

# REFLECTIONS / REFRACTIONS

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University Lowbrow Astronomers Monthly Newsletter

March 2023, Vol 47, Issue 3

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## VENUS & JUPITER CONJUNCTION

BY JODI & ROY MCCULLOUGH

Taken with a TEC 180 f/7 (1260 mm fl) and Canon R5 full sensor camera. Stack of 6 images and darks processed in Images Plus. ■

**More photographs  
of the conjunction  
in this month's  
Objective Lens!**



# 2022 YEAR IN REVIEW

BY CHARLIE NIELSEN

2022 brought us closer to pre-pandemic activity. We continued to hold in-person (most months) plus Zoom hybrid meetings. The meetings were recorded and uploaded to our YouTube channel. We did some member-only observing events at Peach Mountain, which led to the restart of public open houses. We also scheduled a public event at Tecumseh Parks and Recreation, but the weather robbed us of it. We tried to do an event for the Michigan Math and Science Scholars -- which we have been doing for years. The weather took that away from us too. But not to be shut out, Don Fohey and I ran an event at Westland Library, and the weather cooperated.

**January's** meeting featured a presentation by Dr. Dan Durda about the Southwest Research Institute's program to send people and experiments aboard Blue Origins and Virgin Galactic. Dan is one of the people that gets to go! Dan is a former President of our club and many of you probably recognize his name from the many science programs he has been on through television and the Internet. This was the second time he has spoken to us, but this time he had to do it via Zoom. Because he was not in person and due to weather concerns, we held this meeting via Zoom only and had 32 attendees.

**February** was a presentation by Dr. Claude Pruneau, Professor of Physics at Wayne State University and Lowbrow club member titled "Probing the Properties of Hot QCD Matter." This was about the latest work happening at the LHC and Brookhaven colliders regarding studies of gluon and quark plasmas. This meeting was also via Zoom only. We had 33 online attendees.

**March** had 31 people (in-person and online combined) to watch a presentation by club VP, Adrian Bradley. Adrian spoke about his work in astrophotography and his transition to wide-field and earth-based night photography. He showed several photos, with a musical composition, from locations near Ann Arbor, northern Michigan, the thumb area of Michigan, and the Oki-Tex Star Party.

**April** brought us Part 2 of VP Adrian Bradley's talk

about night sky photography at Pointe aux Barques Lighthouse and the book he is writing about it. We had 13 in-person attendees, and 14 via Zoom. We also held officer elections, with 3 VP changes. Liz Calhoun, Joy Poling, and Dave Jorgensen decided to not continue. Our club appreciates them for their fine service. Thank you! Replacing them are Dave Snyder and Jim Forrester, both previous VPs, and first-time officer -- but long-time GLAAC officer -- Brian Ottum.

**May** was another hybrid meeting, and our speaker was Professor Rudi Lindner from the U of M History Department. Rudi is an honorary club member and has presented to us many times. This time his talk was titled "The Michigan-California Axis in Astronomy" and was about the many astronomers through the years from Michigan that went to California and those that came here from there. We had 12 in-person attendees and 24 via Zoom.

**June's** meeting featured a return of Dr. Zachary Constan, Outreach Coordinator for the Facility for Rare Isotope Beams, at Michigan State University. Dr. Z is a very upbeat and humorous presenter, as shown in both his first, and in this, presentation. Zach explained the synthesis of all the elements on the periodic chart via the Big Bang, red giant stars, and supernovae. Several viewers commented that this was the best and clearest explanation they have ever seen and heard. We look forward to having Dr. Z back yet again within the next couple of years. Since Zach could not be in-person, we decided to hold this meeting via Zoom and we had 29 attendees.

**July.** This month we returned to our tradition of holding our July meeting at Eastern Michigan University. We had 9 in-person attendees and 19 via Zoom. Our host, Norb Vance, is the Director of EMU's Sherzer Observatory and their modern and unique planetarium (which is getting a projector upgrade). Norb's presentation was about this upgrade as well as the upgrades at other astronomy locations in the northern part of our state. Norb then led us on a tour of the Sherzer Observatory.

**August** produced a presentation by Karim Jaffer from John Abbott College in Montreal, about how indigenous and ancient people saw and used the night sky in their daily lives. The stories and meanings were then combined with modern knowledge about the objects and patterns they were seeing. It is an

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interesting presentation that causes you to look at the night sky differently than you did before. We then had a second presenter, Austin Edmister, Assistant Director of the Detroit Observatory. He gave us an update on the new facilities at the DO and status of the telescopes, plus examples of their first attempts at doing some astrophotography with the main telescope. This was also a step toward collaboration between the DO, our club, and the UofM Student Astronomical Society. Combined attendance was 29.

**September** was a collision of our monthly meeting and our annual, multi-club event, Astronomy At The Beach, so we canceled the meeting. This was our first Astronomy At The Beach in-person event after two years online due to Covid. Attendance was less than typical, probably a historic low. But the sky was clear enough to work with, and the various events, demos, and exhibits all went well. As usual, the attendees appeared to have had a great time. Keynote speaker was Dr. Nicolle Zellner and her talk was titled "To the Moon! Michigan's Contributions to the Apollo Program and Beyond." Nicolle was the scheduled speaker for our September club meeting, so I asked if she could do AATB instead and she accepted -- and for both nights of AATB. Thank you, Nicolle! Attendance was estimated at 800. Day two of AATB had low attendance as well, perhaps a record low, but higher than Friday night. The sky was again workable and the attendees loved it. Our keynote speaker was again Dr. Zellner, and this time her title was "Life in the Universe." The estimated attendance was 1200.

**October's** meeting featured an excellent presentation about black holes by U of M Professor Elena Gallo. This was the most thorough and detailed explanation of our current understanding of black holes of all sizes that we have ever seen. We had to use a different meeting room since we were locked out of our regular one. Combined attendance was 33.

**November** provided us with an excellent presentation via Zoom by Professor Neil Cornish, of Montana State University. He spoke about gravitational waves, the current and future detectors,

and he gave a very interesting and unique description of why you cannot escape a black hole upon entering the event horizon. It has to do with not being able to avoid your future! We had 9 in-person attendees and 19 via Zoom.

**December** was a treat we only get every few years. It is The Artsy Meaningless Slide Show, by long-time member Fred Schebor. This is a slide show that is set to music and has images from mostly club members that show what we do and who we are. The people that come to see this are never disappointed. We do not go online for this show or record it, so you had to be one of the 32 lucky people to be there in person to witness it. This was a great way to conclude our 2022 meeting schedule.

