



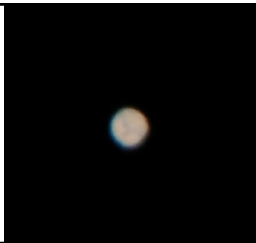
2020 Mars Opposition

Mars 10-2-20

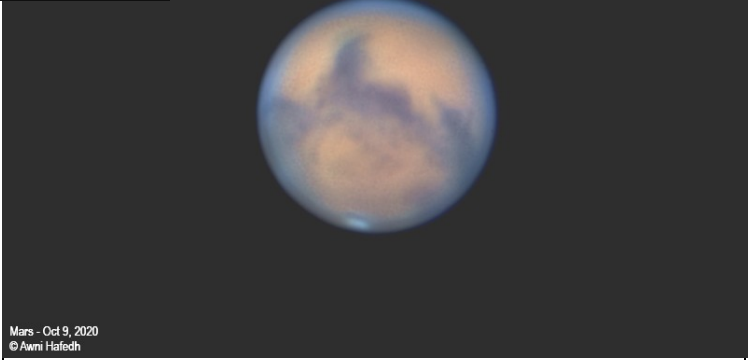
J&R McCullough

Jodi McCullough in an email to members wrote in part: "The close-up picture of Mars was taken using a ZWO 290 MM camera, color filters and a TEC 250 re- fractor."

Don Fohey took this picture Oct. 6th. by attaching his cell phone to a 5mm eye- piece on his 10" DOB.



Jeff Kopmanis wrote in part to members email on Sept 28th.: "Friday night, I imaged" "Mars" "I used my ZWO ASI183MC camera on the Orange Can, an 8" Celestron SCT."



Mars - Oct 9, 2020 © Awni Hafedh

Awni Hafedh wrote in an email to members: "On Oct 9th, I managed to capture Mars Opposition using the SkyWatcher 180Mak and ASI174MM with RGB filter and 2.5x barlow. I captured 5000frame SER video for each filter using FireCapture and Stacked 10% in Autostakkert3. I used WinJUPOS to derotate and align all three filters and the rest was done with PixInsight for the image processing. Not bad for a 7" telescope at F/15 x 2.5 = F/37.5, at least I captured something that is decent enough, hope you like it."

Trip to Boon

By Brian Ottum Ph.D.



After seeing invitations for decades now, I finally made it up to Doug Bock's Boon observing field. The trees were turning and the weather forecast looked fantastic, so I drove up in early October. It took about 3.75 hrs, since I drive like an old man in my motorhome. Doug has 20 acres just a half mile from the tiny village of Boon (just one gas station/quicke mart and a post office, that's it). His lot goes back a long ways, northward from the dirt road. There's a gradual hill. All horizons are nice and low. There are no lights of any kind, anywhere. The first few acres are open, mowed and level, so that's where I parked. There's a 24'x24' heated building with a microwave and dorm fridge. Guests often sleep inside the building. There's also a porta-potty that is frequently emptied.

Doug is a great host. Over the long weekend, there were a total of 26! guests, including 15 "trail guide" scouts. The scouts had a wonderful time camping, learning about the universe and excitedly playing gaga ball. As a service project, they poured a 6'x6' concrete telescope pad.

OBSERVING HIGHLIGHTS

Doug let me use an 18" Starmaster with a magnificent Zambuto mirror, which he wheeled out of the building. As twilight faded, I looked for Jupiter's great red spot and four moons. Then I counted five moons around Saturn, whose Cassini Division was obvious and even the inner dusky ring. Sky Safari is critical for hunting down those fainter moons.

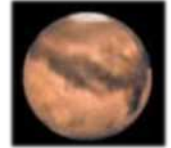
The skies up there are quite dark, so the summer Milky Way came out strong. I quickly visited my old friends, working upward: the lagoon, trifold, swan, eagle, wild duck, ring and dumbbell. It's embarrassingly easy when there are dark skies and a good GOTO.

