

Gemini

a publication of the Minnesota Astronomical Society



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Stories Wanted: Gemini needs your story of how you first became interested in astronomy, what you have done over the years, what equipment you have used, what star parties you have attended in other states, and how you have encouraged others, especially young people, to get involved in this fascinating hobby. Submit your story to: brownreveugene66@gmail.com

E-mail Update: If your e-mail address has changed in the past two years, chances are that the address MAS has is not current. We need to be able to communicate with all of our members on a timely basis. Please submit new e-mail addresses to MAS vice president Steve Emert at: lakeaires@msn.com

The Fourth Time Is the Charm

By Jason Gates

Upon arriving at my fourth Jeffers Star Party, I found Dave Miles and Pat Thomas working to set up their tent. The real light-gathering power at this year's Jeffers was a 16" Lightbridge with a track and train system; there was also a 6" Mak refractor. Pat came all the way from California for this event, where he designs spy-satellite optics for Northrop Grumman. I set up next to them to make sure I'd have easy access to the biggest scope at the party. I found a flat spot, one that for once didn't include a bunch of large thistle stalks missed by the lawnmower, and laid down an old piece of rug with a hole the size of my mount in the center. I arrived earlier than most years, giving me a chance to grab a peek at the Sun before it got too low for good seeing. There were no sunspots, a trend which continued during the entire star party, but there were a few small tendrils extending from the edge of the photosphere.

Just before sunset, the grill was lit and small amounts of bad-tasting wine were consumed. Brats were also on the grill; I topped mine off with some onion and mustard. After plenty of food, a little wine, and a load of B.S. to pass the time, it was starting to get dark. Before Jupiter even appeared in the still-blue sky and the Sun had completely disappeared, there was dew on everything. The blanket on my truck was damp, the tents were too, and the scopes still hot from the Sun were soon to follow. I hooked up a fan, brought as my weapon against bugs; it ended up saving the night for dew later on. Once night fell, Dave, Pat and I opened the night with views of Jupiter with our Dobs and exchanged views of its cloud bands and moons, and later a transit of one of the moons, where we could see its shadow on the disk. The sky was very steady, despite the dew, and a lot of small detail was showing up on Jupiter. While Dave and Pat followed Jupiter for a while longer, I found my way to Sagittarius to test the conditions by viewing some random Messier globular clusters. The nebulae nearby didn't impress me, so I moved on quickly to my target area of Ophiuchus. I nabbed seven of those and would end my logging night with a view of M33 and a very poor view of M102.

After I was through with those globulars, I took a break to walk to the three



A view from the observing/camping area showing the unobstructed view to the west. The field in the foreground is planted in native grasses and flowers.



Wide-angle image of the region from Sagittarius (left) to Scorpius (right). The bright object at upper left is Jupiter. (Five-minute guided exposure with Canon XTi at ISO 400 using a 23mm zoom lens at f/4.)

nearby observers. The dew was very bad on all scopes. The owner of the Lightbridge and the observer directly to the south of him both had heaters on their primaries. The one with the MAS 8" Dob said his finder was completely useless and was having trouble finding anything at all. I had fewer issues with my finder and eyepieces, thanks to the fan providing me a constant flow of air in the absence of the wind we had earlier that day. The narrower tube of the 8" fared much better than mine; my primary mirror was completely wet. I used a rag on the secondary and spent 20 minutes lying on the rug with the fan placed in the opening of my Dob, watching things slowly clear off. Around this time Tom Sanders, the site's director, finally arrived to shut the lights down, and more importantly, give us all access to a much-needed toilet. Some of the observers on the field that night had arrived earlier to a locked building.

We noticed quite a few meteors throughout the night; some were possible Perseids but others were random. The highlight of the night was a fireball so bright I thought someone had hit the four-way flashers or a blinker by mistake. We all looked up to see an orange streak nearly as long as the Big Dipper that was fading fast, maybe two seconds in duration. Someone came out with a night-vision scope, and the observers on the field took turns watching the trail, still visible in the scope for several minutes, as it degraded in the upper winds and formed all sorts of curvy shapes. After this I went back to looking for those faint galaxies I always have problems finding, even at Cherry Grove. I couldn't find any objects at all for at least 45 minutes. Finally, with some more primary defogging and the assistance of another observer, I found them and they looked horrible. With some reluctance, I called it a night.

