

# Gemini

a publication of the Minnesota Astronomical Society



<http://www.mnastro.org>

**April 2006**  
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## The Onan Assembly Detail (TOAD)



Russ – Supervision



Kurt – Tightener



Dave – Scheduling



Bill – Assemblies



John – Safety



Dan – Inspector



Mark – Refreshments

On February 4th, this core implementation team met at Onan Observatory to install two new telescope arrays. These would include an imaging complex and a visual complex, both centered around two new Celestron 14 inch Schmit Cassegrains.



The 14" Mirror of one of the new Celestron C-14's

Continued on Page 3

## The President's Letter

By Michael Kibat

A lot is going on in the MAS this year - new equipment at the Onan Observatory, the ongoing search for a new 'dark-sky' site for use by members, plenty of outreach opportunities, special interest group activities, etc. etc. I hope you'll find time in your busy life to assist or to participate in these. If you're not a member of the MAS but reading this, you might have picked up a copy of this newsletter at our Astronomy Day event, during a public event at our Onan Observatory or from one of several retail shops around the Twin Cities. If you picked up a copy at one of our events or at a monthly meeting I hope you enjoyed your visit with us. And I further hope this newsletter provides a taste of the wide-variety of activities and benefits available to members, and that as a result, you'll consider joining us as a member.

As noted elsewhere in this issue, we've raised our dues slightly. It now costs \$2 per month to be a regular member of the MAS. I trust you'll agree with me that the MAS still remains one of the best values for your hard-earned money, given all the activities and benefits available to members.

Also in this issue is a 'thank you' to the patron members who support the MAS by paying higher dues that feed our 'special projects' fund. In recent years this fund was used to bring Jon Dobson to the Twin Cities and to help fund the acquisition of new equipment and accessories for both our Cherry Grove and Onan observatories. Patron dues are determined by our constitution to be 2.5 times the regular dues, so our patron members will now be asked to pay \$5 per month to support the Society. I hope each patron member will be able to continue their support at this level, and that regular members will consider joining them in supporting our 'special projects' fund should personal circumstances permit.

And, while it may be late in coming, I'd be remiss in not extending a heart-felt 'thank you' to the three MAS members who ended their two-year terms as board members a few months ago - Deane Clark, Patti Neavin and Michael Burr. Everyone in the MAS benefited from their efforts, and I enjoyed working with them during 2005.

Finally, a 'happy birthday' goes out to Gemini, as this issue marks the 30<sup>th</sup> year of its publication. The first issue, published by the Twin Cities Astronomy Club, arrived in members' mailboxes during April 1976. A huge thank you to Carl Harstad, Thor Olson, Brian Litecky, Ron Bubany and a host of other individuals who have worked tirelessly these past decades to produce and deliver such a quality publication!

### MAS Patron Members

Below is a listing of Patron Members of the Minnesota Astronomical Society as of March 1st, 2006. We would like to thank all our Patron Members for their support of the MAS. The additional money from these people helps offset unexpected expenses and funds special projects that benefit all our members. Thank you!

Tom Alm	Michael P. Haydock
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W. Michael Garner	Israel Medina
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William H. Glass	Bob Minor
Thomas Greenwalt	Scott, Beth & Anne Mosley
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Send all MAS membership dues, change of address cards, subscriptions and renewals to the current MAS Membership Coordinator. See "How to pay your dues" on the last page of this newsletter.

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The old Larson scope quietly watches. Are these tears of loneliness we see?



John, Dave and Kurt kneel in awe as Russ carefully levels one of the piers.



Up goes the new equatorial mount for the imaging platform



The new equipment is simple, intuitive and easy to use.



Up goes the C-14 Imager.



Each of these stainless steel weights is 20 pounds. Kurt and John weigh a little more...?

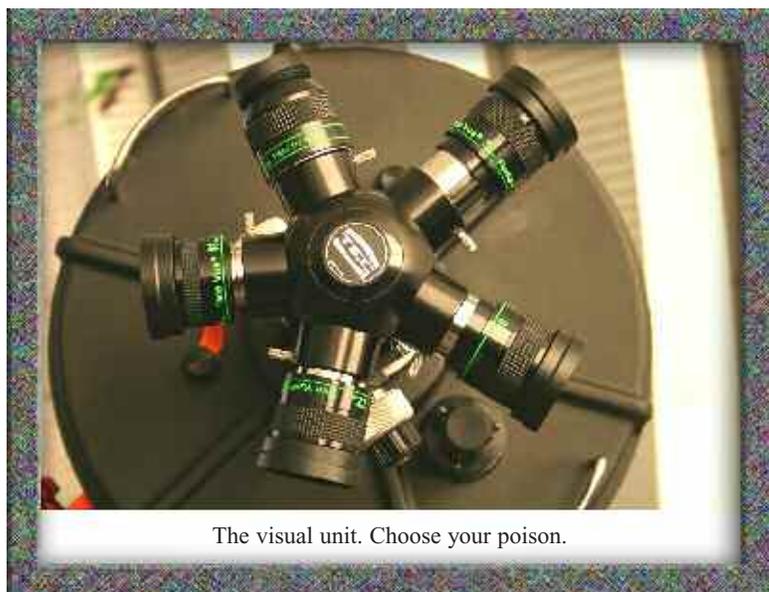
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## Astronomy 101 (Part 3)

By John Young

**Public Night**—Once a month, during tolerable temperature times, the Onan Observatory hosts Public Nights, observing nights that are tailored to bringing the heavens to the public, those who are not members of the MAS but were drawn there for whatever reasons. I, for one, find these evenings to be among the most enjoyable of all MAS night functions. It is so wonderful to be around people who know even less about the night sky than I do! We get kids and adults and teens who don't know the wonders of the night sky...those who have never looked through a telescope...those who have never seen the rings of Saturn or the moons of Jupiter except in National Geographic (see "Oh WOW" in the last Gemini). These public nights are not only extremely fun, but can interest future astronomers and MAS members. I consider participation in the public nights as among the most important volunteer thing I do and they are among the most rewarding things any MASer can do.

**Red Light District**—This refers to the area around any observatory where serious astronomers are gathered. We know that white light ruins our night vision and it takes 15 to 30 minutes to regain. This is why we want people to turn off their headlights when they near an observatory (safety permitting). Star charts, planispheres, and computer screens are all geared to red light, which does not mess up our night vision like white light does. Sadly, great ideas for maintaining the dark (like stationing an astronomer near an entrance with a pellet gun) have been vetoed by Fearless Leader.

