

REFLECTIONS / REFRACTIONS

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University Lowbrow
Astronomers

July 2018

VOLUME 42, ISSUE 7

Members Night at Peach Mt. Tuesday June 5th.

Jim Forrester reported in an email to members on June 6th

“Finally, some clear skies. Though the clouds did not totally dissipate until after midnight, a good time was had by the five Lowbrows attending. Adrain, Awni, Jack, Joy and yours truly enjoyed some terrific views of Jupiter and the transiting GRS at 300x early on and numerous deep sky objects later in the night under the clearest skies on a moonless night we've had for several weeks. It is my hope to open Peach Mt. to the members this summer on the clear dark nights that do not conflict with other club events. While I stayed last night until well after the moon rose and didn't finish packing up until after the beginning of astronomical dawn, I doubt I'll be locking the gate at 4:00 AM every session.”

Awni Hafedh wrote in an email to members on June 6th.

“Hi Jim, Thank you so much for yesterday night, it was a beautiful experience, mainly looking at Jupiter, Saturn, Crescent Nebula and especially the ring nebula, I believe the ring nebula was the one that made me so excited, not to mention M4, M3, M51, M80 that I could remember. My imaging session were successful as well. I managed to capture 45 frames for both M81 and M82 using Ha 6nm filter. The core of those galaxies looked really nice and I can't wait to stack them and check the results,”



M81 and M82 HaLRGB - June 2018
© Awni Hafedh

Awni Hafedh wrote: “I finally managed to capture all the data that I need to create a color image of M81 and M82, I have to say I am very amazed with the details and especially the H Alpha emission for M82, I hope you like it. This is basically called HaLRGB which is 45 subs x 120sec H Alpha 6nm filter. 45 subs x 60sec RGB data. 120 subs x 30sec Lum filter. Total of 3 hours and 15min exposure using EdgeHD 9.25 hyperstar setup.” “for the Lum and H Alpha data I used (ZWO ASI1600MM-cool) and for the color data I used (ZWO ASI1600MC-cool). The first one is a mono camera and the second one is OSC (One Shot Color) camera, both were cooled down to -20 C temp.”

