Messier 81
by M. J. Post
Dr. John Keller will give a presentation about the RECON Project (Research and Education Collaborative Occultation Network).

The goal of this project is to determine the sizes of the many objects that orbit the sun beyond the planet Neptune. To measure the size of a trans-Neptunian object (TNO) they use the shadow the object casts on earth as it moves in front of a distant star. By precisely measuring the occultation from different locations on earth they can determine the size of the object.

Occultation network (RECON). This is a NSF-funded research project involving communities across the western United States.

The LAS meeting this month will be a virtual one beginning at our usual time of 7 pm on Thursday, May 21st.

You may join the meeting at 6:30 pm so you can check your connection and socialize prior to the main presentation.

You will be sent an email with instructions and a link to join the video conference. If you do not have a video camera or don’t wish to be seen you may just watch or attend with audio only. You may also join by telephone.

We will be using Zoom video conferencing software which supports most devices. The software maybe downloaded and installed on your computer or cellphone from links at URL https://zoom.us/download

Dr. Keller is director of the Fiske Planetarium at CU Boulder. He is planetary scientist with research interests in astronomy education and teacher education. He is the Co-Principal Investigator for the Research and Education Cooperative Occultation Network (RECON).

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Events in May

• All LAS public events this month have been canceled due to the Covid-19 flu pandemic.

LAS Officers and Board Members in 2020

• Bill Tschumy, President
• Stephen Garretson, Vice President
• Michelle Blom, Secretary
• Bruce Lamoreaux, Treasurer

Board Members:
• Mike Hotka, Gary Garzone,
• Brian Kimball, Vern Raben
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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](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 location this year is Niwot Inn. 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.

The Longmont Astronomical Society is affiliated with the Astronomical League ([https://www.astroleague.org](https://www.astroleague.org)). The Astronomical League is an umbrella organization of amateur astronomy societies in the United States.
Become a Citizen Scientist by Mike Hotka

During the virtual April club meeting, I gave a presentation on how to become a Citizen Scientist. There was one part of the presentation where I was showing the membership an asteroid moving in a tool I was sharing from my desktop. No one watching my presentation could see the asteroid move. In reviewing the recorded meeting, I determined that my CenturyLink DSL was not transmitting all of my presentation. My reduced bits-per-second was due in large part to something wrong with my DSL line. This article will recap my April LAS club meeting presentation. The term Citizen Scientist is a new way to describe the astronomy Pro-Am Collaboration that has been around for years. The best example of this collaboration is the Amateur Association of Variable Star Observers (AAVSO). Amateurs have been recording the changes in magnitude of variable stars for years, submitting their observations to a database that is then accessed by professional astronomers.

The Astronomical League has put together a Citizen Scientist Observing Program.

This one web page has listed all the opportunities to do Citizen Scientist contributions.

The Level 2 projects are programs where you join the organization, then help them with their particular aspect of the Pro-Am Collaboration. I’ve participated in the Galaxy Zoo organization. Galaxy Zoo has us classify galaxies based on criteria they had set forth. All of the Level 2 projects allow you to participate with no extra equipment needed.

Further down on the Astronomical League’s Citizen Scientist web page are links to all these organizations. You can explore many of them to see if their science is something you would like to help with.

The Level 3 projects are more hands on. I have participated in the Variable Star portion of this level. You can contribute by making observations with binoculars or a small telescope from your backyard. Later I used the iTelescope network to help me record the variable stars I monitored, but that level of participation is not needed to contribute variable star observations.

Also, just below the Level 2 Project links are the links for the Level 3 Projects.

I am currently interested in Near Earth Object (NEO) asteroids. When you click the link to the NEO Observing Program, you are taken to that Observing Program’s webpage.
This organization is a collaboration of groups from all over the world. The IASC processes images from the Pan-STARRS-1 telescope in Hawaii.

