University Lowbrow Astronomers
Ann Arbor, Michigan

REFLECTIONS / REFRACTIONS

University Lowbrow Astronomers

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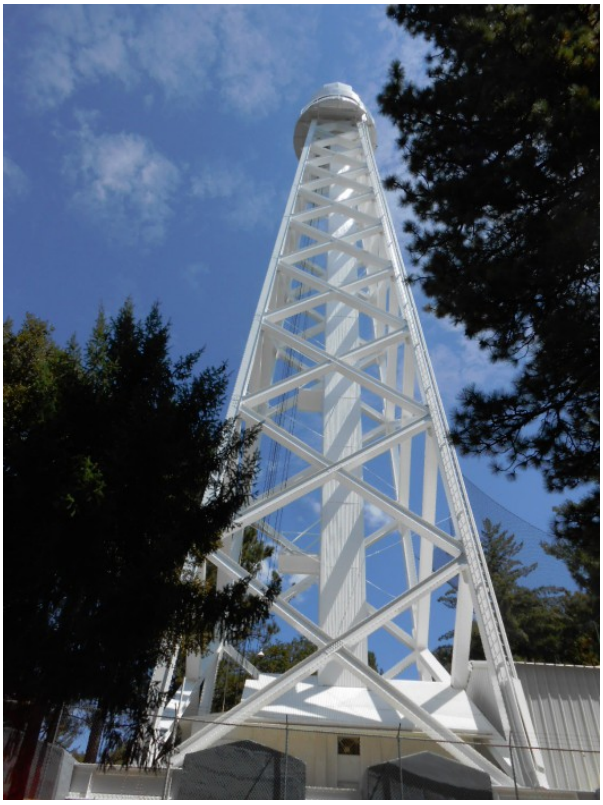
My Visit to Mt. Wilson Observatory

by Chuck Steele

The Mt. Wilson Observatory overlooking Los Angles made some of the most famous discoveries in astronomy. So after the August eclipse, I was in southern California and made a point to visit this historic observatory. On Saturdays they have guided tours which allow you to go inside and see the telescopes. Our tour was led my a retired Cal Tech astronomer who knew many interesting details about the observatory. There are three main historic telescopes plus a number of smaller telescopes. Our tour started with the Snow Solar Observatory. This telescope was built in 1904 and was the first permanent solar telescope to be put into operation. Early operation of the telescope was plagued with image distortion caused by solar heat. The original design with a 24" dia. primary with a 60 foot focal length projected an image through a horizontal shed with lots of heat eddies. It was decided a tower would collect the sun's image via a coelostat of flat mirrors away from ground heating and project the image straight down to an observing table. Interestingly, the construction of the solar tower used the same design of farm wind mills in use across the country. However, the design was beefed up to provided a stable platform for the coelostat. Fans were used to cool the mirrors and finally steady images of the sun were achieved.



Left: Mt. Wilson Solar Tower Telescope.
Above: Observing room of the Solar Observatory. Sun's image at prime focus is about 12 inches. Spectroscopes can be positioned to study the Solar Spectrum. Our tour guide is on the left wearing the black cap. Photos by author.

Astronomers at the Mt. Wilson Snow Solar telescope studied the Fraunhofer lines and determined that sunspots are cooler than the surrounding photosphere of the sun. Astronomers also discovered that sunspots have strong magnetic fields around them. The realization that the Fraunhofer lines correspond to chemical elements opened our understanding of the composition of the sun which gave physicist a foothold to understanding how the sun produces its energy. So this telescope played a key roll in understanding how our sun works.

