

# Gemini

a publication of the Minnesota Astronomical Society



<http://www.mnastro.org>

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## In the pages of the Gemini

### **DIGITAL OBSERVING IN BLACK AND WHITE**

By Tom Lindquist...Page 2-3

### **30 YEARS AGO IN GEMINI**

From the archives of Bob Schmidt...Page 3

### **CHERRY GROVE UPDATE**

By Dick Jacobson...Page 4

### **OBSERVING PROJECTS**

By Greg Haubrich...Page 4

### **DUKE SKYWATCHER...Page 5**

### **A POTENTIAL DARK SKY SITE**

By Greg Haubrich and Ron Bubany...Page 5

### **2006 MIRROR GRINDING WORKSHOP REPORT**

By Ben Mullin...Page 6

## **Astronomy Day**

**By Jackie LaVaque**

All the exciting build-up leading to the two most public astronomy nights of the year is now behind us, and in my estimation, I'd say that Astronomy Day 2006 was an unqualified success, thanks to everyone who showed up!

May 5th was a cool day and presented a clear evening as well. I was told about 80 visitors attended the events of that evening. I couldn't make it out there on Friday, but I was there on Saturday, May 6th, so I will limit my report to that day. I'd say we had at least 100 visitors, if not more, to the observatory on Saturday. We counted 27 telescopes of varying types and sizes set up around the observatory and park grounds... quite an impressive array.

May 6th was warmer; just a gorgeous spring day. Temps in the lower 70's, clear and windy during the day meant lots of opportunities to view the Sun in both white light and h-alpha. There was just one sunspot I could see, but there were a number of prominences on the solar limb. I explained to several visitors what those 'hairy' protuberances were on the limb of the Sun, and that they were each larger than the Earth. This elicited an audible gasp from a Scoutmaster who happened to be accompanying his troop to a combined campout/astronomy trip.

That same Scoutmaster had lots of questions, and a couple of his charges were almost equally inquisitive, so I had a captive audience for about an hour. I really enjoy this part of outreach; most of a typical week for me is spent doing something I'm not very good at (but my boss seems to think I am, and continues to pay me) but once I'm in my element, bring 'em on! I really enjoyed talking with the kids and answering their questions about the planets, astronomy in history and the Milky Way galaxy.

I then made my way down to the picnic pavilion for the BSIG cookout. We had a nice turnout of members, both old and new. Bill Bynum (a self-described "mirror guy") had the rapt attention of several astro-newbies with his demonstration of how a Newtonian telescope works and an excellent presentation on collimation. I learned a lot myself (see, I'm mostly a "lens person," so I could stand some mirror-learnin'). John Young was the star of the grill, providing tasty burgers, hot dogs and brats for the hungry masses, and there were many generous contributions of side dishes, chips and desserts from other members. I ate too much. :)

Mark Saltzmann kindly donated a refractor telescope and a bunch of kids' astronomy books (thanks, Mark!). I don't know who won the telescope, but the books proved to be pretty popular, and lots of kids hovered over the display table, trying to decide which book to bring home.

After dinner, there was an interesting talk given by Russ Durkee on backyard astrophysics. Mike Kibat gave some "couch potato astronomy" talks, and as the skies grew dark, the telescopes started to buzz and hum as we slewed them to a variety of breathtaking objects... Saturn and Jupiter; the Moon, and many Messier objects were just so impressive through the wonderful new visual and video equipment. An International Space Station pass had us all looking up for about a good three minutes, waving to the current crew.

I heard many comments throughout the evening about how wonderful the new equipment is and how impressive the views are. It made me feel proud to be a team member.

Astronomy Day is an event that I look forward to each spring; for me, it means the joy of sharing a wonderful hobby, combined with being around good friends who also enjoy sharing a wonderful hobby. What could be better?? ■

*Continued on Page 3*

## Digital Observing in Black and White

By Tom Lindquist

Here are a couple of images that recently have emerged from my very modest efforts to extend my own observing into the realm beyond the digital divide, to some consternation of my dob friends who fear I've gone over to the dark side. Not so, and I think these two images show it. M-82 was the first decent galaxy shot and benefits from a couple of lucky breaks. Nevertheless, a first light with any scope or camera is always a small special occasion to be shared among observing friends.