The PanStarrs-1 telescope is a 1.8m, f/4.44 telescope that runs every clear night, taking images of the night sky. The detector has a whopping 1.8 billion pixels and takes almost a 3-degree square image of the sky. The image below is the detector for this telescope.

The one 3-degree image of the sky it produces are broken into several smaller images for the IASC teams to process.

A smaller image resembles:

You can see the above image is broken into 16 sections, that I call quadrants. I have never determined whether this image is just one of those individual square detector chips in the man with the total detector image, or a subset of one of the squares.

The IASC has defined campaigns. A campaign is a timer period where lots of images are given to all the participating teams. During this campaign time, the teams process the images and submit their results to the IASC database. An example announcement of an upcoming campaign is shown on the following image.

During these campaigns, all of the teams are given 5 image sets, that each team member downloads to their computer, processes the images and returns the final results back to the IASC. Each image set consists of 4 images, taken in the same location in the sky, spaced 20 minutes apart. This is enough time to show the movement of the asteroid. This allows the team members to record the astrometry (posi-
With one more keystroke, Astrometrica will align the 4 images on the background stars, open a new window to show each of the 4 images for 1 second before displaying the next. When the fourth image is displayed for 1 second, Astrometrica returns and displays the first image again. Astrometrica continues to cycle through all 4 images until you press a key to make it freeze on the current image being displayed. Anything that is a satellite or asteroid will be seen moving from one image to the next. This movement in Astrometrica is called blinking. I then enlarge the blinking image 2 times. This makes it very easy to spot an asteroid in a quadrant. I then methodically scan each of the 16 quadrants, looking for blinking asteroids.

One of the cool things about these images are all the other stuff in them, besides the stars and asteroids. In these two enlarged quadrants in the above image, there are two nice galaxies. These are the nice surprises contained in these images. There are also satellites that streak across the image. Below is a nice galaxy I captured in another image set I processed.

Once downloaded to your PC, you process each image set with a program called Astrometrica, which is provided by the IASC. Once Astrometrica is opened and the 4 images of an image set are loaded, the Astrometrica screen resembles:

With one more keystroke, Astrometrica will align the 4 images on the background stars, open a new window to show each of the 4 images for 1 second before displaying the next. When the fourth image is displayed for 1 second, Astrometrica returns and displays the first image again. Astrometrica continues to cycle through all 4 images until you press a key to make it freeze on the current image being displayed. Anything that is a satellite or asteroid will be seen moving from one image to the next. This movement in Astrometrica is called blinking. I then enlarge the blinking image 2 times. This makes it very easy to spot an asteroid in a quadrant. I then methodically scan each of the 16 quadrants, looking for blinking asteroids.

One of the cool things about these images are all the other stuff in them, besides the stars and asteroids. In these two enlarged quadrants in the above image, there are two nice galaxies. These are the nice surprises contained in these images.

Once I’ve found an asteroid in an image set, I stop the blinking and process the asteroid, one image of the four at a time. I take my cross-hair cursor, place it over the position of the asteroid in the first image and left click the mouse. I am presented with the following dialogue box.
I click the “…” to the right of the Object Designation, which causes Astrometrica to look through all the defined asteroids in the Minor Planet Center’s (MPC) database. Once it is done looking for possible asteroid candidates that match the position of the red circled asteroid (in the above image), the following display is seen:

The blue highlighted text is the closest match to an asteroid in the MPC database that Astrometrica can find, based on the asteroid you selected in the image. You can verify this to be the actual asteroid 2006 VG121 because the numbers in the dRA (delta Right Ascension) and dDe (delta Declination) columns for this selected asteroid are close to zero. The delta numbers are calculated from the known position this asteroid is supposed to be at, as specified for the MPC database entry for this asteroid. I then click OK and then Accept. Astrometrica has recorded the astrometry and photometry of this asteroid.

I advance Astrometrica to the next image with a keystroke and do the same process as was described for the first image. For this particular asteroid, the next image shows it in the area that is between quadrants.

