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Teaching Astronomy through Adult Education Classes

By Michael Kauper

I love teaching astronomy and doing astronomy outreach. By most measures I am a merely O.K. amateur astronomer. I rarely star hop to faint galaxies. I have not memorized the sky, not even naked eye. I shoot wide-field color with a digital SLR rather than five-color channels with a CCD and narrow-band filters.

The major way that I enjoy astronomy has been through teaching and outreach. I have a good understanding of how difficult astronomy is. I appreciate the extraordinary, mind-stretching visualization involved. My goal is to communicate, as clearly as possible, exciting and interesting ideas to non-astronomers. I try to show them our place in the universe at all scales of time and space.

I have been fortunate for the last few years to be the astronomy teacher for Minneapolis Public Schools Community Education Adult Enrichment. I teach evening classes at Southwest High School. My students’ ages range from teens to retired adults. All love the sky, romantic and beautiful. Some are fans of space exploration. A few may even want to become amateur astronomers.

Many adult astronomy students want to enjoy astronomy with their children; most want advice about buying a family or beginner’s telescope. Most of my students think astronomy is cool, mysterious and ancient, and worth their leisure time. I work hard to encourage that attitude. Some students are interested in astrology! I respectfully tell people that astrology is not real. I have developed some creative ways to help astrology students discover real astronomy based on their interest in astrology. I will discuss those ideas later in this article.

When students want telescope-buying advice, the first thing I do is tell them about MAS. “Before you buy, go to a couple of star parties. Discover what you can see through a telescope. Actual views of the night sky do not look like the pictures on the Internet, in magazines, or at the movies.” I urge them to become informed before buying to avoid disappointment. MAS has two free star parties a month in a beautiful park just 50 minutes west, with excellent, world-class telescopes, and amateur astronomy guides who love showing off the sky. Most of my students, and most of the people I meet during my astronomy outreach, have not heard that Minnesota has one of the finest amateur astronomy observatories.
in the world just a few minutes’ drive out of town, offering free star parties.

I emphatically tell students about small, wobbly refractors gathering dust at the back of many closets. If your telescope is wobbly, finding targets is hard and losing objects is easy. When you do find something to look at, the view may be disappointing. A $60 telescope can destroy a person’s ambition to view cool stuff in the sky. I recommend small, portable Dobs, such as the One Sky sold by Astronomers without Borders for $200, or any 6” reflector from Orion telescopes, costing from about $250 to $400. Then I tell them again, always go to an MAS star party before you buy a telescope.

During class I freely mix PowerPoint with hands-on learning. I start with easy material that MAS readers may feel is too basic for adult learners. Actually, my adult classes love it when I get really basic and teach easy stuff about the sky. Important lesson: the easier and the more basic, the better. When doing outreach, it’s hard to make it too clear for adult general public learners.

First I present diagrams showing why the Moon has phases. Then I demonstrate lunar phases with a Moon globe and a focused flashlight. One student is the Earth and sits in the middle. I carry the Moon around the Earth in its orbit. Another student is the Sun and points the flashlight at the Moon. The Earth-person in the middle reports what she sees as the Moon goes around her. When the Moon is between the Earth-person and the Sun (the flashlight), the Earth-person sees a New Moon, completely black. As I carry the Moon around its orbit, the Earth-person reports each phase. I point out to my class the bright, waxing crescent on the right-hand-side of the Moon, visible in the evening sky. This phase is most often noticed by children. Next I emphasize the waning Gibbous Moon, shrinking to a sliver, following the Full Moon and only visible later and later in the night, now illuminated on the left-hand-side of the Moon. Many people have never seen a waning crescent Moon in the early pre-dawn sky.

Sometimes an adult learner will take a turn being the Earth, to see the Moon phases for themselves. Moon phases may seem too obvious to members of MAS. I assure you that my classes love this demonstration. I also love it because it demonstrates the underlying principle of all of my astronomy outreach: what you see depends on where you are standing. If we watch the Moon moving through its orbit from a distance away, we easily see that exactly one half is illuminated at all times. We also understand how the person acting as the Earth sees the phases of the Moon. To me this is the greatest and most valuable lesson of astronomy. We may use our imagination to travel the universe, to see viewpoints other than our own. We see the Earth from the Moon. We understand Carl Sagan’s “Pale Blue Dot” viewed from beyond Saturn.

