

Gemini

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Taking the Plunge -or- Getting Started in ATMing

Michael T. Burr

This is the conclusion to the article whose first part appeared in the December 2002 issue of Gemini.

TESTING & FIGURING

Here is the home stretch, the light at the end of the tunnel, ... and the fly in the ointment for ATMing. It would be nice, in some ways, if we could just polish the mirror, shove it into a sonotube, and look at Io's canyons and craters. Alas, we need to make a paraboloid, and that's a slightly greater challenge.

Instructions won't help much until you start doing it, but I'll offer some general perspective that I hope will help you. (I should point out, also, that these perspectives were first shared with me by others who have much more experience than I have.)

First, nobody will hold a gun to your head and force you to build a Foucault tester. It is possible to get a useable paraboloid with star testing only; this is the way John Dobson does it. However, a big part of telescope making involves learning what's going on when you push your lap around, and what the surface of the mirror looks like. The Foucault tester is invaluable for accomplishing this. Also, it's the only practical way for the first-timer to get an empirical measurement of how much glass needs to be polished away and where. The star test or Ronchi tests can't tell you that by themselves. They are really qualitative rather than quantitative.

Second, while some will say you can build your Foucault tester out of cardboard and baling twine, you really want a sturdy instrument with smooth motions and reliable measurement abilities. It's not rocket science, but as soon as you use a Foucault tester – especially a bad one – you will appreciate the value of a well-engineered tester. (I only have one Foucault tester, and I am not saying it is well engineered. It is passable, and no more.)

With some hesitancy, I direct you to the Stellafane website for Foucault test plans. The plans are specific and detailed, and that is great for someone who has never used a Foucault tester before. But these plans have a major design flaw that is not acknowledged on the website. Namely, your nose and chin will bump into the face of the test stage before you get close enough to get a really good shadow image across the knife edge. This is very bad. It throws your readings off in ways you can't predict, and it makes it difficult to get the information you need. You will probably wind up using the edge of your cornea as a knife edge, and since your cornea moves with your head you will never get a repeatable reading.

Continued on Page 3

Eisenhower Observatory:

Come view the night sky through a powerful telescope on top of the Eisenhower Community Center in Hopkins, MN. Viewing time varies throughout the month and is open to the general public. There is no charge, although a \$2.00 donation is requested. Space is limited, so call Diane for reservations: 612-988-4077.

University of Minnesota:

Observing from the telescope on top of the Physics building, East Bank. Open to the general public. Fridays during the school year: 612-626-0034 for more info.

College of St. Catherine's, St. Paul

The Observatory at the College of St. Catherine houses a 14" Celestron computer driven telescope as well as a number of smaller solar and wide field telescopes for group viewing. The Observatory will not be open to the public until further notice because of installation of air conditioning vents on the roof. The observatory will be moved and reopened. Phone: (651) 690-6023. Leave e-mail questions about astronomy at askastro@stkate.edu The public nights at the Observatory are run by the Student Observatory Assistants of the College of St. Catherine, Mary Wallraff and Rose Stenglein. <http://www.stkate.edu/physics/observatory.html>

Carleton College, Northfield

Goodsell Observatory is located at 93° 7' W and 44° 29' N, on the campus of Carleton College in Northfield, Minnesota. In Goodsell's main dome, there is a 16.2 inch John Brashear refractor and in the smaller dome there is an 8 1/4 inch Alvan Clark and Sons refractor. Both are over a hundred years old. Goodsell also has some modern telescopes. <http://physics.carleton.edu/Astro/welcome.html>

Open houses are held the first Friday of every month. Everyone is invited to come look through the observatory's two historic telescopes. Remember to dress appropriately as the telescope domes are neither heated nor cooled. The open house will be canceled in the event of cloudy skies. For more information contact Jesse at 646 5719 or via email: jball@carleton.edu.

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So follow the Stellafane plans if you want to make a slitless tester, but please modify it so you can get your face really close to the knife edge without bumping the tester. It's not possible to just cut a hole for your nose, because if you do then your forehead and chin will interfere. Really the plans need to be changed so there is just one vertical stage support, and the knife edge and/or Ronchi screen should be held by a much smaller and thinner piece of material. (I'll add photographs of my modified Stellafane tester when I get them developed.)