You can see barely see it and recording its position would serve no value. So I immediately advance to the third image. Putting the cross-hair cursor on the asteroid in the third image and pressing the left mouse button will display the following screen.

Do the same keystrokes to record the position as was done with the first image and then advance to the fourth image. Putting the cross-hair cursor on the asteroid in the fourth image and pressing the left mouse button will display the following screen.

Do the same keystrokes to record the position as with the first and third images. At this point, Astrometrica has the astrometry (position) and photometry (magnitude) of this asteroid. To see the report Astrometry automatically creates, you use a pull-down menu on the top tool bar in
Save this file as a text file for proof that this asteroid was recorded. You can use this proof for an observation in the NEO Observing Program, the Asteroid Observing Program and the NEO Citizen Scientist program.

Then I start Astrometrica blinking the image set again and start looking at more quadrants for additional asteroids. In this image set, there are 2 more asteroids in another quadrant. Click here to see them being blinked in Astrometrica. These are much harder to see than the first one, because they are much fainter. Below are still images the same quadrant from all four images of the image set. I’ve added arrows to point at each asteroid in each image to help you spot them in the animated image you visited on my website. The arrowed asteroids are in the following four images.
That faint glow between the asteroids is a very faint galaxy, probably 23rd magnitude.

The example for this article continues with the top asteroid in this quadrant. I use the cross-hair cursor to identify the asteroid in the first image. Click the left mouse button and get the dialogue box as seen below:

Now looking at the dRA and dDe values for the closest asteroid match Astrometrica could find in the MPC database, the numbers are far away from 0.0. This indicates that this is a potential new asteroid, never seen before and definitely not in the MPC database. At this point, I click Cancel and enter a free form name for this asteroid (in the field to the right of the “…”) as seen in the following image:

I used the text MH501 and then hit Accept. I repeat this process for the next three images of this asteroid, using the text MH501 for this asteroid in each image. Once I am done, I open the report and it now resembles:

Click the “…” next to the Object Designation field and I am presented with the following dialogue box:

You can see the first asteroid recorded (the e2707, a MPC designation for 2006 VG121. To decode this string, click here for the MPC decoder ring), and also this next one, MH501. I would repeat these steps for any other asteroid in this image set. This will add yet more lines for each asteroid to this report.

Once you have identified all the asteroids in an image set, you send this report to the IASC. They are very interested in those asteroids not in the MPC’s database. The ones that you named yourself.

Voila, that is all there is to being a NEO Citizen Scientist. Using the above process and Astrometrica, I’ve recorded 2027 asteroids so far.

If there is interest in the club to form an IASC team, let me know and we can help make that happen. I can show
anyone how to use Astrometrica. In no time, you can be contributing your own asteroid observations.

I find processing images containing asteroids and sending my observations to organizations where professional astronomers might use my data, very rewarding. Being the first one to see and record an asteroid that has never been seen still gets me a bit giddy with excitement. It is what makes the time I spend doing this worthwhile.

**Solar System Highlights for May**

<table>
<thead>
<tr>
<th>Event</th>
<th>Dates and Times</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Moon</td>
<td>May 7 at 4:48 am</td>
</tr>
<tr>
<td>Third Quarter</td>
<td>May 14 at 8:04 am</td>
</tr>
<tr>
<td>New Moon</td>
<td>May 22 at 11:40 am</td>
</tr>
<tr>
<td>First Quarter</td>
<td>May 29 at 9:31 pm</td>
</tr>
</tbody>
</table>

**Mercury**
Mercury may be seen low in the evening sky during the last week of May. On the 22nd it is in constellation Taurus; it moves into Gemini on the 28th. It dims from magnitude -0.5 to +0.2 at month end.

**Venus**
Venus shines brightly low in the western sky after sunset. It decreases in brightness from magnitude -4.5 to -4.3 this month; its disk increases in size from 39 to 51 arc sec.

