REFLECTIONS / REFRACTIONS

University Lowbrow Astronomers

October 2008

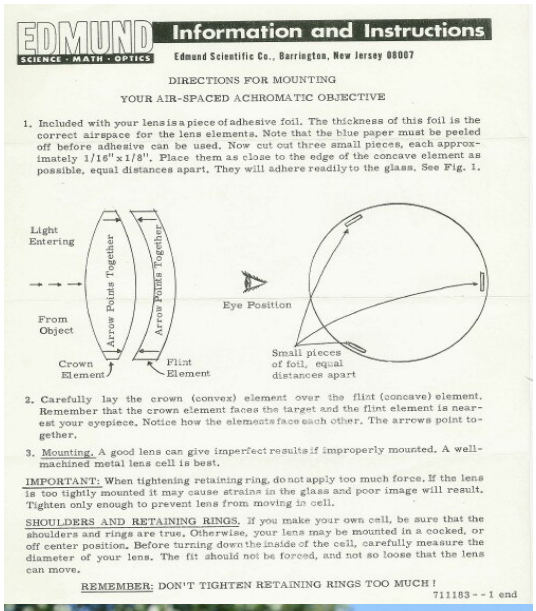
Volume 32 Issue 10

My First Telescope

By Donald Fohey

Many of the first's in life are fondly remembered. For many it's their first car and for astronomers it's their first telescope! I still have mine, stuffed in the rafters of the basement and in a moment of sappy nostalgia, I pulled it down to take a look at it. I made it in either 1968 or 1969. I will never forget that first view of Saturn's rings through this telescope. It also provided my first view of Jupiter and it's Galilean moons. It still works every bit as good as it did 40 years ago.

A casting resin was used, some kind of epoxy, glass cloth in a 2 inch wide roll, plumbing pipes and plumbing drain tubes. I did have limited access to a metal lathe at my college job internship. The project was built from lenses and booklets from Edmund Scientific which is still in business today!



EDMUND SCIENCE · MATH · OPTICS **Information and Instructions**

Edmund Scientific Co., Barrington, New Jersey 08007

DIRECTIONS FOR MOUNTING
YOUR AIR-SPACED ACHROMATIC OBJECTIVE

1. Included with your lens is a piece of adhesive foil. The thickness of this foil is the correct airspace for the lens elements. Note that the blue paper must be peeled off before adhesive can be used. Now cut out three small pieces, each approximately 1/16" x 1/8". Place them as close to the edge of the concave element as possible, equal distances apart. They will adhere readily to the glass. See Fig. 1.

2. Carefully lay the crown (convex) element over the flint (concave) element. Remember that the crown element faces the target and the flint element is nearest your eyepiece. Notice how the elements face each other. The arrows point together.

3. Mounting. A good lens can give imperfect results if improperly mounted. A well-machined metal lens cell is best.

IMPORTANT: When tightening retaining ring, do not apply too much force. If the lens is too tightly mounted it may cause strains in the glass and poor image will result. Tighten only enough to prevent lens from moving in cell.

SHOULDERS AND RETAINING RINGS. If you make your own cell, be sure that the shoulders and rings are true. Otherwise, your lens may be mounted in a cocked, or off center position. Before turning down the inside of the cell, carefully measure the diameter of your lens. The fit should not be forced, and not so loose that the lens can move.

REMEMBER: DON'T TIGHTEN RETAINING RINGS TOO MUCH!