Friday evening provided favorable north winds and relief from the heat. Two other observers and I helped a new arrival from Shoreville, Bill Welch, and his son Cooper and daughter Zoe, set up a 10" SCT, complete with imaging wedge and piggyback equipment. This job turned me off on any thoughts of buying such a scope. A little later in the evening, Tom Sanders and his wife invited the observers to their farm a short distance from the Jeffers site. I entertained the kids in a search for kittens while food was prepared and the others toured the observatory. On the menu was grilled pork chops and corn, fresh-grown beans and potatoes from the farm. The food was great—I passed up the bad wine this time—and there was plenty of it; nobody left hungry. We would need that food for the night to come.

When the Sun went down, the dew was significantly less. The skies were equally steady, the lights were off right away, and there was much better transparency. I decided to exact revenge on the Big Dipper, starting with M64 and logging every Messier object from there to M81 with the ease and speed of cruising the Sagittarius region. Galaxies were surrendering their details, spiral arms, irregular shapes, and even dust lanes. The connecting bridge on M101 was easily visible, as were the ghostly eyes of the Owl Nebula. I worked with the owner of the 16" Lightbridge as I turned my attention to the Sagittarius region, trying to keep up with his large aperture by tracking down the various dim NGC globular clusters in the spout of the teapot. I logged the three Messier globulars in the bottom of the teapot, and with the help of a green laser I got my first look at the Helix Nebula, an item I'd never been able to see through a telescope. I put in a filter, which got the Lightbridge owner up from his 16" to have a look, as well as two or three other persons. It was a fairly quiet evening, without any of us checking out one another's scopes; we were all simply too busy.

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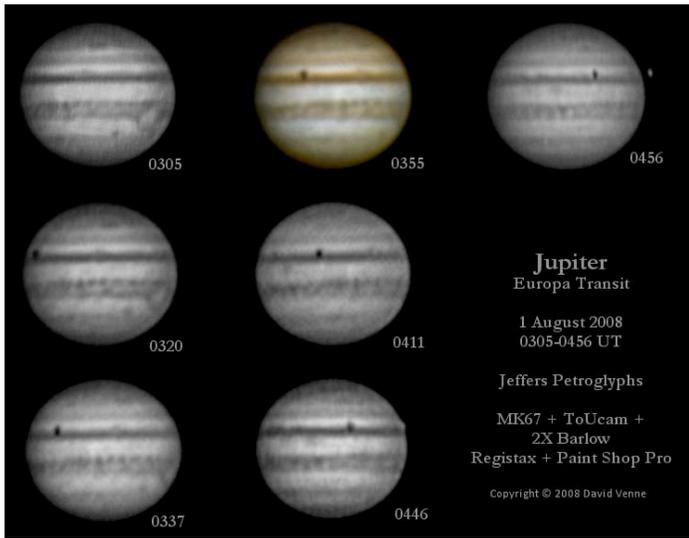
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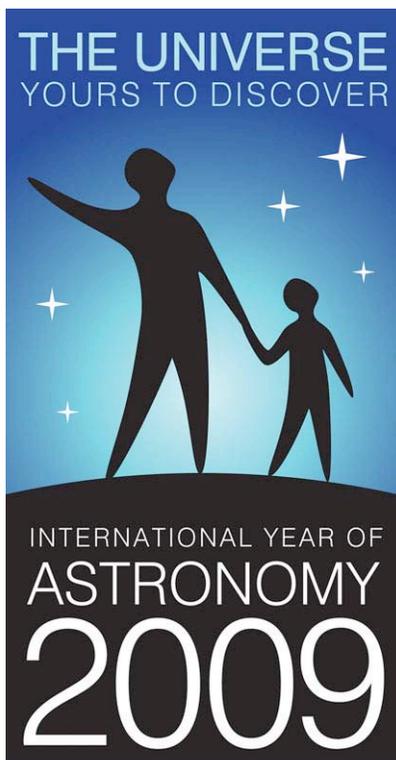
Of the other MAS members there, Kirby bagged a bunch of Messier objects and Bob Kerr worked on a Herschel 400 list. My final total was 20 Messier objects logged (M74 for the first time), a number of NGC galaxies and globulars including NGC 4565, and both sections of the Veil in splendid fashion with and without a filter. I also observed several unlogged Messier objects such as M32 and company, whose disk exceeded the low-power field several times over, Little Dumbbell and the usual suspects such as M13, 22, 27 and 28.

All in all it was quite a productive trip, despite the clouds that prevented a decent observing session with the public on the final night. 🏠



Wide-angle image of the region from Cassiopeia (lower left) to Cygnus (upper right), processed to emphasize the Milky Way. Deneb is at right center, and directly below it is the North American Nebula. (Five-minute guided exposure with Canon XTi at ISO 400 using a 23mm zoom lens at f/4.)

