REFLECTIONS / REFRACTIONS

University Lowbrow Astronomers

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Volume 35 Issue 3

An Editorial: International Darksky Association

We'll start with a little bit about ourselves. Our names are Zach Fogel, Tae ho Kim, and Moritz Lehner, and we are sophomores at Pioneer High School. Our desire to start a chapter of the IDA in Ann Arbor stemmed from an interest in astronomy and frustration over our inability to see stars in the Ann Arbor night sky. Once the chapter is up and running, we plan to talk to the city government and attempt to have light pollution-reducing legislation passed for the city. Next year, we will start a club at Pioneer to raise awareness about light pollution. Now, we'll talk about what we know about light pollution and its effects.

Urban sky glow, which is the brightening of the night sky over inhabited areas, is the force behind the disappearance of the Milky Way in the night sky. It forces observers to travel further to get a view of a clear sky. In addition to these inconveniences, however, urban sky glow has environmental ramifications, affecting the chemical cleansing of the night air. The nitrate radical NO_3, a nitrate that exists only at night, reduces the following day's level of atmospheric pollutants by breaking down harmful emissions from factories and automobiles, according to a study led by Harald Stark of NOAA's Earth System Research Laboratory. Sunlight or artificial light causes NO_3 to become inactive, therefore allowing airborne pollutants to increase.

Urban sky glow is not the only consequence of light pollution, however. Light trespass is another result, occurring when light falls where it is not intended, wanted, or needed. Birds suffer hugely from this. Millions of songbirds die yearly in the United States and Canada when they collide with lighted communications towers and buildings during their migrations. Low cloud cover or fog raises the risk. In places with large amounts of artificial lighting during the night, birds often think this light signals the advent of dawn; thus, feeding and mating patterns are disrupted. Most owls hunt under the cover of darkness, and have trouble hunting when the skies are lit up by artificial light. These disruptions in feeding and migration can in turn upset entire ecosystems.

As well as harming animals and ecosystems, light pollution has a profound effect on humans. While it does inconvenience stargazers and astronomers by forcing them to travel long distances to find a substantial number of stars to view, the real problem is that it damages our health. According to the American Medical Association, excess lighting hampers our bodies' production of melatonin, a hormone that aides in the regulation of dormancy cycles. A study conducted by the Harvard Medical School showed that when the subjects were exposed to unnatural light before bedtime, they produced less melatonin than usual. Light pollution also impedes the immune system and raises the risk of breast cancer and other health issues. Glare from streetlights and buildings leads to unsafe driving conditions by causing eye pupil restriction and reduced visibility. The AMA estimates that 40 percent of the light emitted from standard streetlights is wasted, which "contributes to excess carbon dioxide production and possibly global warming". Light pollution is a problem that poses a serious threat to our health and safety, and so is one that must be addressed and solved.

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Building a Star Finder as a Way to Understand RA / Dec and Equatorial Mounts

By Sandy Dugan

As a newcomer to amateur astronomy and before I invested in a telescope, I had read that each star has a unique Right Ascension (RA) and Declination (Dec) and that an equatorial mount is useful in locating objects. In order to understand these concepts, I designed and constructed what I call a "star finder." The process helped me to grasp the meaning of RA / Dec and the function of an equatorial mount. The instrument could be used for instruction; it can be taken apart for transportation. The total cost was about $25.00.

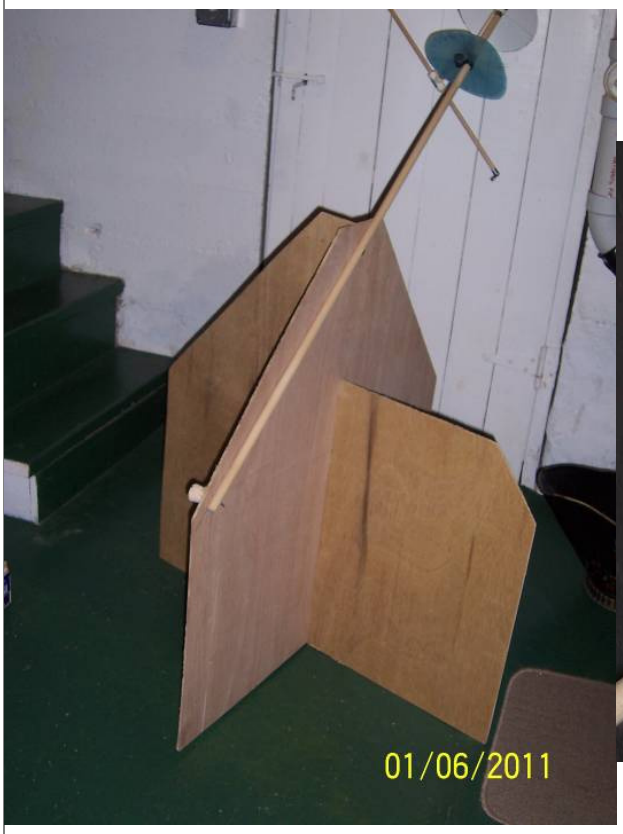
Materials:

one sheet 1/4" plywood; two 5/8" wood dowels, one 7/16" wood dowel; two pvc "T" joints; cardboard, stiff plastic sheet; two threaded right-angle screws; two cork stoppers; four 5/8" interior diameter "O" rings; one screw eye; three bamboo skewers; duct tape.

Description:

--The base: two pieces of 1/4" plywood, approximately 3' 1" X 3', cut and fitted as shown. Image 1

--The Polaris axis: a 5/8" wood dowel, with holes drilled and attached to the base with screws and cork stoppers (for removal and transportation) at a 42º angle, as shown. (The latitude at Ann Arbor is 42º 16' 14" North.) Image 1

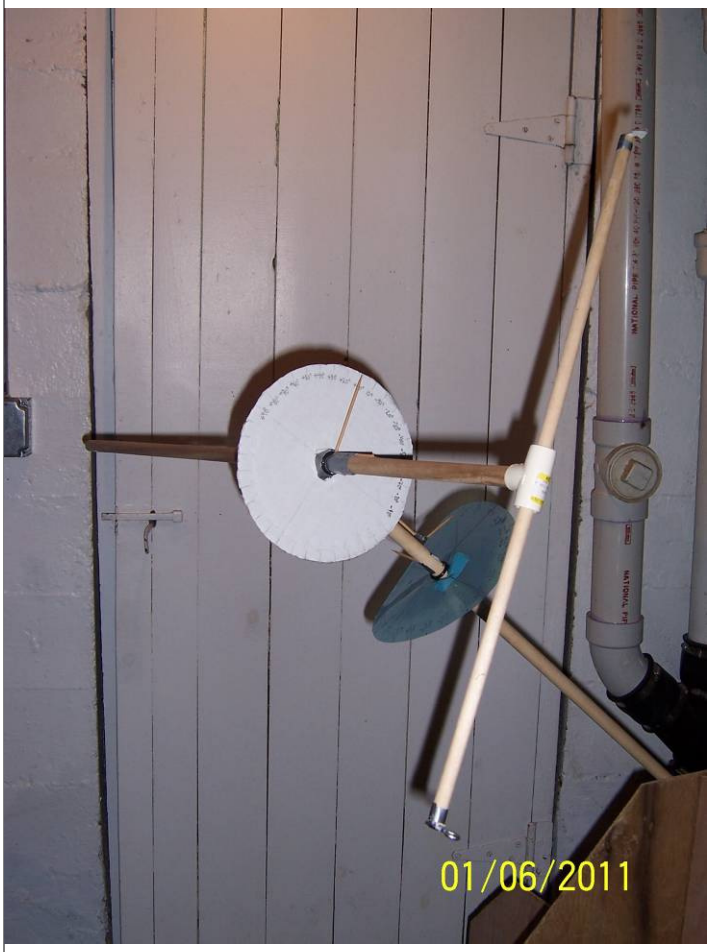


--The transverse piece: a 5/8" wood dowel attached to the Polaris axis by a pvc "T" fitting. Image 2

--The Declination dial: a cardboard circle divided into ninety-degree sectors; marked in 10º units, with +/- ; +90º and -90º are permanently aligned to the Polaris axis. A bamboo skewer bent at 90º is used to set the Dec. Image 3

--The Right Ascension dial: a stiff plastic circle divided into 24 equal one-hour units, marked 0 to 23, is held in place between two "O" rings; it is rotated to follow the apparent motion of the stars. A bamboo skewer bent at 90º is used to set the RA. Image 3

--The star pointer: a 7/16" wood dowel attached to the transverse piece by a pvc "T" fitting and aligned with the declination pointer. One end is fitted with a screw eye, the other with a small cardboard arrow for aiming. Image 4



Function:

In use, the RA dial is set for the time of night, and then only the transverse dowel moves; it rotates within the "T" fitting to reach the Dec setting, and the "T" fitting rotates on the Polaris axis to reach the RA setting. The observer then looks through the screw eye on the star pointer to see the appropriate star.

