NORTHERN LIGHTS

NORTH CENTRAL REGION OF THE ASTRONOMICAL LEAGUE

Winter 2020 – Series II, Volume 4, Number 3

INSIDE THIS ISSUE OF *Northern Lights*

NCRAL CHAIR'S MESSAGE

This issue of ***Northern Lights*** is particularly import. It features several articles that address the problems associated with the "graying" of amateur astronomy and what clubs can do about it. Be certain to read about the recent success of the Twin City Amateur Astronomers (TCAA) in relation to the 2019 NCRAL mini-grant. The TCAA has been very successful with recent membership recruitment efforts, and just about any club can duplicate their efforts making use of their freely available TCAA Guides. Also, be sure to read the "editorial" about recruitment and retention of astronomy club members. It provides additional important insights. Finally, reflect carefully on the article Deva Chatrathi about what new club members want and how clubs can respond to their desires.

This newsletter also contains some amazing work by Dr. Jeffrey Hunt dealing with the upcoming Jupiter-Saturn apparition. He has provided a wealth of detail that we should be sharing with the members of the public to raise both awareness and interest in skywatching and amateur astronomy.

As I mentioned in my Chair's Message printed in the Autumn 2019 issue of ***Northern Lights***, I've set myself several goals for my 2019-2021 term as Regional Chair. Among the goals was the creation of four NCRAL Seasonal Messier Marathons. That goal has been accomplished. I'm delighted to report that the first club to take advantage of the NCRAL's Mini Marathon was Popular Astronomy Club (PAC) in the Quad Cities. Six PAC members conducted the Autumn marathon on the evening of October 8th, with several observers earning the first NCRAL Autumn Messier Marathon Awards. Congratulations to PAC President Al Sheidler for earning Autumn Pin and Certificate #1. I was so inspired by their efforts that I too got out a few days later and completed the Autumn marathon. I hope others will attempt the winter marathon soon. It's great to see this program having its intended effect – increasing enthusiasm among NCRAL members to get out to observe the heavens.

The second item on my list of goals has, in the main, also been accomplished. I have come close to finalizing the second draft of the *Astronomical Bucket List*. The proposal will be sent to the Astronomical League before the spring submission deadline. I will be enclosing a cover letter noting the support of the North Central Region and detailing some of the thoughtful arguments in its favor that were brought up during the business meeting at NCRAL 2019 in Moline, IL. You might recall that an earlier draft proposal of this program was rejected because "it's not an observing list."

The third goal I have set for myself will be to obtain Federal 501(c)(3) status so that NCRAL can receive donations to support its educational programming that will provide the benefit of a tax write-off to the donor. I'm working on that now and hope to report progress in the Spring 2020 issue of this newsletter.

I was honored to address the membership of the Peoria Astronomical Society on December 4th. While the PAS is already an affiliate of the Astronomical League, this was a good opportunity for me to talk about the growing benefits of NCRAL membership. I encouraged the club's participation in future NCRAL events. Thanks to Sheldon Shafer for making this talk possible.

I'm looking forward to a similar opportunity with the Rockford Astronomical Association later in 2020. If possible, I'm happy to meet with other clubs in the Region as well.

Now that we are facing another long hard winter (our northern tier seems to have already been experiencing

winterlike weather for some time), this is the time to start thinking about NCRAL 2020 to be hosted by Northern Cross Science Foundation at Port Washington, WI May 1-2. Don't forget about ALCon 2020 next July as well. I expect to be at both and hope you will be as well. Lastly, don't forget that NCRAL 2021 will be hosted by the Neville Public Museum Astronomy Club in Green Bay, WI. Looking farther ahead, we need a host for NCRAL 2022, and I hope your club will consider hosting. Please let me know if interested.

The next business meeting of the Region isn't so very far away with the early May meeting. Now is the time to consider nominations for various leadership positions, nominations for our Region and newsletter editor awards, and to consider applying for one of two NCRAL mini-grants that will be awarded at NCRAL 2020.

As the Old Year draws to a close and the New Year will soon be upon it, this time is more than propitious for reflecting on the past and for making plans for the future.

I often think of life as the voyage of a ship. I know that without a course and a rudder, the ship of life will go nowhere. Plotting a course and then carefully directing a ship's rudder, we can reach the port of our calling. So, I hope it is for you with amateur astronomy. It is for me.

I urge each of you to reflect upon what it means to be an amateur astronomer, to set yourself both learning and observing goals for the coming year, and then go out there to pursue them – showing the love for the hobby that we all must share.

Carl J. Wenning
NCRAL Chair (2017-2021)
Twin City Amateur Astronomers
carlwenning@gmail.com

NCRAL's First Seasonal Mini Messier Marathon Award Earned

First Messier Mini Marathon Conducted by Popular Astronomy Club. Shown here is the group that convened at the Paul Castle Memorial Observatory near Milan, IL to take advantage of the rare but beautiful clear fall evening night on October 8th. Shown in the photo left to right are Alan Sheidler (PAC President), Chris Nordick, Wayland Bauer, Rusty Case, Dale Hachtel, and Dave Smith. Terry Dufek joined the group later. As Alan noted, "Our intent was to attempt to observe the list of objects in NCRAL's autumn seasonal Messier marathon observation list. Though we had a bright, gibbous moon, we went ahead and gave it the good 'ol college try." Alan successfully completed the observing program and was the first to receive and Autumn pin and certificate.

NCRAL Seasonal Messier Marathon Award

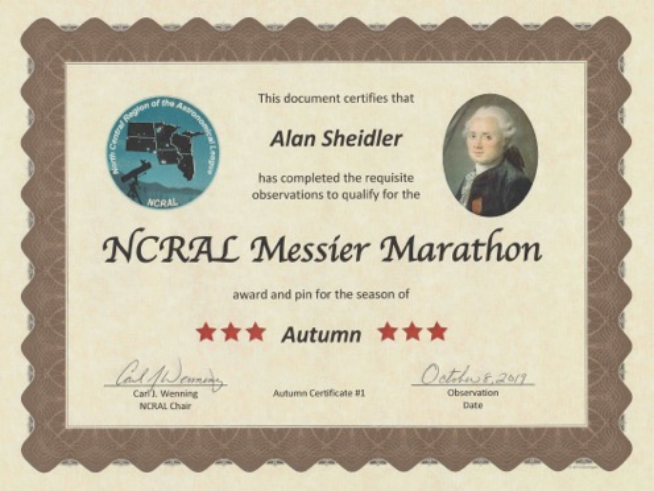
As NCRAL Chair, I am delighted to announce that the first ever NCRAL Seasonal Messier Marathon award had been earned by Popular Astronomy Club president Alan Sheidler.

On the evening of October 8th, Alan completed the necessary observations to qualify for Autumn certificate #1 along with his pin. He turned in his observing record immediately thereafter. His award certificate is shown here.

NCRAL members might want to complete this observing program, details of which can be found in the Autumn 2019 issue of the ***Northern Lights*** newsletter.

Congratulations to Alan on being this first-ever award recipient of an NCRAL Seasonal Marathon recognition! Other members of Popular Astronomy Club also earned their certificates and pins too. Congratulations to all!

Carl J. Wenning, NCRAL Chair (2017-2021)



NCRAL Season Messier Marathon Awards – Autumn 2019

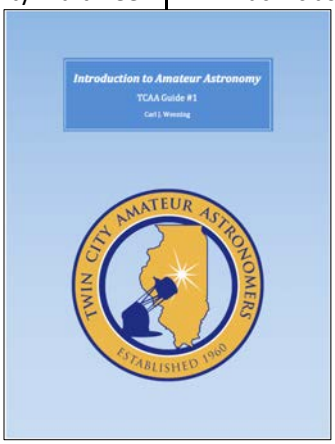
The following individuals have qualified for this award:

#1 Alan Sheidler, Popular Astronomy Club
#2 Wayland Bauer, Popular Astronomy Club
#3 Terry Dufek, Popular Astronomy Club
#4 Carl Wenning, Twin City Amateur Astronomers
#5 Rusty Case, Popular Astronomy Club

Update: First NCRAL Membership Mini-Grant

~ Carl Wenning, Twin City Amateur Astronomers ~

Readers will recall that the Twin City Amateur Astronomers (TCAA) of Bloomington-Normal, IL received the Region's inaugural membership recruitment mini-grant at NCRAL 2019. A preliminary report about the club's efforts using that grant appeared in the Autumn 2019 issue of this newsletter. Since that time, the proposed activity – a three-session, six-hour course providing an introduction to amateur astronomy – has been conducted, and initial outcomes determined. Here is what the TCAA has done with the support of NCRAL's inaugural $250 membership recruitment mini-grant…



Between October 12th and November 2nd, three members of the TCAA taught *Introduction to Amateur Astronomy* using the club's newly revised 58-page *TCAA Guide #1* (shown center) as a basis. Other printed materials included *TCAA Guide #2 – Benefits of Membership, Guide #3 – Astronomy as a Hobby*, and sky maps and observing exercises. An electronic copy of TCAA's 16-page *Guide #4 – The Art of Sky Interpretation also* was provided to give additional content for those who lacked sufficient astronomical background necessary for complete understanding.

Each class consisted of a 2-hour lesson taught at and using the capabilities of the Illinois State University Planetarium thanks to the assistance of TCAA club member and Director Tom Willmitch. The initial lesson used the planetarium extensively, and subsequent lessons employed it as well as several PowerPoint presentations, demonstrations of equipment such as binoculars and telescopes, and their associated components. These aspects of the course were taught by TCAA members, mainly by Lisa Wentzel and Carl Wenning. Each class ran from 3:30 PM to 5:30 PM on a Saturday.

After the first meeting's supper break, about 2/3 of the group traveled to Sugar Grove Nature Center (approximately 7 miles distant) on clear evenings to engage in a viewing session and tour the club's two on-site observatories.

The course was attended by 36 individuals – 31 of whom were new to the club, and 5 of whom were established TCAA members. These 31 new members represent 19 households, many of whom elected to receive and share one materials packet.

The registration fee for the course was $15 per household. Extra materials packets were available at cost – $15 each – and several were acquired. None of the NCRAL's mini-grant was used to pay expenses of the 5 TCAA members who attended.

Lisa Wentzel and Tom Willmitch of the TCAA teaching aspects of the Introduction to Amateur Astronomy course to 31 eager participants in the Illinois State University Planetarium.

Those participants who were new to the club also received a complimentary one-year membership in the TCAA, which includes the club's A.L. Mabel Sterns award-winning newsletter ***The OBSERVER***.

Following the completion of the formal course, new members began training in the use of the club's 11-inch Celestron CPC telescopes, which is housed under a 10-foot Ash Dome at Sugar Grove Observatory where each qualified observer has or will receive a key and unfettered access to that facility.

RESULTS: As a result of this NCRAL-supported event and efforts of the club's leadership, the TCAA's membership increased from some 40 to about 70 almost overnight. That represents a 75% increase when counted as individual members. These new members have done much to reduce the "graying" of the TCAA as most of the participants were middle-aged adults, several with adolescent children who also attended the course. The image below shows some of the results of the first NCRAL membership recruitment mini-grant.

Some of the many new members of the Twin City Amateur Astronomers resulting from the NCRAL membership mini-grant. The whole class was not present at the time of this photograph. Leftmost is Master Observer Lisa Wentzel and rightmost is ISU Planetarium Director Tom Willmitch, both of who helped to teach the Introduction to Amateur Astronomy course along with NCRAL Chair Carl Wenning.

FOLLOW-UP ACTIVITIES: Several tasks remain, and these include additional individual or small group training sessions on the use of the club's Celestron CPC 11" telescope at Sugar Grove Observatory. (These sessions are ongoing with 8 IAA class members having been trained during trained through the December solstice.) The other big task will be to retain these new members after their first-year free membership expires. One expectation is that we will hold several observational astronomy programs and workshops for new and established members starting with the New Year. We have canvassed these new members to see what they want. (See an associated article by IAA participant and new TCAA member Devanand Chatrathi later in this issue.) These activities will not only educate our members but will help build the camaraderie so important to retaining new members. These follow-up activities will be the subject of updates in future editions of this newsletter.

FUNDING: The TCAA effort was supported by NCRAL ($250 mini-grant), the attendees ($480 from registration fees), and the TCAA ($720 in-kind contribution for 19 free 1-year household memberships). Total materials costs for presenting the course amounted to $613. This left the TCAA with a small income of $106 after expenses were paid. These remaining funds will be used to pay Astronomical League dues for new members at renewal time. With the aid of the NCRAL mini-grant, this was essentially a revenue-neutral activity that built up the TCAA significantly at the cost of free first-year memberships and a bit of work. The author and TCAA thank NCRAL for the support without which this course would not likely have happened.

POSTSCRIPT --

LESSONS LEARNED: One lesson learned is that it might be best to hold a new member recruitment and orientation course during the warmer months so that participants are more likely to take advantage of outdoor observing sessions and telescopic training. The cold really does put a kibosh on attendance at these events. Another lesson learned through this mini-grant activity – *and the main takeaway* – is that almost any club, using the TCAA's Guides to Amateur Astronomy (freely available online at the following URL: http://tcaa.us/TCAAGuides.aspx), can be used to grow club memberships significantly thereby reversing the "graying" process. This can be done at very little expense other than time, effort, and a few free first-year memberships. The TCAA has led the way by example and is willing to share its materials and advice. Contact the author of this article (carlwenning@gmail.com) to get the ball rolling.

NEXT YEAR: Don't forget to apply for one (even both) of NCRAL's two mini-grants next year. One mini-grant is for membership recruitment, and the other is for affiliate recruitment. Up to $250 is available through each program. The next awards will be announced at NCRAL 2020 at the banquet on May 2nd. The application deadline is March 31st. See information about the application process later in this issue of ***Northern Lights***.

THOUGHTS ON MAKING AMATEUR ASTRONOMY THRIVE

~ by Carl Wenning, NCRAL Chair (2017-2021) ~

I have heard it said more than once that amateur astronomy is "graying" and I'm sure that you have too. Just look around your club at the next gathering and note the average age. It's probably up there and likely getting higher with the passage of time. If you want to know what your club will look like in 20 years if current recruitment and retention practices don't change, then just add 20 years to everyone's age in the club and do a recount. By this measure, amateur astronomy is not only graying – in some ways, it is dying.