*The opinions expressed in this newsletter are those of the individuals concerned and in no way represent the MAS. -Ed*

**Reflector**—Okay, down to basics. Sir Isaac ("Fig" to his close friends) Newton figured out an improvement on the refractor (see below). Instead on using lenses to bend light, he used a mirror to reflect and concentrate light. Many scopes you see at star parties are reflectors. All "Dobs" (dobsonians) are by definition reflectors. Also called "Newtonians" and "Newts", they were the forerunners for more complicated designs, such as Cassegrains. Dead cats are the best tools for keeping the mirrors of a reflector clean.

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**Refractor**—A scope that allows light to travel from the front to the back through a series of lenses (curved, clear glass). This is the oldest, original design for a telescope and the first that comes to mind when people think of telescope.

**Seeing**—The property of how well or how poorly we can view celestial objects. At first it sounds like bad grammar...("The seeing wasn't so good tonight") Shouldn't that be "The visibility wasn't so good tonight"? Nope. Visibility measures how far you can see. Seeing factors in other things like humidity, air turbulence, light pollution, and cat hair on your mirror. You can have a totally cloudless, moonless night and still have poor seeing.

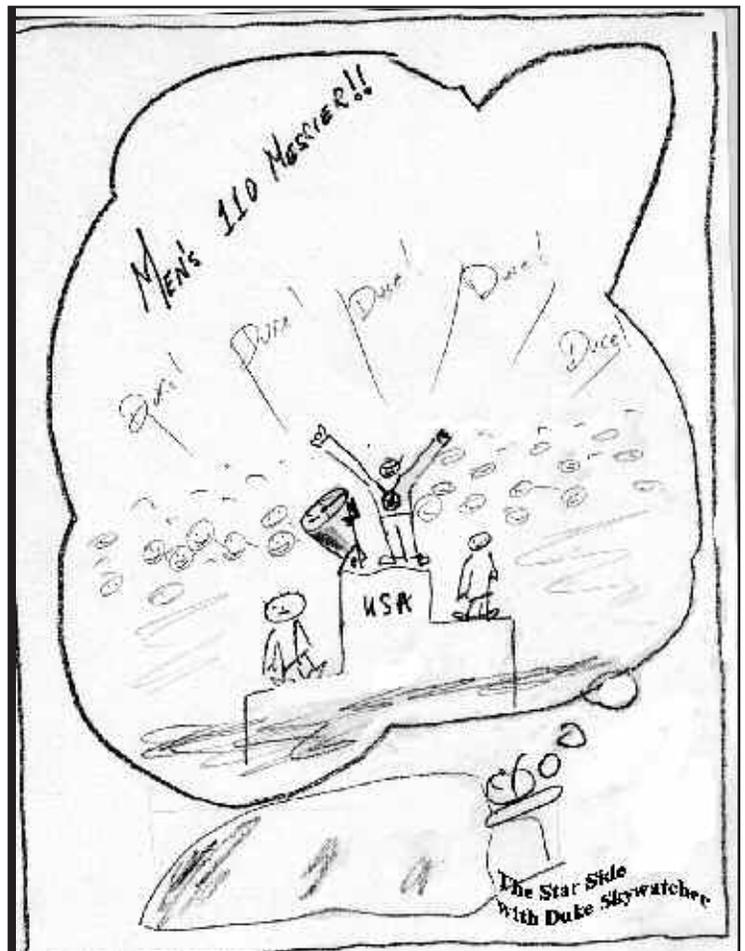
**Star Party**—These come in three types. First, MAS Star Parties that are for MAS members and are not advertised as being open to the public. These are held at the Onan, Metcalf

and Cherry Grove viewing locations. Second, Public Star Parties, held at the Onan one weekend a month, rain or shine. The third type of Star Party is...well...for lack of a better word...canceled. A good Public Star Party can have up to 200 people coming through, saying "Oh, WOW" all night.

**STI...** Short for "Spousal Tolerance Index", an extremely important concept that gauges how many points you have accumulated from your spouse that allows you to attend MAS events. Points can be earned various ways, such as helping around the house, your spouse wanting as much time away from you as possible, gifts, whining, being nice to your in-laws, etc. Points may be lost in many ways too, including spending too much time/money on this addictive hobby. In the Discussion Forums section of the MAS web site you will see STI mentioned often as a reason someone can or cannot attend a certain event. Early in your hobby, your spouse wants you to be happy, so your STI is automatically very high. As the honeymoon phase of your MAS membership grows older, you must work harder to maintain your STI. Divorce is one the most practical ways to avoid STI problems all together!

*The opinions expressed in this newsletter are those of the individuals concerned and in no way represent the MAS. -Ed. ■*

## Duke Skywatcher



## Astronomy Day 2006

By Michael Kibat

The MAS continues its decades-long tradition of hosting Astronomy Day events on May 5th and 6th.

This year's events will once again take place at the Onan Observatory. Public star-gazing takes place Friday night from 7:00 p.m. until 11:00 p.m. Talks, demonstrations and solar observing take place throughout the afternoon on

Saturday, beginning at noon. Public star-gazing takes place again Saturday evening beginning at 7:00 and continuing until 11:00.

The centerpiece attractions of this year's events will be the new, state-of-the-art telescopes and video imaging systems recently donated to the Society's Onan Observatory. These computer-con-

trolled, large-aperture reflecting and refracting telescopes will provide unparalleled views of both daytime and nighttime celestial wonders. The advanced, real-time video capabilities will provide jaw-dropping images of the same objects viewed directly through the telescopes.

All events are open to the public, 'family friendly' and take place fair-weather or foul. (Presentations replace telescope viewing if inclement weather prevents star-gazing either evening.)

Members of the MAS who would like to assist with this year's activities can contact either Mike Kibat (kibatme@visi.com) or Jon Hickman (jon@thehickmans.com) for more information or to volunteer. As event details become available, they will be posted on the Society's web site at [www.mnastro.org/onan](http://www.mnastro.org/onan). Come out and join the fun! ■

## ATM SIG Report

By Ben Mullin

It is time for a little update on the activities of the ATM SIG. In this update I will cover a little old and a little new. The old will be a report on the SIG's last meeting in February. The new will be an exciting announcement about an upcoming event. Read on if I have piqued your curiosity.

I will start the old by saying that I think it was one of the best meetings the SIG has had yet. Bob Benson was kind enough to host a small group of us in his home shop. The space was perfect and the cookies his daughters made were great too. Carl Anderson presented the activity for the evening. Carl is a MAS member, and now a published writer in January's Sky & Telescope magazine. He had offered to give us a demonstration of pouring a pitch lap and we took him up on that offer.

For those who are not familiar with the steps in grinding a mirror, a pitch lap is used to polish and figure a mirror after the rough (optically speaking) curve has been ground. If you have not poured a pitch lap before it can seem like a daunting task so I was very excited to be able to watch one being poured live. For the demonstration Carl used a synthetic pitch called Acculap. Acculap behaves similarly to normal pitch but is much nicer to work with, primarily because it does not require you to open every single window or cause domestic distress.