As I stated at the beginning of this article, we finally started observing events again. It was led off by VP Jim Forrester, who organized several members-only events at Peach Mountain to test our Covid protocols and to give members a chance to catch up on some observing they may have missed prior to entertaining the public. These started in early summer and in late August we held our first public open house since the pandemic began. We got two more in during October.

Also mentioned earlier was our attempt to run an event for the Michigan Math and Science Scholars, and an event at Tecumseh Parks and Recreation, both of which were canceled due to poor weather. However, on September 30, Don Fohey and I entertained 32 guests at the Westland Library. I feared it would be pretty hectic with just two of us and three telescopes, but we managed just fine and the crowd was pleased.

In conclusion, 2022 was a year of getting closer to "normal." Our membership continued to grow and was approaching 200 at the end of the year. The future looks good for the University Lowbrow Astronomers, and as I write this I am looking forward to our new home at the Detroit Observatory. More on that in the 2023 edition of this report.

Written by your humble President, Charlie Nielsen  
(Feb. 26, 2023) ■

# FROM THE DESK OF THE NORTHERN CROSS OBSERVATORY

BY DOUG BOCK

These past months Comet C/2022 E3 has been in our sky flirting with naked-eye magnitudes. With very few clear nights it has been a challenge to capture it visually and photographically. However, there have been a few nights to give it a try.

There were four nights this past month when I was able to open up the observatory and collect data. The comet was easy to spot and fairly bright for imaging, and just bright enough visually to see. A pair of binoculars made it easier early on, but as the

Moon headed towards full it became more difficult with the sky brightening. However, it has been reported to have reached 5.6 magnitude.

The images below are from four nights -- January 30th, February 1st, February 10th, and February 11th. I used both the 105mm f/7 refractor with the ZWO asi2600mc PRO camera and a Canon 300mm f/4 lens with the ZWO asi071mc PRO camera to acquire these comet photos. Some are stacks of multiple frames, and a few are single frames. ■



January 30, 2023 - 154 x 10 second frames - refractor



January 30, 2023 - 8 x 10 second frames - refractor



January 30, 2023 - 10 x 10 second frames - 300mm lens



February 1, 2023 - 66 x 30 second frames - 300mm lens



February 1, 2023 - 74 x 10 second frames - refractor



February 10, 2023 - 1 X 10 second frame - 300mm lens - Mars and the comet



February 11, 2023 - 1 X 60 second frame - 300mm lens - Mars and the comet



February 11, 2023 - 21 x 60 second frames - refractor



2023-02-

# CHASING THE NORTHERN LIGHTS

BY LARRY COATES

## Where and When to Go

My wife and I decided last fall that it was time to check off a “bucket list” item and go see the northern lights. We’d seen them while in the U.P. on a dark night years ago, but we wanted to see them in a great setting. So we did some research and decided to chase the aurora.

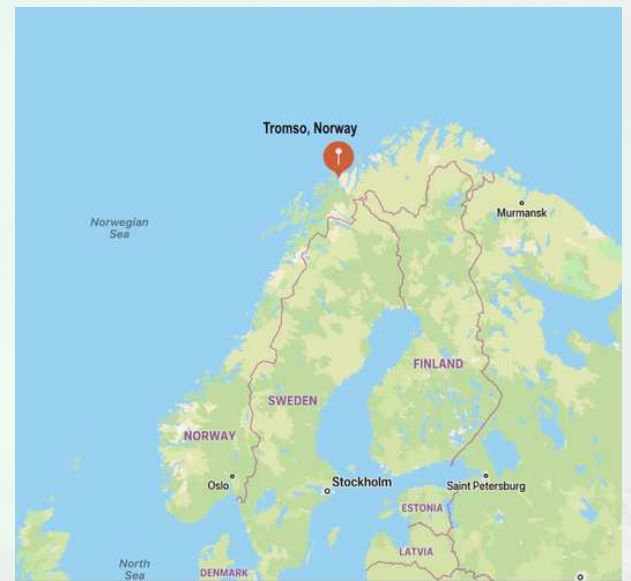
We decided to go in January 2023, following our family holiday get-togethers and when we had a fairly open calendar. We didn’t want to go abroad for the northern lights and catch the flu or Covid. We had gone abroad twice before in 2022 and came home with Covid once and E. coli the other time -- lovely. We had no problems this trip, but we also didn’t eat the lutefisk. :)

We decided an aurora cruise was not for us. I am not a big fan of open-water cruises and the North Sea/Norwegian Sea in January didn’t seem very hospitable. That plus it’s tough to take a long exposure photo from a boat. This left us with a traditional land-based tour.

We chose Tromsø, Norway. Tromsø lies in Northern Norway. It’s a town of about 80,000 people and it’s one of the largest towns north of the Arctic Circle. In fact, it is 200+ miles north of the Arctic Circle, which means it is further north than all of Iceland (another popular northern lights destination). And since it’s a town of 80,000 people, they have hotels – with real beds. No sleeping in an ice igloo for either of us! You see northern lights “igloo trips” on the PBS travel channels and it looks fun, but we concluded it was better watched on PBS than experienced in person. Lastly, Tromsø lies on the Norwegian Sea which due to prevailing currents never freezes despite being north of the Arctic Circle. Its average low temperature in January is 22 degrees, about the same as Ann Arbor. If you went to a similar latitude in Alaska, it’d be much colder.

## The Chase

We knew that seeing the northern lights is hit-or-miss, so we decided to take a direct flight to Amsterdam and spend a few days, then a few more days in Stockholm, Sweden, which has great food,



great people, and a ton of museums. Amsterdam and Stockholm gave us the assurance that a no-show of northern lights would leave us with a trip that had other great activities. After Stockholm, it was off to Tromsø via a connecting SAS flight through Oslo. There was jet service all the way; in fact there were a few hundred people going to Tromsø.

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We used TripAdvisor and set up different tours for each of our three nights. All were land-based and the tours were 6-50 people in size. In hindsight, I'd recommend a smaller tour because they use a smaller bus/van and the smaller bus/van can traverse roads that a bigger commercial bus simply cannot.