Composite of images from a transit of Europa on August 1. The Great Red Spot can be seen on the first few images. (INTES MK-67 and Philips ToUcam with 2x Barlow.)



IYA Kickoff Event in Fridley

January 15 was the worldwide kickoff to the 2009 International Year of Astronomy. Countries around the world participated in celebrations commemorating the 400th anniversary of Galileo first turning his telescope to the skies.

Braving the sub-zero temperatures, about 200 people attended the festivities that night at Fridley High School. The main presentation was a Web cast from the Hayden Planetarium in New York City, with links to

the Como Conservatory in St. Paul; Columbia, South America; and to us in Fridley. Joining MAS at the event were the Minnesota Planetarium Society and the U of M Department of Astronomy. The Planetarium Society also set up their Explore a Dome, a 25-foot diameter portable planetarium that many of those in attendance were able to experience.

For more information, projects, celestial highlights, etc., on the International Year of Astronomy, visit <http://astronomy2009.us> 🏠



Amateur Radio Astronomy

By John H. Thomas, III, Ph.D., W3FAF RO

I would like to start with a brief history of radio astronomy. During the past 70 years, spectroscopic investigations of the heavens using wavelengths well into the radio region of the spectrum ($\lambda > 1\text{cm}$) shows an enhanced view of not only catastrophic astronomical events-background radiation from the Milky Way, novae, etc.-but common features like the Sun. Amateur radio operators and others took notice of these developments and became involved in making their own observations in the 1980s. With the huge advances made in electronics, prices were now low enough that many amateurs could afford to build or purchase radio equipment suitable for astronomical observations. In fact, the first real radio telescope was developed by an amateur /professional in 1937. This work was pioneering and set the stage for many future instrument designs. More recently, amateur scientists have become active and have produced interesting and advanced instrumental ideas. The best instruments are still sponsored by government resources and are owned and operated by universities internationally. This leaves the world of amateur radio astronomy somewhat restrictive in that amateurs cannot afford to put together large facilities. The Society of Amateur Radio Astronomy (SARA) is an active organization and has a well-done web site (radio-astronomy.org) plus many good informational links.

It has been well known by the amateur radio community that one can hear static originating from Jupiter on clear, quiet nights on the 15 meter (21 MHz) band. My interest in radio astronomy was first sparked when I visited the large radio telescope ("the Big Ear") at Ohio State University in Delaware, OH, designed and directed by Prof. John Kraus, W8JK, in 1975. The telescope was used for SETI for a while and was destroyed in 1992 to be replaced by a golf course. Later, during 1994, when the Shoemaker-Levy 9 comet was due to impact Jupiter, I planned to do some observations using amateur radio equipment at my home. Unfortunately, construction of my receiving antenna system was delayed and I did not observe the event. Some amateurs (e.g., Gene Pressler, W3ZXV)² observed this event and published their results. With this incentive, I set up a receiving system to listen to 21MHz synchrotron noise from Jupiter and the Sun.³ It consisted of a radio receiver tuned to 21 MHz and a set of horizontal phased dipoles as shown in figure 14.

Fig-A

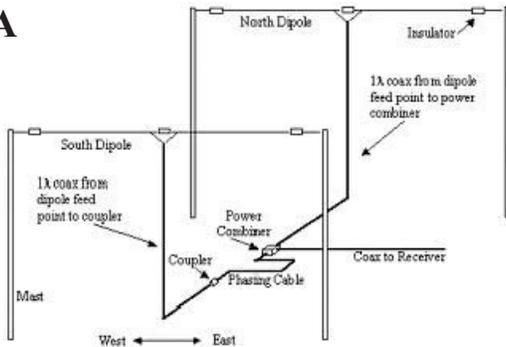


Fig-B

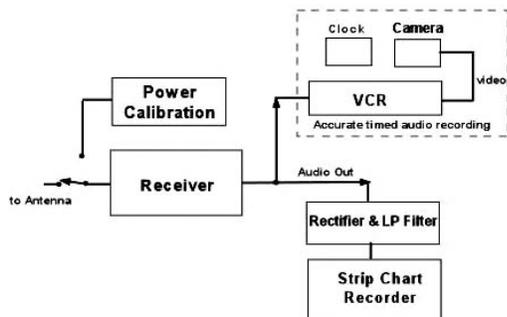


Figure 1: Phased: Dipoles from Radio Jove Project³ and simple receiving and recording system.

