NORTHERN LIGHTS

NORTH CENTRAL REGION OF THE ASTRONOMICAL LEAGUE

Winter 2021 – Volume 5, Number 3

INSIDE THIS ISSUE OF *Northern Lights*

NCRAL CHAIR'S MESSAGE

In many ways, 2020 has been a year to remember. Comet NEOWISE graced both morning and evening skies of late summer and was quite a sight to behold. Mars put on quite a show with its opposition on October 13th. Another bright spot was the beautiful December 21st conjunction of Jupiter and Saturn that also garnered a huge amount of public interest.

While the COVID-19 pandemic continued to worsen over the autumn months, there is a silver lining to this dark cloud. Amateur astronomy is about to experience a renaissance. After communicating with several national astronomical suppliers recently, I found that they were being swamped with orders. There appeared to be a large pent-up demand for astronomy-related materials, and this is good news.

Later in this issue, I've included an article about this growing demand and pent-up interest that bode well for the revival of amateur astronomy as the COVIC-19 pandemic subsides. I want to alert everyone – but especially our leaders – to be vigilant for opportunities to grow our hobby.

I'm pleased how during 2020 many of our astronomy clubs' members completed NCRAL's Mini Messier Marathons. Of note are the intrepid observers of *Popular Astronomy Club* who have earned pins and certificates galore. Nothing seems to keep these intrepid observers down. Would that all other astronomy clubs had such active members when it comes to observing! (Perhaps there are, but they aren't telling!)

Looking Ahead to 2021

NCRAL 2021 is scheduled for Friday/Saturday, May 7-8, and I'm looking forward to it. I hope you are too. The convention will be hosted by the *Neville Public Museum Astronomical Society* in De Pere, Wisconsin, just south of Green Bay assuming the pandemic doesn't interfere as it did last spring. I'm already making plans to attend NCRAL 2021 and hope you are doing the same. Later in this newsletter you'll find information about speakers, activities, and facilities. Get this event into your calendar now so you can avoid a schedule conflict.

Don't forget to think about nominations for Regional officers. This year we need to elect Chair and Vice Chair to two-year terms and vote for a Secretary-Treasurer to complete the second year of a two-year term that began in May 2020. You will recall that due to the rescheduling of NCRAL 2020 to NCRAL 2022, we did not have an election for Secretary-Treasurer in 2020. So, I re-appointed Roy Gustafson to continue in office until such time as either he or his replacement can be elected.

I'm willing to run for a third and final term as Chair if need be (limited to three terms under the NCRAL Bylaws, Article II, Section 3), but I am desirous of stepping down. I will gladly relinquish my position if someone else is willing to serve. My growing health and mobility problems make it increasingly difficult for me to continue in office. I will gladly continue serving as newsletter editor if asked. Please don't hesitate to nominate others and even yourself should you be willing to run for office or serve as newsletter editor.

Don't forget that it is also time to start thinking about nominations for the NCRAL Region Award and the NCRAL Newsletter Editor Award. Let's not forget about Mini Grants too. There are two types of grants – membership recruitment and affiliate recruitment. Read about these grants later in this issue. If you'd like to see what can be accomplished with even a $250 grant, look back to the late 2019 and early 2020 issues of ***Northern Lights***. All nominations and applications must be submitted by the March 31st deadline.

The Region is seeking hosts for the NCRAL 2024 convention and beyond, so please consider making an offer

to do so. Details about the process of hosting an NCRAL convention – from initial offer to completion of a post-convention survey – can be found in the *NCRAL Convention Planning Guidelines*.

During mid-November, Astronomical League past president Terry Mann (2006-2010) asked me to give a 10-minute update about NCRAL during a December 5th online national event. It was a pleasure to be involved with this online "live star party." If you weren't aware of this event, be certain to like and follow the Astronomical League Facebook page as well as the NCRAL Facebook page.

On a personal note, I'm happy to say that I have finally completed an on-again, off-again 31-year effort writing ***The Galileo Observer's Guide to the Heavens***. I started this work in 1989 when my infant daughter Sara was hospitalized. I took 4½ months to write the first draft. I resumed the work after finding new inspiration last summer and completed revisions during the 2020 pandemic. I'm now working with a graphic artist and seeking a publisher. I hope to see the book available late in 2021. It's a much-needed guide for the novice telescope user. It employs Galileo as a personal guide to observe the heavens. The book was written with the small and even "toy" telescope owner in mind. It shows that with telescopes no more able than those used by Galileo can be used to make meaningful discoveries.

I hope that you enjoy this issue of ***Northern Lights***. There are many contributors who have worked long and hard to bring this information to you. I thank them for their efforts and encourage you to do the same as well as share this release with your affiliate's members. Only about 450 of some 1,900 NCRAL members have subscribed to receive this newsletter and important announcements via email.

I'm looking forward to seeing each of you at NCRAL 2021. May you have clear skies and a safe and healthy winter!

Carl J. Wenning
NCRAL Chair (2017-2021)
carlwenning@gmail.com

NCRAL Financial Statement Autumn 2020

~ Reported by Treasurer Roy Gustafson ~

Check #	Date	Description	Check Amount	Deposit	Daily Balance	Monthly Balance	
	31-Aug-2020					$8,747.93	Aug
	30-Sep-2020					$8,747.93	Sep
1015	12-Oct-2020	Carl Wenning (reimbursement for pins, mailers, and postage for Mini Marathon)	$79.12			$8,668.81	
	31-Oct-2020					$8,668.81	Oct
	30-Nov-2020					$8,668.81	Nov

NCRAL 2021 May 7-8

~ by Gerry Kocken, Convention Chair ~

NCRAL 2021 is slated for Friday/Saturday, May 7/8. The convention will be hosted by the Neville Public Museum Astronomical Society of Green Bay Wisconsin. The event will be held on the St. Norbert's College Campus in De Pere, Wisconsin. The College's Bemis Center will serve as venue. We have booked the Kress Inn as the hotel of choice. The two buildings are located across Third Street from one another, and both are world-class facilities.

We are still entertaining ideas for possible speakers for the convention. If anyone is interested in making a presentation, please contact me at either (920) 676-6363 or gerryk@kockenwi.com and present a short description of your talk. Individuals or clubs will be able display any equipment or artifacts that they bring. Our plan is to post event details and registration by early January. Stay tune for further details. For now, here is the tentative program.

FRIDAY, MAY 7th

2:00 – 10:00 PM – Registration Opens
3:00 – 7:00 PM – Parmentier Observatory Tour
4:00 – 10:00 PM – Display Area Open
5:00 – 8:00 PM – Swap Meet
8:00 – 9:00 PM – Speaker Jerry Schaefer (*It Came from Outer Space)*

IF THE SKY IS CLEAR, VIEWING CAN BE DONE AT PARMENTIER OBSERVATORY

SATURDAY, MAY 8th

8:00 AM – Registration Opens/Display Area Opens
9:00 – 9:15 AM – Opening Remarks
9:15 AM – William Dirienzo (*Radio Astronomy*)
10:15 AM – Group Photo
10:30 AM – Break
10:45 AM – Richard Jacobsen (*30 Inches, No Ladder, No Trailer*)
11:30 AM – Door Prizes, Announcements
11:45 AM – Lunch
1:00 PM – Brian Chopp (*Solar System Model*)
1:20 PM – Dick Francini (*Astronomical Sketching*)
1:40 PM – Break
2:00 PM – Rodrigo Roesch (*Astrophotography*)
3:00 PM – Deadline: Trivia/Astrophotography Contests
3:00 PM – Registration Closes
3:00 PM - NCRAL Council/Business Meetings
4:00 PM – Door Prizes/Announcements
4:15 PM – Afternoon Session Ends
6:00 PM – Social Hour
7:00 PM – Banquet Dinner
7:45 PM – Alison Kelsman (*ASTRONOMY* Magazine – *Comets or Asteroids? How Color Reveals Solar System History*)
8:30 PM – Awards and Door Prizes
9:00 PM – Convention Closing

CALL FOR 2021 NCRAL NOMINATIONS & APPLICATIONS

CHAIR/VICE CHAIR/SECRETARY-TREASURER/REGION AWARD/NEWSLETTER EDITOR AWARD/MINI-GRANTS

The terms of Regional Chair and Vice Chair end with the next Regional Business Meeting when we elect officers for two-year terms. Our Secretary-Treasurer is serving during the interim until such time as he or his replacement can be found to complete the second year of a two-year term. See this quarter's Chair's Message for details.

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 2021 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 2021, to be held at De Pere, WI, the second weekend of May.

The Rules for nomination are 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 the 2021 Region Award MUST BE RECEIVED by March 31st. Any nominations received after this date will be kept on file for 2022.

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.

and should 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

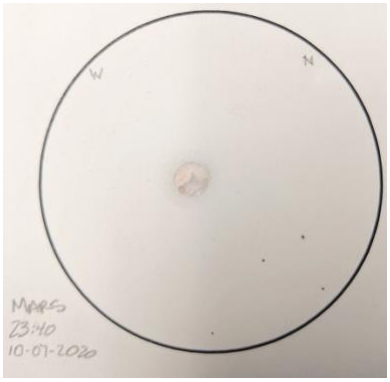
Let's not forget about the **NCRAL Newsletter Editor Award**. It is expected that the next award will be conferred at the NCRAL 2021 meeting. Submission Guidelines: The president of the club/society/association should email a copy of the designated issue of the associated newsletter in Adobe Acrobat 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 2021. *An extension of time to complete the grant activities will be automatically granted for 2021 due to the pandemic, so don't hesitate to apply.*

NCRAL Seasonal Messier Marathon Awards – Autumn 2020

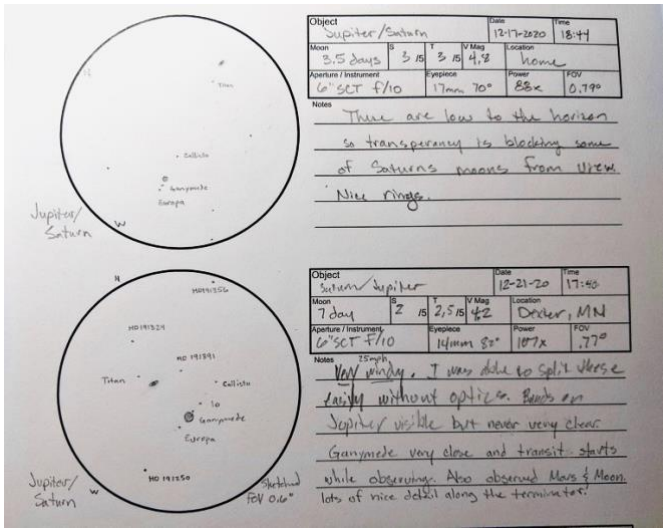
The following individuals have qualified for NCRAL's **Autumn Mini Messier Marathon** certificate and pin. The letter "U" indicates unassisted. Pins and certificates will be distributed shortly. Congratulations to our successful observers!