Third, when it comes time to actually measure the figure, don't expect your first sets of measurements to be accurate or repeatable. If they are, you are a better person than me. Instead, you should expect to spend a lot of time testing and re-testing and learning how to identify zones before you can start getting real measurements.

Testing with a Foucault tester is a black art that is only mastered with a lot of practice. Go slow at this stage. Don't get frustrated; just analyze what you're doing, ask questions and keep working on it.

Testing is a challenge, but the payoff is huge. And when you're this close to your goal, testing and analyzing and making figuring corrections becomes a game that will make you as giddy as a schoolboy (or girl). It is a challenge of the best kind, intellectually and even spiritually, in a strange and wonderful way.

The measurement process itself sometimes seems very subjective, but the data that result are coldly empirical. To the degree that you are diligent and honest in the testing process, you will get an accurate read on your mirror's figure. To the degree that you "fudge" the numbers or lie to yourself about your ability to identify a given zone, you will get inaccurate readings. And your confidence in these readings is vitally important when prescribing corrective strokes. So take your time. Build your skills at testing. Ask questions and seek help until you are confident. Take it slow, but keep moving forward.

Figuring is much less of a black art than Foucault testing, but it is definitely an art as much as a science. I will say only a few things about it, since I have not mastered this art except in the most rudimentary, ham-fisted way.

1) Polish with Cerium Oxide, but figure with rouge. Rouge works more slowly, and in figuring you want the figure to change slowly. It's going to move all over the place, no matter how hard you try to make tiny baby steps toward the paraboloid. So don't handicap yourself with a fast-cutting polish like CeO, unless you can get some really fine sub-micron stuff.

People say rouge is too messy. I say rouge is only as messy as the person using it. I always figure at the kitchen table, and I have never had a problem with staining anything that could not easily be cleaned. Keep the stuff away from the walls, woodwork, fabric and carpets and you'll be fine. (And in fact it comes out of fabrics pretty well in my experience.) It stains less than, for example, the ink in the Sharpie you were using during grinding.

2) Using TOT, it helps to imagine that the edge of the tool is doing the work, and using MOT, to imagine that the center of the tool is doing the work. Neither is really true, but it does help to envision it that way. (If you haven't even started grinding yet, don't worry about figuring. But try to remember this

advice when you come to figuring. It will help you grasp what you're doing to the curve.)

As an extension of that idea, consider this: When a part of the mirror is not in contact with the tool, that part is getting zero attention. Add up in your mind the amount of time those parts get zero attention, compared to other parts that get more attention, and you will understand why strokes do what they do. (The same thing is true in grinding stages.)



Photo by Michael T. Blurr

The completed ATM project is a source of immense pride and satisfaction. The author finished this, his first homemade telescope, in about four months, from ordering mirror-making supplies to enjoying first light. (The 8" f/6 plate-glass mirror is mounted inside a concrete form tube. About 15 coats of paint make the tube presentable.)

3) Figuring is more about thinking than it is about doing. Be prepared to take lots of time thinking and planning, and very little time actually pushing the lap to change the figure. It can be tough to make the transition from polishing – where you want to make as much progress as possible in as little time as possible – to figuring, where you want only miniscule changes to occur.

4) For god's sake, if you have a fully polished mirror, don't ever go back to fine grinding unless you absolutely have no other choice. If you get scratches or dings, ... well, you have to make a judgment call. But remember that the vanes of your spider are just like enormous, deep gouges, and every piece of hair or lint or dust on your mirror acts like a scratch, scuff or pit. Don't worry about little defects like this. The overall figure is 10 times more important.

A final note about testing and figuring: Don't rely solely on any one testing method, because each one has its strengths and weaknesses. You could have a 1/40th wave peak-to-valley (P-V) figure according to the four zones you've measured with your Foucault tester, but between those zones your figure could look like a roller coaster. If the inside and outside zones are where they need to be, and the Ronchi lines curve the way they are supposed to, ... then you probably have a good figure. Star test the thing to make sure, and send it off to the aluminizer.

