Rosette Nebula  by Stephen Garretson on Nov 8
Next LAS Meeting
Annual Banquet January 16, 2020

We do not meet in December. The next meeting will be at the annual banquet meeting which should be on the third Thursday in January -- which is the 16th. Date and time is subject to availability of a particular venue. The location of the banquet has not yet been determined.

From the President, Bill Tschumy

Just a reminder that nominations for next year’s officers are now open. We will be holding elections at the Holiday Banquet in January. Right now I know of these vacancies that will need to be filled:

- Treasurer
- Secretary
- 1 Board Member-at-Large

If you are interested in these, or want to challenge another position, please let me know. I am willing to continue as President but if anyone else wants to do it I won’t try to stop you.

Bill

2020 LAS Officer Positions

The terms of all LAS officers is only one year so each position is up for election each year. Please consider volunteering some of your time to support LAS by being a club officer in 2020!!

- President – determine meeting agenda, arrange for speakers, and lead meetings; make decisions regarding the club with the assistance of other officers and board members;
- Vice President – assist president and direct meetings if president is absent
- Treasurer/ALCor – handle club finances, receive payments, deposit funds and report financial status at meetings
- Secretary – keep notes for meetings; record any motions and votes at business meeting
- Board member-at-large (3 positions) – make various decisions regarding club policies and finances
- Webmaster - maintain club website (appointed by president)
- Newsletter editor - publish monthly newsletter of meeting, events, and member images (appointed by president)
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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

The Longmont Astronomical Society is a 501 c(3), non-profit corporation which was established in 1987. Our main goal is to promote local amateur astronomy. This is accomplished through regular monthly meetings, star parties and public observing sessions. Regular meetings are held every month (except December) on the third Thursday. The current location is at the First Evangelical Lutheran Church, 3rd Avenue and Terry Street, Longmont, CO. Meetings are open to the public and begin at 7:00 PM.

A broad spectrum of topics are covered at the meetings and include such things as deep sky observing, planetary imaging, narrow band imaging, equipment discussions and demonstrations just to name a few. These subjects are presented by both club members as well as special guests who are professional astronomers or experts in a particular field.

November 21 LAS Meeting Minutes by Vern Raben

Meeting Minutes for Thursday, Nov 21, 2019, 7 pm MST. Location: First Evangelical Lutheran Church, 805 3rd Ave, Longmont, CO

Bill Tschumy, President, opened the meeting. He welcomed new member Armand Charbonneau and Dominic, a visitor who is a member of the Boulder Astronomy Society.

Officers present were: President, Bill Tschumy; Vice President: Stephan Garretson; Treasurer: Marty Butley; Board members, Vern Raben, David Elmore, Tally O’Donnell, Brian Kimball, and Gary Garzone.

Events since last meeting -
• Sanborn Elementary on October 25th was a success with about 200 people attending
• Prairie Ridge Elementary on Nov 1 was canceled

Upcoming events -
• No meeting in December; we traditionally do not have a meeting as it is close to Christmas
• Annual banquet meeting coming up in January. Bill asked for suggestions. Beau Joe’s and Pinocchio’s were mentioned.

Business Meeting

Treasurer report: Marty announced that he will not be treasurer next year. Expenses this month were $40 per month for website; two year savings account is about to role over; post office box will cost $156.

Stephen mentioned an initiative by Clark and himself to work with schools. They have met with Soaring Heights Elementary in Erie and Silver Creek High School in Longmont and discussed astronomy events and programs.

Presentation - Building and Using a Spectrometer by Clark Yeager

Clark explained that a spectrometer is an optical device for measuring the wavelength of light. He was looking into getting started with astrophotography and realized that in order to take long exposures of faint astronomical objects he needed to filter out light from nearby street lights. To determine the effectiveness of various filters he needed a device that could measure levels of light at different wavelengths, the spectrometer.

Commercial versions of spectrometers are fairly expensive. Fortunately, there are plans available on how to build your own spectrometer with a 3D printer. He selected the LOWSPEC spectrometer designed by Paul Gerlach (See https://www.thingiverse.com/thing:2455390). The plans were for a F10 telescope so Clark modified them to work with his F7 telescope.

A spectrometer uses a grating or a prism to disperse light into narrow bands of color. The higher the dispersive power device, the longer the optical path needed. To keep the size of the spectroscope reasonable the optical path is folded as shown in the diagram of the LOWSPEC spectrometer that Clark
The photo shows a top view of the LOWSPEC spectrometer. (I annotated a few of the components to indicate how they relate to the optical path diagram above it).

Nearly everything we know about the universe is from measurements made by spectrometers. Light from a source has a unique spectral signature in the pattern of lines observed. A detailed analysis of the lines reveal the composition of the object being studied.

Clark did a live demo showing us the spectrum from an incandescent light and one from a compact fluorescent light (CFL).

What causes these spectral lines? Spectral lines are the result of interaction between an atom and a photon. When a photon has the right amount of energy it is absorbed and the electrons in the atom move to a different orbital.

The spectral line may be observed as either an emission line or absorption line depending on it material and temperature relative to another emission source.