While the recent success of the Twin City Amateur Astronomers (TCAA) in recruiting new members with the support of the first NCRAL membership recruitment mini-grant is indeed impressive, it is important to realize that membership recruitment and retention are two sides of the same coin. We can't have one without the other if our clubs are to survive or, better still, thrive. Getting new members doesn't count for much if current members disappear as quickly as new members appear. When this happens, a club will not grow.

Putting it another way, club membership is like a leaky bucket. While new members might flow into the bucket like a stream of water, the level of the water in the bucket will not rise if it continues to leak water at the same rate that it acquires it. Only when the water flowing in exceeds the water flowing out will the level of the water in the bucket rise.

I've recently been thinking about this other side of the membership coin – retention. I'm concerned about retention of both new and established rank and file astronomy club members, including the leadership. Getting older and having been involved in several astronomy clubs over the course of my adult life, there are a number of reflections I have had as a leader that I want to share.

Before I start, it's critically important to note that we must clearly identify a problem before functional solutions can be worked out. Unless a problem is properly identified, no workable solution is possible.

Experience has shown that most clubs have an active core of 20-25% of the membership who are dedicated to amateur astronomy and need little to no additional support to keep them involved with a club. These rank and file members are the backbone of any club, and all successful clubs seem to have them. New members must be treated differently, however, and here are a few suggestions:

- Find out what enticed these new members to join and then do more of it. When what attracted a new member is no longer available, disillusionment soon follows, and departure occurs shortly thereafter.
- Point out from time to time, the wide variety of benefits that membership in your club provides. Consider developing an informational guide such as the *TCAA Guide #2 – Membership & Benefits*.
- Work to keep new members engaged. When they show up at your meetings, be certain to greet them, acknowledge their presence, shine some limelight on them, and engage them in discussions about their interests and needs. Make this a personal goal and don't count on others to do so as they are often too engaged with those they already know.
- Get new members involved in club activities and sustain their participation. Get them involved by encouraging their use of club or personal equipment. Keep in mind that amateur astronomy really is a type of mentorship because today the learning curve can be both steep and confusing (to say nothing about the cost of quality equipment), and

many don't make the transition from new to rank and file membership without some form of regular assistance from established members.

- Identify who is not engaging and try to win them back by personally inviting them to participate in club events. Don't wait! The longer they are away from the club, the harder it will be to bring them back.
- Diversify and increase the frequency of your club's events. Different events appeal to different people, so be sure to hold a wide variety of member education and public outreach events. Public and "members only" observing sessions, club socials, mini courses, talks, lab activities, and workshops will lead to retained memberships.

The "transition" experience of passing from new member to "rank and file" can be a long one. Unless this transition is made, clubs will likely lose their new members. See the article in the September 2019 issue of ***Reflector*** by Chuck Allen for many other ideas about making this transition successful.

My experience over the years also has shown that keeping club leadership is just as important as keeping new members. Why is it that some clubs tend to lose leaders after their terms of office expire? It's a common occurrence, and we've probably all seen this happen.

I could list a considerable variety of reasons why leaders sometimes quit, but I'll forego that here. Suffice it to say leaders often leave a club because they too often perceive that their work goes either unnoticed or is underappreciated if it is noted at all. This leads to disappointment and finally, disillusionment.

What can rank and file members do to change some of our leadership's perception of being underappreciated? What follows are a few pointers based on my many years of experience as a club leader and North Central Region Chair:

- When a leader calls for nominations for the next club election, seriously consider serving. If you don't, the existing officeholders might "coerced" into serving yet another term.
- When a leader asks for an opinion, give yours clearly, concisely, and with all honesty, too many leaders have learned the hard way that what members call "a good idea" is not necessarily one that members will support.
- When a leader calls for a volunteer, be sure to respond to the call for action. Taking the lead on particular activities is a great way to assist club leaders.
- When a leader creates a Facebook or web page or email list, do take advantage of it from time to time and leave a comment, or at least give some sort of acknowledgement indicating that you have visited. Otherwise, it's like no one is paying attention.
- When a leader arranges a club activity such as a social or observing program, do your best to attend.
- When a leader has obtained your promise to accomplish a particular task, don't let month after month go by with that promise going unfulfilled.
- When a leader has gone out of his or her way to do a job or provide a particular service, be certain to thank or otherwise acknowledge the leader's efforts.
- When a club secretary sends out minutes for review, please review what has been written and get back to the secretary with any errors or omissions, or at least acknowledge the review process even if you have nothing to add or change.
- When a club editor puts out a monthly newsletter, be certain you read it, doing it more than once if possible. It can take an editor many hours over the course of a month to put together an issue and only a few minutes for members to read it.
- When a club editor requests input from the membership, be sure to contribute something even if it is small such as a picture or a news note.

Are these sound bits of advice? I certainly believe so! When leaders within a club experience anything less, they often become frustrated. Eventually, this frustration turns to disappointment and later into disillusionment. Before long, the exit seems pretty inviting, and all too often, leaders depart a club forever. This shouldn't be happening, and it won't happen if our club's leaders received encouragement, support, and recognition due them for their service to a club.

Remember what English parliamentarian Edmund Burke once said, "The only thing necessary for the triumph of evil is for good men to do nothing." That too, is sage advice in relation to astronomy clubs.

What Do New Members Want from an Astronomy Club?

~ Devanand Chatrathi, Twin City Amateur Astronomers ~

I recently participated in the Twin City Amateur Astronomer's *Introduction to Amateur Astronomy* course. Carl Wenning, the lead instructor, asked me to come up with a list of suggestions telling him what new members want. I had discussions with course members and conducted an online survey. Below are some suggestions that might capture the interest of newcomers, and translate that interest to active engagement. Astronomy clubs and their members might want to implement as many of the following suggestions as possible:

- Conduct amateur astronomy programs to spread awareness on the subject. The program to be scheduled around a spring time frame so that the members can take advantage of the summertime to attend observing sessions organized by the club.
- Present hands-on, minds-on activities dealing with specific topics that are suitable for both adults and families with children. (These would include lab activities, paper-and-pencil worksheets, and skywatching activities such as lunar-planetary gatherings or appearances of the International Space Station)
- Engage new members in the club's public viewing sessions and also plan for viewing sessions where members can form groups and discuss their thoughts and ideas on the subject, thereby engaging and involving in the subject.
- Conduct a couple of small group observing sessions with eyes and binoculars out under the stars at the initial stages so that the members can start getting acquainted with the sky and locate the basic stars, planets, galaxies, constellations, etc.
- Offer individualized or small-group training sessions using an observer-friendly telescope (altazimuth mounted "goto" telescope).
- Have members in the club give a session or two about parts of the telescope, different types of mounts, etc. on a practical basis to make members feel comfortable using a telescope.
- Greet new members at meetings and social gatherings, making them feel welcome.
- Encourage involvement in education (for club members) and public outreach (for nonclub members).
- Encourage new members to enroll in the group's email list to keep them aware of club activities and share updates about new activities planned.
- Create a platform for members to give short talks about topics of interest.
- Communicate with new members regularly, constantly encouraging them and inviting them to be involved.
- Plan for a local planetarium visit and engage new members in a discussion about what they have experienced.
- Organize a quarterly meet up with new members and provide a forum for active discussion on future events.
- Circulate a club newsletter on a monthly basis to all the members who have subscribed to the group email list.
- Provide family observing sessions where everyone in the family can participate and share a unique learning experience and continue engaging the kids to collaborate more.

It is my belief that providing these types of services to new members certainly should help at least some of them make the transition from want-to-be amateur astronomers to the real thing.

NCRAL 2020 Coming Soon

~ by Jeff Setzer ~

The planning for the NCRAL 2020 Convention is progressing at a steady pace! Our theme is *Vision 2020* which, in this context, suggests a clear view of amateur and professional astronomy. To that end, we have an exciting list of confirmed speakers:

- Dr. William Dirienzo, Assistant Professor of Physics & Astronomy at University of Wisconsin-Sheboygan
- Pranvera Hyseni, founder of Astronomy Outreach of Kosovo
- Kate Meredith, Founder & Director of Education at Geneva Lake Astrophysics & STEAM
- David Prosper, Program Manager for Amateur Astronomy at the Astronomical Society of the Pacific & Administrator of the NASA Night Sky Network: "The Latest From The NASA Night Sky Network"
- Dr. Angela Van Sistine, Research Assistant at University of Wisconsin-Milwaukee: "Astrobiology: Life Beyond Earth"
- Brandon Hamil, Minnesota Astronomical Society: "The Traveling Astronomer"

Our Saturday night banquet dpeaker will be Dr. Francis Halzen, Gregory Breit Professor and Hilldale Professor at University of Wisconsin-Madison, and Principal Investigator of the IceCube Neutrino Observatory in Antarctica.

We have a few additional speakers for Friday and Saturday being confirmed, in addition to finalizing a few topics, so be sure to check the website (https://ncsf.info/ncral-vision-2020/) for updates.

Additional activities on Friday include a tour of the Jim & Gwen Plunkett Observatory at nearby Harrington Beach State Park, which features some upgrades to the building and the instrumentation since our previous NCRAL hosting. Other Friday afternoon and evening activities are being discussed by the committee, as well; again, updates will be forthcoming.

Editor's Note: NCRAL 2020 is being hosted by the Northern Cross Science Foundation. The convention will be held at Port Washington, WI, May 1-2, 2020. Get this event into your schedule no so as to avoid scheduling conflicts – one of the leading causes of members being unable to attend.

NOTEWORTHY!

With this issue of ***Northern Lights***, your editor is beginning a column to be known merely as Noteworthy! Here will appear a list of points with which NCRAL members should be familiar. Should your NCRAL affiliate have short announcements such as award winners, newly-elected officers, or member accomplishments that are worthy of note, then please send notification to NCRAL Chair Carl Wenning (carlwenning@gmail.com) who compiles the content of this newsletter. Here are some noteworthy points for this quarter:

- NCRAL was prominently featured in the September issue of the A.L.'s newsletter ***Reflector*** when an article about NCRAL 2019 by Sara Sheidler was republished there. The article originally appeared in the September 2019 issue of ***Northern Lights***.
- A.L. Vice President Carroll Iorg is now disseminating time-sensitive news from the Astronomical League in a monthly publication titled *What's Up with the Astronomical League*. This information is being sent to League members through their clubs' ALCors. If your ALCor's contact information is not up to date with the national office, it's likely that your club is missing out on important information.
- NCRAL members were recognized with an A.L. award at ALCON 2019 as noted the September 2019 issue of ***Reflector***. The awards and awardees are as follows:
  - *Astronomical League Sketching Award* – Former NCRAL Chair **Gerry Kochen** from the Neville Public Museum Astronomical Society in Green Bay, WI was this year's award winner. His 2018 sketching project – his first ever – was focused on the moon's craters. Congratulations Gerry! The Region is proud of your efforts. They represent some of the best work done by NCRAL members.
  - **Nicholas Bauer** from Rochester, MN was recognized with the *Horkheimer/O'Meara Youth Journalism Award.* His sponsor was **Julie Gawarechi**, treasurer of the Rochester Astronomical Society.
  - Binocular Messier Observing Program – **Lynn Ward**
  - Carbon Star Observing Program – **Gerard Jones**
  - Constellation Hunter Observing Program (Northern Skies) – **Bradley Nesset**
  - Galileo Observing Program – **Jonathan Boppele**
  - Lunar Observing Program – **Kieth Northon**
  - Messier Observing Program (Honorary) – **Joe Timmerman**
  - Outreach Observing Award – **Bradley Nesset, Jim Erwin**
  - Sketching Observing Award – **Kevin C. Carr**
  - Solar System Observing Program – **Brian Chopp**
  - Southern Sky Telescopic Observing Program – **Joe Timmerman**
  - Two in the View Observing Program – **Joe Timmerman**
- PAC President Al Sheidler reported on Sunday, December 22nd, "Last night a small group of us met at the Paul Castle Memorial Observatory to take advantage of the clear skies and warm December weather. In the group photo (shown right) are Steve Sinksen, Rusty Case, Dale Hachtel, and Al Sheidler (l. to r.). Gary Nordick also joined the group after this photo was taken. We started out by observing the planet Venus and grilling bratwursts on the charcoal grill while we waited for it to get dark. Our goal for the evening was to observe the 27 objects in the NCRAL Winter Messier Marathon list. I think one of us actually had the fortitude to complete the list and will be sending it in for the award. The rest of us succumbed to the cold and gave up around 9:00 PM. Some of the objects rise pretty late this early in the season, so we plan to try again in January or February."

✯ TRANSIT OF MERCURY – While most within the North Central Region were prevented from observing the November 11th transit of Mercury, three intrepid observers of the Iowa County Astronomers were able to view it through breaks in the clouds. The three lucky observers (shown left to right) are Jean Napp, Lynda Skeeter Schweikert, and John Heasley. They viewed the phenomenon from southwest Wisconsin where Lynda was able to capture the transit peering through the clouds. Mercury is that tiny dot in the lower left quadrant of the sun's disk. After the event was over, Jean noted, "How fun to see the planet moving across the sun this morning. I arrived late, so I only saw it heading toward the sun's limb, but John and Lynda had the telescope all set up at Governor Dodge State Park and were viewing when I arrived... Amazing!" Thanks to Jean and Lynda (and even John) for sharing their pictures with us.