In January, Tromsø has a few hours of daylight (say 10 am to 3 pm) and the tours go out at 5 pm/6 pm and return when they feel like they've had enough. We set up the three tours and had the following experiences:

**First night:** 40-60mph winds. Trip canceled. I have stayed many nights in hotels for work and pleasure but never until this night did I have my bed and the whole building shake because of the wind. It was crazy. Welcome to 200 miles north of the Arctic Circle and real winter weather.

**Second night:** This was the night we actually saw and took pictures of the northern lights. I've included a few pictures of our trip that the guide took.

**Third night:** 18" of snow fell that night, so we stayed back at the hotel and enjoyed a local restaurant.

We also used SpaceWeatherLive.com to predict the northern lights over the next few hours while with our guides.

### Taking Pictures of The Northern Lights

Unlike most astrophotography, to take pictures of the northern lights you want a wide-angle lens. I used my Sony a9 mirrorless camera with a 12mm-24mm wide-angle zoom lens. The "live view" on the camera helps a lot as did my solid Benro carbon-fiber tripod. To take the picture, you place your camera in aperture mode allowing the most light, then you set your ISO high, but not so high that you get noise. (I used 6400 ISO based on the recommendation of the tour guide leader.) You then use the manual focus feature of your camera and take your picture. Expect 2-5 second exposure times.

If you want to be in the photograph, then you stand still during the 2-5 second exposure and have someone flash an iPhone flash or camera flash during the exposure so that you'll show up and not be in the dark.

This technique worked surprisingly well and our tour guide was a pro at "northern light portraits."

### My Advice If You're Thinking of a Similar Trip

I am a big fan of Tromsø Norway as an aurora destination. I also think going to another place like Oslo or Stockholm for a few days is a good idea. Using a local guide is key as they know where it is most likely to have little cloud cover and they can help you take a picture or take a picture for you with their camera.

I would also probably go in the fall instead of the winter. It's better weather and I hear the bugs aren't as bad as in the spring. Fall 2024 is expected to be an especially good time to go based on sunspot cycles.

Oh, if you go in the fall there's always Oktoberfest in Germany -- hint: just a suggestion.

If a northern lights trip is on your bucket list, take a look at Tromsø. We had a great trip and many memories for a lifetime. ■



# OVER THE HORIZON

Observing: (all times EST)

Average Sunrise 07:45, Sunset 19:41.

\*\*\* Special Note : Daylight Savings "Spring Forward" March 11th. \*\*\*

BY JACK SPRAGUE

This month's list of targets features those below the celestial north pole. Next month, we'll cover in-depth some of the north sky objects. There simply is a great deal to observe if the weather clears!

We begin to edge into galaxy time. For true night owls, and the automated AP/EAA crowd, the time towards dawn yields some great visions of what we less hardy observers see in a month or so. Nevertheless, there are gems available here as we cover the 7hr - 9hr RA region of the mid-month meridian.

The moon favors observing in the last half of the month which hopefully brings more modest weather than those around Ann Arbor have endured of late. I write this waiting to see if we have 6" of wet snow tomorrow or 13" of wet snow tomorrow.

The Messier Marathon is upon us. The Lowell Observatory is conducting its own version for the public using its new CDK 14" Planewave telescope. They are broadcasting live at 19:00 PDT from their deck. Details can be found online. Their weather might - might - be better than ours.

## Meridian Constellations as of 15 March - 22:00 hours.

(-), (--) represent a positional modifier to constellations and objects east of the meridian by less than an hour and more than an hour. (+), (++) represent a positional modifier to objects west of the meridian by less than an hour and more than an hour, respectively.

I mention here a few objects contained in the constellations which I find meaningful. The list is in no way comprehensive!

--Southern Horizon--

### Puppis (The Ship's Stern)

Caldwell 71 / NGC 2477 - open cluster. The Electric Guitar cluster. This brilliant cluster (Mag. 5.8) makes a great binocular object at 20' in diameter. It is a rich, dense star field that makes seeking out the southern exposure really worth it. It was discovered in 1755 by Abbe Nicolas Louis de Lacaille during an expedition to the Cape of Good Hope in South Africa. Harvard astronomer Harlow Shapley called C71 in his 1930 edition of Star Clusters "the richest of galactic clusters." That is high praise. I am unable to resolve the cluster

### The Moon Phases:

14 Mar	Monday	Third Quarter	Rise 02:37	set 11:25
21 Mar	Monday	New Moon	Rise 07:50	set 19:57
28 Mar	Monday	1 <sup>st</sup> Quarter	Rise 10:42 (27th)	Set 02:58

from my obstructed southern exposure. The program Stellarium shows I should be able to resolve it if Michigan had fewer trees. 7hr 52' 12" x -38° 32'.

NGC 2467 - an open cluster AND an emission nebula. 2 for 1! An OIII filter is a very useful aid to observing the nebulosity in this object. It is an oval star field approximately 3' x 4'. The nebula is bright enough that 10x50 binoculars can resolve it rather well providing you have steady hands. See if you can find the "Y" asterism in the central core. 7hr 52.5' x -26° 24'.

M 93 / NGC 2447 - open cluster. The Butterfly Cluster. This object benefits from solid (say 75x) magnification. The star field is rich and bright and a stunning showpiece for any session. It lies about 3400 light years distant. I called the cluster "uneven" when I used my 73mm doublet. I called it "rich but erratic" in my 127mm triplet. 7hr 44.6' x -23° 52'.

M 46 / NGC 2437 - open cluster. Another member of the cluster-happy Puppis constellation. This shows crowded evenly bright stars in a nearly uniform distribution. NGC 2438 is a planetary nebula (see June's upcoming "Objective Lens") embedded in the visual realm of the cluster and worth searching out (it isn't too hard to spot yet constitutes a challenge object). Sue French suggests an OIII filter really helps the nebula stand out and dims the background stars. I didn't require such in my imaging and was shocked in my first exposures at how sharp and clear this "fairy ring" appears. Note the nebula is 3300 light years distant and the cluster itself is around 5000 light years distant. Its appearance in the cluster is an optical artifact. 7hr 41.8' x -14° 49'.

M 47 / NGC 2422 - open cluster. In contrast with the above M46, M47 is notable for the distribution of uneven magnitudes of stars the brightest being a Mag 5.7 blue-white gem right in the center of the cluster visible to the unaided eye. I see a chain of stars running across the field in the way your mind creates asterisms even when nothing famous or notable is known. Nevertheless, look for yourself for a range of stars bisecting (or nearly so) the cluster. 7hr 36.7' x -14° 30'.