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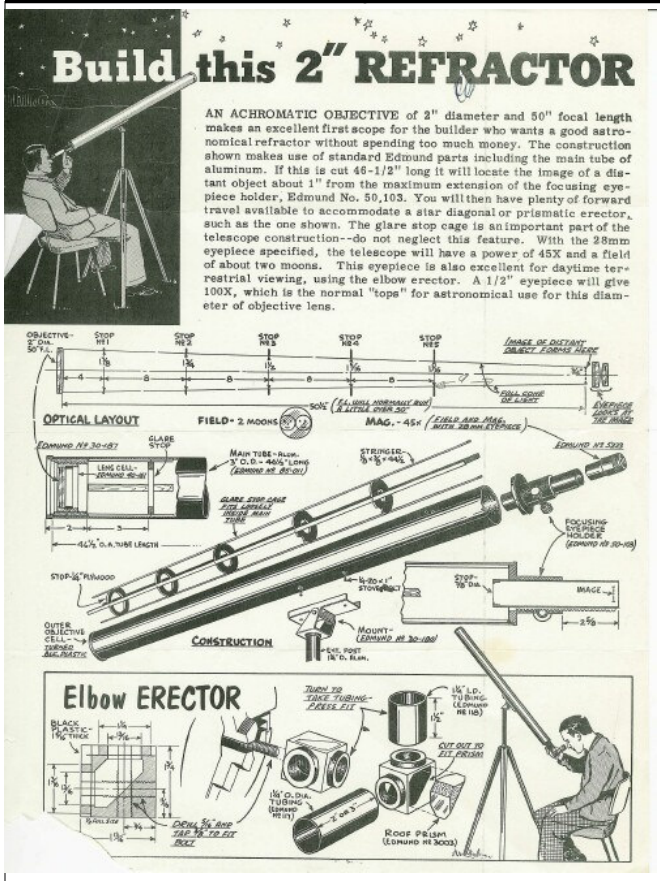
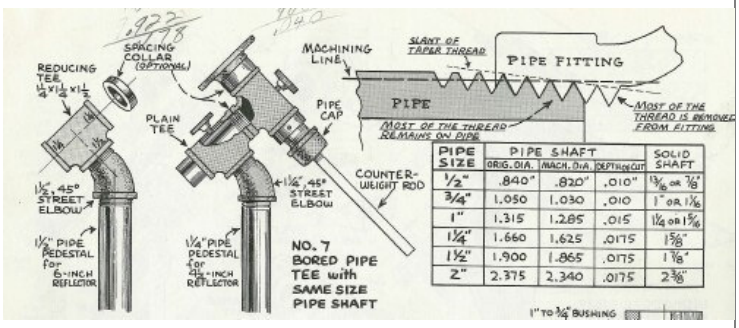
Objective Lens

The objective lens is a 2 inch diameter 50 inch focal length air spaced achromatic lens. Yes that is an f25 objective. The lens cell was made by casting resin into concentric tin cans and then machining with a lathe to obtain the final dimensions.



Tube

The tube was built from the basic Edmund plan. It was made by wrapping the wood stringers with 2 inch wide glass cloth and then coating the glass with an opaque brown epoxy. I remember this being very messy as the epoxy dripped off the tube as it was curing.



Mount and Tripod

The tripod and mount construction followed direction from the famous Edmund booklet No 9082 “Mounting Your Telescope”. Pipe and pipe tees were machined on a lathe to make the equatorial mount. The counter weight was made by melting and combining tire balancing weights. At that time without consideration of lead poisoning.

Eyepieces

The light cone of an f25 lens doesn’t place a high demand on an eyepiece and a ½ inch f.l. eyepiece will yield 100 magnification. I purchased from Edmund plano convex lens pairs for Ramsden eyepieces. The lens mounts were made from casting resin and then assembled into tubes cut from 1 ¼ inch drain tube. Focus was obtained by sliding in and out a section of telescoping drain tube.

Sizing Up the Moons of the Solar System

By Jason Maguran

Ever since I was about ten years old, I liked observing the moon, and liked watching it progress through its phases throughout the month, especially once I understood why it did so. But ever since I really took an interest in astronomy when I was a teenager, I often wondered why we have only one moon, while many of the other planets in our solar system have several moons orbiting them. What if we had more than one moon? "That would be pretty cool, to see several moons in the night sky," I thought. What a sight it would be to see the night sky as it might be seen on Jupiter, Saturn, or Uranus! Can you imagine seeing so many prominent objects in the night sky? I know those of you who relish the dark, moonless nights for observing galaxies and nebulae are cursing me for making such a statement, because it would be a rare occasion indeed to have a moonless night on one of those planets.

Well, that idea got me thinking. Would the other moons really appear as large and prominent as our own? I've seen tables showing the diameters of the various moons of our solar system, which give a great comparison of the size of them compared to our own moon. Ours is one of the larger moons in the solar system, but certainly not the largest. But these tables don't give any idea of how these moons would appear in the sky as viewed from the respective planets they orbit, or how they would compare to the apparent size of our moon in the Earth's sky. Would the largest moons appear small in the sky or the smaller moons appear large? The moon tables usually also gave the distances of the moons from the planets they orbit. I thought, "This information, along with a bit of my high school trigonometry should give me an idea."