*Tom Lindquist Feb 06*

M-82 "First Light" Sac8

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### Editors

Brian Litecky  
Ron Bubany

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John Treadwell

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### MAS Officers

**President: Mike Kibat**

E-Mail: kibatme@visi.com  
952-884-0039

**Vice President: Ben Mullin**

E-Mail: benjamin.t.mullin@gmail.com  
651-784-7469

**Treasurer: Bob Benson**

E-Mail: rrsbn@earthlink.net  
952-937-5451

**Secretary: Steve Emert**

E-Mail: lakeaires@msn.com  
651-426-2502

**Board Member: Greg Haubrich**

E-Mail: greghaubrich@comcast.net  
763-421-4736

**Board Member: Jon Hickman**

E-Mail: jon@thehickmans.com  
763-476-4021

M-100 was shot in considerably less light pollution from next to the MAS/Onan building on a lovely warm night in April, and has its own unique problems as an “imaging” image that we’ll overlook and confine remarks to what’s being apparently observed. When this emerged from the stack of individual frames and the curve bending and filter games we play, I really was taken aback. My particular observing concern was with the conspicuous gap between the arm on the left side and the one on the right side which appear to be aligned. David Malin’s observatory images show I wasn’t that bad, the gap is indeed real. So, still “observing” myself, I head back to the original stack, only roughly calibrated but with all the real data and noise still in it, and look, like examining the field in the eyepiece. So what did I see? As far as I could “see”, it looks like I couldn’t “see” the extremely faint halo that extends to the bright companion on the left, but I could “see” faint streaks of the faint detail of the apparent debris field extending upward to the other companion, though I couldn’t “see” the fainter-overall debris swath in its overall shape.

That’s definitely not “imaging”, and that’s definitely not “visual observing” in the way either of those well established amateur astronomy activities are correctly understood. It seems to me that digital observing is something else, with its own fascinations and rewards, something to be recorded more in the observing notebook among visual observations possibly through a digital eyepiece. It may be transformational as it comes to be understood and accepted, and while it can and should never replace either the amazing ccd image or the personal amazing view through the eyepiece, it can make a lot of observing easier and more fun.

I really have to get this camera to darker skies! ■



## 30 Years Ago in Gemini

From the archives of Bob Schmidt

July 1976

Andy Fraser reports that, through his efforts, NSP has donated a transformer and incoming power lines to the Metcalf site worth about \$400. Our thanks to NSP for this substantial donation.

Andy is now soliciting electrical contractors for a service head and control box. When these are obtained, power can be installed. Eventually, underground lines will feed permanent pedestals scattered about the site. ■

## Cherry Grove Update

By Dick Jacobson

The most exciting development over the winter was the installation of a Servo CAT drive system on the 24" Starmaster "Big Dob". This system provides highly accurate tracking of objects, plus a "go-to" capability that lets you rapidly locate thousands of objects by Messier or NGC number. It works in conjunction with Argo Navis digital setting circles and includes a handpad controller for manual slewing. If you aren't familiar with the Servo CAT system, or prefer to operate the telescope manually, you can quickly disengage the drive by releasing two clamps.

As of this writing, the Cherry Grove Observatory Maintenance and Administration Committee (CGOMAC) is planning an internal training session so that we can all become familiar with the Servo CAT and subsequently train others in its operation. For information on training, watch the Discussion Forums at [www.mnastro.org](http://www.mnastro.org) under MAS Announcements or Cherry Grove Observatory Discussions. Or you can e-mail [badmac@mnastro.org](mailto:badmac@mnastro.org) or call me at 763-553-1306 for more information.

There's also been progress on the 16" equatorially mounted

## Observing Projects

By Greg Haubrich

Are Observing Projects for You? Ever been stuck Observing the same objects, over and over? Do you ever wonder what other fascinating objects that you and your telescope are capable of seeing that you are missing? Would you not only like to expand the number of objects you see, but also be able to improve your Observing skills, and understand astronomical objects better?

If you answered "yes" to any of the above questions, Observing Projects are definitely for you!