#6. Tim Stone, TCAA (Oct 6), U
#7. Dale Hachtel, PSC (Oct 6)
#8. Jeff Moorhouse, LAAS (Oct 7), U
#9. Lisa Wentzel, TCAA (Oct 7), U



Jeff Moorhouse (LAAS) recorded his observation of Mars after completing his Autumn Mini Messier Marathon on October 7th – the night of Mars' closest approach to Earth.

I have these from the Great Conjunction. It was clear here on Thursday the 17th but clouds ever since. We drove west to find clear sky on 12-21-2020 and ended up in Dexter, Minnesota 1.25 hours west of here (La Crosse, WI). I have attached my notes and a snapshot at the eyepiece. It was really windy (25mph) and we parked so we could set up just out the back of the truck to use it as a windbreak. I was using a Celestron 6SE but mounted it on a CPC tripod (the one used for the 11" Celestron double fork mount), it still shook like leaf at times. *Jeff Moorhouse*



On October 6th, a group of *Popular Astronomy Club* members (Quad Cities) met at the Paul Castle Observatory to take advantage of clear skies and warm temperatures. Shown are Al Sheidler, Dale Hachtel, Terry Dufek, Alex Holt, Byron Davies, Hugh Holt, Tim Holt, Mary Holt, and Rusty Case. Several Mini Messier Marathon certificates are proudly shown. Image by Al Sheidler.

NOTEWORTHY!

The following NCRAL members were recognized in the December 2020 issue of the Astronomical League's ***Reflector*** magazine for having completed observing programs. Congratulations to all for their many and varied successes!

Binocular Double Star Observing Program:
John Zimitch, Minnesota Astronomical Soc.
Jeffrey S. Moorhouse, LaCrosse Area Astro. Soc.

Carbon Star Observing Program:
Antone G. Gregory, Minnesota Astronomical Soc.

Dark Nebula Observing Program:
Kevin C. Carr, Minnesota Astronomical Society

Deep Sky Binocular Observing Program:
Jean Napp, Iowa County Astronomers

Double Star Observing Program:
Don Gazdik, Minnesota Astronomical Soc.

Lunar I Observing Program:
Don Gazdik, Minnesota Astronomical Soc.

Lunar II Observing Program:
Bradley Nassett, Minnesota Astronomical Soc.

Messier Observing Program:
Trena Johnson, Minnesota Astronomical Society

Sketching Observing Award:
Dick Francini, Neville Public Museum Astro. Soc.

Solar System Observing Program:
Gerald Jones, Minnesota Astronomical Society
Antone Gregory, Minnesota Astronomical Society

Two in the View Observing Program:
Antone Gregory, Minnesota Astronomical Society

Master Observing Progression:
Gerald Jones, Minnesota Astronomical Society
Antone G. Gregory, Minnesota Astronomical Society

Binocular Master Observer:
Antone G. Gregory, Minnesota Astronomical Society

PROFILES IN AMATEUR ASTRONOMY

Continuing with this issue, we shine the limelight on one of our most active Regional members. Hopefully, this will serve to inspire others to get out under the stars and show that amateur astronomy is alive and well despite the suppressing effect of the recent pandemic. This quarter, we spotlight **Alan Sheidler**, president of *Popular Astronomy Club/Quad City Astronomical Society*, both club spanning the Iowa and Illinois border. What follows are Allan's own words in response to a series of questions. If you, dear reader, know of a member who is a shining star worthy of being emulated, please let the Regional Chair know.

Alan Sheidler

Popular Astronomy Club/Quad City Astronomical Society

How long have you been an amateur astronomer, and who or what stimulated your interest?

I remember seeing a meteor in the night sky at a very young age. I vividly remember the impression it made on me. At the time, I was too young to have sufficient verbal skills to be able to question my parents about what it was I saw. Over time, I naturally became more curious about objects in the sky.

My dad gave me a pair of 7x35 binoculars when I was perhaps 8 or 10 years old, which I employed to scan the sky. This served to pique my interest in observing, so my dad gave me a very inexpensive, cardboard tube, 3" reflecting telescope which gave my first good views of Jupiter, Saturn, and other objects. The US space program was also a huge impetus in my developing interests in science and engineering.

My fourth grade English teacher gave me a lot of encouragement. While the other students were doing book reports, she allowed me to do research about space flight and do a talk about my design for a space mission to Mars which ended up taking up one entire class session. She permitted me to use recess time to make cross-sectional drawings of the space craft and orbital diagrams on the chalkboard prior to giving my talk. In high school I joined the school astronomy club.

My physics teacher had a Celestron C8 which we would set up in the football field to observe planets, the moon, and other objects. Basically, I had a lot of encouragement from several folks coupled with my own curiosity and history making accomplishments such as the Apollo program which combined to stimulate my interests.

What sort of telescopes do you and have you owned?

When I was a kid, I had a pair of 7x35 binoculars and a 3" reflecting telescope. Later I purchased a pair of 11x80 binoculars. Several years ago, I purchased a used 10" Meade LX200 telescope which is my primary scope currently.

How long have you been a member of various astronomy clubs?

Popular Astronomy Club: 30 years; Quad City Astronomical Society: 5 years.

Have you earned any awards or honors in the field of amateur astronomy? Please describe.

Astronomical League Observing Program Awards: Double Stars; Planetary Transit Special Awards: 2012 Transit of Venus, 2016 Transit of Mercury, 2019 Transit of Mercury. Outreach Award, Stellar Level. I have also earned the NCRAL Seasonal Messier Observing Awards for Spring, Summer, Fall, and Winter.

With which observing programs are you currently involved?

AL Globular Cluster Observing Club and the AL Planetary Nebulae Observing Club. I am attempting to image these objects using my DSLR camera. It appears I may be able to capture the globulars using 30-second or less "snap shots."

What is your greatest satisfaction in the realm of amateur astronomy?

Observationally, the things that stand out for me are the 2017 solar eclipse, the 2012 Transit of Venus, the 2006 Transit of Mercury, and comets Bennet (1970), Kohoutek (1974), Halley (1986), Hyakutake (1996), Comet Hale-Bopp (1997), and NEOWISE (2020). I also love double stars. Many of them are

easy to recognize visually. Their contrasting magnitudes and colors have provided me many hours of viewing pleasure.

What are your fondest memories as an amateur astronomer?

One of my fondest memories is probably the rebuilding and refurbishing of PAC's Paul Castle Memorial Observatory. This was the club's major summer activity during the pandemic. I am in awe of how club members came together on numerous occasions to completely disassemble the observatory, repaint the dome, pour a concrete pier foundation, reassemble the dome and dome support, install a motorized dome opener and brand new CPC1100 HD telescope. It was unbelievable how well the club worked together and finished the project within a 3-month time frame. I will always remember this as one of the highlights of my time as a member of PAC.

Another memorable event for me was the NCRAL 2019 Convention. This was another example of the Popular Astronomy Club members pitching in and doing a bang-up job organizing a "stellar" astronomy event. When I had the idea that PAC be the host (two years before the conference), I must admit I had some doubts that we were up to the task. But obviously my doubts were unfounded! Our conference had so much content we had to expand the agenda to three days. I guess this proves once again that I have the honor of being involved with a talented and enthusiastic group of amateurs. This event was a landmark in PAC's long history of supporting and popularizing the science of astronomy. I will always cherish this.

What are your goals today as an amateur astronomer?

My goals are to have fun and inspire others to cultivate their own interests in science.

What are your thoughts about professional and amateur astronomy today?

The observational capability of astronomers today could scarcely be imagined when I was growing up. Professionals have access to immense and unbelievably sophisticated telescopes. New types of telescopes using the entire spectrum of electromagnetic radiation are opening new avenues of inquiry. We can even observe black hole collisions using gravitational waves. As these capabilities expand, I expect we will very soon identify exoplanets as candidates for life. Coupling these observational capabilities with the ability to physically visit worlds in our own solar system, especially if we find life, will massively change the way we think of our place in the universe.

Amateur astronomers have access to equipment superior to what was available to professions not too long ago.

CLUB LEADERSHIP FOR OUR TIME

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

Each generation has its undisputed great leaders. When I think of great political and social leaders of the recent past, I think of Winston Churchill, Mahatma Gandhi, Nelson Mandela, Mikhail Gorbachev, Margaret Thatcher, Ronald Reagan, Mother Teresa, Pope John Paul II, and many more. Most leaders are ordinary and that's as it should be. Great leaders are rare and necessarily standout among ordinary leaders, or else they wouldn't be extraordinary (from Latin for "outside the normal course of events").

Some leaders are strong whereas others are weak. Some are proactive whereas others are reactive. Some are at the front of a charge while others lead from behind. Some don't lead at all; rather, they merely occupy office. I have seen all types of leadership styles in my 50 years as a member of various astronomy clubs.

Due to the recent pandemic, it is my considered opinion that significant efforts will soon be needed by our leaders to rebuild amateur astronomy as we have known it. I also believe that there is a pent-up demand for the "services" of the amateur astronomy community. Thus, I am calling for renewed *club leadership for our time!*

So many of the networks that have sustained our clubs in the past have suffered due to the COVID-19 pandemic and its social distancing. Gone are most club meetings, group observing sessions, public outreach events, new member courses, state star parties, Regional conventions, and more. In addition, the memberships of some clubs have dwindled because some members see no sense in paying dues to a club in which they cannot participate. While Zoom and social networking have helped, the bonds that hold the rest of us together have undoubtedly been stressed and weakened as we've learned to do things on our own.

When I recently tried to order astronomical materials from two major suppliers, I was made of aware of the fact that "we are experiencing unusual call volume due to the Coronavirus pandemic, so please be patient." After writing emails to these same suppliers, I was informed that it might take several days for a response "due to high volume." Disappointing personally, this comes as surprisingly good news for amateur astronomy.

With so many people sheltering at home, the number of amateur astronomers is either increasing or that already dedicated amateur astronomers are showing increasing interest in the hobby. Regardless of what is happening, amateur astronomy stands to benefit from the "unusual"

demand and our clubs must prepare to take advantage of this situation.

