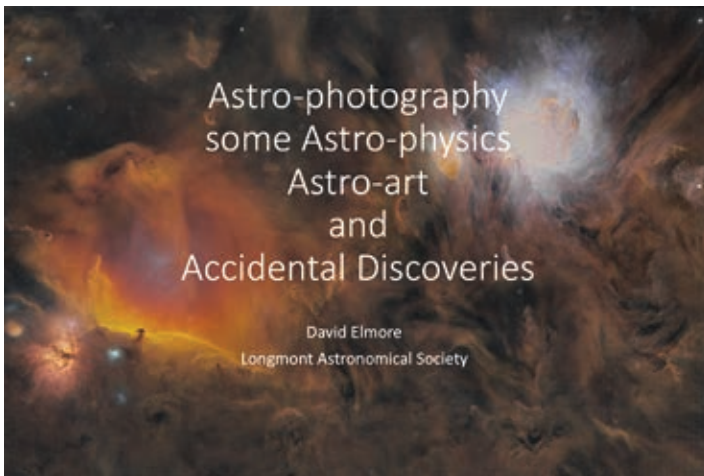
by Vern Raben

I. Introduction

The October LAS in-person/Zoom meeting was held on October 19 at the Longmont First Evangelical Lutheran Church. President, Vern Raben began the meeting with a self-introduction by all members attending in person and those on Zoom. Fourteen members attended in-person, twelve attended via Zoom.

II. Meeting Presentations

Astro-photography, some Astro-physics. Astro-art, and Accidental Discoveries presentation by David Elmore



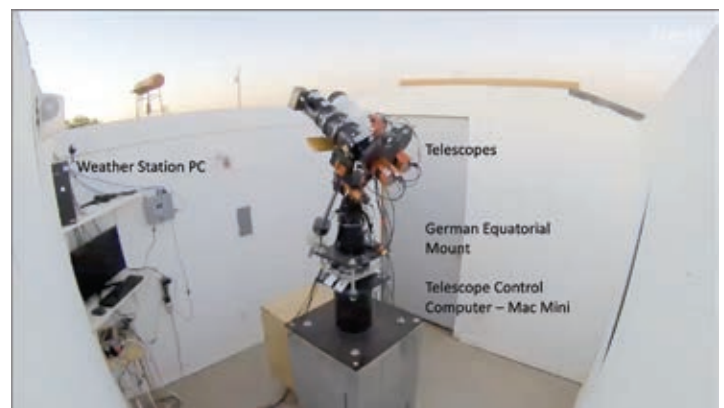
David Elmore is an Astronomer Emeritus for the National Solar Observatory. His professional career centered around conceptualization, design, and construction of solar research instruments attached to solar telescopes. His particular expertise is in measurement of magnetic fields on the sun utilizing the polarization properties of light. His instruments have been deployed at observatories around the world, the stratosphere, and on spacecraft. After decades at the High Altitude Observatory of the National Center for Atmosphere, Mr. Elmore served as Instrumentation Scientist for the newly completed and world's largest solar telescope, the National Science Foundation Daniel K. Inouye Solar Telescope.

Astrophotography has been a hobby for David from film to digital. Currently he remotely operates wide-field telescopes located in a rented observatory at a dark site in southern New Mexico. This talk features images from that observatory tracing the cycle of life in the Milky Way from clouds of galactic cirrus to new stars to planetary nebulae

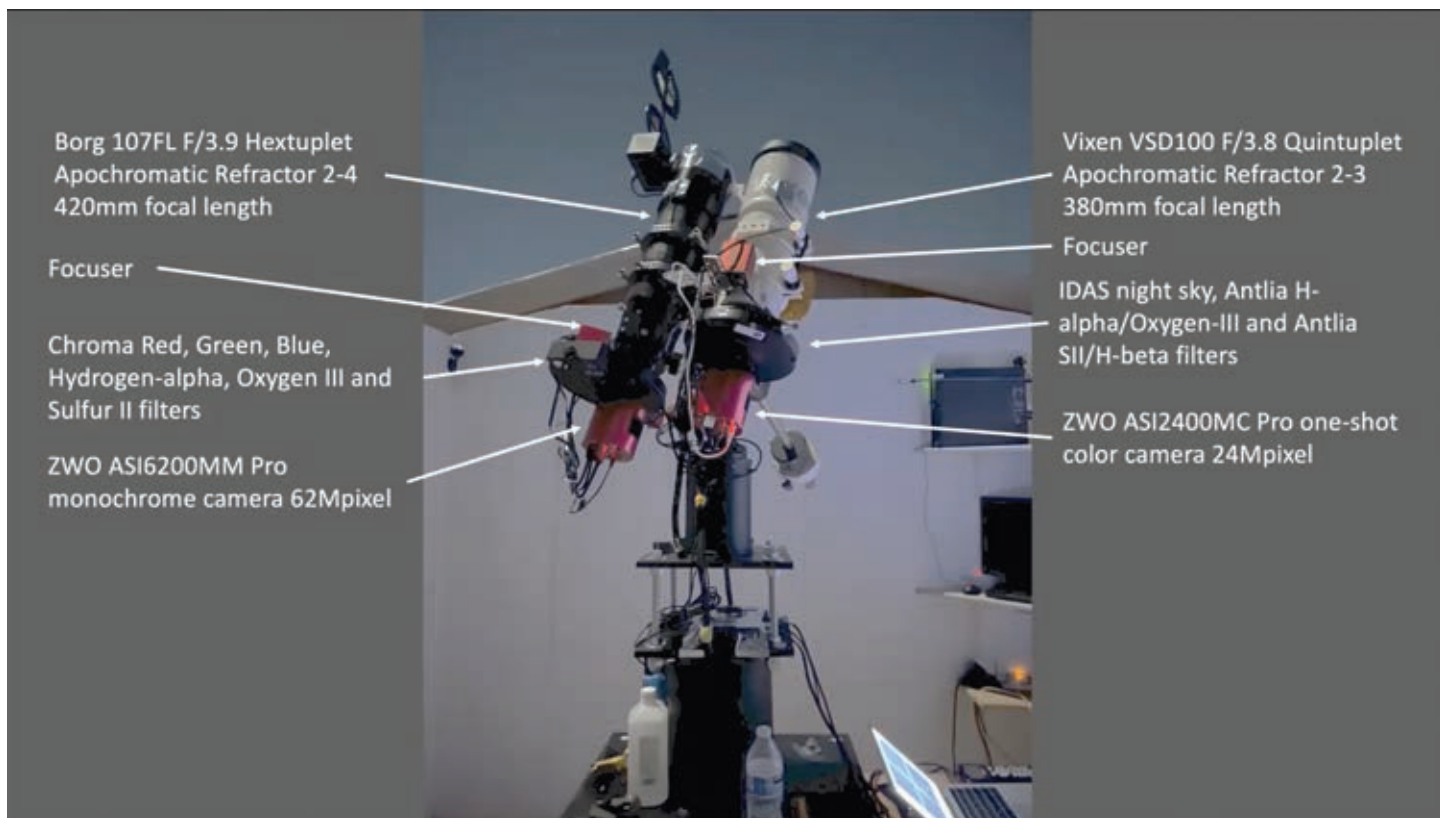
and super novae back to clouds in the galaxy. As a sidelight David will describe the accidental discovery of three never before identified planetary nebulae.



David's observatory, "Cosmos Siding" is at Dark Sky New Mexico. In the background note the weather station so he can tell whether or not the observatory should be opened. Also in the background is a telescope built by Clyde Tambough, who discovered Pluto.