Recording the noise produced by the Sun or Jupiter when they were visible was provided by a strip chart recorder and accurately timed audio recorder.

Noise bursts from the Sun and Jupiter are swept frequency events⁵; with a single channel receiver as shown above it is difficult to get a true spectral picture of the emission events. The signal received represents a convolution of the receiver pass band and the frequency swept noise event. It is simple to make improvements in the recording system and reception of weak signals. The dipoles are a minimal antenna to observe these events. My receiving station was upgraded quickly to the 6-element yagi shown in figure 2 and a computerized recording system based on a well-used satellite-tracking program. The 6-element yagi is also used for ham radio on the 15-meter band when not being used as the radio telescope antenna. With the program it is possible using an alt-azimuth mount for the antenna to track either Jupiter or the Sun during their visible transits.

Accurate time measurements are necessary. Jim Sky provides a free downloadable computerized strip chart recorder that can be synchronized with WWV NIST universal coordinated time⁶. This takes the place of the mechanical strip chart recorder and the VCR/clock/camera. A wide-frequency coverage computer-controlled receiver such as the Icom PCR1500 can be swept rapidly to obtain near real-time 20MHz scans from 15 to 30 MHz of astronomical noise sources. This requires a broadband antenna as well, such as a log periodic array. Much of this is beyond an amateur's pocketbook, but for some it can be within a reasonable price range. Jim Sky has also developed a panoramic recorder for this type of reception; see his website. Research radio telescopes use much more sophisticated receivers that can capture a broad range of frequencies simultaneously.



Figure 2: A 6-element force 12 21MHz mono band yagi antenna (44-foot boom) mounted on a 24-foot tower with an alt-azimuth computer-controlled tracking system to track the Sun or Jupiter at W3FAF RO.

Using the large yagi shown in figure 2 makes reception of both solar bursts and Jupiter noise storms rather easy at one frequency. The choice of 21 MHz was made for two reasons: the availability of cheap equipment (antennas and receiving equipment) and because this is a reasonably good frequency for observation. W3FAF/RO consists of this large yagi plus a dedicated computer to record events and a dedicated communications receiver (Icom R75) which has an AGC (automatic gain control) off position. The AGC of the receiver tries to maintain a constant audio output for variations in signal strength. Consequently, the signal heard is not representative of the actual signal strength. It is necessary to record an output that is directly proportional to the signal strength. A second receiver is set up to record 1421 MHz (hydrogen line) from the Sun, but at present the antenna is not functional.

As in optical astronomy, the instrumental resolution (that is, the ability to discern stellar objects) is very important. The simple phased dipole array has a very broad aperture and is fixed imposition. This is

somewhat limiting in performing spatially resolved observations, but it is a good starting tool. The yagi shown above has a broad aperture but smaller than the twin dipoles; the beam width of the dipoles is 107° by 70° , at elev. = 80° fixed by the antenna height above ground and the 6 element yagi is 53° by 27° , at elev. = 25° , variable. The full gain of the 6 element yagi (~ 13 dbi) used in tracking mode provides higher amplitude measurements of storms from Jupiter and the Sun at a fixed frequency. To provide better spatial resolution, multi-antennas can be used in an interferometer antenna system. Two similar antennas can be spaced at some wavelengths apart and data collected as a two-element interferometer; that would improve the spatial resolution of the array. However, horizontally polarized antennas, as shown, are generally not used in this configuration. Microwave arrays are easier to adapt as an interferometer due to their smaller size and the possibility of easily making a circular polarized antenna.

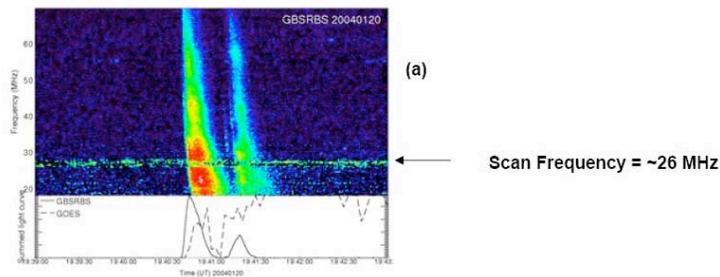


Figure 3: (a) A typical type III solar event as obtained from the Green Bank Solar Radio Burst Spectrometer 7 with an equivalent single frequency sweep shown below the panoramic display. (b) A typical type III event observed at 21 MHz at W3FAF RO. Note the similarity of the two events. The time it takes to go from 60MHz to 20MHz is 60 seconds.