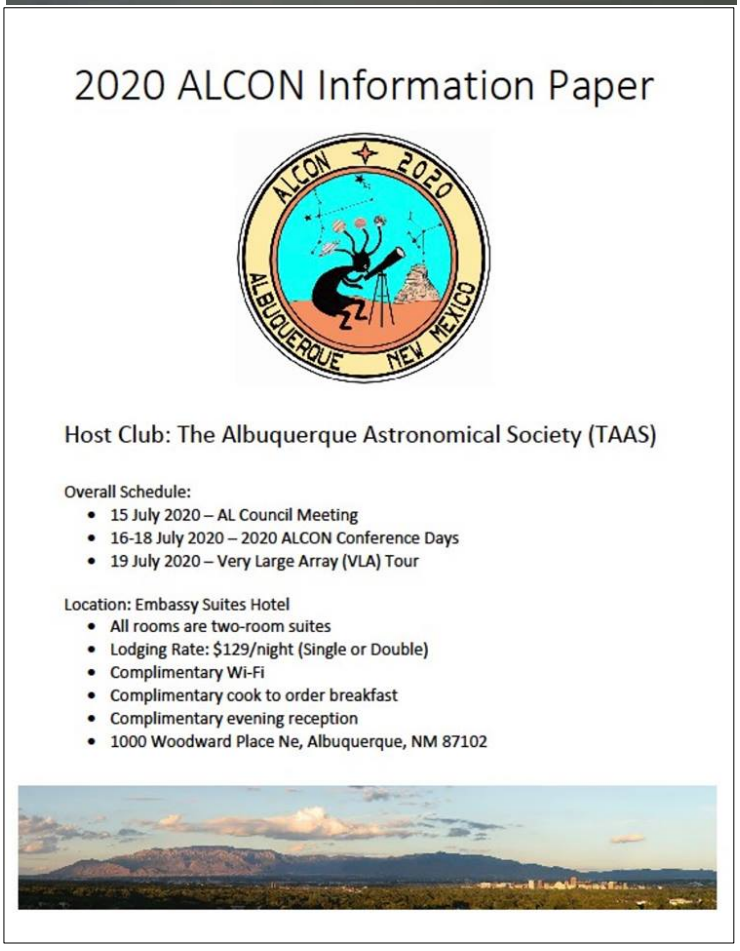
✯ Several NCRAL members were recognized in the December 2019 issue of ***Reflector***. They are as follows:

- **Dave Tosteson**, Chicago City, Minnesota, had a 4-page article *Gravitational Lenses* published. See pages 22-25. Dave is a regular contributor to ***Reflector***.
- ALCon Binocular Observing Challenge – **Elizabeth Davidson, William Davidson**
- Caldwell Observing Program – **Bill Hennessy**
- Comet Observing Program – **Tim Tomljanovich**
- Constellation Hunter Observing Program (Northern Skies) – **Jeffrey S. Moorehouse**
- Double Star Observing Program – **Jeffrey S. Moorehouse**
- Lunar Observing Program – **Jeffrey S. Moorehouse, Bradley Nasset**
- Observer Award – **Jonathan Poppele**
- Messier Observing Program (Honorary) – **Jeffrey S. Moorehouse**
- NASA Observing Challenge: Apollo 50th Anniverary – **Jeffrey S. Moorehouse**
- Outreach Observing Award – **John Zimitsch, Alex Holt, Mary Holt, Mark Pershing**
- Planetary Nebula Observing Program – **Bill Hennessey**
- Solar System Observing Program – **Jonathan Poppele**
- Urban Observing Program – **Jeffery S. Moorehouse**

MIKE REYNOLDS (1954-2019)

✯ It is with sadness that we note the untimely passing of Dr. Mike Reynolds – longtime amateur astronomer, eclipse chaser, meteorite collector, college professor, author, and man of many other titles – who passed away on October 15th from heart attack while at home. Mike was a longtime supporter of the Astronomical League. Included in his many accolades are recognition for his service as Vice President, originator of the Outreach Observing program, Chair of ALCon 2004, recipient of the Astronomical League's Leslie C. Peltier Award for observing, presenter at numerous A.L. events, and much more. Those who attended NCRAL 2016 hosted by the Twin City Amateurs in Bloomington, IL will remember him regaling us with stories about solar eclipse chasing. He will be missed.

- If you are not following NCRAL on Facebook, here is just another of the many thing that you might have missed…. From time to time the Regional Chair [cjw] posts interesting notes and astronomical diagrams showing events of the night sky such as that shown right. (Image drawn for Central Illinois.) Others are invited and encourage to post to the site for the benefit of others as well.
- Don't forget! Save the date! Makes plans now to attend **ALCON 2020,** July 16-18: https//alcon2020.astroleague.org *(website live by January 1, 2020)* Hosted by: **The Albuquerque Astronomical Society** www.taas.org



SECRETARY-TREASURER'S REPORT

~ by Roy E. Gustafson, Popular Astronomy Club ~

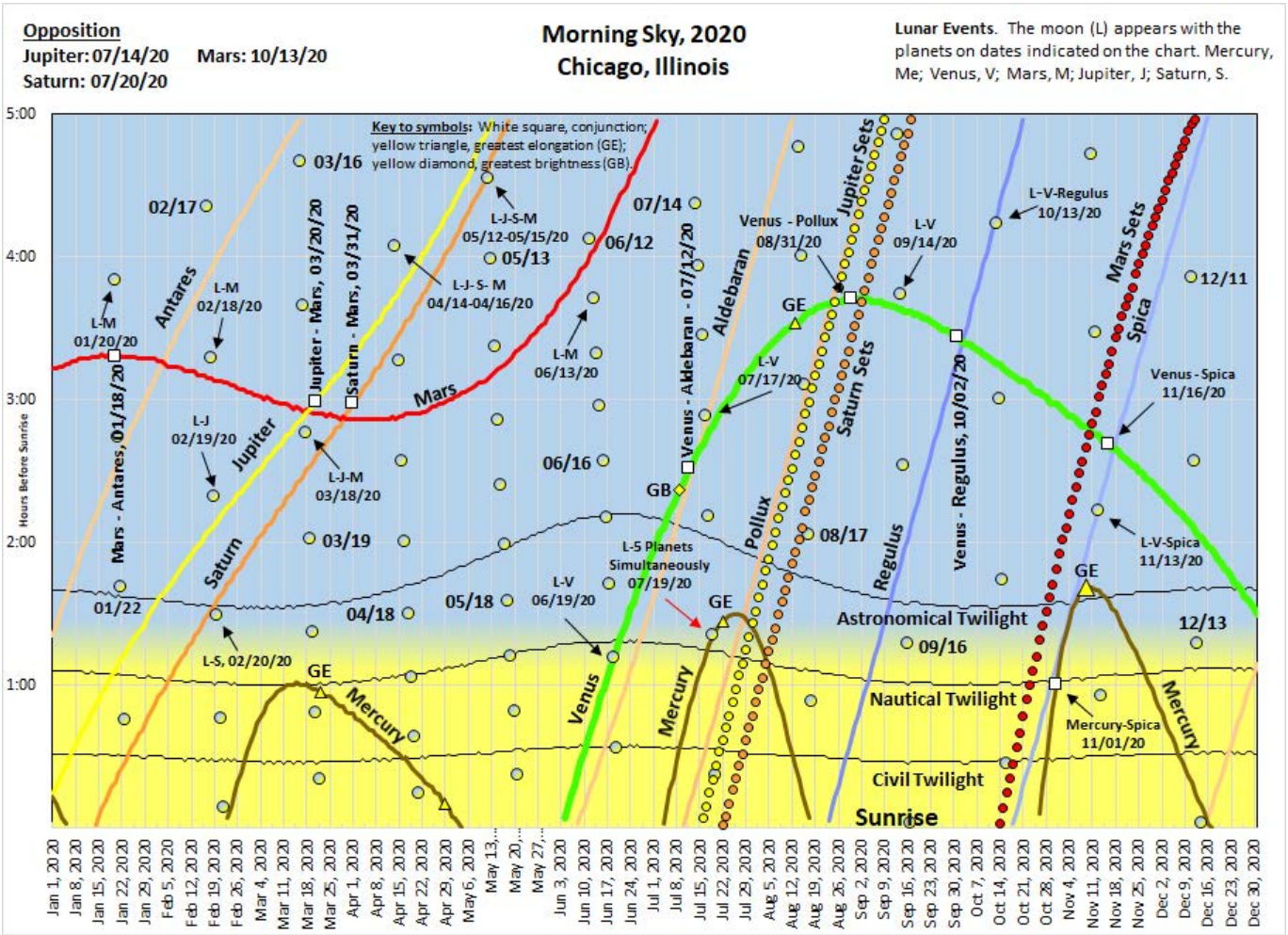
Date	Description	Check Amount	Deposit	Daily Balance	Monthly Balance	
20-Sep-19	Starting Balance				$9,331.18	Sep
24-Oct-19	William Davidson – attend A.L. Council Mtg	$250.00		9081.19	$9,081.19	Oct
30-Nov-19	Ending Balance				$9,081.19	Nov

2020 RISING AND SETTING CHARTS

~ by Jeffrey L. Hunt ~

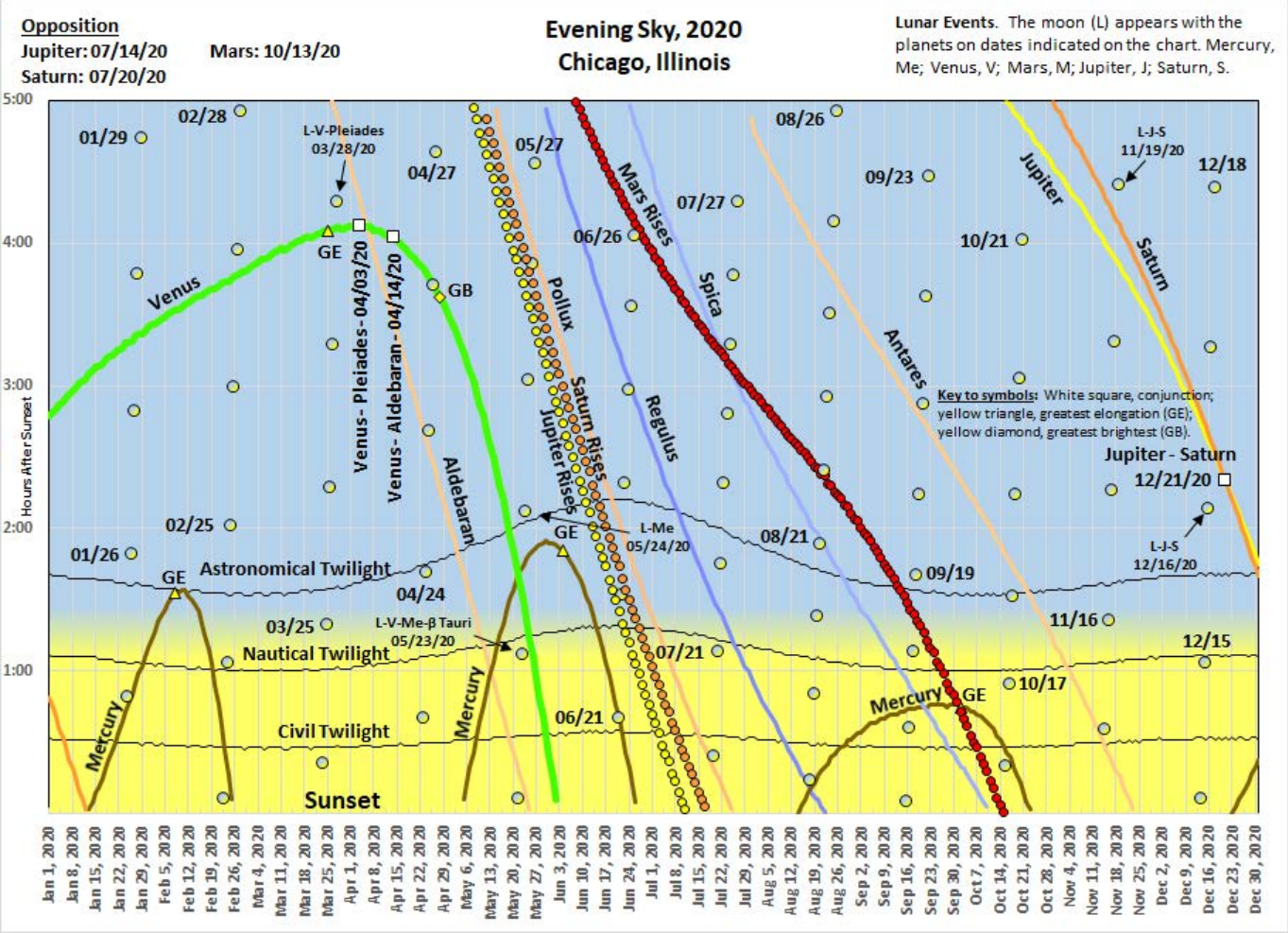
The two charts with this summary show the rising and setting of the naked-eye planets, moon, and bright stars near the ecliptic for 2020. The charts show the rising and setting of these celestial bodies compared to sunrise and sunset for time intervals up to five hours before the sun's appearance or disappearance. The three phases of twilight are displayed as well. On the rising chart, activity occurs in the eastern sky, except for the setting curves (circles) of Jupiter, Saturn and Mars. When they set in the west at sunrise, they are at opposition. On the setting chart, the activity occurs in the western sky, except for the Jupiter, Saturn, and Mars rising curves (circles). When they rise at sunset, they are at their oppositions.

It should be noted that when two objects set at the same time intervals after sunset (same clock time), they are not necessarily near each other. It merely means that they set at the same time interval after sunset or rise at the same time interval before sunrise. Because the charts feature objects' activities near the ecliptic, they are likely to be up to 10° apart. For example, on April 26, 2020, the moon and Venus set at nearly the same time interval, 222 minutes after sunset. The moon setting circle coincides with the Venus setting curve. The waxing crescent moon, though, is nearly 7.5° to the left of Venus on that evening. The charts are calculated from data by the U.S. Naval Observatory, for Chicago, Illinois. **Key to symbols:** White square, conjunction; yellow triangle, greatest elongation (GE); yellow diamond, greatest brightness (GB).



Rising Chart

Early in the year, the morning sky offers the three Bright Outer Planets – Jupiter, Saturn, and Mars – in the eastern predawn sky. As Mars moves eastward it passes Antares, Jupiter and Saturn. On several mornings, the moon passes the planetary trio. The highlight occurs on the morning of February 18 as the moon occults Mars as sunrise approaches in the Central U.S. Venus enters the morning sky at mid-year. The appearance of a lunar crescent with the brilliant planet is a beautiful sight. The moon appears with Mercury as the planet enters the morning sky in late July. On the morning of July 19, the moon and the five naked eye planets are in the sky. As the moon moves toward its evening appearance, Mercury appears higher in the sky, making it a little easier to see. Venus reaches its period of greatest brightness; the mid-brightness date is marked by the yellow diamond. Venus moves past Aldebaran, Pollux, Regulus, and Spica as it moves towards its superior conjunction in early 2021. Mercury's best evening appearance occurs during November. While this is its smallest morning elongation, the angle of the ecliptic places it higher in the sky.



Setting Chart

As 2020 opens, Venus is the bright Evening Star, appearing in the southwest. Mercury makes its best evening appearance, setting at the end of evening twilight in early February. Mercury's June elongation is larger, but it sets several minutes before the end of twilight, making it difficult to observe in the brighter sky. After Venus moves past the Pleiades and Aldebaran, it moves toward Elnath (β Tauri), and then plunges toward its inferior conjunction. Jupiter and Saturn pass opposition during July. After Venus disappears from the evening sky, the slow procession of bright stars – Pollux, Regulus, Spica, and Antares – disappears into evening twilight. Jupiter and Saturn appear on the setting chart in late October, just after Mars reaches opposition. The moon has two interesting appearances with the planetary duo on November 19, 2020 and just days before the Jupiter-Saturn Great Conjunction on December 21, 2020.