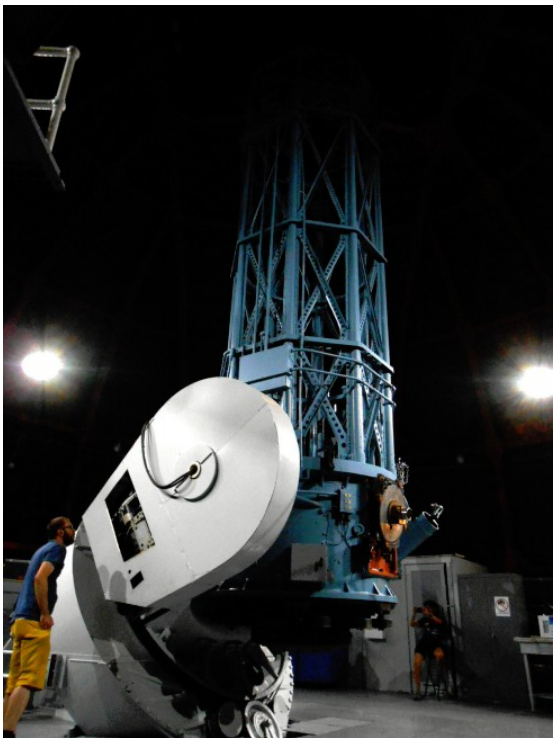
Next on our tour was the 60 inch telescope that was put into operation in 1908 and was the world's largest telescope until the 100" Hooker Telescope saw first light in 1917. This telescope was used to study star spectrums which led to the classification of stars by their color. The understanding that the cooler stars are red and the hotter stars are blue led to further classification with the absolute brightness of stars. By plotting the stars by color and absolute brightness showed the Main Sequence of stars. In the early 20th century astronomers thought our sun was near the center of the galaxy. Harlow Shapley used the light gathering power of this telescope to show that our sun is at least half way out from the center of the MilkyWay. Today both the 60" and 100" telescopes are retired from professional use; however, are now open to the public. Amateur astronomer and clubs can rent these telescopes for observations.

The Hooker 100" telescope celebrated its 100th anniversary in November 2017.

Last on our tour was the Hooker 100" telescope. It is the most famous of the three, for it was with this telescope the Edwin Hubble discovered other galaxies and that the universe was expanding. Hubble discovered groupings of stars which he first called "Island Universes" and later became known as galaxies. He soon realized these star groups were outside our Milky Way at great distances. Using Cephei variable stars in these galaxies he was able to calculate how far away they are. He also studied the spectrums of these galaxies and noted that most of them showed spectrums shifted to the red end of the spectrum. He also noted that the further away the galaxy the more the spectrum was shifted to the red. The shifting of the light spectrum is a result of the light source moving away from us at high speeds. So most of the galaxies are moving away from our Milky Way and each other, thus the universe is getting larger. Einstein had predicted with his theory of Relativity that the universe should be expanding. However, as the common thought at the time was that the universe was static and unchanging, Einstien added an ad hoc "cosmological constant" so his formula to make a static universe. After Hubble discovered the universe was expanding, Einstein said, adding the "cosmological constant" to his theory was the biggest blunder of his scientific career. Hubble invited Einstein to the Mt. Wilson Observatory and there are pictures hanging on the wall of Einstein looking through the Hooker 100" telescope.

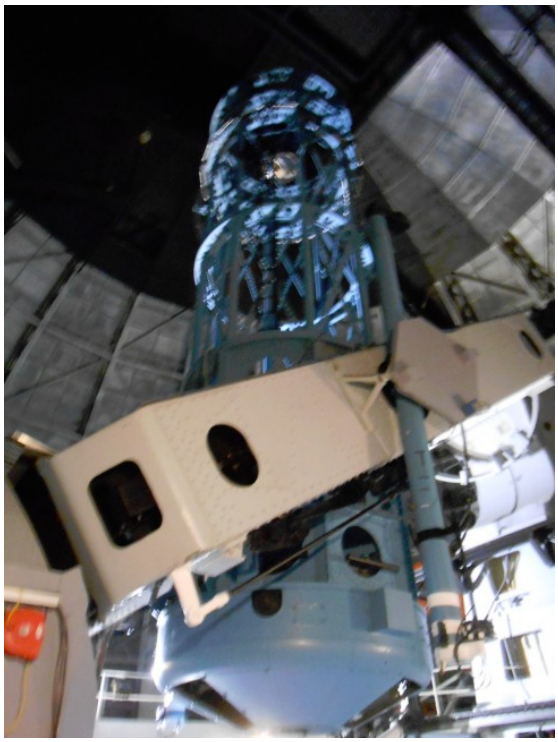
As we were sitting there admiring the telescope our guide removed a panel off the back of the telescope. One of the ladies in our group looked at the back of the telescope mirror and I heard a gasp, as she exclaimed, "There are bubbles in the glass!" . . . . . Our retired astronomer said, "There is a story to this." He went on to explain. The casting of mirror blank was given to a French company in Paris. They used ground up wine bottles which where then melted down for the mirror. (The glass has a green cast to it.) As this was such a big casting their ladle was not big enough to cast it in one pouring and required three separate pours. When the mirror blank was delivered to be ground there was much dissatisfaction with the quality of the blank. A law suite was going to be filed and the grinding of the mirror was delayed for five years. Finaly an optician studied the glass in some detail and noticed that the bubbles on one side were much less than the center and other side. He suggested that the mirror blank could be ground without breaking through a bubble at the surface. So they carefully started the grinding process and were able to polish the mirror without any defects. . . . . So many wine drinking Frenchmen played a part in discovering the expanding universe.