During my Astronomy at the Beach live telescope demonstration, I got a lot of requests for planetaries. So I decided to hunt them down visually. I could easily see the "handles" on the Saturn nebula, the complex tiny structure within the Cat's Eye, the very Blue Snowball, the often-overlooked Bowtie. The planetary highlight was the Blinking nebula. Using a big dob, the nebula would certainly dim while concentrating on the central star but it certainly does not disappear as it does with smaller scopes. The Crescent, Iris and Bubble were a bit disappointing, given my experience taking long-exposure images of them. So Doug gave me the OIII filter and they became more apparent. Still not anything like the images you see online. But since the OIII filter was in, I slewed over to the Veil Nebula. The Witch's Broom was fantastic, exhibiting fine filaments that really look like transparent fabric, and the spiky broom was cool. I loved seeing the "fangs" in the western Veil.

I did not remember that Almach (Gamma And) was a brighter version of Albireo! Very pretty. Of course, I had to stop by Andromeda Galaxy with its two companions. Dust lanes in the big one and detail on one of the small ones.

As things got later, I visited the open clusters in the fall milky way: the ET/owl is always a crowd favorite at public nights. The fireworks galaxy easily showed great spiral arms. Then I looked at the galaxy that is close by and would be the brightest in our sky if it weren't for the dust cloud in front of it. But I guess I've killed too many brain cells because I cannot right now remember its number. One of the highlights of the night was 7479, a Caldwell object, which is a very nice spiral with a BIG bar in the middle. I did not remember viewing that before. It was also fun tracking down NGC open clusters that are very concentrated and globulars that are not.

The highlight of the weekend, no contest, was Mars. On Thursday October 15th at 11pm, the seeing was steady. Doug and I agreed that it was the greatest view of Mars either of us had seen in our combined 100 years of observing! Syrtis Major was at the limb, but we could see the sharp open gap between Mare Cimmerium and Mare Tyrrenum. We could see the bluish atmosphere. Of course, the north pole was a small white spot with serrated edges. No picture I've seen, not even Hubble's, can match the view through the eyepiece. The human eye can integrate the scene and retain the details caught during moments of perfect seeing. Just like the in-person view of a total solar eclipse exceeds any image. Just my opinion. This shot (grabbed from the interwebs) shows the approximate details and orientation:



STAR PARTY NEXT YEAR

Doug is inviting us Lowbrow observers up to Boon for the dark moon days in the middle of April, 2021. Of course, this event is **TOTALLY** weather-dependent. There is lots of space for pitching tents and scopes next to your car. There's no water on-site so we need to bring that. Social distancing will likely to still be required (and masks indoors). More to come via email. Here is a shot looking uphill and then one back downhill.



The October meeting was recorded and can be viewed on you tube
<https://youtu.be/ON7bv0G2ojw>

Upcoming Events

Open House events have been canceled until further notice.

DATE	EVENT	LOCATION	
Friday Nov.20th. 7:30 pm	Monthly Meeting	By Video Conference. Instructions will be emailed to members,	Richard Teague, SMA Fellow, Har- vard-Smithsonian Center for Astro- physics

Expansion of the Universe

By Dave Snyder

As you know, the universe is expanding. The concept of an expanding universe has entered popular culture, for example there is a scene in the movie “Annie Hall” (1977).

As this movie starts, the protagonist Alvy Singer is talking about his life and relationships. This is followed by a flashback: Alvy is eight years old at the doctor’s office. He is with his mother and the doctor.

Alvy’s Mother (to Dr. Flicker): He’s been depressed. All of a sudden, he can’t do anything.

Dr. Flicker: Why are you depressed, Alvy?

Alvy’s Mother (to Alvy): Tell Dr. Flicker.

Alvy’s Mother (to Dr. Flicker): It’s something he read.

Dr. Flicker: Something he read, huh?

Alvy: The universe is expanding.

Dr. Flicker: The universe is expanding?

Alvy: Well, the universe is everything, and if it’s expanding, some day it will break apart and that will be the end of everything.

Alvy’s Mother (to Alvy): What is that your business?

Alvy’s Mother (to Dr. Flicker): He stopped doing his homework.

Alvy: What’s the point?

Alvy’s Mother (to Alvy): What has the universe got to do with it? You’re here in Brooklyn. Brooklyn is not expanding.