After the pandemic, it will take good leadership to take advantage of pent-up interest and to rebuild our clubs, our Region, and our hobby. This article serves as both a reminder of the need for good club leadership and what sort of practices are important to effective club leadership. I also propose a new method for qualitatively assessing leadership within a club.

The Practices of Effective Club Leaders

Astronomy club leaders have important roles to play in the maintaining and renewing amateur astronomy regardless of their management styles. As I see it, the roles of club leaders are to *educate, motivate, energize, organize,* and *mobilize* existing club members and *recruit* new members.

*Good leaders **educate** club members about the need to become active participants in amateur astronomy.* From my experience of nearly 50 years in one astronomy club or another, typically only about 20% to 25% of a club membership is actively engaged in the hobby. The majority are satisfied with being passive participants – armchair amateur astronomers if you will. They need to be educated in such a way that they become more aware of the potential within the hobby and provided with avenues for both participation and success.

*Good leaders **motivate** club members to become more socially engaged within their club community.* This usually requires consideration of key human motivations: the need for affiliation, the need for achievement, and the need for influence. All humans have a need for some degree of human companionship, to form personal relationships, and to experience the concern for and by others. The human spirit also craves success by working toward and attaining goals. Every human it seems wants to prove their worth by sharing in responsibility for the greater community. Some aspire to greatness and are motivated by the ability to influence others and direct resources for the common good.

*Good leaders **energize** club members to participate in communal activities.* – Effective leaders make constant efforts to keep all members interested in the activities of the group. These efforts will include frequent email updates, writing messages for newsletters, encouraging participation in observing sessions, recommending readings, and so forth. The crux of energizing a membership is constant communication. Another key factor is energizing the membership by shows of appreciation and recognition of accomplishments.

*Good leaders **organize** activities to engage the club membership.* – Many club members lack the motivation or technical skill to bring others together for a common good. Effective club leaders will organize public and members-only observing sessions, organize interesting and informative membership meetings, and host special events for the public as well as the membership. The goal is to keep the members engaged with rewarding activities.

*Good leaders **mobilize** club memberships***.*** In effect this means to prepare club members for active service. Not only doe effective leaders provide opportunities for service but ensure that members are capable do of doing so. This often means providing club members with educational offerings and hands-on experiences. Clubs can produce guidelines, write procedural manuals, and hold training sessions geared toward specific practices.

*Good leaders **recruit** new members.* A club will not long survive if it doesn't receive a regular infusion of "new blood." Clubs invariably shed members due to a loss of interest, moving away of members, and death to name but a few. Those leaders seeking to recruit new members should carefully examine the recommendations that appeared in the ***Northern Lights*** newsletter last quarter (THE STATE OF OUR ASTRONOMY CLUBS: HEALTHY OR AT-RISK? Autumn 2020, pp 11-14).

Producers and Consumers

I would be remiss if I did not mention something about a club's membership in relationship to its leadership as well. I'm sure that every concerned leader knows this, but it is bears repeating for those club members who are not keenly aware of this critical difference. Every club has members, all of whom can be said to be consumers of its goods and services. Still, there are club members who can be considered primarily producers or primarily consumers.

There is a select group within each club that organizes events, gives talks, hosts meetings, schedules observing sessions, maintains observatories, writes newsletters, produces brochures, assembles meeting minutes, manages finances, donates materially to a cause, and so forth. These are primarily producers. There is another group within a club that tends to consume the offerings of the producers.

In most clubs, the number of consumers tends to outnumber the producers, and this is understandable. In order to be a producer, one must be experienced with amateur astronomy. Those who lead know more than those who follow. To increase the number of those who tend to produce more than they consume, it is incumbent upon a club's leadership to bring consumers up to the point where they can become producers of a club's offerings.

Membership Performance Index

Just how well a club's leadership functions can be assessed qualitatively by what I propose to call the membership performance index. I define it as follows:

$$MPI = \frac{number\ of\ major\ producers}{total\ membership\ number}$$

If the number of major producers in relation to the entire membership is small, then a club's *MPI* will approach zero. If most of a club's membership consists of major producers, then a club's *MPI* will approach one. The *MPI* within a given club is a way of diagnosing the effectiveness of that club's leadership.

While it's difficult to put a precise numerical value on a club's *MPI*, even a casual examination will give some idea of the value. For instance, in a club the active leadership number (and therefore major producers) is about 10. This number includes board members, officers, and chairs of various activities who are leaders, not mere office holders. The club's total membership is about 50. Hence, this club's *MPI* is about 0.2. This is a rather low *MPI*, but not atypical of most clubs I suspect. In my estimation this club's leadership has its work cut out for it.

The purpose of presenting the *MPI* concept is not to evaluate or judge a club's leadership; rather, it is to help a club's membership to see whether something needs to be remedied in terms of how leadership is performing by looking at the number of leaders relative to the membership number. It's only when we look at our club's *MPI* and realize that there is a problem that we are likely to do anything about it.

Resources for Growth

The COVID-19 pandemic has produced lots of problems for astronomy clubs. These problems are not of our making. Sometimes, however, clubs do experience problems of their own making. Regardless of the source, problems affecting amateur astronomy must be addressed effectively if our hobby and clubs are to not only survive but thrive. *Taking charge of the effort to identify and reduce or eliminate problems is the role of a club's leadership.*

I have noted before that are several resources that clubs might use in order to increase the benefits to members. Most important among them are a series of guides, most of which I produced on behalf of the Twin City Amateur Astronomers. The TCAA guides can be downloaded through the following URL: http://tcaa.us/TCAAGuides.aspx. I encourage every reader to take the time now to view this group of 10 guides and determine which might be useful in your efforts to remediate the problems recently brought on by the pandemic. I also encourage readers to think about what good can come from a NCRAL mini grant. Consider looking through past issues of ***Northern Lights*** to see what the TCAA has done with the inaugural membership recruitment mini grant. In my opinion, the results were impressive. Lastly, think about what new initiatives can help your club recover from the pandemic. Each affiliate within NCRAL is an incubator of new ideas. If you discover something that works, be sure to share it with the Region through this newsletter.

Will having such "medicines" cure the "patient?" Not necessarily. If medicines are not taken or taken only sporadically, then they likely will not have their desired effect. Only when the correct medicine is taken systematically until an illness of entirely over will it be effective.

Every Member a Producer?

Now, I do not see every problem that a club encounters as a reason for criticism and recrimination of the leadership. Some situations are like a captain of a ship at sea beset by a storm. The captain is neither the cause of the storm nor responsible for the storm but has the responsibility of helping the crew weather it. When a ship's captain fails to give the crew the proper commands at the appropriate times, then the worsening situation or the sinking of the ship is rightfully the fault of the captain.

As I see it, the problems that an astronomy club faces are things that good leadership will address. As I see, problems present opportunities for growth. Given the problem of the pandemic and the evident pent-up demand for our services, the opportunities for growth seem considerable.

What is needed now is effective leadership. The first step club leaders should talk would be to conduct assessments of their clubs so they can identify areas where potential for growth exists. Once the problems have been identified, then effective solutions need to be worked out, proffered to the membership, and implemented following approval.

Is it too much to hope that every member will also be a producer, that a club's *MPI* will reach a value of unity?

RADIO ASTRONOMY

~ By Tim Stone, Twin City Amateur Astronomers ~

Radio Astronomy has been an interest of mine for nearly as long as my interest in astronomy itself. As a youngster I would look at the huge radio dishes at Jodrell Bank, Arecibo, and Green Bank, and wonder why they called the 200" Hale telescope the largest in the world. Clearly it was not as large as any of those telescopes! Now, all these years later, my fascination with those giant machines and the universe only they can see has not waned.

Some years ago, my lifelong friend and ham radio operator, Jeff Lovell, invited me to go with him to the Dayton

Hamfest. Held every spring, it is one of the largest gatherings of ham radio afficionados in the world. The "flea market" of radio-related parts and equipment covers an area of several football fields. I readily agreed and enjoyed it very much. We've tried to make it to the event every year since then.

While attending the 2017 event, we ran across a table from the Society of Amateur Radio Astronomers (SARA). As I talked to the people attending the table, it became clear to me that radio astronomy was in fact being done by amateurs, and this discovery encouraged me to try my hand at it. Of course, knowledge of radio techniques, concepts, and equipment is necessary to do radio astronomy, so I asked Jeff if he would help me with this quest. He was interested himself, so he agreed, and a project was born.

Sometime after that, Jeff located a 1.4m satellite dish someone in his club, the Central Illinois Radio Club of Bloomington (https://www.qsl.net/w9aml/), was going to throw away. We helped the member achieve that goal, and the dish came to my house shortly thereafter. It had mounting hardware, and with a few judiciously drilled holes and a 2" pipe driven into the ground, the dish was ready for outfitting.

Then spectrography happened. Inspired by the results of Jamey Jenkins' homebuilt spectrometer, the radio telescope project went to the back burner and I jumped into spectrography with both feet. First a Star Analyzer transmission grating, then two (yes, two) LowSpec 3D-printed spectrometers (which Jeff also helped me with), took my attention away from the dish still patiently standing in my back yard.

Once the second LowSpec was finished, we thought it was time to get started on the radio telescope again. He constructed the receiving hardware, and I purchased the needed electronics. Over the course of the last couple months, we finished the instrument, and I'm happy to report that we are receiving clear Hydrogen 21cm radio signals!

The amateur radio and amateur radio astronomy communities have been revolutionized by a relatively recent technology. Software Defined Radio (SDR) is extremely sophisticated radio frequency signal processing hardware, originally designed to enable computers to be Digital Video Broadcasting receivers, essentially turning computers into television sets that receive broadcasts via an antenna rather than over the internet. Once this equipment was released to the market, amateur radio enthusiasts quickly realized it could be used to receive signals in a huge swath of the radio spectrum, typically from AM radio through low microwave frequencies. Software is all that is required to configure the hardware to receive a particular frequency range, along with an antenna capable of responding to signals in that same range. While one might think this hardware would be awfully expensive, a typical SDR looks like a thumb drive, plugs into a computer's USB socket, and costs about $30.

SDR quickly became all the rage in amateur radio, and amateur radio astronomers picked up on it very quickly as well. Where once radio astronomy required many hundreds or even thousands of dollars of specialized equipment, now with a couple hundred dollars, a junk radio dish, some software and some guidance, a bona fide radio telescope is entirely within reach.