The Hooker Telescope Building



The 60 inch Mt. Wilson telescope.

Photos by Author



The 100 inch Hooker telescope.

Now wouldn't it be fun for the Lowbrows to rent the telescope out for one night, and as many that could go and spend the night looking through it. Those that couldn't make the trip we might be able to take camera shots through the telescope and live stream them back to the club members in Michigan. Just a thought. . . . . I would force myself to stay awake all night for such an event. A long term project would be to fit the telescope(s) for automation so that they could be operated by remote control observations sessions. I asked the astronomer about this and said it would be nice but there is no funding for such a project. Maybe we could do this in conjunction with a number of astronomy clubs to spread out the cost?

Wi-Fi-Access Point for Sky Safari

By Barry Wissman

After spending a few nights at Peach Mountain this past summer during which I witnessed others magically controlling their scopes with just the touch of a finger, I was intrigued. I wanted to be able to wirelessly control my Meade LX90 using SkySafari running on an Android device. I chose to use Wi-Fi rather than Bluetooth in the hopes that it might offer a better range, and/or be more robust. Besides, clever folks like Don Fohey have already figured out how to do this via Bluetooth, so I wanted to learn something new. In the interest of full disclosure, it is possible to do this with a commercial product known as SkyFi, which retails for $200. But where's the fun in that? Besides, the money I saved by doing it myself could go into my eyepiece/beer fund. So after doing some Googling, I determined that what I needed was a Wi-Fi Access Point (AP) to serve as a bridge between my Android device and my scope's serial port. So I collected the following items:

ESP8266 D1 mini board (<$10 on Amazon)
Micro USB cable for power
TTL/RS232 converter w/male DB9, 3.3V capable (<$10 on Amazon)
Home-made DB9 (female) to RJ10 cable (specific to my Meade mount)
Perf board
2"x3" project box

I hacked some Arduino code from www.roboremo.com to configure the ESP8266 for AP (as opposed to Station) mode, and give it a SSID, password, IP address, and port number. If you're like me and don't fully understand what these terms mean, it doesn't

Photos by Author

matter; you just need to make sure your device's Wi-Fi settings match those of the ESP8266 AP. Through some testing with a free Wi-Fi analyzer app, I learned that the signal is surprisingly strong, given the relatively small antenna built into the ESP8266 board. (I measured -30 dBm at a typical working range, compared to -50 dBm for my home router). I then connected the TTL/RS232 adapter pins (3.3V, gnd, Rx, Tx). Once I was sure the components were talking nicely to each other, I soldered them to some perf board, and put the whole thing in the proverbial black box, which I attached to my mount with Velcro. I added a small magnetic dashboard-type mount to hold my tablet, and I was in business! I had no issues setting up SkySafari for my scope, but in the process I discovered that the Meade programmers added a "feature" whereby the left and right manual slew controls are reversed (but only at the highest speed!), so that's fun.

Note that SkySafari seems to be quite flexible, having the ability to communicate with a variety of different scope mounts, including direct communication with encoders. In fact, my next project is to add a pair of encoders to my old home-made Dob to make it a "Push-To" (as opposed to "Go-To") system. I would also like to add a temperature-controlled cooling fan for the primary, and a dew heater for the secondary mirror, but that's another story …

All in all it was a very rewarding project: I learned some things, saved some $$, and ended up with a widget that has changed the way I use my scope. Rather than struggling to remember what objects I had wanted to observe, then scrolling through menus on the scope's hand box trying to find said objects, I simply look at the sky map, see what looks interesting, and give it a tap with my finger. Magic! Now all I need is warm weather and clear skies …

Learning to Operate the 24" McMath Cassegrain Telescope.

By Adrian Bradley

Don Fohey at McMath Telescope. Photo by Mark Bialek

McMath Telescope

Learning to operate *the 24" McMath Cassegrain Telescope,* can seem to be a daunting task. But it is very rewarding if you manage to figure it out.

Step 1: Read and understand the history of the McMath. I consider this a very important first step. As an operator, you are handling equipment that has been around for a very long time and has not changed fundamentally for many years. It will also confirm for you the sizes of the mirrors, the focal length and ratio, and many other important things about the McMath that you should know before taking on the task of operating it.