Inside David's observatory with roof rolled back. On the left is his weather station computer. On top right are a couple telescopes on an equatorial mount. Below the mount are a couple plates; the telescope control computer resides between them.



Another view of the inside of the roll-off observatory taken at night in moonlight. On the left is a refractor of about 4 inch diameter; the focal ratio is 3.9 (focal length to diameter) which is considered “fast” for a refractor. The smaller the focal ratio the more light you get on a pixel from a light source. It is a apochromatic hex-tuplet (2 lenses in the front and 4 in the back). In the optical train there is a focuser to focus the telescope remotely; a filter wheel with red, green, blue, hydrogen-alpha, oxygen III, and sulfur II filters; the camera is a ZWO ASI 6200 MM Pro monochrome camera which is 62 mega pixels.

The telescope on the right [above] is a Vixen VSD100 F/3.8 which is a quintuplet apochromat. It has a configurable focal reducer so it can be setup as an opt-tuplet at F/3. At time of photo it was configured as F/3.8. It also has a focuser, filter wheel and a 24 megapixel one shot color camera.

His system is designed for a high signal to noise ratio.

- Cameras are fast (low f-ratio)
- Dark site is used to minimize background light
- Narrow band filters are used to minimize spurious signals
- Low noise cameras are used to reduce various types of noise originating from the digital camera itself

Read noise from the cameras is about 1.5 electrons



which corresponds to about 1.5 photons. The dark current which is the signal generated by the camera because it is not absolutely cold is about 1 electron per exposure. The sky background in southern New Mexico with narrow band filters is about 4 electrons per exposure of about 10 minutes. In other words in about 2.5 minutes you might get an electron from a photon! This gives an idea of how faint some of the objects we are looking at.

Another aspect of his system is the large field of view.

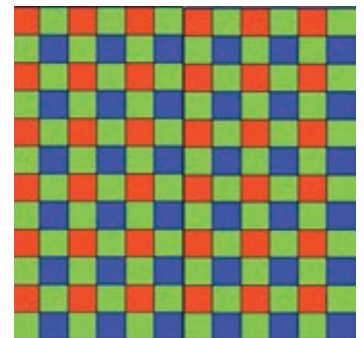
Note that the field spans about 6 moon diameters.



Filters

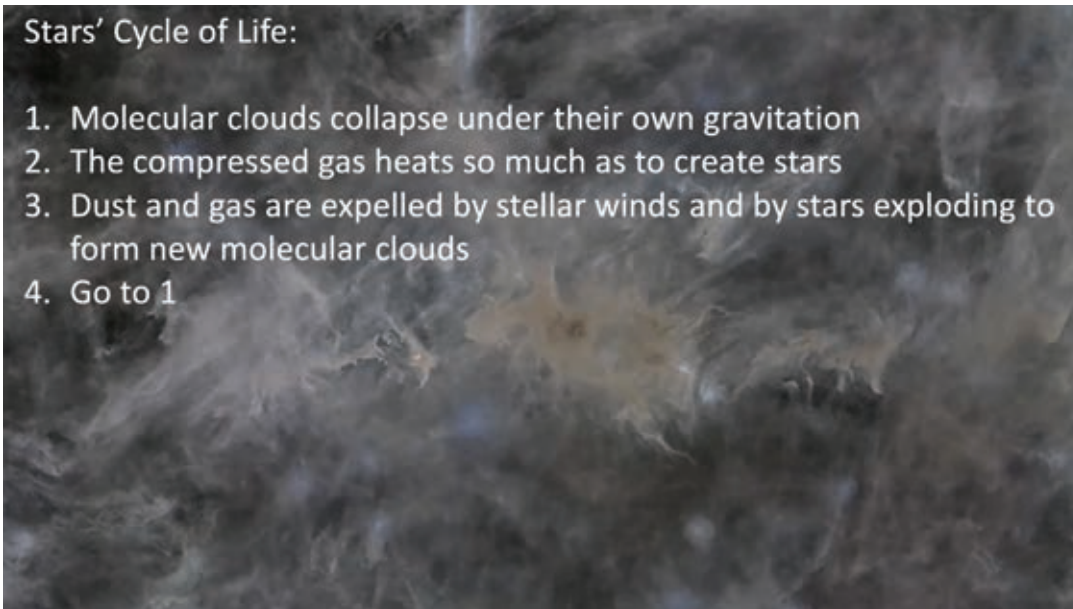
One of his cameras is monochrome. It detects a certain amount of light but it knows nothing about what color of light that is. If you place a red, green, and blue filter in front of it and image an object you may then combine them to produce a color image.

Many cameras such as your cell phone also use filters but they are fabricated onto the sensor in front of the pixels. By interpolating between the pixels a full color image is produced.



Stars' Cycle of Life:

1. Molecular clouds collapse under their own gravitation
2. The compressed gas heats so much as to create stars
3. Dust and gas are expelled by stellar winds and by stars exploding to form new molecular clouds
4. Go to 1



So now we have a camera that can take red, green, and blue images and we can use it to look at various objects. Let's start by looking at molecular clouds which are mostly hydrogen. These hydrogen clouds begin to collapse under their own gravitation. As they compress they heat up more and more. The compressed gas heats so much that stars are created.

These young stars produce stellar winds that blow

gasses and dust. Stars such as our sun have solar winds of gas and dust though they expel much less. If the stars are large enough they may end their lives by exploding as a planetary nebula which produces gas and dust. Massive stars may go through several cycles of explosions and collapse.



Polaris region - 10 degrees across

David got his new telescope which was set up with red, green, and blue filters and wanted to try it out. Since he was pointing at the north star he decided to take a picture of it. This is what he saw -- which is not what he expected. Visible in the image was galactic cirrus which is also known as integrated flux nebula. These are molecular clouds that are in our galaxy but also above and below the plane of the galaxy.

He started looking at more of these clouds. Image below is centered more or less on M81 and M82. Usually the M81 or M82 would fill the field of view. In this image you can see the Volcano Nebula below and right of M82. The Angel Nebula is in the upper right of the picture.



The temperature of these molecular clouds are only about 10° Kelvin. We can see these clouds because they are illuminated by light from surrounding stars in the galaxy. Molecular clouds are not only above and below the plane of the galaxy but they also permeate through the whole galaxy.



Another example is the Witch Head Nebula (above) which is illuminated by the star Rigel.



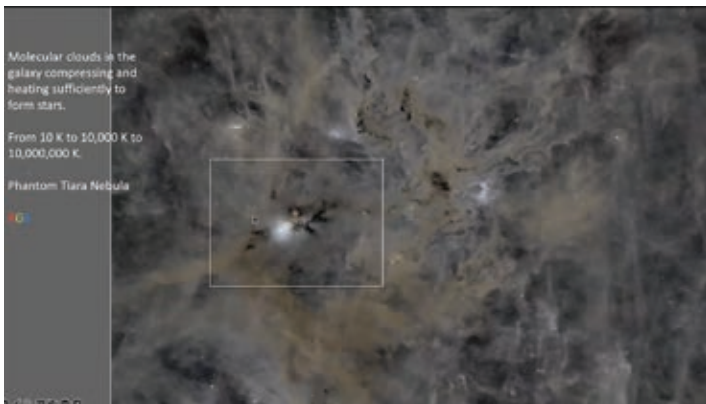
The Sea Horse Nebula (above) is an example of a molecular cloud just beginning to compress under its own weight.



The previous image is near the Baby Eagle Nebula. The gases as they are compressing form some wonderful shapes. Toward the bottom right we can see glows which are heating up quite a bit. Another example of this is the region near the Dark Shark Nebula.