Delta 31 Double Star -> Y Puppis. A yellow and a white with a separation of 13" provides a good early evening

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target for splitting. Mag 5.0 (wht) and 8.3 (yllw) (I thought a little dimmer but it was a poor seeing night and observed so long ago my notebook pages have yellowed to nearly that of a legal pad!). 6hr 38.6' x -48° 13'.

### Canis Major

Alpha -> 9 Canis Majoris. Sirius and the Pup. Famous in lore, now is the time to see the pup with a large instrument (10" of reflector is not too much). I have twice been unsuccessful this spring in splitting but I'm normally distracted when atmospheric distortion is low and so seldom give it a good try. 8.7 light-years distance makes this our 5th nearest star and as you know, the brightest in the sky (Mag -1.5). The Pup is a white dwarf only (average) 24 AU distant from its bright companion. The separation of the pair should be around 4" (+/-) presently. 300x is not too much magnification to use! I'm going to try a 3x focal length extender in my next attempt. (?). 6hr 45.1' x -16° 43'.

M 41 / NGC 2287 - open cluster. This bright cluster (Mag 4.5) located very near Sirius benefits from a low-power wide-field telescope. Look for the red(ish) K-star near the center which is 700 times as bright as our sun but at a distance of 2350 light years appears merely noticeable in the cluster. 6hr 47' x -20° 44'

TOM 1 (Tombaugh 1) - open cluster. A faint (Mag 9.3) but rich cluster was discovered by Clyde Tombaugh while searching for trans-Neptunian planets (Pluto!) and much like Messier, found this cluster unintentionally while looking for something entirely different. Remember: Tombaugh discovered Pluto - however you want to classify it ... I'm not going there - then attended university (University of Kansas) to earn his bachelor's and master's degrees. Can you imagine your professor of mechanics in physics lecturing on orbital motion to an undergraduate who had discovered a planet? Enjoy a little history! (I used to observe at the Clyde Tombaugh observatory on the campus of KU as an undergraduate. I never found a planet. I did however occasionally try to date the sorority members who would come to Friday Night Observing after the drinking age was raised to 21 and such innocent pursuits became the undergraduate norm). 7h 0.4' x -20° 28'.

Canis Major Dwarf Galaxy / PGC 5065047 - An "overdensity" object in the process of being shredded by the Milky Way's gravity, the CMa Dwarf was discovered in November 2003. It is the nearest galactic object to the Milky Way. I have heard that it is possible to image this galaxy in the IR spectrum. I'm including it here

because it is an interesting object but otherwise is obscured by the dust of the Milky Way. If you have one of those Planewave gold foil CDK17s (actually IRDK 17 in their newest catalog) hanging around the telescope storage bin, you have a good shot at imaging the star stream being shredded in the tidal deformation. In the interim, try a filter that cuts out everything below 640nm. 7hr 12' 35" x -27° 40'.

S.W. Burnham 324 - multiple stars. The AB pair is Burnham 324 and the AC pair is James South 537. A (Mag 6.3) and B (Mag 7.6) are white with a 1.8" separation. C (Mag 8.6) some 30.5" away is blue-ish. I've only observed these once and even then I wasn't sure I had the proper stars. The D member is listed as a 12.8 mag companion lying 5' south. There is James South 538 - a wide double of 27.2" separation - composed of a white (Mag 7.2) and blue (Mag 8.5) pair which is in the immediate area of S537. Take some time resolving and splitting to appreciate this tight group. The Cambridge catalogue will help. 6hr 49.7' x -24° 5'.

### Monoceros (The Unicorn)

M 50 / NGC 2323 - open cluster. This is a fine binocular object: bright, rich, and spread over 25'. Messier discovered it on April 5, 1772 though as the catalogue publisher he gets some credit beyond what might be due. Cassini probably recorded it in his notes in 1711 but history rewards its writer! 2900 light years distant, this shines with a Mag 5.9 surface brightness and holds at least 150 resolvable stars 8th to 14th magnitude visible at relatively low power given decent seeing. There is a coil of stars within as an asterism called "Copeland's Coil" after a long-time writer in Sky & Telescope. The coil is obvious to me and once you resolve it, the spiral will stay with you as well. 7hr 3.2' x -8° 20'.

NGC 2237 - 39. Rosette Nebula. Emission nebula and several embedded open clusters. Resolvable in binoculars despite its relatively dim brightness, this is a 30' object! If you are doing EAA for the neighbors, this is at the top of the list. And, Messier missed it! A hydrogen alpha filter can greatly help with the resolving. In 2019, the governor of Oklahoma signed a bill making the Rosette the state astronomical object. Boomer Sooner, indeed. 6hr 23.3' x 5° 3'.

Caldwell 54 / NGC 2506 - open cluster. The word here is "concentrated" as more than 100 (to my notes) resolvable stars are in a 7' area. Most are Mag 12 and brighter. I see a chevron-like layout but that



may be my eyes or my sensor. My single image of this cluster did not include flat calibration frames so ...maybe something didn't get aligned? It is a fine EAA target. Lovely. 8 hr x  $-10^{\circ} 47'$ .

NGC 2264 – open cluster and emission nebula! The Christmas Tree Cluster. The Cone Nebula is the dark intrusion in the image. (Also, the Fox Fur nebula and the Snowflake cluster – though I do not know these on sight!). Easily a binocular object but is an AP showpiece and a great candidate to image for a few hours on multiple nights, stack, and print on your own holiday cards. OIII filters definitely help but UHC filters do reasonably well also. The highlight? The tree (inverted and pointing south) is “topped” by a 6th magnitude star that you'll have to work not to blow out in your imaging! This is a classic object worth serious time. 6hr  $41.1' \times 9^{\circ} 53'$ .

NGC 2301 – open cluster. Sue French in her Deep Sky Wonders collection of articles from Sky & Telescope (buy it ... superior tour of the galaxy stuff!) calls this one “Copeland's Golden Worm.” After spending a little time at the eyepiece or EAA screen, the worm jumps right out! It holds 60+ resolvable stars in a 10' area with several star chains across the diameter. I see more of a “Y” than a single “worm.” Three stars in the center hold good color: two forming a clear blue and gold pair and another notable that is a pinkish-red color. 6hr  $51.8' \times 0^{\circ} 28'$ .

