

THE OBSERVER

OF THE TWIN CITY AMATEUR ASTRONOMERS



Volume 45, Number 2

February 2020

INSIDE THIS ISSUE:

- 1 ★ Editor's Choice: Image of the Month – Dick Wentzel RIP
- 2 ★ President's Note
- 3 ★ Calendar of Celestial Events – February 2020
- 3 ★ New & Renewing Members/Dues Blues/E-Mail List
- 4 ★ This Month's Phases of the Moon
- 4 ★ This Month's Solar Phenomena
- 4 ★ TCAA Calendar of Events for 2020
- 5 ★ Minutes of the January 7, 2020 BoD Meeting
- 6 ★ Message from NCRAL Chair Carl Wenning
- 6 ★ AstroBits – News from Around the TCAA
- 7 ★ Make Plans Now to Attend TCAA Annual Meeting
- 8 ★ My New Spectrometer by Tim Stone
- 9 ★ February 2020: Moon Occults Mars; Planet Parade
- 15 ★ TCAA Active on Facebook
- 16 ★ Did You Know?
- 16 ★ Renewing Your TCAA Membership
- 16 ★ Public Viewing Sessions for 2020
- 17 ★ TCAA Treasurer's Report as of January 28, 2020



DICK WENTZEL (1930 – 2020)

The TCAA is an affiliate of the [Astronomical League](#) as well as its North Central Region. For more information about the TCAA, be certain to visit the TCAA website at [tcaa.us/](#)



Visit [Astroleague.org](#) for additional information about the League and its numerous membership benefits, including observing programs.



Also, visit the NCRAL website at [ncral.wordpress.com](#) for information about our North Central Region. Find out about our next Regional convention during May 2020.



It is with great sadness that we note the passing of Richard (Dick) Frank Wentzel, 89, of LeRoy. He died peacefully at home in Le Roy on Wednesday, January 1, 2020. *Our sincerest condolences to his wife Sally and daughter Lisa.*

Dick was born March 12, 1930 in Lorain, OH. He is survived by his wife of 68 years, Sally Jean (née Resch), brother Willard Wentzel, daughters Jayne Wentzel Johnson (Walt), and Lisa Wentzel, grandchildren Erik Johnson (Tiffany) and Haley Johnson, as well as great-grandchildren Zeke and Vaylen. He was preceded in death by his parents, two brothers, and two sisters.

After serving as a sergeant in the Army during the Korean Conflict, Dick returned home to Ohio to work in the family photography business, and later in other photography businesses mostly in California and Colorado. After retiring, he became a popular substitute teacher, retiring from that job at age 85.

Dick enjoyed many activities including scuba diving, boating, flying, travel, cruising, and RV-camping. He loved any opportunity to learn something new or make another friend. He was especially known for his great cooking and lighthearted jokes. He was a warm, caring, and wonderful soul who will be dearly missed.

The family is grateful to Dick's friends and family for their kind visits and best wishes while Dick was in hospice. In lieu of flowers, the family suggests a donation to Samaritan's Purse.

The OBSERVER

is the monthly *electronic* newsletter of Twin City Amateur Astronomers, Inc., a registered 501(c)(3) non-profit educational organization of amateur astronomers interested in studying astronomy and sharing their hobby with the public.

TCAA OFFICERS & CHAIRPERSONS

President, Director, & Property Manager

Tim Stone 309-531-2401

tim.stone.piano@gmail.com

Vice President & Director/Membership Coord.

Tom Willmitch 309-846-2423

trwillm@ilstu.edu

Treasurer & Director/Registered Agent

Dave Osenga 309-287-0789

DaveOsenga@msn.com

Secretary & Director/Historian/Editor

Carl J. Wenning 309-830-4085

carlwenning@gmail.com

5th Director/Assistant Property Manager

Scott Wade 309-310-2464

wader101@aol.com

Astronomical League Correspondent

Robert Finnigan 309-846-9533

robertfinnigan5@gmail.com

Technology Coordinator

Justin Meyer 630-649-0611

justin_meyer@me.com

Webmaster

Lee Green 309-454-7349

lee@starlightsoftware.com

Lighting Educ. & AL Observing Club Coordinator

Lisa Wentzel unlisted number

wentzel@msn.com

The OBSERVER

Carl J. Wenning, Editor

*Submission deadline two days before
the end of each month.*

MEMBERSHIP DUES

Individual Adult/Family \$40

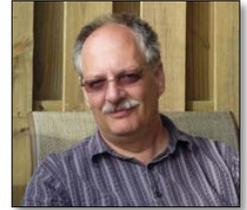
Full-time Student/Senior \$25

(Senior status equals ages 60+)

To join, send your name, contact info, and dues payment to Dave Osenga, TCAA Treasurer, 1109 N. Linden St., Normal, IL 61761-1471.

PRESIDENT'S NOTE

On January first, Dick Wentzel passed away. He was a great friend to our club. I have many fond memories of his involvement with our activities. Here are a few of them. At our solar eclipse field trip to Camp Ondessonk, Dick and his daughter Lisa drove their RV and stayed in it. I think it was at lunch the first full day we were there, that I was walking from our dorm to the cafeteria, and I was getting HOT. If you recall, it was very hot those days, and about halfway to the cafeteria, the door popped open and Lisa asked if I wanted to cool down. I took advantage of the opportunity and had a delightful time in their air conditioning talking about RVs, astronomy, telescopes, and eclipses, as well as random other topics, with both Lisa and Dick.



President Tim Stone

Dick was a faithful attender of our Board meetings. He would always bring a bottle of white wine, and we'd share some with him. He would sit patiently and listen to our proceedings with interest and every now-and-then he would interject a quip of some kind to keep the mood light. After the meeting was over, he'd get up and invariably have a joke ready for everyone. He'd tell the joke, we'd laugh, and he would head on out to the car with a smile on his face.

I'm sure Dick had bad days. We all do. But I never saw him without that smile. He will be missed. When we have our moment of silence at the beginning of each annual meeting, amongst others I will remember him.

In case you haven't heard, consider this your invitation to attend our annual banquet on Saturday, February 8th, at the Normal Township Hall, 304 East Mulberry Street in Normal. The hall is across the street, to the north, of Ace Hardware. We will have great food catered by Nelson's (starting at 6:30 PM), our short annual business meeting, and an excellent presentation by Dr. Matt Caplan from the Illinois State University Physics Department. He uses computational astrophysics techniques to study the interiors of neutron stars. Personally, I can't wait to hear his presentation, and I can't wait to see YOU there!

Keep looking up,
Tim Stone, President

REGISTER NOW FOR TCAA BANQUET

Members need not register to attend the TCAA's annual business meeting; however, reservations are required for the associated banquet. This year's banquet will consist of chicken and vegetarian entrées, potatoes, green beans, tea, coffee, water, lemonade, and a celebratory cake. Despite the great banquet menu, members are encouraged to bring a small side dish (e.g., a regional or ethnic food) to share to increase the amount and variety of food options. The banquet cost will remain at \$20 per person (sorry, no discounts for children). Payment is to be made upon arrival at the event.

You may register now by going online to the signup page for the 2020 Annual Meeting banquet at: <http://tcaa.us/AnnualMeeting2020.aspx>. The deadline for banquet registration is Monday, February 3rd at noon. For additional information about the proceedings, schedule, speaker and so forth, see further on in this issue of the newsletter. Alternatively, for information not found in this publication, contact Treasurer Dave Osenga using his information found in the left column of this page.

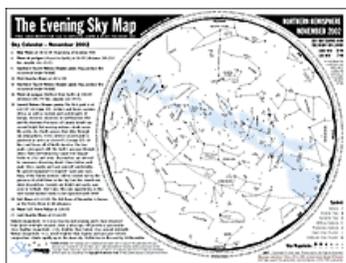
CALENDAR OF CELESTIAL EVENTS – FEBRUARY 2020

MORNING PLANETS (2/14): Mars (♂), Jupiter (♃), & Saturn (♄)
EVENING PLANETS (2/14): Mercury (☿), Venus (♀), Uranus (♅), & Neptune (♆)

The following table gives the date and time (24-hour clock) of important astronomical events for this month. All events are given in Central Standard Time.

Day	Time	Event
01	19:30	Moon at Apogee: 404580 km
02	22:45	FIRST QUARTER MOON
04	03	Quadrantid Meteor Shower
05	02	Earth at Perihelion: 0.98324 AU
07	15:09	Aldebaran 3.0°S of Moon
09	17:29	Moon at Ascending Node
10	09	Mercury at Superior Conjunction
10	13:10	Pen. Lunar Eclipse; mag=0.896
10	13:21	FULL MOON
10	20:26	Pollux 5.3°N of Moon
11	17:54	Beehive 1.0°S of Moon
13	05:37	Regulus 3.8°S of Moon
13	08	Saturn in Conjunction with Sun
13	14:20	Moon at Perigee: 365964 km
17	06:58	LAST QUARTER MOON
17	17:03	Mars 4.7°N of Antares
20	13:13	Mars 2.3°S of Moon
22	14:31	Moon at Descending Node
22	20:42	Jupiter 0.4°N of Moon: Occn.
24	15:42	NEW MOON
28	01:29	Venus 4.1°N of Moon
29	15:28	Moon at Apogee: 405390 km

<http://www.astropixels.com/ephemeris/astrocal/astrocal2020cst.html>



EVENING SKY MAP

Click on the icon found here to access a current evening sky map along with a more detailed celestial events calendar.