Use:

On a late fall evening, I set up the instrument, with the Polaris axis dowel aimed at Polaris. From star maps and with the help of other Lowbrows I had learned to identify by sight some of the constellations and brightest stars in the night sky; I also had a list of the 20 brightest stars with their RA / Dec. I moved the transverse piece to aim the star pointer at Caph (RA 00h 09m) in Cassiopeia and then set the RA dial on the instrument at 0. Referring to the star list, I moved the transverse piece so that the readings on the RA dial and the Dec dial matched some of those on the list; the star pointer then pointed close to the respective star. The instrument is very crude; star locations were only approximated. But building it and testing it provided the satisfaction of putting theory into practice. Subsequently, looking for a telescope to purchase, I went with an equatorial mount, without a motor. I am glad to have it; the RA / Dec dials provide approximate locations, but I rely mostly on "star hopping" to bring in objects of interest.

Stay on the Sunny Side of the Street, Because The Best Is Yet To Come

By Tom Ryan

I got a call the other day from the director of the Space Physics Laboratory at the University of Michigan. He was cleaning out their basement, and had come across some old memorabilia which was near and dear to his heart. He had worked with this stuff in his first job out of college, and like most people who know they have to throw out something which has sentimental value, wanted to give it to someone who might use it, or who would at least throw it away out of his sight, and he thought of me.

When I was a very small lad, my mother told me never to refuse a gift, and I've ever tried to follow her advice, no matter what the burden. This has led me to collect a lot of useless junk, but I take solace from the fact that my behavior is common for our times, and I expect that my son will correct all of my life's errors when he inherits and will responsibly haul all of this accumulated junk to the dump.

In the meantime, I told the director I'd be happy to take all of it. "All of it" turned out to be about half the parts of a nuclear fusion laser, and included the electronics and laser light pulse amplifiers, beam combiners, power detectors, large optical flats, light beam micropositioners, and boxes and boxes of optical bench hardware.

Missing were only the really large later stage lasers, the clamshell-mirror fusion chamber, the Deuterium-Tritium fuel pellets and, of course, the shielding to absorb the neutron and X-ray radiation.

This stuff was the leftovers from the efforts of the company, KMS Fusion, to produce the first fusion power source outside the sun itself. The company went out of business, but before it did, it actually succeeded in producing nuclear fusion with this laser.

Not many people know that laser fusion has already been achieved. At the time it was operating, KMS Fusion faced incredible opposition from the government in its efforts to privatize nuclear fusion. Many people, in and out of government, felt that something as important as fusion power should be controlled completely by the U.S. government, and while the government did have a parallel program to develop fusion power, it was far behind KMS. KMS Fusion's owner, Kip Siegel, had already made a fortune by successfully building technology companies in the Ann Arbor area, and when he decided to tackle nuclear fusion, he had both the ability and the resources.

One of the things that has surprised me about Ann Arbor, as I've wandered around for the past forty years, in and out of many of its technology companies, is how many of the smartest people I've encountered have one thing in common. They worked for KMS Fusion, and remember it as being the best company they ever worked for. Their reasons for saying so vary from one person to the next. Some say they worked harder than they ever had before or since, but as a result, did their best work there. Some say the technology was the most advanced in the world. All of them loved the company. Nowadays, you'd have to look to Apple to find that kind of devotion. But there is one big difference between Apple and KMS Fusion. Apple makes Walkie-Talkies, and KMS Fusion made clean energy.

When I arrived at the U of M in 1971 as a Physics student, one of my Physics professors organized an evening field trip to KMS Fusion. We toured the building, viewed the progressively larger laser amplifiers as they led to the fusion chamber, and listened as the professor breathlessly explained that when fusion was achieved, and they were very close, the business model included using the energy to create methane gas from carbon dioxide and water, which could then be pumped through existing pipelines to local electrical generating plants, homes, businesses, and service stations.

What I saw, though, were dimly lit rooms full of obviously hastily-made equipment, and when I saw that they were sorting the glass fusion pellets, which were hollow spheres to be infused with Deuterium and Tritium, on a rotating turntable, and that the tiny spheres were glass beads used in making cheap furniture, I was not impressed. After all, in my short lifetime I had seen Sputnik, vaccines, television, supersonic aircraft, lasers, holography, hydrogen bombs and men walking on the moon, so why not fusion? Pan-American Airlines was selling passenger tickets to the moon, interstellar travel was just around the corner, and the future was so bright, you had to wear shades. But this stuff looked cheap and improvised. In fact, looking back, I remember my primary reaction to their efforts as being disdain.