Now not only did Carl give us a demonstration, he brought enough little mirror blanks for several of us to try our hand at pouring a lap. Having now poured a 2" lap I feel I am much more prepared to pour one on a real project... when I get there that is. Carl gave a great demonstration and came well prepared to share his knowledge with us. My hat is off to him for a great presentation.

At that same meeting we also had the opportunity, thanks to Mark Austin, to watch a video of Carl Zambuto (a fairly successful mirror maker) pouring and carving a pitch lap. It was interesting to see the similarities and differences between his technique and Carl Anderson's technique.

So, now if you have managed to read this far we can get to the new I promised you. Over the last several years I have had sporadic requests for a mirror-making workshop. Each time I am confronted with the lack of a willing and able presenter. I have found one. So I would like to announce the

### 2006 MAS Mirror Making Workshop

Katy Haugland is a college student here at Macalaster College. She comes to us trained by John Dobson himself. She warned me of this fact, but I personally think we will probably do just fine. At the point this article was submitted for publication, that is the extent of the details I have prepared. For the unprepared details I know the following things. The workshop will need to occur prior to mid-May, as our presenter will be heading home to sunny California for the summer. We are currently targeting 6" or 8" mirrors and total time investment will probably be 10-16 hours over two or more days. I hope to make arrangements to use the classrooms at the Eisenhower Observatory for the workshop.

*As of this writing, the meeting with Katy has not yet been scheduled. It may turn out that the meeting takes place prior to the time you receive this newsletter. To be safe, please call Ben (number below) to confirm the actual meeting details. -Ed.*

So stay tuned to the MAS Forums and email list for more details as I get them arranged. If you don't frequent the forums or don't do email, feel free to call me and let me know of your interest so I can be sure to get the details to you. I hope we can generate some excitement and make this workshop a success.

Ben Mullin 651-784-7469 ■

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**EXCEPTIONAL PROPERTIES**

## **Notes from the Secretary**

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**By Steve Emert**

I have a few short but important items to discuss this month:

### **MAS Membership Dues Increase**

This year, we have found it necessary to increase membership dues by a small amount. MAS is seeing increased costs across the board including the typical things you would expect - insurance, electricity, Gemini postage and printing costs, etc. Rather than reduce benefits or defer maintenance items, the MAS membership at the January business meeting voted overwhelmingly to approve a dues increase effective April 1st, resulting in the following dues schedule:

- Regular Member - \$ 24.00 annually
- Patron Member - \$ 60.00 annually
- Student Member - \$ 12.00 annually

Please note that both the Regular and Patron membership includes all members of your household. In looking at dues structures for other Societies, it appears that MAS is somewhat unique in that respect. Also, we are lucky in that our dues remain lower than many other societies. Even with this slight increase, we hope to remain that way.

## **The Dark Sky Site (DSS) Committee Report**

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**By Greg Haubrich**

We have drafted a Press Release from the MAS to Papers in the Aitkin, Carlton, and Pine County target areas.

Prior to sending the Press Release, we are awaiting the clarification of quotes, final review by the DSS Committee, and review by the MAS Board.

Ten to Twelve papers in the three target counties will be Faxed/Emailed with the approved Press Release and will receive a follow-up MAS phone call to answer any questions on the Press Release.

The DSS is also taking some Sky Quality Measurements (Sky

## **May MAS Meeting to be Held on U of M Campus**

The May meeting of the MAS will be held on Thursday, May 4th at the Physics building on the University of Minnesota campus. University of Minnesota Astronomy Professor Charles (Chick) Woodward will be our main presenter for the evening. The meeting will begin at 7:00 and last until 8:30 pm. The meeting will be held in Room 166. Address and directions are:

University of Minnesota  
Physics Building (Tate Laboratory of Physics), Room 166  
116 Church Street SE  
Minneapolis, MN 55455

The Physics Building is located on the west side of Church St. NE, about three blocks south of University Avenue SE. A map showing the location of the building can be found at: <http://onestop.umn.edu/Maps/Phys/index.html>

### **University-Level Astronomy Course Donation to MAS Library**

Thanks to a generous donation the MAS has a new 15 hour university level video course on astronomy. Also, several astronomy reference books were included in the donation as well. These resources will be added to the MAS library in the very near future! Thanks to Dan Maciej for the donation. ■

Darkness) in the general targets' southern areas to determine how far north we will need to travel. The light pollution maps indicate sky darkness at zenith, and we need to be aware of light domes as well as any changes to the 5 year old light pollution data maps.

Cherry Grove, currently our darkest club observing site, is also being baselined for comparison. Relative humidity will also be noted when making these measurements as this has an effect on the Sky Quality reading.

By the time you are reading this in Gemini, we will have "cast the net" for potential land donors. It's income-tax time too. Nice timing!

Stay tuned.... Greg Haubrich and the DSS Committee, Feb. 27, 2006 ■

## **30 Years Ago in Gemini**

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### **Thirty Years Ago in the Gemini**

**From the archives of Bob Schmidt**

#### **Going, Going and Gone**

Twin Cities astronomers enjoyed cloudy skies during most of the visit of Comet West, but some TCAC members did get a brief look at the spectacle. A few lucky ones caught brief glimpses of West well into morning twilight on the mornings of March 7 and 11. But it was not until the morning of March 13 (unlucky?) that amateurs across the entire area got a long look at West in total darkness. Several club members got photographs.

On the 13th, the comet had faded from about magnitude -2.2 (a guess based on the fact it was about three magnitudes brighter than predicted) to about magnitude +1.6.

Amateurs may still be able to locate Comet West during April, when it will be near Alpha Delphinus, rising about 3 a.m. If it remains brighter than predicted, it should be about magnitude 4.5 at the beginning of the month, fading to 9.1 by the end of the third week of April. ■

## Head Out on the Highway.....

By Gene Kramer

Soooo....warm weather is coming and you're wondering what the sky looks like a little farther away from the city lights. OK, then, where you gonna' go? The following are some suggestions for places and what to do when you get there.

### In calendar order:

*Texas Star Party* - April 23-30, 2006  
<http://www.texasstarparty.org/>

The ultimate for serious astro programs. Multiple distinguished presenters and many of the amateur astronomy heavy hitters are there. Excellent viewing with occasional high winds/storms. Prude Ranch is in a good location and lodging is moderately priced. Fort Davis is a few miles away and has B&Bs, and good food.

*Wisconsin Observers Weekend* - Waupaca, WI - June  
<http://www.new-star.org/WOW/index.htm>

An informal get together at a state park. Lots of great telescopes to drool over and talk about. Good folks, a lot from the Chicago area.

*Rocky Mountain Star Stare* - June 22-25, 2006  
<http://www.rmss.org/>

According to Matt Russell, "one heck-of-a-good star party in the Colorado Rockies."