NEW & RENEWING MEMBERS

The following individuals have paid dues for new or renewed memberships as of January 28, 2020. (Others who paid after that date will appear in the February 2020 issue of *The OBSERVER*.)

Welcome! Welcome! Welcome! Welcome! Welcome!

New:

Renewing: Vivian Hoette (two years); David Peters; Allan Griffith; Jim Gibbs (2 years); William Carney

Welcome! Welcome! Welcome! Welcome! Welcome!

DUES BLUES

If you have received a “your dues are due” statement along with the email that brought you this issue of *The OBSERVER*, please remit your dues to Mr. Dave Osenga, TCAA Treasurer, 1109 N. Linden St., Normal, IL 61761-1471. Dues are currently \$25 for seniors (60 years of age and over) and \$40 regular.

SUBSCRIBING TO THE NEW TCAA EMAIL LIST

Welcome to the tcaa@groups.io group at Groups.io. This is a free, easy-to-use group email service set up for the TCAA’s communication purposes. You can subscribe, visit your group, start reading and posting messages here: <https://groups.io/g/tcaa>

The email address for this group is tcaa@groups.io. After you successfully subscribe, please add this email address to your safe sender list in your email client's contacts, so emails from this list do not end up getting classified as junk mail.

Once subscribed, you can set your subscription settings here: <https://groups.io/g/tcaa/editsub>. You can opt to receive all messages in individual emails, collections of messages in a digest, a daily summary, or only special notices. If you do not wish to belong to this group, you may unsubscribe by sending an email to tcaa+unsubscribe@groups.io

If you have general questions about the group, check email tcaa+help@groups.io. For questions not answered there, contact the moderators of this group (Deva C., Tim S., and Carl W.) by emailing tcaa+owner@groups.io.



THIS MONTH'S PHASES OF THE MOON



First Quarter
Sunday, February 2



Full Moon
Monday, February 10



Last Quarter
Monday, February 17



New Moon
Monday, February 24

All moon phase dates are Central Standard Time. Moon phases for the 2020 calendar year can be found by clicking [here](#). Images provided by J. K. Howell of the Champaign-Urbana Astronomical Society & used with permission.

THIS MONTH'S SOLAR PHENOMENA

In the table below, you will find times of sunrise and sunset along with rising and setting azimuths (Az), length of the day including the change from the previous day, start and end times of astronomical twilight, and the time of solar noon along with the elevation (El) of the midday sun. These data come from <https://www.timeanddate.com/sun/usa/bloomington>

2020	Sunrise/Sunset		Day Length		Astronomical Twilight		Solar Noon	Solar Dist.
	Sunrise (Az)	Sunset (Az)	Length	Diff.	Start	End	Time (El)	MIL. MILES
1	7:05 AM (112°)	5:13 PM (248°)	10:07:47	+2:09	5:32 AM	6:47 PM	12:09 PM (32.4°)	91.589
11	6:55 AM (108°)	5:25 PM (252°)	10:30:47	+2:24	5:23 AM	6:57 PM	12:10 PM (35.6°)	91.737
21	6:42 AM (103°)	5:37 PM (257°)	10:55:44	+2:33	5:11 AM	7:08 PM	12:09 PM (39.0°)	91.929

TCAA CALENDAR OF EVENTS FOR 2020

Date	Event	Speaker/Coordinator(s)	Location	Times
February 8	Annual Banquet & Meeting	Dr. Matt Caplan/Dave Osenga	Normal Township Hall	6:30-9:00 PM
April ???	TCAA Social	Tom Willmitch?	ISU Planetarium?	TBD
April 25	Public Viewing Session	Carl Wenning	SGNC	8:15-10:15 PM
May 1-2	NCRAL 2020*	Northern Cross Science Fdn	Port Washington, WI	All Day
May 2	Astronomy Day (Spring)	Tom Willmitch	TBD	TBD
May 23	Public Viewing Session	Tim Stone	SGNC	8:45-10:45 PM
June 20	Public Viewing Session	Sunil Chebolu	SGNC	9:00-11:00 PM
July ??	TCAA Summer Picnic	TBD	In-town Park?	TBD
July 18	Public Viewing Session	Mark Boulware	SGNC	9:00-11:00 PM
August 22	Public Viewing Session	Mark Cabaj	SGNC	8:15-10:15PM
September 19	Public Viewing Session	Sandullah Epsicokhan	SGNC	7:30-9:30 PM
September 26	Astronomy Day (Autumn)	Tom Willmitch	TBD	TBD
October ??	TCAA Social	Tom Willmitch?	ISU Planetarium?	TBD
October 17	Public Viewing Session	Lee Green	SGNC	7:00-9:00 PM

* Register now for NCRAL 2020. **Convention registration is open.** You'll find everything you'll need to know about this event at <https://ncsf.info/ncral-vision-2020/>. Thus far Sharon MacDonald and Carl Wenning from the TCAA are planning to attend this fun and memorable event. Please contact either if you would like to join them. They have room for two additional passengers in the vehicle. There is a possibility of shared accommodations which could also help keep costs down.

MINUTES OF THE JANUARY 7, 2020 BOD MEETING

Tim Stone called the meeting to order at 6:30 PM at the Wenning residence. In attendance were Tom Willmitch, Dave Osenga, Carl Wenning, Scott Wade, Bob Finnigan, Sunil Chebolu, and Lisa Wentzel. Justin Meyer and Lee Green were not in attendance.

There were no officer or chair reports with the following exceptions: (1) The balances of TCAA checking was \$1,066.23, savings \$2,017.90 for a total of \$3,084.13. (2) Carl reported on behalf of Deva Chatrathi that he continues to make progress on the development of the new TCAA website. He expects to have a working site by the end of January for review by the leadership. Tim noted that he recently secured a more desirable URL of TCAA.CLUB which seems to be memorable than the TCAA.US we are using currently.

OLD BUSINESS:

- Arrangements for the Annual Meeting were reviewed and finalized.
 - Dave will make final arrangements with the Nelson Catering; we will have chicken and vegetarian lasagna as entrées along with beans, potatoes, salad, and rolls. Members will be asked to bring side dishes to share. The cost will remain at \$20 per person. The club will absorb excess costs.
 - Lee will manage online reservations this year. Carl will providing complete details to the membership. Carl also will prepare the printed program, bring ice water and lemonade in 2-gallon containers, and provide a 60th anniversary sheet cake.
 - Tom will offer a \$100 honorarium to the invited speaker on behalf of the club, ask him about his A/V and internet needs, and advise Carl who will bring the club's video projector.
- Nominations for the five open Board positions were reviewed; they remain unchanged since the last Board meeting. The nominations process remains open until formally closed at the Annual Meeting.

NEW BUSINESS:

- Carl showed and distributed the new 2020 Public Viewing Session brochures and noted that he had thanked **bopi** on behalf of the TCAA. The TCAA has received 2,000 color, bi-fold brochures through **bopi's Print4Good** Campaign.
- Attention was drawn to the fact that Deva Chatrathi had established the groups.io email list making Tim and Carl administrators. Deva's service on behalf of the club was noted with appreciation.
- Bob spoke briefly about outdoor lighting for the new truck stop for Atlanta, IL. He has spoken with the contractor and they are willing to meet with him and Carl to talk about exterior lighting recommendations with the purpose of protecting Waynesville Observatory. Bob, Carl, and perhaps Lisa will travel to Springfield to meet with Mark Seppelt (electrical unit chief at the Illinois Department of Transportation) to talk about recommendations. During the interim, Bob will forward basic light pollution information to the contractor with suggestions provided by Carl from the International Dark-Sky Association.
- Bob and Tim spoke briefly about the new proposal for a DeWitt County windfarm, again potentially threatening Waynesville Observatory. Tim will speak to the Appeals Board of the DeWitt County Zoning Commission. Scott is also on the docket to speak, but Tim will take the lead on behalf of the club because he has spoken to the Appeals Board before. The goal will not be to oppose the windfarm, but to protect the night sky from unwanted nearby light pollution. The date for the talk is about three weeks away and has not been formally set as of now.
- The date for the next Board of Directors meeting has been set for Tuesday, March 10th, though the start time will have to be delayed until 7:00 PM as Carl (host) is teaching a 5:30-6:45 PM class.
- Tim pointed out that no nominations for any TCAA award (Schuette, John & Bertha Kieviet, Miller Family) has been received, nor were any called for in the last newsletter. Carl will put out a call for nomination via groups.io to the subscribed members. The Board will manage the approval process in expedited fashion later if nominations are received.