Dr. Jeffrey L. Hunt

About the Author: *Jeffrey Hunt has had a life-long interest in astronomy and astronomy education. He has taught astronomy at all levels from preschool students to university courses. Jeff is a former director of the Waubonsie Valley High School Planetarium in Aurora, Illinois. Dr. Hunt holds several degrees including a master's degree in planetarium education from Michigan State University. He writes an astronomy blog (http://jeffreylhunt.wordpress.com) showing easily-seen sky events. Currently he is retired with his wife and cat in Northern Illinois.*

REMINDER: NCRAL 2020 FAST APPROACHING

~ by Jeff Setzer, Northern Cross Science Foundation ~

Work is progressing steadily for the NCRAL 2020 convention themed ***Vision 2020***. The convention will be held Friday/Saturday, May 1-2, 2020, at the Lakeview Conference Center attached to the Country Inn & Suites in Port Washington, WI. Activities and speakers are being planned for Friday afternoon and all day on Saturday. We are excited to work with a great catering company for the conference meals.

We have a block of rooms at the conference hotel reserved for NCRAL ***Vision 2020*** guests. Most are double queen, but some are single king. They are all offered at the same discounted rate of $109/night (plus tax) based on double occupancy. Additional occupants for these rooms are $10/night (plus tax). All registered guests will enjoy full use of the hotel facilities, including indoor pool, whirlpool, fitness room, game room, and full hot breakfast each morning. Our block of rooms will be open until April 1, 2020, and is limited in number, so don't delay! Call the Country Inn & Suites in Port Washington, WI at (262) 284-2100 and ask for the NCRAL Convention rate. You may also want to peruse the website, which is linked from our conference webpage.

In the coming months, we will be finalizing agenda, speaker and other details, so look for updates on our website: www.ncsf.info. For now, be sure to SAVE THE DATE, reserve your room, and plan on attending a valuable and highly enjoyable NCRAL convention.

NCRAL SEASONAL MESSIER MARATHON TELESCOPIC OBSERVING PROGRAM

Autumn: M55, M69, M70, M75, M11, M26, M56, M57, M71, M27, M29, M39, M2, M72, M73, M15, M30, M52, M103, M31, M32, M110, M33, M74, M77, M34, and M76. (27 objects)

Winter: M1, M45, M36, M37, M38, M42, M43, M78, M79, M35, M41, M50, M46, M47, M93, M48, M44, M67, M40, M81, M82, M97, M101, M108, M109, M65, M66. (27 objects)

Spring: M95, M96, M105, M53, M64, M85, M88, M91, M98, M99, M100, M49, M58, M59, M60, M61, M84, M86, M87, M89, M90, M104, M3, M51, M63, M94, M106, and M68 (28 objects)

Summer: M83, M102 (NGC 5907?), M5, M13, M92, M9, M10, M12, M14, M19, M62, M107, M4, M6, M7, M80, M16, M8, M17, M18, M20, M21, M22, M23, M24, M25, M28, and M54. (28 objects)

RULES:

1. All required observations for a given season must be completed *during a single dusk-to-dawn night*; no object substitutions or time extensions are permitted. The only acceptable observations are those made on or after September 23, 2019 – the official start date of this NCRAL observing program.
2. Observations for a particular season must be completed during that season – from equinox to solstice or vice versa.
3. Observers must find each object themselves and observe it using a telescope (not binoculars); merely viewing an object through your or someone else's telescope after they find the object does not qualify as an observation.

4. Assistive devices are permitted (e.g., setting circles, goto telescopes, etc.) to find objects. No distinction will be made on the observing program certificate.
5. Observer name, NCRAL affiliation (give club name or indicate A.L. membership-at-large), date(s) of observations, location, type and size of telescope(s) used, eyepiece(s) used, magnification(s) used, field(s) of view of eyepiece(s) used, seeing, transparency, limiting magnitude, and moon phase must be recorded. A summary statement is sufficient for all observations unless there are significant changes during the course of the night's observing run.
6. For individual observations, provide a record consisting of sequence number (1, 2, 3, etc.), Messier number, common name of object (if applicable), type of object (OCl – open cluster, GCl – globular cluster, PlN – planetary nebula, SnR – supernova remnant, BrN – bright nebula, Gal – galaxy, Dbl – double star, etc.), constellation, and time of observation. See the sample observing record below.
7. Observational records of affiliate members must be confirmed by and submitted through the affiliated club's ALCor. In the event that the ALCor has made the observations, then any affiliate officer may confirm and forward the observations. Members-at-large may send in their observations without confirmation.
8. Records must include the name, email, and mailing address of observer and/or ALCor for sending the certificate and pin.

NCRAL Chair Carl Wenning (2017-2021) will serve temporarily as the program manager. Electronic submissions (e.g., Excel file with cover letter in the body of an email) are preferred and may be sent to carlwenning@gmail.com. Be certain to include "Seasonal Messier Marathon" in the subject line. Alternatively, send a physical copy of observing record to Carl Wenning, NCRAL Chair; Seasonal Messier Marathon; 21 Grandview Drive; Normal, IL 61761-4071. Mailed physical copies will NOT be returned. Please indicate to whom and to what address the certificate(s) and pin(s) should be sent.

SAMPLE OBSERVING RECORD:

The following sample observing record was created using Excel.

AUTUMN 2019 SEASONAL MESSIER MARATHON

Observer: Dalilah Grover
NCRAL Affiliation: Twin Bay Astronomy Club
Date(s) of Observations: September 28-29, 2019
Location: Olive Grove Nature Center, Oil City, IL 63874

Telescope(s) used: Celestron CPC 11" goto
Eyepiece(s) used: 26mm Meade Super Plössl
Magnification(s) used: 107.5X
Field(s) of view: 0.65 degrees
Moon phase: waning crescent (~27.5 days)
Seeing: 3/5
Transparency: 4/5

Sequence	Messier No.	Object Type	Common Name	Constellation	Time Observed
1	55	GCl	none	Sagittarius	8:22 PM
2	69	GCl	none	Sagittarius	8:30 PM
3	70	GCL	none	Sagittarius	8:37 PM
4	57	PlN	Ring Nebula	Lyra	8:43 PM
5	11	OCl	Wild Duck	Scutum	8:50 PM
6	31	Gal	Andromeda Galaxy	Andromeda	9:02 PM
7	27	PlN	Dumbbell Nebula		

For details about the objects to be observed, see Messier Object list in the *RASC Observer's Handbook* and available online at the following URL: http://www.messier.seds.org/xtra/similar/dataRASC.html Please note that the RASC seasonal list does NOT correspond exactly with the objects found in the NCRAL Seasonal Mini Marathon observing program.

PROGRAM NOTES:

NCRAL recognition will be a ¾-inch colored enameled star pin and a printed certificate. There is no direct cost to the membership for either; the cost of the program (pins, certificates, mailers, postage) will be borne by the Region as a benefit of affiliation. An award recipient therefore must be either a member of an NCRAL affiliated club or an A.L. member-at-large living with the boundaries of NCRAL.

NCRAL's Seasonal Messier Marathon observations do NOT qualify observers for the Astronomical League's Messier Observing program; the two programs are unrelated and have different observing requirements. The main requirement of the NCRAL program is to quickly observe and check off items from a seasonal list of Messier objects, completing all observations during a single night. There are many other differences as well.

- ***Autumn:*** This season's objects span a wide range of right ascension and declination. With several objects located in Sagittarius and disappearing into the glare of the sun by mid-autumn (M55, M69, and M70), it is best to complete the autumn observing program before the end of October. After that they will be too near the sun to observe during late autumn evenings.
- ***Winter:*** It probably would be best to begin the winter Marathon around mid-February or later. Any earlier in the year than that, observers will have to wait until late into the night for all winter objects to have risen high enough in the sky to observe. With winter weather moderating in March, it wouldn't be too late to start then so long as observations are completed prior to the March equinox.

Additional notes for mini Messier Marathon observing at other times of year will be provided as the seasons progress and more experienced is gained with this program.

Add Your Email Address to the NCRAL Member Database

Did you know that only about 400 of some 1,850 NCRAL members are receiving this newsletter via email? That's only 22% of the members. Still, this represents a small but important increase since that last report on the summer solstice when only 375 were on the list! Please help NCRAL get its newsletter out to the membership by encouraging fellow club members to add their email addresses to the NCRAL member database.

When one adds his or her email address to the NCRAL member database, they get direct mailings of ***Northern Lights*** and important and timely announcements about Regional conventions, star parties, and so forth. Only blind addressing (Bcc:) will be used with this email list so that others will not see your email address. Email addresses will never be shared with or sold to outside entities.

No one will add your email address to this list for you, so you'll need to do it yourself. Sign-up takes only about a minute. You'll need to provide your name, email address, astronomy club affiliation (or indicate A.L. membership-at-large) and let us know if you hold specific positions within your club. Go to the following case-sensitive URL to add your information to our database at https://goo.gl/gsS8SF today so you won't miss important future communications.

Reflector Editor and *Reflector* Team Members Needed Immediately

Have you admired the high-quality quarterly publication that the ***Reflector*** has evolved into during the past few years? And do you have experience professionally with editing a print and digital publication and meeting the necessary deadlines? Finally, do you have that burning desire to once again be part of a team that creates a high-quality magazine? If so, we would like to hear from you. In addition to the Editor position, we can use your help with other *Reflector* functions. If interested, please contact: president@astroleague.org.

A.L. Calendars Available

The Astronomical League is again producing a League calendar for 2020. It is available at the A.L. Web Store for just $13. Quantity discounts are also available. Sales this year will support A NEW PROGRAM. To acquire your issue, visit the following URL: https://store.astroleague.org/index.php?main_page=product_info&cPath=2&products_id=155

CALL FOR 2020 NCRAL NOMINATIONS:

REGIONAL REPRESENTATIVE/REGION AWARD/NEWSLETTER EDITOR AWARD/MINI-GRANTS

As was mentioned in the last Chair's message, the Region did not elect a Regional Representative to a new 3-year term at NCRAL 2019. Vice Chair Bill Davidson (former Regional Rep.) is now filling both positions on an interim basis. An election will be held at NCRAL 2020 to fill the remaining two-years of the unexpired Regional Rep. term. Please send your nomination for Regional Rep. to NCRAL Chair Carl Wenning at carlwenning@gmail.com

It's never too early to start thinking about nominations for the NCRAL Region Award. Do you know someone who has dedicated his or her time and energy to promoting astronomy? Wouldn't you like to let them know they are appreciated for their hard work? This is your chance! This award recognizes exceptional individual effort and meritorious service to amateur astronomy through the member's local astronomy club, public outreach, the NCRAL, or the Astronomical League.

The Regional is now calling for nominations for the 2020 Region Award. Using the guidelines and submission forms below, we have made it easier than ever to nominate someone you feel deserves this award. This award will be presented in a ceremony concluding the dinner banquet of the next Regional convention, NCRAL 2020, to be held at Port Washington, WI, the first weekend of May.

The Rules for nomination are set as follows:

1. The individual must be a member in good standing, either through an AL/NCRAL-affiliated club, association, or society or as a current member-at-large in the North Central Region.
2. The three current regional officers and the regional representative are NOT eligible for this award. Past winners are also ineligible for this award.
3. The regional officers are the voters and will base their decision on the information provided. Past winners of this award will be asked to assist in the case of a tie vote. Each member votes independently and will use his/her best judgment. All decisions are final.
4. The winner will be contacted not less than 21 days in advance of the NCRAL meeting at which the award will be presented. The winner will not be publicly revealed until the time of the presentation. Those nominated but not selected will not be revealed.
5. All non-winning nominations will be kept on file for two years after initial submission. After such time, a new nomination needs to be competed. Nominations for 2020 MUST BE RECEIVED by the date of the March 31st. Any nominations received after this date will be kept on file for 2021.

There are many deserving candidates within NCRAL. We look forward to receiving your nomination(s). If there are any questions, please contact Vice Chair Bill Davidson via phone or email using the contact information found below.

Submission Form for the NCRAL Region Award

Nominee's name (as it will appear on plaque) _____

Nominee's email address _____

Street address _____

City _____ State _____ Zip _____

Club affiliation _____

Nominator's name _____

Club affiliation _____

Street _____

City _____ State _____ Zip _____

Phone _____

Email _____

Submission Guidelines

Prepare a *statement of the nominee's accomplishments* in one or more of the areas listed under the criteria described in first paragraph on page 1. This statement should:

- Not exceed 3 double-spaced pages (1,000 words). Length does not necessarily equal strength.
- Include the number of years in office or committee membership.
- Include the dates of said membership.
- Include the length of time participating in public education, number of presentations, etc.

Include *supporting data*

- Any relevant newspaper clippings, photos, and other articles that support the nomination.
- For service to groups such as schools, scouts, etc., it would help the committee if you could obtain a brief statement from the teacher, leader, chair etc. on the usefulness of the presentation.

All nominations must be sent via email to Bill Davidson, NCRAL Vice Chair, at rochesterskies@outlook.com

Let's not forget about the **NCRAL Newsletter Editor Award**. It is expected that the next award will be conferred at the NCRAL 2020 meeting. Submission Guidelines: The president of the club/society/association should email a copy of the designated issue of the associated newsletter in Adobe Acrobat pdf file format to NCRAL Vice Chair Bill Davidson (rochesterskies@outlook.com), along with a cover letter of recommendation in the same file format. In addition, complete contact information of the editor must be included. A photo of the newsletter editor, preferably in an astronomical-type setting, must be received electronically in jpg format to the same email address by March 31st.

Lastly, don't about the two **NCRAL mini-grants**. A mini-grant will be awarded following a successful written proposal originating with the president of an NCRAL affiliate. The focus of a mini-grant must be oriented to an increase in either: (1) an affiliate's membership whose mini-grant proposal must focus on both recruitment and retention (Member Recruitment & Retention Mini-grant), or (2) an increase in the number of A.L.-affiliated clubs, societies, or associations within the North Central Region (Non-affiliate Recruitment Mini-grant). A unified online mini-grant application must be completed by the deadline noted below. The application link may be found at the following URL: http://bit.ly/2W2pdeA Deadline: The application deadline for all mini-grants is March 31st. Mini-grants, if approved, will be announced at NCRAL 2020.