Figure 3 shows two views of a typical type III (fast frequency drift bursts) noise burst that originates mostly from sunspot activity. The first picture shows a panoramic view of the intensity of the noise burst as a function of time frequency and was obtained at the Green Bank Solar RBS system. The intensity of a single frequency measurement is shown below-two peaks as a function of time. A similar type III burst (Solar RBR #4740 from <http://swpc.noaa.gov/ftpmenu/indices/dayevt.html>)⁸ was obtained with my telescope. The intensity of this noise peak of 20×10^6 Kelvin was confirmed at other amateur locations. Solar bursts are categorized by NOAA into various types depending on their drift rate and frequency coverage. Their intensity is also noted as a part of the event description. Comparisons of data such as this are useful to the radio astronomical community. Similar events are observed on Jupiter but tend to be more rapid bursts that drift more rapidly in frequency. At very high drift rates they sound like “pops” on the receiver. If they are recorded

rapidly and slowed down, the drift across the pass band of the receiver can be heard. I have collected almost 10 years of solar activity and hope to have time to perform some detailed analysis soon.

For comparison purposes and as an experimental standard measurement of source intensity, amateur radio astronomers typically calibrate their telescopes by measuring the intensity of a calibrated white noise source at the receiver terminals. The receiver’s antenna is disconnected and transferred to a calibrated 50-ohm impedance noise generator, as shown in figure 1, so that the noise voltage at the receiver input terminals can be later compared to the output of the receiving antenna system. Signal intensity is measured in degrees Kelvin but does not represent the actual temperature of the astronomical source. This is known as the equivalent temperature of the object being observed.

If you are interested in participating in any of these interesting events, please visit the Radio Jove web site. My radio telescope is also available to anyone who is interested in hearing it work. Unfortunately, we are in a solar minimum and Jupiter is low in the horizon and will be visible for only a brief period this year.

References:

1. Grote Reber, W9GFZ, built a 32-foot parabolic reflector and VHF antenna in his back yard in a suburb of Chicago. His results, studies of cosmic noise, were published in the proceedings of the IRE 28, p. 68, The Astrophysical Journal 91, p. 621, and others.
2. E. C. Pressler, W3ZXX, QST December 1994, p. 51. Gene built a 21 MHz corner reflector antenna to do this observation as part of one of his yearly summer projects.
3. Synchrotron noise is generated when charged particles circle intense magnetic fields such as that of Jupiter or the Sun with momentum toward the gravitational source.
4. Phased horizontal antennas and receiver were suggested and designed by R. S. Flagg, AH6NM, as part of the NASA-sponsored Radio Jove Project.
5. Charge particles in a magnetic field have a tangential velocity that is proportional to the attracting mass. In the case of Jupiter most charged particles are generated by Io, Jupiter’s innermost moon, and are accelerated toward Jupiter’s magnetic poles.
6. This software is available at RadioSky.com and is part of the Radio Jove Project sponsored by the NASA Goddard Space Flight Center in Washington DC.
7. The Green Bank Solar Radio Burst Spectrometer, R. Bradley, C. Parashare, T. Bastian, S. White, & L. Wye, EGS 2004 General Assembly, Nice, April 2004.
8. NOAA posts descriptions of solar bursts daily. Recently we have been in a solar minimum and no data are observed. ■

Minutes of MAS Board November/December 2009 Star Party Schedule

The secretary presented the star party schedule for 2009, which includes the Onan public nights. The schedule lists all possible LLCC weekends. After the LLCC gets back to us on the nights that fit their schedule, we will finalize it. Also included is the “100 Hours of Astronomy” event for the 2009 International Year of Astronomy, the “Campout with the Stars” weekend, and a possible two or three day special star party at LLCC.

Paul Wright

MAS member Paul Wright passed away on November 10. Paul was an active member of the club and was interested in variable star observing. Paul’s family has donated his nice collection of astronomy books to MAS. We will need to decide what to do about the offer. We passed a card around at the November monthly meeting for members to sign, and we collected donations of \$114.

Since Paul participated in variable star observing through the AAVSO, the money collected, along with \$200 from the club, was donated to the AAVSO.

Onan

The last Onan public night of 2008 was held on November 22. Many thanks to the Onan crew for a job well done for 2008. We counted over 2,500 visitors for the year.