I invite students to apply this lesson to other parts of their lives. Perhaps this is the challenge of our times: with global travel and global communication, understanding the viewpoints of other people.

The next topic after Moon phases is the seasons. I have found that very few adults, even school teachers, correctly explain why we have seasons. As before, I first show Constellation Orion model viewed through eyehole
several PowerPoint diagrams showing the Earth in its orbit, demonstrating the apparent movement of the Sun in the sky from summer and winter and then back again, due entirely to the tilt of the Earth on its axis.

Michael adds a little astronomy humor to his classes.

Then we use an Earth globe and the flashlight to show how the incident angle of the light changes, why the days are shorter and then longer, and why we say that the Sun crosses into the Northern Hemisphere on the Vernal Equinox. This is difficult stuff. I try to explain it several ways, with much encouragement of questions. Again, my students strongly react to these basic ideas. I can feel them understanding for the first time ideas they felt they were always supposed to understand but didn’t. Please note once again that what we see when viewing Earth’s seasons depends on where we are standing: on the Earth or far above it; on the Equator or at the poles.

After Moon phases and the seasons, I teach everyone how to use the planisphere, aka starwheel. I supply heavy cardstock copies of the starwheel on the Sky & Telescope website for students who want to make and take their own starwheel. We practice extensively with the starwheel indoors and then outside the school under the sky. The city sky is poor, but we have enough first- and second-magnitude stars to learn how the planisphere works.

Everyone wants to show me the planetarium software on their phone. I compliment them and agree that the phone apps are amazing. Then I show them how the starwheel can tell them about the whole sky at once. The starwheel can show the movement of the sky through the night and through the seasons. We can use the starwheel to show when a favorite constellation will be high in the sky for easy viewing.

While we have the planispheres in hand, I introduce celestial navigation, for the Vikings from Norway to Iceland and for the Pacific wayfarers from Hawaii to Tahiti and Fiji and back again. Deneb is the zenith star for Minneapolis and St Paul. Arcturus is the zenith star for Hawaii. Sirius is straight overhead in Fiji and Tahiti. Certain stars in the Big Dipper are zenith stars for particular Norwegian coastal cities. Stars which skim the northern or southern horizons may also tell latitude with good accuracy. I maintain a large collection of commercially made star wheels, which are easier to use than the small paper S&T starwheels. I also use the larger commercial planispheres to talk about astrology. I use astrology interest to teach some real astronomy.

My commercial starwheels are personally modified with an addition I call the Sunline. I ask a student when her birthday is and what her Sun sign is. I explain that the Sun sign is what people are referring to when saying “I am a Taurus,” “I am a Libra,” or whatever. The place where my Sunline crosses the ecliptic is where the Sun is on the student’s birthday: their real Sun sign. Most of the students are not superstitious; they do not really believe in astrology. But everyone is intrigued; everyone wants to know their real Sun sign. This causes much smiling, laughing, and shaking of heads. I will tease a couple of adults, asking them “Now that you know the truth, will you have to file for divorce?” Everyone wants to know why their Sun sign is wrong. So I talk about Ptolemy, 2,000-year-old star maps, and precession. This introduces yet another way that the Earth moves, and it begins to get at astronomical time.

I have another favorite tool that is useful for bridging from astrology to astronomy. I have built 3D constellation models with the stars positioned to true scale using Gaia distance data. When viewed from the Earth (through a metal screw eye), the familiar constellation emerges from a random scattering of stars. To me this demonstration powerfully suggests that these ancient and beloved constellations were created by imagination alone, out of random scatterings of stars. Once again, what you see depends entirely on where you are standing.

I use this discussion to go on to my PowerPoint: Astronomy, the Versatile Hobby. The PowerPoint touches briefly on each of many ways to be an amateur astronomer. The PowerPoint slides are interspersed with videos. To further show our place in time and space, I like Monty Python’s Galaxy Song, from the movie “The Meaning of Life.” Out of thousands of astronomy videos on YouTube, I am partial to “How the Universe Is Way Bigger than You Think.” To ask students to help preserve the night sky for all of us, I show “Losing the Dark,” a video about light pollution by the International Dark Sky Association. Light waste harms everyone.
Back to my PowerPoint, I show some history of star maps and planispheres, how we specify binoculars, the types of telescopes, best family telescopes, best and easiest objects to observe. I particularly show many examples of how things look in the sky when viewed various ways: how planets look naked eye, with binoculars, through small and large telescopes. I especially note the huge difference between photographs and what the eye sees. I warn the class again that a small, cheap telescope, or even a big, expensive one, may not show them what they expect.