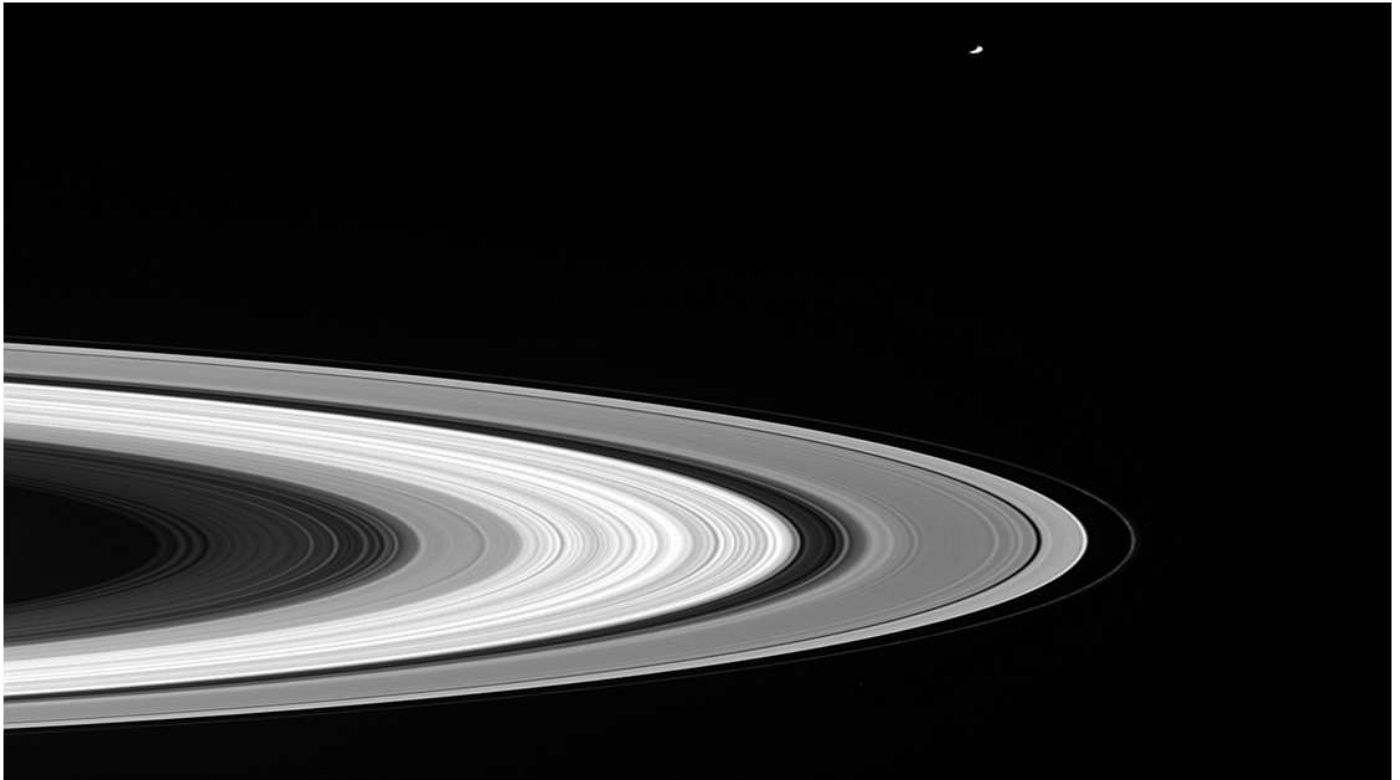
Observing Saturn's Rings

By Jim Forrester

Friday, July 29, a group of Lowbrows and friends gathered in John Causland's driveway (10 miles closer to Ann Arbor and $\frac{1}{2}$ magnitude brighter than Peach Mountain) to observe Jupiter and view some deep sky objects before the almost full moon rose high enough to wash out even brighter targets. As Saturn would not emerge from behind the trees on John's property until after midnight, we fled the mosquitoes and heat, sojourning in John's home to consume mass quantities of water and cookies.

We returned to our scopes at 12:30 AM to some very steady air and Saturn near transit in the south. Saturn's moons and rings are the favored targets and we were not disappointed. We saw eight moons: Titan, Hyperion, Rhea, Tethys, Mimas, Enceladus, Iapetus and Dione. Magnitude 14.7 Janus was lost in the glare of the rings.

Spectacularly, we were able to see several features of Saturn's Rings, including the absurdly slim Enke Gap. But the question is, did we really see it? We confirmed observing this feature in John's 24 inch, Mike Radwick's 14.5 inch and my 12.5 inch telescope. But the nature of the Rings makes actually seeing anything but the brighter bands a challenge.



11-1-04--The Cassini spacecraft took this photo on its approach to Saturn from 2.2 million kilometers. The wide dark band between the bright B ring and the somewhat duller A Ring is the Cassini Division. The dark gray inner band is the Crepe (C) Ring. Almost invisible is the outermost F Ring. The narrow dark band about $\frac{3}{4}$ to the edge of the A Ring is the Encke Gap. The very, very thin line just inside the outer edge of the A Ring is the Keeler Gap. Saturn's moon Tethys is near the top. Photo: NASA Jet Propulsion Laboratory and the Cassini Imaging Team

Gian Cassini in 1675 discovered his namesake feature with a 20 foot, 2.5 inch refractor. One would think modern optics could produce views of this division in smaller apertures, but experiments by several observers have demonstrated it disappears in a 2 inch instrument.

Observing Saturn's Rings Continued

The Cassini Division is trickier to see than one might think. Its 4800 kilometer width might seem huge but at 900 million miles or more from earth, it subtends but 0.7 arc seconds. The outer A Ring has a darker inner portion that is difficult to pick apart from Cassini's discovery and extends the dark width closer to a full arc second. Most likely, when we see the Cassini Division, we're seeing a combination of the two.

The dark Crepe Ring is another more difficult than it looks object. The father and son team of William and George Bond first observed it in 1850 with the Harvard Observatory's 15 inch refractor. The difficulty comes with the ring's 5 meter thickness and its 0.05 to 0.12 optical depth, making this ring invisible to small apertures. The plain English is there is hardly any stuff and what there is doesn't reflect much light. I've seen it often, but not always in my 12.5 inch Dobsonian and I suspect reflectors much smaller would have difficulty producing the necessary contrast. I should note, though, I have seen the Crepe Ring in my 105mm refractor.