The Gaggle of Geese – A collection of objects surrounding NGC 2245 (a reflection nebula itself). Spending a little time in the 10' surrounding NGC 2245 yields Collinder 95 (open cluster), IC 2169 (reflection nebula), NGC 2247 (reflection nebula), and Barnard 37 (dark nebula) all with only a little searching! They are in a near-straight line in the sky and are excellent for EAA survey tours showing the relatives and friends what types of things are in the sky besides stars and galaxies. Start with NGC 2245. 6hr  $32.7' \times 10^{\circ} 10'$ .

## Hydra

We are going to only focus on the westernmost area of Hydra as this largest of all constellations will persist in our sky for an extended springtime stay. It is worth noting that Hydra covers nearly  $100^{\circ}$  of sky. If you were on an astronomy journey to cover one object extremely well, you'd do worse than picking Hydra as your project constellation!

M 48 / NGC 2548 – open cluster. This object is a “missing Messier object” believed to be an observation transcribed in error in his notes. It is a binocular object though you need powerful lens and a steady hand or some of those image stabilized wonders now available. A small wide-

field works well also. I see more than 50 stars “sprinkled” as if a generous pinch of salt was dropped into a well-seasoned dutch oven. This is a great time for a triplet refractor to come into its own! 8hr  $13.8' \times -5^{\circ} 48'$ .

Struve 1216 – double star. Certainly, a challenge object. Mag 7.1 and 7.4 stars separated by nearly 1" ! This requires a night of good seeing, powerful magnification, and a dedicated eye. Well worth it, though. 8hr  $21.3' \times -1^{\circ} 36'$ .

NGC 2835 – face-on spiral galaxy.  $6.3' \times 4.5'$  in size. Mag 10.4. At least 34 Mly distant. It is part of the NGC 2835 galaxy group and displays a fairly significant asymmetry in the development of the spiral arms well worth the observation. AP works best but 20+ 45 sec exposures in EAA will bring out the details worth viewing. It is a very slow star forming galaxy. 8hr  $40.7' \times 4^{\circ} 7'$ .

Hickson 40 / Arp 321 – interacting galaxies. The Hickson catalogue published in 1982 lists compact groups of galaxies. This group #40 resolves into five interacting galaxies at the very least. The web site Telescopius will give you a wonderful idea of the field of view with your equipment if there are questions about resolving the objects. I have to crop an image just a little at 958mm of focal length. Many of you have far larger scopes and will have no difficulty spotting these. AP works well with at least three hours of integration. 9hr  $38.9' \times -4^{\circ} 51.1'$ .

NGC 2784 / H 59 – lenticular galaxy. What are lenticular galaxies? These are flat disks without spiral arms. Most have used up their cool gas and have little star formation activity. H 59 here sits dead center in the Hubble – De Vacouleurs galaxy classification diagram and that is its notoriety. It isn't listed in O'Meara's Herschel 400 Observing Guide and I don't believe it is on the list for the Astronomical League – though I could be wrong there. Perhaps H 59 refers to the Harvard catalogue and not Herschel? H 59's utter conventionality is its fame for we Lowbrows and at  $5.5' \times 2.4'$  with its very bright core, it is a nice object. 9hr  $12.3' \times -24^{\circ} 10'$ .

Abell 33 – planetary nebula. Spring means a ring. Here we have a true engagement ring object. The large planetary halo ( $4.5' \times 4'$  as these things go) can be a pain to resolve due to HD 83535 – a rather bright star at Mag 7.2 on the SW edge. This makes a lovely image but the post-production takes some work to first capture the nebulosity and then to add in the star without allowing it to out the exposure! I suggest

a pair of narrowband filters in H-alpha and OIII for the nebula portion then a short series exposure cycle for the star processed and stacked terminally in the final image. I'd love to see the various Lowbrow efforts in the June Objective Lens feature. 9hr 39.1' x -2° 48'.

**Challenge Object: NGC 2610** – planetary nebula. This faint, tiny smudge of a feature requires exceptional magnification and light gathering (Mag 12.8 and size 35" ?). I'll let you read up on your own if you choose to chase it as it is beyond a great deal of our amateur wide-field equipment. You doubt me? Prove me wrong; but, bring at least 275x magnification to the dance! Kitt Peak has a nice image for reference. William Herschel spotted this in his 18" class scope On 31 December, 1785. The central star is a magnitude 16 twinkle. 8hr 33.4' x -16° 9'.

### Cancer

M 44 / NGC 2632 – open cluster. The Beehive Cluster or Praesepe (manger as in donkey from the Latin). Famous. This cluster is made for binocular observation at 1.5° across and Mag 3.7. More than 75 stars from the 12th magnitude make up this lovely treat. Galileo was the first to resolve the stars as a true cluster in 1610 with his newly invented telescope. 8hr 40.1' x 19° 59'.

M 67 / NGC 2682 – open cluster. One of the oldest clusters known at between 3 and 5 billion years of age! Open clusters normally are in the hundreds of millions of years in age. More than 500 members comprise the cluster spread over a 30' diameter. 8hr 50.4' x 11° 49'.

Zeta Canceri -> 16 Canceri – triple star. The AB pair (Mag 5.6, 6.0) are very tight separated by only 0.8". C is a Mag 6.2 star with a 5.7" separation from the AB pair. All are yellow stars. 8h 12' x 17°39'.

Iota-1 -> 48 Canceri – double star pair. Almost as striking as the blue-gold Albireo (beta Cygni). Deep yellow and blue. Mag 4.2, 6.6. Separation 30.5". 8hr 46.7' x 28° 46'.

X Canceri – a variable carbon star whose outer layer is more rich in carbon than oxygen, thus creating a strong reddish tint. Its magnitude varies between 7.5 and 5.6. 8hr 55.4' x 17° 14'.

NGC 2775 – exotic hybrid spiral galaxy. A flocculent outer band surrounds a tightly wound core. 67 Mly in distance the core is relatively gas free thus it has very low starburst activity. This one is made for an AP showpiece with a high angle of incidence displaying its best features in a pleasing array. 4.3' x 3.3' in size. 9 hr 10.3' x 7° 2'.

Abell 31 – planetary nebula. One of the largest in the night sky at 16' it is also fairly dim at Mag 12.0. Hydrogen

alpha filters may help but Abell 31 is dominated by OIII though only in the central region. So for a complete representative image, both filters should be employed. 8hr 54.2' x 8° 54'

### Gemini

M35 / NGC 2168 – open cluster. Over 75 stars are resolved in a 30' area and they are all bright and distributed in chains and groups of three and four. Nearby, NGC 2158 is resolvable in low powered wide-field telescopes and makes a solid contrast to M 35. 6hr 8.9' x 24° 20'.