Step 2: Become familiar with the operation of an equatorial telescope mount. The McMath is sitting on a huge equatorial mount, so learning how to use one will greatly aid you in knowing how to move the McMath. If you already understand how to use and operate an equatorial mount, then you can skip this step.

Step 3: Attend an open house when a McMath Operator is present, and assist them in operating the scope. Right now, we have only a precious few scope operators. Jack Brisbin, Don Fohey, and John Walbank are three names that come to mind, and I (Adrian Bradley) am the rookie operator of the bunch. There are some Lowbrows who have operated the scope in the past, so they are somewhat familiar with how it works. If you are one of those who operated the McMath in the past, just let the club officers know if you are serious about becoming an operator again.

Step 4: Muscles and technique. Unfortunately it *does* take a bit more strength to operate the McMath than just about any other telescope. The scope moves smoothly on it's axes, but it is not a one-handed job to move the McMath in position.

Step 5: Practice. It takes a couple sessions to get used to how the McMath works, how to put the finders in focus, and how to use the large FOV eyepieces. I find that the combination of using a 25mm 1.25 in the small finder, a 25mm 2" eyepiece in the 6" finder, and the 125mm eyepiece in *the 3 inch main diagonal* works for me. For an even narrower field of view for planets and smaller objects, the ~50 mm eyepiece works.

Step 6: Planning. What you can observe with the McMath depends heavily on what is visible around the observatory. It also depends heavily on obstructions that may prevent viewing of some objects. For example, turning the scope towards the north puts it at a position where it is very difficult (nearly impossible) to get to any of the eyepieces with a ladder. So showing that Polaris is a double star may not be a good plan for you if you are a McMath operator. At some times of the year, the position of Ursa Major or Cassiopeia may prevent you from showing some of the objects in and around those constellations. It is best to stick to what is viewable. The ecliptic passes in front of the viewing area of the McMath, so planets are always in play. The southern sky, the upper eastern sky, and the upper western sky are open to observation by the McMath. Additionally, if you are selecting targets for the general public, be sure to pick bright targets that are relatively easy to find. Making a lot of visitors wait while you try and center a very faint target may not leave the best impression to those visitors who would otherwise be blown away by seeing the rings of Saturn or the cloud bands of Jupiter.

Step 7: Enjoyment. If you have gotten to the point where you are comfortable with moving the scope around, and you even know when to lock the RA and DEC axes in place so the motors can track the object, and you get fairly good at centering objects in the main eyepiece, then you can start to do some serious observing with the scope and get familiar with it.

Step 8: There are 3 scopes in one on that McMath. Utilizing all three can enhance the viewing experience for yourself and visitors. Some objects will look better in the *6" refractor* than the McMath's main *3 inch eyepiece* (e.g. The moon, a large open cluster, or a DSO with a large surface area like the Andromeda Galaxy). Even larger star clusters and other objects that look better in binoculars will also look good in *the shorter, smaller (60 mm) finder with 1.25 focuser*. A good example of this is the Coathanger cluster near Saggita the arrow. The finder can allow you to center the entire asterism to show folks.

In my experience with the *24" McMath telescope,* I've been able to get some very impressive views of all different types of stellar objects. It is my hope that someone reading this article is inspired to learn more about our 'flagship' telescope and develop a desire to operate it.

Note: I*talicized* text above added by Jack Brisbin

Addendum by Jack Brisbin (Observatory Director)

Members are welcome to learn how to use the 24 inch McMath Telescope. A new requirement is the understanding of the new additions to the McMath drive and tracking system. There were update's to the Argo Navis system, new 32K encoders, WIFi and Bluetooth additions, that all tie into the Sky Safari Pro software used on Android or Apple operating software/device (handheld or computer). Not to forget the Hand Controller user requirements.

A lot of this will be explained in the upcoming user manual that should be done before Open House season starts.

2018 Open House Schedule

March 10th	**June 9,16**	**September 8,15**
April 14,21	**July 7,14**	**October 6,13**
May 12,19	**August 4,11**	**November 3,10**

March 17 we are doing a members and guests Messier Marathon (either at Peach Mt. or Lake Hudson) By September 15, Mars will be reduced to 18", but that probably won't matter to a crowd who has been hearing about Mars all summer. Any of our events from July on could attract crowds. Astronomy at the Beach is not expected to be Sept. 15th.