My ignorance and stupidity were, of course, astounding.

KMS Fusion had not only conceived of and were executing a plan to create nuclear fusion, but had figured out a way to make money from the deal. A lot of money, in fact.

Kip Siegel was already rich from his other companies, but the ability to literally turn seawater into fuel and feed the world's insatiable desire for energy promised to make both him and his investors much, much richer.

I find it hard to comprehend how much of our human-created world runs on cheap, plentiful energy. Energy heats our homes, drives our cars, composes our clothes and toys, powers our computers, and effectively separates us from the squirrels that live outside and die from wear and tear when they've reached a quarter of their potential lifespan.

Unfortunately, most of that energy comes from burning carbon that has been stored in the ground, and the sup-

ply of oil, like gold, nitrates for fertilizer, and human kindness, is finite. I look at old pictures of cities in the nineteenth century, and what I see is a dearth of trees. They had all been cut down for building material and for heating, and I neither want to go back to that world, nor visit places on earth where it still exists today, and as long as I have cheap energy, I don't have to.

Oil has been a wonderful boon to mankind. As I said, it has elevated us above the squirrels and made a large proportion of us very comfortable. The reason for that is its extremely low price.

If you calculate the amount of energy in a standard 42 gallon barrel of oil (1,700kWh), and compare that to the amount of power a human laborer can produce in one hour (250 W), you'll find that a single barrel of oil represents 3.4 years (at 2000 hours/year) of human labor. And you can buy that labor for less than one hundred dollars.

This means that you can expend three man-years of labor effort for every barrel of oil you use, and still come out ahead. You can support oil company executives, refineries, tankers, pipelines, drilling rigs, troops to guard the pipelines, and corrupt governments which occupy the oil fields, and still come out ahead. What you can't do is live on a planet with acid oceans and a CO2 atmosphere and expect to come out ahead. No one is selling vacation lots on Venus.

Kip Siegel proposed to bypass all that. Fusion would take radioactive Deuterium and Tritium out of seawater, fuse it into valuable helium (dirigibles, superconductor coolant), and generate enough power in the process to convert CO2 and water vapor into methane and oxygen, just like plants do, but a whole lot faster. Burning this methane would not add to the CO2 supply in the air, because it would be made from the CO2 that's in the air in the first place.

Relentless opposition from the government and from weapons labs made it difficult for Siegel to raise money from investors. He responded by cannibalizing his other companies to keep the research at KMS going. When he achieved fusion, on May 1, 1974, scientists in competing labs denied that he had succeeded. But in fact, in talking to one of my friends who had worked in the lab, KMS had achieved fusion, but were just an order of magnitude or so from the break-even point, where the amount of energy they got out was greater than the amount used to power the lasers. But they thought they knew how to fix the problem and could get past the break-even point.

By now, Siegel was nearly broke, but the penultimate nail was driven in when federal agents raided KMS and confiscated all materials relating to fusion research, on the grounds that information relating to nuclear energy was the exclusive property of the federal government.

Kip Siegel died of a stroke on March 14, 1975, while testifying before Congress in defense of his fusion research.

For the past forty years, the government has had a laser fusion research lab, and they say they'll be ready to turn on the lasers and ignite some Deuterium, maybe this year. Or may next. But you can be assured they're working on the problem. No plans for commercialization, though.

In any case, the human race needs to find an alternative to burning oil and coal, and the laser in my basement isn't going to do it. I don't think we can expect the government to provide an alternative, either. If they supported solar power or fusion the way they support oil, we'd have daily service on torch ships to Ganymede by now. I'm afraid we're going to have to do it ourselves, one solar panel, one windmill, one insulated house and one start-up at a time. It won't be as cheap as oil, but it won't cost nearly as much, either. And if we make this investment, you and I, if we steer the money away from the oil companies and the banks (which are busy investing your tax-funded bailout money overseas right now because the interest rates there are higher), then the future will be so bright, we'll need to wear shades.

Things Fall Apart

By Tom Ryan

Doug Nelle and Jack Brisbin and I were out under the stars last week, freezing our extremities off while trying to star test the club's 17.5" mirror. We have been refiguring it for the past year or so, testing it on a bench as it progressed, and it had finally arrived at a state where it warranted star testing. Hence, our foray into Leslie Park in the middle of a stunningly cold, snowy and overcast night. And unfairly, because we were all virtuous and lived good lives, we were encountering problems.