Abell 21 / Sharpless 2-274 / PK205+14.1 – planetary nebula. The Medusa Nebula. At slightly larger than 10' x 10' in size, the lower overall magnitude of 10.3 is fairly washed out meaning an OIII filter can really help the resolution. EAA and AP work for me but your eyes – and a filter – may serve you better in eyepiece resolution. Try a magnification of 100x. The interesting thing about the Medusa is that it is a very old planetary nebula as are several in Gemini. NGC 2158 (see M35 above) is 2B years old itself! 7hr 29' x 13° 15'.

Castor -> Alpha Geminorum, 66 Gemini – triple star. The 23rd brightest star in the sky isn't a single star at all but rather three binary pairs for a total of six stellar objects. A and B are difficult to split (Mag 1.9, 2.9) with a separation of 4". C is a variable running between 9.6 to 9.1 in magnitude some 73" away from the pair. Try at least 175x magnification in a 10" class reflector and resolve the AB pair as two brilliant white stars. 7hr 34.3' x 31° 53'.

NGC 2371 / NGC 2372 – planetary nebula. Herschel believed this nebula as two objects thus the two numbers. Dreyer continued with the two-object list in his New General Catalogue. The nickname is the double bubble nebula and is striking in appearance. Its two-lobed construction benefits again from an OIII filter. The central star is a Mag 14.8 object so good seeing is required along with solid magnification. RASC of which several Lowbrows are members lists this among its "110 Finest NGC" object list. 7 hr 25.6' x 29° 29'. ■

## Chasing Dark Skies

Member Adrian Bradley will present a talk at the Pittsfield branch of the public library titled "Chasing Dark Skies: Milky Way Photography in Michigan" Thursday, March 30, 6:30pm, Pittsfield Branch, 2359 Oak Valley Dr.

<https://aadl.org/node/612132>

# TRACKING UPGRADED TO STEPPER MOTORS

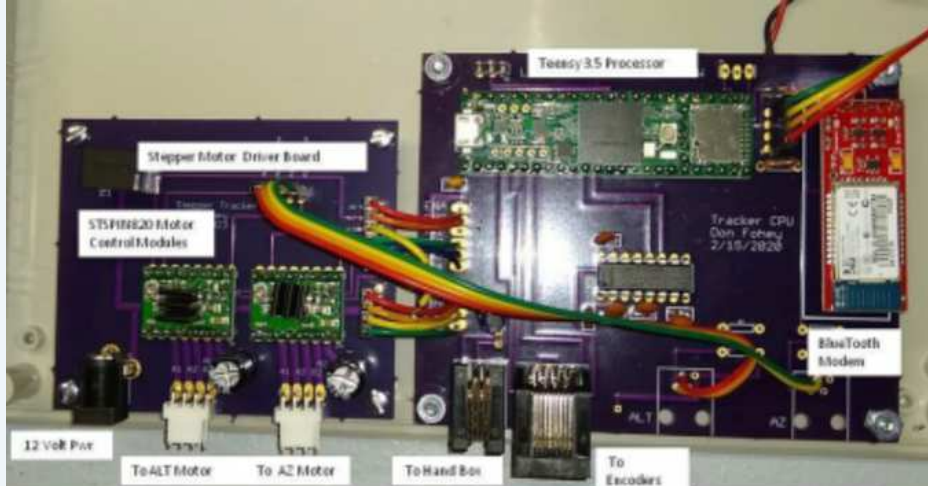
BY DON FOHEY

My first design for a telescope tracking system used DC motors. I described it in an article in the Sept 2021 newsletter. It would pulse the motors to adjust tracking every 5 to 20 seconds or so depending on sky location. The image in the telescope eyepiece would drift and then jump back to a more centered location. It was nice to have a tracking scope, I could walk away, select another eyepiece, or visit a friend's telescope and the image would still be in view. It made star parties like AATB easy. I could sit back and talk to the line of observers knowing that the object would stay in view. The image jumping however surprised all who first saw it and it did take a little getting used to. This summer I saw and liked Jim Forrester's new telescope with the smooth tracking of the Stellar Cat system which used direct drive stepper motors. My winter project was to convert my system to stepper motors.

I did some rough calculations, some of my considerations were: My altitude movement has a lot of drag and that axis needs consider able more torque than azimuth. I have very little clearance for the azimuth motor. There is a very large speed range required from sidereal tracking to telescope slewing. Stepper motor torque reduces dramatically with increased speed. Many motors available on the internet have very little in the way of specifications. I found a 200 step motor with a 17:1 right angle gear drive that would provide plenty of torque in a low profile configuration with enough speed for slewing. I decided to give them a try.



ALTITUDE MOTOR



The CPU control board was adapted from the previous system. A new motor control board was designed for the stepper motors. Parts are getting hard to procure. The Teensy is now out of stock and the Bluetooth modem is no longer available.



AZIMUTH MOTOR

Bench testing with an H-Bridge circuit and single stepping software verified that the motors had the speed and torque that I needed however the noise level was unacceptable. I then ordered a stepper motor controller that would drive the motors with 16 micro steps for every motor step. That also had an unacceptable noise level, the noise level was different, but a galloping sound at the motor revolution rate was annoying. I then ordered a motor controller that could do up to 256 micro steps. I implemented the system with 128 micro steps and the noise level may be acceptable. I will try it in the field this summer and see if my neighboring astronomers and I can tolerate it. Some of the squeaky noises make one wonder whether the telescope is inhabited by ET.

STEPPER MOTORS continues, p. 12

With stepper motors I have precise control of the motor speed so I decided to track by simply driving the motors at the required velocity. The mathematics is much simpler.

LA = Latitude, ALT = Altitude, AZ = Azimuth

$$\text{Azimuth Velocity} = (\text{Sidereal Rate}) * ((\text{sine}(\text{LA}) * \text{cosine}(\text{ALT}) - \text{cosine}(\text{LA}) * \text{sine}(\text{ALT}) * \text{cosine}(\text{AZ})) / \text{cosine}(\text{ALT}))$$

$$\text{Altitude Velocity} = (\text{Sidereal Rate}) * \text{sine}(\text{AZ}) * \text{cosine}(\text{LA}) \text{ (Notice that Altitude Velocity is not a function of Altitude. )}$$

The tables at right list the sidereal rate multiplication factor for azimuth and altitude tracking. For example, look at the red boxes. At a position of 180 degrees (due South) and an altitude of 45 degrees the AZ velocity is 1.41 times sidereal. At position 180 degrees the ALT Velocity is zero. Of course at the zenith azimuth velocities can get very high. I used the table to better understand the tracking rates and directions, notice altitude tracking is upward pointing east and downward (negative) pointing west.