My first radio telescope consisted of several components. The first and most visible one is, of course, the dish. It is made of aluminum and is parabolic in figure. Its mount is intended to be equatorial so it can be adjusted to the correct latitude and moved to point at a particular satellite in the geosynchronous band. I've modified it with a 45-degree elbow so it can operate as a transit, moving along the meridian and utilizing the earth's rotation to acquire data along a single line of declination every sidereal day.

Like the mirrors in our optical telescopes, the dish collects photons and concentrates them. Unlike optical telescopes, these photons are turned to electromagnetic signals by a simple antenna inside a structure called the feedhorn. The feedhorn serves to trap the collected photons in a resonant cavity so they can be detected by the embedded antenna, and to shield that antenna from unwanted radio frequency interference. The antenna itself is just a short piece of bare copper wire, ¼ of the desired wavelength. In this case the wavelength is 21cm, so the antenna is 5.25cm long.

The electrical signals from the antenna are sent down a shielded coaxial cable to the next component, a multi-purpose piece of hardware. It has a Low Noise Amplifier (LNA) which strengthens the extremely low-level signal from the antenna, a filter which passes a narrow band of wavelengths around 21cm, followed by a second LNA to further amplify the

signal. I use a SAWbird+ H1m LNA from a US-based company named nooelec (https://www.nooelec.com/store/).

After the LNA/filter/LNA, the amplified signal goes to the Software Defined Radio. For that, I used the NESDR SMArTee V2 SDR, also from nooelec. Together the two pieces of hardware cost me $77, plus tax and shipping. I was in business for the cost of some pipe fittings, metal for the feedhorn, and signal processing hardware.

Nearly a decade ago, the technology industry was revolutionized by another breakthrough development: the development of small, inexpensive Single Board Computers (SBC). The first commercially viable general-purpose SBC, the Raspberry Pi, was released in 2012. It was produced by an open-source not-for-profit foundation in the United Kingdom, with the goal of providing low-cost computing capabilities to underserved populations around the world. Even before they achieved that goal, the rest of the world stood up and took notice. Almost overnight the promise and utility of these computers resulted in back order times of months. Today, Raspberry Pi computers are used all over the place and in all kinds of ways, one of them being Software Defined Radio.

In a radio telescope, any attempt to move the faint signal from one point to another over a coaxial cable results in losing some of that signal. The trick is to digitize that signal as close to the antenna as you can because digital signals can travel long distances with minimal loss. The SDR accomplishes this digitization, but USB itself has distance limits of 25’ or so. A computer to receive the signal digitized by the SDR and turn it into an ethernet signal is needed, as ethernet signals can travel anywhere in the world.

Enter the Raspberry Pi. About the size of a deck of cards, and fully outfitted between $70 and $100, It is small and inexpensive enough to be used in an application where it will not be in the friendly confines of a house, yet powerful enough to handle the signal processing needed to record the signal on a thumb drive. This computer is accessible from my desktop computer in my office, where I can perform other processing on the observations and aggregate them for purposes such as mapping or presentation. As the Raspberry Pi is at the dish, it is housed in a weatherproof enclosure, along with the thumb drive and a power supply.

I affectionately named my first dish "RaDish," a play on "Radio Astronomy Dish." A few months after building RaDish with its 1.4m solid dish, a local amateur radio operator offered me a 3.1m mesh dish that sat unused in his back yard for years. I gladly relieved him of it (who among us would turn down a free 3.1m telescope?) and set about rebuilding it. My granddaughters and I spent a Saturday afternoon repairing the mesh and bolting its sections together. My friend helped me attach the new dish to the mount I used for the 1.4m dish, and then I adapted the feedhorn to mount on the dish feed support. RaDish 3.1m has a much-improved beam width of about four degrees. I am fortunate to have a dish at the upper end of the size amateur radio astronomers typically use. Dishes much larger than this can present challenges related to wind loading and stability.

These simple radio telescopes are perfectly capable of receiving 21cm signals from cold neutral Hydrogen (HI) present in the plane of our galaxy. To "see" this signal, the raw digital signal is averaged and integrated over several minutes. This improves the signal to noise ratio in the same way stacking multiple exposures does this with digital photography. In this case, though, we average hundreds of millions of individual observations. My SDR takes 2,048,000 samples *per second*. I integrate them for three minutes for each single observation. I do this repeatedly, hour after hour, as the earth's rotation continually exposes my telescope to a slightly different patch of sky.

In any astronomical endeavor, data acquisition is only the first step in the observing "pipeline." Radio astronomy is no exception. With the signal from the radio telescope duly recorded, it remains to be processed. My dish is in a city environment, where Radio Frequency Interference (RFI) is everywhere. RFI is a form of light pollution. It floods the environment with unwanted electromagnetic radiation which interferes with radio observing in the same way visible light interferes with visual observing. The effects of RFI must be dealt with as the first step of processing the data into useful results. Software is used to filter RFI from the signal. This processing cannot eliminate the effects of RFI but can reduce it to within a manageable margin of error. After this calibration and filtering, we can apply further statistical operations to enhance the signal to noise ratio, and finally use the result for further study. As a computer programmer, I've had the added pleasure of writing much of the software to do this work for me. There is plenty of free software to do the same things, so the ability to write software is not a requirement to enjoy doing radio astronomy.

A typical observation result is a graph of frequency against Signal to Noise Ratio (SNR), the greater the SNR, the more powerful the signal. This graph changes shape as the earth's rotation sweeps my beam along a line of declination, showing marked increases in signal strength as the Milky Way passes through the beam. In fact, the signal from H1 extends far above and below the plane of our galaxy, as defined visually. This Hydrogen is transparent, and at about 10 degrees K does not emit significant thermal radiation. The only way to detect its presence is using radio telescopes tuned to 1.4204 gigahertz.

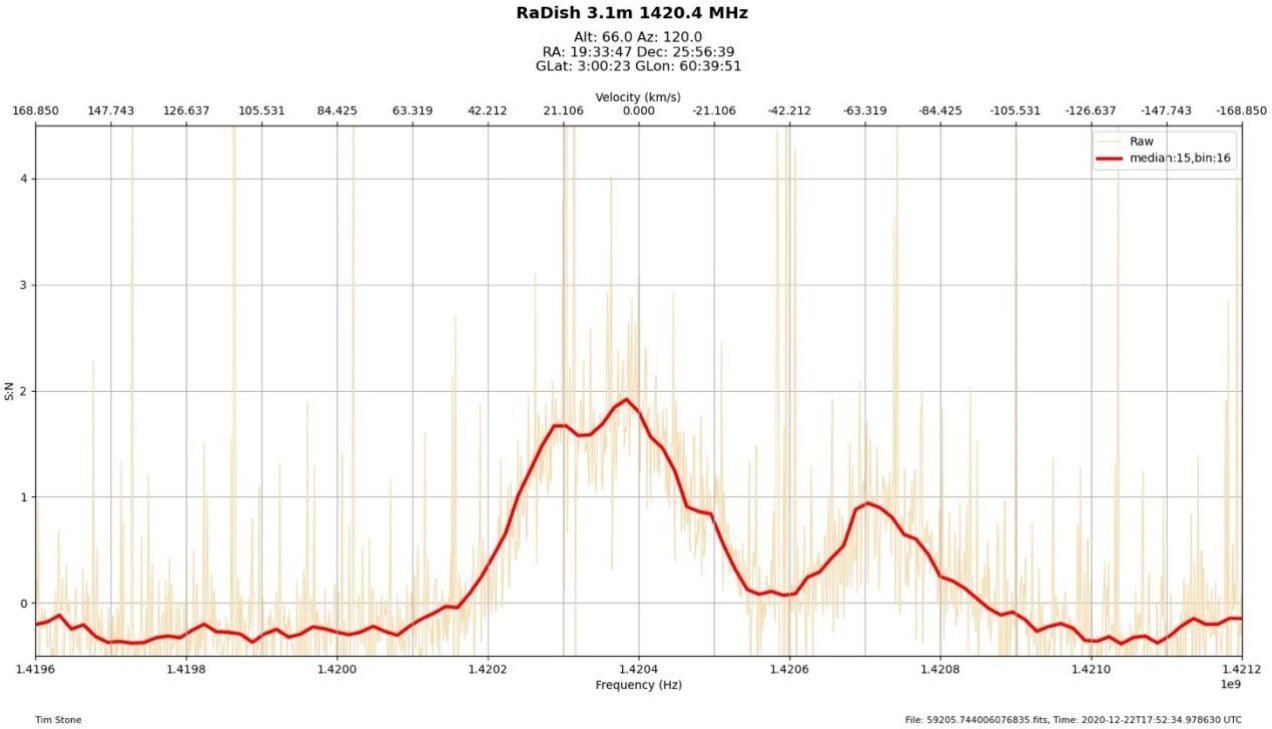
What I see as the plane of the galaxy passes through the middle of my beam is a bump in the otherwise flat, relatively featureless signal. It's not completely featureless, simply because the environment around my house is fairly noisy even at these microwave wavelengths. The HI bump is very noticeable and pronounced enough to be able to do red/blue shift calculations and map the coarse structure of the Milky Way's spiral arms, where most of this Hydrogen exists. In this example, we are looking a little south of Albireo. The raw signal in all its noisy glory is plotted in tan, with the processed

signal superimposed in red. Here we see two signal peaks, one near the rest frequency extending redward, and one blue-shifted to the frequency of 1.4207. The first peak shows Hydrogen at rest relative to us, with a tail that tells us there is also Hydrogen moving away from us. The second peak shows Hydrogen approaching us at about 63 kilometers per second. We use data just like this to map the structure of the Milky Way.

Amateur radio astronomers have used systems even less sophisticated than mine to produce maps of H1 abundance and doppler shifts for the whole sky. They have used those observations to show the orbital speeds observed do not conform to Newtonian orbital mechanics, thus inferring the presence of Dark Matter here in our own galaxy. We have timed pulsars, observed radio galaxies with active nuclei including supermassive black holes, and even "listened" to solar flares. Many such intensely interesting activities are entirely possible with this kind of simple system.

The first time I turned my radio telescope on and pointed it at the zenith, I really expected to see nothing. Surely, I *must* have done *something* wrong, I thought. I must admit I was shocked to see the signal I had anticipated, at exactly the right place and time. My current setup is positioned manually. I must go out to the scope and turn a crank to alter its altitude or turn the whole thing to alter its azimuth. I hope to implement a rotator and actuator system to allow remote control of pointing the dish. Once I can control it remotely, it will be possible to move it to a location with much lower RFI. This would enable more sensitive observations, such as detection of H1 in M31.