If we take a look at this region in the Phantom Terra Nebula we see a region that is compressed enough that we



can see new stars being formed. The compression of the



molecular cloud went from 10° Kelvin to 10,000° Kelvin to 10,000,000° K which was enough for hydrogen atoms to begin star formation.

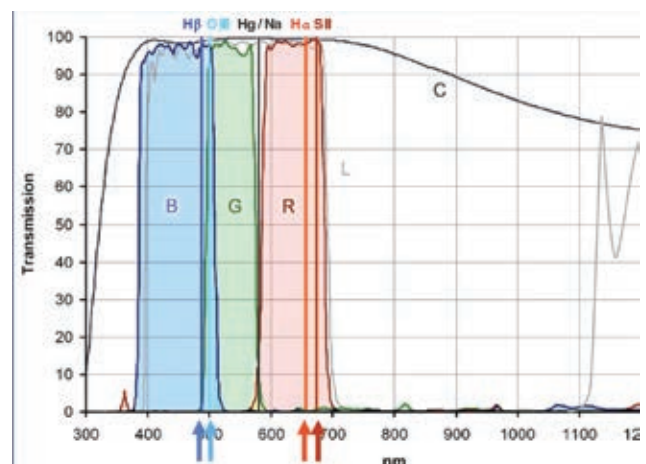
If we take a look at a region around the Iris Nebula (near bottom of image below) we see another effect taking place.

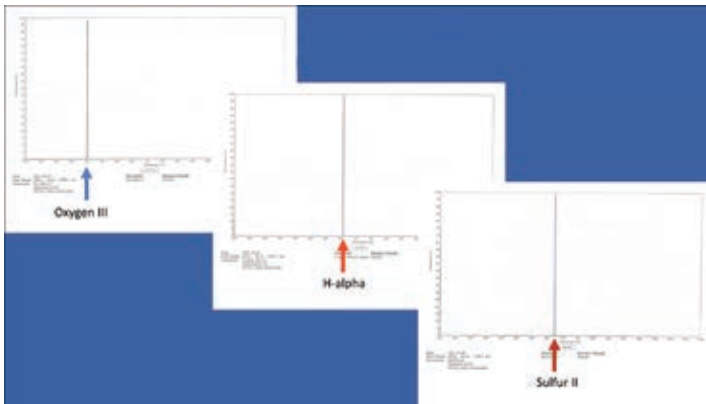


These young stars with their stellar winds are beginning to blow away the molecular cloud from which they were formed. These young stars can cause the molecular cloud

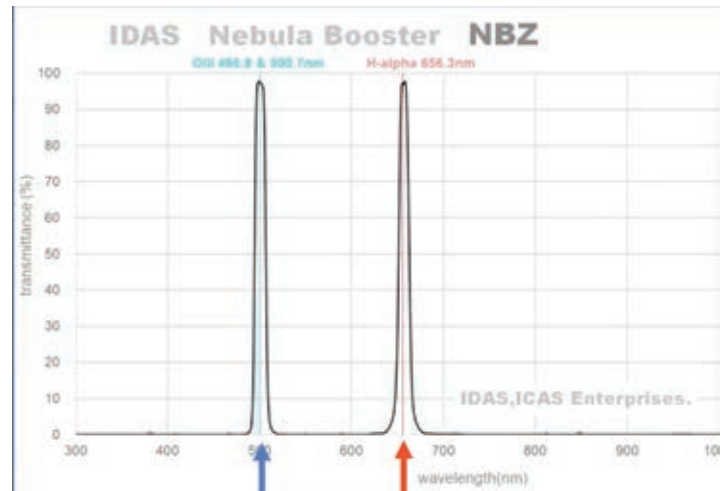


to radiate light by a different mechanism than just scattering bright light. Their radiation is so intense that it can blow electrons off the atoms and cause the molecular gas to change energy states. As the atoms go through distending energy states they emit protons. We can observe that using filters that are tuned to those particular wavelengths of light that are emitted through the transitions.

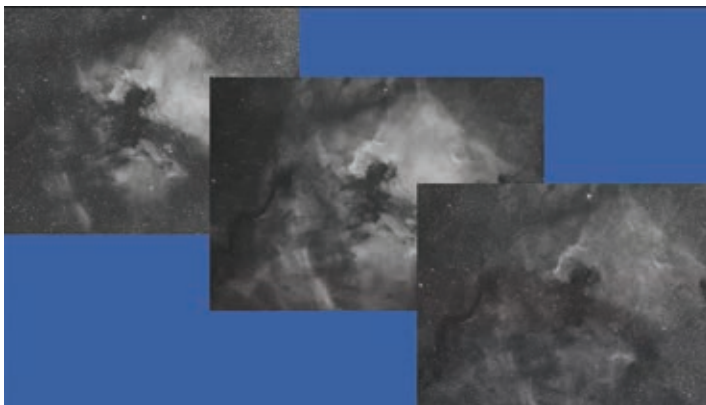




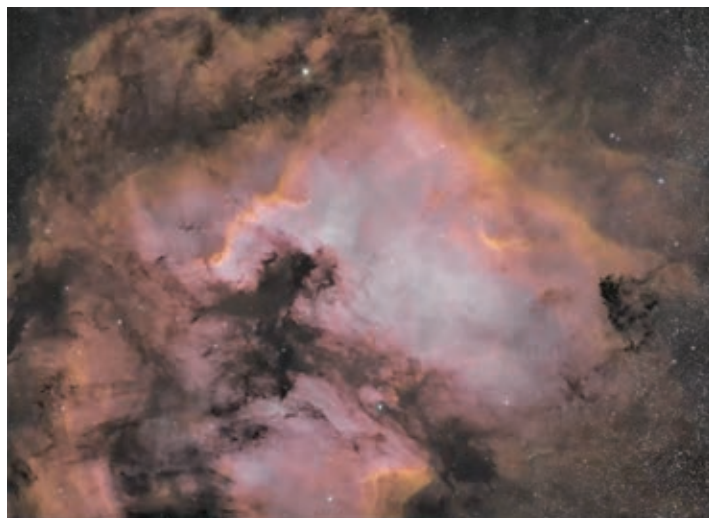
We can then create images for each of those filters. Here are the pass bands for Oxygen III, Hydrogen Alpha, and Sulfur II filters. The horizontal axis is the visible spectrum plus some infrared. Note that the pass bands are very narrow perhaps 1/100th of the visible spectrum.



You then end up with a narrow band filtered image that shows up in color.



So we can take images at each of those colors, assign a color to each of those mono-chrome images, and produce a full color image.



In the case of a one shot color camera the sensor already has red, green, or blue filters over each pixel. Fortunately someone invented a filter in which Oxygen III is sensed by the blue and green filtered pixels and the hydrogen-alpha is sensed by the red filtered pixels.