Now we come to the confounding Encke Gap. Physically, it is but 325 kilometers wide, or about 0.05 arc seconds as seen from earth, and only 0.5 arc seconds from the outer edge of the A Ring. Compounding the challenge is the variation in brightness across the A Ring discovered by Johann Encke in 1837. Much broader than the Encke Gap itself and variable with the tilt of the rings to the observer, this darkening is often mistaken for the famous Gap.

We know through long experience the ability of a telescope to resolve the angular separation between two point sources is the Dawes Limit, described by the equation 4.466 divided by the aperture in inches yielding a quotient in arc seconds. So how could a scope less than a couple of meters in diameter resolve the detail?

There are three keys. The first is knowing the Gap is very close to the outer edge of the A Ring. The second is the very high contrast between the lit ring and the black gap. Last, and most important, the ring edges and the Encke Gap are not point sources but extended objects. High contrast between extended details can leverage the resolving power of a telescope by a factor of two to five. Observing the thin rilles on the Earth's moon are another example of this effect.

My understanding of this phenomenon is thin, but my research tells me it is an optical fact. My research also tells me perfect seeing and magnification of several hundred power are a must for seeing this feature in any amateur telescope (at least they *should*, more on this later), regardless of aperture. Theoretically, a 9.1 inch instrument could do the job and a few observers with 10 inch instruments have reported success.

There is a report of seeing the Encke Gap in a 4 inch f/10 Zeiss refractor (the web link to which now goes nowhere) but this and other similar observations should be treated very skeptically. However, when it comes to fine detail, the physical characteristics and experience of the individual observer come into play. Very few of us have the retinal structure to resolve an extended object against a bright background to one arc second. E.E. Bernard, (of dark nebula fame and much else) reported a daytime naked eye observation of a wire stretched against a bright sky when it was 0.44" wide. William Pickering picked out a human hair at a quarter mile, in less than steady air conditions, with an 11 inch scope when its angular width was only 0.03".

So, despite all you might think about what a person could possibly see in a telescope, some folks were born with tools that simply allow them to see *more*.

As most of you know, patience and experience play a large role in successful observing. The Telescope Limiting Magnitude Calculator is an on line tool I often use to evaluate what might be possibly viewed on a particular night. You plug in the values for a dozen variables and it calculates the faintest magnitude object of a particular size you can see. Changing only the experience variable from novice to expert yields a magnitude difference of over a magnitude!

The first observer to report seeing the Encke Gap in its subsequently confirmed position was William Dawes in 1843 using a 9 inch Newtonian at 450x. Confirmation did not come until January 7, 1888, the evening Lick Observatory's 36 inch refractor saw first light. Fortunate in having a rock steady night, James Keeler aimed the great scope on Saturn and at 1000x saw the Gap.

Saturn's current path through Sagittarius introduces a good deal of atmospheric extinction as well making periods of steadiness in the eyepiece brief and rare. Our seeing June 29, however, on a scale of one to five with five as best, was a very nice four and for very brief moments a five. Magnification of 300x and more put very clear images in view.

Observing Saturn's Rings Continued

The clearest image I had in my 12.5 in Dob came at 300x at about 01:00 June 30. And there it was, a thin black line near the edge of the A Ring. I wouldn't have believed what I was seeing if the other observers present (Adrian Bradley, John Causland and Mike Radwick) hadn't sat down at my scope and confirmed the view. It was best visible at the outer edges and more pronounced than I expected. If the observation hadn't been confirmed and the dark curved line not exactly where it was supposed to be, I would have written off the view as an optical illusion.

I tried going to 400x, but could no longer get a sharp image. This is the lowest magnification for observing the Encke Gap I've found. I've actually had sharper views of Saturn at higher power (595x) at Peach Mountain and saw only a solid A Ring. So I had written off seeing the Gap in my scope, reserving the effort for an opportunity with a larger instrument.

The great Gerard Kuiper (discoverer of the Kuiper Belt) peered at Saturn in 1954, on a "near perfect night" at 1170x using the equally great 200 inch Hale Telescope on Mount Palomar. He saw only the Cassini Division. Kuiper concluded previous observations were wrong, writing off the ring features seen for the past nearly 3 centuries as either variations in density or simply not there.