Upcoming Events

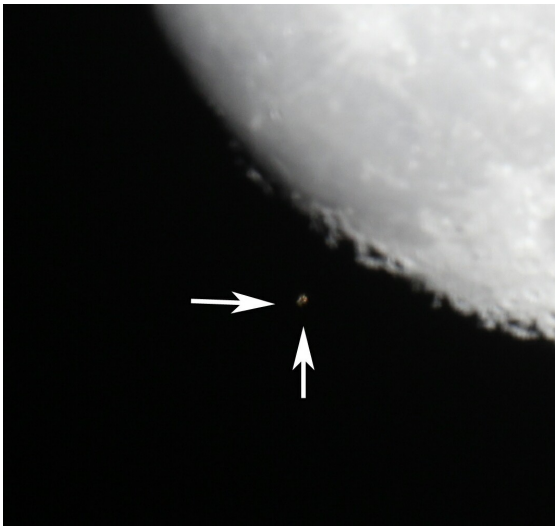
Lowbrow Monthly Meeting, Friday January 19th. 7:30pm Angel Hall
Speaker: Jamie Cutler, U of M Associate professor, Department of Aerospace Engineering

Member Photos

Doug Bock emailed to members December 30th.

"My observatory roof is not movable this winter, so in order to get anything at all of the occultation, I had to use an alternative. Celestron SE mount, 4" f/10 SCT and my Canon camera. I got ingress, but missed egress due to communications from the camera to the laptop stopping. But here are two images going in. Over exposed the Moon, so you can see Aldebaran."

Model	Cannon EOS REBEL T3i
Date Time	2017:12:30 18:17:00
Exposure Time	1/20 sec.
Exposure	Manual
ISO	200



Model	Cannon EOS REBEL T3i
Date Time	2017:12:30 18:17:08
Exposure Time	1/20 sec.
Exposure	Manual
ISO	200

Editor cropped photos, added arrows and extracted photo meta data.

University Lowbrow Astronomers
Meeting Minutes Dec 15, 2017

President, Charlie Nielsen, opened the meeting at 7:46PM. He then introduced our speaker, Sandra Macika, and she gave us Part 2 of her meteorite talk. Following her talk, the audience was allowed to view the sample meteorites which she has collected. Charlie presented her with a gift certificate to Applebee's restaurant as a "thank you" for her presentation.

Business meeting:

President, Charlie Nielsen, asked if there was member interest in doing something special after our April 2018 meeting since it is also Statewide Astronomy Night. He suggested optics demos and the consensus was that we should participate.

VP, Larry Halbert, reported that about 800 brochures have been distributed around the area. He is working on adding the 2018 club dates to a new brochure. A minimum order of 1000 brochures is required.

VP, Adrian Bradly, gave a Facebook report. Adrian adjusted the Facebook cover page to an image of the doomed Chinese Satellite Tiangong1. And he reported that "we have well over 600 followers on our Facebook page".

VP, David Jorgensen, reported that our January speaker will be Jamie Cutler, U/M Space science. And that the ServoCat installation work sessions will resume on Jan 6, and that our 2018 speaker schedule is full.

Webmaster, Krishna Rao, reported that an Instagram account has now been established, with Ginia Forrester coordinating inputs to that account.

Treasurer, Doug Scobel, reported a membership of 139, and a treasury of $5723. He mentioned that there have been a few small additional expenses related to the ServoCat installation on the 17.5" scope.

Observatory Director, Jack Brisbin, met with Jim Shedlowsky at a Seven Ponds Astronomy Club event. Jim is a V. President of the McMath Hulbert Astronomy Club an gave a lecture on: "The History of the McMath Hulbert Observatory" and would like to speak to us when an opening occurs.

Member, Rob Sulewski, said he has 40 years of Sky and Telescope magazines in good condition that he would be willing to give to anyone in the club that is interested.

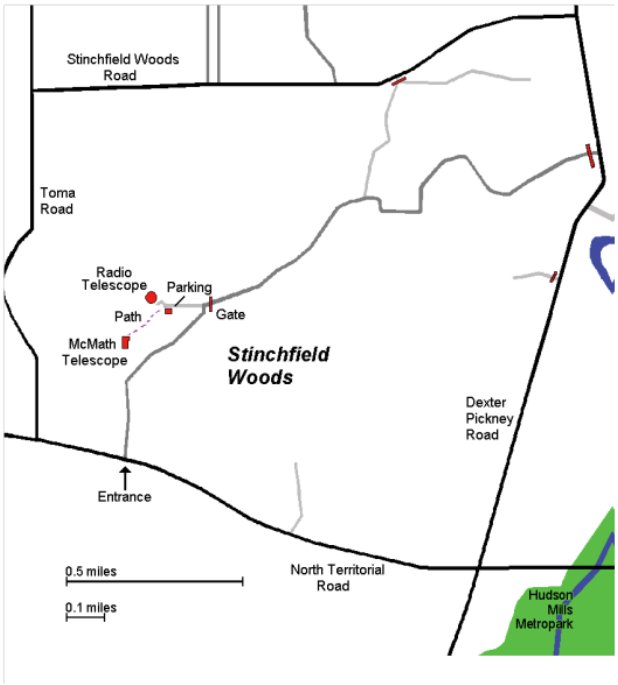
The meeting ended at about 9:30PM.