Dr. Flicker: It won’t be expanding for billions of years yet Alvy. And we’ve got to try to enjoy ourselves while we’re here, huh? (laughs)

Now Alvy was correct, the universe is expanding. But Alvy’s mother was also correct, Brooklyn is not expanding. At first glance this seems like an inconsistency. But it is not. The observable part of the universe is billions of light years across. A single light year is vastly larger than anything in normal human experience, a billion light years is even worse. These vast distances mess with our human intuition.

Continued On Next Page

Hubble Expansion

To resolve the inconsistency, it is best to use math and get numeric values. In physics, there are situations where the math is difficult, however we've lucked out here. The relevant equation is easy to use.

$$v = H_0 D$$

To understand the meaning of this equation, suppose we have two galaxies separated by a distance D . Hubble expansion predicts that the two galaxies will be moving apart with a velocity of D multiplied by H_0 (where H_0 is a constant known as the Hubble constant). This expansion will occur for any pair of galaxies. (However, there are exceptions, which I'll get to below. Most commonly, one of the two galaxies is the Milky Way, this allows the computing the velocity of a distant galaxy relative to us).

Before proceeding I should point out a few things

- 1) For our purposes, it is not necessary to do this calculation with much precision (as will be obvious in a moment).
- 2) Over the years, different values for H_0 have been published. I will use the value $H_0 = 70$ (km/s)/Mpc. Or alternatively 70 kilometers per second per megaparsec (a megaparsec is one million parsecs, or about 3.3 million light years). Recent values are reasonably close to this, and little inaccuracy will not matter.
- 3) If D is large enough, v will be greater than the speed of light. This does not contradict either special or general relativity. And it does not matter for our purposes.
- 4) Since the universe is expanding, the distance between galaxies increases over time and thus D is not constant. When dealing with cosmological distances this can be an issue, I'll ignore this issue here.

Brooklyn and the Planet Earth

What is the expansion velocity of Brooklyn? Suppose we approximate Brooklyn as a sphere of solid rock. On a map, Brooklyn has an area of about 69.5 square miles. This means a sphere about 10 miles in diameter or about 16 kilometers in diameter.

Now consider a particle of rock on one side of our sphere, and another particle of rock 16 kilometers away on the opposite side of the sphere. We can use the equation above to calculate the velocity of the first of these particles relative to the second (assuming Hubble expansion holds on this scale). The hard part is keeping the units straight. As discussed above $D = 16$ kilometers. Since the units for H_0 are in megaparsecs, convert D to megaparsecs.

$$D = 5 \cdot 10^{-19} \text{ Mpc}$$

Now we can calculate v .

$$\begin{aligned} v &= 3.5 \cdot 10^{-17} \text{ km/s} \\ &= 3.5 \cdot 10^{-14} \text{ m/s} \end{aligned}$$

Anything moving with this velocity is moving extremely slowly. This is approximately 40 times the diameter of a proton per second. The forces holding the sphere together are strong enough to resist such a tiny velocity.

Repeat this for the earth, which is approximately a sphere 13000 km in diameter. I will not go through the calculations, suffice it to say the values of D and v are bigger, but v is still a tiny velocity, not enough to have any effect on our planet.

Galaxies

Next, the Milky Way Galaxy. We can compute the escape velocity of the sun with respect to the rest of the galaxy.

$$v_e = \sqrt{\frac{2GM}{r}}$$

v_e is the velocity the sun must have (in addition to the motion it already has) to remove it from the galaxy. G is the gravitational constant. This formula only applies for objects that are spherically symmetric (the Milky Way isn't spherically symmetric, but it's close enough). r is the radius of the sphere that represents the galaxy, and M is the mass inside that radius (mass outside the radius doesn't count). Note, r doesn't have to be the radius of the galaxy. You can use any value you like, but you must adjust M accordingly and r can't be so large that it includes multiple galaxies.

Rephrasing this, r represents the current position of the sun relative to the center of mass, and v_e is the velocity needed to move the sun from that position to an infinite distance. Note that v_e normally will get smaller as r gets larger (and we get further away from the center of mass).