Dave Olmstead, Onan Committee chairman, has decided to step down from the committee. He recommended that Merle Hiltner be appointed to take over the role. Dave has served at Onan in various capacities since its construction. Merle has been very active at Onan for the last few years as equipment wrangler and has a deep understanding of the Onan building, equipment and operations. We all felt that Merle is an excellent choice for the job. Ben Huset appointed Merle as the new chairman and he accepted the assignment. We would all like to express our sincere thanks to

Dave for his contributions over the years and our congratulations to Merle. Thank you, Dave and Merle.

The Onan committee now consists of Merle, Dave Schultz, Jackie LaVaque and John Treadwell. We discussed the need to replace Dave and to possibly expand the size of the committee from five to seven members. Additional help will be needed to work on fundraising and outreach. We will announce that the committee is looking for additional volunteers.

Elections

The election for new board members was held at the December general meeting. Ben Huset was re-elected as president, Drew Smith is the new secretary, and Walt Filson is the new board member at large. (The voting for the latter ended in a tie that was broken by a coin toss.)

We discussed voting issues and decided to allow voting by MAS members who are current at the time of the start of the meeting or at the time voting begins. We further decided to break all ties with a coin toss. Merle will draft guidelines for the board's review.

Gemini

We were only \$47 over budget on Gemini this year, and we've improved the frequency and timeliness of the publication. This is the result of some excellent work last year by Ron Bubany to switch printing services for our newsletter.

New Member Orientation

In the past we held a new member orientation in January, al-

though this was not done in 2008. Steve Emert is interested in renewing this effort and possibly increasing the frequency to quarterly. We felt that this is a key element in getting more beginners involved in the club and increasing new member retention. Steve will put a presentation together. Ben expressed interest in having a short version which could run as a stand-alone presentation at other events. Drew stated that one of his goals as secretary is to increase the flow and availability of information. We all endorsed these as valuable activities.

LLCC

The garage is finished. The LLCC will build a divider between MAS and LLCC portions. They will also increase the size of the concrete apron, at their expense. We would like to see it made longer so that the scope could be set up on concrete a little farther from the garage than the current pad. The 30" Obsession has been delivered to Loren Hoen's home for winter storage and some maintenance work. Our LLCC bill for 2008 was \$300. We received credit for three outreach activities.

Treasurer's Report

The final numbers for 2008 are not in yet, but it appears that we will be pretty close to budget. Donations are up considerably: \$6,275 vs. \$3,200 projected. We discussed ways to acknowledge these generous donations. Membership dues, however, will be about \$1,000 below budget. 🐿

Directions to the Star Party Locations

For maps and further details about the sites, please go to our website at www.mnastro.org/facilities.

Baylor Regional Park

To reach Baylor Regional Park, head west on Minnesota Highway 5, through Chanhassen and Waconia, to the town of Norwood-Young America. Turn right onto Carver County Road 33 and continue approximately two miles north. Baylor Regional Park is on the right side of the road, marked with a prominent sign. When entering the park, stay to the right and follow the road approx 1/4 mile. When visiting the Baylor Regional Park, MAS members are requested not to park or drive on the grass. There is a drive up to the observatory which can be used for loading or unloading or handicapped parking only. For an alternate route from the southern suburbs, take U.S. Highway 212 west to Norwood-Young America. Turn right at the second traffic light onto Carver County Road 33. Continue two miles north to the park entrance.

Cherry Grove

Cherry Grove is located south of the Twin Cities, in Goodhue County, about 20 miles south of Cannon Falls. To reach Cherry Grove, head south on Highway 52. On 52 about six miles south of Cannon Falls, and just past the Edgewood Inn, is a large green highway sign for Goodhue County Rd. 1 west. Turn right, and follow County 1 straight south for about sixteen miles until you arrive at a "T" intersection with County A. The observatory is immediately at your right, nestled in the shoulder of the "T." Parking is permitted on the site, or along the road, preferably County A.

Metcalf

To reach Metcalf, head east from St. Paul along Hwy. 94. About four miles east of the I-694 / I-494 crossing is Minnesota State Highway 95, also known as Manning Avenue (exit 253). Turn south (right turn) and then almost immediately turn left onto the frontage road (Hudson Road S). Continue east on the frontage road for about one and one-half miles. Turn right onto Indian Trail, checking the odometer as you turn. Follow Indian Trail south for just about one and one-tenth miles, where you'll see an unmarked chain-link gate on the right, opening onto a dirt driveway with slight up-slope. This is the the entrance to Metcalf.