ANNOUNCEMENTS:

- Tim noted that Jill at SGNC has asked for assistance in relation to some sort of an astronomy class. Dave will follow up this request.
- Tim noted that Julie McCoy from an area school is looking for a classroom presentation. Tom also received this request. Tom will follow up with Julie.

- Tim noted that the storage locker at SGNC is again a mess, and was authorized to get rid of useless and unused materials at his own discretion forthwith.

The meeting was adjourned at 7:21 PM.

Respectfully submitted,
Carl J. Wenning, Secretary

MESSAGE FROM NCRAL CHAIR CARL WENNING

TCAA members,

Here are four important updates for you in relation to NCRAL with which the TCAA is affiliated:

1. **NCRAL 2020 convention registration is now open.** You'll find everything you'll need to know about this Saturday-Sunday, May 1-2 event at <https://ncsf.info/ncral-vision-2020/>.
2. Please nominate your club's most outstanding member for the **2020 NCRAL Region Award** so he or she might be duly recognized at NCRAL 2020. Only one TCAA member has ever been so recognized. Check out the award's requirements printed in the last issue of *Northern Lights* at <https://ncral.wordpress.com/newsletter-archive/>. Deadline: **March 31st**.
3. Please consider applying for the NCRAL's Affiliate Recruitment mini grant. The TCAA received the \$250 Membership Recruitment & Retention mini grant last year from which came the *Introduction to Amateur Astronomy* course taught this past autumn at the ISU Planetarium. No affiliate applied for the \$250 Affiliate Recruitment mini grant and we would possibly use it for fun-filled event with another Illinois club that is not an NCRAL affiliate. Check out the application process at <https://ncral.wordpress.com/awards/>. Deadline: **March 31st**.
4. NCRAL's Seasonal Messier Marathon guidelines have been updated and new resources provided. Check it out at <https://ncral.wordpress.com/awards/>

Carl

--

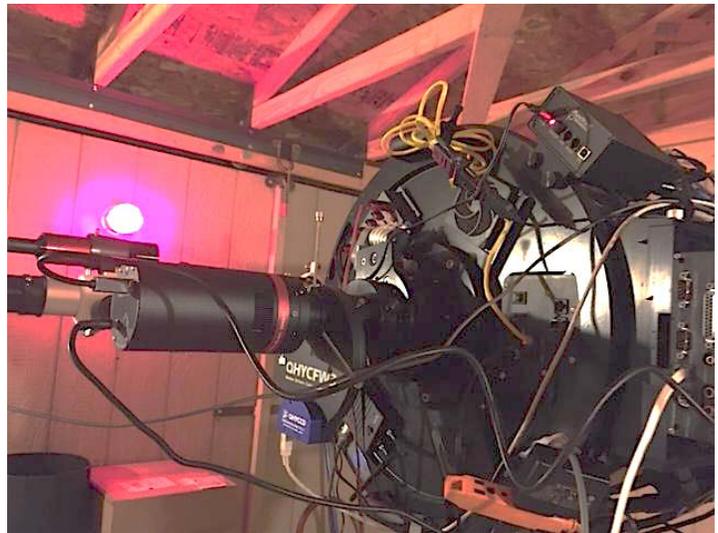
Carl J. Wenning, Regional Chair (2017-2021)
[North Central Region Astronomical League](https://ncral.wordpress.com/)



ASTROBITS – NEWS FROM AROUND THE TCAA

- ★ Lest you should forget, 2020 is a leap year. We add an extra day to February this year, the 29th. Any calendar year divisible by 4 without a remainder ($2020/4=505$ exactly) are leap years. Different rules apply for century years (1900, 2000, 2100, etc.) and millennial years (1000, 2000, 3000, etc.). The rules are set up in such a way as to keep the calendar aligned with the seasonal cycle (tropical year) of 365.242199 days. The present calendar is accurate to one day in 68,000 years.
- ★ Carolyn and Carl Wenning observed the passage of the International Space Station on the morning of January 7th. Despite the mostly cloudy sky, they were able to view the ISS through breaks in the clouds. Carolyn, who is an eagle-eyed observer, noted and drew attention to the fact that a second satellite – likely a transfer module rendezvousing with the ISS – was in the same orbit preceding the ISS by about 5°. The two passed in tandem 77° above the northeastern horizon.
- ★ Dick Wentzel's mortal remains were laid to rest with full military honors on Thursday, January 16th, at Camp Butler National Cemetery in Springfield. Our condolences to the Wentzel family.
- ★ Last year, 2019, was another good year for outreach. Lee Green who keeps track of all such manner of events noted that, "As a club, we did at least 35 events and interacted with over 1100 people!" Members were involved a total of 160 times though this represents only a handful of highly dedicated volunteers, several of whom made the bulk of the presentations.
- ★ Devanand Chatrathi continues to work on a new website for the TCAA using a Board-approved template. We look forward to his first edition before long. Deva reports that he's making good progress.

- ★ On Sunday, January 19th, Deva, Bob and Scott made progress working with the PSO 11" as an astrophotographic rig starting at around 4PM. They were able to home the mount and moved the QHY168 from the 17" and made the connections to the guide and main cameras. They took sample images with both to test the connections. Because the computer already had all the software and drivers, things went very smoothly. The next step is to get a point and focus once they get a clear (and warmer!) night. They did all this despite the temperature hovering around 10°F.
- ★ Scott Wade noted via email on Friday, January 24th, "Our QHY600M black and white camera was delivered today. The QHY600 uses a full-frame (36mm x 24mm, 3.76µm cells, 61.17 megapixel) back-illuminated CMOS Sony sensor. It's the newest camera from QHYCCD. Bob (Finnigan) and I installed it on the 17" at the PSO this afternoon. It will be used with the QHYCFW3 color filter wheel. Installation went smoothly. We loaded a couple of drivers and a plug-in for *The SkyX*. We successfully took a photo (of the wall). The next step is to get focus on the next clear night. Our hope is to capture the Horsehead Nebula (Barnard 33) as our first DSO....if it clears soon!" Thanks for all your work Scott and Bob and for the update Scott!



MAKE PLANS NOW TO ATTEND TCAA'S 60TH ANNUAL BUSINESS MEETING & BANQUET

Make plans now to attend the TCAA's Annual Meeting. This year, 2020, will be the 60th anniversary of the club's founding. Our 60th anniversary celebratory event will be held on Saturday, February 8th, at the Normal Township Hall, 304 East Mulberry Street, Normal. The doors will open at 6:00 PM, with those gathered called to order at 6:30 PM. The TCAA Annual Meeting one of the most enjoyable activities that the club holds throughout the year, and you'll not want to miss it!

The Annual Meeting consists of a banquet, an annual business meeting at which we hear reports and vote for the following year's Board of Directors, watch the presentation of awards, and listen to an invited speaker. This year's speaker will be Dr. Matt Caplan from the Illinois State University Physics Department. Dr. Caplan joined ISU in the fall of 2019. He earned his Ph.D. from Indiana University in 2017. Prior to joining ISU, Dr. Caplan was a CITA National Fellow at the McGill Space Institute. His research uses large scale computer simulations to study the interiors of neutron stars.

This year's banquet has been arranged by Treasurer Dave Osenga and will be catered. The meal will consist of chicken and vegetarian entrées, potatoes, green beans, tea, coffee, water, lemonade, and a celebratory cake. Despite the great banquet meal, members are encouraged to bring a small side dish (e.g., a regional or ethnic food) to share to increase the variety of food options. The banquet cost will remain at \$20 per person (sorry, no discounts for children). Payment for the banquet meal is made to the Treasurer upon arrival.

You may register for the banquet now by going online to the Annual Meeting and Banquet registration page at: <http://tcaa.us/AnnualMeeting2020.aspx>. Deadline for meal registration is Monday, February 3rd at noon. No reservation or registration is needed to attend the business meeting portion of the event.

DOOR PRIZES AND GIVEAWAY TABLE: As has become the custom, we will hold a door prize drawing consisting of a few new or otherwise used but high quality items. We will also have a giveaway table at which members will find items free for the taking. If you have items for either the door prize drawing or the giveaway table, please bring certain to bring them with you to the meeting.



Dr. Matt Caplan

My New Spectrometer

~ by Tim Stone ~

Some of you may know I've been constructing my own spectrometer from plans available online that utilize 3D printing technology for fabrication of the components. I began the project in August of last year and completed assembly just before the end of the year. I started making the adapters I would need to adapt the instrument to my telescope and mount a camera on it for photography, a process that took longer than expected. While that was in progress, I used the instrument with an eyepiece to examine the solar spectrum visually. I have to say, seeing the spectrum with my eye rather than in an image was mind-blowing. The purity of the colors, the stark contrast of the absorption lines against the beautiful background, and the amount of detail visible were really astonishing.