After having done radio astronomy for just a few months, I am very inspired and excited to work on my skills and improve my results. Some of my long-term goals include producing my own all-sky Hydrogen map and observing the Crab Nebula pulsar. I hope at some point to acquire a second dish so I can do interferometry; there are amateurs doing this right now. Perhaps I will be one of them one of these days!



2021 Rising and Setting Charts

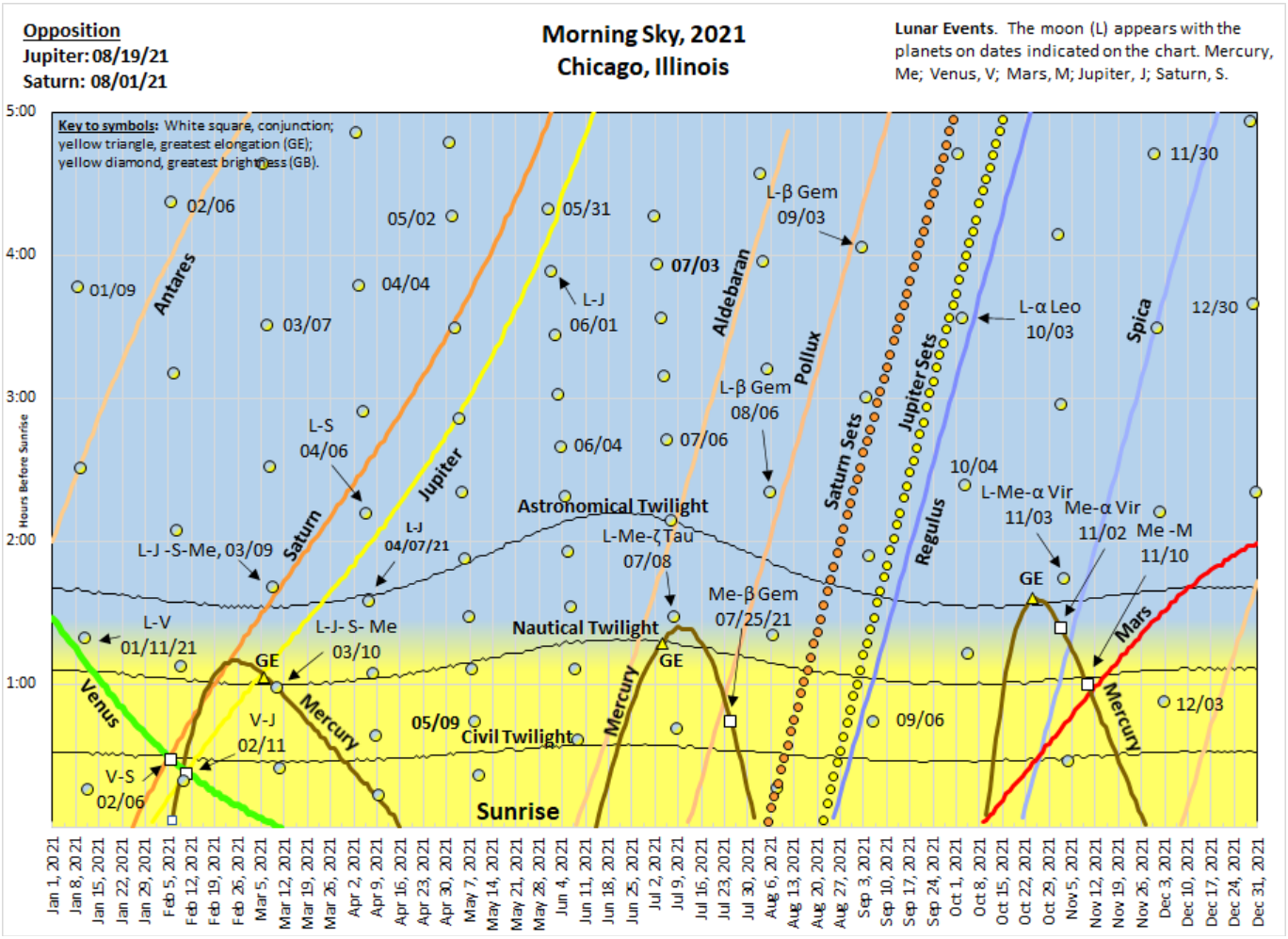
~ by Jeffrey L. Hunt ~

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 graphs display 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 and Saturn. 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 and Saturn rising curves (circles).

It should be noted that when two objects rise or set at the same time intervals after sunset (same clock time), they are not necessarily near each other. It merely means that they rise or set at the same time interval after sunset or rise at the same time interval before sunrise. Since the charts feature objects' activities near the ecliptic, they are likely to be up to 10° apart. For example, on the morning of March 9, 2021, the moon and Saturn rise at nearly the same time interval, 100 minutes before sunrise. The moon rising circle nearly coincides with the Saturn rising line. The waning crescent moon, though is 7.8° to the right of the Ringed Wonder that morning

The charts are calculated from data by the U.S. Naval Observatory, for Chicago, Illinois.



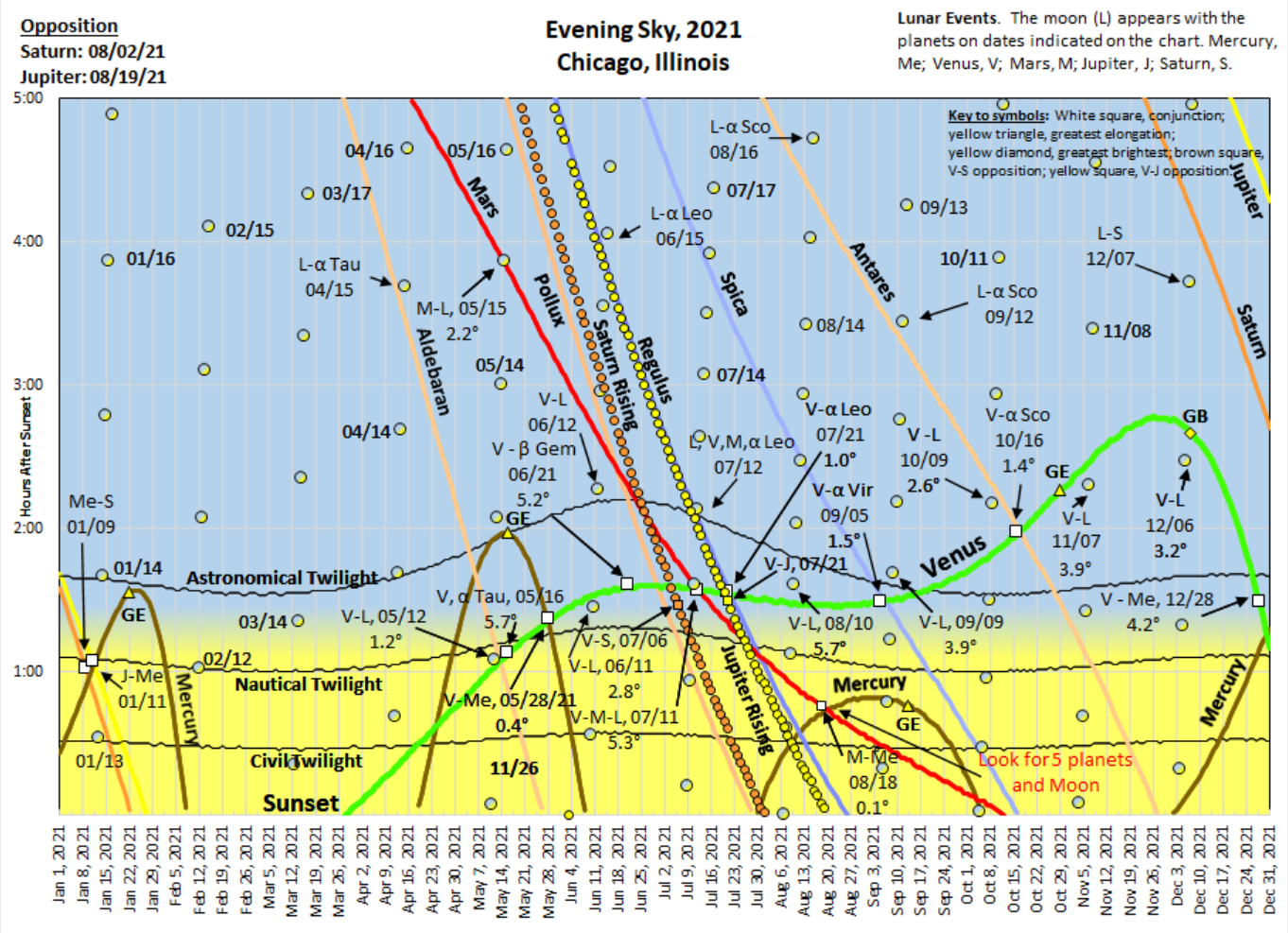
Rising Chart: The year begins with Venus low in the southeast before sunrise. It is on a slow slide into the sun's glare. On New Year's Day, Venus rises after the beginning of morning twilight. As Venus leaves the morning sky, it passes Saturn, Jupiter, and Mercury, as these planets begin new apparitions. While these conjunctions occur during bright twilight and they are near the horizon, you might try a daytime observation of the Venus – Jupiter conjunction on February 11. Venus crosses the meridian about 30 minutes before local noon. Block out the sun with a building or other obstruction to see Venus 0.4° to the lower left of Jupiter. If your telescope has an equatorial mount, practice using your setting circles before the conjunction or look for the planets with a computerized mount. Use a low-power eyepiece to view them together.

As the year progresses, the annual appearances of the bright stars occur, and Mercury makes a summer appearance where it sets at about the time of Nautical Twilight.

For the gap between the Saturn rising and the Saturn sets lines at sunset, from the end of May until the planet's opposition with the sun, Saturn is visible in the sky before sunrise, although it is farther west. After opposition, Saturn sets before sunrise. The same occurs for Jupiter starting during early June.

During the final three months of the year, Mercury makes its best morning appearance as Mars enters the morning sky, after its solar conjunction. They are very low in the east-southeast during bright twilight. The gap is nearly 1.0°.

The year ends with Mars as the lone naked eye planet in the morning sky.



Setting Chart: The evening sky is full of planetary activity with a possible sighting of the 5 naked-eye planets around August 18.

The year begins with Jupiter and Saturn moving toward their solar conjunctions after their historic great conjunction. They have difficult-to-see conjunctions with Mercury.