Long Lake Conservation Center

From Western Twin cities: Take I-94 west to Rogers/MN 101. Go north/right on MN 101 through Elk River, where MN 101 becomes 169. Continue north on US 169 approximately 90 miles to Aitkin. At stoplight in Aitkin, turn east/right onto US 169/MN 210 and go out of town eight miles. Then turn east/right, following MN 210 toward Duluth. Proceed seven miles. A large green highway sign marks the turn off 210 to Long Lake Conservation Center. Turn north/left on County Rd. 5. After three miles, turn east/right on gravel County Rd. 88. It is approximately one mile to the LLCC gate. Follow signs to parking and unloading areas.

From Eastern Twin cities: Go north on I-35 to Finlayson/Exit 195. Turn west/left and go one mile to County Rd. 61 and MN 18. At stop sign turn right/north and go two miles. Follow MN 18 west/left and continue 19 miles to MN 65. Turn north/right on MN 65 and proceed 30 miles to McGregor. Intersect with MN 210 and follow 210 west/left (through McGregor) for seven miles. A large green highway sign marks the turn off MN 210 to Long Lake Conservation Center. Turn north/right on County Rd. 5. After three miles, turn east/right on gravel County Rd. 88. It is approximately one mile to the LLCC gate. Follow signs to parking and unloading areas.

Minnesota Astronomical Society 2008 Star Party Schedule

Date	Star Party Location	Onan Public Night	Special Events	Astronomical			Moon % Illuminated
				Twilight Begins	Moonrise	Moonset	
2/13/09	Metcalf			7:17 PM	10:59 PM	9:10 AM	84%
2/20/09	Onan			7:27 PM	4:53 AM	1:24 PM	20%
2/27/09	Cherry Grove			7:36 PM	7:38 AM	9:17 PM	5%
3/13/09	Metcalf			8:55 PM	10:48 PM	8:36 AM	94%
3/20/09	Onan, LLCC	3/21/09		9:05 PM	4:25 AM	1:15 PM	36%
3/27/09	Cherry Grove,LLCC		Messier Marathon at CG (March 28 alt)	9:15 PM	7:05 AM	9:16 PM	1%
4/3/09		4/4/09	100 Hours of Astronomy 4/2-4/5	9:26 PM	1:01 PM	4:19 AM	57%
4/17/09	Onan,Metcalf,LLCC	4/18/09		9:50 PM	2:55 AM	12:06 PM	53%
4/24/09	Cherry Grove			10:03 PM	5:30 AM	8:12 PM	1%
5/1/09		5/2/09	Astronomy Day 5/1-5/2	10:17 PM	12:09 PM	2:50 AM	43%
5/15/09	Onan,LLCC	5/16/09		10:45 PM	1:23 AM	10:59 AM	69%
5/22/09	Cherry Grove,LLCC		Virgo Venture at CG and LLCC	10:59 PM	3:56 AM	7:04 PM	7%
5/29/09	Metcalf	5/30/09		11:12 PM	11:15 AM	1:18 AM	29%
6/12/09		6/13/09		11:32 PM	12:12 AM	9:53 AM	83%
6/19/09	Cherry Grove,LLCC			11:36 PM	2:23 AM	5:56 PM	17%
6/26/09	Onan,Metcalf,LLCC	6/27/09		11:36 PM	10:14 AM	11:44 PM	17%
7/10/09		7/11/09		11:23 PM	10:38 PM	9:52 AM	93%
7/17/09	Onan,Metcalf,LLCC			11:13 PM	12:54AM	4:49 PM	31%
7/24/09	Cherry Grove,LLCC		Camping under The Stars 7-/24-7/26	11:00 PM	9:08 AM	10:08 PM	7%
8/7/09		8/8/09		10:31 PM	9:03 PM	8:49 AM	99%
8/14/09	Onan,LLCC	8/15/09		10:15 PM	12:17 AM	3:45 PM	45%
8/21/09	Cherry Grove,LLCC		Special LLCC Star Party*	9:59 PM	7:59 AM	8:32 PM	1%
8/28/09	Metcalf	8/29/09		9:44 PM	4:05 PM	12:23 AM	58%
9/11/09	Onan,LLCC	9/12/09		9:12 PM	11:09 PM	3:41 PM	59%
9/18/09	Cherry Grove,LLCC		Fall Mini Messier Marathon at CG	8:57 PM	6:49 AM	6:55 PM	1%
9/25/09	Metcalf	9/26/09		8:43 PM	2:45 PM	11:11 PM	41%
10/9/09	Metcalf	10/10/09		8:16 PM	10:08 PM	2:27 PM	73%
10/16/09	Cherry Grove			8:04 PM	5:44 AM	5:19 PM	5%
10/23/09	Onan	10/24/09		7:53 PM	1:21 PM	9:59 PM	25%
11/6/09	Metcalf	11/7/09		6:34 PM	8:10 PM	12:08 PM	85%
11/13/09	Cherry Grove,LLCC			6:28 PM	3:43 AM	2:46 PM	14%
11/20/09	Onan,LLCC			6:23 PM	10:55 AM	7:49 PM	11%
12/4/09	Metcalf			6:18 PM	7:11 PM	10:43 AM	95%
12/11/09	Onan			6:18 PM	2:46 AM	1:14 PM	27%