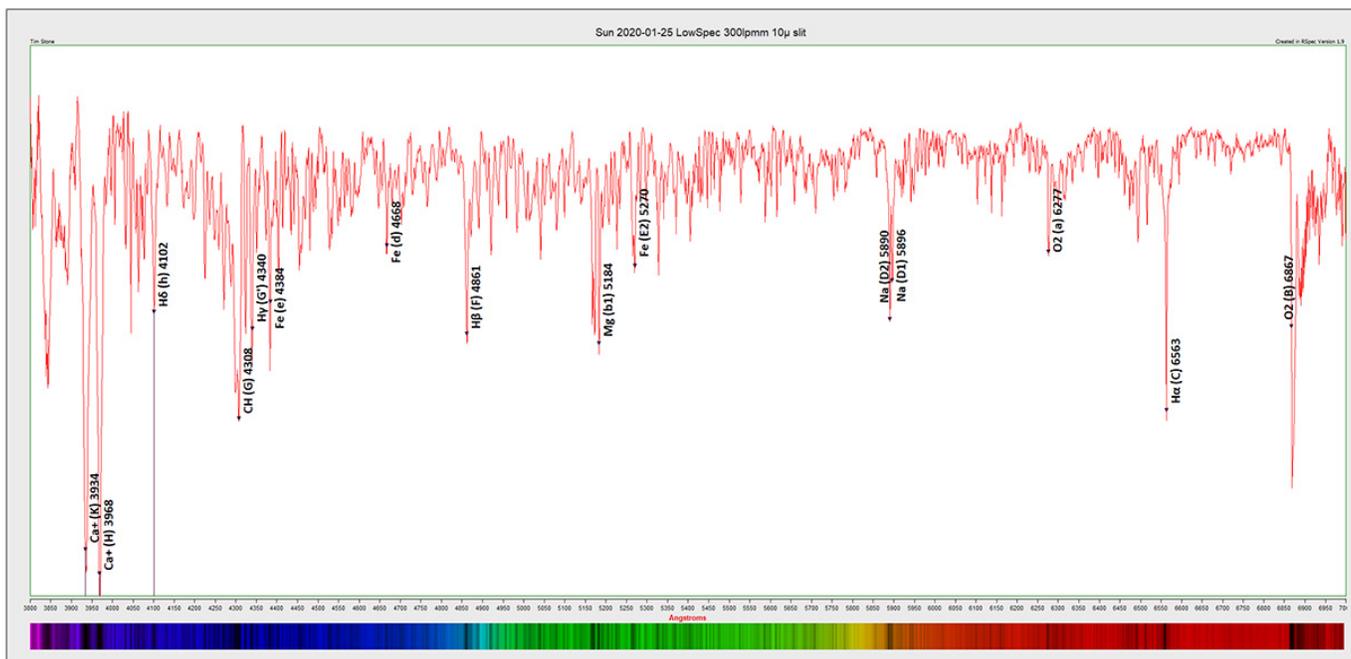


This morning (January 25th) I awoke to a fresh snow cover, and I knew the solar spectrum was my goal for the day. While the sun wasn't directly visible, the clouds and snow have largely the same spectrum, because they're illuminated by the sun. After a day of work, you will find the solar spectrum I made below this article. I consider this to be first light with this instrument, and so far I'm REALLY pleased with it.

The new spectrometer, called a "LowSpec," has 12 different slits which are selectable. The narrowest one is 10 μ , which is the one I used for this spectrum. Together its 3000-lines-per-millimeter grating and slit combination give about 4x the resolution of the simple slitless transmission grating I've been using on my 8" for stellar spectrography.

Having completed the adapters needed, a couple of days ago I mounted the spectrometer on my 80mm refractor, put a camera on it, and pointed it at a high-pressure sodium light down the street. This helped me to get it focused, and to find lines for an initial calibration.

I have a 1200-lines-per-millimeter grating that isn't installed at this point. This will result in much higher resolution, but because of that using it will be more challenging. I'll use the lower-resolution grating as I work my way up the learning curve in this fascinating activity.



FEBRUARY 2020: MOON OCCULTS MARS AND MORNING PLANET PARADE

~ by Jeffrey L. Hunt ~

At the month's opening when morning twilight begins (about 5:30 a.m. CST), Mars is the lone planet in the southeast to the left of Antares. The other bright markers of the ecliptic – Spica, Regulus, and Pollux – stretch from the south to the west-northwest horizon. Spica, now west of the meridian, is about one-third of the way up in the sky. Golden-orange Arcturus is nearly two-thirds of the way up in the sky, above Spica. The positions of these two bright stars indicates that the Big Dipper is high in the northwest. Farther west from Spica, Leo is tilted over in the west. Regulus, above the western horizon, has about the same altitude as Spica. Farther northwest, the Gemini Twins – Pollux and Castor – are very low in the sky. Trace out the plane of the solar system from Mars, past Spica and Regulus, and ending at Pollux. From Gemini, look farther north. Capella is low in the north-northwest. Back in the northeast, the Summer Triangle – Vega, Altair, and Deneb – make their appearance together, seemingly out of place for the season. Because of their northerly declinations – especially Deneb and Vega – they appear in the sky at seemingly unseasonable times of the year. Compare the positions of Deneb and Capella this evening at the end of twilight (about 6:40 p.m. CST) to this morning's locations. At that time, Deneb is low in the northwest, and Capella shines from over two-thirds of the way up in the east, above the bright stars of the Winter Congregation. These searchlight-stars – Sirius, Procyon, Betelgeuse, Rigel, Capella, Aldebaran, Castor, and Pollux – comprise our winter evening sky. They are well-placed in the southeast at this time. Use a binocular to clearly identify their colors. This region of bright stars is a good example of the breadth of stars displayed on a Hertzsprung-Russell diagram. The sky also presents stellar nurseries, a supernova remnant, and star clusters, a great example of the life cycle of the stars. At this hour, brilliant Venus shines from the southwest and the moon is in the south approaching Taurus. The Big Dipper is nearly standing on its handle in the northeast, indicating that Leo is rising soon.

As for the planets, all the naked eye planets are in the sky this month, but not simultaneously. Mars and Jupiter are morning planets early in the month, joined by Saturn as the month ends. Venus dominates the evening sky as Mercury races in for a quick appearance early in the month. This is Mercury's best evening appearance of the year, although planet's elongation is only 18° when it sets at the end of evening twilight.

Watch the motion of Venus during the month. It moves rapidly eastward along the ecliptic, covering over 32° of ecliptic longitude during the month. The ecliptic is tilted

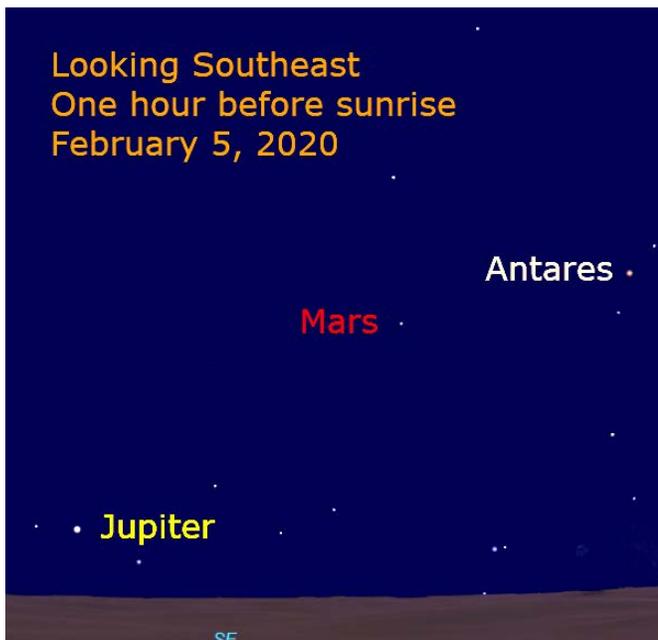
upward at a high angle. During the autumn months, I wrote about how the visibility of Venus suffered from a poorly inclined ecliptic. Now the opposite is occurring. The visibility of this brilliant planet is benefitting from a highly inclined ecliptic. The rapid eastward motion of Venus among the stars with this high inclination makes the planet seem like it is nearly moving vertical compared to the horizon. This is most apparent near month's end when the moon appears in the sky with the brilliant planet. Observe the moon's daily position starting February 24 until the lunar crescent is past Venus.

In comparison, the morning view of the ecliptic is less favorable. The ecliptic has a low inclination with the eastern horizon. In addition, Mars is moving near the position of the Winter Solstice, celestial coordinates: 270° celestial longitude; 0°, celestial latitude (18 hours, right ascension; -23.5°, declination). The planet moves eastward along the ecliptic nearly 20° during February. Thirdly, the sun is farther north and rapidly moving northward during the month, rising earlier at a noticeable clip. These three factors combine to put Mars in about the same altitude each morning. Mars moves eastward among the stars. It seems to move southward along the horizon somewhat, but the planet seems to be locked into the same altitude for many mornings.