REAPING THE REWARD

Doubtlessly you've heard people say how gratifying it is to look through the telescope that you made with your own

hands. This is certainly true, but I believe the most gratifying aspect of becoming an ATMer is the learning process that occurs when you do it. You will gain skills and understanding of things that you probably would never gain any other way. These skills will serve you well in the future – whether you build more telescopes or not.

In short, ATMING makes you a better person. Remember what I said about testing being an intellectual and spiritual challenge? At the risk of seeming corny, I think ATMING in general is a spirit-building exercise. Imagine what you are doing here. You are taking a big hunk of glass – which is just a whole lot of silicon dioxide crystals stuck together – and shaping them in a very careful and methodical way so that you can focus the light of the cosmos into your eye, into your mind, and into your self.

What a cool thing to be able to do! So stop reading! Order that glass!

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Photo by David Schultz

MAS Photo Page

Dave Schultz

Moon photo Taken with Meade LXD55, 10 inch, Olympus OM-1 camera, positive projection using a 25 MM lens 1/2 second, November, 2002, St. Paul backyard.

Sun photo Taken with a Celestron G-5, solar filter, Olympus OM-1 camera, prime-focus technique 1/1000 second, October, 2002, St. Paul backyard.



Photo by David Schultz

Messier Marathon 2003

Greg Haubrich

The 5th Annual MAS Messier Marathon!!! Has winter "photon deprivation" got you down? Boy, has the Messier SIG got the cure: A night of pure "Messier Marathonning Madness"!

It's a chance to view many of the heaven's most beautiful objects in just one night! No advanced registration is required, just sign in on the sheet in the Cherry Grove warming house early in the evening, and sign out with your total Messier Object count (observer's honor) in the morning. There will be copies of the "Messier Marathon Observer's Form" for logging in the warming house.

As an added incentive, Dan Fish of Radio City in Mounds View usually graciously donates three prizes (from his fine stock of

astronomy equipment and literature) to be awarded to lucky, and skilled, marathon participants. (Most M objects via star-hopping: one over 13yrs. and one 13yrs. or younger category; and one random drawing of participants.) Here's the details:



Photo by Greg Haubrich

Setting up Scopes at the 2002 Messier Marathon

Location:

Cherry Grove Date: March 7 or 8, or March 28 or 29, 2003 (Dusk until Dawn - - or as late as you'd like to stay - - the first clear night that the "GO" is given).

Note: March 28 and 29th are optimal, but we can't afford to let the "alternate" weekend of March 7 or 8 to slip by. As usual, check the MAS phone message @ 651-649-4861 for a go/no-go (updated by 5 PM; or call my home phone: 763-421-4736 if it's not updated - - I'll leave a message on the answering machine if I've already left).

This event is an awesome OBSERVING experience that can not be easily conveyed. You must experience it to know! Almost everyone that makes it through their first full night of the Messier Marathon are hooked for life! We come back for another fix year after year.

Any and all levels of observing experience and interest are welcome. Single efforts, team efforts, star-hopping,

go-to scopes, DSS', and any level of seriousness is welcome! Observers are encouraged to check it out (maybe you can piggy back with a Die Hard and see 100+ Messier Objects in one night!). Beginners are welcome with their own equipment to observe as many Messier Objects as possible to kick off the year's prime observing season in style! Other's may try a Binocular Messier Effort (50 Bino Messier Objects or more in one night!). 2 Gallons of Warm Cider and a large box of Cookies should power observers from dusk until dawn (literally for a growing group of us!).

In my opinion, this is a right-of-passage for serious/obsessed observers; or also just a fun way to boot-strap the annual observing season!

HERE'S A FEW HINTS FOR PARTICIPANTS:

1) Arrive a half an hour before sunset if possible. Sunset is around 18:10 CST.

2) Dust off and collimate the telescope optics (or at least check to see if the mirror/objective fell out!)

3) PREPARE STAR/MESSIER FINDER CHARTS. (This is a must!)

4) Bring extra batteries for the red flashlights, telrads, dew heaters, etc. (12VDC hair dryers work pretty well to zap dew if necessary too). We also have 110VAC to plug in extension cords for hair dryers too.

5) Dress very warmly (I'll also bring two gallons of warm apple cider, cups, and cookies to share in the warming house.)