In my first draft of this article, I had compared the apparent size of a given moon to that of our own, without really defining "size". I then realized that some who may read this would consider "size" to mean diameter, while others would consider it to mean area. Therefore, I included both comparisons for each given moon.

Earth

We'll begin at home with our own moon. With a diameter of 3,476 km (2,160 mi) and an average distance from us of 384,400 km (238,850 mi), it spans 31.1 arc minutes, or just over ½° in the night sky at its largest (full phase).

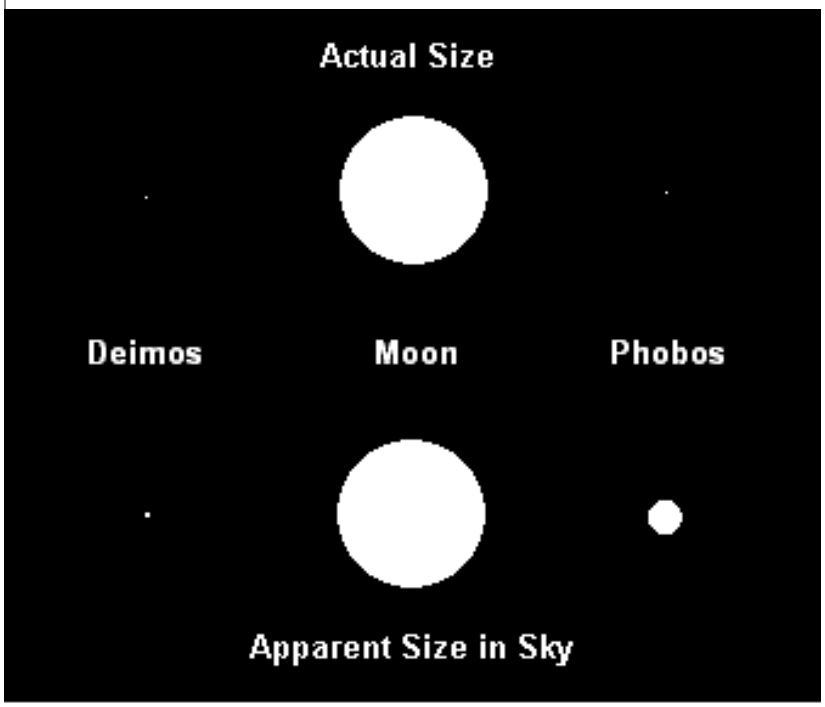


Figure 1: Moons of Mars

Mars

When I was a teenager, I also had wondered why we can't see the moons of our closest neighboring planet. After all, we can easily see the Galilean moons of Jupiter with a good pair of binoculars, and they're much further away from us than the moons of Mars. After discovering those moon tables many years ago, I realized that the moons of Mars are both too small, and too close to the planet to be seen from Earth, at least with any equipment I would likely ever own. But what would they look like from the Martian surface? At 7.4 arc minutes, Phobos would appear about ¼ of the diameter (6% of the area) in the Martian sky as our moon appears in our sky. At 1.2 arc minutes, Deimos would merely look like a bright star, about twice the diameter of Jupiter in our sky. A visual comparison of the moons' actual size versus the apparent size in the sky as viewed from their respective planets is shown in Figure 1.

Jupiter

Since the Galilean moons of Jupiter are so large that they can easily be seen with a good pair of binoculars, I figured that they must be massive in the Jovian sky. However, this is not the case. Io would appear as the largest moon in the Jovian sky, which would be slightly smaller than our moon appears in our sky. Europa and Ganymede would each appear about half of the diameter (¼ of the area) of our moon, and Callisto would appear about ¼ of the diameter (6% of the area) as our moon. A visual comparison of the moons' actual size versus the apparent size in the sky as viewed from their respective planets is shown in Figure 2.