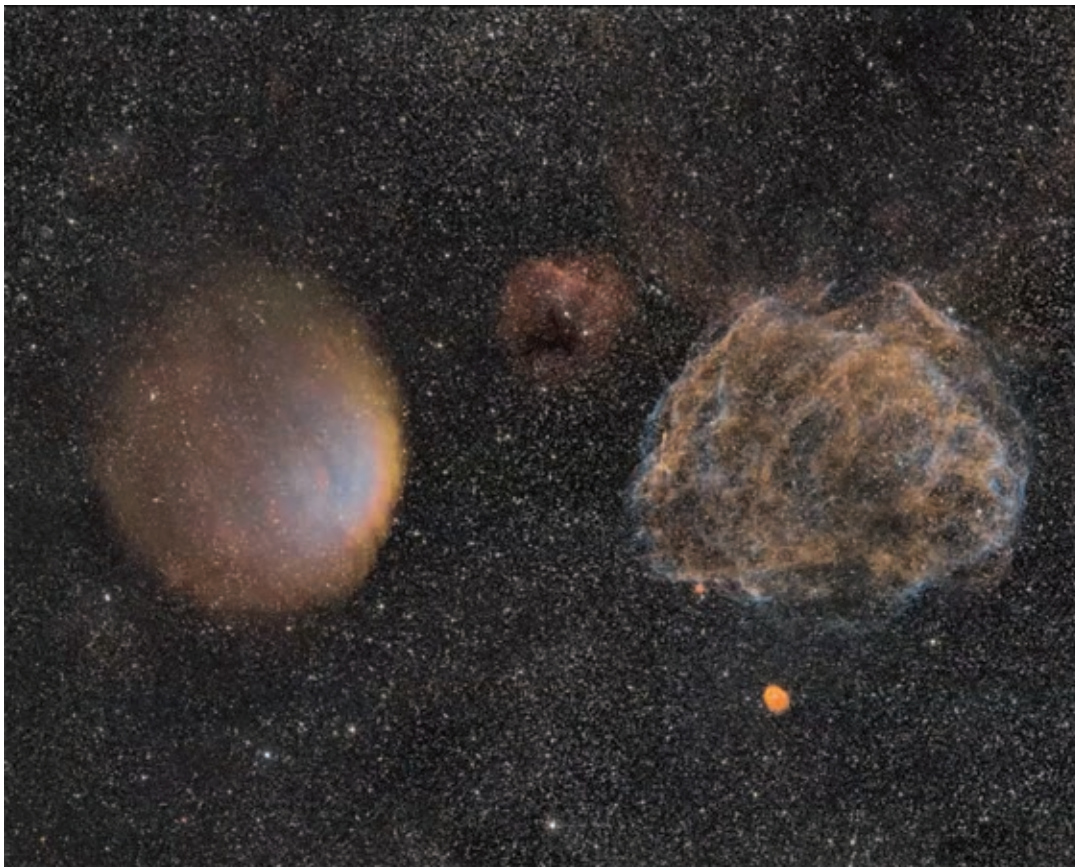
We can apply these filters to image objects such as the El-



phant's Trunk Nebula" (above). The stellar winds cleared out the molecular clouds. We are seeing emission in a ring around the center. We also see some wonderful shapes in the residual molecular cloudy caused by stellar wind and photo pressure. This ring is where energetic protons from young stars have traveled outward to where there is some remaining molecular cloud and blasted electrons off the atoms. The atoms have been re-capturing electrons and

emit light in red hydrogen alpha band. Further out those protons have exhausted and there is nothing left to excite the molecular cloud.

The young stars generally form in clusters. The image at the right is the Pleiades. They have completely blown away the molecular cloud from which they were formed. However they are moving through another molecular cloud. They are lighting it up with their pretty blue light. If we come back in 50,000 years or so they may have moved off to another part of the galaxy and be lighting up another molecular cloud.



This image of Sh 2-216 and Sh 2-221 shows two different stars that have ended their lives.

The object on the right is pretty large, pretty distant, and pretty bright. It is a super-nova remnant. That star turned hydrogen into helium in its core. Stars are a marvelous balance. It generates energy in the core which is trying to expand but it has gravity which tries to compress it. These forces remain in balance for most of the life of the star. The hydrogen gas burns in a ring about the core which decreases in mass. Eventually the heating wins out over the

gravitational collapsing and the star expands. At some point it will have burned out all of its hydrogen. Gravity then wins; the star collapses and heats up even hotter. Helium then begins converting to heavier elements -- nitrogen, oxygen, carbon. Once those elements are exhausted it gets bigger and bigger again. It throws off gases and then collapses. If the star is massive enough it can repeat this cycle several times until it gets to iron. It then blows off its outer shell and collapses until gravity forces the protons and electrons to form to a neutron star about the size of the Earth. The resulting

super nova explosion blows off the outer layer. If the star is even more massive it collapses to black hole.

The star on the left in the photo [on the previous page] was not as massive and lived for billions, not millions of years. Less massive stars slough off outer layers as nuclear fuel is depleted as well. They become planetary nebula and leave a white dwarf star.

The Spaghetti Nebula is an example of a supernova explosion.

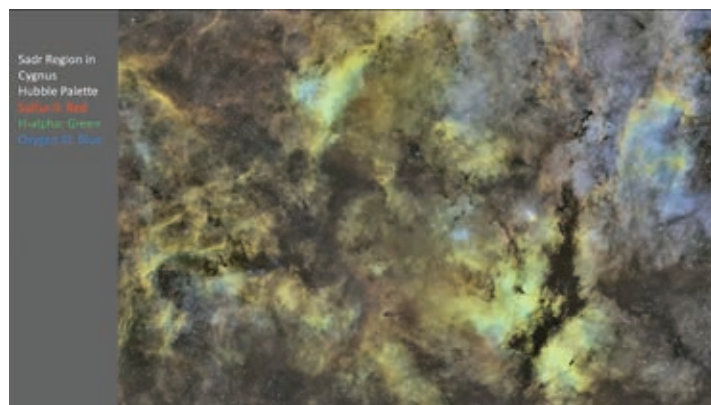


Helix Nebula is an example of planetary nebula. In the center is a dwarf star.

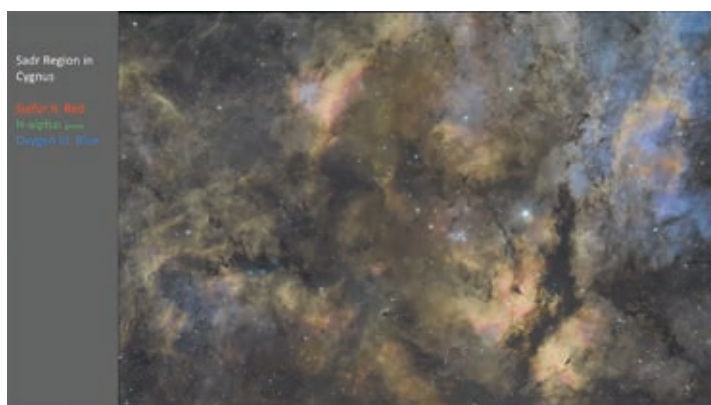
When assigning colors to images there are artistic choices to be made. In the image below of the Sadr Region in Cygnus hydrogen-alpha has been assigned to red, sulfur II to yellow, and oxygen III to cyan.



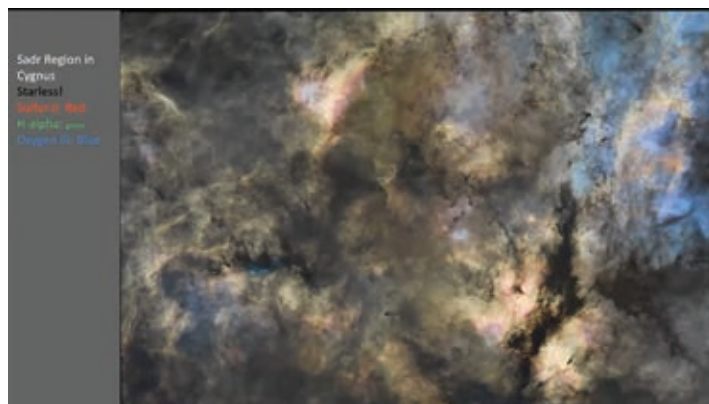
Scientists on the Hubble project decided that they could see more scientific species in an image if they assigned sulfur II to red, hydrogen-alpha to green and oxygen III to blue.