The best explanation for this boner, until now, has been Kuiper was observing near opposition, rings at the brightest with the increased glare obscuring finer details.

But Saturn's 2018 opposition was last week, with the rings just as bright as in 1954 and while our night was very good it was nowhere "near perfect." Additionally Saturn transited at 25 degrees on June 29 but was 41 degrees up in 1954. Kuiper should have seen much more than he did as I should have 50+ years later with a sharp 595x view. And I only saw what I should have seen then in less than optimal conditions at half the magnification.

How to explain this? I have no idea.

Sources: Some of these are very good and some need to be taken with a grain of salt. Most are web pages and, as I found out while searching them out, web pages don't last forever. Quite a bit of discussion among amateurs took place in the early 2000's concerning the Rings, some ill informed, some heated but some very valuable, providing many leads to more considered information. The Cloudy Nights discussions were hard to find. The site changed hands several years ago and accessing archived material from the web site is very frustrating. I'm not sure where these pages are now hosted, so if you have an interest, get while the getting is still possible.

-- Thomas Dobbins and William Sheehan.

Sky and Telescope, November 2000, "Beyond the Dawes Limit: Observing Saturn's Ring Divisions."

--J.B Sidgwick, *Amateur Astronomer's Handbook*, pp. 422-439

--Cloudy Nights Forum: <https://www.cloudynights.com/topic/4913-seeing-encke/>

--Cloudy Nights Forum: <https://www.cloudynights.com/topic/23199-history-of-encke-division-observations/>

--Cloudy Nights: "What Does It Take To See The Cassini Division?" <https://www.cloudynights.com/articles/cat/articles/observing-skills/what-does-it-take-to-see-width-in-the-cassini-division-r1097>

--telescopeOptics.net, "Telescope Resolution" http://www.telescope-optics.net/telescope_resolution.htm#can_vary

--Wikipedia.org: "Angular Resolution" https://en.wikipedia.org/wiki/Angular_resolution#Explanation

--Wikipedia.org: "Rings of Saturn: https://en.wikipedia.org/wiki/Rings_of_Saturn#A_Ring_structures

--Cassini Imaging Team, Ciclops.org: <http://ciclops.org/view/572/Rings-from-Afar>

--1728.org: "Angular Size Calculator" <http://www.1728.org/angsize.htm>

--Google Groups: "Visibility of Saturn's Encke Gap" <https://groups.google.com/forum#!topic/sci.astro.amateur/mP0-8hgKrcs>

**Members Night at Peach Mt.
Wednesday June 13th.**

by Don Fohey



Photo by John Landino enhanced by Awni Hafedh

It was a lovely evening at Peach Mt. I arrived as Jim Forrester opened the gate and set up to the far right in the above photo. I don't remember everyone who stopped by, some only briefly because it was a work night. I shared views with John Manny, Barry Wissman. Jack Brisban was joined early by Adrian Bradley at the McMath telescope. Later in the evening as I packed up many of the group walked down to the McMath to enjoy views thru it.



Photo of NGC6888 (Crescent Nebula) by Awni Hafedh

Awni Hafedh wrote in an email to members "Hi All, A follow up to yesterday's star party, first of all thanks for Jim for opening Peach Mountain and staying late because of me, it was a really nice sky, probably 8 people or more showed up and it was nice to see so many telescopes and astronomers, many objects were seen as always, but the most interesting ones that I personally saw was Saturn through the McMath and a super bright shooting star that lit everything up, it was one of it's kind, also my target for that night was NGC6888 (Crescent Nebula), I did a quick edit and I hope you like it."

**First Open House of the Year!
Saturday June 16th.**



Photos of the Moon and Saturn by Awni Hafedh

Adrian Bradley wrote in an email to members on June 17th. "We had a successful first open house of 2018! This is the cliff notes version as I can recall: Lowbrows in attendance: John (Walbank), Ken, Joy, Jim, Doug, Awni, Barry, Mike, Adrian. I'm sure there were more Lowbrows there, if you were please respond if I missed you.

We estimated anywhere between 40 to 60 visitors to our open house. So I'll leave the final total at... 50! We had some who stopped on the top of the hill to observe in one of the many scopes or computer screens. There were others who made a bee line to the observatory to look at things through the McMath. The newly renovated 17.5 scope was also put to use.