The best Observing Projects out there are created and run by the Astronomical League (A.L.), of which the MAS is an affiliated society. These projects vary in the level of difficulty, scope, and the equipment required to enable an amateur astronomer at ANY Observing level to find one or more Observing Projects that are well suited to their level. These Observing Projects are virtually guaranteed to increase your awareness and interest in astronomical Observing. I have not talked with anyone that completed any of these Observing Projects that was not happy they did so. In fact, most go on to complete many additional projects.

Start by surfing over to the Astronomical League's webpage for "Observing Clubs": <http://www.astroleague.org/observing.html>. The "Observing Projects" are actually termed "Observing Clubs" by the A.L. and offer both on-line and booklet forms of instructional material for completing each project. The projects are geared for individual completion and offer both a certificate and a pin once your Observing Log has been reviewed by the MAS or A.L. reviewer.

Some Observing Projects are topical, others a grand tour of the sky at varying levels of difficulty (from rank beginner, to advanced

Newtonian and its roll-off roof observatory. The mirror has been re-coated. Vic Heiner and John Connery have been hard at work on some maintenance issues including fixing the motor drive for the roof. We are in the process of replacing the deteriorating fiberglass roof with a steel roof. In addition to the telescopes and observatories, Vic and his wife replaced the carpeting in the warming house and Vic did some electrical repairs.

Those of you who have been to Cherry Grove are familiar with the problem of light from automobile headlights sweeping across the observing area as cars make turns at the corner. We have kicked around some ideas including portable light-shield panels and a "shower curtain" of black fabric along the road. We can't erect a permanent fence or wall that would block the view at the intersection. Any ideas you may have are welcome!

If you've never looked through the two big Newtonians at Cherry Grove, you owe it to yourself to try out these fine instruments. The Servo CAT system was primarily funded from the special projects fund supported by patron members, and the other maintenance work is funded by regular member dues. Thanks to all of you who made this possible! 🐾

amateur). The most popular Observing Project/Club is the Messier Club. This is a Project for Observing the Messier Objects, which are 110 of the best/brightest of the deep sky objects which are visible with a 4" or larger telescope (6" or larger recommended). Other lists are based on Telescope or Binocular Observing, or even naked eye Observing.

I've personally finished 10 A.L. Observing Projects/Clubs and would highly recommend them to any amateur astronomer interested in seeing new objects, improving their Observing skills, and in learning about astronomical objects. It is sure to help you break out of any Observing rut that you may be in or just help you sink your teeth/eye into Observing.

Here's a list of the A.L.'s Observing Clubs/Projects:

The Messier Club, Binocular Messier Club and the Herschel 400 Club, the Deep Sky Binocular Club, the Southern Skies Binocular Club, the Meteor Club, the Double Star Club, Lunar Club, Globular Cluster Club, Constellation Hunter Club, Southern Sky Telescopic Club and the newly formed Open Cluster, Planetary Nebula, Lunar II and Outreach Clubs. Other clubs are the: Arp Peculiar Galaxy Club, Asteroid Observing Club, Caldwell Club, Comet Club, Double Star Club, Earth Orbiting Satellite Club, Galaxy Groups & Clusters Club, Herschel II Club, The Master Observer Club, Meteor Club, Planetary Observers Club, Sky Puppy Club, Sunspotters Club, Universe Sampler Club and Urban Observing Club.

The sky has so much to offer an Observer with a modest amateur telescope. These projects will open your mind and your eyes to astronomy!

Clear Skies and Good OBSERVING!

Greg Haubrich — A.L. Observing Club Coordinator, MAS Board Member at Large, and Dark Sky Site Committee Chairman 🐾

## A Potential Dark Sky Site

By Greg Haubrich and Ron Bubany

The Dark Sky Site Selection Committee continues to investigate possibilities for a new observation site. In this article, we describe one of the potentials. We also have two other sites under review - more in the upcoming issues of Gemini.

Ron Bubany and I (Greg) headed up to The Audubon Center, on Grindstone Lake near Sandstone, carpooling from my house at about 1:10 PM. On the way up, Ron told me about how he used to fish this lake and that he met a local who had caught the record Sturgeon right on Grindstone Lake in the late 50s or early 60s. It only took about an hour and 15 minutes from Champlin to the Audubon Center (610 to 35 N). We got there early and drove slowly through the 523-Acre facility. The driveway was about a quarter mile long from the County Road to the Office.