6) If you really are serious, brush up by going through the Virgo Cluster of galaxies one more time prior to the Marathon. (Per email requests to me at: haubr003@tc.umn.edu, I can email you back an excellent

.PDF galaxy/star chart featuring a good Virgo Cluster search sequence on it. Use it for the Marathon, or use it to go through the cluster for the first time.

7) HAVE FUN!!!! Team up with someone less experienced? Get to know a new club member. Just plain have a good time under the stars! - - I hope to see you there!

- - Greg Haubrich (a.k.a. "The Messier Madman") for the Messier SIG. 🐱



Photo by Greg Haubrich

MAS Messier Marathon 2002

MAS SIG

Greg Haubrich

I am pleased to review the status of MAS Members' A.L. Certificates for this month:

Awards ready for presenting (CONGRATULATIONS FOR A GREAT JOB OF OBSERVING!):

1 Regular Messier Certificate (for Observing 70 or more Messier Objects): Megan Eagen - - Certificate received and ready for presentation at the January MAS Monthly Meeting.

1 Regular Caldwell Catalog Certificate (for Observing 70 or more Caldwell Catalog Objects): Tim Parson - - Certificate received and ready for presentation at the January MAS Monthly Meeting.

1 Binocular Messier Certificate (for Observing over 50 Messier Objects with Binoculars): Greg Haubrich - - I will wait for my good friend Doug Brown to award this to me at an upcoming meeting at his convenience.

1 Herschel 400 Certificate (for Observing all 400 Objects on the Herschel 400 List): Greg Haubrich

Letters of Approval and Qualification to the Astronomical League (i.e. the A.L. is processing the award):

3 Honorary Messier Certificates (for

Observing all 110 Messier Objects): Dave Venne, Tim Parson and Tom Youngblood.

1 Binocular Messier Certificate (again, for Observing over 50 Messier Objects with Binoculars): Tim Parson.

1 Lunar Club Certificate (for observing 100 features on Earth's Moon): Doug Brown.

Upcoming Events:

EVENT#1:
The 5th Annual MAS Messier Marathon!!!
(see details in this Gemini).

EVENT#2:
Joint Beginner's SIG and Messier SIG Meeting February 26
(location to be announced). Topic: Astronomical League OBSERVING Clubs/Projects.



Photo by Greg Haubrich

Megan Eagen receiving her Regular Messier Certificate at the January MAS Meeting.

Thanks,

Greg Haubrich

MAS Messier SIG
Coordinator and MAS
A.L. Awards Coordinator.



New Mexico Skies

Tim Hagen

The rain pelting off the windshield was not a good sign. When my wife Rachel and I had started the drive to New Mexico Skies from Carlsbad 150 miles away, I rationalized that weather can change a lot in that distance. But as we slowly climbed into the mountains of the Lincoln National forest the sky was not looking good. As we pulled off the main road and made the final climb up a dirt road to the site, you could tell you were entering an astronomical haven: Everywhere you looked there were large roll roof observatories. The only thing keeping a lid on the excitement was the clouds. I kept telling myself I had four days. A few had to be nice, right?

As we checked in the owners Mike and Lynn Rice told me not to pay any attention to the late afternoon clouds. Hopeful but not convinced we unloaded and checked out the grounds. The rooms were very nice and obviously adapted to the unique astronomical requirements of the guests, down to the red light in the refrigerator. Why plastic white chairs? Because they're easier to see in the dark and less damaging to the toes if you don't. I don't know that I would have thought of that but Mike and Lynn have obviously been at this a while.

The observing field was amazing – a set of four clamshell domes surrounded by patio decks as well as large patio decks for each of the large DOBs. There were even concrete pads for user equipment. In addition, the main lodge had a fully furnished library with several net connected PCs available for use

and a remote imaging lab. The whole setup was perfect. I was on tap for the 30" DOB that night, I just needed clear skies.

As the sun set on an overcast sky, the guests all gathered in the library to swap stories and lament about the weather. We were joined by the owners and their adopted greyhound Bowzer. The guests included a couple traveling the southwest in an RV, a father son team from Indiana and even a very serious fellow from Germany named Hans who spent two weeks here every year looking for supernovas. I stepped out for one last look at the skies and saw stars... tons of them. The stars were finally out and the news cleared the library quickly as people scrambled to grab their gear and head out to the observatories.