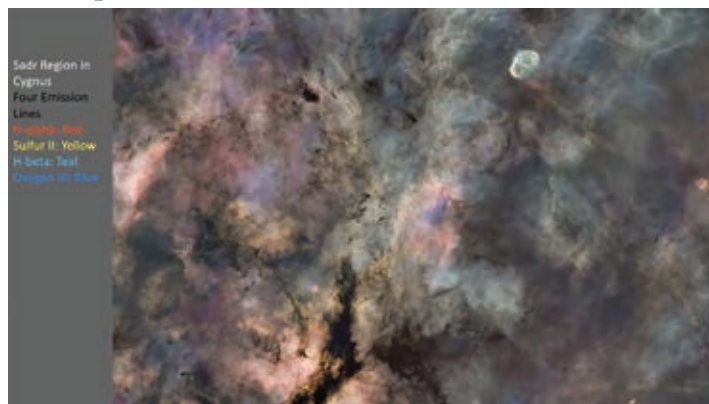
But then you might decide that you have too much hydrogen and so you tone it down.



Then you might decide you could see the nebula better if you took all the stars out or maybe only 20% stars.



If you add in a hydrogen-beta filtered image you then come up with even more color combinations.



Accidental Discoveries

If you want to see if something in your image might be an undiscovered planetary image, then the object:

- Must have an OIII shell
- Must have a remaining white dwarf star
- Must not have been identified previously

David searched through his images and came across this one and sent it in. It has been designated EL-1.



In collaboration with Dana Patchick they have also discovered a couple other planetary nebula: PaEl-1 and PaEl-2.

Sharpless 2-119 by Marty Butley

Marty sent out this image of Sh 2-119 and Stephen commented that it looked terrible.



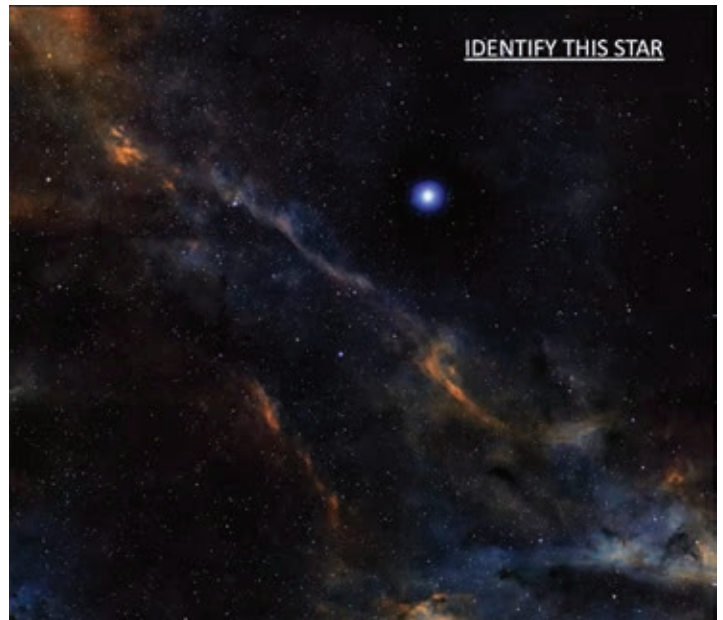
He worked on it a bit and came up with this:



But he still thought it was missing something so added:



But contrary what was in his email he did not take the picture of the moon from his backyard.



- Deneb has a diameter about 203 times that of the sun. That makes Deneb one of the largest type A spectral class stars known.
- The star Deneb in the constellation Cygnus the Swan is one of the most distant stars you'll ever see with your eye alone. That's because it's one of our Milky Way galaxy's most luminous stars.
- The name Deneb derives from the Arabic Al Dhanab al Dajajah meaning the Tail of the hen. Obviously dates from earlier incarnation of Cygnus not as a swan but as a chicken.

Old/New Business

Upcoming Events:

- Oct 16 from 6:15 pm to 8:45 pm - Rabbit Mountain star party
- Nov 16 LAS October Meeting here
- Nov 17 6 to 8 pm - Erie Elementary Star Party
- Consider volunteering to be LAS Officer or board member for 2024
- Do we want to do an LAS 2024 calendar? Interest has been waning. When we first did one we sold 200; last year only 75. Consensus was that we should do another.
- Stephen reported that we had a spectacular event during the partial solar eclipse on Oct 6? at the Louisville Community Park. About 300 or so people attended and we had maybe 10 telescopes. People were excited and had lots of questions.
- No meeting in December

Treasurer Report - Bruce Lamareaux



Longmont Astronomical Society

P.O. Box 806
Longmont, CO 80502-0806

LAS Treasurer's Report - Bruce Lamoreaux

10/20/2023

Main Checking Account (xxx-1587)

Begin Balance:	\$ 9,160.00	9/5/2023
Deposits:	\$ 100.00	Membership
Expenses:	\$ (70.00)	Bank Charges, Library Telescope Parts, Stripe
Current Balance:	\$ 9,190.00	10/3/2023

2-Year Savings Account (xxx-1478) (matures 10/23/23)

Past Balance:	\$ 8,170.00	6/30/2023
Interest:	\$ 15.00	
Balance:	\$ 8,185.00	9/29/2023

Telescope Fund (xxx-0165)

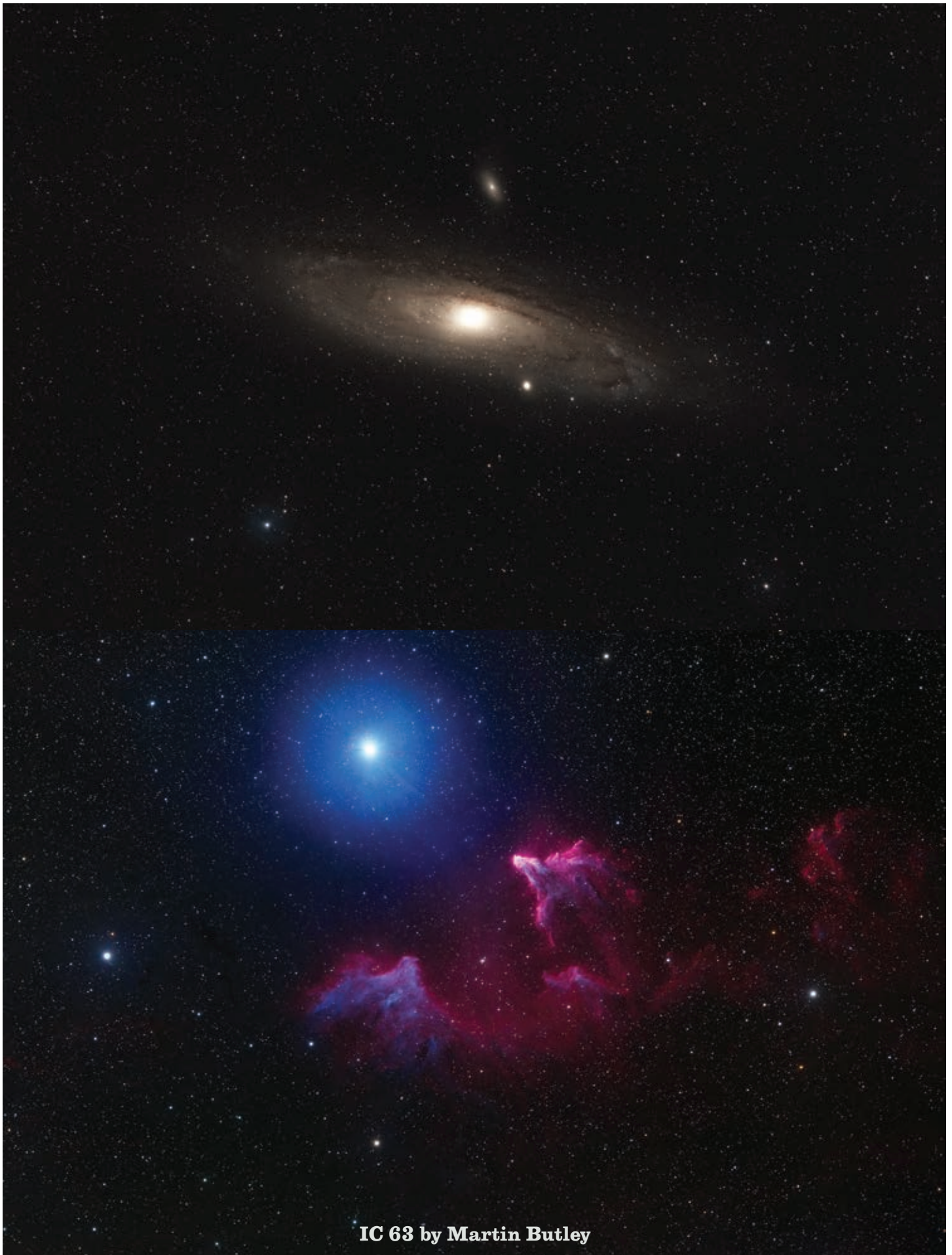
Past Balance:	\$ 1,100.00	8/30/2023
Deposits:	\$ -	
Expenses:	\$ -	
Balance	\$ 1,100.00	9/28/2023