Celestial Highlights I can remember included the waxing crescent Moon, Jupiter, Saturn, M104 (Sombrero), M51, M101, The Sunflower Galaxy, The Black Eye Galaxy, M13, M3, M5, M92, M68, M80, Spindle Galaxy, M57, M71, the Veil Nebula, and Carbon stars UX Draconis and T Lyrae. Mars rose in the wee hours of the morning so it may have been observed by those who stayed late to take advantage of even better seeing prior to astronomical twilight." " I forgot to mention something, we had a 'Lowbrow Junior' helping us out. I put my son, Tyrahn Bradley, to work, helping with greeting people and guiding them to the field or down the trail to the observatory. Larry and John also assisted me with OHC duties, Ken had the 17.5 going, and Joy did a great job helping to work the McMath scope."

Doug Scobel wrote in an email to members on June 17th "Yes, it was a lot of fun, Adrian. Also observed were the Blinking Planetary NGC 6826, which Barry broke temporarily (it wouldn't blink in his scope), but later on it did so I guess it wasn't permanent. NGC 6207, the 11th magnitude galaxy next to M13 was easy, but a hunt for IC 4617, a 14 or 15th magnitude galaxy even closer to M13 went unsatisfied, even using Mike Radwick's eagle eyes in my 16" and Jim's 12. Also viewed were the Cat's Eye nebula NGC 6543, Silver Needle galaxy NGC 4244, M27, M22, M81/82, Whale galaxy NGC 4631, and maybe a couple others I don't remember.

Despite the haze that made its appearance off and on all night, steadiness was better than average, allowing some good high power viewing. Saturn at between 300 and 400x was spectacular late in the night. Speaking of high power, one crowd pleaser that you folks with larger Dobs should think about during open houses is putting big, bright globulars in your scope at high power. M13, M3, M5, and the like at 200-300x will get as many oohs and ahhs as a good view of Jupiter or Saturn. Oh, and we picked up a new membership too."

Awni Hafedh wrote in an email to members on June 18th. "Thank you all for the wonderful night, we did have a great time and clear sky, the mosquitoes were brutal though even though I made sure I spray every uncovered part of my body I got bitten behind my jeans and hair real bad but I am still alive, with that said I did capture a beautiful image of Saturn later that night I hope you like it. In the beginning of the night I snapped a photo of the moon with the phone through Jim's telescope and I have to say it looked beautiful, thanks all again for everything and I hope we can do this one more time."

University Lowbrow Astronomers
6/15/2018
Meeting Minutes

Time start: 7:35pm

Speaker for the meeting was Ethan Siegel, astrophysicist and science writer. He gave a talk via Google Hangouts on the following topics:

- The History of the Hubble Space Telescope and it's limitations.
- How the James Webb Space Telescope will go beyond Hubble's limits to peer into views of the Early Universe and direct imaging of exoplanets.

Business meeting started @ 8:45pm

Charlie Nielsen, President

- Many requests from different groups, including Metro Hills Park, had to be rejected due to dates coinciding with our open house dates. There is one request for a private night on Peach Mountain on July 5th or 6th. Adrian Bradley and John Walbank were available to assist with doing this private event. The group stated that they were willing to make a donation to the club.
- The Cromaïne Library has asked for our group to return sometime in August or September of this year. We are not sure if it will be a solar viewing event again like last time. John Walbank has agreed to follow up.
- NSN Outreach Pins were awarded to Charlie himself, John Walbank, and Adrian Bradley.

Jim Forrester, Vice President

- Worked successfully with Ethan Siegel and Krishna Rao on getting the Google Hangout communication working on Wednesday of that week (6/13). Struggled but successful in getting the Google Hangouts setup for Ethan's talk with the help of Charlie and Adrian. Got it working just in time for the meeting.
- Had two good members-only observing sessions at Peach Mountain. Will continue to open the gates for Peach Mountain when observing conditions are good. Taking suggestions for key usage, since there are only 3 keys available to the club.
- Camp Burt Shurly will start again in July. Will send out maps to the campgrounds from Peach Mountain. This is a wonderful opportunity to do astronomy outreach to this Detroit Public School's science camp. John Walbank added that the first camp will be on the first Monday after July 4th.
- Mars will be at opposition on July 26-27th. Saturn will be a month earlier - June 26-27th.