- February 1:** Mars ($m = 1.4$) moves south of the ecliptic. One hour before sunrise, find it about 18° up in the southeast. Use a binocular to see the planet 1.5° above Omicron Ophiuchi (\omicron Oph, $m = 5.1$). This star is between the planet and Theta Ophiuchi (θ Oph, $m = 3.2$). Theta is 2.6° to the lower left of the planet. Through a telescope, Mars is unimpressive, only 4.8" across. At the same time, Jupiter ($m = -1.9$) is nearly 5° up in the southeast, about 24° to the lower left of Mars. Saturn ($m = 0.6$) rises about 50 minutes before sunrise. Daylight has now stretched to 10 hours; darkness – the time between the end of evening twilight and the beginning of morning twilight – is less than 11 hours. Later this month, daylight and darkness are equal. In the evening sky, Mercury ($m = -1.0$) is beginning its best evening appearance of the year. Find it with a binocular about 30 minutes after sunset, over 7° up in the west-southwest. Each evening it is higher and a little northward along the horizon. As it appears higher in the sky, it dims. This evening Mercury is 25° to the lower right of brilliant Venus ($m = -4.1$). Through a telescope, Venus is an evening gibbous, 15.4" across and 73% illuminated. Thirty minutes later look for the nearly First Quarter phase moon (8.1 days past the New phase, 49% illuminated),

almost 60° up in the south, is in southern Aries. It is nearly 15° below Hamal (α Ari, $m = 2.0$). The moon reaches its First Quarter phase at 7:42 p.m. CST.

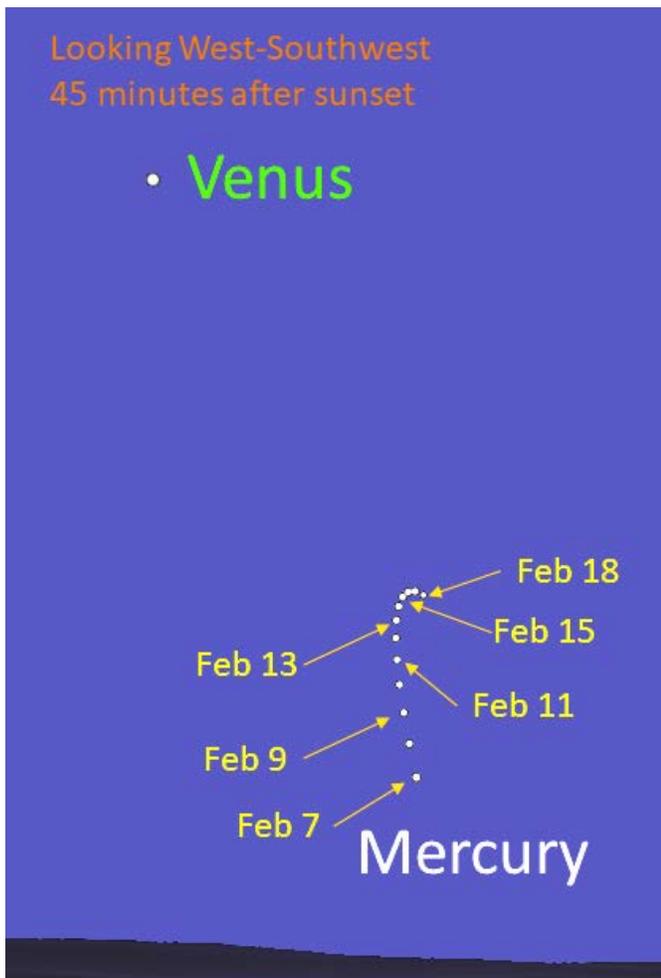
- **February 2:** One hour before sunrise, Mars ($m = 1.3$), about 18° up in the southeast, is 1° above Omicron Ophiuchi. At this hour, Jupiter is nearly 5° up in the southeast, to the lower left of Mars. In the evening, Mercury is over 8° up in the west-southwest at 30 minutes after sunset. Venus is 25° to the upper left of Mercury. About 30 minutes later, the moon (9.1d, 59%), over 60° up in the south, is over 10° to the lower right of the Pleiades (M45). Venus moves into Pisces, about 7° to the lower left of six, fourth magnitude stars that outline the western fish of Pisces.
- **February 3:** Jupiter rises at 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. Jupiter is over 23° to the lower left of Mars. The Red Planet is 1.9° to the upper left of Omicron Ophiuchi. In the evening, 30 minutes after sunset, Mercury is nearly 9° up in the west-southwest, nearly 25° to the lower right of brilliant Venus. As the sky darkens further, look for the moon (10.1d, 69%), over two-thirds of the way up in the sky above the southeast horizon. This gibbous moon appears above the Hyades and 4.0° to the upper right of Aldebaran (α Tau, $m = 0.9$). A closer look through a binocular shows the moon about 0.9° above Delta1 Tauri ($\delta 1$ Tau, $m = 3.8$).



February 5: One hour before sunrise, look for bright Jupiter, Mars, and Antares.

- **February 4:** One hour before sunrise, Mars is over 17° in altitude in the southeast. It is 1.8° to the upper left of Theta Ophiuchi. Thirty minutes after sunset, Mercury ($m = -0.9$), over 9° up in the west-southwest, is over 24° to the lower right of Venus. As the sky darkens further, the moon (11.1d, 78%), nearly 60° up in the east-southeast, is 5.1° to the upper right of Zeta Tauri (ζ Tau, $m = 3.0$), the Southern Horn of Taurus.
- **February 5:** Saturn rises at Nautical Twilight. One hour before sunrise, Mars, over 17° up in the southeast, is 0.9° to the upper left of 44 Ophiuchi (44 Oph, $m = 4.2$). Thirty minutes after sunset, Mercury is nearly 10° up in the west-southwest. It is 24° to the lower right of Venus. Through a telescope, Venus is 15.8" across and 72% illuminated. As the sky darkens further, about an hour after sunset, the moon (12.1d, 86%), nearly 50° up in the east-southeast, is 2.1° to the upper right of Mu Geminorum (μ Gem, $m = 2.8$).
- **February 6:** Mars rises at its most southerly rising azimuth, 122°, until March 5, 2020. In the evening, 30 minutes after sunset, Mercury, over 10° in altitude in the west-southwest, is nearly 24° to the lower right of Venus. About 30 minutes later, find the moon (13.1d, 93%) in central Gemini, about 40° up in the east. It is 8.7° to the right of Pollux (β Gem, $m = 1.2$).
- **February 7:** One hour before sunrise, Mars, about 17° in altitude in the southeast, is 0.6° to the upper left of 51 Ophiuchi (51 Oph, $m = 4.8$). With a binocular, observe the planet and the star. Thirty minutes after sunset, Mercury ($m = -0.8$), nearly 11° up in the west-southwest, is nearly 24° to the lower right of Venus. As Mercury approaches its greatest elongation, it can be found later during twilight. At 45 minutes after sunset, it is over 8° in altitude. Fifteen minutes later, look for the bright moon (14.1d, 98%) about 30° up in the east, nearly 10° below Pollux. Venus sets west (azimuth 270°) 211 minutes after sunset. It passes the vernal equinox, celestial coordinates: celestial longitude, 0°; celestial latitude, 0°.
- **February 8:** Jupiter passes 0.8° to the lower right of Omicron Sagittarii (\omicron Sgr, $m = 3.8$). Forty-five minutes before sunrise, Jupiter is nearly 9° up in the southeast. Use a binocular to find Mars over 20° to the upper right of the Giant Planet. During the next few days, depending on your latitude, the length of daylight (sunrise to sunset) and the length of darkness (from the end of evening twilight to the beginning of morning twilight) are equal, approximately 10.5 hours. For my location that date is February 11, 10 hours, 26 minutes. The sunrise and sunset times change rapidly this time of the year, along with the northerly movement of the sun's rising and setting azimuths. Forty-five minutes after sunset, Mercury is over 8° up in the west-southwest. It is nearly 24° to the lower right of Venus. As the sky darkens further, locate the moon (15.1d, 100%),

in eastern Cancer near the Leo border. The lunar orb is about 15° up in the east-northeast.



February 7-18: Mercury makes its best appearance for the year. With a binocular watch it appear higher in the sky each night, dimming as it approaches its evening greatest elongation.

- **February 9:** The moon is Full at 1:33 a.m. CST. The season of perihelion full moons – so-called supermoons – is occurring. One hour before sunrise, the bright moon (15.6d, 100%) is 15° up in the west, over 8° to the right of Regulus (α Leo, $m = 1.3$). About 15 minutes later, Jupiter is about 9° up in the southeast, 20° to the lower left of Mars. Forty-five minutes after sunset, Mercury ($m = -0.7$) is over 8° up in the west-southwest. It is nearly 24° to the lower right of Venus ($m = -4.2$). This evening Venus is about 7° to the lower left of Omega Piscium (ω Psc, $m = 4.0$). Tomorrow evening the separation is about the same, although Venus is farther east along the ecliptic. This evening at the end of evening twilight, Venus is over 20° up in the west-southwest. Two hours after sunset, the

moon (16.2d, 99%) is over 13° up in the east, 3.8° to the left of Regulus.