**Light Pollution**

Most light pollution comes from streetlights. The sodium vapor street light is most common. You can tell sodium vapor lights from their amber color. Mercury vapor lights are common as well; they are much whiter and have a slightly greenish color.

Clark used his spectrometer to study the spectrum of nearby street lights.
Get up just before 6 am to see Mercury for the next couple weeks. It is just above the horizon in the east-south-east in the constellation Libra. It is magnitude -0.6 in brightness and the disk is about 6 arc sec across.

Venus is visible until about the 13th of this month very low in the south-west just above the handle of the teapot. It is magnitude -4 in brightness and the disk is 12 arc sec across.

Look for Mars about 5:45 am toward the southeast in constellation Libra. It is magnitude 1.7 in brightness and disk is 3.9 arc sec across.

He then took spectra of the street lights with a IDAS D2 filter and a Astronomic CLS filter. His results indicated that the Astronomic filter was a much more effective filter to reduce both sodium and mercury street light pollution.

LED street lights are going to be serious problem for astrophotographers as the pollution is not concentrated at particular frequencies; it is distributed throughout the spectrum.

In summary, choose appropriate filters for your setup:
- If you have fast telescopes like an F2 or F4, use a filter designed for that f-ratio
- Check that it is large enough to prevent vignette
- It is always better to work with knowledgeable supplier

### Solar System Highlights

**Mercury**
Get up just before 6 am to see Mercury for the next couple weeks. It is just above the horizon in the east-south-east in the constellation Libra. It has magnitude -0.6 in brightness and the disk is about 6 arc sec across.

**Venus**
Venus is visible until about the 13th of this month very low in the southwest just above the handle of the teapot. It is magnitude -4 in brightness and the disk is 12 arc sec across.

**Mars**
Look for Mars about 5:45 am toward the southeast in constellation Libra. It is magnitude 1.7 in brightness and disk is 3.9 arc sec across.

**Jupiter**
Jupiter disappears into the bright evening twilight around the 4th of this month.

**Saturn**
Saturn also disappears into the bright evening light around the 20th this month. It is in constellation Sagittarius and is 0.6 magnitude in brightness and the disk is 15 arc sec across.

**Uranus**
Uranus may be viewed in the early evenings in constellation Aries. It is 5.7 magnitude in brightness and the disk is 3.7 arc sec across.

**Neptune**
Neptune may be found in constellation Aquarius in the early morning as well. It is magnitude 7.9 in brightness and disc is 2.2 arc sec across.

**Meteor Showers**
The Geminids meteor shower peaks on the night of Dec 13-14. Unfortunately the full moon will obscure all but the brightest ones.
Comets in December

Comet C/2017 T2 (PanSTARRS)

Comet C/2017 T2 PanSTARRS is now about magnitude 10. It may reach magnitude 8 in January. It will be at perihelion in early May 2020. The Panoramic Survey Telescope and Rapid Response System (PANSTARRS) is located at the Haleakala Observatory in Hawaii.

<table>
<thead>
<tr>
<th>Date</th>
<th>Optimal time</th>
<th>RA</th>
<th>Dec</th>
<th>Brightness</th>
<th>Size (arc min)</th>
<th>Constellation</th>
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<tbody>
<tr>
<td>Dec. 1</td>
<td>12:12 am</td>
<td>04h54m50.5s</td>
<td>+46°50'29&quot;</td>
<td>10.3</td>
<td>1.7'</td>
<td>Auriga</td>
</tr>
<tr>
<td>Dec. 6</td>
<td>02:29 am</td>
<td>04h42m14.5s</td>
<td>+48°43'00&quot;</td>
<td>10.1</td>
<td>1.8'</td>
<td>Perseus</td>
</tr>
<tr>
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<td>11:04 pm</td>
<td>04h28m50.6s</td>
<td>+50°23'12&quot;</td>
<td>10.0</td>
<td>1.8'</td>
<td>Perseus</td>
</tr>
<tr>
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<td>09:25 pm</td>
<td>04h14m05.4s</td>
<td>+51°55'09&quot;</td>
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<td>1.8'</td>
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<td>03h58m14.9s</td>
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<td>9.8</td>
<td>1.8'</td>
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<td>03h42m14.8s</td>
<td>+54°23'56&quot;</td>
<td>9.7</td>
<td>1.9'</td>
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<tr>
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<td>03h26m29.6s</td>
<td>+55°18'13&quot;</td>
<td>9.6</td>
<td>1.9'</td>
<td>Perseus</td>
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Comets in December

Comet C/2018 N2 (ASASSN)