Petty Cash

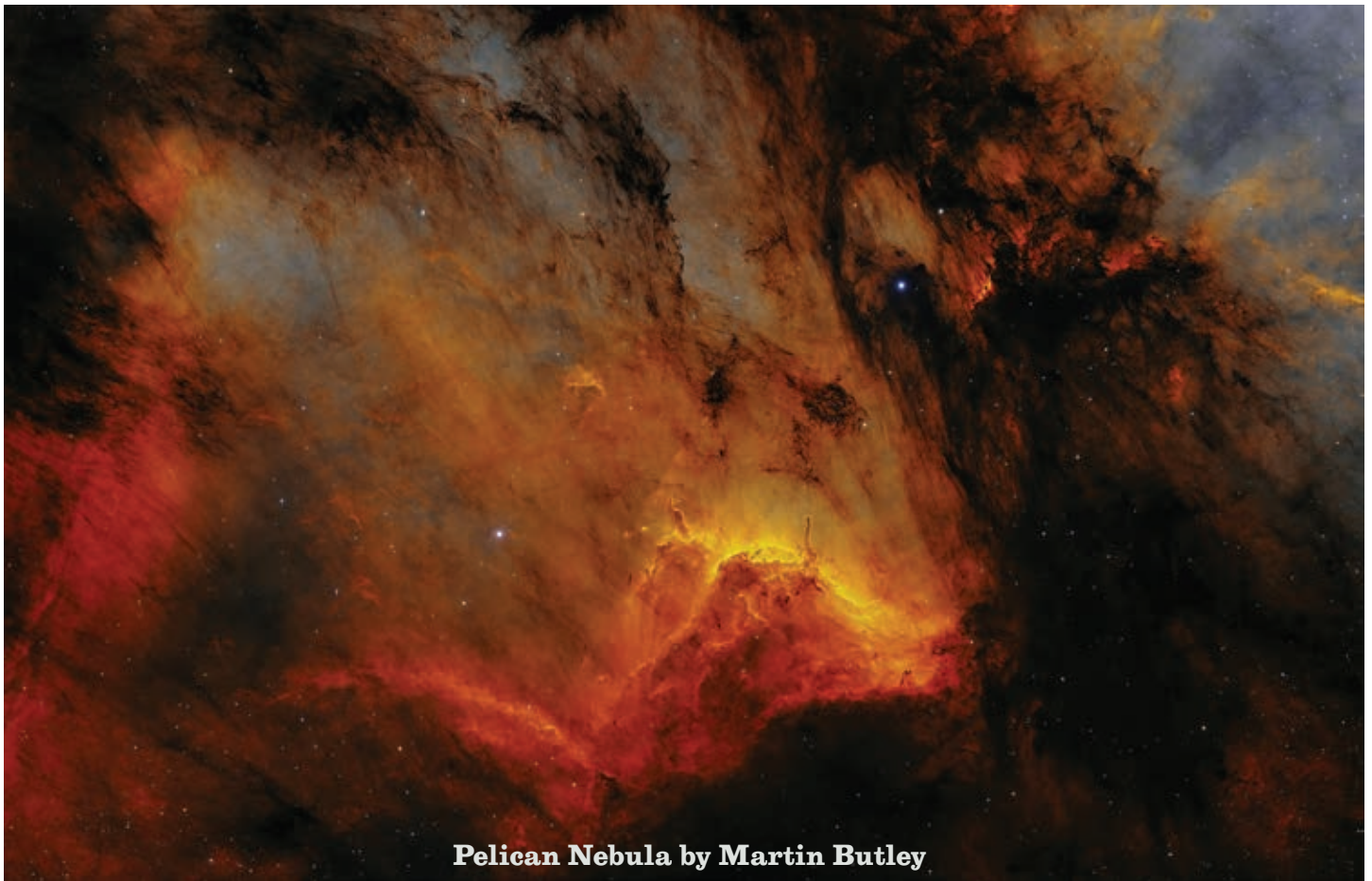
Past Balance:	\$ 50.00
Deposits:	\$ -
Expenses:	\$ -
Balance	\$ 50.00

<u>Total Assets</u>	\$ 18,525.00	\$18,480.00	\$ 45.00	Up from last report
----------------------------	---------------------	-------------	----------	---------------------