- **February 10:** At the beginning of morning twilight, the moon (16.6d, 98%), nearly 30° up in the west, is over 7° to the upper left of Regulus. As the sky brightens, Jupiter rises higher in the sky, and Mars fades into morning twilight. One hour before sunrise, Mars is 17° in altitude in the southeast. Jupiter, 7° in altitude, is about 20° to the lower left of Mars. Mercury is at its eastern greatest elongation (18.2°) at 7:56 a.m. CST. The moon is at perigee at 2:28 p.m. CST, when it is 223,980 miles away. Forty-five minutes after sunset, Mercury ($m = -0.6$) is nearly 9° up in the west-southwest, over 23° to the lower right of brilliant Venus. Through a telescope, Venus is 16.3" across and 70% illuminated. Three hours after sunset (8:15 p.m. CST), locate the moon (17.2d, 95%), nearly 11° up in the east. It is about 9° to the right of Denebola (β Leo, $m = 2.1$).
- **February 11:** One hour before sunrise, the moon (17.6d, 93%), nearly 30° up in the west-southwest, is over 8° to the lower left of Denebola. Farther eastward, Mars moves into Sagittarius. It begins to approach the bright nebulae and rich star field above the Teapot of Sagittarius. Use low powers to view the planet and the starry background. As the moon approaches the region and wanes further during the next week, watch Mars move between the Lagoon Nebula (M8, NGC 6523) and the Trifid Nebula (M20, NGC 6514). Mars crosses the constellation in 50 days. The three Bright Outer Planets are in the constellation Sagittarius, spanning nearly 30°. While the moon is in the western sky, Mars is 17° up in the southeast. Jupiter is over 19° to the lower left of Mars. In the evening, forty-five minutes after sunset, Mercury ($m = -0.4$) is nearly 9° up in the west-southwest, over 24° to the lower right of brilliant Venus. Through a telescope, Venus is an evening gibbous, heading toward its half phase. It is 16.9" across and 68% illuminated. Later in the evening, about 5 hours after sunset (about 10:15 p.m. CST), the moon (18.3d, 87%), nearly 19° up in the east-southeast, is about 7° above Gamma Virginis (γ Vir, $m = 3.4$). At the end of evening twilight, the Hyades are at the meridian. This star cluster appears as a "check mark" shape in our sky. When Aldebaran is included, the composite "V" shape makes the face of Taurus the Bull. In *The Amateur Astronomer's Handbook*, Muirden describes the cluster as "a loose sprinkle of stars west of Aldebaran" (p. 296). The apparent size of the cluster is far too large to fit into even a low-power telescopic eyepiece. It is best observed with a binocular. There is a lavish collection of mythology about the Hyades and its neighbor, the Pleiades. Robert Burnham, in his *Celestial Handbook*, relates stories that connect the Hyades with rainy and stormy weather. He explains another relationship with farm animals, and that

the cluster was known as the *Suculae*, “The Little Pigs” (p. 1821), and that Aldebaran was the sow. The Hyades is one of the closest galactic (open) clusters to our solar system. Its distance is measured at about 150 light years and Aldebaran’s is about half that distance. The cluster’s movement through the galaxy and its motion relative to our sun are known well. The cluster is moving toward a point just east of Betelgeuse as it recedes from our view. In 50 million years or so it will appear as a faint telescopic cluster, less than the moon’s apparent size, just east of Orion’s shoulder.

- **February 12:** One hour before sunrise, the moon (18.6d, 86%), 33° up in the southwest, is 3.4° to the right of Gamma Virginis. Jupiter, nearly 8° up in the southeast, is nearly 19° to the lower left of Mars. In the evening sky, forty-five minutes after sunset, Mercury ($m = -0.3$) – over 8° up in the west-southwest – is over 24° to the lower right of Venus. Six hours after sunset (about 11:20 p.m. CST), the moon (19.3d, 79%), over 16° up in the east-southeast, is over 8° to the upper left of Spica (α Vir, $m = 1.0$).
- **February 13:** One hour before sunrise, the moon (19.6d, 76%) is 36° up in the southwest. It is 6.5° above Spica. Forty-five minutes after sunset, Mercury ($m = -0.1$), over 8° up in the west-southwest, is 25° to the lower right of brilliant Venus.
- **February 14:** One hour before sunrise, the moon (20.6d, 66%), nearly 36° up in the south-southwest is midway from Spica to Zubeneshamali (β Lib, $m = 2.6$) and about 2° to the left of Kappa Virginis (κ Vir, $m = 4.2$). Use a binocular to locate the dimmer stars this morning. Jupiter passes Pi Sagittarii (π Sgr, $m = 2.9$), 1.4° to the lower right of the star. Mars is nearly 18° to the upper right of Jupiter, 1.6° to the upper right of 4 Sagittarii (4 Sgr, $m = 4.1$) – the western gateway to the bright nebulae in Sagittarius. Watch Mars move through this region during the next several mornings. The challenge is to find a reasonable time to view Mars among the nebulae so that it has enough altitude, but when the sky is still dark enough to find the faint clouds. 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. In the evening, forty-five minutes after sunset, Mercury, now fading rapidly ($m = 0.2$) is about 8° up in the west southwest, nearly 26° to the lower right of Venus. What is the last date that you can see Mercury?
- **February 15:** One hour before sunrise, the moon (21.6d, 55%) is over one-third of the way up in the south, nearly in the middle of Libra, made by Zubeneshamali, Zubenelgenubi (α Lib, $m = 2.8$), Gamma Librae (γ Lib, $m = 3.9$), and Iota Librae (ι Lib, $m = 4.5$). Farther east, Mars, nearly 17° up in the southeast, is 0.9° to the upper right of

4 Sagittarii. At the same time, bright Jupiter, 8° in altitude, is over 17° to the lower left of Mars. Fifteen minutes later, Saturn is nearly 6° in altitude, about 10° to the lower left of Jupiter. A binocular is helpful during these morning observations to see the dimmer stars and Saturn as twilight progresses. During the day, the moon reaches its Last Quarter phase at 4:17 p.m. CST. Venus crosses the ecliptic moving northward. Forty-five minutes after sunset, brilliant Venus dominates the early evening western sky. It is nearly 27° to the upper left of Mercury ($m = 0.4$), over 7° up in the west-southwest. As the sky darkens further, use a binocular to see the 5.5° gap between Venus and Delta Piscium (δ Psc, $m = 4.4$). Venus is below the star. Watch the planet rapidly close the gap.

At the start of morning twilight at mid-month (about 5:15 a.m. CST), Jupiter and Mars are in the southeast near Antares. As at the beginning of the month, the bright markers of the ecliptic span the sky, although Pollux is very low in the west-northwest. The slightly gibbous moon is nearly mid-way from Spica to Antares, among the stars of Libra. The Summer Triangle is now higher in the eastern sky, and Capella is very low in the north-northwest, likely blocked by even the lowest terrestrial obstructions. At the end of evening twilight (about 7 p.m. CST), Orion is slightly east of the meridian. Its distinctive outline is easily identified. The Pleiades are about two-thirds of the way up in the southwest. They are about 50° above brilliant Venus. Watch Venus approach the cluster during the next few months. Venus passes the Pleiades during early April.

- **February 16:** One hour before sunrise, the moon (22.6d, 44%) is nearly 30° up in the south. With a binocular observe that it is 0.4° to the upper right of Nu Scorpii (ν Sco, $m = 4.0$). Farther east, Mars ($m = 1.2$) is nearly 17° up in the south-southeast. Locate it with optical help, 0.2° to the upper right of 4 Sagittarii. While it is south of the ecliptic, Mars passes the sun’s Winter Solstice point today. Jupiter is to Mars lower left, about 9° in altitude above the southeast horizon. It is 1.4° to the lower right of Pi Sagittarii. As the sky brightens further, look for Saturn with a binocular, 6° in altitude about 10° to the lower left of Jupiter. Regulus rises at sunset. In the evening, about 45 minutes after sunset, Mercury ($m = 0.8$) is 6° up in the west-southwest, about 28° to the lower right of Venus. Fifteen minutes later, the brilliant planet is nearly one-third of the way up in the sky. It is 4.2° below Delta Piscium.
- **February 17:** One hour before sunrise, Mars, nearly 17° up in the southeast, is about 13° to the lower left of the moon (23.6d, 33%). Watch the moon pass the morning planets during the next few mornings. The Red Planet is passing

between the bright nebulae in Sagittarius. It is 0.5° to the left of 4 Sagittarii. Bright Jupiter, nearly 11° up in the southeast, is over 16° to the lower left of Mars. Jupiter is 1.5° below Pi Sagittarii. Saturn is nearly 10° to Jupiter's lower left, about 6° in altitude. Forty-five minutes after sunset, Mercury ($m = 1.2$) is over 5° up in the west-southwest, about 30° to the lower right of brilliant Venus. One hour after sunset, Venus, about 30° in altitude above the west-southwest horizon, is 3.2° to the lower left of Delta Piscium. Use a binocular to see Venus and the dimmer star.