<table>
<thead>
<tr>
<th>Date</th>
<th>Optimal time</th>
<th>RA</th>
<th>Dec</th>
<th>Brightness</th>
<th>Size (arc min)</th>
<th>Constellation</th>
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<tr>
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<td>23h48m37.1s</td>
<td>+39°16'58&quot;</td>
<td>11.4</td>
<td>2.5'</td>
<td>Andromeda</td>
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<tr>
<td>Dec. 6</td>
<td>06:30 pm</td>
<td>23h43m20.4s</td>
<td>+39°18'05&quot;</td>
<td>11.5</td>
<td>2.4'</td>
<td>Andromeda</td>
</tr>
<tr>
<td>Dec. 11</td>
<td>06:51 pm</td>
<td>23h39m01.7s</td>
<td>+39°20'04&quot;</td>
<td>11.5</td>
<td>2.4'</td>
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</tr>
<tr>
<td>Dec. 16</td>
<td>06:21 pm</td>
<td>23h35m41.4s</td>
<td>+39°23'42&quot;</td>
<td>11.6</td>
<td>2.3'</td>
<td>Andromeda</td>
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<tr>
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<td>+39°29'37&quot;</td>
<td>11.7</td>
<td>2.3'</td>
<td>Andromeda</td>
</tr>
<tr>
<td>Dec. 26</td>
<td>06:20 pm</td>
<td>23h31m33.0s</td>
<td>+39°38'21&quot;</td>
<td>11.7</td>
<td>2.2'</td>
<td>Andromeda</td>
</tr>
<tr>
<td>Dec. 31</td>
<td>06:22 pm</td>
<td>23h30m37.9s</td>
<td>+39°50'19&quot;</td>
<td>11.8</td>
<td>2.1'</td>
<td>Andromeda</td>
</tr>
</tbody>
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Comet C/2018 N2 (ASASSN) was discovered by the All-Sky Automated Survey for Supernovae” (ASASSN) program, early July 2018 with the 14-cm “Cassius” survey telescope at Cerro Tololo, Chille.
Navigating the December Night Sky

For observers in the middle northern latitudes, this chart is suitable for late November at 9 p.m. or early December at 8 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.

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

1. Face south. Almost overhead is the "Great Square" with four stars about the same brightness as those of the Big Dipper. Extend an imaginary line southward following the Square's two westernmost stars. The line strikes Fomalhaut, the brightest star in the southwest. A line extending southwest from the two easternmost stars, passes Deneb Kaitos, the second bright star in the south.

2. Draw another line, this time westward following the southern edge of the Square. It strikes Altair, part of the "Summer Triangle." 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, 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.

Astronomical League www.astroleague.org/outreach; duplication is allowed and encouraged for all free distribution.
If you can observe only one morning celestial event this month, consider this one:

For an unrelated bonus event, look low in the southwest 60 minutes after sunset on Dec. 10 & 11 for brilliant Venus passing Saturn. Binoculars will help see Saturn.

The Scene: Mars visits Zubenelgenubi

Look to the southeast 90 minutes before sunrise.
- Look towards the southeast for the bright star Spica.
- Mars will be the moderately bright reddish object about half between it and the horizon.
- Aim binoculars at the Red Planet on Dec. 11, 12, and 13.
- In the same field twinkles the double star Alpha Librae, also called Zubenelgenubi. (Try saying that quickly five times!)
- On Dec. 12, Mars lies right next to Zuben, almost bumping into its two component stars.
- A small telescope at high magnification will show Mars' small, ruddy 4 arc second diameter disk shining next to the split double star. The Red Planet lies over 215 million miles from Earth, compared to Zuben's 77 light-years — which is over 2 million times more distant.

December 2009
The banquet on Jan 23, 2010 will be at the IHop Restaurant; the cost should be $15 per person.
Nominations for 2010 officers are Dick Mallot for ALCOr, Ray Warren for Librarian, JD Birchmeier for Newsletter Editor, Vern Raben for President, Mike Fellows for Treasurer, Gary Garzone for Vice President, Brian Simpson and Steve Albers for Webmasters. Thanks to Dieter Kurtz for being LAS Librarian the past couple years.

December 1999
The banquet on Jan 15, 1999 will be at Sally Callact's at the Longmont Golf Course, the price is $15 per person. Guest of honor at the banquet is Ray Martin from University of Wyoming.
Nominations for officers in 2000 are Dave Street for President, Dave Larson for Vice President, Mike Hotka for Secretary Treasurer, Paul Hale for ALCOr, Jim Sapp for Newsletter Editor, and Steve Albers for Web Page Manager.

December 1989
The LAS banquet is set for Dec 16 at Henry D's. Nominations for club officers in 1990 are Dave Spohn for President, Dave Street for Vice President, Chris Schouenbauer for Secretary, Jennifer Getson for Treasurer, Kevin Brose and Bud Cohce for Newsletter Editor, Kirk Schneider and Jim Wilson for ALCOR. Jerry Wilkinson of Galaxy Optics gave a mirror grinding class. Comet Okazaki-Levy-Rudenko is now about magnitude 5.
Mercury Transit November 11, 2019

Near mid transit by Tally O’Donnell

Near end of transit by Brian Kimball

Last full contact by Barry Halpern
Comet 260P (McNaught) on Nov 11 by Gary Garzone

Comet C/2017 T2 (PanSTARRS) on Nov 11 by Gary Garzone

Comet C/2018 N2 (ASASSN) on Nov 11 by Gary Garzone
Stephen Garretson’s wide field equipment.