After Venus and Mercury reenter the evening sky during the spring months, brilliant Venus and Mercury put on a beautiful display with the moon – for a short spell – and Aldebaran from mid-May until month's end.

Mars enters the scene on its way to its solar conjunction. The Red Planet passes Pollux and Regulus. In between Venus overtakes and passes Mars.

Saturn and Jupiter appear in the eastern evening sky and begin to appear with Mars and Venus.

Two pairs of planet oppositions occur during the summer. A planet – planet opposition after sunset signals that one of them is entering the evening sky in the east, while the second is lower in the west. The Saturn – Mars opposition occurs July 1, followed by Venus – Saturn (July 6). By mid-month, Mars and Venus are in the west, while Saturn is low in the east. Next, the Venus – Jupiter opposition (July 21) is followed by the Jupiter – Mars event (July 29). By the first week of August, Jupiter and Saturn are in the east, brilliant Venus is in the west, and Mars is descending into brighter twilight.

On August 18, Mercury passes Mars. While this conjunction is very low in the west, brighter Mercury may guide you to Mars (m = 1.8). If observable, five brightest planets and the gibbous moon are in the sky simultaneously just after sunset.

The Venusian apparition suffers from a poorly inclined ecliptic, initially from a narrow elongation from the sun, and longer twilight hours during the summer months. During the spring and summer, Venus appears farther south along the horizon each evening as it sets before the end of evening twilight. It finally sets in darkness 176 days after its superior conjunction.

Because Venus shows rapid motion against the sidereal background, it passes Aldebaran (May 16), Pollux (June 21), Regulus (July 21), Spica (September 5), and Antares (October 16).

After the Antares conjunction (1.4°), Venus makes a pass through the Teapot of Sagittarius.

During the last quarter of the year, Venus quickly climbs into the evening sky passing its greatest elongation and period of greatest brightness, before it begins its dive between the sun and Earth.

At the end of the year, a widely-spaced conjunction occurs with Mercury.

The moon's closest grouping with Venus (1.2°) occurs on May 12. Look for the moon with Mars (2.2°) three days later. The lunar crescent is part of the western celestial traffic jam beginning July 10 and lasting two more evenings.

The year ends with Mercury, Venus, Jupiter and Saturn within a 40° span in the western sky after sunset.

ASTRONOMICAL LEAGUE 75TH ANNIVERSARY COMING!

The beginning of the Astronomical League dates to 1939 when members of eleven amateur astronomical societies met at the American Museum of Natural History in New York City. Similar meetings followed in Pittsburgh, 1940, Washington D.C., 1941, and Detroit, 1946.

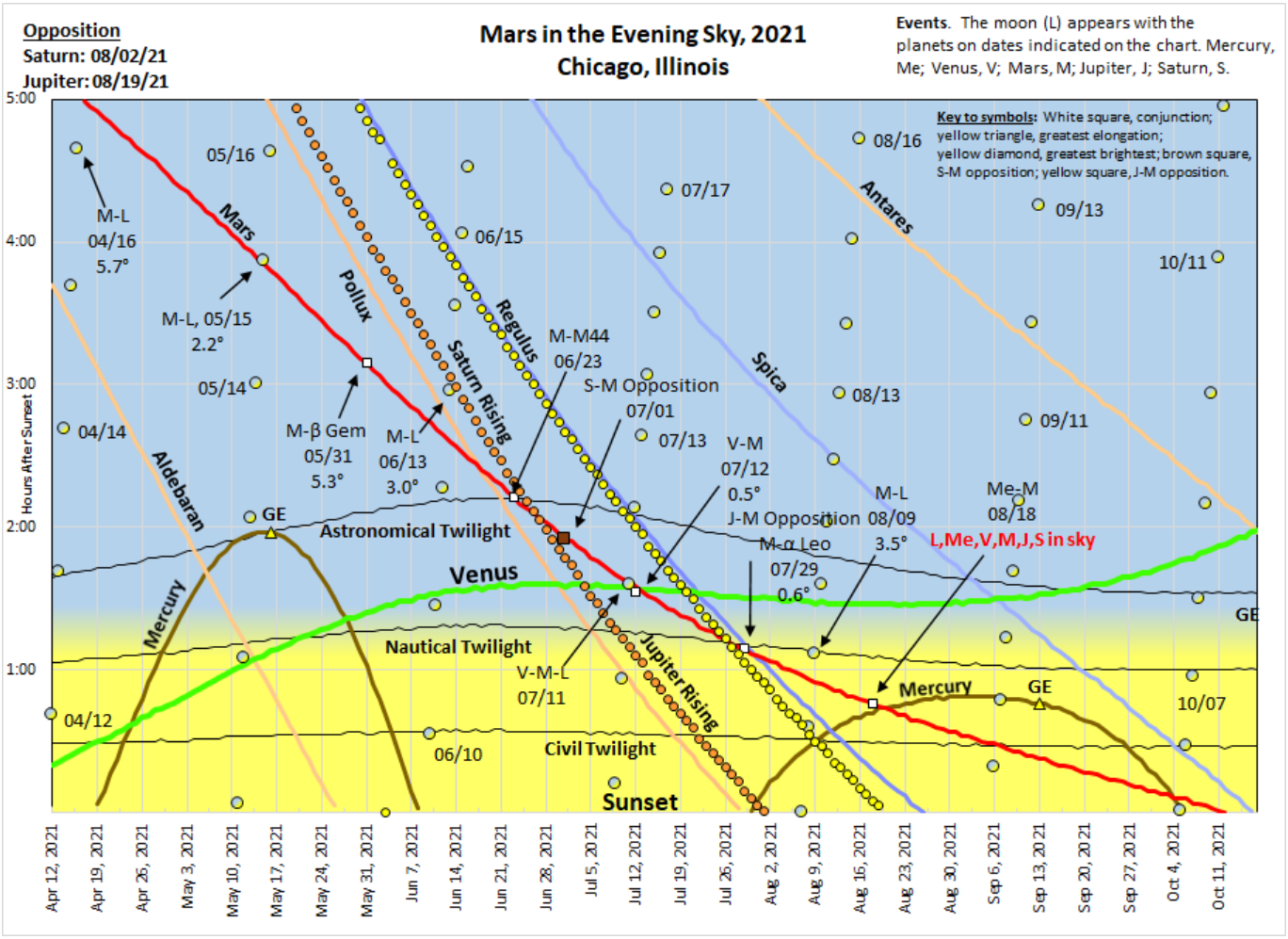
At the last meeting, final plans laid the foundation for a permanent organization constituting a nationwide federation of societies. The next convention took place in Philadelphia, July 4, 1947, where the federation came into being with the adoption of bylaws, the election of officers, and the name *Astronomical League* selected. Shortly thereafter, the entity was incorporated as a non-profit organization.

Source: https://en.wikipedia.org/wiki/Astronomical_League

Purchase your AL 2021 calendar through the Astronomical League Store now for only $13.00 plus S&H. Proceeds will support the ALCon Jr. Conference program.

MARS 2021: UNTIL CONJUNCTION

~ by Jeffrey L. Hunt ~



This chart shows the setting time differences between sunset and the objects' settings. Moonset is indicated by circles. The rising circles of Jupiter and Saturn, display their rising time in the eastern sky after sunset. Data is from the U.S. Naval Observatory.

After its bright opposition and end of its retrograde, Mars renewed its eastward march through Pisces. As 2021 begins, the planet is near Pi Piscium heading toward Aries. During late February it begins a trek through Taurus, passing between the Pleiades and the Hyades. The planet rapidly dims and decreases in size as the space between Mars and Earth increases. By the end of May during evening hours, Venus and Mars appear in the west. Venus is beginning its evening apparition as Mars is lower in the west each evening. Although not at an ideal time or altitude, Mars moves through the Beehive cluster (M44) during late June and toward a conjunction with Venus on July 12. Meanwhile, Saturn and Jupiter enter the evening sky with Mars and Venus. Saturn is at opposition with Mars (Saturn rises as Mars sets) on July 1, followed by the Jupiter – Mars opposition on August 8. Meanwhile, Mars continues to set earlier. At the Jupiter – Mars opposition, the Red Planet sets about the time of Nautical Twilight. The apparition concludes with a conjunction of Mars and Mercury, one of the closest in recent years, even closer than the recent Jupiter – Saturn conjunction. The five bright planets are in the sky along with the moon, but this is a challenging observation.

The chart above shows the bright stars near the ecliptic, bright planets, and the moon setting in the western sky after sunset beginning April 17, 2021, when Mars sets 5 hours after sunset, until Mars reaches its conjunction with the sun. The chart shows the difference in setting time between sunset and the setting time of the object. The moon's setting times

are indicated by circles. Conjunctions of Mars with other stars are noted with white boxes. Close groupings (less than 6° of separation) of Mars with the moon are included. Mercury's greatest elongations are displayed with yellow triangles and the letters "GE." The three phases of twilight are displayed as well.

Saturn's rising time (in the east), as a difference with sunset, is indicated by circles and well as Jupiter's rising. When the planets rise at sunset, they are at opposition. In the evening sky, the two planets become easier to see in the sky together.

The graphs are computed and plotted with raw data from the U.S. Naval Observatory for Chicago, Illinois.
In the daily notes, information at the beginning of the note indicates the planet's apparent magnitude, apparent diameter in arcseconds, and the planet's distance from Earth. The beginning notes are for one hour after sunset.

January – February: From Pisces to Aries

Bright Mars starts the evening high in the southeast in Pisces. It moves eastward toward Aries and crosses into the constellation early in the month. The brightest stars of Aries are farther away from the ecliptic than we might expect, as Mars passes nearly 9° from Hamal late in the month. By mid-February, the annual westward parade of the constellations carries Mars to the southwest during the early evening.