*Jeffers: Starry Night, Prairie Night* - July and Sep/Oct  
<http://www.thudscave.com/petroglyphs/2006events.htm>

Exceptional dark skies for the drive to southwest Minnesota. This is a MN Historical Society site featuring native art and prairie information. They provide a mowed field next to the site, a public viewing night, and a grilled dinner one night. Facilities in the interpretive center.

*Nebraska Star Party* - July 23-28, 2006  
<http://www.nebraskastarparty.org/>

Awesome skies. A very family vacation oriented star party.

*Southern Skies Star Party* - Bolivia - July 22-29, 2006  
<http://www.sssp.org/SouthernSkies/Title1.html>

A week of awesome southern skies with a 4 star hotel for a very reasonable price. Rick Singmaster donated a 21" Starmaster that is on-site for use. If I went to just one international star party, this would be the one! The Ayamara people near the site are very supportive and friendly.

*CVAS Northwoods Starfest*- Eau Claire, WI - August 18, 2006  
<http://www.cvastro.org/events.htm>

A small, but very professionally done party. And it's less than three hours away. Good camping, reasonable viewing, good folks and group meals. Some very nice programs.

*Iowa Star Party*  
<http://www.iowastarparty.com/>

September 21-24 "at the beautiful Garst Farm Resort in rural Guthrie County near Coon Rapids, Iowa."

*AstroFest - Illinois* -  
<http://www.chicagoastro.org/>

One of the best astro flea markets around with most of the major vendors. Fair to poor viewing, but some very good programs.

Some camping on-site.

*Okie-Tex* - Oklahoma - September 16-24, 2006  
<http://www.okie-tex.com/>

Great viewing, big winds. See the Winter 2004 issue of Gemini.

*Lowell Star Party* - Arizona - September  
<http://www.lowell.edu/Public/>

*ICSTARS Star Party* - Missouri - October 22 - 2006  
<http://www.icstars.com/Ranch/starparty/>

A great, family oriented star party hosted by tour guides and photographers Vic & Jen Winter. About an hour from Kansas City. Nice folks.

That takes you pretty well through the summer and fall. It's just scratching the surface, but if you do half of them, you'll be a happy partier!

### For Starters:

The most popular parties for Minnesota folks seem to be the Northwoods Festival in Wisconsin and the informal Jeffers get-togethers in southwest MN. Do these, anyway. If you want to stretch a bit, lots of folks have gone to the Nebraska, Texas and Oki-Tex parties for the more southerly skies, all very well recommended.

If you have never been to one, check out the local, monthly MAS and other star parties. See the list for details.

### Star Party Tips:

Consider the star party as a dark sky camping trip. If you meet some interesting people, great!

Some parties have been better than others for educational programs: Texas, Oregon, Stellafan, and Northwoods.

As always, use the minimum of light as baffled as possible. Never drive into a site at night with your lights on!

Security: you are normally OK to leave your scope set up (and covered for weather/dust), but take out or lock up your eyepieces and small accessories. Almost everyone is honest; there are some....

Pets are often not welcome. Noise is an irritant, too. Some parties are more tolerant of children; Nebraska comes to mind.

The people who plan star parties are interested in your having a good time, and plan social activities to support that. The rest is up to you. It's the rule of temporary relationships....have a good time, be considerate, and take care of yourself.

Going with people you know is often a good idea, but stretch your self a little and meet some other folks who might have a different perspective.

### RoadTrip Forum

The online RoadTrip forum can be helpful to find other folks who want to travel where you do. If you're like me, sharing expenses is always desirable. Talking to someone who has been there is valuable. Post your question or interest on the forum. Be patient. It may take awhile for the right people to have the time to check it out, but they will. Check out the Beginner's SIG, also. It's OK to cross post. If you have a question that isn't getting answered, feel free to email me directly. I do not pretend to be an expert, but rather truly an "amateur", that is, one who loves it.

Talk to you soon.... █

## **The Seven Sisters and Comet Halley**

**By Hal Yngve**

Many of us know the Pleiades are sometimes referred to as the Seven Sisters. This open star cluster also goes by the name of M45. If you view them through binoculars they look like a miniature dipper. They appear in the eastern evening sky in the fall of the year as a small smudge without optical aid.

John Weinel and I were living in Nogales, Arizona in the fall of 1986. The skies were black and the weather relatively warm. We wanted desperately to see Halley's Comet with John's new 60mm refractor telescope. He bought a copy of Sky and Telescope, which had a finder map showing Halley's Comet passing right through The Seven Sisters that night. We didn't know it at the time but all times listed on the map were Universal Time or roughly eight hours ahead of us. And since the comet moved relatively quickly, this eight hours made a significant difference where to find it.

We arrived at our viewing site, got the scope working, found the

## **Traveling to Australia**

**By Gene Kramer**

By the time you read this, I should be on the way back from the Star Party of the South Pacific sponsored by the Astronomical Society of New South Wales (ASNSW) at Wiruna. Three years ago, my wife and I were privileged to be able to attend the SPSP there and did the trip that Tony Buckley describes very well in his recently published article in their newsletter, Universe. We cannot forget the incredible beauty of the southern skies combined with awesome dark viewing and the great people and scenery. We also spent a lot of time in Warumbungles National Park where the mammals and birding are excellent. The Anglo-Australian telescope site is adjacent to Warumbungles. The following is excerpted by permission of the author.

## **THE COONABARABRAN EXPERIENCE**

**By Tony Buckley of the ASNSW**

Wiruna, our club dark sky site is about as good a place as you could wish for within 200 km of Sydney.

However, if you have a three-day weekend, or perhaps a week to play with, you owe it to yourself to experience the place and sky that David Malin's superb photos have made famous. Coonabarabran is situated three hour's drive north west of Wiruna (Ilford),

If at all possible, avoid night driving, particularly for the second leg of the trip as kangaroos and wombats are thick on the ground after dark, and if you HAVE to drive at night, take it SLOW. The easiest route from Sydney is via Mudgee, Gulgong, Dunedoo and Mendooran. Coonabarabran is well fixed for motels.

If you want to combine some observing with your visit, there are two good choices, the Warumbungles Mountains Motel, and Timor Country Cottages, both of which are situated between the town and the Observatory and under dark sky. If

Seven Sister's and there was no comet at the coordinates. There was, however, something off to the side that one might think could be a comet. But at the exact coordinates for that hour listed, we came up blank. We hovered around the Pleiades and that "thing" that could be the comet for about an hour or two and then went home. We discussed at length that the magazine couldn't be wrong, so where was the comet? Somewhat confused, we felt a sense of disappointment.