This schedule is subject to change. You can also check the MAS online calendar at www.mnastro.org for a complete schedule of all MAS events. Onan/Baylor, Cherry Grove and Metcalf Star Parties are held on Friday nights, with Saturday reserved as the backup night if Friday is cloudy. LLCC Star parties are held on both Friday and Saturday night. Onan Public nights are held on Saturday nights only. In 2009 daylight Savings time begins March 8 and ends on Nov 1.

You're Invited to Observe With Us at the 11th Annual Messier Marathon

- See over 100 of 110 Messier Objects in a Single Night! • March 27th at Cherry Grove. (March 28th is the backup night).
- Refreshments and Snacks Provided in the Warming House. • Prizes for Most Objects, Beginners Award and Random Door Prize. • All skill and experience levels invited. Any scope you want to bring is welcome.

Helpful hints and other items

- Sunset is at 7:30 P.M. (CDST) on 3/27 (3/28 backup date), please try to arrive 30 minutes earlier to sign in, set up and get organized. • Bring your favorite Messier charts. If you don't have any, basic charts will be available. • A Messier check off list, in suggested viewing order, will be provided. • Dress warmly, very warmly and you may want to have a dew (or frost) control strategy for your scope. • While there is competition involved, don't sweat it, the main idea is to get out there and have fun and observe! and Sorry, Goto or Digital Setting Circle Computer aids not allowed for observing prizes. 📖

February Business Meeting Notice

The February meeting is the MAS annual business meeting. Please join us to help finalize our budget for 2009 and establish the society's priorities and agendas for this very important year, the 400th year of astronomy, the International Year of Astronomy (IYA2009), as we plan our activities to celebrate 400 years since Galileo first observed Jupiter and its moons through his refracting telescope. We promise that before we get into the details of the business meeting we'll start out with a short program on winter observing. And of course we'll find time to finish up with our regular cookies-and-pop session, where you can visit with other members to discuss your latest projects or observations. 📖



MN ASTRONOMICAL SOCIETY

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How to pay your dues

Your MAS membership expires at the beginning of the month shown on your *Gemini* mailing label. Send your payments to the MAS Membership Coordinator at: Minnesota Astronomical Society, Attn: Membership Coordinator, P.O. Box 14931, Minneapolis, MN 55414. Make checks payable to MAS or you can pay by PayPal on the MAS web page. The current annual membership dues and subscription fees are: \$24 for regular memberships (\$56.95 including a Sky and Telescope subscription discounted to the annual member subscription rate of \$32.95), \$60 for patron memberships (\$92.95 including Sky and Telescope subscription) and \$12 for student memberships (\$44.95 including Sky and Telescope subscription).

To Renew Your *Sky and Telescope* Subscription

If you like, you may mail your renewal notice with payment directly to S&T or renew via phone with Sky Publishing at 1-800-253-0245. This new process will especially be of benefit to those of you who wait until your subscription is about to expire before renewing.

You will still need to send in your MAS membership renewal to the MAS Membership Coordinator at the MAS Post Office box address, or renew your membership via PayPal.

If you wish, you can still submit your S&T subscription renewal to the MAS when you renew your membership in the MAS, and we will enter your renewal on your behalf just as we always have done.

New subscriptions to Sky and Telescope at the MAS member discount must still be sent to the MAS for group membership subscription processing. Send new subscriptions to the attention of the Membership Coordinator at the MAS at the Post Office box address shown on the back cover of the *Gemini* newsletter

To subscribe to the MAS e-mail list visit:
<http://lists.mnastro.org/mnastro/listinfo/>
and follow the subscription instructions.

There is a general list (MAS) as well as special interest group (SIG) lists. Archives of the lists are also available by visiting the listinfo page for a specific list.

The MAS list has about 40% of the membership on it.