



REFLECTIONS / REFRACTIONS

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University Lowbrow
Astronomers

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Doug's Deep Sky Challenge:

Have You Seen the Supermoon?

by Doug Scobel

That tag line reminds me of a song. Come on, sing with me (to the tune of "Do You Know the Muffin Man"):

"Have you seen the Su-per-moon, the Su-per-moon, the Su-per-moon?
Have you seen the Su-per-moon that looks so huge and bright?"

Well, have you?

The so-called Supermoon has been all over the news lately. The (relatively recently popularized) term "Supermoon" refers to the full moon of the year that falls closest to when the moon is at its closest distance to earth, that is, when the moon is at perigee. It then presents its largest angular diameter to us here on our home planet. In other words, it looks bigger, and hence brighter, than usual – a "super-sized" full moon. We just had a Supermoon on August 10. But is a Supermoon really that "Super"?

Now before I go any further, I want to clarify one thing. Many of you reading this are thinking to yourself "The moon doesn't qualify as a deep sky object, so what was this bozo thinking calling this a 'Deep Sky Challenge'?" To those of you thinking this, or something similar (in other words using a name stronger than "bozo" to describe me), yes you are correct. The term "Deep Sky" refers to celestial objects beyond our solar system. But I have my reasons. The first is I've already written a series of articles named "Doug's Deep Sky Challenge", and I didn't want to start a new series called "Doug's Solar System Challenge". It just doesn't have the same ring to it. Plus, as you'll find out, in this article I'm talking about naked eye observing. What natural objects do you normally see when you look up? Clouds, atmosphere, birds, etc. Really near stuff. Celestial objects, even if they're part of our solar system, are much farther away. The nearest, the moon, is at least a thousand times farther away than the farthest cloud or bird you can see. So comparatively speaking, the moon is indeed a deep sky object. Therefore, I've included it in the "Doug's Deep Sky Challenge" series. The bottom line is, my article, my series, my rules.

Enough of the preliminaries and on to the subject at hand. My challenge to you: Can a casual observer, using nothing other than his or her eyes and memory, look up at a full or nearly full moon, and more-or-less accurately determine whether the moon is near perigee (closest to the earth), near apogee (farthest from the earth), or somewhere in-between? Not using any kind of measuring device, such as one's thumb or something else held at arm's length, or any other object at a constant distance. Just looking up at it.

Some claim that they can. There's a fellow who works in the office where I work, I'll call him "Fred", who says he did just that. "Hey, Doug, did you notice how big the moon was yesterday morning? It looked bigger than normal." Fred was speaking of Wednesday morning, Aug 13. He noticed the moon in the west (it was more than three days past full), above some trees, and it looked really big to him. Skeptic that I am, I mentioned that it could have been the well-known but little understood moon illusion, or that the "Supermoon" had been all over the news recently, which may have set a subliminal, subconscious message in his brain which set him up to see a big moon. Besides, I insisted, virtually no one can simply look up at the moon and make an accurate judgment as to whether or not it is bigger or smaller than "normal". I'll spare you the gory details of the argument/discussion that ensued, but Fred insists that he can indeed make that judgment. So this got me to thinking. The general consensus amongst astronomer types like us, or at least the skeptical ones like me, is no, folks really can't tell the difference. But now I'm wondering if maybe some people actually can.

First, a really quick primer on the apparent diameter of the moon as seen from earth. The moon's orbit is approximately elliptical, so its distance from the earth varies as it travels. (There are a lot of perturbations to consider when calculating

the moon's orbit, so its path is close to, but not quite exactly, an ellipse.) Not only that, but its apogee and perigee distances vary with each orbit, so no two full moons, even when close to apogee or perigee, are quite the same distance away. At its nearest, the moon can come closer than 357,000 kilometers to earth (measured from the earth's center to the moon's center); at its farthest, it can be over 406,500 km away. That makes it look up to about 14 percent bigger and about 30% brighter at perigee than at apogee. This increase in size and brightness puts the "super" in "Supermoon".



Figure 1: Comparative size of the full moon when at its most distant (left) and when at its closest (right). The difference in size is about 14 percent. All photos by the author.