We passed a large (80-acre?) field of restored prairie grass on the left and a swamp on the right just into the facility. After a block the road takes a right with more swamp on the left for another block or so and trees on the right. The first set of buildings one comes to is a large old house on the left, and a farm building complex on the right. Many maple syrup collection bags and buckets were filling on the maples as the sap was running. The farm building complex had maple syrup boiling vats and maintenance machinery as well as a large children's physical activity center (combo playground and obstacle course) beyond the buildings (this area had electricity and overlooked a large open swampy area to the south and was to be the first area we would be shown as an Observing Site Option #1). We continued further down the road following the signs that pointed to the "office".

About 100 yards further we ended up in a medium sized parking lot (yes, with one full cut-off light in the center) and parked. The Audubon Center Lodge, Student Dormitories and Classrooms were very large and impressive wooden structures located right off the eastern shore of Grindstone Lake. The center includes offices for a staff of about 12 people (some part-time naturalists, student naturalists, maintenance staff, and the director of the center for the past 32 years, Mike Link, who we met and who subsequently took us on a very nice tour). Apparently about 160 school-aged children can be housed in the dormitories and take meals in the large cafeteria in the lodge. The lodge had a very large stone fireplace as its centerpiece and a large display area and store. Currently there were about 60 school children from an urban school that had come out for a week of getting a very comprehensive Northwoods nature education from the student and full-time naturalists. There was also a nice array of 3 very large photovoltaic solar

panels next to the dormitories.

The area around the lodge and office had lighting off the buildings in addition to the parking lot light. Mike agreed that even though it was a large open area, it would not do for observing. Lights are considered necessary for managing the facility and the children apparently. But not to worry, two more Observing Sites were shown as possibilities!

Both were actually out of the above mentioned driveway and down and across a dirt road (not often used, and isolated from the sites by a row of tall and dense pines to the west of the Observing sites).

The second site was not accessible by car/truck directly. It was through a shallow ditch and on a short hiking trail, about 50 yards from the road. It was a relatively clear field except for the row of pines to the west (blocking the dirt road). Additionally, there were a few straggling young pines sprinkled every 70 yards or so that might be an issue in a few years. We were later shown a possible indirect route which would be accessible with a vehicle (4 wheel drive?). We did not drive in however.

The third site seemed like a potential winner. A driveway through a very shallow ditch (definitely truck accessible, probably minivan accessible, but perhaps needing some class 5 work, i.e. kind of like

CGO, but maybe a bit narrower and more steep) through a gate to a large maintained open field on the far side of that same row of pines (but about 0.25 mile further down the road). The field was mowed, and large (about 2 acres?) with two out-houses and a small log-classroom with electricity and a wood stove! The field had a clear view to the north, south and east, with pines blocking the dirt road to the West. There was a small hill to the southeast that rose up about 10 feet and overlooked the whole area. It was not easily accessible for scopes as is, but could be tamed with a bulldozer if necessary (or simply left and looked over). Mike did not want cars staying parked on the field, but wanted cars/trucks to unload and park outside the gate. Almost all cars would need to be parked on the road.

Ron, Mike and I agreed that this observing site (no lighting either) was closest to our ideal. Mike even talked about us being able to build a storage shed if necessary. He thought that perhaps the classroom might be usable as a warming house. Mike was a bit leery about potential accidental misuse of the wood stove and the consequences. Liability insurance was discussed.

We agreed that the next step is to get a small contingent of Dark Sky Site Committee Members out with our light meter and scopes for an evaluation star party. We need to call Mike Link, the director, to let him know that we are coming out. Mike indicated that he's alerted his staff to our potential presence and that we can go out there unattended. The gate should be open. The classroom may, or may not be, we can negotiate that.

As yet we have been unable to make this visit, due to conflicting schedules and the limited number of new moon evenings. We should be getting out there soon, however.