FUTURE NCRAL REGIONAL CONVENTIONS

Each year at NCRAL's annual business meeting, the Region receives offers for hosting upcoming meetings. The following affiliates have agreed to hosting future conventions. We are still in need for additional hosts, but especially for 2022, 2024, and the years beyond. It's never too early to start planning to host.

- 2020 Port Washington, WI: Northern Cross Science Foundation, May 1-2
- 2021 Green Bay, WI: Neville Public Museum Astronomical Society (confirmed)
- 2022 OPEN
- 2023 Bloomington-Normal, IL: Twin City Amateur Astronomers (confirmed)
- 2024 OPEN

If your club has never hosted an NCRAL Regional convention, please consider doing so. While it is a considerable amount of work, it can be quite rewarding – even fun. It provides an opportunity to showcase your group's facilities and accomplishments, build club camaraderie, and to get to personally know interesting guest speakers. You can also use such an event to grow your club's membership.

Remember, NCRAL now has its own convention planning guidelines. The guide was developed by experienced hosts of NCRAL conventions in conjunction with one future host who asked lots of excellent questions. Significant contributions were made by Alan Sheidler (Popular Astronomy Club) and John Beck (Door Peninsula Astronomical Society). NCRAL Chair Carl Wenning, served as contributor and lead author.

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made by Alan Sheidler (Popular Astronomy Club) and John Beck (Door Peninsula Astronomical Society). NCRAL Chair Carl Wenning, served as contributor and lead author.

The ***NCRAL Convention Planning Guide*** has three sections. Section 1 deals with the "preliminaries" of what it takes to host a Regional convention. Section 2 deals with programming information. Section 3 deals with budgeting information.

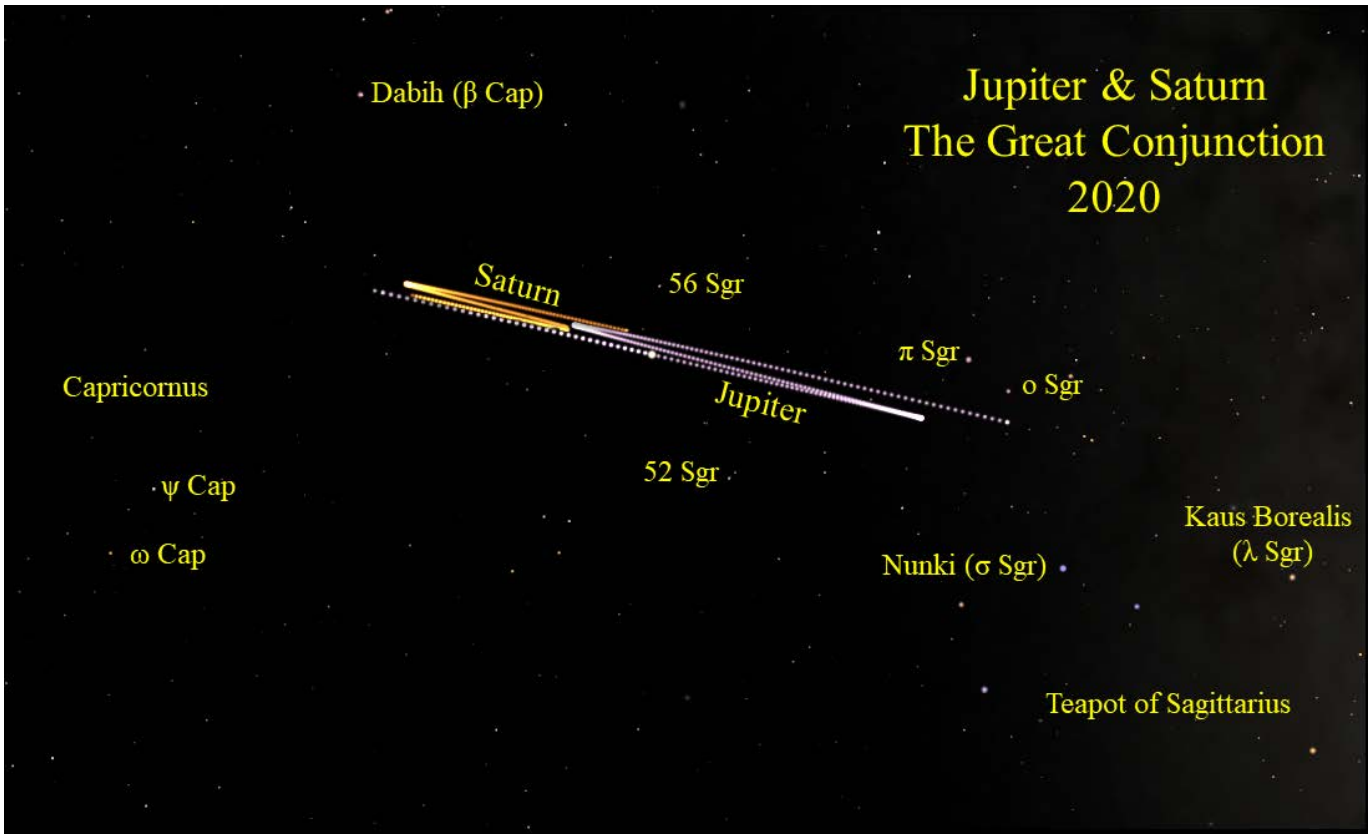
The guide is considered a "living document" that will be updated as new survey information becomes available. The recent NCRAL 2019 post-convention survey was included in the recently updated document. Results from the 2018 NCRAL Convention Preferences Survey are also included. The goal is to increase the benefits of convention attendance, thereby increasing attendance at our Region's conventions.

To download and review the planning guide, you may access it through the NCRAL website the following URL: https://ncral.wordpress.com/conventions/. Look for the link at the bottom of the page.

Please contact NCRAL Chair Carl Wenning at carlwenning@gmail.com should you have any questions or wish to toss your hat into the ring for hosting a future NCRAL convention.

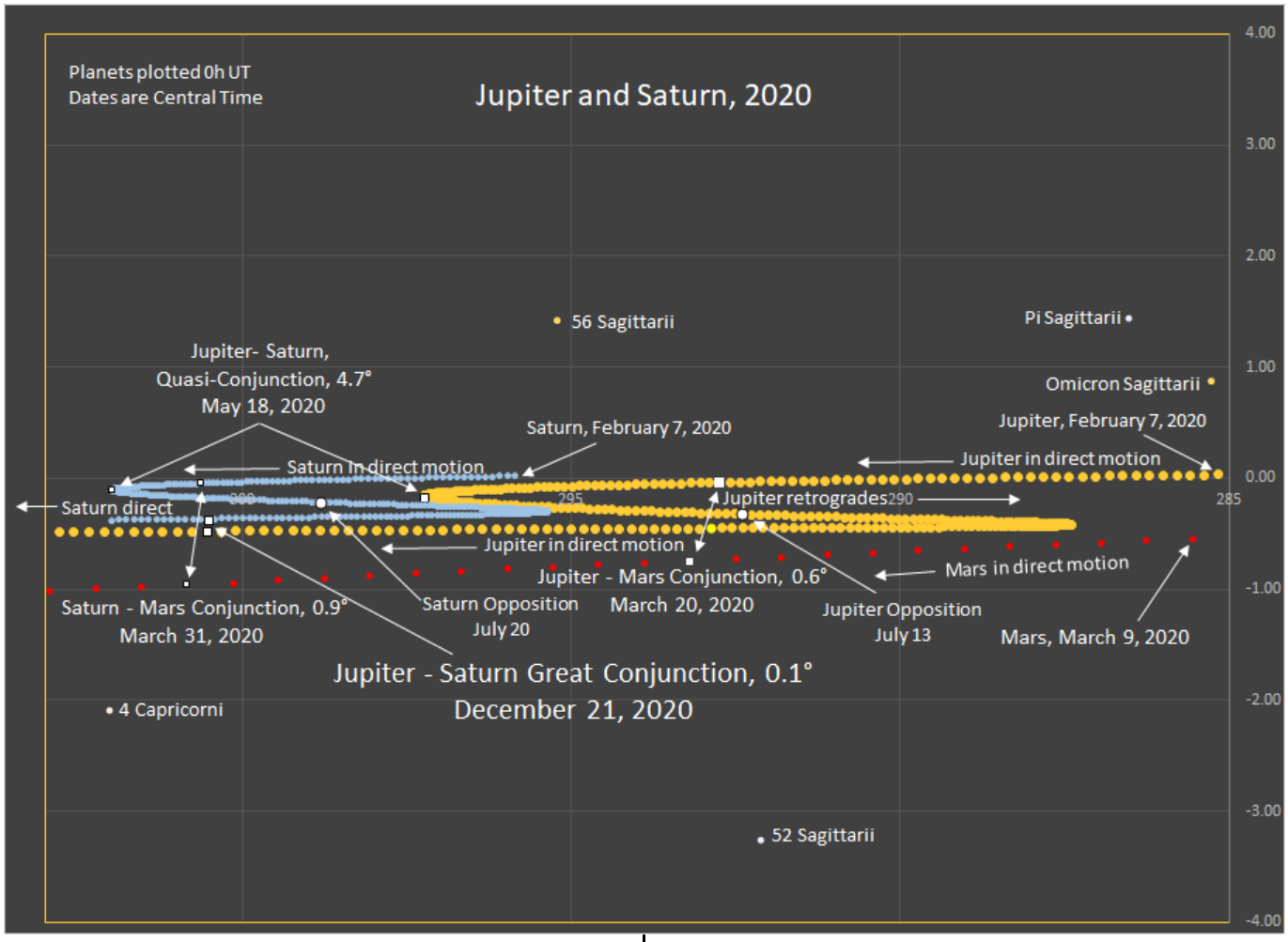
JUPITER AND SATURN IN 2020: THE GREAT CONJUNCTION

~ by Jeffrey L. Hunt ~



A Great Conjunction of Jupiter and Saturn occurs December 21, 2021. The chart above shows the general celestial regions for the apparitions of the planetary pair among the dim star fields of Sagittarius and Capricornus.

Jupiter – Saturn conjunctions occur every 20 (19.86) years, so-called Great Conjunctions. The 2020 conjunction occurs December 21. The planetary separation is 0.1°, easily fitting into a telescopic field. It is the closest conjunction of this planetary pair since July 16, 1623. The record is unclear whether that conjunction was observed. More about this later.



The chart above shows a section of the ecliptic, 18° long, where the planets appear during most of 2020. The planets appear against the background stars of eastern Sagittarius and western Capricornus. The chart includes the path of Mars through the region in March 2020 and its conjunctions with Jupiter and Saturn during that month.

To track the planets, early sky watchers – even those we consider serious astronomers – divided the ecliptic into 12 equal parts that were 30° long. To solve the cosmological problem of the day – planetary motion – the sky watchers tracked, charted, plotted, and calculated the planets' positions on these diagrams. They predicted planets' conjunctions with other planetary bodies and stars, adjusting their own calculations when the observed positions deviated from their predicted coordinates.

Jupiter and Saturn conjunctions have long been interesting to observe. Occurring once every human generation and moving slowly against the background stars, they appear close to each other for nearly a year between their successive solar conjunctions. Each year, Jupiter moves about 30° eastward against the stars of the ecliptic, while Saturn moves over 12° annually. Jupiter catches and passes Saturn in nearly twenty years. It has been long noted that Saturn moves over 240° along the ecliptic during the twenty-year interval. After three conjunctions, the next conjunction occurs when the planets are slightly east of the first conjunction's coordinates in the sequence.

If a Jupiter – Saturn conjunction occurs in Aries, the next conjunction occurs in Sagittarius, and the third occurs in Leo. The fourth conjunction likely occurs in Aries, several degrees east of the initial conjunction. Lines drawn between three successive Great Conjunctions, as seen from above the ecliptic, roughly form a triangle (trigon). The fourth begins a new trigon. The vertices of each successive trigon appear farther east along the ecliptic than the previous shape. Depending on the reference system, a complete set of conjunctions occurs along the entire ecliptic on a cycle that ranges from 794 years to 913 years or 40 to 46 conjunctions. Often 800 years is the round number that refers to the 794-

day-interval, measured by coordinates that are shifted by precession.

The trigon planetary configuration was of special interest to those looking to predict world affairs. Three 30° intervals of the ecliptic – Aires, Sagittarius, and Leo – were known as the fiery trigon, and provided special interest in world affairs. Only the appearance of a comet was more ominous than planetary events in the fiery trigon, especially those of Jupiter and Saturn. Today, there is a web site that notes presidential deaths during the occurrence of a Great Conjunction in this triad of ecliptic doom!

In 1961, the Jupiter – Saturn conjunction occurred in the morning sky, about 2° below 56 Sagittarii. (Note the star's location on the accompanying charts, nearly 5° west of the Capricornus – Sagittarius border.) The 2020 conjunction occurs about 6° farther eastward, just east of the constellations' border.

During his lifetime, the Jupiter – Saturn trigon sent Kepler looking for other geometrical shapes to explain planetary movements and conjunction relationships. His mathematical prowess yielded three dimensional shapes to represent the known planets' relationships.

Kepler became interested in Jupiter – Saturn conjunctions during the Great Conjunction of 1603, occurring in Sagittarius, along with the first appearance of the *Nova Stella in Pede Serpentarii* (New star on the foot of the Serpent Holder) nearby in southern Ophiuchus in 1604. Mars passed Jupiter and Saturn several months later at the nova's first appearance. His research and detailed calculations centered on the Jupiter – Saturn triple conjunction of 7 B.C. and a later passage of Mars. He thought this Great Conjunction explained the Star of Bethlehem.

In the simplest description, a triple conjunction occurs when faster moving Jupiter overtakes slower moving Saturn before they reach opposition. Then as the planets retrograde, Jupiter again passes Saturn. After Jupiter begins its direct motion, it passes Saturn a third time. It should be noted that the two planets' 2020 apparitions coincide with an apparition of Pluto. Jupiter has a triple conjunction with Pluto during this apparition. The conjunctions are listed in the highlights, but a detailed finder chart is not included here. I encourage those with the desire to see Pluto near Jupiter and have sufficient apertures to consult other sources that provide detailed guidance to find the distant, dim planet.