**Saturn**
Saturn is visible in the morning sky in constellation Capricornus. On May 1st it is magnitude +0.6 in brightness and disk is 17 arc sec across. On May 31st it is magnitude +0.4 in brightness and the disk is 18 arc sec across.

**Mars**
Mars is visible in the morning sky in constellation Capricornus. It moves into Aquarius on the 8th. Its brightens increases from +0.4 to +0.0 magnitude this month; its apparent disk increases from 7.6 to 9.2 arc sec across.

**Jupiter**
Jupiter is visible in the morning sky in constellation Sagittarius. It is magnitude -2.4 to -2.6 in brightness and disk increases from 41 to 45 arc sec across.

The Great Red Spot mid transit times this month are:
- May 5 at 3:53 am altitude 24°
- May 7 at 5:32 am 30°
- May 10 at 3:01 am 20°
- May 12 at 4:40 am 29°
- May 17 at 5:18 am 27°
- May 19 at 5:26 am 30°
- May 22 at 2:55 am 24°
- May 24 at 4:33 am 30°
- May 27 at 2:03 am 21°
- May 29 at 3:41 am 30°
- May 31 at 5:19 am 29°
(assuming a GRS longitude of 331°)

**Uranus**
Uranus is not visible in May.

**Neptune**
Neptune is visible low in the morning sky in constellation Aquarius. It is magnitude 7.9 in brightness and the disk is 2.2 arc sec across.
Navigating the May night sky: Simply start with what you know or with what you can easily find.

1. Extend a line northward from the two stars at the tip of the Big Dipper’s bowl. It passes by Polaris, the North Star.
2. Through the two diagonal stars of the Dipper’s bowl, draw a line pointing to the twin stars of Castor and Pollux in Gemini.
3. Directly below the Dipper’s bowl reclines the constellation Leo with its primary star, Regulus.
4. Follow the arc of the Dipper’s handle. It first intersects Arcturus, then continues to Spica. Confirm Spica by noting that two moderately bright stars just to its southwest form a straight line with it.
5. Arcturus, Spica, and Denebola form the Spring Triangle, a large equilateral triangle.
6. Draw a line from Arcturus to Vega. One-third of the way sits “The Northern Crown.” Two-thirds of the way hides the “Keystone of Hercules.” A dark sky is needed to see these two dim stellar configurations.

**Binocular Highlights**
- A: M44, a star cluster barely visible to the naked eye, lies to the southeast of Pollux. Look near the zenith for the loose star cluster of Coma Berenices. C: M13, a round glow from a cluster of over 300,000 stars.
If you can observe only one celestial event this month, see this one:

Mercury appears in the bright twilight. Therefore, it is difficult to spot.

Mercury is still relatively far. It appears as a gibbous phase making it relatively bright.

Venus is near its closest to Earth and sports a thin crescent phase.

May 2020:
Mercury & Venus forty minutes after sunset in the west-northwest

Mercury appears about '1 fist width on a fully extended arm' above the true W-NW horizon forty minutes after sunset.

The Scene:
Mercury and Venus in the evening twilight

Have you ever spotted Mercury? Many stargazers have not. The third week of May presents a good opportunity to catch the elusive little planet as it moves in the same part of the sky as bright Venus. Look low into the west-northwestern twilight forty minutes after sunset.

Mercury rises above the w-nw horizon after May 18, then climbs higher each evening, becoming easier to spot. Simultaneously, easily-seen Venus drops closer to the horizon all month, eventually passing the sun on June 3.

- As Venus drops closer to the horizon, it becomes difficult to see after May 24.
- Using binoculars, look on May 20-22 for little Mercury passing the much brighter Venus. Can you see it with the unaided eye?
- With steadily held binoculars, can you see the tiny, thin crescent of Venus? You may need to wear sunglasses to cut through the glare of the planet.