Jack Brisbin, Observatory Director

- Brochure holders are in place in the observatory. Light Pollution Brochures are in one of them.
- Created open and closing checklist for Observatory and manuals for telescopes: McMath, 17.5", and 8" Cave.
- Tested push-to functionality with McMath and Sky-Safari. Results were good, with variance within 4-6 arc minutes. Even switching devices worked.
- Other observatory maintenance was completed.

Adrian Bradley, Vice President

- We are at 705 likes... we have passed 700!
- Assisted Jack Brisbin with testing of McMath push-to functionality.

Doug Scobel, Treasurer

- 139 memberships, down a couple from last month. \$6485.32 in our club account.
- Will send in \$100 yearly donation to International Dark Sky organization.
- Presented proposal to send \$400 for Astronomy At the Beach. Motion seconded and passed by membership.
- Astronomy League renewals are due by end of June. Price is \$7.50/yr
- Will send Ethan Siegel a club hoodie.

Meeting Minutes Continued

Don Fohey, Newsletter Editor

- Worked with a gentleman named Benjamin Setterholm on how to make mirrors for telescopes. He is going to work with University of Michigan grad students at a 'mirror making party.' Other Lowbrows may be able to assist with this effort.
- A paper copy of the June Newsletter went out this week.
- There is no newsletter for July. As always, we need more submissions from the membership.

Larry Halbert, Vice President

- He is moving out of state to California, near Mt. Wilson.
- Optics and Demo kits will be left with the club back in Michigan, and they need a new home.

MEETING CONCLUDED AT 9:30PM

Submitted by Adrian Bradley

Upcoming Events

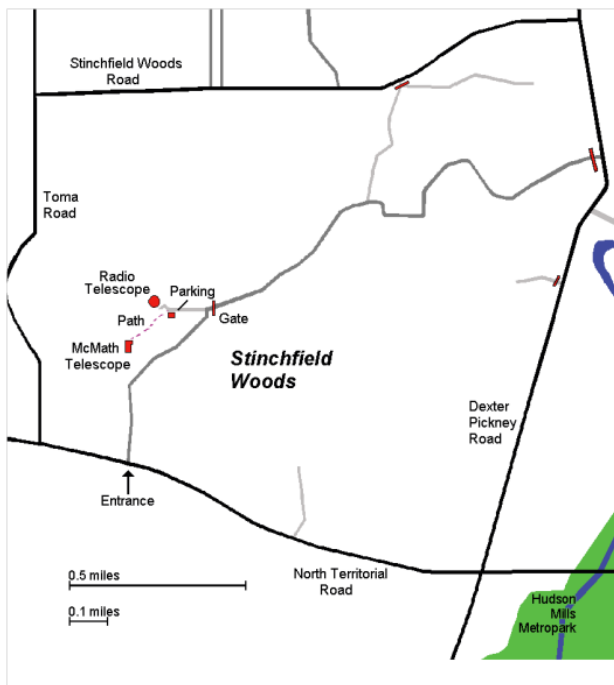
The Detroit Public Schools Science Camp, Camp Burt Shurly has six weeks of camp. We show the kids the night sky and how telescopes work once each week over the summer. Monday is the designated evening, but if cloudy we go Tuesday and so on. The first week's session took place Monday July 2nd. See photo on page 6. Watch you email for session the weeks of July 9th, July 16, July 23rd, July 30th and August 6th. We're usually packed up and long gone before midnight. Camp Burt Shurly is about 5 miles west of Peach Mt. It is very rewarding to show these kids the wonders of the universe.

DATE	EVENT	LOCATION	
Saturday July 7th.	Open House	Peach Mt.	Coordinator: Charlie Nielsen
Saturday July 14th	Open House	Peach Mt.,	Coordinator: Jim Forrester
Friday July 20th. 7:30pm	Meeting	Eastern Michigan University Planetarium	Speaker: Dan Davis Co-Author of the book Turn left at Orion..
Tue July 24th, 8pm-11pm	Star Party for the Michigan math and Science Scholars	Peach Mt.	Coordinator: Charlie Nielsen
Tue. July 31st, 8pm-11pm Rain Date	Star Party for the Michigan math and Science Scholars	Peach Mt	Coordinator: Charlie Nielsen

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 or \$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



Member Club



Astronomical League Member Society
#201601, Great Lakes Region

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