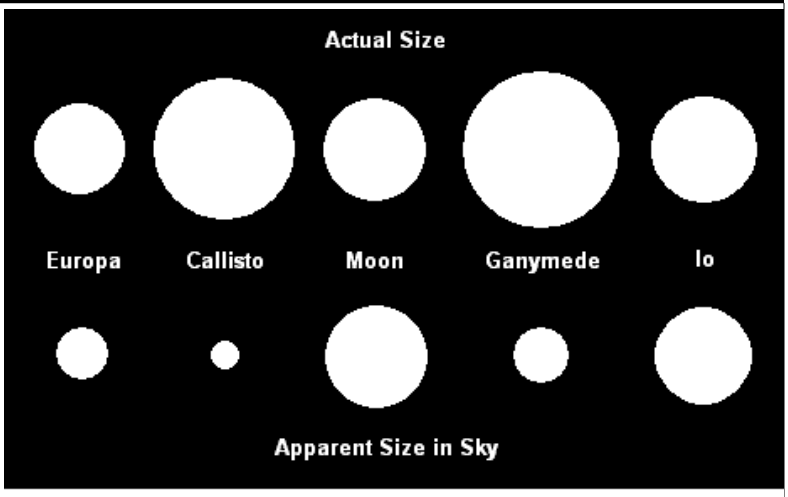


Figure 2: Moons of Jupiter

Saturn

Saturn is the planet with the greatest number of significant moons, which also have the greatest variation of apparent sizes in the night sky. Titan is Saturn's largest moon, and also happens to appear the largest in the Saturnian sky at slightly less than half the diameter (¼ of the area) of our moon in our sky. Next is Tethys, which appears a bit smaller than Titan. Dione and Rhea both appear about ⅓ of the diameter (11% of the area) of our moon. Enceladus and Mimas are next, appearing about ¼ of the diameter (6% of the area) of our moon. The remaining three moons, Hyperion, Iapetus, and Phoebe, would appear as no more than stars in the Saturnian sky. Hyperion and Iapetus at 0.5 and 1.4 arc minutes respectively, would be fairly bright, while Phoebe at less than 4 arc seconds, would be much smaller and fainter. A visual comparison of the moons' actual size versus the apparent size in the sky as viewed from their respective planets is shown in Figure 3.