The next day I received an excited call from John. He explained about universal time and that WAS THE COMET we were looking at last night. Needless to say, we were at the viewing site come sundown that evening, anxiously awaiting darkness and anxious to confirm our sighting of the previous night. We weren't disappointed. There was Halley's Comet. Right exactly where it should be...A bright orb that very slowly moved across the backdrop of stars against Southern Arizona's Black skies...We stayed until sleepiness got the better of us. That night we went home, content with the knowledge we accomplished our goal... ■

you are taking your own scope, the Motel is a good choice, with rooms fully set out with kitchens and the equivalent of three football fields of grassy lawns at the back, having been used in previous years for a spring star party, and being the venue for a large group of US amateurs who visit every two years. If you are not taking a scope, the Timor Country Cottages

[www.coonabarabran.com/timor](http://www.coonabarabran.com/timor) are an option, being two km closer to the Observatory and having a 12 inch f/5 Dobsonian available for hire. This site has been used for a week's observing in June 2004 and April 2005 by a group of Texas Star Party regulars, together with some Obsession users - in April including Mr. Obsession himself, Dave Kriege. The Coonabarabran sky is darker than sites nearer to Sydney, and being further inland than Wiruna less troubled by coastal cloud, a major thing for observers from abroad who have to maximise their observing opportunity and don't enjoy our luxury of being able to try again next month.

The town is well fixed for eats, having two Chinese restaurants, a "Subway", and traditional country pub meals, as well as two supermarkets. The local astronomy club for example dines at the Imperial Hotel and then has it's meeting in a back room. There is an internet cafe and an internet facility at the local library. There is a visitor's center at Siding Spring Observatory, only a half hour's drive west of the town, and the Warumbungles National Park another 15 minutes west of there. The park provides photo ops for kangaroos, emus, abundant bird life and, for the keen eyed, the occasional koala.

An easy 100 km drive north brings you to the Australia Telescope Radio Telescope, with big dishes on kilometers of railway track and which can be linked up with a radio dish near Siding Spring, and Parkes, and Tidbinbilla and even Tasmania for a really long baseline. The Australia Telescope has a great visitor's center with audio visual display.

Here is an account written by two San Francisco amateurs at at Timor Country cottages of an observing week enjoyed over

August/September new moon:

“The 12 inch scope worked out great. We worked on collimation and mounting the Rigel Quickfinder when we arrived. It was a huge help to have it available on site, rather than having to pack a scope. My friend brought a custom 10 inch airline transportable Dob with him. He was planning to switch over to the 12 inch scope for the remaining nights for the additional aperture. We both loved the cabin and location. Truly wonderful to be able to set up scopes under dark skies, and wander back and forth to the fridge, bathroom, and fireplace anytime during the night.”

Although I'm writing this OR on September 6th, this actually covers the night of Sept. 1-2. Even though cirrus clouds menaced David and I during the day, the sky was clear at astro twilight. Venus and Jupiter hung very close together in the big, bright zodiacal light. Venus was mildly gibbous, and a satellite had just emerged from behind Jupiter. Planetary images in the CPT were quite nice, even though the planets were fairly close to the horizon. Astro twilight arrives at 7 p.m. down here this time of year, and astro dawn isn't until 5am. This gives the potential for a 10hr observing night. As it's turned out so far (as of 9/6), the night of 9/1-2 was the only complete all-nighter, and it was an amazing night.

At about 7pm, I made this note: “I'm facing SSW as I sit here, and I could really get used to the view I get as I lift my head up from my notebook - Eta Carinae... Crux... Alpha and Beta Cen... Norma starcloud...”

Scorpius... Sagittarius starclouds. Lord have mercy, that's nice. I'm spoiled.”

That last part is really true. I've been under these austral skies long enough now that I'm going to expect the same thing when I get home. Gotta start getting my head ready for that. During the night, I observed a number of objects from Hartung's “Astronomical Objects for Southern Telescopes”. This is a great book to have during one's first (and not-so-first) Southern Hemisphere observing trip. Here are a few highlights of Hartung objects that I saw:

The Blue Planetary: Cute tiny little blue disc, looks like Uranus or Neptune.

NGC 3766: Very pretty cluster. Has distinctive shapes amongst its chains and arcs of stars.

NGC 3603: Cute little OC in a rich field. According to U2000, there are supposed to be some nebulae nearby... Wow! with an OIII filter, the nearby group of nebulae (3576/79/81/81/85/85) looks great!

This a very remarkable group of nebulae, almost like something from the LMC.

Eta Carinae region: David turned me on to what we called the “E14 Terminagler Tour” — you start at Eta, go to NGC 3532 (an amazing open cluster, the equal of either member of the

Double Cluster, IMO), back to Eta, over to the ‘square’ C+N shown on H-B page E14, then to the tight OC in the ‘rectangle’.

Somewhere in here there's also a stop at a nice orange double star. BTW, David and I both re-discovered Uranometria on this trip. Neither of us had bothered using it for years, but it has turned out to be the main atlas for both of us. We thought that H-B was going to be perfect, but we just can't handle the rectangles and diamonds that it uses for nebulae. When either of us got into an area like Eta Car, Sagittarius, or the LMC or SMC, the rectangles just weren't cutting it. We needed the drawn shapes from U2000. The problem with Uranometria, though, is that it has too few stars and too many faint objects. We got around this problem by annotating our Uranometria with transparent, writeon-able sticky notes. This is the way to go when preparing for an observing session.

### Back to the objects...

The “Running Chicken Nebula” showed up nicely in the Terminagler with an OIII, but I couldn't quite see any poultry.

The Dark Doodad: Not sure if I saw it. I might argue that I could see a ‘corridor’ of fewer-field-stars-than-normal”, but it was hard to be sure.

NGC 5189: One of the best planetary nebulae I've seen in quite a while! Nice detail, looks like a tiny little picture of the LMC. It's what everyone expects the Crab to be, but isn't. I spent a lot of this night logging objects with my usual NGC-style abbreviations, but eventually I succumbed to the sinful pleasure of just noodling around on a chart page, hopping from one object to another, not spending any time writing notes. It felt oh-so-good. √√Around 22:00-22:30, I spent some time looking at the Lagoon/Trifid area. I used the A17 chart on U2000, and it was a great time. The central Milky Way had moved off of the zenith, but was probably still 45-50 degrees up. I finally found a comfy position on the stepladder that I'd been using as an improvised observing chair, and that was really nice. I'll always remember sitting there comfortably on the ladder, feet propped up on a patio chair, atlas open on my right leg, glasses hanging lightly on the fingers of my left hand, as I cruised amongst the ‘promised land’ of the CMW. The austral winter air was chilly with a faint breeze, and the smell of eucalyptus smoke wafted gently past from the cottage's wood heater. A slice of paradise pie.

While in the neighborhood, I had a nice wide-angle look at the 652/6528 area, also called ‘Baade's Window’.