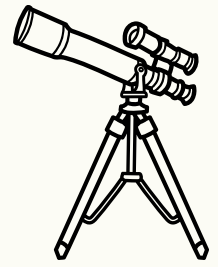
Latitude	42.50	AZIMUTH factor (used to modify Sidereal Velocity)											
Altitude	0	30	60	90	120	150	180	210	240	270	300	330	360
89	-41.56	-35.90	-20.44	0.68	21.79	37.26	42.91	37.26	21.79	0.68	-20.44	-35.90	-41.56
80	-3.51	-2.95	-1.42	0.68	2.77	4.30	4.86	4.30	2.77	0.68	-1.42	-2.95	-3.51
70	-1.35	-1.08	-0.34	0.68	1.69	2.43	2.70	2.43	1.69	0.68	-0.34	-1.08	-1.35
60	-0.60	-0.43	0.04	0.68	1.31	1.78	1.95	1.78	1.31	0.68	0.04	-0.43	-0.60
50	-0.20	-0.09	0.24	0.68	1.11	1.44	1.55	1.44	1.11	0.68	0.24	-0.09	-0.20
45	-0.06	0.04	0.31	0.68	1.04	1.31	1.41	1.31	1.04	0.68	0.31	0.04	-0.06
40	0.06	0.14	0.37	0.68	0.98	1.21	1.29	1.21	0.98	0.68	0.37	0.14	0.06
30	0.25	0.31	0.46	0.68	0.89	1.04	1.10	1.04	0.89	0.68	0.46	0.31	0.25
20	0.41	0.44	0.54	0.68	0.81	0.91	0.94	0.91	0.81	0.68	0.54	0.44	0.41
10	0.55	0.56	0.61	0.68	0.74	0.79	0.81	0.79	0.74	0.68	0.61	0.56	0.55
0	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68

Latitude	42.50	ALTITUDE factor											
Azimuth	0	30	60	90	120	150	180	210	240	270	300	330	360
All ALT's	0.00	0.37	0.64	0.74	0.64	0.37	0.00	-0.37	-0.64	-0.74	-0.64	-0.37	0.00

As before, the tracking system is aligned by pointing to Polaris. This upgrade did away with the dial used to set latitude. I now connect to the systems with a Bluetooth terminal emulator and have implemented a command to enter observing latitude if it is significantly different from the default 42.5 degrees. Testing with Sky Safari demonstrated that the tracking seems to work very well. The definitive test is to see how well it tracks when observing the sky. I thank Dave Jorgensen for making the motor adapter plates and the AZ drive spindle for me. I could not have made those parts myself.

The biggest disappointment is the backlash in the gear train. There was no specification for backlash on the internet site from which I ordered the motors. It amounts to a whopping 0.28 degree in the sky. I have compensated somewhat for it with software, but only so much can be done. We will see how annoying it is when I get under the sky with the system this year. My project next winter maybe to change to a quieter running, no backlash direct drive motors. ■

# UPCOMING TOPICS FOR THE OBJECTIVE LENS



BY JACK SPRAGUE

All images are welcome and while we have a monthly theme, we love any submission.

Images submitted will be included in ‘The Objective Lens’ and in the annual *Backfocus* compilation without any rights transfer beyond your permission to allow The University Lowbrow Astronomers use of your image for inclusion in these two documents.

When will *Backfocus* be available? Jack and Amy are working on it now with the goal of having the proofs together in the next 60 days. We’re also still working on the details of distribution and dissemination. The immediate goal is to assemble the comprehensive review from the proceeding monthly images. We’ll provide a status update in the April edition of *Reflections*. Honestly, the persistent clouds have helped.

**April – Moons:** Ours, Jupiter’s, Saturn’s. We spend so much time in AP work dodging this great glowing orb and planning ways to defeat its influence. Let’s do some lunar captures! (Apollo landing sites especially desired!).

**May – Observing partners.** Mine have tails. Yours may have s’mores smeared faces. Observing whether visual or in image capture brings late nights and solitude. Breaking that solitude are our partners. Let’s see them!

**June** – In the past several months, there have been stunning demonstrations of the prowess of the Lowbrow photographers at work. Truly we have some amazingly competent imagers among our number so: a challenge. In June, let’s examine our collection of **planetary nebula images**. These can take a bit of effort with cropping, post processing, and even the acquisition of sufficient focal length instruments to capture the beasties. Evidence shows our members have the equipment and the processing skills to bring these true gems to the forefront. June: planetary nebulae. It’s showtime!

**July** – Just a courtesy heads-up of coming attractions. Let’s return to a popular topic of last summer with the stunning **skyscapes of Michigan**. Daytime -- clouds and weather appreciated – or nightscapes. Spring is lovely in Michigan and so in this issue, we embrace those things that suggest the joy of the non-parka months. (13” of snow predicted for Friday as I write this so I am a little nostalgic for shirt-sleeve weather!) Daffodils and stars? Why not! Dogwoods at dusk? Absolutely! The squall line threatening to turn cabin opening weekend into a card-playing huddle by the woodstove? Let’s get those in there too. ■

## UPCOMING MEETING SPEAKER SCHEDULE

**MARCH 17:** Dr. Mojtaba Akhavan-Tafti, U-M

Astronomy.

Topic: ***Parker Solar Probe: Mission Design and Scientific Discoveries***

**April 21:** Jeff Morgenthaler, Ph.D, Planetary Science Institute.

Topic: ***Studying Volcanic Activity on Jupiter's Moon Io Using Equipment You Can Buy at a Camera Shop***

**May 19:** Buddy Stark, Planetarium Manager, U-M Museum of Natural History. (***Visit to the U-M Museum of Natural History Museum Planetarium***)

**June 16:** Jim Shedlowski.

Topic: ***Orbital Light Pollution***

**July 21:** Norbert Vance, Director of Sherzer Observatory @ EMU.

Topic: ***Updated Planetarium***

**August 18:** Tamas Gombosi, UM Center for Space Environment Modeling

Topic: **TBA**

# University Lowbrow Astronomers

## Monthly Club Meeting Minutes

17 Feb 2023, 7:40 pm, Room G115 Angell Hall and on Zoom

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

### Speaker

**Who**

Ken Bertin, 'needs no introduction!' long time amateur astronomer

**Subject**

The Birth, Life, & Death of a Star

After a questions and answer session relating to the presentation, Charlie Nielsen called the business meeting to order.