Then I cover comets and meteors best observed with the naked eye; astronomy on the Internet; checking NASA's Astronomy Picture of the Day; participating in astronomy research on the Internet; star parties in Minnesota and all over the world; astronomy vacations; total solar eclipse and aurora chasing. Again I urge them to definitely positively visit ELO before they buy a telescope.

If we have any time left in the four evening classes, I will go on to more advanced topics, such as my PowerPoint on Finding Exo-Planets, or my PowerPoint on Fighting Light Pollution. I always invite the class to meet me out at ELO on the evening of an already scheduled public star party. I tell them that our monthly Roseville meetings are open to the public and that MAS welcomes beginning astronomers.

Please tell your non-MAS friends and relatives to take my astronomy class. We are finally beginning to beat the Community Ed astrology class in enrollment!

A Vintage Scope; or Close Enough to a Questar for Me
By Daniel Gunter

Like many an amateur astronomer, I have long lusted after the gemlike beauty of a Questar Maksutov-Cassegrain telescope. I got hooked in spring 1976 when I took an astronomy course at the storied institution Southeast Missouri State University, my undergraduate alma mater. The school's collection of telescopes can be described, generously, as meager. It consisted of a 6" refractor with a fungused lens, a Criterion RV-6, two Celestron C-5s, and two 3.5" Questar Maksutov-Cassegrains.

Mr. Ueleke, our professor, loved the Questars. He delighted in showing us the many details of their construction, including the ingenious (and almost unusable) finder, the built-in Barlow, and the sliding dew shield with its decorative (but not particularly useful) star map. I used the Questars on the few evenings that we spent under the stars, trying to find objects through the light-glazed humidity of the southeast Missouri spring nights. But I had more success with the Criterion RV-6—and that spring a friend of mine and I pooled our meager resources to purchase one.

The 2045 has a mixed reputation for optical performance, with some units reportedly suffering from poor quality control. But mine appears to be a good example. The optics are very clean, and they do not appear to have been aggressively cleaned by prior users. More important, the optics appear to be reasonably well collimated. Defocused stellar images are almost perfectly round, both inside and outside of focus. Given what I paid for it, I’m not complaining.

Once collimated, the Criterion—a 6" f/8 Newtonian reflector—provided good views of many objects. After I obtained a drive corrector for the AC-powered clock drive, the German equatorial mount tracked very well. When I troubled to align the mount carefully, I could keep an object centered in a 25mm eyepiece (probably an Achromatic Ramsden) for more than fifteen minutes at a time, even though the declination axis did not have slow-motion controls of any sort.

As much as I loved the Criterion, I continued to lust after a Questar. But I also fell prey to time and responsibility. Like little Jackie Paper, I put away my Criterion—indeed, sold it—so that it could make way for other toys: the toys of work, marriage, and children.

Eventually I returned to astronomy, purchasing first a Meade 90mm refractor (fine optics; horrible mount) and later an Orion 127mm Maksutov-Cassegrain (fine optics; barely usable mount). I also purchased a couple of other refractors, including a Meade AR-5 optical tube with excellent optics—and, of course, a degree of chromatic aberration. For a time I owned a D&G 6" f/12 achromat, which provided beautiful views—but I found it difficult to use because of its extremely heavy mount. I’ve also owned a couple of 8" Schmidt-Cassegrains (a Meade and a Celestron). But I continued to yearn for a Questar.

After moving to Minneapolis, I used (principally) the Mak-Cass and the AR-5. We live near Bde Maka Ska, and my tiny backyard has only one spot from which I can both (a) see Polaris to achieve accurate polar alignment and (b) see anything else. Moreover, the combination of light pollution and haze erases most faint fuzzies.

I often haunt Craigslist, looking for used telescopes. About eighteen months ago I purchased a used Meade 2045, a 4" (102mm), f/10 Schmidt-Cassegrain in a fork mount. This is an early version, probably manufactured in the early 1980s, with an aluminum case in generally good condition.