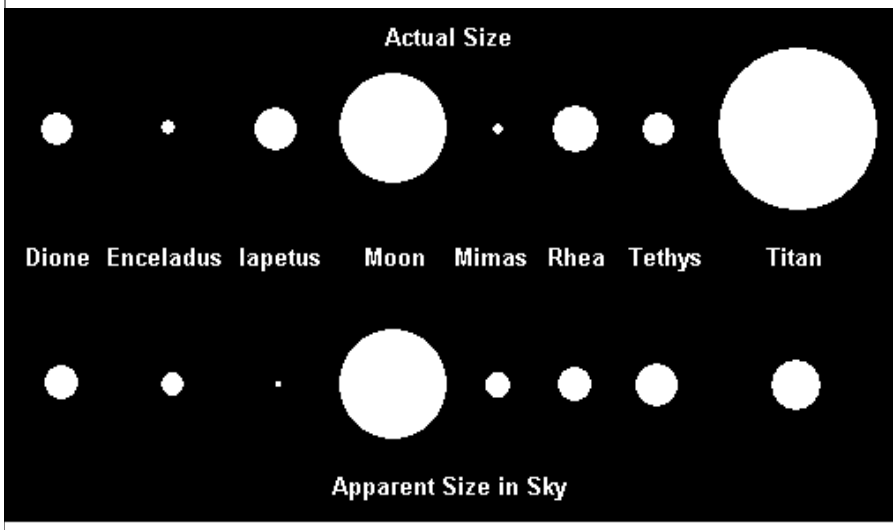


Figure 3: Moons of Saturn

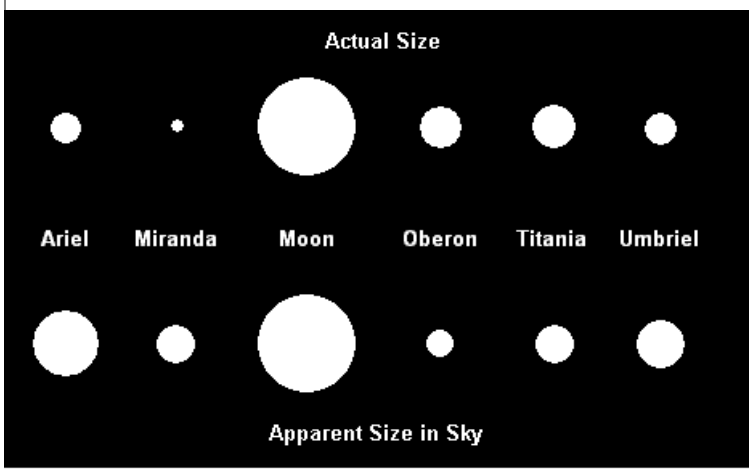


Figure 4: Moons of Uranus

Uranus

The moons of Uranus seem to appear closer together in size in the Uranian sky than the other planets' moons. The largest would be Ariel at ⅔ of the diameter (44% of the area) of our moon in our sky, then Umbriel at ½ of the diameter (¼ of the area) of our moon. Miranda and Titania would appear the same diameter in the Uranian sky at 40% of the diameter (16% of the area) of our moon in our sky. Oberon is the largest moon of Uranus, but it would appear as the smallest in the Uranian sky at a little less than ⅓ of the diameter (11% of the area) of our moon in our sky. A visual comparison of the moons' actual size versus the apparent size in the sky as viewed from their respective planets is shown in Figure 4.

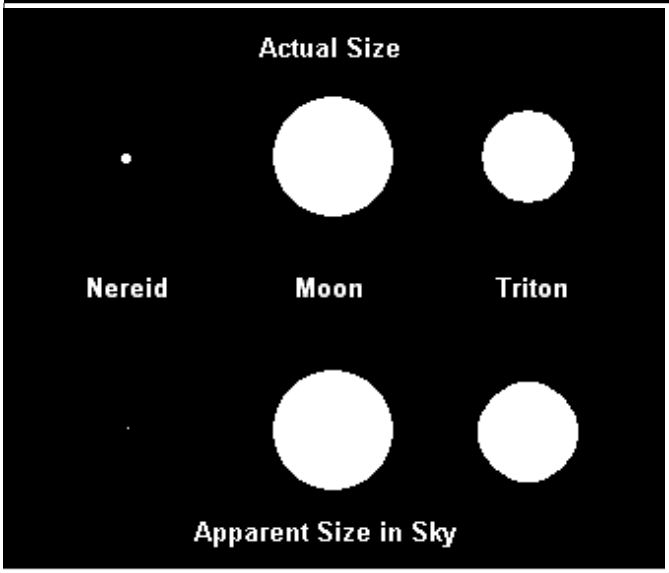


Figure 5: Moons of Neptune

Neptune

Neptune's largest moon, Triton, would also appear as one of the larger moons at about 84% of the diameter (71% of the area) of our moon in our sky. Nereid would merely appear as a bright star in the Neptunian sky. A visual comparison of the moons' actual size versus the apparent size in the sky as viewed from their respective planets is shown in Figure 5.

Neptune is the last planet that I will cover in this article, since Pluto is no longer considered to be a real planet. Actually, that's not really why, especially since I think Pluto should retain its planet status because it has been considered a planet for over 75 years now. The real reason is because Pluto and Charon really behave more like a binary planet system because they are closer in size to each other, as well as closer to each other than most moons are to the planets which they orbit. A summary of the moons' sizes, distances, actual sizes, and apparent sizes is shown in table 1 below, for those of you who just have to have the numerical data.