### Business Meeting

Name	Topic
Charlie Nielsen, President	<ul style="list-style-type: none"><li>• April's meeting will be the first of future meetings in the Detroit Observatory.</li><li>• Information about parking for the Detroit Observatory will be sent in a later email.</li><li>• Club Officer Elections will be in April.</li></ul>
Doug Scobel, Treasurer	<ul style="list-style-type: none"><li>• We have 199 memberships and \$14,106.23 in the treasury</li><li>• Besides our usual monthly costs for the Open House "hotline" and printed newsletter printing and mailing costs, our only recent expenditure was \$89.50 to replace the altitude encoder on the club's 17.5" Dobsonian TeleKit.</li></ul>
Adrian Bradley, V.P.	<ul style="list-style-type: none"><li>• Will be doing an outreach event on March 30<sup>th</sup> at the Ann Arbor Public Library on behalf of the Lowbrows.</li></ul>
Amy Cantu, Newsletter	<ul style="list-style-type: none"><li>• Please continue to send in articles and images for both the Newsletter and the Objective Lens.</li></ul>
Jeff Kopmanis, Communications	<ul style="list-style-type: none"><li>• The new website location is <a href="http://umich.edu/~lowbrows">http://umich.edu/~lowbrows</a> (or <a href="https://websites.umich.edu/~lowbrows/">https://websites.umich.edu/~lowbrows/</a> ... the first URL automatically links you to the protected one. Members-only passwords are working again. Thanks goes out to UM-ITS for fixing our website issues.</li></ul>
Dave Snyder, VP	<ul style="list-style-type: none"><li>• Dave attended a private open house at the Detroit Observatory in November</li><li>• The Lowbrow club meetings will be held in a new building located near the 1854 Observatory Building. From the new building, you can get to the old building via stairs or elevator.</li></ul>
	<ul style="list-style-type: none"><li>• May's meeting will be held in the Museum of Natural History</li><li>• Language on our website concerning meetings will need to be changed. Agreed with Jim Forrester's suggestion that wearing masks are strongly encouraged, and if anyone is feeling sick, stay home.</li></ul>
Jack Brisbin, Observatory	<ul style="list-style-type: none"><li>• Work continued on the Club's 17.5" Dobsonian TeleKit, as well as other areas within the Observatory.</li></ul>
Jim Forrester, VP	<ul style="list-style-type: none"><li>• Less money than expected was spent on repairing the club's 17.5" Dob TeleKit.</li><li>• The scope is almost ready to go... a test would be done the following week.</li><li>• First light for the newly repaired scope would very likely be the Messier Marathon in March, which takes place on the 18<sup>th</sup>. Backup date for the marathon is March 20<sup>th</sup>.</li></ul>

### Addendum

Attendance for tonight's hybrid meeting: 20

**Adjourned**

9:08:00 PM

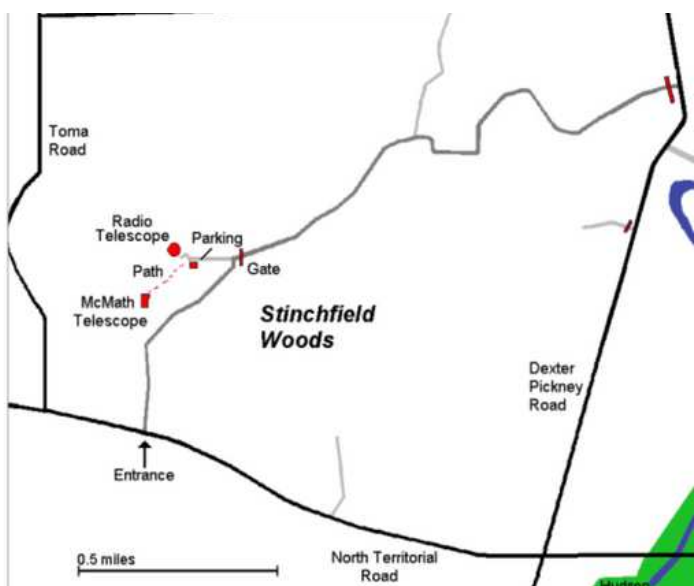
**Minutes were taken and transcribed by**

Adrian Bradley

## PLACES & TIMES

Monthly meetings of the University Lowbrow Astronomers are held the third Friday of each month at 7:30 p.m. The location is usually Angell 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 radiotelescope, 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 canceled if the forecast is for clouds or temperatures below 10 degrees F. For the most up-to-date info on the Open House / Star Party status call: (734) 975-3248 after 4 pm. 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. Evenings can be cold so dress accordingly.

Lowbrow's Home Page  
<http://www.umich.edu/~lowbrows/>

## MEMBERSHIP

Annual dues are \$30 for individuals and families, or \$20 for full time students and seniors age 55+. If you live outside of Michigan's Lower Peninsula then dues are just \$5.00. Membership lets you access our monthly newsletter online and use the 24" McMath telescope (after some training). Dues can be paid by PayPal or by mailing a check. For details about joining the Lowbrows, contact the club treasurer at: [lowbrowdoug@gmail.com](mailto:lowbrowdoug@gmail.com)

Lowbrow members can obtain a discount on these magazine subscriptions:

**Sky & Telescope** - \$43.95/year

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

### Newsletter Contributions:

Members and non-members are encouraged to write about any astronomy-related topic. Contact the Newsletter Editor: Amy Cantu [cantu.amy@gmail.com](mailto:cantu.amy@gmail.com) to discuss format. Announcements, article, 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
	Brian Ottum
	Dave Snyder
Treasurer:	Doug Scobel (734) 277-7908
Observatory Director:	Jack Brisbin
Newsletter Editor:	Amy Cantu
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 to the Observatory and the North Territorial Road gate to Peach Mountain. University policy limits possession of keys to those whom 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](mailto:Lowbrow-members@umich.edu)



# University Lowbrow Astronomers