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The fork mount is surprisingly robust and stable. The AC clock drive works, but it won’t drive the scope with my Sony a6000 attached to it. If I become bold enough, I’ll open up the base to try to improve the drive’s functioning, and I’ll also open up the optical tube to make some changes recommended to provide better (and more stable) collimation. Despite the lack of a functioning motor drive, the slow-motion control in right ascension works well enough for my current purposes. The declination control is even smoother.

The 2045 came with three rods that can be screwed into its base to prop it up for tabletop use. That’s cute if you want to use the scope as a decoration. If you’re exceptionally cautious, perhaps you could use this tabletop setup for lunar observation.

I put together some pieces of aluminum to create an adjustable wedge. Thumbscrews attach the scope’s base to the wedge. I mount the wedge on a heavy camera tripod, which is reasonably stable. More important, the entire setup breaks down into light, easily transported pieces that can be assembled quickly.

The 2045s were supplied with a useless straight-through 5x24 finder. I replaced mine with a red-dot finder, which functions well for my purposes.

Unfortunately, at about the same time I purchased the scope, I began to realize that the vision in my right eye was deteriorating; I later learned that I suffer from macular pucker. I can’t discern fine details, and shapes are warped. I can use my left eye, but I haven’t yet trained my brain to think properly with that eye. (I am reluctant to use my left eye too much; if I do, I may lose all sight in my right eye.) Given that limitation, I’ve been using the 2045 as a grab-and-go scope for occasional photography of the Moon and Sun. It works well for those purposes, and I can achieve critical focus using the focus-peaking feature of the a6000, despite the impaired vision in my right eye.

Exploring the Cosmos Together

By Susan Haugh, Belwin Conservancy program director

Belwin Conservancy has incredible landscapes, dark skies, and a hunger to share nature with others. The Minnesota Astronomical Society (MAS) has facilities at Belwin, incredible telescopes, and knowledge to share. Together we bring outer-space vistas, near and far, to viewers just 15 miles from the Capital.

Belwin’s partnership with MAS began in 2008, when Belwin purchased land that included the Metcalf Observing Field on Indian Trail in Afton. Two years later, MAS and Belwin built an observatory at Belwin’s Education Center. The mutual values of science, exploration and community involvement brought the two organizations closer and solidified a long-lasting partnership. Today, Belwin lands are home to two MAS east metro sites: Metcalf Observing Field and the Joseph J. Casby Observatory. MAS uses the Metcalf field for beginning astronomy workshops (B-SIG events) and other programming.

The Joseph J. Casby Observatory at Belwin is a direct extension of our partnership. In 2009, a facility was needed to house a donated 10" refractor telescope. At the time, no such spot existed. MAS membership had long wanted a permanent telescope housed in the east metro to complement those already located in other areas of the state. The chosen site at Belwin boasts a southern sky with very little light pollution for a metro location and a unique panoramic view. In 2010, the observatory opened with one of the largest refractor telescopes in the state.
The Color of the Moon
by Thor Olson

I was 16 years old when Apollo 11 landed on the Moon. Color television had been invented but most TVs were still black and white. I had seen a few color televisions on display and in other homes, but the color was usually pretty awful, partly because the broadcasting signals had to be compatible with black and white sets. It was a remarkable technical achievement for a television to display color, while at the same time the older TVs could still show a nice black and white picture of the same show. One of the drawbacks, however, was that the color TV had to be very carefully tuned, aligned and calibrated, a challenge for the electronic components of the day, which were prone to drifting off perfect reception. The result was that people’s faces often turned green or purple. Viewers are quite tolerant of colors being wrong, but not when it makes humans look like Martians.

Like most families, we had a black and white TV. Color televisions were very expensive. My dad, ever frugal, even as an early technology adopter, purchased a color TV kit from a company that offered such things to hobbyists. It came with a lengthy, step-by-step instruction guide and what seemed like a zillion parts. The basement ping-pong table became a workbench on which the components were sorted and organized. I recall being impressed by the complexity of the project. Circuit boards had to be assembled and soldered. Wire harnesses and connectors had to be built. The color picture tube was fragile and huge, nearly 25 inches in diameter. It all had to be built into a chassis and then installed into a TV console. This was an enormous project, but Dad was up to the task, having acquired the electronics skills from his amateur radio hobby. I couldn’t provide much help, other than to cheer him on.

Belwin and MAS work together to bring exploration and understanding about the cosmos. With our complementary work, we are extending our knowledge and love of nature within and beyond the Milky Way.