Since the Hubble expansion works on each star in the galaxy the same way, if the Hubble expansion is enough to remove the sun, it can remove many other stars as well causing the galaxy to expand.

The escape velocity is roughly 500 km/s (taking r to be the distance of the sun from the center of the galaxy), whereas the Hubble expansion velocity is 0.6 km/s. Clearly the Hubble expansion is too slow. But notice the difference is only 3 orders of magnitude, so were getting closer. The numbers vary, but for all known galaxies, escape velocity is faster than Hubble expansion velocity. Galaxies are not expanding.

Galaxy Clusters

If we move to clusters of galaxies, it gets more interesting. Simple use of the escape velocity formula shown above is not possible. (Calculating escape velocity in this situation is a more involved procedure I will not go into). However, we can use measurements of the velocities of actual galaxies to determine if galaxy clusters are expanding.

Galaxies show random motions in addition to motion due to Hubble expansion. Roughly speaking, when a galaxy cluster is 40 megaparsecs or larger, the calculated Hubble expansion of individual galaxies is bigger than observed random motions of those galaxies. These large galaxy clusters are known as superclusters and they are expanding, but smaller galaxy clusters are not expanding.

Note that 20 years ago it was discovered that the expansion of the universe is accelerating. This affects the expansion of galaxy clusters but doesn't change the 40 megaparsec cutoff in any important way.

Conclusions

Solid objects such as the earth are held together by electric forces (which originate in chemical interactions), these forces are strong enough to resist the Hubble expansion found in any reasonably sized object.

Bigger objects such as stars, galaxies and galaxy clusters are held together by gravity. Gravity is weaker than the electric forces mentioned above, but gravity wins out over Hubble expansion in all such objects, except for superclusters. Superclusters are expanding, smaller objects are not.

University Lowbrow Astronomers

Monthly Club Meeting Minutes

16 October 2020, 7:35 pm, Individual Live Connections via conferencing tools

After some chatter to allow for late arrivals, President Charlie Nielsen called the meeting to order and then introduced our speaker.

Speaker

Who

U of M Professor Gus Evrard

Subject

Adventures of a Computational Cosmologist: Virtual Worlds and Atlas

A Q&A session occurred afterward with audience members using multiple formats to ask questions. Charlie thanked our speaker for the presentation.

Business Meeting

Name	Topic
Vice President Adrian Bradley (1:43:53)	Is assisting David Levy with distributing his recent autobiography <i>A Nightwatchman's Journey: The Road Not Taken</i> . Your \$40 will get you a free autograph and free shipping. Contact Adrian for details.
Vice President Jim Forrester (1:45:05)	Officers are hoping to discuss possibly arranging Members-Only Nights on Peach before it gets too cold out. Members should submit their ideas on how they believe member nights on the Hill could work.
Newsletter Editor Don Fohey (1:53:26)	<ul style="list-style-type: none"> Encourages newsletter articles and prefers things that have not already been circulated by email. The upcoming newsletter may or may not be later than usual due to a shoulder injury this week that could prevent typing. Jim Forrester has volunteered any help if needed.
Observatory Director Jack Brisbin (1:56:54)	<ul style="list-style-type: none"> The roads at the Observatory have been fixed. The Observatory is finished being painted.
Treasurer Doug Scobel (1:57:42) email read by Charlie	"My report is that I have nothing to report, other than we move into our new place this weekend. Within a couple weeks I should be back in business. I'll send an announcement to the membership when I am."
Online Coordinator Jeff Kopmanis (1:58:16)	<ul style="list-style-type: none"> Initially had a problem with the sound for the live stream today that was fixed. Starting today, those waiting for the live stream to start will be treated to a photo montage of astro pics and shots from previous club activities instead of a welcome screen promising to start around 7:30. Thanks to Brian Ottum for pointing out that feature. Both of those leads to more items to add to the pre-air checklist.
John Wallbank (2:02:55)	<ul style="list-style-type: none"> Will be meeting with other area astronomy club members to become more proficient with YouTube live streaming of Zoom meetings. We have a new Dark Sky Park in Livingston County. Liam Finn of The Ford Astronomy Club has worked to get Lutz Park designated as an official Urban Night Sky Place.