Now I have a question for you. If we have a term for the full moon when it is at its closest and largest, then why don't we have a term for when it's farthest away and thus at its smallest and least bright? I read an article somewhere that referred to a full moon that occurs near apogee as a "Micromoon". But to me that doesn't convey the right idea. If "super" is short for superior, then the word inferior would be its opposite. A shortened version of "inferior" would be "infer", so the antonym of "Supermoon" should be "Infermoon". But who would know what an "Infermoon" is? I don't see that catching on. We need a different word. I'd like to propose "Lousymoon" to refer to the most distant full moon of the year. I think it conveys the meaning perfectly. If super=good, and lousy=bad, then "Lousymoon" is the perfect opposite of "Supermoon". Okay, maybe it will never be an official term, but I'll still use it for the remainder of this article.

So an increase of 14% in apparent diameter from Lousymoon to Supermoon should be easily apparent to the unaided eye, shouldn't it? Not so fast! If you had two moons side-by-side in the sky, one at its smallest possible apparent diameter, the other at its largest (like in Figure 1 above), then the answer would be obvious. Equally obvious is that this is not what happens. It is 14 to 15 days between apogee and perigee, so observations are necessarily separated by a couple weeks. The transition between the two is gradual. Moreover, in a lunar cycle where you have a Supermoon, the moon is near new when it's at apogee and you can't see it at its smallest due to proximity to the sun. So in reality, when looking at a Supermoon, you ought to compare its size against that of the average full moon. In other words, an increase in size of at most seven percent, not fourteen. Figure 2 below shows the two extremes flanking an average-size full moon. You can see for yourself that the differences from extreme to average are less obvious.



Figure 2: Left to right – Relative sizes of Lousymoon, average full moon, Supermoon.

To further help illustrate all this, I used Guide 9.0 to generate the following table showing the size and distance of each of this year's full moons, plus the first three of 2015. (The earth-moon distances are rounded to the nearest 100km, and were calculated at 12:00 UT of the specified days. So the distances are not precise, but are close enough for the purposes of this article.)

| Date (UT) | Distance (km) | Apparent size (arcmin) | Type of moon |
|-----------|---------------|------------------------|--------------|
| Jan 16 | 405,500 | 29.5 | Lousymoon |
| Feb 14 | 404,400 | 29.5 | |
| Mar 16 | 397,000 | 30.1 | |
| Apr 15 | 385,600 | 31.0 | |
| May 14 | 377,500 | 31.7 | |
| Jun 13 | 365,700 | 32.8 | |
| Jul 12 | 360,600 | 33.1 | |
| Aug 10 | 358,700 | 33.3 | Supermoon |
| Sep 9 | 360,400 | 33.2 | |
| Oct 8 | 366,100 | 32.6 | |
| Nov 6 | 374,200 | 31.9 | |
| Dec 6 | 386,000 | 30.9 | |
| Jan 5 '15 | 397,000 | 30.1 | |
| Feb 3 '15 | 403,400 | 29.6 | |
| Mar 5 '15 | 406,600 | 29.4 | Lousymoon |

Table 1: Full moons of 2014 and into 2015

As you can see from the table, it is seven months from this year's Lousymoon to Supermoon, and another seven months to the following Lousymoon. So again my question to you is, can one detect a change in the apparent size of the full moon of seven percent over a period of three to four months? Or detect that it looks 14% larger (or smaller) after more than half a year? Personally, I have my doubts.

And another question. Why do folks only seem to pay attention to Supermoons? Why not Lousmoons too, when it should look exceptionally small? I've never heard anyone say "Did you see the Lousymoon last night? It looked soooo small!". Have you? So why do people make such a big deal about how big the Supermoon is? After all, both are the same percentage difference in size from your average run of the mill full moon. I have my theories:

- Supermoons are normally accompanied by news hype, so folks are expecting it to look big. And when they look at it, by golly, it sure does!
- The "Moon Illusion". This is the universal (well, on this planet at least) illusion where the moon always looks bigger when its low in the sky. And the full moon rises as the sun sets, so it is widely seen by lots of people, mainly when it is low in the sky. And when they know they're seeing a Supermoon ahead of time, it looks even bigger.
- We've been conditioned to believe that bigger is better. The idea that "less is more" takes a little more convincing.