For astronomical experts, the telescope housed in the Casby Observatory is an eight-foot-long 10” TMB f/9 refractor driven by an Astro-Physics 3600GTO “El Capitan” mount. This professional-quality telescope and mount are accompanied by a TMB 130 f/7 scope, an Orion ST 120 guide scope, and a Lunt hydrogen-alpha solar scope, all mounted piggy-back on the 10” scope. These scopes are housed within a 16.5 foot Ash-Dome observatory.

On Friday, April 26, we held our first Galaxy Party at the Joseph J. Casby Observatory for adventurers of all ages. We were successful in viewing several stars and superclusters as well as galaxies. We also learned about nightscape and astrophotography from MAS members. Thank you to the MAS members who made this a great event.
the clock, with Dad working furiously to complete each assembly step and check it off in the instruction manual, with the rest of us asking “When will it be done?”

It came down to the last few hours. Apollo arrived at the Moon and the landing module was preparing to come out of lunar orbit during the final assembly steps of tuning and converging. It was quite exciting to see the picture tube come to life and show a test pattern of colored dots. The dots had to all line up, horizontally and vertically, so that they converged on top of each other to make rows and columns of white dots. After adjusting and readjusting, my Dad was finally satisfied. He connected the antenna and Walter Cronkite appeared in full color, narrating the historic event. It was beautiful full color too, better than I remembered from the few other color televisions I’d seen. We watched in fascination as the video camera on the lander sent back images of mankind’s giant leap. Unfortunately, it was a black and white camera.

In the years since, I learned how technically difficult it is to get a video signal of any kind to travel the quarter-million miles to Earth and still be viewable. In subsequent Apollo missions, further advances allowed them to use a color video camera. It did not change the imagery, however. It turns out that the Moon itself is black and white!

Astronomy Day • May 11, 2019
by Merle Hiltner

Another Spring Astronomy Day has come and gone. This year was the 20th Astronomy Day at the Onan/Eagle Lake Observatory. We started the day cloudy, which prevented solar viewing, but the evening cleared enough to have some viewing. We had a great lineup of speakers and presentations throughout the day, with an abundance of great keyholders helping and more than 100 guests attending during the day.

Joe Ballalatak, winner of Orion Star Blast telescope

The observatory opened at 1:00 p.m. with Brad Nasset giving a presentation on the Onan plaza: “Understanding the Solar System.” This was a live demonstration using models of the Sun, the Earth, and other planets, to create a visual, interactive Solar System. We were able to see how the orbits of the planets determine when and where we are able to see them. Brad next moved into the classroom for his presentation: “Where Do I Look? Finding the Constellations.” He explained where the constellations are and why the night sky always seems to look different each time we look at it.

Next, Colin Kilbani showed us how to build our own model rocket using index cards, a plastic Easter egg, a paper towel tube, a bit of string and some foam. Colin explained the basics of model-rocketry safety and was able to help several guests launch their rockets. Michael Kauper then showed us how to make and use a starwheel to take home, teaching all present to find constellations and stars in the sky, any time of night, on any clear night, all year round.

After the dinner break, Steve Emert gave his

Continued on page 10.
Patron memberships are available to those who wish to contribute a little extra to support MAS activities. Patron memberships are established by constitution at 2-1/2 times the Regular membership rate—currently $65 annually for a patron membership. The $39 additional contribution is tax deductible. Patron memberships help fund equipment acquisitions, facility improvements, outreach activities and more. We would like to thank the following patron members as of May 2.

Tom and Arlene Alm
Scott Anderson
Steve Anderson
Stephen Anthony
Jack Atkins
Steve Baranski
Greg Baril
Bradley Beisel
Omkar Bhujad
Scott Billeadeau
Katie Bloom
Wayne Boline
Natalie Broshar
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Alan Noot
Douglas Oines
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Christopher Paola
Mark Petchenik
Becky Pollack
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Neil Worthingham
Gene Yates
Karen Ziemek
John Zimitsch
Mark Zimitsch
Neal Zimmerman

MAS Board Minutes for March and April

By Trena Johnson, secretary

March

Attendance: Dave Falkner, Trena Johnson, Matt Dunham and Suresh Sreenivasan. Guests: Steve Emer and Vic Heiner (dial in). Site Reports: CGO: Vic and Steve presented options on the phone line update. Frontier & Comcast are not available. AT&T and Verizon have service, with Verizon being the stronger signal with a possibility of WIFI hotspot. There is also the possibility of using the neighbor’s WIFI for a small donation to him. SimplySafe is $15/month using cell service while a hotspot is $75/month. Vic warned to keep it low key and of burglary radar. Concern discussed is support for the imaging rigs. Robert Miller or Venne is currently driving to help with user errors.