About 28 devices attended tonight's virtual meeting.

Adjourned

9:26 pm

Minutes were taken and transcribed by

Joy Poling

University Lowbrow Astronomers

Officers Meeting Minutes

21 October 2020, 7:09pm, Individual Live Connections via conferencing tools

Attendees

President Charlie Nielsen
 Vice Presidents Adrian Bradley, David Jorgensen, Joy Poling
 Observatory Director Jack Brisbin
 Newsletter Editor Don Fohey
 Webmaster Krishna Rao
 Online Coordinator Jeff Kopmanis

Absent

Vice President Jim Forrester
 Treasurer Doug Scobel

Agenda Items

Name	Topic
Jack	Peach Mountain internet updates
Krishna, Various	Can we safely hold Member Nights on Peach Mountain

Findings

Issue	Assessment/Plan
Peach MTN Internet	Jack spoke of information obtained from meetings he has been attending with CoE and SEAS on behalf of the Lowbrows with the goal of internet connectivity at various places on the Hill. A proposal from Charter Communications was reviewed. Lowbrow needs were considered and discussed. Despite not knowing specific speed and bandwidth needs, it was agreed that of the three departments, the Lowbrows probably require the least. This amount would likely be well below the minimum size cable that is typically used these days anyway. Although he already has meetings booked at that time, Jeff will try to make himself available to attend Jack's next meeting.
Member Nights	After an informative COVID update from Krishna, the officers felt more comfortable holding members only viewing on the Hill and proceeding with the next steps in obtaining permission from the University. Adrian agreed to draft a Lowbrow proposal that Krishna will present for consideration. A few times, Krishna referenced a website he uses to track data, My Safe Start Map and an article he feels all should read from The Atlantic . Jeff also shared a website he found helpful, Bridge Michigan .

Adjourned

8:43pm

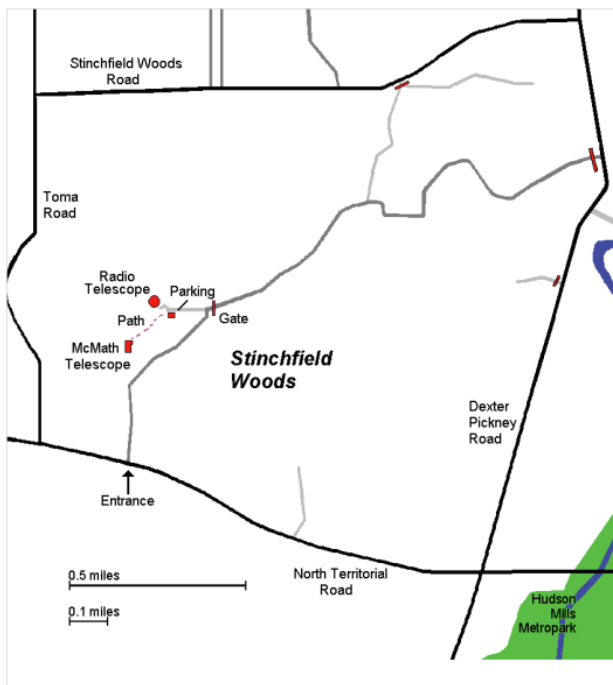
Minutes taken and transcribed by

Joy Poling

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

Annual dues are \$30 for individuals and families, \$20 per year for students and seniors (age 55+) and \$5 if you live outside of the Lower Peninsula. Membership entitles you online access to our monthly Newsletters and use of the 24" McMath telescope (after some training). A mailed copy of the newsletter can be obtained with an additional \$18 annual fee to cover printing and postage. Dues can be paid by PayPal or by mailing a check. For information about dues or joining the Lowbrows contact the club treasurer at:

lowbrowdoug@gmail.com.

Lowbrow members can obtain a discount on these magazine subscriptions:

Sky & Telescope - \$32.95/year or \$65.90/2 years

Astronomy - \$34.00/year, \$60.00/2 years or \$83.00/3 years

For more information about magazine subscriptions contact the club treasurer.

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
	Joy Poling
	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
Online Coordinator	Jeff Kopmanis

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

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

STAMP