- **January 1**: (−0.2, 10.3", 0.91AU) Mars – over 55° in altitude in the southeast – is 1.1° to the lower left of Pi Piscium (π Psc, m = 5.5).
- **January 5**: (−0.1, 9.9", 0.94AU) Mars moves into Aries. Over 57° in altitude in the south-southeast, the planet is 7.3° to the lower left of Gamma Arietis (γ Ari, m = 3.9).
- **January 13**: (0.1, 9.2", 1.02AU) Mars passes 6.0° to the lower left of γ Ari. Look for the planet and the star over 60° up in the south-southeast.
- **January 15**: (0.1, 9.0", 1.04AU) Over 60° up in the south-southeast, the Red Planet passes 7.3° to the lower left of Beta Arietis (β Ari, m = 2.6).
- **January 20**: (0.2, 8.6", 1.08AU) Nearly 63° in altitude in the south, the moon (7.8 days past the New phase, 51% illuminated) is 7.0° to the lower right of the planet.
- **January 23**: (0.3, 8.4", 1.11AU) Over 63° up in the south, Mars passes 8.7° to the lower left of Hamal (α Ari, m =2.0).
- **February 12**: (0.7, 7.2", 1.31AU) Over 64° up in the south-southwest, Mars passes 2.8° to the lower left of Epsilon Arietis (ε Ari, m = 4.6).
- **February 16**: (0.7, 6.9", 1.35AU) Over 63° in altitude in the southwest, Mars passes 0.4° to the lower left of Eta Arietis (η Ari, m = 2.8). The planet is also 9.3° to the lower right of Alcyone (η Tau, m = 2.8), the brightest star in the Pleiades star cluster (M45).
- **February 18**: (0.8, 6.8", 1.37AU) About 63° up in the southwest, Mars is 3.8° to the upper right of the moon (7.2d, 43%).

February – April: Mars Traverses Taurus

Mars moves into Taurus during late February as the planet approaches the Pleiades. The planet passes the cluster with nearly a 3° gap on March 4. This occurs when Taurus in higher in the west-southwest. Taurus is rich with field stars. Locate your favorite stars and watch the planet pass them. As Mars moves through Taurus, it loses 0.7 magnitude of brightness and over 25% of its angular diameter.

- **February 23**: (0.8, 6.6", 1.42AU) Mars moves into Taurus. Look nearly 62° up in the southwest. It is 5.6° to the lower right of Alcyone. Mars closes in for a conjunction with the star cluster. Gaps with Alcyone until the conjunction: **02/24**, 5.1°; **02/25**, 4.6°; **02/26**, 4.1°; **02/27**, 3.7°; **02/28**, 3.3°; **03/01**, 3.0°; **03/02**, 2.7°; **03/01**, 2.6°.
- **March 4**: (1.0, 6.2", 1.50AU) Nearly two-thirds of the way up in the west-southwest, Mars is 2.6° to the lower left of Alcyone. The gaps increase after the conjunction: **03/05**, 2.7°; **03/06**, 2.9°; **03/07**, 3.2°; **03/08**, 3.6°; **03/09**, 4.0°; **03/10**, 4.5°; **03/11**, 5.0°.
- **March 7**: (1.0, 6.1", 1.53AU) Over 58° in altitude in the west-southwest, Mars passes 0.5° to the left of 32 Tauri (32 Tau, m = 5.6).
- **March 8**: (1.0, 6.1", 1.54AU) Mars passes between Aldebaran (α Tau, m = 0.8) and Alcyone. The planet is over halfway up in the west-southwest, 3.6° to the upper left of Alcyone and 9.9° to the lower right of Aldebaran.
- **March 9**: (1.0, 6.0", 1.56AU) Mars – 57.0° up in the west-southwest – passes 0.3° to the lower right of 37 Tauri (37 Tau, m = 4.3).
- **March 13**: (1.1, 5.9", 1.59AU) About 56° up in the west-southwest, Mars passes 7.2° to the upper right of Gamma Tauri (γ Tau, m = 3.6). The star is in the Hyades star cluster.
- **March 14**: (1.1, 5.8", 1.60AU) Over 55° in altitude in the west-southwest, Mars passes 2.2° to the upper right of Omega Tauri (ω Tau, m =4.9). The planet is below a line that connects Aldebaran and extends through Epsilon Tauri (ε Tau, m = 3.5). Tomorrow, Mars is on that line.
- **March 18**: (1.1, 5.7", 1.64AU) Nearly 54° in altitude in the west-southwest, Mars passes 4.0° to the upper right of ε Tau. Within the starfield, the planet is 0.8° to the upper

right of Kappa Tauri (κ Tau, m = 4.2) and 0.3° to the upper right of Upsilon Tauri (υ Tau, m = 4.2).

- **March 19**: (1.2, 5.7", 1.65AU) Over 53° up in the west-southwest, Mars is 3.2° to the lower right of the moon (6.6d, 35%).
- **March 20**: (1.2, 5.6", 1.66AU) About 53° in altitude in the west-southwest, Mars passes 6.9° to the upper right of Aldebaran. This evening the planet is nearly 10° to the upper left of Alcyone.
- **March 24**: (1.2, 5.5", 1.70AU) Mars – over 51° in altitude in the west-southwest – is 0.7° to the upper right of Tau Tauri (τ Tau, m = 4.2).
- **April 1**: (1.3, 5.3", 1.77AU) Less than 50° in altitude in the west, Mars passes 2.6° to the upper right of Iota Tauri (ι Tau, m = 4.6)
- **April 11**: (1.4, 5.1", 1.86AU) About halfway up in the west, Mars passes 3.9° to the lower left of Elnath (β Tau, m = 1.6), the Northern Horn of Taurus.
- **April 12**: (1.4, 5.0", 1.87AU) Nearly 44° up in the west, Mars is below a line from Elnath to Zeta Tauri (ζ Tau, m = 3.0). The planet is 4.0° to the lower left of Elnath and 3.9° to the upper right of ζ Tau, the Southern Horn of Taurus.
- **April 13**: (1.4, 5.0", 1.88AU) About 43° in altitude in the west, Mars is above the line that extends between the horns of Taurus. At this time the planet is 2.7° to the upper right (north) of the Crab Nebula (M1, NGC 1952). With an equatorial mount, use lower power, start at the planet, and move the telescope south to the nebula.
- **April 16**: (1.4, 4.9", 1.90AU) About 42° up in the west, Mars – above the line that extends between the Bull's horns – is 5.7° to the upper left of the crescent moon (5.0d, 20%).
- **April 17**: (1.5, 4.9", 1.91AU, 249m) Nearly 42° up in the west, Mars is 5.8° to the lower right of the moon (6.0d, 29%). **This is the first day plotted on the setting chart. The daily data now includes the planet's setting time interval measured in minutes after sunset.**

April – June: Through Gemini

The Red Planet is now distinctly dimmer to the eye and much smaller in a telescopic eyepiece than it was at the beginning of the year. The planet is less than halfway up in the west as the stars become visible in the evening. Mars continues its eastward march through Taurus' and Gemini's rich star fields. On April 26, Mars passes near the star cluster M35. On May 15, the moon pairs with Mars beneath Castor and Pollux. This is the closest grouping of the planet and the moon during the interval of this summary. Venus is appearing low in the western sky as it sets at Nautical Twilight late in May. Mars reaches Pollux at May's end.

- **April 24**: (1.5, 4.8", 1.97AU, 283m) Over 38° up in the west, Mars is in Gemini, 3.6° to the lower right of Eta Geminorum (η Gem, m =3.3).
- **April 26**: (1.5, 4.7", 1.99AU, 278m) Nearly 38° up in the west, Mars is 0.6° to the upper right of the star cluster M35 (NGC 2168).
- **April 29**: (1.5, 4.6", 2.01AU, 271m) Over 36° in altitude above the western horizon, Mars passes 2.3° to the upper right of η Gem.
- **May 2**: (1.6, 4.6", 2.03AU, 263m) Nearly 35° up in the west, Mars passes 2.2° to the upper right of Mu Geminorum (μ Gem, m = 2.8).
- **May 9**: (1.6, 4.5", 2.09AU, 246m) Over one-third of the way up in the west, Mars passes 0.6° to the lower left of Epsilon Geminorum (ε Gem, m = 3.0).
- **May 15**: (1.7, 4.4", 2.14AU, 231m) Less than 30° in altitude in the west, Mars is 2.2° to the upper left of the moon (4.3d, 16%).
- **May 16**: (1.7, 4.4", 2.15AU, 228m) Nearly 29° up in the west, Mars is 0.1° below Omega Geminorum (ω Gem, m = 5.2). Mars – to right of a line from Castor (α Gem, m =1.6) to Gamma Geminorum (γ Gem, m = 1.9) – is 10.6° to the lower left of Castor and 9.5° to the upper right of γ Gem.
- **May 17**: (1.7, 4.4", 2.15AU, 226m) About 28° up in the west, Mars is to the left of a line that extends from Castor and γ Gem. Mars is 10.3° to the lower left of Castor and 9.8° to the upper right of γ Gem. Mars is 0.5° to the upper left of ω Gem.
- **May 22**: (1.7, 4.3", 2.19AU, 212m) Nearly 26° in altitude in the western sky, Mars is between Pollux (β Gem, m = 1.2) and γ Gem. Mars is 7.5° below Pollux and 11.8° above γ Gem.
- **May 23**: (1.7, 4.3", 2.20AU, 210m) About 25° up in the west, Mars passes 1.5° to the upper right of Delta Geminorum (δ Gem, m = 3.5).
- **May 24**: (1.7, 4.2", 2.20 AU, 207m) Mars is about 25° up in the west. It passes 4.3° below Iota Geminorum (ι Gem, m = 3.8).
- **May 28**: (1.7, 4.2", 2.23AU, 197m) Mars – less than 25° altitude in the west – passes 3.8° to the lower left of Upsilon Geminorum (υ Gem, m = 4.0).
- **May 31**: (1.7, 4.2", 2.25AU, 189m) Over 20° up in the west-northwest, Mars passes 5.3° to the lower left of Pollux.
- **June 8**: (1.8, 4.1", 2.30AU, 169m) Mars moves into Cancer. The Venus – Mars gap is about 20°. Mars is

over 18° in altitude in the west-northwest, while Venus is about 5° in altitude.

June: Mars and the Crab

Now starting the evening less than one-third of the way up in the west-northwest, Mars moves through Cancer. While in a very unfavorable altitude in the western sky as night falls, Mars appears in the middle of the Beehive cluster (M44) on June 23. Venus and Mars are converging toward a conjunction. Jupiter begins to appear in the east before Mars sets. By the end of the planet's time in Cancer, it is nearly 5° from Venus.