The Jupiter – Saturn conjunction of 1623 occurred in the wake of the invention of the telescope, so observing was in its infancy; yet, the sky was full of planetary activity. A partial lunar eclipse (April 15, 1623) was visible throughout the Americas and in Central Europe, where the moon was setting as the eclipse reached its 90% magnitude. Venus passed Jupiter and Saturn in late June and Mercury passed the planetary pair less than two weeks later, when the planets were about 22° east of the sun. With the inner planets in the vicinity of the impending Great Conjunction and Mars reaching opposition (July 4, 1623), surely sky watchers were observing the planets' locations to test and revise their planetary motion equations.

By the time of the Great Conjunction on July 16, 1623, the planetary pair was less than 13° east of the sun. By Civil Twilight, the pair was near the horizon at mid-latitudes. Without optical help, the conjunction likely went unobserved, even for those with recently minted telescopes. Even then, the observer needed some luck to find the conjunction.

In later years, two British publications stated that the 1623 conjunction was not observed. In 1886, the *Monthly Notices of the Royal Astronomical Society* state that the February 8, 1683, Jupiter – Saturn conjunction was the first observed "since the invention of the telescope" and that the 1623 passing went unobserved. The same statement was written in the *Journal of the British Astronomical Association* in 1897. Perhaps the conjunction was observed without optical aid and recorded from more southerly latitudes, when the planets were higher in the sky.

Did the two British publications make the statements out of parochialism, rather than from factual observations made around Europe regarding the first Great Conjunction observed with a telescope, or was this the first time that the conjunction fit into an eyepiece since the telescope's invention? The February 24, 1643, conjunction was visible in the western sky during mid-twilight as well as the October 16, 1663, conjunction. At the second conjunction the planets were about 10° up in the southwest at one hour after sunset. However, at both conjunctions, the planets were nearly 1° apart. At the 1683 conjunction, the planets were close, about 0.2° apart, twice the separation of the upcoming event. While the two previous conjunctions were visible to the naked eye and individually in a telescopic eyepiece, the 1683 conjunction was the first observed with both planets simultaneously in an eyepiece. With a separation of 0.1°, the 1623 conjunction would have fit into telescopes eyepieces of that generation, but certainly those early telescopes were unwieldy to steer and hold steady, and the telescope operator needed some persistence during the days preceding the conjunction to follow the converging planets into bright twilight while they had sufficient altitude to observe them. So, while the British publications are accurate about viewing the planets simultaneously through a telescope, the two preceding conjunctions were visible to the unaided eye and individually through a telescope, and this does not speak to the issue as whether the 1623 conjunction when unobserved across all of humanity.

In recent times, Great Conjunctions occurred February 18, 1961; followed by a triple conjunction of the two planets in 1980-81; and the last occurred May 30, 2000, although this was difficult to observe.

As 2019 closes, the Great Planets, Jupiter and Saturn, are near their solar conjunctions. Jupiter's occurs December 27, 2019, followed 17 days later by Saturn. They begin a slow climb into the morning sky and toward their Great Conjunction that occurs December 21, 2020.

In the notes that follow, specific times are calculated for Chicago, Illinois. Observers should note time differences for their observing locations. Here is the summary of the "co-apparition" of the two planets:

January 2020

Jupiter makes its first morning appearance late in the month, joining Mars as morning planets. Saturn passes its solar conjunction near mid-month and slowly crawls into the morning sky.

- **January 7**: Jupiter rises at the start of Civil Twilight when the sun is 6° below the horizon.
- **January 13**: Saturn is at its solar conjunction, 9:17 a.m. CST.
- **January 20**: Jupiter (m = −1.9) rises at the start of Nautical Twilight, when the sun is 12° below the horizon. Thirty minutes before sunrise, it is 5° up in the southeast, nearly 30° to the lower left of Mars (m = 1.8). The dimmer Red Planet is lost in the brightness of the pre-sunrise sky, but the moon (25.2 days past the New phase, 19% illuminated) is nearby, 3.9° to the upper right of Mars. Use a binocular to see them.
- **January 22**: Forty-five minutes before sunrise, Jupiter is about 4° up in the southeast. The crescent moon (27.2d, 6%) is 7° to the upper right of Jupiter.
- **January 24**: Saturn rises at the start of Civil Twilight.
- **January 27**: Jupiter passes 3.4° to the upper left of Nunki (σ Sgr, m = 2.0), a star in the handle of the Teapot of Sagittarius.

February 2020

Bright Jupiter appears among the stars of Sagittarius, appearing higher in the southeast each morning. Mars begins to close in on the two other Bright Outer Planets. By month's end, the planetary trio appears in the southeastern sky. The moon occults Mars on the morning of February 18.

- **February 3**: Jupiter rises at the start Astronomical Twilight, when the sun is 18° below the horizon. Forty-five minutes before sunrise, the Giant Planet is over 7° in altitude in the southeast among the stars of Sagittarius.
- **February 5**: Saturn rises at the start of Nautical Twilight.
- **February 8**: Jupiter passes 0.8° to the lower right of Omicron Sagittarii (o Sgr, m =3.8). Forty-five minutes before sunrise, Jupiter is nearly 9° up in the southeast.
- **February 9**: About 45 minutes before sunrise, Jupiter is about 9° up in the southeast, 20° to the lower left of Mars (m = 1.3).
- **February 14**: Jupiter passes Pi Sagittarii (π Sgr, m =2.9), 1.4° to the lower right of the star. Forty-five minutes before sunrise, Jupiter is over 10° in altitude in the southeastern sky. Saturn is about 10° to Jupiter's lower left, nearly 6° in altitude.
- **February 18**: One hour before sunrise, the crescent moon (24.6d, 24%), about 17° up in the southeast, is 0.4° to the right of Mars. Mars is nearly 16° to the upper right of Jupiter. As sunrise approaches, the moon inches toward the planet. If you can track Mars into a brighter sky, the moon occults it a few minutes after 6 a.m. CST, about 35 minutes before sunrise in Chicago. Observers in the Western U.S. see the moon occult Mars in a darker sky.
- **February 19**: Saturn (m = 0.6) rises at the start of Astronomical Twilight. Forty-five minutes before sunrise, Jupiter, nearly 12° up in the southeast, is 3.9° to the left of the crescent moon (25.6d, 16%). Saturn is 9.5° to the lower left of Jupiter.
- **February 20**: Forty-five minutes before sunrise, the old moon (26.6d, 9%) is about 6° up in the southeast, 2.5° to the lower right of Saturn. Jupiter is 9.0° to the upper right of the moon.

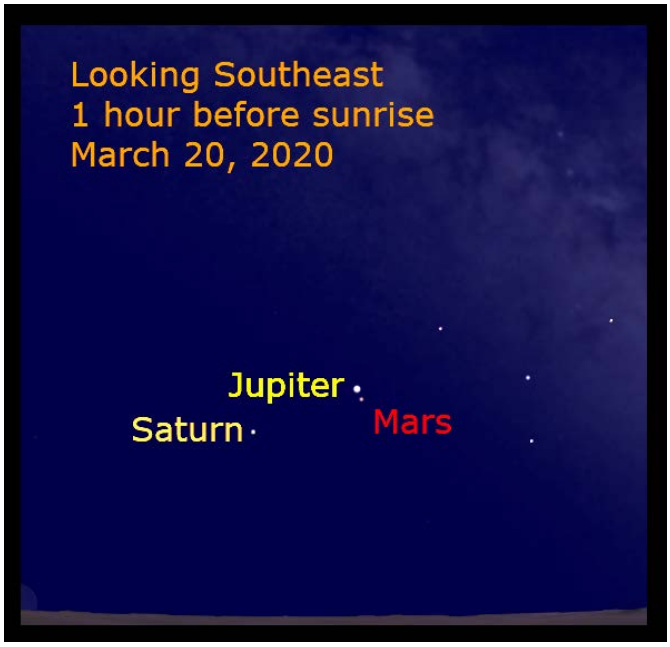
March 2020

The three Bright Outer Planets appear in the southeast before sunrise. Early in the month, they appear equally spaced with Jupiter between Saturn and Mars. Mars closes in and passes the planets as the month progresses.

- **March 1**: About an hour before sunrise, Jupiter (m = −2.0) is about 16° up in the southeast. Mars (m = 1.1) is 10° to the Giant Planet's upper right, and Saturn (m = 0.7) is nearly 9° to Jupiter's lower left. During the next few mornings watch Mars close the gap on Jupiter and the planetary trio is equally spaced along the ecliptic.
- **March 5**: One hour before sunrise, Jupiter is over 16° above the southeast horizon. The planets are nearly equally spaced. Mars is about 8° to the upper right of Jupiter and Saturn is over 8° to the Giant Planet's lower left.
- **March 11**: One hour before sunrise, Jupiter, over 16° up in the southeast, is 4.9° to the lower left of Mars (m = 1.0). At the same time, Jupiter is nearly 8° to the upper right of Saturn. Mars continues to close the gap on Jupiter. Separations until the Jupiter – Mars conjunction: **Mar. 12**, 4.3°; **Mar. 13**, 3.7°; **Mar. 14**, 3.3°; **Mar. 15**, 2.7°; **Mar. 16**,

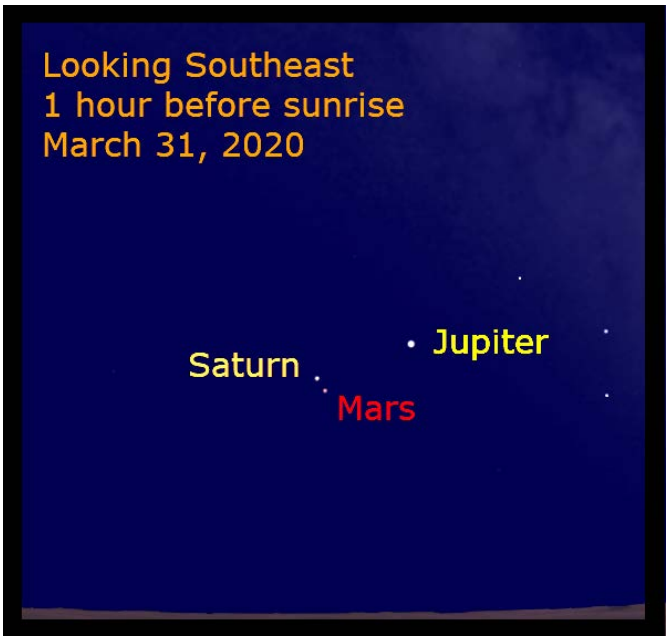
2.2°; **Mar. 17**, 1.7°, Mars to the right of Jupiter; **Mar. 18**, 1.2°; **Mar. 19**, 0.9°.

- **March 15**: One hour before sunrise, Jupiter, 16° up in the southeast, is 2.7° to the left of Mars. The Red Planet is 10° to the upper right of Saturn (m = 0.7).
- **March 16**: One hour before sunrise, Jupiter, 16° up in the southeast, is 3.2° to the upper left of 52 Sagittarii (52 Sgr, m = 4.6).
- **March 18**: The crescent moon (24.1d, 29%) joins the scene with Jupiter (m = −2.1) and Mars. The trio makes a small triangle; the moon is 2.4° to the lower right of Jupiter and 2.2° to the lower left of Mars.
- **March 19**: The crescent moon (25.1d, 21%), 9° up in the southeast, is over 6° to the lower left of Saturn. The Jupiter – Mars gap is 0.9°. Mars is to the lower right of brighter Jupiter.



Mars passes Jupiter in the southeastern morning sky with Saturn nearby.

- **March 20**: Jupiter is now rising about 3 hours before sunrise. This morning is the **Jupiter – Mars conjunction!** Mars is 0.6° to the lower right of Jupiter. The gaps after the conjunction as Mars moves away from Jupiter: **Mar. 21**, 0.9°; **Mar. 22**, 1.3°; **Mar. 23**, 1.7°; **Mar. 24**, 2.3°; **Mar. 25**, 2.7°; **Mar. 26**, 3.4°; **Mar. 27**, 3.9°; **Mar. 28**, 4.5°; **Mar. 29**, 5.0°.
- **March 24**: One hour before sunrise, Jupiter is over 17° up in the southeast, nearly 7° to the upper right of Saturn. Mars is 4.6° to the upper right of Saturn and 2.3° to the lower left of Jupiter. The Saturn – Mars gaps until the conjunction: **Mar. 25**, 4.0°; **Mar. 26**, 3.4°; **Mar. 27**, 2.6°; **Mar. 28**, 2.2°, Mars to the right of Saturn; **Mar. 29**, 1.7°, Mars to the lower right of Saturn; **Mar. 30**, 1.2°.
- **March 26**: One hour before sunrise, Jupiter is over 17° up in the southeast. Mars (m = 0.8) is nearly equidistant from the two bright giant planets, although Mars is below a line that connects Jupiter and Saturn. Mars is 3.3° to the lower left of Jupiter and 3.4° to the upper right of Saturn. The Jupiter – Saturn gap is 6.4°.



Look in the southeast for the Saturn – Mars conjunction about an hour before sunrise.

- **March 31**: One hour before sunrise, Jupiter is over 18° up in the southeast. The Giant Planet is 6.3° to the upper right of Saturn. This morning is the **Saturn – Mars conjunction**! Mars is 0.9° to the lower right of Saturn. The Saturn – Mars gap grows after the conjunction: **Apr. 1**, 1°; **Apr. 2**, 1.4°; **Apr. 3**, 1.9°; **Apr. 4**, 2.5°; **Apr. 5**, 3.1°; **Apr. 6**, 3.7°; **Apr. 7**, 4.3°; **Apr. 8**, 5.0°. This morning the Jupiter – Mars gap is 6.1°.

April 2020

Jupiter and Saturn continue to rise earlier in the morning, now before 3 a.m. daylight time. Jupiter continues to inch toward Saturn. Both planets move through dim star fields. Choose your favorite 5th or 6th magnitude stars in the region and watch the planets approach the stars. Mars, now moving away from Jupiter and just after its conjunction with Saturn, continues its eastward march, widening its gap with the two other Bright Outer Planets.

- **April 2**: Saturn (m = 0.6) rises 3 hours before sunrise. One hour before sunrise, Jupiter (m = −2.2) is nearly 19° in altitude above the southeast horizon. Saturn is about 6° to

Jupiter's lower left. Mars is near Saturn, 1.4° to the Ring Wonder's lower left.