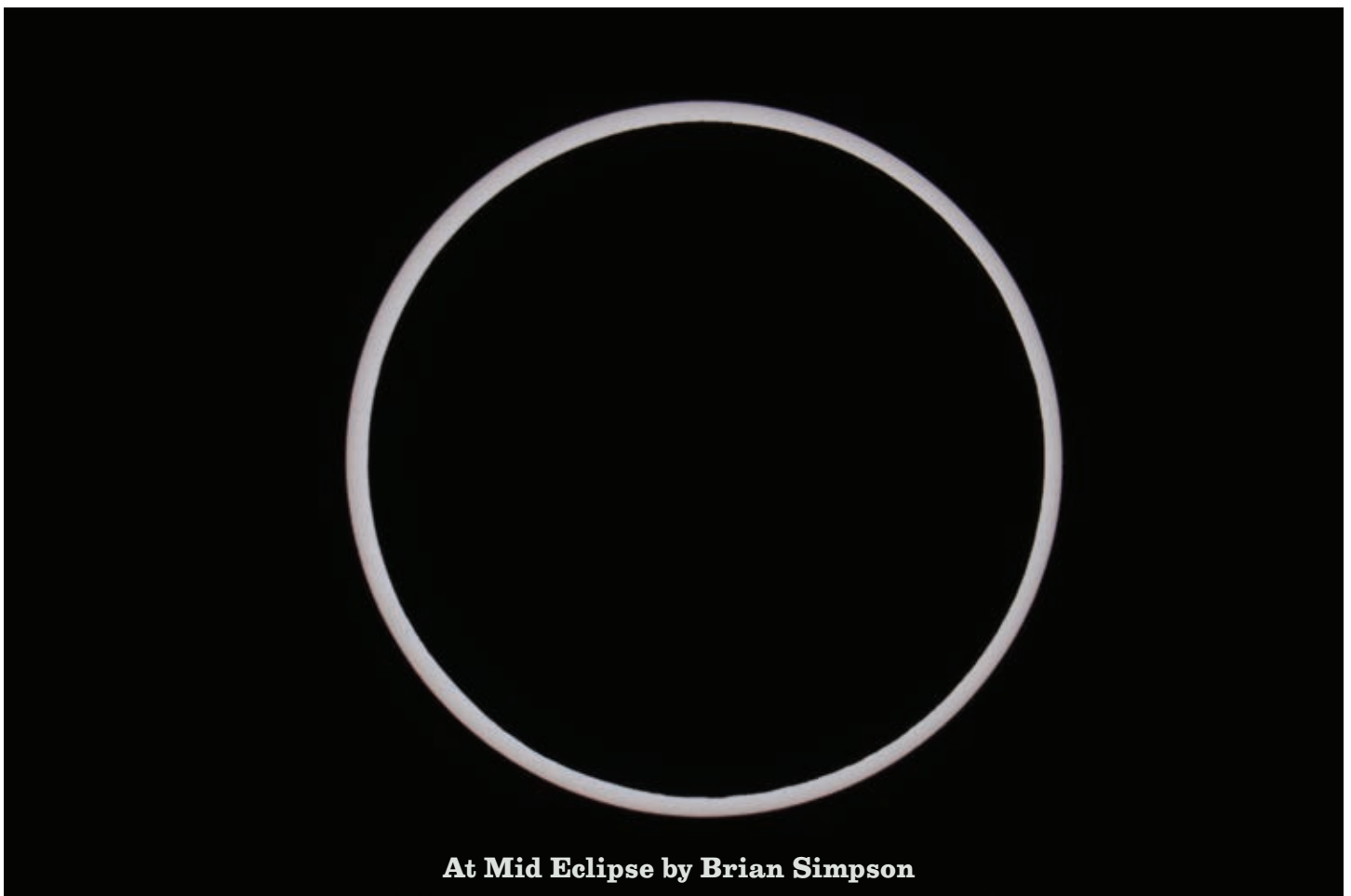
Active Membership:	98
Student Membership:	2
Total	100