Photo by Tim Hagen

Shot off the deck from our apartment.



Photo by Tim Hagen

Sculptor Galaxy (NGC253)

I could hardly wait as Mike and Lynn collimated and aligned the 30" scope. While I waited I was leafing through my observing binder going over the observing plan when I changed my mind. There would be no plan. Tonight, I was going to wander through the skies and just soak it in. They gave me a quick how-to on the DSS and then they were off to help setup other equipment.

I looked up and the first thing that caught my eye was Andromeda and I decided it was as good a place to start as any. I swung the telescope around, bounded up the ladder, popped in the eyepiece and was greeted with, well, disappointment. Don't get me wrong – I like the view but I couldn't even swear that it was that much brighter than the view in

my LX90. I sat back and looked at the jet black sky and it just didn't seem right. Back at the eyepiece and there it was. A bit deflated I decided to go looking for the satellite galaxy M32. As I panned over, an awesome spiral galaxy filled the eyepiece – alternating dark and light patches of the dust lanes visible even to my barely adapted eye. An ear to ear grin spread across my face as it hit me – I'd been looking at M110. THIS was Andromeda and it was gorgeous.

The nights observing only got better from there. I would scan the sky for a favorite target, swing the scope around, move the ladder and up I went. The only downside to an otherwise perfect evening was once when I fumbled with one of the big 2" eyepieces and it occurred to me that I really didn't want to drop a \$400 eyepiece. At that moment, I happened to look down from my perch at the exposed 30" mirror almost directly below me and a cold sweat washed over me – I REALLY don't want to drop a \$400 eyepiece onto an \$8000 mirror. Note to self: Don't change eyepieces at zenith.

The second night I had reserved an imaging dome. It was equipped with a 16" SCT, a high end CCD camera and all the accessories. Again the setup was perfect and the pointing dead on. I'd let the scope soak up photons as I happily scanned the skies with my binoculars. The lattes and steamed milk Mike would serve each night around midnight was generally enough to draw most of the observers into the library for a warm-up break and a little conversation.

All in all, I ended up with four full nights of observing and 250MB of images on a CD when I left. Even the non-astronomically inclined wife had a great time relaxing in the mountains and on the day trips to White Sands NM, Apache Point Observatory and just knocking around the shops and restaurants scattered throughout the small mountain community. She even took a few turns at the eyepiece. We spent the remainder of the week touring the rest of the state and both got on the plane to leave knowing we would be back.

For more information about New Mexico Skies, visit the web site at: www.nmskies.com. 



Photo by Tim Hagen

The observatories



Photo by Tim Hagen

"Apache Point" - This is a shot of the Astrophysical Research Consortium's 3.5-meter telescope dome.



Photo by Tim Hagen

"Big Dob" - This is what Lynn called the 'playpen.' It's the home of the 30" dob. Notice the rather tall ladder...



"LX200" - This is the imaging dome containing the 16" LX200 that I used two of the nights. Complete with wireless LAN back to the server in the library. Can't beat that with a stick.

2002 Star Parties

Star parties are held on Friday if weather permits, otherwise on Saturday. Call (651) 649-4861 after 6:00 p.m. on a star party date to hear whether it will be held.