- **April 4**: One hour before sunrise, Jupiter, over 19° up in the southeast, is 0.7° to the upper left of Pluto (m = 14.3) for the first conjunction of three during this apparition of Jupiter. Saturn is 6.0° to the lower left of Jupiter, and Mars is 2.5° to the lower left of Saturn.
- **April 7**: One hour before sunrise, Jupiter, about 20° up in the southeast, is 1.4° to the lower right of 56 Sagittarii (56 Sgr, m = 4.8). Mars (m = 0.7) is 10° to the lower left of Jupiter and over 4° to the lower left of Saturn.
- **April 14**: One hour before sunrise, the moon (21.0d, 55%) is over 20° up in the south-southeast. It is about 7° to the lower right of Jupiter and Jupiter is 5.5° to the upper right of Saturn. Mars, about 16° up in the southeast in central Capricornus, is nearly 9° to the lower left of Saturn.
- **April 15**: One hour before sunrise, the thick crescent moon (22.0d, 45%) is 3.3° below Saturn, 20° up in the southeast. Mars is 10° to the left of the moon. This morning Jupiter is 5.5° to the upper right of Saturn and nearly 15° to the upper right of Mars.
- **April 16**: One hour before sunrise, Mars is 10° to the lower left of Saturn. Mars, over 16° up in the southeast, is 3.8° to the upper right of the crescent moon (23.0d, 36%).
- **April 22**: Jupiter (m = −2.3) rises at 2:00 a.m. CDT, 4 hours before sunrise. One hour before sunrise, Jupiter is nearly 23° in altitude in the south-southeast, 5.2° to the right of Saturn. Mars is in Capricornus, near Theta Capricorni (θ Cap, m = 4.1), over 14° to the lower left of Saturn.
- **April 29**: Saturn rises at 1:50 a.m. CDT, 4 hours before sunrise. One hour before sunrise, Jupiter is over 24° in altitude in the south-southeast, 4.9° to the right of Saturn. Mars continues to move through Capricornus. This morning it is over 18° to the lower left of Saturn, near Gamma Capricorni (γ Cap, m = 3.6).

May 2020

Both planets begin to retrograde this month. Jupiter retrogrades 9.8° along the ecliptic, while Saturn moves 6.6° in its apparent westward movement. Jupiter has a quasi-conjunction with Saturn near midmonth. Jupiter does not pass Saturn, but it moves within 5° as the two planets retrograde.

- **May 10**: Saturn (m = 0.5) stops moving eastward and begins to retrograde, 109° west of the sun. It rises a few minutes after 1 a.m. CDT, nearly 4.5 hours before sunrise. One hour before sunrise, Saturn is nearly 26° up in the south-southeast, 4.7° to the left of bright Jupiter (m = −2.4).
- **May 12**: One hour before sunrise, Saturn is 26° up in the south, 4.7° to the left of Jupiter. The moon (19.3d, 72%) is 3.1° below Jupiter.
- **May 14**: Jupiter's direct motion ends and it begins to retrograde, 117° west of the sun. It rises at 12:30 a.m. CDT, 5 hours before the sun. One hour before sunrise, Jupiter is 26° up in the south, 4.7° to the right of Saturn.
- **May 18**: **This morning is a Jupiter – Saturn quasi-conjunction!** For several previous entries, the separation for Jupiter (m = −2.5) and Saturn has been 4.7°. When fractions of a degree are considered, this morning the planets are closest in a quasi-conjunction, when two planets are within 5° of each other. One hour before sunrise, Jupiter is 26° in altitude in the southern sky with Saturn to its left.
- **May 23**: Jupiter is now rising before midnight CDT. One hour before sunrise, it is 27° up in the south, 4.7° to the lower right of Saturn.

June 2020

This month the planets are rising before midnight and appearing in the southwest before sunrise. They continue to retrograde. Jupiter moves away from Saturn. The apparent gap between them widens to nearly 6° by month's end. The moon passes the pair early in the month.

- **June 8**: One hour before sunrise, the moon (16.6d, 92%), 22° up in the south, is 5.8° to the lower right of Jupiter (m = −2.6). The Giant Planet is 5.0° to the lower right of Saturn (m = 0.4).
- **June 9**: One hour before sunrise, the moon (17.6d, 85%) makes a triangle with the two planets. The moon, 25° up in the south, is 4.8° to the lower left of Saturn (m = 0.3) and 8.9° to the left of Jupiter. The Jupiter – Saturn gap is 5.0°.
- **June 12**: One hour before sunrise, Jupiter, over 25° up in the south-southwest, is 5.1° to the lower right of Saturn. Later that night, Jupiter rises at 10:30 p.m. CDT, about 130 minutes after sunset.
- **June 17**: One hour before sunrise, Jupiter (m = −2.7) is nearly 25° up in the south-southwest. It is 5.3° to the lower right of Saturn. Later that night, Saturn rises at 10:30 p.m. CDT, about 120 minutes after sunset.
- **June 20**: One hour before sunrise, look for Jupiter 1.6° to the lower left of 56 Sagittarii, 23° up in the south-southwest. Saturn is 5.5° to the upper left of Jupiter.
- **June 27**: Jupiter rises at 9:30 p.m. CDT, about one hour after sunset. An hour later, Jupiter is nearly 9° up in the southeast. It is 5.9° to the upper right of Saturn (m = 0.2). By the next morning, about 60 minutes before sunrise, Jupiter is 20° up in the southwest. Saturn is to its upper left.

- **June 29**: As midnight approaches, Jupiter is over 19° up in the south-southeast. Jupiter passes 0.6° to the upper left of Pluto (m = 0.6°). At this hour, Jupiter is 5.9° to the upper right of Saturn as the planetary trio (Jupiter, Saturn, and Pluto) retrogrades.

July 2020

The planets are now appearing in the sky nearly all night. They pass opposition this month, about 7 days apart. As they retrograde, the gap between them continues to widen to nearly 8° by month's end.

- **July 1**: Saturn rises one hour after sunset, about 9:30 p.m. CDT. An hour later, Jupiter is over 11° up in the southeast. Jupiter is 6.1° to the upper right of Saturn. Overnight, the planets move farther west. By one hour before sunrise, Jupiter is 18° up in the southwest, to the lower right of Saturn.
- **July 4**: At 10:30 p.m. CDT, about 2 hours after sunset, the moon (13.9d, 100%) is 15° in altitude above the southeast horizon. It is over 10° to the upper right of Jupiter which is 6.2° to the upper right of Saturn.
- **July 13**: Jupiter (m = −2.8) is at opposition at 8:58 p.m. CDT. As midnight approaches, Jupiter is over 24° up in the south-southeast. The Jupiter – Saturn gap is 6.7°. Jupiter is to the right of Saturn (m = 0.1).
- **July 15**: Pluto is at opposition at 8:12 p.m. CDT. Just before midnight, Pluto is nearly 24° up in the south-southeast, 1.7° to the lower left of Jupiter.
- **July 16**: Jupiter passes 2.9° to the upper left of 52 Sagittarii. Use a binocular to see the planet and the star.
- **July 20**: Saturn is at opposition at 11:28 a.m. CDT. As midnight approaches, Saturn is 25° up in the south-southeast, 7.1° to the left of bright Jupiter (m = −2.7).
- **July 31**: One hour after sunset, the moon (11.4d, 93%), nearly 20° up in the south-southeast, is 12.0° to the right of Jupiter, while Saturn is 7.6° to the lower left of the Giant Planet.

August 2020

The retrograding planets are well up in the east during the early evening hours and setting a few hours after midnight. They end the month over 8° apart. The moon passes the planets twice during the month.

- **August 1**: Four hours before sunrise (about 1:45 a.m. CDT), the moon (11.6d, 94%) is about 13° up in the southwest. It is to the lower right of Jupiter. The moon, Jupiter, and Saturn extend along an 18° arc. In the evening, one hour after sunset, the moon (12.4d, 97%) is 14° up in the southeast, 2.9° to the lower left of Jupiter and 6.7° to the lower right of Saturn.
- **August 2**: Four hours before sunrise, the bright gibbous moon (12.6d, 98%), nearly 19° up in the southwest, makes a pretty triangle with the planetary duo. The moon is 4.2° to the left of Jupiter and 5.2° to the lower right of Saturn (m = 0.2). The planets are 7.7° apart. One hour after sunset, the moon (13.4d, 100%) is about 10° in altitude in the southeast. It is nearly 8° to the lower left of Saturn.
- **August 3**: Four hours before sunrise, the moon (13.6d, 100%), nearly 20° up in the south-southwest, is nearly 10° to the upper left of Saturn. The Ringed Wonder is 7.6° to the upper left of Jupiter, over 11° up in the southwest.
- **August 15**: One hour after sunset, Jupiter, over 21° up in the south-southeast, is 8.2° to the upper right of Saturn.
- **August 25**: One hour after sunset, Jupiter (m = −2.6), over 23° up in the south-southeast, is 8.3° to the upper right of Saturn (m = 0.3). Jupiter sets at nearly 2:30 a.m. CDT.
- **August 28**: Just after midnight, the gibbous moon (9.1d, 75%), over 9° up in the southwest, is 12° to the lower right of Jupiter, while Saturn is 8.3° to the upper left of the Giant Planet. The Ringed Wonder is over 20° in altitude in the south-southwest. In the evening, one hour after sunset, the moon (10.0d, 83%), over 21° up in the south-southeast, is 2.2° to the lower right of Jupiter.
- **August 29**: As the new day begins, the moon (10.1d, 84%), over 15° up in the southwest, is 2.6° to the lower left of Jupiter. In the evening, one hour after sunset, bright Jupiter is nearly 24° up in the south-southeast. The Jupiter – Saturn gap is 8.3°. Saturn is to the lower left of Jupiter. The moon (11.0d, 90%) is 5.7° to the lower left of Saturn.
- **August 30**: Just after midnight, the bright moon (11.1d, 91%), nearly 22° in altitude in the south-southwest, is 6.7° to the left of Saturn.

September 2020

The planets are about one-third of the way up in the southern sky after sunset. Retrograde motion ends for both planets during September and they resume their direct motion. The Great Conjunction is about three months away. Watch Jupiter close the gap.

- **September 5**: One hour after sunset, Jupiter (m = −2.5), nearly 25° up in the south-southeast, is 8.2° to the right of Saturn.
- **September 12**: Jupiter's retrograde ends 117° east of the sun. It is 2.0° to the lower left of Pi Sagittarii. Find them one hour after sunset when the Giant Planet is 25° up in the south. Saturn (m = 0.4) is 8.1° to the left of Jupiter.
- **September 20**: One hour after sunset, Jupiter, nearly 26° up in the south, is 7.8° to the lower right of Saturn.

- **September 24**: One hour after sunset, the gibbous moon (7.6d, 60%), 23° up in the south, is 4.2° to the lower right of Jupiter (m = −2.4). The Jupiter – Saturn gap is 7.7°.
- **September 25**: One hour after sunset, the brightening moon (8.6d, 70%), 23° up in the south-southeast, is 3.7° to the lower left of Saturn. The Jupiter – Saturn gap is 7.6°.
- **September 28**: Saturn's retrograde ends 109° east of the sun. One hour after sunset, the Ringed Wonder is over 26° up in the south, 7.5° to the upper left of Jupiter. With a binocular observe that Saturn is 1.7° to the lower left of 56 Sagittarii.

October 2020

Jupiter and Saturn are now west of the meridian during the early evening hours. They are setting in the southwest before midnight. Jupiter continues to close the gap to Saturn during the month, reducing the separation to less than 5.5° by month's end.

- **October 1**: One hour after sunset, Jupiter is 25° up in the south. It is now past the meridian at this time interval. Jupiter is 7.3° to the lower right of Saturn (m = 0.5).
- **October 10**: Jupiter (m = −2.3) is 90° east of the sun. One hour after sunset, Jupiter is 25° up in the south, 6.8° to the lower right of Saturn.
- **October 13**: Mars (m = −2.6) reaches opposition over 90° from Jupiter. Through a telescope, Mars is 22.3" in apparent diameter.
- **October 17**: Saturn is 90° east of the sun. One hour after sunset, it is 27° up in the south, now past the meridian at this time interval. The Ringed Wonder is 6.3° to the upper left of Jupiter (m = −2.2).
- **October 21**: One hour after sunset, the crescent moon (5.2d, 34%), nearly 20° up in the south-southwest, is over 10° to the lower right of Jupiter. The Jupiter – Saturn gap is 6.0°.
- **October 22**: One hour after sunset, the thick crescent moon (6.2d, 44%), 23° up in the south, makes a nice triangle with Jupiter and Saturn. The crescent is 4.4° to the lower left of Jupiter and 4.2° to the lower right of Saturn. The Jupiter – Saturn gap is 5.9°.
- **October 23**: One hour after sunset, the slightly gibbous moon (7.2d, 55%), 25° up in the south, is 11° to the lower left of Saturn (m = 0.6). The Jupiter – Saturn gap is 5.8°.
- **October 28**: One hour after sunset, Jupiter, nearly 25° up in the south-southwest, is 5.4° to the lower right of Saturn.

November 2020

The planetary duo is in the south-southwest during the early evening hours, setting before 9 p.m. standard time. Jupiter cuts the distance to Saturn in half by month's end. The Giant Planet passes Pluto again for the third conjunction.

- **November 2**: One hour after sunset, Jupiter (m = −2.1), over 24° up in the south-southwest, is 5.0° to the lower right of Saturn.
- **November 7**: One hour after sunset, Jupiter, nearly 24° up in the south-southwest, is 4.5° to the lower right of Saturn.
- **November 8**: One hour after sunset, Jupiter, nearly 24° up in the south-southwest, is 2.8° to the upper left of 52 Sagittarii. Use a binocular to see the star with the planet.
- **November 12**: At the end of evening twilight, Jupiter, 19° up in the southwest, is 0.6° to the upper right of Pluto, for the third conjunction of Jupiter's apparition. At the same time, Jupiter is 4.0° to the lower right of Saturn.
- **November 14**: Jupiter is 60° east of the sun. Find it nearly 23° up in the south-southwest, 3.8° to the lower right of Saturn.
- **November 18**: Look for the crescent moon (3.8d, 18%) over 16° in altitude in the south-southwest. It is 6.8° to the lower right of Jupiter. The Jupiter – Saturn gap is 3.5°. Jupiter is to the lower right of Saturn.
- **November 19**: Saturn is 60° east of the sun. Find it near the crescent moon (4.8d, 28%), one hour after sunset. The moon is over 22° up in the south-southwest, 5.4° to the lower left of Saturn. The Jupiter – Saturn gap is 3.3°.
- **November 24**: One hour after sunset, Jupiter, nearly 21° up in the south-southwest, is 2.8° to the lower right of Saturn.
- **November 26**: Jupiter (m = −2.0) passes 1.8° to the lower left of the dim star 56 Sagittarii. Look for them with a binocular one hour after sunset, when Jupiter is over 20° up in the south-southwest. At this time Jupiter is 2.6° to the lower right of Saturn.
- **November 29**: One hour after sunset, Jupiter is less than 20° up in the south-southwest. It is 2.3° to the lower right of Saturn.