IC 63 by Martin Butley



Pelican Nebula by Martin Butley



At Mid Eclipse by Brian Simpson



Solar Eclipse by Brian Simpson



Sh 2-93 Sh 2-95 by David Elmore



SH 2-115 by Rolando Garcia



IC 63 by Rolando Garcia



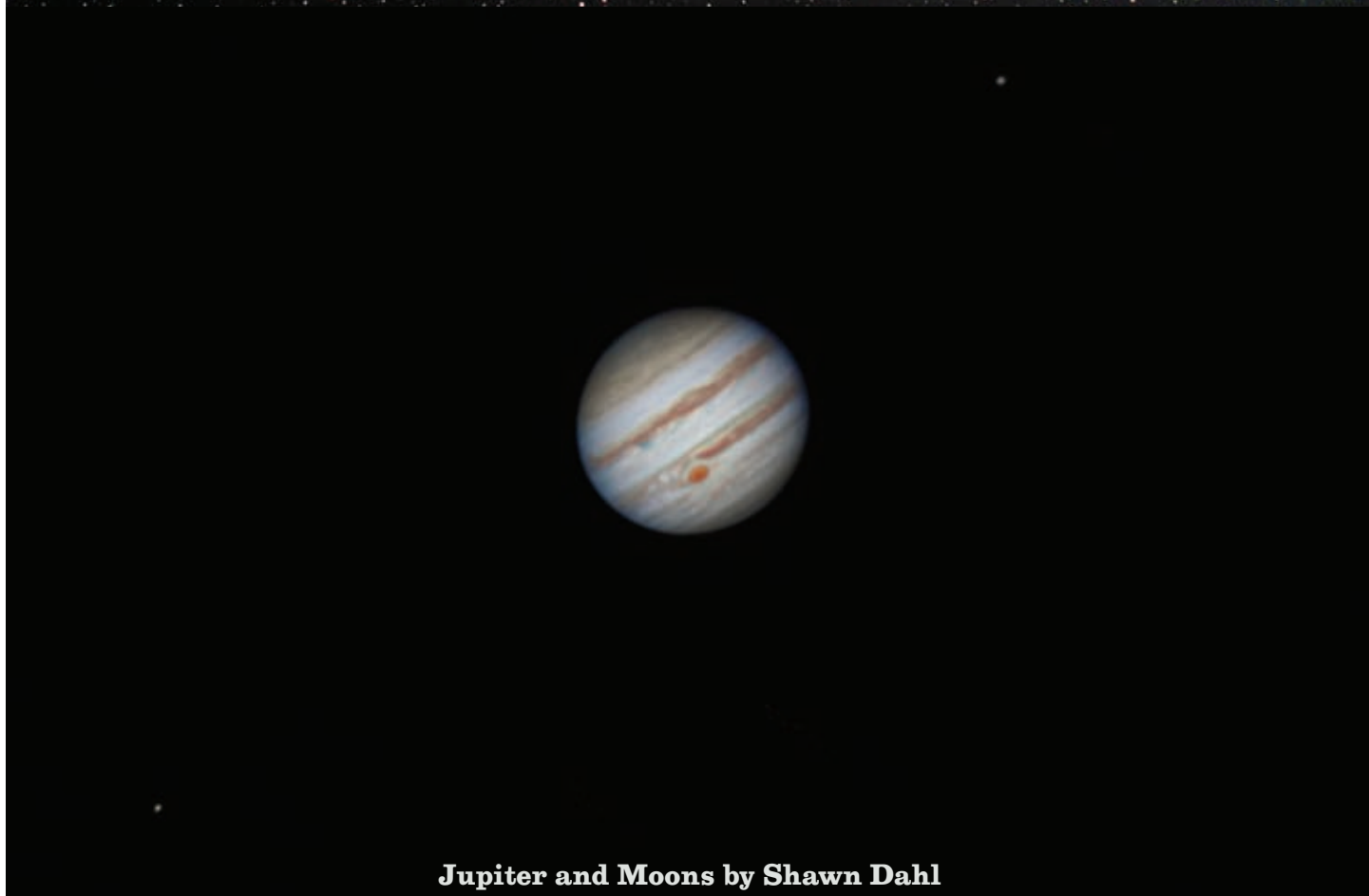
HB3 by Stephen Garretson



NGC 1499 by Stephen Garretson



NGC 281 by Gary Garzone



Jupiter and Moons by Shawn Dahl



Solar Eclipse collage by Paul Robinson



Leaf Shadows during Eclipse by Brian Kimball



Eclipse series by Tally O'Donnell



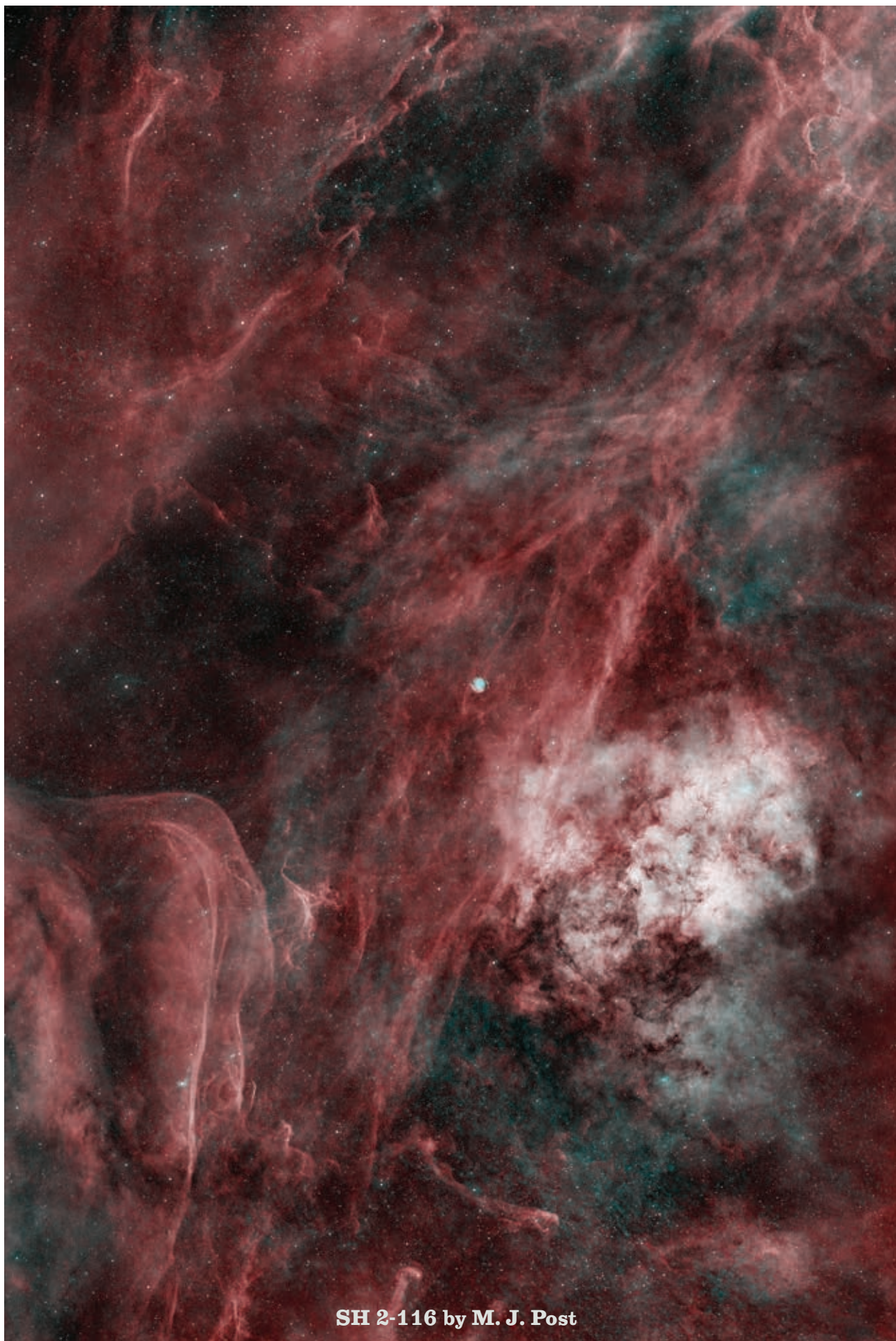
Cocoon Nebula by Jim Pollock



Comet 126P by M. J. Post



NGC 6946 by M. J. Post



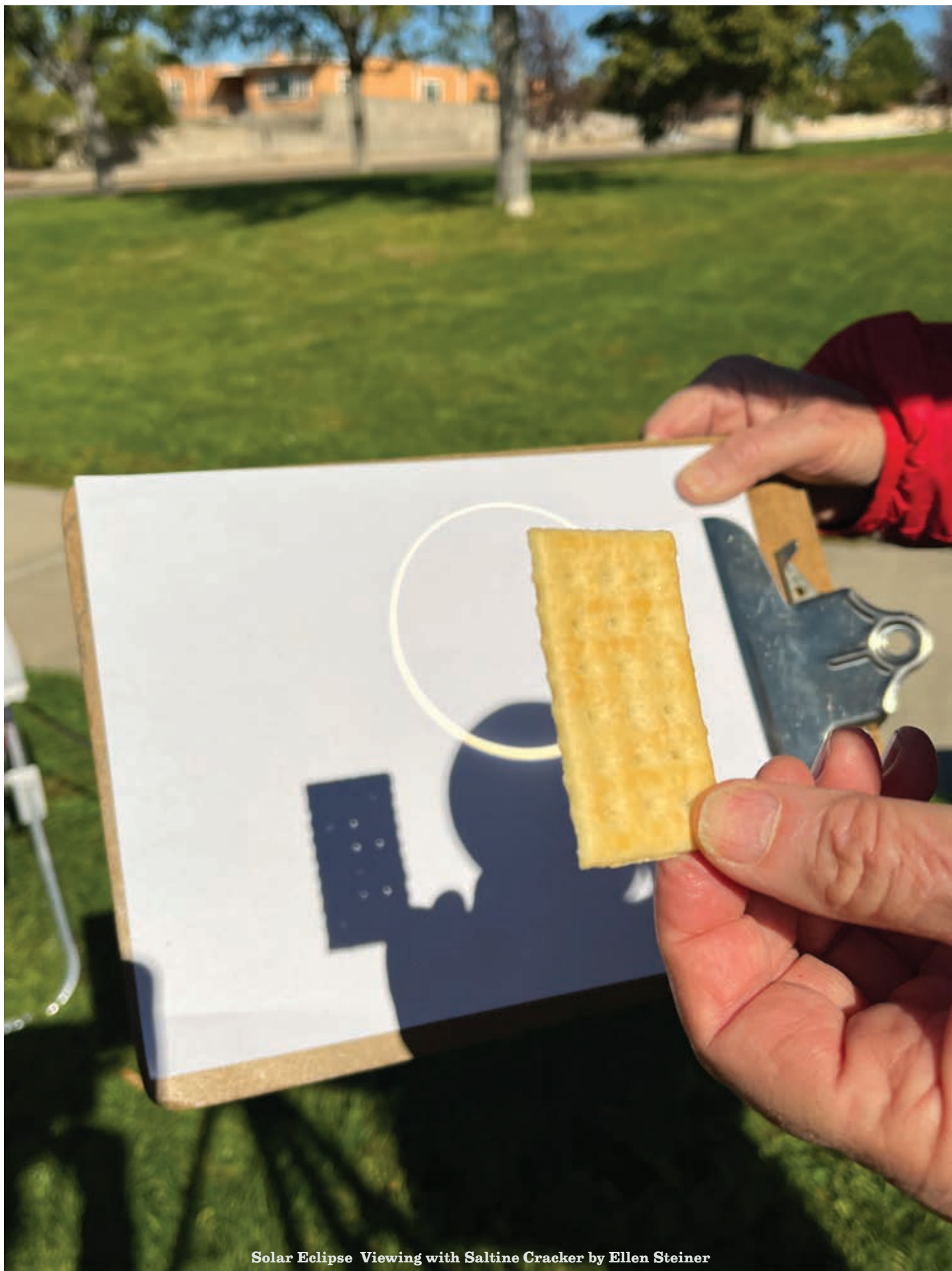
SH 2-116 by M. J. Post



Solar Eclipse by Jim Pollock



Mid Solar Eclipse by Jim Pollock



Solar Eclipse Viewing with Saltine Cracker by Ellen Steiner



Above: “Solar Scopes with Longmont Astro-nomical Society” at the Louisville Public Library Solar Event on Oct 7 by Bill Tschumy



Left: Solar Eclipse Watch Party” at Louisville Community Park Event on Oct 14 by Bill Tschumy

LONGMONT ASTRONOMICAL SOCIETY
PO Box 806, LONGMONT, CO
[HTTPS://WWW.LONGMONTASTRO.ORG](https://www.longmontastro.org)



SOLAR ECLIPSE WATCH PARTY
AT LOUISVILLE COMMUNITY PARK
BY DAVID ELMORE