"Comet C/2019 Y2 (ATLAS) on April 4" by Marty Butley
Comets in May

Comet C/2020 F8 (SWAN)

Comet C/2020 F8 (SWAN) is just now becoming visible to the naked eye low in the morning sky in constellation Pisces (May 4). It should reach magnitude 2.6 in brightness about May 18th. The comet was discovered by the SOHO space craft on April 11.

<table>
<thead>
<tr>
<th>Date</th>
<th>Optimal time</th>
<th>RA</th>
<th>Dec</th>
<th>Brightness</th>
<th>Size (arc sec)</th>
<th>Constellation</th>
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<tbody>
<tr>
<td>May 1</td>
<td>05:28 am</td>
<td>00h02m41.5s</td>
<td>-15°36'03&quot;</td>
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<td>4.4</td>
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<tr>
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<td>05:21 am</td>
<td>00h57m28.3s</td>
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<td>3.5</td>
<td>5.6</td>
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<tr>
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<td>02h16m38.1s</td>
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<td>4.2</td>
<td>Perseus</td>
</tr>
<tr>
<td>May 29</td>
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<td>04h59m31.1s</td>
<td>+46°07'46&quot;</td>
<td>3.2</td>
<td>3.2</td>
<td>Auriga</td>
</tr>
</tbody>
</table>
Comet C/2019 Y4 (ATLAS) has broken apart into 4 or so fragments. It is currently (May 4) about magnitude +10 in brightness.

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<th>Size (arc min)</th>
<th>Constellation</th>
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<tbody>
<tr>
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<td>05h12m46.6s</td>
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<td>10</td>
<td>?</td>
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<tr>
<td>May 8</td>
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<td>04h45m15.1s</td>
<td>+55°02'08&quot;</td>
<td>?</td>
<td>?</td>
<td>Camelopardalis</td>
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<tr>
<td>May 15</td>
<td>09:36 pm</td>
<td>04h15m55.8s</td>
<td>+48°31'32&quot;</td>
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<td>5.5</td>
<td>Triangulum</td>
</tr>
<tr>
<td>May 22</td>
<td>05:01 am</td>
<td>03h51m46.1s</td>
<td>+44°55'37&quot;</td>
<td>2.6</td>
<td>4.2</td>
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</tr>
<tr>
<td>May 29</td>
<td>9:04 pm</td>
<td>04h59m31.1s</td>
<td>+46°07'46&quot;</td>
<td>3.2</td>
<td>3.2</td>
<td>Auriga</td>
</tr>
</tbody>
</table>

Comet C/2019 Y4 (ATLAS) on April 30 by Gary Garzone
Comet C/2019 Y1 (ATLAS) is now about magnitude +8.2. It is currently moving through constellation Camelopardalis. It was discovered by the University of Hawaii’s Asteroid Terrestrial Impact Last Alert System (ATLAS) on Dec. 19th, 2019. The two telescopes used by the ATLAS system were built by DFM Engineering in Longmont.