Stay tuned for further updates as your Dark Sky committee continues its efforts to locate a new and useful observing site for the Society. ■

## Duke Skywatcher



## 2006 Mirror Grinding Workshop Report

By Ben Mullin

As I reported in the last issue of Gemini, the ATM SIG held its first mirror grinding workshop in probably close to 20 years in April. The plan was to use the classroom connected to the Eisenhower Observatory in Hopkins on two consecutive Saturdays as a space for grinding. Katy Haugland offered to share the skills she learned from John Dobson with us. 6" plate glass and 8" Pyrex mirror kits were ordered for the four new grinders (I already had a hardly touched kit). Several other grinders with already partially completed mirrors (one mirror started 25 years ago) also expressed interest in joining the fun. The hope was that by the end of the two Saturdays we would have several completed mirrors, or nearly so.

That was the plan. The plan changed slightly the first Saturday. First, Katy suggested that rough grinding was a messy task, and since the day was nice, the classroom was abandoned for the front lawn of the observatory. Second, I reluctantly decided not to show up and leave Katy solely and capably in charge (low STI due to a just barely over 12 hour old son). From the reports I heard, the day went extremely well. Katy aptly led everyone into the start of the mirror making process.

The first step is rough grinding which removes the bulk of the glass to form the concave surface of the mirror. This is dirty work with lots of water and grit. As the grinding proceeded it is necessary to check the progress towards the desired focal length. This was done outside by wetting the surface of the mirror and focusing a reflection of the sun on a light pole and measuring the distance from the surface of the mirror to the image on the pole. Once the rough curve has been created the next step is to smooth the shape and surface of the mirror into a perfect spherical section using finer and finer grits (fine grinding).

By the end of the first day people had progressed to various stages of fine grinding. With additional work over the week in between sessions it would be possible for people to start polishing their smoothed mirrors the following Saturday. Otherwise the following Saturday would bring a chance to finish fine grinding. One of several positive sentiments expressed after the first day was the following quote from Darryl Ponder. "My thought was that this is something that I wanted to do, but expected it to be boring. So far it isn't at all..."

As it turned out Darryl's lack of boredom resulted in him being the only person ready for polishing the next Saturday. Everyone else was finishing fine grinding (except for me who was just getting started). To polish a mirror a pitch lap is created using the glass tool as a foundation. For an explanation of pitch lap pouring see the April 2006 Gemini.

The weather for the second Saturday was far less favorable than the preceding session with cold temperatures and periods of rain and mist. So it was up to the observatory classroom to lay down plastic on the floor to keep the mess to a minimum. The day proceeded with people making progress on their fine grinding and with the pouring of two pitch laps. Along with Katy's presence, we were also lucky enough to have Steve Emert and Bob Benson join us this time. Both Bob and Steve have experience in the final stages of fine grinding and polishing and were an asset in assisting people in those stages.

By the end of the day we were not as far as I had hoped everyone would get. Despite Bob Seabold's assessment that, "It seems that mirror grinding can get bogged down in a lot of technical details so I really liked the perspective Katy brought to us, that is, in getting to a finished scope as quickly and as simply as possible," no one had a finished mirror. This was due to first time over optimism in what can get accomplished in a mere 16 hours. What we

*continued on page 7*

## 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.*

Date	Alternate or Time	Event	Location
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

do have is a group of people well on their way to grinding their first mirror and hopefully we can continue working as a group to ensure that everyone does have a finished mirror in the end. Of course, once the mirror is finished we can use another of the great MAS assets in the aluminizer housed at the Eisenhower Observatory. And beyond that everyone gets to embark upon one of the other aspects of ATM, building the telescope that will house the newly finished mirror.

Overall, I would consider the 2006 mirror grinding workshop a success despite the lack of completed mirrors. We can leverage this experience to come back in 2007 and have an even better workshop. I would encourage anyone who finds the prospect of creating their own mirror, or even assembling their own scope

using commercial optics to join the ATM SIG discussions and possibly join us next year for a mirror grinding workshop.

A couple of final notes: First I would like to thank Katy for sharing her time and expertise with us. Without her help this project would not have gotten off the ground. Secondly I would like to thank the Eisenhower Observatory and Bob Shaw in particular for providing us the space to work. And last of all I would like to thank everyone who attended, those with fresh mirrors and those with nearly finished mirrors for making this a successful workshop. Finally I would like to leave you with a quote from Dick Jacobson, "Pushing glass is getting addictive!"

Ben Mullin MAS ATM SIG Coordinator ■



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