December 2020

Jupiter closes in and passes Saturn so closely (0.1°) that the planetary pair fits into telescopes' eyepieces of modest magnifications, the 2020 Great Conjunction.

- **December 2**: The Jupiter – Saturn gap is 2.0°. One hour after sunset, find bright Jupiter 19° up in the southwest, to the lower right of Saturn.
- **December 7**: The Jupiter – Saturn gap is 1.5°. Look for them over 15° up in the southwest, one hour after sunset. The planets are setting about three hours after sunset.
- **December 11**: The Jupiter – Saturn gap is 1.0°. Look for them about 15° up in the southwest about one hour after sunset. The Jupiter- Saturn gaps until the conjunction: **Dec. 12**, 0.9°, **Dec. 13**, 0.8°; **Dec. 14**, 0.7°; **Dec. 15**, 0.6°, Saturn

moves into Capricornus; **Dec. 16**, 0.5°; **Dec. 17**, 0.4°; **Dec. 18**, 0.3°, Jupiter moves into Capricornus; **Dec. 19**, 0.2°; **Dec. 20**, 0.1°, Jupiter below Saturn.

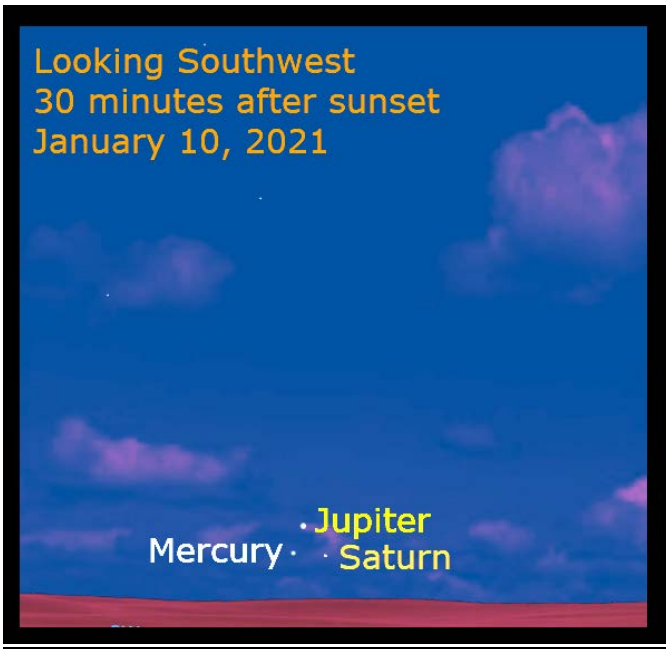
The crescent moon joins the impending Jupiter – Saturn conjunction in the southwest about one hour after sunset.

- **December 16**: One hour after sunset, the crescent moon (2.3d, 7%) joins the planets. It is over 6° up in the southwest, about 5° below Jupiter. The Jupiter – Saturn gap is 0.5°.
- **December 17**: One hour after sunset, Jupiter is over 11° up in the southwest, 0.4° to the lower right of Saturn. The waxing crescent moon (3.3d, 13%) is over 10° to the upper left of Jupiter.
- **December 21**: **Jupiter – Saturn Great Conjunction!** One hour after sunset, Jupiter is about 12° up in the southwest, 0.1° to the lower left of Saturn. They are 30° east of the sun. Both fit into the eyepieces of modest telescopic powers. Jupiter's Galilean Satellites are nicely lined up along the equatorial plane of the planet. Ganymede, Io, and Calisto are east of Jupiter, and Europa is west of the planet. Titan is nicely placed to the northwest of Saturn. After the conjunction, Jupiter moves eastward along the ecliptic, separating from Saturn. Each evening the planetary pair appears lower in the sky. The Jupiter – Saturn gaps after the conjunction: **Dec. 22**, 0.1°, Jupiter left of Saturn; **Dec. 23**, 0.2°, Jupiter is to the upper left of Saturn; **Dec. 24**, 0.3°; **Dec. 25**, 0.4°, **Dec. 26**, 0.6°, **Dec. 27**, 0.7°, **Dec. 28**, 0.8°, **Dec. 29**, 0.9°; **Dec. 30**, 1.0°.
- **December 26**: The planets set two hours after the sun sets.
- **December 30**: One hour after sunset, Jupiter is about 8° up in the southwest.
- **December 31**: Saturn sets at the end of evening twilight.

January 2021

Jupiter and Saturn rapidly fall into twilight as they head toward their solar conjunctions. Mercury joins the view, but clear horizons and some optical help are needed to catch the trio together.

- **January 3**: One hour after sunset, Jupiter is nearly 6° up in the south-southwest. Saturn is slipping lower in the sky at this hour and becoming more difficult to see. Use a binocular to see it 1.5° to the lower right of Jupiter. The Giant Planet sets at the end of evening twilight.
- **January 8**: Saturn sets at Nautical Twilight when the sun is 12° below the horizon.
- **January 9**: Thirty minutes after sunset, Jupiter (m = −1.9), about 7° up in the west-southwest is 2.2° to the upper left of Saturn. Use a binocular to locate them, especially Saturn. Mercury (m = −0.9) makes a pretty triangle with Jupiter and Saturn. It is 1.6° to the lower left of Saturn and 2.8° below Jupiter.



Mercury joins Jupiter and Saturn in the southwest during bright twilight as the outer planets head toward their solar conjunctions.

- **January 10**: Again, this evening, look for Jupiter and Saturn with a binocular about 30 minutes after sunset. The Jupiter – Saturn gap is 2.0°. Mercury is 2.0° to the left of Saturn and 1.8° below Jupiter. The trio makes nearly an equilateral triangle.
- **January 11**: Saturn continues to be difficult to see as it is lower in the west-southwest during early twilight. Look with a binocular to see Jupiter, less than 6° in altitude and

2.4° to the upper left of Saturn. Mercury is 3.1° to the upper left of Saturn and 1.4° to the lower left of Jupiter. Jupiter sets at Nautical Twilight.

- **January 12**: Let's attempt to view Saturn one more evening with optical aid around 30 minutes after sunset. This will be a challenge. Jupiter is about 5° up in the west-southwest, 2.5° to the upper left of Saturn. Mercury is 4.5° to the upper left of Saturn and 2.1° to the upper left of Jupiter.
- **January 14**: Thirty minutes after sunset, with a binocular look for Jupiter about 3° in altitude in the west-southwest. Mercury is 4.5° to the upper left of Jupiter. The young moon (1.8d, 4%) is nearly 7° to the upper left of Mercury.
- **January 16**: Saturn sets at Civil Twilight when the sun is 6° below the horizon.
- **January 20**: Jupiter sets at Civil Twilight.
- **January 23**: Saturn is at its solar conjunction, 9:01 p.m. CST.
- **January 28**: Jupiter is at its solar conjunction, 7:40 p.m. CST. The planets' apparitions of the Great Conjunction of 2020 ends.

The next Great Conjunction is October 31, 2040, when looking at the closest approach. This occurs in the morning sky. One hour before sunrise, Jupiter (m = −1.7) is 1.1° to the lower right of Saturn (m = 0.8). The planets make nearly an equilateral triangle with Theta Virginis (θ Vir, m = 4.4), about 1° to the lower left of Jupiter. Mercury is also in the morning sky, nearly 5° up and 4.0° to the lower left of Jupiter. The crescent moon (25.3d, 19%) stands over 37° to the upper right of Jupiter.

The Great Conjunction of 2020 provides several opportunities to observe Jupiter creep toward Saturn, separate during retrograde, and make its approach and close passing of Saturn before the planetary pair disappears into evening twilight. Mars passes both planets early in their apparitions. Mercury makes a difficult to observe grouping with Jupiter and Saturn after their conjunction as they move toward their solar conjunctions. For those with sufficient apertures, Jupiter provides general guidance to view distant Pluto. Celebrate this once-in-a-generation conjunction!

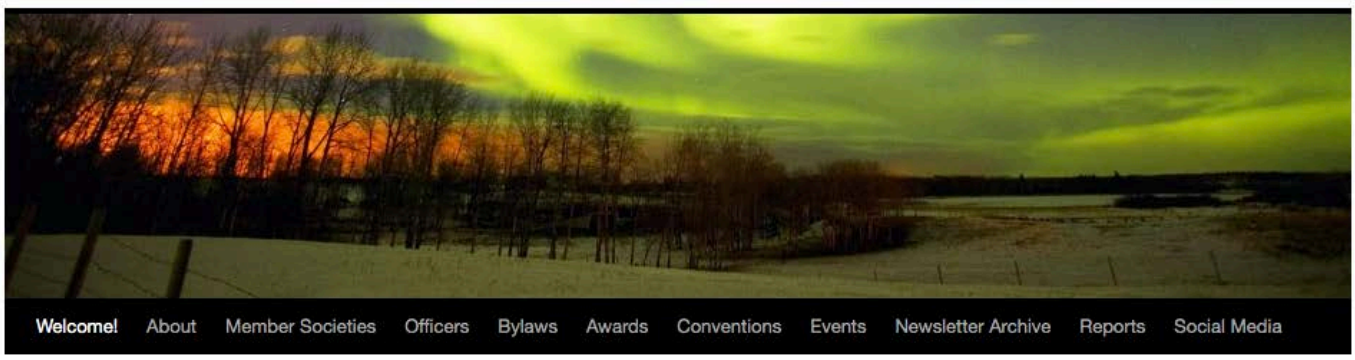
Updating the Regional Council Email Database

The national Astronomical League office only very rarely provides updates in relation to the names and email addresses of affiliates' presidents and Astronomical League correspondents to your Regional Chair – even after repeated requests as experience has sadly shown. It is therefore essential that Regional affiliates inform the Regional Chair of changes in the offices of President and ALCor following elections. Please have someone within your affiliate to email carlwenning@gmail.com with the names and emails of any newly elected president and/or ALCor.

It is important for the NCRAL Chair to maintain the most compete and up-to-date email database of these individuals for the purpose of communicating with every member of the Regional Council. Even if you are uncertain about whether or not the NCRAL Chair has this critical information, please send it to him anyway. Don't let your affiliate fall outside the loop. Better safe than sorry.

NCRAL Website

~ by Jeff Setzer ~



Did you know that NCRAL has its own website? It's true! Point your browser to ncral.wordpress.com and you'll see a central repository for information about our Region and affiliates, the Region's Bylaws, back issues of ***Northern Lights***, and much, much more.

Will the website progress from an occasionally used reference to something more? That's entirely up to you, dear reader. If you have ideas or submissions, contact me at astrosetz@hotmail.com

REGIONAL OFFICER & LEADER CONTACT INFORMATION

Chair: Carl Wenning (2-year term expires Spring 2021, in second term)

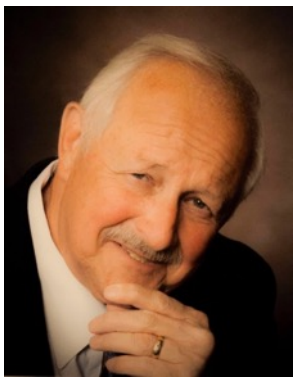
Bio: Carl has been an amateur astronomer since being introduced to the sky by his grandfather during July 1957. Today he is an A.L. Master observer. He has been a member of the Twin City Astronomers of Bloomington-Normal (Illinois) since 1979. He serves as the club's secretary, historian, and editor of ***The OBSERVER*** newsletter for which he received the AL's 2017 Mabel Sterns Newsletter Editor Award. Carl is a former planetarium director and physics teacher educator who remains actively involved in both astronomy and physics education as well as public outreach event.

Contact: carlwenning@gmail.com

Vice Chair: Bill Davidson (2-year term expires Spring 2021, in first term)

Bio: In the days of the Apollo missions, Bill first observed the moon (and sunspots!) with a 50x, 60mm JC Penny's refractor telescope. Not discouraged, 40 years later, he built and observes with a 6.25-inch achromatic doublet objective, f/10, 1600 mm focal length refracting telescope. He recently retired as a college mathematics instructor, has been a member of the Rochester Astronomy Club (Minnesota) for 20 years, and serves as editor of the club's newsletter *RochesterSkies.*

Contact: rochesterskies@outlook.com



Secretary-Treasurer: Roy Gustafson (2-year term expires Spring 2020, in first term)

Bio: Roy got interested in astronomy when visiting the Adler Planetarium in Chicago when he was in 2nd Grade. The stars projected by the Zeiss Projector hooked him and started him on the path of astronomy. He has been active in outreach and has presented astronomy programs to over 20,000 people. He was awarded the Master Outreach award from the Astronomical League. Roy travels with his telescopes and has observed both Transits of Venus and last year the Total Solar Eclipse. Roy also taught astronomy at Black Hawk Junior College in Moline, IL. Roy retired from John Deere & Company after 32 years of service.

Contact: astroroy46@gmail.com

Regional Representative to the Astronomical League: Bill Davidson (Interim 2019-2020)

Contact: rochesterskies@outlook.com

NCRAL Webmaster: Jeff Setzer (appointed)

Bio: Jeff has been an amateur astronomer since 1984 and has been part of the Northern Cross Science Foundation (Wisconsin) since that time. He is a longtime member of their Board of Directors, has held several office positions, and is currently their President. He has completed several Astronomical League observing programs, made his own telescopes and optics, and is a self-described telescope nut. You will often find him at star parties with his 22" Starmaster and TeleVue 85 telescopes.

Contact: astrosetz@hotmail.com

***Northern Lights* Editor-in-Chief:** Jim Gibbs (appointed)

Bio: Jim has been observing the starry skies since he was 10 years old and on and off ever since. His primary affiliation is with the Twin City Amateur Astronomers (Illinois) where he has been a member for 5 years. He is also a member of the Fox Valley Astronomical Society where he has held several leadership positions. He is an avid amateur astronomer who enjoys observing and especially imaging around the TCAA dark sites and travelling around finding other dark sites. He is a software engineer and currently is concentrating in growing his small consulting business.

Contact: jrgibbs@msn.com