- **June 10**: (1.8, 4.0", 2.31, 164m) Mars, over 17° up in the west-northwest passes 3.1' (arcminutes) from Mu Cancri (μ Cnc, m = 5.3).
- **June 12**: (1.8, 4.0", 2.33AU, 159m) Mars is 9.8° to the upper left of the crescent moon (2.6d, 6%). The moon is 8.4° to the upper left of Venus and 4.5° to the lower left of Pollux. The Venus – Mars gap is 18.0°.
- **June 13**: (1.8, 4.0", 2.33AU, 156m) Mars, about 16° up in the west-northwest, is 3.0° below the crescent moon (3.6d, 12%).
- **June 17**: (1.8, 4.0", 2.36AU, 147m) Mars, nearly 15° up in the west-northwest, is 15.0° to the upper left of Venus. Mars is 1.6° to the lower right of Eta Cancri (η Cnc, m = 5.3). Venus appears 6.9° below Pollux.
- **June 20**: (1.8, 3.9", 2.38AU, 140m) Mars, over 13° in altitude in the west-northwest, passes 0.3° to the lower left of η Cnc. The Venus – Mars gap is 13.2°.
- **June 23**: (1.8, 3.9", 2.39AU, 1.33m) Mars is 12.0° up in the west-northwest. The planet appears in the Beehive Cluster (M44, NGC 2632). The sky is nearing mid-twilight, but it is bright. This is not the ideal observing setting for the star cluster, as Mars sets at the end of evening twilight, 133 minutes after sunset. The Venus – Mars gap is 11.4°.
- **June 24**: (1.8, 3.9", 2.40AU, 1.30m) Mars – over 11° up in the west-northwest – is below a line from Delta Cancri (δ Cnc, m = 3.9) to Gamma Cancri (γ Cnc, m = 4.6). Mars is 1.3° to the upper right of δ Cnc. The Venus – Mars gap is 10.8°.
- **June 25**: (1.8, 3.9", 2.40AU, 128m) Over 11° in altitude in the west-northwest, Mars is above a line from γ Cnc to δ Cnc. The Red Planet is 1.1° to the upper right of δ Cnc. The Venus – Mars gap is 10.3°.
- **July 1**: (1.8, 3.8", 2.43AU, 115m) This is the Saturn – Mars opposition. Saturn rises as Mars sets. While Mars appears lower in the sky, begin looking for Venus, Mars, and Saturn after sunset. After an evening opposition of two planets, they are soon visible in the sky simultaneously. One is in the eastern sky, the other in the west. The Venus – Mars gap is 6.7°.

July – August: From Cancer in Leo, Conjunctions and Five Planets

The summary shifts the description to 45 minutes after sunset. During early July, Venus dramatically overtakes and passes Mars. This occurs about 10° above the west-northwest horizon. Venus quickly moves away from Mars. By mid-July, after the Saturn – Mars opposition, three planets are visible across the sky. Mars is now setting during twilight and a binocular is necessary to observe interesting events near the western horizon. Mars passes Regulus (July 29) and Mercury (August 18). The observing challenge on August 18 is to see all five planets and the gibbous moon simultaneously. Mars is only 2° in altitude! Observing this is an extreme challenge and likely impossible to find Mars at this altitude. I have observed Venus and Sirius near the horizon, but with the planet's apparent magnitude (1.8), I am likely overstating this opportunity.

- **July 4**: (1.8, 3.8", 2.45AU, 110m) **The time interval shifts to 45 minutes after sunset**. Mars is over 10° in altitude in the west-northwest. The Venus – Mars gap is 4.9°. The gaps until the Venus – Mars conjunction: **07/05**, 4.4°; **07/06**, 3.8°; **07/07**, 3.2°; **07/08**, 2.6°; **07/09**, 2.0°; **07/10**, 1.5°, Mars moves into Leo.
- **July 11**: (1.8, 3.8", 2.48AU, 97m) Mars is over 8° in altitude, the Venus – Mars gap is 0.9°. Venus is to the right of Mars. The crescent moon (2.0d, 4%) is 5.3° to the lower right of Mars.
- **July 12**: (1.8, 3.8", 2.48AU, 95m) Mars is over 8° up in the west-northwest. The Venus – Mars gap is 0.5. Venus is to the upper right of Mars. The moon (3.0d, 9%) – over 14° in altitude in the west – is 6.7° to the upper left of Venus. The gap increases after this conjunction: **07/13**, 0.5°; **07/14**, 1.0°; **07/15**, 1.5°; **07/16**, 2.1°; **07/17**, 2.6°; **07/18**, 3.2°; **07/19**, 3.8°; **07/20**, 4.6°.
- **July 21**: (1.8, 3.7", 2.52AU, 81m) Mars is only 4° up in the west-northwest 5.0° to the lower right of Regulus. Venus is 4.9° to the Red Planet's upper left. The brilliant planet is 1.0° to the upper right of Regulus. The gaps until the Mars – Regulus conjunction: **07/22**, 4.4°; **07/23**, 3.8°; **07/24**, 3.1°; **07/25**, 2.5°; **07/26**, 1.9°; **07/27**, 1.3°; **07/28**, 0.8°.
- **July 27**: (1.8, 3.7", 2.54AU, 71m) Mars sets at Nautical Twilight, 71 minutes after sunset.
- **July 29**: (1.8, 3.7", 2.55AU, 69m) Mars – only 3° up in the west-northwest – is 0.6° to the upper right of Regulus.

Jupiter and Mars are at opposition. Jupiter rises as Mars sets.

- **August 9**: (1.8, 3.6", 2.59AU, 55m) Thirty minutes after sunset, use optical help to locate Mars – 4° up in the west – 3.5° to the lower left of the razor-thin crescent moon (1.5d, 2%).
- **August 18**: (1.8m, 3.6", 2.60AU, 46m) Thirty minutes after sunset, Mars – about 2° up in the west – is 0.1° to the upper left of Mercury (m = −0.5). In Jean Meeus' book *Astronomical Tables of the Sun Moon and Planets*, this conjunction is 21st on his list of "Close Planetary Conjunctions" from 2013 to 2039. It is interesting to note that the great conjunction of 2020 is not on the list of the 25 closest conjunctions of this time span. If you can locate them at this time, all five planets and the gibbous moon are visible simultaneously. This is clearly a challenge to find Mars at this altitude. Bright Mercury can guide you to Mars.
- **September 6**: Mars sets at Civil Twilight.
- **October 7**: Mars is at its solar conjunction.

The Red Planet begins an apparition that carries it to its opposition on December 8, 2022. At that time, the planet (m = −1.9) is in Taurus, 9.6° to the upper left of Aldebaran and 12.0° to the upper right of a bright moon (15.1d, 99%).

Future NCRAL Conventions

During NCRAL's annual business meeting the Region receives offers for hosting upcoming conventions. The following affiliates have agreed to hosting future conventions. We are in need for hosts for 2024 and the years beyond. It's never too early to start planning to host.

- 2021 De Pere, WI: Neville Public Museum Astronomical Society (May 7/8)
- 2022 Port Washington, WI: Northern Cross Science Foundation (dates TBA)
- 2023 Bloomington-Normal, IL: Twin City Amateur Astronomers (May 12/13 tentative dates)
- 2024 **OPEN**

If your club has never hosted an NCRAL Regional convention, please consider doing so in 2024 or later. While hosting a Regional Convention 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 guide. 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 was developed by experienced hosts of NCRAL conventions in conjunction with one future host who asked lots of excellent questions. To download 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.

NCRAL Seasonal Messier Mini Marathon Observing Program

Don't overlook or forget about the NCRAL Seasonal Messier Marathon! The Seasonal Messier Marathon observing program is NCRAL's introduction to viewing the Messier objects. This program is intended to serve as motivation to get NCRAL-affiliated members out under the stars to observe.

The program permits the use of goto telescopes to find the objects and, as such, the program must not be taken as proof of observing prowess. NCRAL will permit Astronomical League's Messier observing program to serve that purpose. Still, for those who have asked for some sort of demarcation, NCRAL observing certificates will hence forth include the words "manual" or "assisted." Certificates and pins are now being distributed on the equinoxes and solstices along with ***Northern Lights***.

Up-to-date details about the Region's four observing program and helpful observing record sheets can now be found on the NCRAL website: https://ncral.wordpress.com/awards/. Below are the seasonal observing lists followed by some helpful observing notes.

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, 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)

OBSERVING NOTES:

- ***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, 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 by the March equinox.
- ***Spring:*** This season's objects span a rather narrow region of right ascension, with most of the objects being associated with or in proximity to the Virgo-Coma cluster of galaxies. At the start of spring, an observing run beginning near the end of astronomical twilight should allow observers to view all objects by around 10:30 PM. By mid-April, all objects should be well enough placed at the end of astronomical twilight allowing for their fastest possible observation.
- ***Summer:*** All summer Marathon objects are above the horizon at the end of astronomical twilight on the first day of summer through the last day of summer. They are nearly all tightly clustered around the galactic center and most are globular clusters with a few notable exceptions.

ADD YOUR EMAIL ADDRESS TO THE NCRAL MEMBER DATABASE

Did you know that just over 425 of some 1,900 NCRAL members are receiving this newsletter via email? That's only 23% of the membership. 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. Editors, please include this information in your affiliate's newsletter.

When one adds his or her email address to the NCRAL member database, he or she will receive direct notifications about the availability of ***Northern Lights***. In addition, subscribers will receive 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.

NCRAL WEBSITE

~ by Jeff Setzer ~

Did you know that NCRAL has its own website? 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***, information about observing programs, awards, and grants, and 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 (2-year term): Carl Wenning (term expires Spring 2021, in second term)

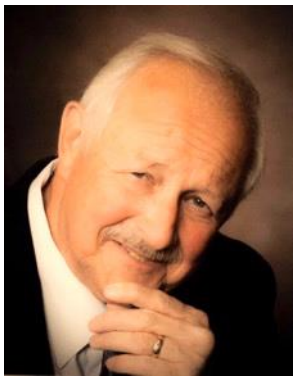
Bio: Carl has been an amateur astronomer since being introduced to the sky by his grandfather during July 1957. Today he is an A.L. Master observer. He has been involved with the Twin City Astronomers of Bloomington-Normal (Illinois) since September 1978. He currently serves as the club's secretary, historian, and editor of ***The OBSERVER*** newsletter for which he received the AL's 2017 *Mabel Sterns Newsletter Editor Award*. He also serves as the ***Northern Lights*** newsletter editor. Carl was planetarium director (1978-2000) and physics teacher educator (1994-2008) at Illinois State University. He continues to teach physics education courses in retirement.

Contact: carlwenning@gmail.com

Vice Chair (2-year term): Bill Davidson (term expires Spring 2021, in first term) and
Region Representative (3-year term): Bill Davidson (term expires Spring 2022, in second 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 award-winning newsletter *RochesterSkies.*

Contact: rochesterskies@outlook.com



Secretary-Treasurer (2-year term): Roy Gustafson (Interim 2020-2021)

Bio: Roy, a member of Popular Astronomy Club (Quad Cities), 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

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