Incredibly rich field in the Large Sgr starcloud. Then, I did yet another decadent, non-logging tour on chart A20. This is the region around M7 and M6. So many wonderful objects. Near M7, there is a wonderful “sense of scale” illustration. First, there's big, bright, spectacular M7 in the foreground. Then there's 6444, clearly an OC, but smaller, fainter, and clearly farther away. Then there's 6453, a globular cluster that really LOOKS far, far away in space. Some star clouds (6455, 6437, 6421) are also somewhere out there in the distance. This was

far and away the most 3D view I'd ever had through a telescope.

Around midnight to 1 am, I did the SMC. Saw all of Hartung's recommended objects, and it was quite nice.

### **That was just a warm-up though...**

At about 1:25, I looked at NGC 253 through the 12" Dob that David was using. It was at, you guessed it... the zenith. The view was awesome. At 1:56, I made this note: "Wonderful darkness and transparency throughout the sky. Dark background, with bright, crisp stars down to the horizon. Bright LMC and SMC, showing hints of detail to the naked eye. Connoisseur level skies."

Then came the LMC... And everything about the hobby changed...I'd looked at the LMC a few times up to this point, and I'd certainly admired the Tarantula. Wow. And David had been a big LMC fan since his last Oz trip, and he made it clear that the LMC was a big part of why he came back to Oz. But it wasn't until I hit on the right magnification that I really understood: The LMC is DIFFERENT. These clouds are not like anything else in the sky. George Ellery Hale used to have a stock line about how "The Sun is a star, the only one close enough for us to study up close". Well, replace "Sun" with "LMC", and "star" with "galaxy", and you've got it. We see clusters and nebulae around us in the spiral arms of the Milky Way, and so we have a pretty good idea of what those look like. We see external galaxies, and occasionally we can see hints of HII regions or globular clusters in those galaxies, but we can never see any significant detail. But in the LMC, we have a nearby galaxy where the nebulae are close enough to show a wealth of detail, and the clusters are close enough to resolve individual stars. Once you start to understand the scale of things, it's a whole different perspective. I started by using my 15x50 IS binos and the main U2000 LMC chart. This made a great introductory tour, and I began to smile. I was starting to see why David made such a big deal about this beast. It's just full of good stuff. Then I put the 31 Nagler on the CPT and did a 'Terminagler Tour', just panning the scope around, not even looking at the atlas. (Did I mention how well the CPT performs for widefield? One tends to think of an f/5.7 Royce optic like that as specializing in high-magnification stuff, which is true, but it gave awesome views through the 31 Nagler field, too. And no Para Corr needed.

This was the life-changing moment. My smile broke out into a big 'ol grin, as I panned over to one huge complex of nebulae and clusters after another. It went on and on and on... far too much good stuff. This hobby has had a lot of great 'firsts': First time I looked at the Moon through Rich Neuschaefer's AP155 with a binoviewer First time I looked through an 18" Dob, courtesy of Bruce Jensen. First time I went to Downtown Virgo. First time I used the Challenger by myself. But right up there with all of those, and in some ways belonging to a category by itself, was my first good look at the LMC. A few days later, I think

David referred to it as 'the inexhaustible deep well'. How true. Jim Van Nuland has said "Even if Saturn

were the only thing in the sky, I'd still own a telescope". I've dittoed that, and that's certainly also true for the moon, at least for me. Add the LMC to that list. But the LMC is different. When it's up, it sort of IS the only thing in the sky! It's entirely possible to just drop everything else and look at the LMC, and have no regrets. And I've only used the Uranometria charts! I haven't even touched those nutty E and F charts from H-B! (I think they would require a really big scope to fully exploit.)

Here's a really good way to sum it up: The LMC is so damn good, it's as good as new gear. Once I saw this beast, I began to value plane tickets to Oz every bit as much as any piece of new gear. Sure, a beefier mount for the 6" Mak would be nice. Sure, a binoviewer would be nice. Sure, it would be nice to try imaging. Sure, it would be nice to have an H-alpha scope again. But those things all have one fatal flaw - none of them will show me the LMC. Only a 747 can do that. I'll be back.

As the wee hours wore on towards 5am, I continued gazing at the LMC and laughing at my good fortune.

Then I started to think I was going crazy - I started to see flashes in the sky. I thought it was just fatigue, until David saw them, too. From behind the Timor Rock (our miniature backyard Devil's Tower), silent flashes lit up the clear, dark, sky. Eventually a few wee clouds came by, and we realized that it was distant, silent lightning somewhere beyond the horizon. (Never a sound - I half-expected a big tripod to come walking by...). It made a great wrap-up to a great night.

Went to sleep after ten incredible hours of observing. Life was very good. (Did I mention the electric mattress pad?) 38 Fahrenheit and 99% humidity. Hard to believe it's summer back home. What a night. You never forget your first time...Clear Skies. 🌌

## Astronomy on the Prairie - Part I: The Time Machine

By Glenn Lee

As amateur astronomers, many of us are familiar with the idea of the telescope serving as a time machine. Step up to the eyepiece, and you're immediately seeing old light whether it reflected off the moon several seconds ago, or was created in a very faint galaxy several hundred million years back. The more distant objects that we see may in fact no longer even exist. Time irrevocably changes everything, and one of the strangest mysteries is that we are able to apprehend time itself, measure it, and put it to use in our daily lives. In a practical way, astronomy is all about time, and astronomical observatories can be time machines as well. To see this more clearly, let's look at an example in our own backyard: Goodsell Observatory in Northfield.



*Goodsell Observatory*

Goodsell looks like everything that an old astronomical observatory should be. Completed in 1888, its silver-painted domes sit atop red brick buildings and are surrounded by the quiet campus of Carleton College, itself founded the year after the Civil War ended. Step inside Goodsell, and you're back in the late 19th century. It was a time of intense interest in astronomy, and a small college could do no better than to have a state of the art observatory. The beautifully preserved interiors of Goodsell, crowned by the spectacular 8.25-inch Alvan Clark and 16.2-inch Brashear refractors, might lead one into the easy presumption



*William Wallace Payne*

that this was the first and most famous observatory in Minnesota history. That would be only half correct. William Wallace Payne

The story starts years earlier when the college hired William Wallace Payne in 1871 with the title of Professor of Mathematics and Natural

Philosophy. In those days, Natural Philosophy was what we now call "physics." Payne's real passion was astronomy. He had spent time in his youth as an assistant at the Cincinnati Observatory and, with his mathematics and physics credentials, was as prepared for a career in astronomy as it was possible to be.

By 1877, he had started an astronomy program, acquired some basic equipment, and convinced the college to fund construction of an observatory. He had to have been a very persuasive man. The college agreed, perhaps bowing to what it saw as inevitable, and promoted him to Professor of Mathematics and Astronomy. In 1878, the building was completed. Curiously, no one seems to have officially named it, and references today simply call it "The Old Observatory". It was the first one in Minnesota history.