Jack had built a Dobsonian-style mount to hold the mirror. Because he hadn't wanted to spend a couple grand on making a real mount, he had re-used the base of the original mount, fabricated a straight box frame made of 1x2's for the tube, made a nine-point mirror cell with a sling, mounted an old focuser on the upper plate (all of which was a tremendous amount of effort), and was discovering that it didn't work.

I mean, nothing seemed to work. My first complaint, naive perhaps, because I don't normally observe through large scopes, was that I was too short to look through the eyepiece without standing on a ladder, which we didn't have. Jack couldn't do anything about my height, but I could have thought to have brought a ladder, don't you think? Then, the eyepiece focuser was too loose to hold the eyepieces steadily in place. Then, there was a huge amount of glare entering the eyepiece, because the top of the tube was open and the lights around Leslie Park had a straight shot into the eyepiece. Then, the tube was so far out of balance that it took a nose dive into the ground as soon as we let go of it. Then, the clips on the mirror cell were bending the mirror so much (Jack swears they applied no pressure to the mirror, but he tightened them with a 3/8" socket wrench, and that mirror was NOT going to fall out of the tube) that the star images were triangular.

One by one, we overcame the problems, but we got steadily closer to freezing to death as we did so. After about two hours of fixing one problem, only to encounter the next, when the clouds cleared off, the temperature started to seriously decline, and I could no longer feel my feet, we were finally ready to observe a star.

The mount did not have a drive to follow the stars (of course), so we had to push it along to follow our test star. In a basic Dobsonian mount, this is normal, and it normally works fine. In fact, it works so well that a cheap Dobsonian mount is the rival of equatorial mounts that cost twenty times more. But this one didn't work well. When we pushed on the tube to follow the star, the tube would lozenge and bend and the plastic bearings wouldn't slide, so when we released the tube, it would spring right back to where it had been, which was an empty field where the star had been before the earth's rotation carried it on its merry way.

As my brain descended into hypothermia, I realized that the tube had no diagonal braces to stiffen it enough to transfer the push we were giving it to the bearings. It was sort of like trying to drive your car by holding onto Slinkies attached to the steering wheel, and I realized that this was one problem we weren't going to be able to fix before we froze to death. Hypothermia was too, too near. We had worked as hard as we could, had made great progress and had overcome difficult obstacles and in the end, we had still failed. All we could do was pack up and go home. Fortunately, my car's accelerator pedal didn't require feeling in my toes to move the car around. (The engineers, who were extremely conservative, had worked on this problem for about 110 years and pretty much had it right, by the time they designed my car.)

We took a lot for granted in building this mount. When Jack and Doug and I were designing it, we never dreamed that the omission of a simple stick, used to diagonally brace the tube, would mean the difference between success and failure. We assumed that because Dobsonians have worked in the past, and because this mount looks very much like normal Dobsonians do, we can screw around with them and they'll still continue to work in the future. In fact, all of us assume that our jobs, our families, and the world in general, will continue on without bump or interruption, and one stick, or one law, or one word, added or taken away, won't make a difference. But it very much can make a difference. The future is not guaranteed to be a happy or successful place.

Everything we have, everything we see around us, is the end result of a long series of failures which finally succeeded because someone didn't give up. On the other hand, there are a lot of things that people work on which should fail. I'm sure you can think of a few. Broccoli-flavored ice cream and Sarah Palin for President are two things that pop immediately into my mind.

Walking out under a clear, dark sky and looking up at the stars can help to put things into perspective, and can help sort out the difference between what we should and shouldn't do.

At least, that's true when I'm not freezing to death.

In any case, Jack and Doug and I plan to add a stick or two to the mount and we'll try again. The end result, I hope, will be worth it.

No Charge Astronomy: Part I *A quick look at Freeware Astronomy Software*

By Mark S Deprest

A presentation and demonstration of a few Astronomy Software program that can be downloaded and used FREE of charge, a.k.a. Freeware. We will look at some of my favorites and most useful programs.

So, what is Freeware? Simply put it is software designed by people like you and I for people like you and I that cost nothing to download and use. Most of these programs are pretty simple and do one or two very specific things really well.

Safe download site: http://freeware.intrastar.net/astronmy.htm

The first couple of programs are very simply and specific, they do one or two things really well.

1. Messier Marathon (German) for a copy email me at msdeprest@comcast.net I will send you a zip file of the program or you can do a "Google" search for "Messier Marathon" and download it from www.zdnetasia.com

   This program will give you a text file of the proper observing order for a Messier Marathon any day of the year and any where in the world*.