Finally, let's look at the facts concerning Fred's sighting. He was driving west near Rochester Hills, at around 9:10 a.m., on August 13. According to Guide 9.0, the moon should have been around 10.4 degrees above the horizon. The moon being three days past full puts it at roughly 363,000 kilometers from earth and 32.9 arc minutes across, which should have made it look on that morning about 5% larger than an average full moon. That's not a lot. I'm guessing that Fred's "big moon", being fairly low in the sky, and just above some trees, was due to the well-known but little understood moon illusion. But that's just my opinion.

You don't have to take my word for it. You can see for yourself at the next full moon on September 8. It will be almost as close to earth as the Supermoon of August 10, and will only appear about a tenth of an arc minute smaller. So judge for yourself, and report what you see.

Of course, all of this could just be MoonPie in the sky. But though technically speaking the moon isn't considered a "Deep Sky" object, I'd still like to know - *what do you see?*

Approaching the Hubble

The Trifid Nebula

By Brian Ottum



This is a very colorful area of the sky. Messier #20, this is a combination of three different types of nebulae. The red is an emission nebula, where stars are born. It is hot and glows. The blue is a reflection nebula. Finally, there are dark clouds of dust – dark nebulae. You can spot M-20 as a small glow above a bigger glow (Lagoon nebula), both bubbling out of the spout of the “teapot” Sagittarius. Binoculars work great, and even better in dark skies. Look southwest after sunset in September.

I took this in late June with my remote control New Mexico telescope (to be demonstrated at the November meeting). A total of 4 hours' worth of three minute exposures were needed to bring out all three nebulae. If you look close you can see a dark nebula lurking on the right. The camera is a Canon 5D mark III, modified to see red better. The telescope is a 10” f/5 Newtonian reflector, on top of a Paramount MX mount. Autoguiding, as you can see, was not well done. I use

a 4" refractor with a small CCD autoguider.

Summer desert lightning blew out my PC's motherboard. Although Dell did an on site replacement, I am going out to get all the software working together again. Next year, I'm likely to unplug everything during the summer monsoon season. Live and learn.

In this version, I have superimposed the 1997 Hubble shot. There are two "stellar jets" that protrude from the star-forming "hump" region. Brand new stars inside that "hump" region are blowing out those $\frac{3}{4}$ light-year long jets. When I really zoom into my shot, I can see tiny evidence of the jets. Cool stuff!
It is amazing what technology can do today.

Lowbrow in Ann Arbor Art Gallery Showing

Lowbrows may be interested in an upcoming show at the Ann Arbor Art Gallery. The theme of the show is "Unseen." This is a multi-media exhibition in which over 50 local, regional, national, and international artists and scientists explore the thresholds of visibility, revealing crucial, unseen phenomena that impact, inform and enrich our daily lives. Many contemporary artists and scientists dedicate themselves to researching and expressing the unseen, to making the invisible visible.

Lowbrow Brian Ottum has four of his astrophotography images in the show, so you may enjoy a trip to 117 W. Liberty in downtown A2. The show is from Friday, September 12th to Sunday, Oct 12th. Hours are 10 AM - 7 PM Monday-Friday, 10 AM - 6 PM Saturday, 12 PM - 5 PM on Sundays. Admission to the exhibit is free.

<http://annarborartcenter.org/unseen>



M 13 photo by Brian Ottum



Seth McCubbin took this photo of the Milky Way the night of June 22/23 at Peach Mountain Photo: Lowbrow Archives

Largest Star Party in Michigan

Astronomy At The Beach

By Paul Walkowski

There is a refreshing nip in the night air around Michigan. It must be time to dust off your favorite telescope and head out to Astronomy at the Beach at the Kensington Metropark. This is our 18th year participating as a club in what has come to be the largest annual star party in Michigan. Yes the Metro Park PR folks don't want it called a star party because it conjures up their memories of Woodstock and worse, memories most of us never had. But if you see long lines of the public standing near perhaps 50 telescopes staring at star clusters, galaxies, and nebulas—it's probably not due to the ingestion of mind altering substances.

AATB really sells itself, but to newcomers it is an adrenalin rush of a public star party. The large crowds used to be the result of an astronaut in attendance every other year, but lately it has received better publicity by educators, scout troops, and home schoolers. We still try to schedule astronauts and scientists, but the current White House administration will not allow NASA scientists or Astronauts to travel and speak (even when their expenses are covered by outside organizations) because of the Congressional austerity measures for non-essential departments.