Table 1: Planetary Moon Data

Planet	Moon	Distance from Planet (km)	Distance from Planet (mi)	Diameter (km)	Diameter (mi)	Apparent Size in Sky (arc min)[1]	Relative Diameter[2]	Relative Area[3]
Earth	Moon	384,000	238,850	3,476	2,160	31.1	100%	100%
Mars	Phobos	23,460	14,577	8	5	1.2	3.8%	0.1%
	Deimos	9,270	5,760	20	12	7.4	24%	5.7%
Jupiter	Callisto	1,883,000	1,170,045	4,800	2,983	8.8	28%	7.9%
	Europa	670,900	416,879	3,126	1,942	16.0	52%	27%
	Ganymede	1,070,000	664,869	5,276	3,278	17.0	55%	30%
	Io	421,600	261,971	3,629	2,255	29.6	95%	91%
Saturn	Dione	377,400	234,506	1,120	696	10.2	33%	11%
	Enceladus	238,020	147,899	498	309	7.2	23%	5.4%
	Hyperion	1,481,000	920,253	226	140	0.52	1.7%	<0.1%
	Iapetus	3,561,300	2,212,895	1,436	892	1.4	4.5%	0.2%
	Mimas	185,520	115,277	398	247	7.4	24%	5.6%
	Phoebe	12,952,000	8,048,020	220	137	0.06	0.2%	<0.1%
	Rhea	527,040	327,488	1,528	949	10.0	32%	10%
	Tethys	294,660	183,094	1,060	659	12.4	40%	16%
	Titan	1,221,850	759,224	5,150	3,200	14.5	47%	22%
Uranus	Ariel	191,240	118,831	1,160	721	20.9	67%	45%
	Miranda	129,780	80,642	472	293	12.5	40%	16%
	Oberon	582,600	362,012	1,526	948	9.0	29%	8.4%
	Titania	435,840	270,819	1,580	982	12.5	40%	16%
	Umbriel	265,970	165,267	1,190	739	15.4	50%	25%
Neptune	Nereid	5,513,400	3,425,876	340	211	0.21	0.7%	<0.1%
	Triton	354,800	220,463	2,705	1,681	26.2	84%	71%

Footnotes:

1)Relative size in arc seconds as observed from the respective planet. 2)Ratio of diameter relative to our moon as viewed from Earth.3)Ratio of area relative to our moon as viewed from Earth.

A Visit to Mauna Kea

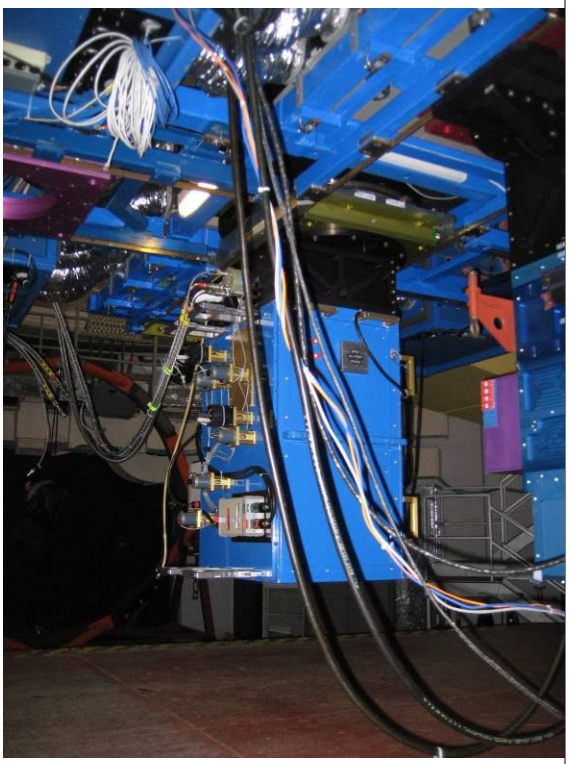
By Arthur Suits

Last December, my work took me to Hawaii (you gotta do what you gotta do), and I decided to take the opportunity to see all the glass on top of the Mountain on the Big Island. Fortunately, a colleague was able to connect me with Prof. Alan Tokunga, who is Director of the NASA/UH Infrared Telescope Facility, a 3.0-m telescope and one of the first built on the summit of Mauna Kea. Prof. Tokunaga kindly arranged for me to receive a guided tour, and in what follows you may share in that experience.

On reaching the summit (13,796 feet), a somewhat arduous drive only permitted for 4WD vehicles, you will see a remarkable sign with some familiar names. Note they seem to have strange shotguns there.

A view looking down on Keck and Subaru. Don't bother visiting Keck, you are only admitted to the lobby, where you can see nothing and can only press a button to hear the same tape that is played on their web site.

(above) The IRTF and the 3.0 m telescope. Here we have a view from below up toward the secondary.



(right) The large blue box is a detector in use. These can be swapped out readily as visitors come with their own instruments.

The azimuth drive gear and my guide, Lars Bergknut, Observatory Foreman.

Telescope control panel. Hasn't changed in 30 years, but then, it hasn't needed to.