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<th>Size (arc min)</th>
<th>Constellation</th>
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<tbody>
<tr>
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<td>9:36 pm</td>
<td>05h53m45.7s</td>
<td>+82°42'28&quot;</td>
<td>8.2</td>
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<td>Camelopardalis</td>
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<tr>
<td>May 8</td>
<td>09:47 pm</td>
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<td>+76°51'52&quot;</td>
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<td>3.7</td>
<td>Draco</td>
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<tr>
<td>May 15</td>
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<td>+67°20'20&quot;</td>
<td>8.9</td>
<td>3.5</td>
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<tr>
<td>May 22</td>
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<td>11h12m36.4s</td>
<td>+57°57'45&quot;</td>
<td>9.3</td>
<td>3.3</td>
<td>Ursa Major</td>
</tr>
<tr>
<td>May 29</td>
<td>10:10 pm</td>
<td>11h28m53.7s</td>
<td>+49°27'34&quot;</td>
<td>9.8</td>
<td>3.1</td>
<td>Ursa Major</td>
</tr>
</tbody>
</table>
Comet C/2017 T2 (PanSTARRS) is now about magnitude 8.5. 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>
</tr>
</thead>
<tbody>
<tr>
<td>May 1</td>
<td>9:36 pm</td>
<td>06h38m56.2s</td>
<td>+76°18'53&quot;</td>
<td>8.5</td>
<td>4.2</td>
<td>Camelopardalis</td>
</tr>
<tr>
<td>May 8</td>
<td>09:46 pm</td>
<td>07h58m16.2s</td>
<td>+75°37'29&quot;</td>
<td>8.5</td>
<td>4.2</td>
<td>Camelopardalis</td>
</tr>
<tr>
<td>May 15</td>
<td>09:56 pm</td>
<td>09h09m50.9s</td>
<td>+73°26'09&quot;</td>
<td>8.5</td>
<td>4.3</td>
<td>Camelopardalis</td>
</tr>
<tr>
<td>May 22</td>
<td>10:04 pm</td>
<td>10h06m14.9s</td>
<td>+69°58'58&quot;</td>
<td>8.5</td>
<td>4.3</td>
<td>Ursa Major</td>
</tr>
<tr>
<td>May 29</td>
<td>10:12 pm</td>
<td>10h48m38.8s</td>
<td>+65°36'59&quot;</td>
<td>8.5</td>
<td>4.3</td>
<td>Ursa Major</td>
</tr>
</tbody>
</table>

Comet C/2017 T2 (PANSTARRS) on April 30 by Jim Pollock
“Sun in Calcium K on April 29” by Brian Kimball
"Super Moon on April 4" by Eddie Hunnell

"Comet C/2019 Y4 (ATLAS) by Eddie Hunnell"
"Iris Nebula" by Jim Pollock

"Real Iris" by Jim Pollock
“Owl Nebula” by M. J. Post
“NGC 4438 Wide Field” by Tally O’Donnell
NGC 4438 by Tally O'Donnell
The May 2010 monthly meeting was at the IHop Restaurant in Longmont. The speaker at the meeting was Craig Betzina who talked about “Designing and Building a Backyard Domed Observatory”. Craig is an active amateur astronomer from Strausberg, CO who became interested in building his own observatory several years ago. Utilizing his engineering background he designed and built several small observatories. He discussed various trade-offs and interesting bumps along the way to success.

Following Craig’s presentation was a talk about a proposed design and budget for an “All Sky Camera Project” by Vern Raben. The project and budget were approved by the membership.

Mike Hotka talked about amendments to LAS by-laws regarding non-profit 501(c)(3) status. The membership approved the $95 fee required to incorporate in the State of Colorado.

Stephanie Faucet was recognized for being awarded 3rd place in the Astronomical League National Young Astronomer Award.

The club had two very successful events in April with the 1st annual Messier Marathon at Pawnee and the Astronomy Day public star party at Flanders Park in Longmont.

President Dave Street talked about sun spots and solar activity and mentioned resources available online from the NOAA Space Weather Center in Boulder.

Bob Spohn reviewed the April Astronomy Day events. Seventeen members helped with the mall display. Mirror grinding was a big hit as was the mural of Saturn.

Bob then reviewed the exciting summer events coming up: FRASC star party on Jun 22-24, LAS annual picnic on Jul 14, and the Star Stare Jul 20-22.

Dave Street talked about the constellation Cygnus, Tom Johnston presented Corona Australius, and Jim Wilson presented Wilson crater which is at the southern end of the moon. Ed Lebow presented a stereo slide show of Haley's comet in 3D. Dorothy Pilmore gave the main presentation “Time in the Solar System” which examined relative differences between time on earth and time on other planets.
“Messier 81 and Messier 82” by Rolando Garcia