So why do the crowds come? Its not because of any sudden surge of high school students to enroll in the Science, Technology, Engineering, and Math (STEM) subjects! Its partially because the parents involved still remember the glory days when the US was the world leader in space exploration. The other part is due to the dedication of a few amateur scientists to show the youth what is really out there in space just outside their every day grasp, explain about the phenomenal sizes of the objects and distances involved, talk a little about what we think is going on, and wait for the wows, oohs, and aahs to come rolling out. When there is a long line waiting behind every scope and everyone ahead of them is astounded, the anticipation grows intense to see what everyone is awestruck about.

Who: *The Lowbrows & 7 other Astronomy clubs from SE Michigan*

When: *September 26 & 27, 6:00 PM till 11:30 PM*

Where: *Maple Beach; Kensington Metro Park; entrance just North of Kensington Rd and I-96, about 20-30 minutes north of Ann Arbor.*

Who will attend: *1,500-3,500+ youth and their families, scout troops, and school field trip groups; typically ages 7-17.*

Why: *To see some short talks and demonstrations on astronomy and space sciences, Dr Shannon Schmoll of the Abrams Planetarium, and to look through telescopes as part of the sky scavenger hunt.*



*Your Editor gives a young astronomer an eyeful of Jupiter at the 2009 Astronomy At The Beach.
Photo: Lowbrow Archives*

So how do we prepare for this big event? Come with a list of favorite bright objects and a sentence or two explaining about each one. Plan various objects in different quadrants of the sky in case one area is cloudy. The sky tour will again consist of the moon, planets, colored stars, galaxies, nebulas, and star clusters. Astronomers are forewarned to have pens and red flashlights to sign off the sky scavenger hunt sheets for contestants. There are prizes at stake (packets of astronomy spectacular objects from NASA in a base ball card format) for those who complete the scavenger hunt.



A few of the scores of scopes at the 2008 Astronomy At The Beach

Photo: Lowbrow Archives

We hope to contain all of the light spill over from the concession stand to the beach this year and the park will rope off the stairs to the pavilion so that folks do not fall on them. Those with solar observing equipment start around 6-6:30 PM and get a yellow helium balloon from George at the Ford Club Table in the pavilion so the public can find you.

The new park administrator will prohibit astronomers from using the back driveway or bike path down to the observing area. Her preferred entry point for cars is the west most sidewalk where most of the public enters the AATB event, and she would like the cars motionless after 6 PM. Past administrators insisted that all vehicles be removed from the beach area before 6 PM. Nothing has been said about a ranger transporting equipment from the parking lot to the observing area and back this year, but due to short staffing, the rangers have not attended most GLAAC meetings as was their custom in the past.

The talks in the big tent run from 6:15-9:45 pm, as will a portable planetarium and the demo and info tables in the pavilion. The observing will continue at sunset (7:25 PM) with a first quarter moon (sets at 8:30 PM), Mars, Saturn (sets at 9:30 PM), and perhaps Mercury (sets at 8:00 PM). Uranus and Neptune are situated fairly high in the SE, Observing will round out with open and globular clusters, nebulas, and galaxies. Those astronomers with computerized equipment will start to pick up deep space objects a few minutes earlier than the rest of us, but things will be well underway by 9 pm.

A word to the wise is that even though the youth are well behaved and supervised at AATB, there are a few kids who will run through the crowds and others who might handle an unattended telescope. Please remember leave someone else in charge of your equipment if you must step away.

Astromony At The Beach is the largest and most important Astronomy event of the year in southeastern Michigan. Barring rain, two to three thousand (or more) area residents will attend over the two nights. Please be there with your scope or to help out the members bringing equipment.--Editor

Recent Maintenance at the Observatory



The photo shows the completed masonry work on the south east corner of the observatory.

The masonry work was completed using Rapid Set Mortar Mix. Rapid set is a blend of hydraulic cement and quality aggregates and is used in wet environments. It is designed for concrete repairs from a 1/2 inch to 6 inches deep/thickness. We will see how well it lasts through winter then I will know if it is going to hold up. It does look good!!

The cracks were filled with Silkaflex Mortar Fix/ Polyurethane sealant

I still have a couple more spots to do.....

Jack Brisbin

Dave Jorgenson recently completed constructing and mounted this good looking eyepiece box on the club's 17.5" Dobsonian.