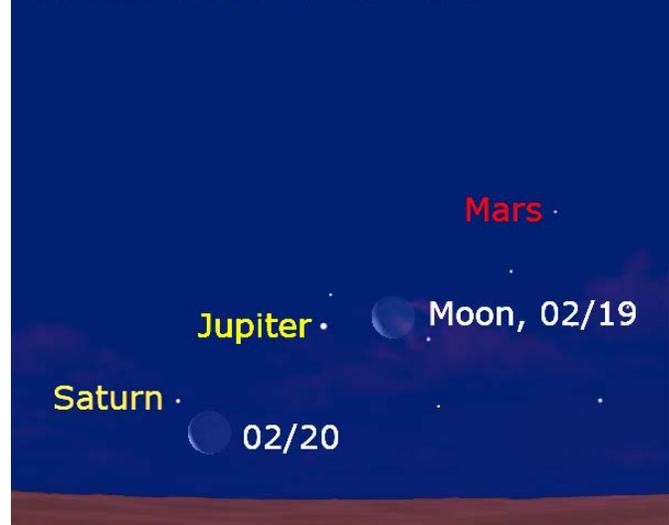


February 18: Through power observe the moon and Mars before 6 a.m. as the lunar crescent occults the Red Planet.

- 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. If you look earlier, when the moon is lower in the darker sky, the lunar crescent is between M8 and M20. This is clearly a bit of a stretch to have a good view of the nebulae, the moon, and Mars. The objects' low altitudes and the approaching twilight make this a challenge. Notice that Mars is 1.5° to the upper right of 1 Sagittarii (1 Sgr, $m = 4.9$). Watch it approach and pass the star during the next few mornings. Jupiter is to the lower left of the Moon – Mars pair, nearly 11° up in the southeast. Saturn is to the lower left of Jupiter, likely lost behind terrestrial obstructions. As sunrise approaches, the crescent moon inches toward Mars. If you can track Mars into a brighter sky, the moon occults it a few minutes after 6 a.m. CST. Observers in the Western U.S. see the moon

occlude Mars in a darker sky. In the evening, 30 minutes after sunset, Mercury ($m = 1.6$) is over 7° in altitude in the west-southwest, over 30° to the lower right of Venus. One hour after sunset, Venus, nearly one-third of the way up in the west-southwest, is 2.3° to the lower left of Delta Piscium.

Looking Southeast 45 minutes before sunrise



February 19-20: The lunar crescent passes Jupiter and Saturn on these mornings.

- February 19:** One hour before sunrise, the old moon (25.6d, 16%) is 10° up in the southeast. It is 4.0° to the right of bright Jupiter. The planet is 1.7° to the lower left of Pi Sagittarii. Saturn is over 9° to the lower left of Jupiter. Dimmer Mars, over 16° up in the south-southeast, is nearly 12° to the upper right of the thin lunar crescent. The planet is 0.8° to the upper right of 1 Sagittarii. Watch Mars approach Kaus Borealis (λ Sgr, $m = 2.8$), the star at the top of the lid of the Teapot of Sagittarius. This morning Mars is nearly 5° to the upper right of the star. Are you still following Mercury? This evening it is 6.0° up in the west-southwest, 32° to the lower right of Venus. After the sky darkens further, observe that Venus passes 1.8° to the lower left of Delta Piscium. Also notice that the planet is 3.7° below Epsilon Piscium (ϵ Psc, $m = 4.2$).
- February 20:** One hour before sunrise, Mars is over 16° in altitude in the south-southeast. With a binocular observe that it is 0.2° to the upper right of 1 Sagittarii. This morning Mars is 4.2° to the upper right of Kaus Borealis. Bright Jupiter, 10° up in the southeast, is nearly 15° to the lower left of the Red Planet. The Giant Planet is 1.9° to the lower left of Pi Sagittarii. About fifteen minutes later, the moon (26.6d, 9%) is 2.6° to the right of Saturn and 9.0° to

the lower left of Jupiter. Saturn is over 7° up in the southeast. One hour after sunset, Venus is nearly one-third of the way up in the sky above the west-southwest horizon. It is 2.7° below Epsilon Piscium. Through a telescope, Venus is 17.5" across and 66% illuminated.

- **February 21:** One hour before sunrise bright Jupiter is 10° up in the southeast, 2.0° to the lower left of Pi Sagittarii. Dimmer Mars is over 14° to the upper right of Jupiter. The Red Planet is moving away from the bright nebulae in Sagittarius. This morning it is 0.5° to the lower left of 1 Sagittarii and 3.6° to the upper right of Kaus Borealis. Use a binocular to locate Mars among the dimmer stars. As the sky brightens further, look for Saturn, over 8° up in the southeast and over 9° to the lower left of Jupiter. In the evening, one hour after sunset, Venus is nearly 30° up in the west-southwest. With a binocular observe that it is 1.4° below Epsilon Piscium.
- **February 22:** One hour before sunrise, the planet parade is taking shape in the southeastern sky. Bright Jupiter is 10° up in the southeast, 2.1° to the lower left of Pi Sagittarii. Saturn, nearly 6° up in the east-southeast, is over 9° to the lower left of Jupiter. Dimmer Mars, over 16° up in the south-southeast, is over 14° to the upper right of Jupiter, 1.1° to the lower left of 1 Sagittarii, and 3.0° to the upper right of Kaus Borealis. One hour after sunset, Venus is nearly one-third of the way up in the west-southwest. With some optical help, observe that the planet is 0.5° to the lower left of Epsilon Piscium.
- **February 23:** One hour before sunrise, the three Bright Outer Planets span nearly 23° in the southeastern sky. Bright Jupiter, nearly 11° up in the southeast, is about 14° to the lower left of Mars and over 9° to the upper right of Saturn. Mars is 2.5° to the upper right of Kaus Borealis, while Jupiter is 2.3° to the lower left of Pi Sagittarii. The moon reaches its New phase at 9:32 a.m. CST. In the evening, one hour after sunset, brilliant Venus is over 30° up in the west-southwest. It is 1.0° to the upper left of Epsilon Piscium. Use a binocular to see the dimmer star.
- **February 24:** One hour before sunrise, Saturn is nearly 7° in altitude in the southeast. Bright Jupiter is over 9° to the upper right of Saturn and 2.4° to the lower left of Pi Sagittarii. Moving higher, Mars is 13.0° to the upper right of Jupiter and 2.1° above Kaus Borealis. The moon returns to the evening sky. Thirty minutes after sunset, the moon (1.4d, 2%) is nearly 6° up in the west-southwest. It is over 30° below brilliant Venus ($m = -4.3$). As the sky darkens further, use a binocular to observe that Epsilon Piscium is 2.0° to the lower right of the planet.
- **February 25:** One hour before sunrise. Mars, over 16° up in the south-southeast, is 1.8° to the upper left of Kaus Borealis. Bright Jupiter ($m = -2.0$), 11° up in the southeast, is over 12° to the lower left of Mars. Jupiter is 2.6° to the

lower left of Pi Sagittarii. Saturn is 9.0° to the lower left of Jupiter. In the evening sky, one hour after sunset, the moon (2.4d, 5%), over 10° in altitude in the west-southwest, is nearly 20° below Venus. Through a telescope, Venus is 18.2" across and 64% illuminated.



February 25-28: Watch the moon pass Venus in the evening sky.

- **February 26:** One hour before sunrise, Mars ($m = 1.1$), 16° up in the south-southeast, passes 1.8° to the upper left of Kaus Borealis. The planet is slightly closer to the star this morning than yesterday's appearance. Bright Jupiter is 12.0° to the lower left of Mars. The Jupiter – Saturn gap is now less than 9.0° as they head toward their conjunction later in the year. Jupiter inches eastward faster than Saturn. This morning, the Giant Planet is 2.7° to the lower left of Pi Sagittarii. The moon is at apogee at 5:34 a.m. CST, 252,449 miles away. One hour after sunset, the moon (3.4d, 10%) is over 20° in altitude in the west-southwest. The moon is in Cetus this evening. The lunar crescent is about 10° below brilliant Venus. Mercury is at inferior conjunction at 7:45 p.m. CST.
- **February 27:** One hour before sunrise, the morning planets – Mars, Jupiter, and Saturn – span about 20° . Bright Jupiter is in the middle, about 11° up in the southeast. It is about 2.9° to the lower left of Pi Sagittarii. Dimmer Mars is nearly 12° to the upper right of the Giant Planet. The Red Planet is now past Kaus Borealis, 2.0° to the star's upper left. Meanwhile, Saturn is less than 9° to

Jupiter's lower left. The Ringed Wonder is 7° in altitude. In the evening, Venus and the moon (4.4d, 16%) are in a classic artist's scene. Brilliant Venus is 6.7° to the right of the lunar crescent. Photograph the pair with a tripod-mounted camera. Vary exposures from 1-10 seconds to capture earthshine on the night portion of the moon.