Date	Location	Sunset	Moonrise	Moonset	Moon Phase
March/07/2003	Cherry Grove	18:06	8:47	22:54	21% Waxing Crescent
March/21/2003	Baylor	18:24		8:04	18% Waning Gibbous
March /28/2003	Cherry Grove	18:33	4:48	2:18	15% Waning Crescent
April/04/2003	Metcalf	18:42	7:12	21:47	8% Waxing Crescent
April/25/2003	Baylor	19:09	3:21	13:17	28% Waning Crescent
May/02/2003	Cherry Grove	19:18	5:40	20:44	2% Waxing Crescent
May/09/2003	Metcalf	19:26	11:27	2:24	>54% First Quarter
May/09/2003	Baylor	19:26	11:27	2:24	>54% First Quarter
May/23/2003	Baylor	19:42	1:49	12:13	43% Waning Crescent
May /30/2003	Cherry Grove	19:48	4:10	19:40	0% New Moon
June/06/2003	Metcalf	19:54	10:29	0:53	>40% Waxing Crescent
June/20/2003	Baylor	20:01	0:14	11:07	58% Waning Gibbous
June/27/2003	Cherry Grove	20:02	2:42	18:33	4% Waning Crescent
July/04/2003	Metcalf	20:01	9:33	11:21	26% Waxing Crescent
July/18/2003	Baylor	19:52		9:57	74% Waning Gibbous
July/25/2003	Cherry Grove	19:46	1:15	17:24	12% Waning Crescent
August/01/2003	Metcalf	19:38	8:36	21:47	15% Waxing Crescent
August/22/2003	Baylor	19:06		16:12	25% Waning Crescent
August/29/2003	Cherry Grove	18:54	7:37	20:14	6% Waxing Crescent
September/05/2003	Metcalf	18:41	16:20	0:36	>76% Waxing Gibbous
September/19/2003	Baylor	18:15		14:56	23% Waning Crescent
September/26/2003	Cherry Grove	18:01	6:32	18:38	1% Waxing Crescent
October/03/2003	Metcalf	17:49	15:10	23:36	62% Waxing Gibbous
October/17/2003	Baylor	17:23		13:40	57% Waning Gibbous
October/24/2003	Cherry Grove	17:11	5:22	17:01	1% Waning Crescent
October/31/2003	Metcalf	17:01	13:52	22:38	47% First Quarter
November /14/2003	Baylor	16:44		12:21	73% Waning Gibbous
November/21/2003	Cherry Grove	16:37	4:11	15:23	7% Waning Crescent
December/05/2003	Metcalf	16:30	14:54	5:26	>12% Waxing Gibbous
December/13/2003	Baylor	16:29		11:31	78% Waning Gibbous
December/19/2003	Cherry Grove	16:31	3:05	13:46	18% Waning Crescent

Metcalf

Metcalf is the grassy parking lot of Metcalf Nature Center, about 20 miles east of St. Paul along highway 94. About 6 miles E of the 694/494 crossing is county road 15 (Manning Ave.). Turn right, then left onto the frontage road and continue east, crossing over county road 71. Turn right (south) onto Indian Trail; follow it 1.1 miles to an chicken-wire gate on the right, (marked by three blue reflectors), opening onto a dirt driveway, which is the entrance to Metcalf.

Baylor Regional Park

Baylor Regional Park is roughly 25 miles W of the SW corner of 494. Head west on highway 5, through x, to Young America. Turn right onto county road 33 and follow it about 2 miles to the park, a right turn. The observing site is through the gate and roughly 100 yards beyond. Card-carrying MAS members may observe at Baylor at any time; call the park keepers in advance at 448-6082.

When visiting Baylor Regional Park, MAS members are requested to NOT park on the grassy areas next to the observatory (or any other grassy areas for that matter). This is a matter of being considerate to the park, its caretakers, and other visitors, so PLEASE PARK in the PARKING AREA. Annual Park Permits (optional, not required for observing) can be purchased by sending a check to Carver County Parks, 10775 County Road 33, Norwood Young America, MN 55397. The cost for the Annual Permit is \$18. Permits are also available at the Park Office at Baylor Park, the Carver County Government Center located at 600 4th St. in Chaska, through the honor box systems and gate houses when staffed at both Baylor and Lake Minnewashta Regional Parks. Lake Minnewashta Regional Park is located in Chanhasen off of Hwy. 41 between Hwy. 5 and Hwy 7 .

Cherry Grove

Cherry Grove is about 20 miles south of Cannon Falls. Head south on Hwy 52. Around 6 miles south of Cannon Falls, take a right onto Goodhue County 1 and follow it around 16 miles, where it ends in a T with Dodge County A. The observatory and warming house are at your right, nestled in the corner of the T.



MN ASTRONOMICAL SOCIETY

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<i>Subscription to Gemini for other persons</i>	\$9.00

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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 \$29.95) to the MAS Treasurer (Chuck Jorgensen) at 1615 E. River Parkway Minneapolis, MN 55414-3627). Make checks 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.