With Verizon an option might be to dial in via Google Voice Free or a Verizon Jet Pack. Discussion was tabled needing further research. ELO: Request was made for two counterweights for SAC AP mount to bring it up to specifications as assigned by the manufacturer. The AP mount for JJC will also need up to two counterweights. Motion made to purchase up to four counterweights, approved. NNSF: Suresh updated the board with a summary of attendance, cost, income, and promotion of event. Labor Day weekend seems to bring the most attendees. Steve Emer will send info to Sky and Telescope along with putting a notice in Amateur Astronomy magazine. New Image: Dave Venne is tasked with creating a new image for use on posters, handouts and a banner. Common Grant Application: Annie Sarver has agreed to work on the MN Common Grant Application form. Thank you. Gemini: The board discussed
the reaction of members to the non-printed edition of Gemini.

B-SIG: The potential of recording the B-SIG winter talks and/or general meetings was reviewed. The board decided that more research is needed. CCWS and NNSF: Advertisements have been submitted to the Reflector. Surplus Items: A discussion was held about surplus items that are up for sale. These will need to be advertised in the Market Place: 12.5" NGT; 14" Meade SCT OTA & mount (no tripod); 12" Meade SCT LX200; 8" SCT orange tube w/mount and tripod. Storage: Matt Dunham is to check into small storage that Fairview Community Center offers; it is your basic school locker. Belwin: Andy Fraser is working on MOU with Belwin. Open Volunteer Positions: communications coordinator; IT administrator; observing coordinator; student board liaison; monthly program director; constitution update sub-committee members. Coronado: The donation of a Coronado PST with Synta4 mount was discussed; board members seemed to think that this would be a good scope to put into the loaner program.