The four receptacle wall outlet was brought back to life by Doug Nelle and Jack Brisbin to allow for convenient charging of the scopes batteries.

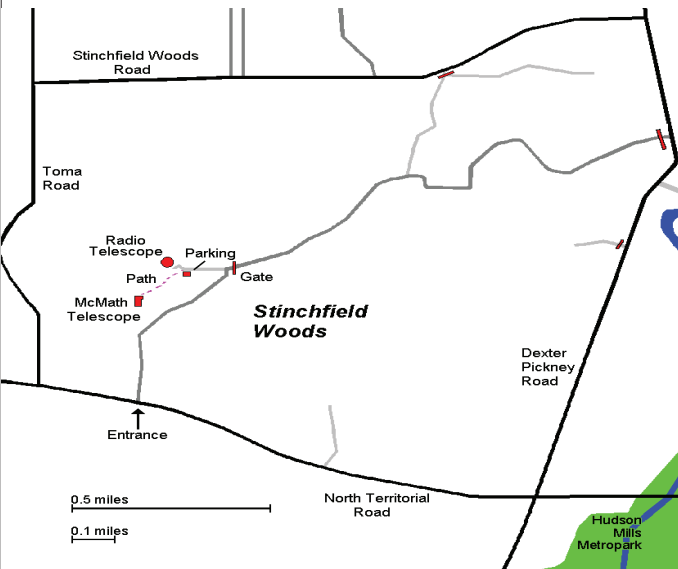
All photos by Jack Brisbin



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 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. A club observing session at the Peach Mountain Observatory, weather permitting, often follows the meeting.

Peach Mountain Observatory is the home of the University of Michigan's 25 meter radio telescope as well as the University's McMath 24" telescope, maintained and operated by the Lowbrows. Located northwest of Dexter, MI; the entrance is off North Territorial Road, 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 Mountain observatory, but are usually cancelled if the sky is cloudy at sunset or the temperature is below 10 degrees F. For the most up to date info on the Open House / Star Party status call: (734)332-9132. Many members bring their telescope to share with the public and visitors are welcome to do the same. Peach Mountain is home to millions of hungry mosquitoes, so apply bug repellent, and it can get rather cold at night, please dress accordingly.

Membership

Membership dues in the University Lowbrow Astronomers 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.

This entitles you to the 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 or by check made out to University Lowbrow Astronomers and mailed to:

The University Lowbrow Astronomers

P.O. 131446

Ann Arbor, MI 48113

Membership in the Lowbrows can also get you a discount on these magazine subscriptions:

Sky & Telescope - \$32.95 / year \$62.95/2 years

Astronomy - \$34.00 / year or \$60.00 for 2 years

For more information contact the club Treasurer at:

lowbrowdoug@gmail.com

Newsletter Contributions

Members and (non-members) are encouraged to write about any astronomy related topic of interest.

Call or Email the Newsletter Editor: **Jim Forrester (734) 663-1638** or jim_forrester@hotmail.com to discuss length and format. Announcements, articles and images are due by the 1st day of the month as publication is the 7th.

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Lowbrow Calendar

September 12--October 12: "Unseen." This is a multi-media exhibition in which over 50 local, regional, national, and international artists and scientists explore the thresholds of visibility, revealing crucial, unseen phenomena that impact, inform and enrich our daily lives. Lowbrow Brian Ottum has four of his astrophotography images in the show. **Ann Arbor Art Center, 117 West Liberty, Ann Arbor, MI 10AM - 7PM Monday-Friday, 10AM - 6PM Saturday, 12PM - 5PM on Sundays. Free!**

Friday, September 12: Star Party at the Leslie Science Center, 8:00-11:00 PM, 1831 Traver Road, Ann Arbor

Friday, September 19: Lowbrow monthly meeting, 7:30 PM, Room G115, Angell Hall. Speaker: Fred Adams, Professor of Physics, University of Michigan: "Relativistic Planets and other curiosities." (NOTE ROOM AND BUILDING CHANGE)

Saturday, September 20: Open House at Peach Mt.-- Begins at sunset, may be cancelled if cloudy.

Friday, September 26 and Saturday September 27: Astronomy At The Beach, 6:00 PM-Midnight, Maple Beach, Kensington Metro Park, Milford, MI. See <http://www.glaac.org/kensington-astronomy-at-the-beach/> for more information.