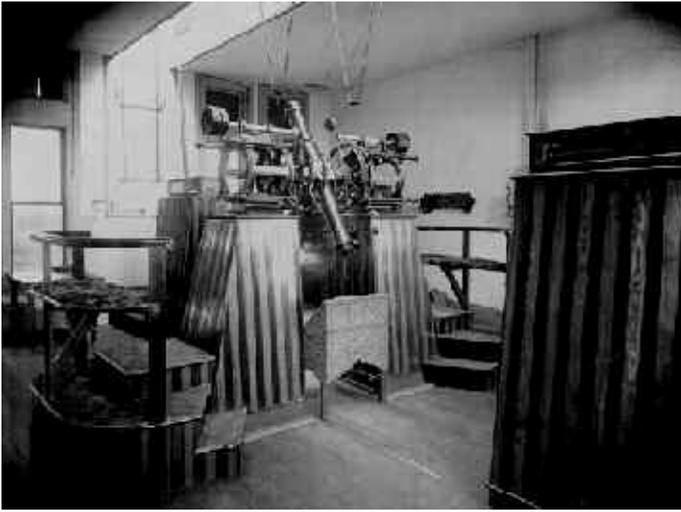


*The Old Observatory*

Dr. Payne wasted no time. In 1877, he purchased the first telescope, a 4.3-inch Byrne equatorial refractor. Thereafter came the Alvan Clark & Sons 8.25-inch refractor. If the Clark & Sons name sounds familiar, you may have run into other instruments made by this famous family at the United States Naval Observatory, the Lick Observatory, the Yerkes Observatory, or other notable sites. Many of these instruments are still in use today, as is the one owned by Carleton.

The next acquisitions by Dr. Payne may seem a little unusual at first. A Fauth 3-inch transit circle was purchased along with two highly accurate clocks made by Howard & Co. What were these instruments for? A transit circle is a combination of a transit which observes objects crossing the local meridian (right ascension), and a meridian circle, which measures the zenith angle (declination) of astronomical objects. When used in conjunction with the clocks (sidereal and solar time), the transit circle observations of a star with known coordinates gives a precise latitude and longitude of the observatory.

All that is well and good, but Dr. Payne had something more in mind than creating the working elements of an astronomical observatory. Working the same calculations in reverse, observations of stars can yield a highly precise local time. This may not seem like a pressing need in our day of digital watches and atomic clocks, but in the late 19th century there was an industry with a crucial requirement of this kind of information: the railroads.



*Transit Circle*

Nationally, nearly anything or anybody moving any considerable distance went by railroad. Schedules had to be met and rail switches had to be thrown on time to avoid delay, or worse, collisions. With the telegraph connecting the railroad stations and switching yards, all that was needed was a centrally-located time keeping station. When his observatory was in working order and its geographical coordinates established, Dr. Payne personally built a telegraph line to the outside world and so connected the movements of the stars to the movements of trains. It was a highly successful operation, though not the only one of its kind, or even particularly remunerative. The US Naval Observatory in Washington D.C. was a major competitor, but by the turn of the century it was the only other remaining time service. As a consequence, the Old Observatory and Carleton College received much publicity and, eventually, national prominence.



*16.2-inch Brashear Refractor Telescope*

readings could be made, so the offer was accepted and a 5-inch state-of-the-art was ordered from Repsold, a German firm. Unfortunately, the jeweler died shortly afterward, and the promised funds never materialized. The College appealed to James J. Hill, whose railroad had benefited greatly from the time service, and he agreed to pay for the new and improved meridian circle. Ironically, when it arrived, it was found to be much too big to fit into the Old Observatory. Dr. Payne then asked the Board of Trustees for funds to build a new observatory. Again, he must have been extremely convincing, or the perhaps College may have decided that it had little choice. In any event, ground was broken for a new astronomical observatory in 1886. It was named in honor of Charles Moorehouse Goodsell, the College founder. The time service was transferred to the new facility on its completion in 1888 and the Old Observatory was dismantled in 1905.

After the completion of Goodsell, money was donated by a wealthy benefactor for the purchase of the 16.2-inch Brashear refractor in the early 1890's. The golden age of astronomy at Carleton had arrived and Minnesota's second oldest astronomical observatory was in business.

Many thanks to the Carleton College archive department for assistance in preparing this article. All photos are courtesy of Carleton College. ■



*Goodsell Observatory*

By the time the time service was successfully established, the Astronomy Department was considered to be the Colleges' foremost academic program, and the Department looked for ways to improve the existing facilities. An unexpected opportunity arose when a St. Paul jeweler offered the College a \$5,000 donation to buy a larger meridian circle. This would mean that more precise



**Messier Number: M51**  
**NGC Number: NGC 5194**  
**Common Name: The Whirlpool Galaxy**  
**Constellation: Canes Venatici**  
**Distance from Earth: ~37 Million Light Years**  
**Visual Magnitude: 8.0**  
**Size: 11.0 x 7 arc minutes**  
**Date Taken: 2/2/2006**  
**Location: Black Forest, CO**

**Equipment: 16" RCOS Ritchey-Chretien Bisque Paramount ME SBIG STL-11000M AstroDon Series I Filters**  
**Exposure Specs: 330 minutes total**  
**Lum: 10x15 min**  
**Red: 6x10 min**  
**Grn: 6x10 min**  
**Blu: 6x10 min**  
**Processed with: MaximDL v4 Adobe Photoshop CS**

## Twin Cities Regional Science Fair

By Ben Huset

Another great year for HS science! At the Twin Cities Regional Science fair I had the honor of judging over 400 entrants and passing out the following awards:

### MN SFS Certificate of Achievement

Jeffrey Bissoy-Mattis : "Can a Rocket Fly with Baking Soda & Vinegar?"

Julian Seine : "What Paper Airplane Flies Best?"

Peter Harkema : "5-4-3: Which Will It Be?"

Jacob Okerland : "Hummingbirds and Helicopters"

Chloe Adams : "How Do Gliders Fly?"

Daniel Grady : "3-2-1 Blastoff!"

Jonathan Chavez : "Does the Shape of a Rocket's Nose Cone Effect the Altitude a Rocket Attains?"

Nicholas Reynolds : "What Does the Ideal Nose Look like?"

### MAS: Certificate of Merit.

Ali Colburn: "More Twinkle: Windy or Still Night?"

Shahrazad Negeye: "What are Sun Spots?"

Eric Nycklemoe : "Black Holes: A Fatal Attraction"

Katie Miller : "Temperature of a Star and the Frequency of a Musical Pitch"

Thanks to NASA Glenn, Radio City and MN Planetarium for providing prize materials. ■

## Directions to the Star Party Locations

For maps and further details about the sites, please go to our website at [www.mnastro.org/facilities](http://www.mnastro.org/facilities). You can also check the MAS online calendar at [www.mnastro.org](http://www.mnastro.org) for a complete schedule of all MAS events.