   *with user supplied co-ordinates

2. Jupiter ver.2 (French) for a copy http://astrosurf.com/rondi/jupiter or the link above.

   This program shows you graphically the positions of the Galilean moons of Jupiter and the position of the GRS. The program also produces very nice spiral ephemeris charts (printable) of the Galilean moons positions for a user specified time period.

3. Mars Previewer II (USA) for a copy see the link above.

   This program shows the face of Mars for a user specified place and time. (printable)

4. Virtual Moon Atlas ver. 5.0 (French) for a copy http://astrosurf.com/avl or the link above.

   This is an impressive full feature Virtual Atlas of the Moon that no Lunatic should be without. Although the download time & size of the catalogs is a bit long & large (14 different catalogs of images & feature plus the program itself totals 645MB) (printable)

5. Stellarium ver. 0.10.2 (French) for a copy www.stellarium.org or the link above.

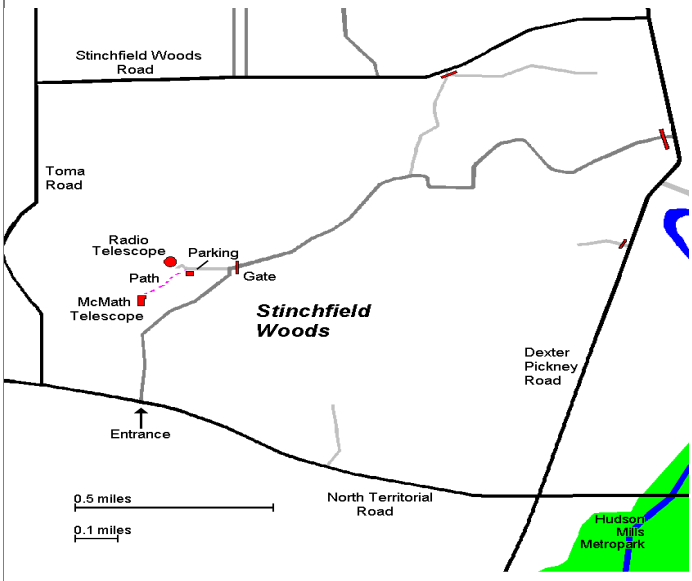
   This a graphics laden planetarium program that is a great learning tool for beginners; and a wonderful program to display realistic skies any time and any where in the world. Many catalogs to download and add on, heavily graphic based so, it may take some time to download.

These programs are tested and bug and virus free to download and share. I hope you enjoy these as much as I do. I have many other freeware programs, so this talk might become a series of 3 or 4 … stay tuned.

Places & Times

Dennison Hall, also known as The University of Michigan's Physics & Astronomy building, is the site of the monthly meeting of the University Lowbrow Astronomers. Dennison Hall can be found on Church Street about one block north of South University Avenue in Ann Arbor, MI. The meetings are usually held in room 130, and on the 3rd Friday of each month at 7:30 pm. During the summer months and when weather permits, a club observing session at the Peach Mountain Observatory will follow 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 which is maintained and operated by the Lowbrows. The observatory is located northwest of Dexter, MI; the entrance is on North Territorial Rd. 1.1 miles west of Dexter-Pinckney Rd. A small maize & blue sign on the north side of the road marks the gate. Follow the gravel road to the top of the hill and a parking area near the radio telescopes, then walk along the path between the two fenced in areas (about 300 feet) to reach the McMath telescope building.



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 $20 per year for individuals or families, $12 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 $12 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

c/o Liz Calhoun

P.O. 4465

Ann Arbor, MI 48106

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

Sky & Telescope - $32.95 / year

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

For more information contact the club Treasurer. Members renewing their subscriptions are reminded to provide the renewal notice along with your check to the club Treasurer. Please make your check out to: "University Lowbrow Astronomers"

Newsletter Contributions

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

Call or Email the Newsletter Editor: **Mark S Deprest (734)223-0262 or msdeprest@comcast.net** 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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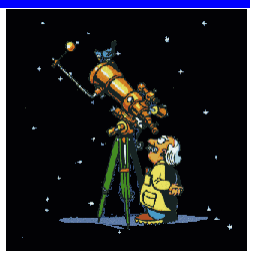
Reflections & Refractions



Website
www.umich.edu/~lowbrows/

Coming Soon

To a Star Party Near you!

Image by Doug Scobel

University Lowbrow Astronomers
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Check your membership expiration date on the mailing label