(above left) Lars showing 9-inch floppies still in use for the control LSI-11 computers. Again, if it ain't broke…Ahh, takes me back to my youth.

(above right) Back down to the visitor center at dusk. There are a number of scopes available for public viewing at 9000 feet including a number of big SCT's and an AP refractor. You can freely commandeer these. Nice views, but there are cars coming and going so don't expect too much.

Imaging Quest

By Belinda Leeb

The cool part of astronomy is all the great things you get to see. The hard part is sharing it with friends who don't have the same interest. Yes, at times they'll humor you and stand outside for a while but the bugs, cold, time of day or many other factors limits them in seeing those amazing starry sites. So, the next best thing is having pictures.

Now, Hubble has made sharing what you see a whole heck of the a lot easier. But, that is cheating it really isn't what most of us get to see. So, why not take a picture! After all how hard can taking a picture be, right! But, we know better than that, imagine is a lot of work. But, there has to way to take pictures that isn't complicated, right.

Well, the first is trying hand held shots. It works if you have a steady hand, which I don't but my view partner does. So, that what we or should I be honest and say he did. This is a sample of the early results.

Please note that this is an unedited photo. My partner in crime has steady hands the type of which that cuts things to save there lives whereas the folks like me cut things that dead or soon will be dead. None the less, it certainly gives one something that can be shared with! But, what about more!

Well, knowing that CCD offers even more possibilities it was the next logical step. It certainly has its' share of challenges. And yes there is one we are playing with but so far the images are not anything great.

But, there is an alternative to those fancy CCD a plan old webcam produced this image of Jupiter. Once a again a bit of creativity leads to some nice results!

One day there will be images from the CCD but in the short term this is great!

Editor's Note: *I want to thank everyone who has written articles over the past few months and want to let you know that if you haven't yet seen your article in a newsletter, please don't think I forgot of lost them.*

As the editor I have to try and make things fit into a specific format. Size, content and time sensitivity all weigh in as factors toward choosing the which articles or pictures make in into a specific newsletter.

Up-Coming Newsletter Articles:

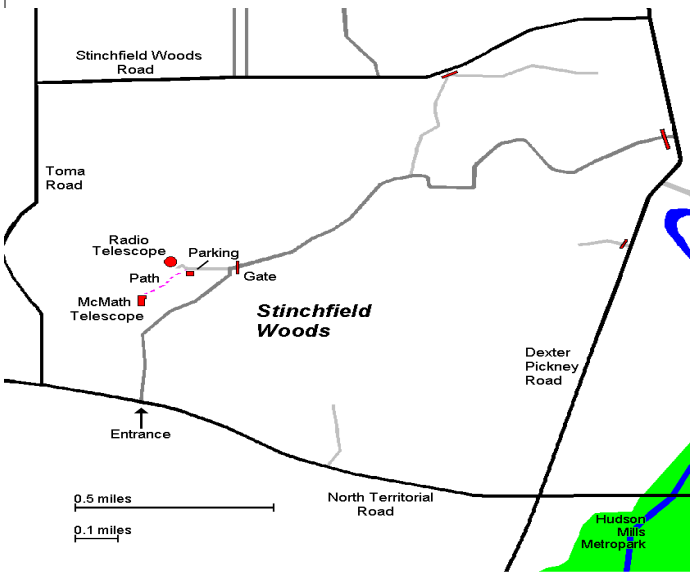
- A Simple Heads-Up Display— by Tom Ryan
- Why go to a Star Party— by Doug Scobel
- One Night at Tomahawk Creek— by Mark Deprest
- You're Welcome & Thank You— by People we have connected with.

Thank You All for Supporting your Newsletter!

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 Astronomer c/o Yasuharu Inugi

2918 W Clark Rd #203
Ypsilanti, MI 48197

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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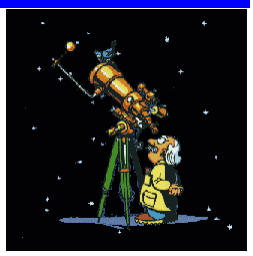
Reflections & Refractions



Website
www.umich.edu/~lowbrows/

No trip to the Big Island is complete without a visit to the Volcano Park. Things were hot that day. *Images by Arthur Suits.*

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Check your membership expiration date on the mailing label