Submitted by David Jorgensen

Places & Times

Monthly meetings of the University Lowbrow Astronomers are held the third Friday of each month at 7:30 PM. The location is usually Angel Hall, ground floor, Room G115. Angell Hall is located on State Street on the University of Michigan Central Campus between North University and South University Streets. The building entrance nearest Room G115 is the east facing door at the south end of Angell Hall.

Peach Mountain Observatory is the home of the University of Michigan's 25 meter radio telescope and McMath 24" telescope which is maintained and operated by the Lowbrows. The entrance is addressed at 10280 North Territorial Road, Dexter MI which is 1.1 miles west of Dexter-Pinckney Rd. A maize and blue sign marks the gate. Follow the gravel road to the top of the hill to a parking area south of the radio telescope, then walk about 100 yards along the path west of the fence to reach the McMath Observatory.



Public Open House / Star Parties

Public Open Houses / Star Parties are generally held on the Saturdays before and after the New Moon at the Peach Mt. Observatory, but are usually cancelled if the forecast is for clouds or temperature below 10° F. For the most up to date info on the Open House / Star Party status call: (734) 975-3248 after 4pm. Many members bring their telescope to share with the public and visitors are welcome to do the same. Mosquitoes can be numerous, so be prepared with bug repellent. Evening can be cold so dress accordingly

Lowbrow's Home Page

http://www.umich.edu/~lowbrows/

Membership

The University Lowbrow Astronomers membership dues are $30 per year for individuals or families, $20 per year for students and seniors (age 55+) and $5 if you live outside of the Lower Peninsula of Michigan. Membership entitles you access to our monthly Newsletters on-line at our website and use of the 24" McMath telescope (after some training).
A hard copy of the Newsletter can be obtained with an additional $18 annual fee to cover printing and postage. Dues can be paid at the monthly meetings, by PayPal, or be check made out to University Lowbrow Astronomers and mailed to:

The University Lowbrow Astronomers
P.O. Box 131446
Ann Arbor, MI 48113-1446

Lowbrow members can obtain a discount on these magazine subscriptions:
Sky & Telescope -$32.95/year or $62.95/2 years
Astronomy -$34.00/year, $60.00/2 years of $83.00/3 years
For more information about dues or magazines contact the club treasurer at: lowbrowdoug@gmail.com

Newsletter Contributions

Members and non-members are encouraged to write about any astronomy related topic. Contact the Newsletter Editor: Don Fohey donfohey@gmail.com to discuss format. Announcements, articles and images are due by the 1st day of the month as publication is the 7th.

Telephone Numbers

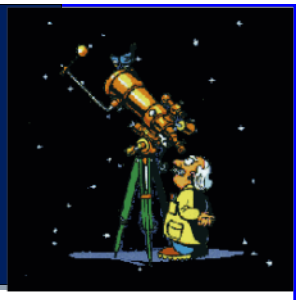
President:	Charlie Nielsen	(734) 747-6585
Vice President:	Adrian Bradley	(313) 354 5346
	Jim Forrester	(734) 663-1638
	Larry Halbert	
	Dave Jorgensen	
Treasurer:	Doug Scobel	(734) 277-7908
Observatory Director:	Jack Brisbin	
Newsletter Editor:	Don Fohey	(734) 812-3611
Key-holders:	Jim Forrester	
	Jack Brisbin	
	Charlie Nielsen	
Webmaster	Krishna Rao	

A NOTE ON KEYS: The club currently has three keys each to the Observatory and the North Territorial Road gate to Peach Mountain. University policy limits possession of keys to those who they are issued. If you desire access to the property at an unscheduled time, contact one of the key-holders. Lowbrow policy is to provide as much member access as possible.

Email to all members

Lowbrow-members@umich.edu

University Lowbrow Astronomers



Night Sky Network

Member Club

Astronomical League Member Society
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