- **February 28:** One hour before sunrise, find Saturn nearly 8° up in the southeast. Bright Jupiter is over 8° to the Ring Wonder's upper right. Jupiter continues to amble eastward among the sidereal background. This morning it is 3.1° to the lower left of Pi Sagittarii. Dimmer Mars is 11.0° to the upper right of Jupiter. This morning with a binocular notice that the Red Planet is 0.4° to the upper right of the globular cluster M22 (NGC 6656). One hour after sunset, the waxing crescent moon (5.4d, 24%) is over 40° in altitude above the west-southwest horizon. It is nearly 15° to the upper left of brilliant Venus. This evening the moon is back in the constellation Cetus.
- **February 29:** Happy Leap Day! This day is added to the calendar nearly every four years to match the calendar month with the seasons. One hour before sunrise, bright Jupiter is nearly 12° up in the east, 3.2° to the lower left of Pi Sagittarii. Dimmer Mars is over 10° to the upper right of the Giant Planet. This morning, look at Mars with a binocular. It is 0.5° to the upper left of M22 and 2.9° to the upper left of Kaus Borealis. Saturn is over 8° to the lower left of Jupiter. In the evening, about one hour after sunset, the thick crescent moon (6.4d, 33%) is over 50° up in the southwest. Brilliant Venus is over 30° up in the west-southwest, 3.7° to the lower right of Omicron Piscium (o Psc, m = 4.2). Through a telescope, Venus is 18.8" across and 63% illuminated.

As morning twilight begins at month's end (before 5 a.m. CST), the Bright Outer Planets – Jupiter, Saturn, and Mars – shine in the southeast. Jupiter is nearly midway from Mars to Saturn in a morning planet parade. Antares, now approaching the meridian, is nearly 30° to the upper right of Mars. Farther west, bluish Spica is in the southwest. Look high above Spica for Arcturus, nearly two-thirds of the way from the horizon to overhead. Leo and Regulus are approaching the western horizon, with the Lion's heart only one-fifth of the way up in the sky. Moving northward, the Big Dipper is about halfway up in the northwest with its Pointers consistently aiming northward toward Polaris. On the eastern part of the sky, Cassiopeia is about one-fifth of the way up in the north-northeast. The Summer Triangle is nicely placed in the eastern sky, with Vega over halfway up in the east. The sun is in the sky for over 11 hours and darkness lasts 30 minutes less than the sun's daily reign. At the end of evening twilight (about 7:15 p.m. CST), a crescent moon decorates the southwestern sky above brilliant Venus. The bright Winter Congregation dominates the southern sky, with Betelgeuse at the meridian. The flagship constellation of the season, Orion, is nicely placed in the south for visual inspection of its grand deep sky spectacles. Castor, Pollux, Procyon, and Sirius are east of the meridian. Rigel, Aldebaran, and Capella are west of the imaginary line that divides the rising stars from the setting stars. With Capella a few degrees west of the meridian, Deneb makes its last stand in the evening sky. It is very low in the north-northwest, below Cassiopeia. Leo is tilted upward in the eastern sky. This indicates that the Big Dipper stands on its handle in the northeast. Pegasus is low in the west, with Andromeda's stream of stars pointing upward toward Perseus.

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.

TCAA ACTIVE ON FACEBOOK



Did you know that the TCAA is on Facebook? We encourage users of social media to follow the TCAA to see what the club is doing and to learn about nightly events that only require the observer to step outdoors and view with the unaided eye. You can find us on Facebook by searching either TCAA or Twin City Amateur Astronomers. If you haven't followed TCAA's Face-book page, you have missed out on a lot during the past couple of months.

Did You Know?

Are you looking for back issues of *The OBSERVER*? Look no further than here: <http://tcaa.us/Observer.aspx>

Are you looking for information about the **history of the TCAA**? Find out more here: <http://tcaa.us/History.aspx>

Are you looking for the **TCAA Guides** to amateur astronomy? Visit this page: <http://tcaa.us/TCAAGuides.aspx>

RENEWING YOUR TCAA MEMBERSHIP

The TCAA works to promote in every way among its members and the public an interest in and knowledge of astronomy and its allied sciences, to advance amateur astronomy and observational techniques, to render assistance to other individuals or organizations working in the same or related fields, and to do everything necessary and proper to further such on a formal or informal basis. The TCAA is a Federally recognized non-profit entity organized exclusively for educational and scientific purposes within the meaning of Section 501(c)(3) of the Internal Revenue Service code.

The TCAA currently supports family-friendly public observing sessions at SGNC, public outreach events such as the recent May 9, 2016 transit of Mercury and the August 21, 2017, total solar eclipse field trip, hosting of NCRAL meetings (2010 and 2016), September mini-conferences, and education courses for our membership and the public. The TCAA maintains three observatories, including payment of insurance, and publishes an award-winning club newsletter. We support Sugar Grove Nature Center through its membership program, maintain a loaner telescope program, and provide many other benefits as outlined in TCAA Guide #2 – *Membership and Benefits*.

Your TCAA membership supports education and public outreach in Central Illinois and regions beyond. Membership dues and the generosity of its members are the club's primary means of financial support. We receive no grants or public funds. We have unmet needs. By renewing your membership when it comes due, you can help to ensure our continuing efforts.

PUBLIC VIEWING SESSIONS FOR 2020

April 25: *Mars and the Events of 2020* (Carl Wenning)

8:15-10:15 PM

Mars makes its closest approach to Earth every 780 days (1.9 years). The next closest approach will occur on October 13th, 2020, when it appears opposite the sun in the sky. Prepare now to observe Mars as it moves rapidly eastward among the stars of the zodiac, brightening all the while, and then suddenly executing an impressive 13-degree-long retrograde zigzag!

May 23: *Galaxies of the Spring Sky* (Tim Stone)

8:45-10:45 PM

In the spring, our line of sight on the sky looks straight out of our galaxy into the vast space beyond, showcasing thousands of bright galaxies and millions of dim ones. We will tour this neighborhood of the universe, highlighting some of the most beautiful galaxies in the heavens.

June 20: *Navigating with Stars* (Sunil Chebolu)

9:00-11:00 PM

For centuries, navigators have relied on stars to identify directions, compute latitude, and even read local time. We will explore these ideas and also examine the problem of measuring one's longitude at sea – a fascinating problem that defeated some of the best minds in the world for many years.

July 18: *Jupiter & Saturn* (Mark Boulware)

9:00-11:00 PM

Jupiter and Saturn offer stark contrasts when compared to the inner planets. We will review how and why they formed in their current locations and their impact on the formation of the rest of the solar system. We will learn how the two greatest planets are similar yet different.

August 22: *Touring the Milky Way* (Mark Cabaj)

8:15-10:15 PM

The Milky Way is one of the countless stellar islands floating in a cosmic foam of dark matter, dark energy, and matter. Humanity is trying to find out what our galaxy looks like inside and out using ingenious observing methods and increasingly more sensitive equipment. Take a tour of our "cosmic home" to see what we know so far.

September 19: *The ISS: Past, Present, and Future* (Sandullah Epsicokhan)**7:30-9:30 PM**

The International Space Station (ISS) is humankind's largest artificial satellite. Given the right time and conditions, it can be easily seen orbiting overhead. We will look at how it was constructed, how it is used, what it is like living in space, and where it is headed in the future.

October 17: *Missions to Mars* (Lee Green)**7:00-9:00 PM**

As we reach our closest approach to Mars for the year, the Red Planet shines brightly throughout the evening. Let's review the many spacecraft missions we've sent there, what they are revealing, and how they are paving the way for a future manned mission to Mars.

TCAA TREASURER'S REPORT AS OF JANUARY 28, 2020**Checking Account Information**

Memo	Category	Amount
BALANCE 12/27/2019		990.97
Vivian Hoette	Dues Received	25.00
David Peters	Dues Received	25.13
Allan Griffith	Dues Received	25.13
Quicken Renewal - Double Billed - Good to 11/2021	Subscriptions	(38.05)
Jim Gibbs	Dues Received	80.00
William Carney	Dues Received	25.00
Electrical Service	Waynesville Observatory	(59.12)
BALANCE 01/28/2020		1,074.06

Checking Account Balance – January 28, 2020	\$1,074.06
Savings Account Balance – January 28, 2020	<u>\$2,017.93</u>
- Includes \$0.03 cents interest as of this date	

Total TCAA Funds – January 28, 2020 **\$3,091.99**

All transactions are reconciled with the bank statements as of this date.

Respectfully submitted,
Dave Osenga, Treasurer