### 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.

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.

When visiting the Baylor Regional Park, MAS members are requested NOT TO PARK OR DRIVE on the grass. There is a parking lot just past the observatory.

### 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 entrance to Metcalf.

## 2006 Star Parties

*Star parties are held on Friday if weather permits, otherwise they are rescheduled for Saturday.*

*Call the MAS hotline at 952-467-2426 after 5 p.m. (3 p.m. in the winter) to hear a message about the status for that night.*

*Public stargazing nights at Onan Observatory at Baylor Regional Park are staffed and held whether it is clear or cloudy.*

<b>Date</b>	<b>Alternate or Time</b>	<b>Event</b>	<b>Location</b>
4/1/06	7:00 pm - 10:00 pm	Public Stargazing at Onan	Onan Observatory. Fair or foul weather event
4/7/06	4/8/06	Baylor star party	Baylor Regional Park (Onan Observatory)
4/21/06	4/22/06	Virgo Venture at Cherry Grove	Cherry Grove Observatory
4/21/06	7:00 pm - 10:00 pm	Public Stargazing at Onan	Onan Observatory. Fair or foul weather event
4/22/06	7:00 pm - 10:00 pm	Public Stargazing at Onan	Onan Observatory. Fair or foul weather event
4/28/06	4/29/06	Cherry Grove (Alternate for V. V.)	Cherry Grove Observatory
5/5/06	5/6/06	Metcalf star party	Metcalf Nature Center
5/5/06	7:00 pm - 10:00 pm	Astronomy Day and Public	Onan Observatory. Fair or foul weather event
5/6/06	12:00 Noon - 6:00 pm	Astronomy Day daytime activities	Onan Observatory. Fair or foul weather event
5/6/06	7:00 pm - 10:00 pm	Astronomy Day and Public	Onan Observatory. Fair or foul weather event
5/19/06	5/20/06	Baylor star party	Baylor Regional Park (Onan Observatory)
5/26/06	5/27/06	Cherry Grove star party	Cherry Grove Observatory
6/2/06	6/3/06	Metcalf star party	Metcalf Nature Center
6/2/06	7:00 pm - 10:00 pm	Public Stargazing at Onan	Onan Observatory. Fair or foul weather event
6/3/06	7:00 pm - 10:00 pm	Public Stargazing at Onan	Onan Observatory. Fair or foul weather event
6/16/06	6/17/06	Baylor star party	Baylor Regional Park (Onan Observatory)
6/23/06	6/24/06	Cherry Grove star party	Cherry Grove Observatory
6/30/06	7/1/06	Baylor star party	Baylor Regional Park (Onan Observatory)
7/7/06	7/8/06	Metcalf star party	Metcalf Nature Center
7/14/06	7:00 pm - 10:00 pm	Public Stargazing at Onan	Onan Observatory. Fair or foul weather event
7/15/06	7:00 pm - 10:00 pm	Public Stargazing at Onan	Onan Observatory. Fair or foul weather event
7/21/06	7/22/06	Baylor star party	Baylor Regional Park (Onan Observatory)
7/28/06	7/29/06	Cherry Grove star party	Cherry Grove Observatory
8/4/06	8/5/06	Metcalf star party	Metcalf Nature Center
8/4/06	7:00 pm - 10:00 pm	Public Stargazing at Onan	Onan Observatory. Fair or foul weather event
8/5/06	7:00 pm - 10:00 pm	Public Stargazing at Onan	Onan Observatory. Fair or foul weather event
8/18/06	8/19/06	Baylor star party	Baylor Regional Park (Onan Observatory)
8/25/06	8/26/06	Cherry Grove star party	Cherry Grove Observatory
9/1/06	9/2/06	Metcalf star party	Metcalf Nature Center
9/15/06	9/16/06	Baylor star party	Baylor Regional Park (Onan Observatory)
9/22/06	9/23/06	MAS Mini Messier Marathon (4M)	Cherry Grove Observatory
9/22/06	7:00 pm - 10:00 pm	Public Stargazing at Onan	Onan Observatory. Fair or foul weather event
9/23/06	7:00 pm - 10:00 pm	Public Stargazing at Onan	Onan Observatory. Fair or foul weather event
9/29/06	9/30/06	Metcalf star party	Metcalf Nature Center
9/29/06	7:00 pm - 10:00 pm	Public Stargazing at Onan	Onan Observatory. Fair or foul weather event
9/30/06	7:00 pm - 10:00 pm	Public Stargazing at Onan	Onan Observatory. Fair or foul weather event
10/13/06	10/14/06	Metcalf star party	Metcalf Nature Center
10/13/06	7:00 pm - 10:00 pm	Public Stargazing at Onan	Onan Observatory. Fair or foul weather event
10/14/06	7:00 pm - 10:00 pm	Public Stargazing at Onan	Onan Observatory. Fair or foul weather event
10/20/06	10/21/06	Cherry Grove star party	Cherry Grove Observatory
10/20/06	7:00 pm - 10:00 pm	Public Stargazing at Onan	Onan Observatory. Fair or foul weather event
10/21/06	7:00 pm - 10:00 pm	Public Stargazing at Onan	Onan Observatory. Fair or foul weather event
10/27/06	10/28/06	Baylor star party	Baylor Regional Park (Onan Observatory)
11/10/06	11/11/06	Metcalf star party	Metcalf Nature Center
11/17/06	11/18/06	Cherry Grove star party	Cherry Grove Observatory
11/17/06	7:00 pm - 10:00 pm	Onan Observatory.	Fair or foul weather event Leonid Meteor Shower
11/18/06	7:00 pm - 10:00 pm	Public Stargazing at Onan	Onan Observatory. Fair or foul weather event
11/24/06	11/25/06	Baylor star party	Baylor Regional Park (Onan Observatory)
12/8/06	12/9/06	Metcalf star party	Metcalf Nature Center
12/15/06	12/16/06	Baylor star party	Baylor Regional Park (Onan Observatory)
12/22/06	12/23/06	Cherry Grove star party	Cherry Grove Observatory



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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 get Sky and Telescope at the club's discounted rate, you must renew your subscription through the club. When you get a renewal notice from S&T, send the notice along with a check for the amount indicated on the notice (currently \$32.95) to the MAS Membership Coordinator at: Minnesota Astronomical Society, Attn: Membership Coordinator, P.O. Box 14931, Minneapolis, MN 55414. Make your check payable to MAS. If desired, you may renew your MAS membership at the same time, and write one check to cover both payments.

To subscribe to the MAS e-mail list visit:  
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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.