April

Attendance: Dave Falkner, Suresh Sreenivasan, Matt Dunham and Trena Johnson. Guests: Miles and Molly Duffin. The board welcomed Miles Duffin as our new student representative. Miles hopes to bring teen programs to his school and community and to the younger members of MAS. He would also like to have more teen-based star parties and events, such as a B-SIG along with astronomy talks regarding current findings—such as the recent photo of the Black Hole. Site Reports: JJC/ Metcalf: Dave is going to talk to the new Belwin director and communicate a need to complete moving the concrete pads at Metcalf. ELO: We have been working on cutting pieces for the SA Casby railing; we have about 40 of the 172 rail spindles left to cut. We’ll probably start welding the SA Casby sections after Astronomy Day. We will also begin installation of the lower plaza railing sections after A-Day. Once the lower plaza railing is installed, we will add the electrical outlets there as well. Bob and Doug S have been working on adding internal and external security cameras as well as a new DVR in the HotSpot and SA Casby. They are also working the video system in upgrading the cameras and cable from Onan and SA Casby to the HotSpot. Mark has been working on installation and setup of the SkyX upgrade on the imaging and visual platforms in Onan. We are waiting for the arrival of the additional counterweights for the AP mount in SA Casby (as well as JJ Casby) and will schedule the installation ASAP. (Backordered.) Merle has sent plans for the Onan roll-off roof modification to bid but hasn’t heard back yet. Bob is building two upper cabinets that will be installed over the desk and over the accessory cart in SA Casby. These are to replace the large stand-alone steel cabinet we removed prior to ALCON last year. Merle will be scheduling an optics-cleaning work party prior to A-Day. He has asked experienced keyholders who have done this in the past to do so again. Keyholder training is scheduled for April 27. CGO: Paving the driveway and parking lot was the major topic. A simple solution of overlaying the current gravel area was rejected because with the slope toward the observatory and observing field it is not practicable. The cost for regrading and asphalt would be $16,000. While a paved parking area would be desirable, it would not significantly add to availability of the site, since the observing field would still be wet. Also, using the observatory would not require bringing in much equipment, and users could park on the road; this was the only way in the past. The committee will continue to look into it and potentially add it to their FY2020 budget request. The security system was discussed, and it was agreed to proceed with the Simply Safe system with two sensors, one on each door of the observatory. Details concerning who would get notified in the case of the alarm sounding still need to be worked out (def note: this service was previously stated to be about $15/month). Does it include the cost of connecting for cell service? If yes, maybe we can include hotspot; more clarification is needed. We will proceed with procuring the work mats for around the two scopes in the observatory; this is in the budget. The concrete pads will proceed. However, number and details on volunteer work need to be worked out. Observatory pressurization is proceeding. Two items were discussed and rejected: curtains for the warming house and WIFI hotspot installation. Posters: The board is exploring options for varying poster sizes with costs ranging from $40 to $140 per item. We discussed the possibility of a QR code on the posters and handouts. The board has tabled this until we have image options from Dave Venne. The MN Common Grand Application form will need to be completed and submitted in time for the Onan Foundations fall board meeting. There was a discussion of surplus items that are up for sale. Several were mentioned at the general meeting but also need to be advertised in the Market Place: 12.5" NGT; 14" Meade SCT OTA & mount (no tripod); 12" Meade SCT LX200; 8" SCT orange tube w/mount and tripod (sold at general meeting). The 8" Celestron Frankenscope was donated to Jackson Middle School. Open Volunteer Positions: communications coordinator and IT administrator. Volunteer Positions Filled: purchasing coordinator—Mark Job; student board liaison—Miles Duffin; monthly program director—Ahmed Reda; MAS constitution committee—Mary Williams, Bill Glass, Merle Hiltner, Antone Gregory, Dave Johnson. Constitution: Dave Falkner contacted Legal for Good attorneys to be our constitution guide. A motion was made and passed to hire Jenn Urban with Legal for Good to be our consultant. Library Loaner Scope: The board discussed how much MAS should be involved with the library loaner scope program that is spearheaded by Mark Job and Andy Fraser. Discussion was tabled until the May meeting. Fall Astronomy Day: We are going to investigate getting a lunar sample from NASA for a couple of weeks to display as part of an ELO event commemorating the 50th anniversary of the Moon landing. Dave is investigating this and will have an update by the next board meeting. It takes many individuals to make this program work. Thank you to all who have taken the time to help in any way possible. ☑
“Conspiracies” presentation. Unchecked social media has spawned an increase in conspiracy theories, such as “We didn’t go to the Moon in 1969”; “The Moon and the planets aren’t real, they are projections.”; and “The Earth isn’t a sphere, it’s flat.” Steve humorously talked about some of these and gave us a little ammunition we can use to respond when we meet a Flat Earther or Moon Conspiracy theorist.

Our final speaker of the day was MAS president and NASA Solar System ambassador, Dave Falkner. Dave’s presentation, “The Mars Curse,” taught us about the 54 missions to the Red Planet and how more than half of them have ended in total or partial failure. Dave discussed why Mars is such an alluring target, the attempts at sending spacecraft to Mars, which nations have hardest hit by the Mars curse, and what we’ve learned about the difficulties of sending humans to this forbidding world.

After Dave’s presentation, we had the door-prize drawings. We had an assortment of books, MAS hats, shirts, mugs, binoculars for kids and even cupcakes. A pair of Celestron binoculars was the first prize and an Orion tabletop Star Blast telescope was the grand prize. The 12 x 60 Celestron binoculars went to John Mathwig. The grand prize of the Orion Star Blast telescope was won by Joe Ballalatak. Congratulations to John and Joe as well as to all the prize winners.

Thanks again to our MAS members and guests for joining us.
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<th>Friday Date</th>
<th>Sunset</th>
<th>Twilight ends:</th>
<th>Completely dark</th>
<th>Moon % Illuminated</th>
<th>ELO Public Night (Saturday)</th>
<th>Cherry Grove</th>
<th>LLCC Weekend</th>
<th>B-SIG @ Metcalf (Sat.)</th>
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CGO (Latitude: 44.1971 Longitude: -92.8623): star party dates are for Friday nights with the alternate (if cloudy) for Saturday night.

LLCC (Latitude: 46.6470 Longitude: -93.4650): Star parties are held on both Friday and Saturday nights.

Eagle Lake Public nights are held on Saturday nights only.

J.J. Casby: Latitude: 44.9245 Longitude: -92.7924

Metcalf: Latitude: 44.93734 Longitude: -92.82157
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