



REFLECTIONS AND

REFRACTIONS

OF THE UNIVERSITY LOWBROW ASTRONOMERS

February 2005

Upcoming Events February 2005

- **Saturday, March 5, 2005.** May be cancelled if it's cloudy or too cold. (Starting at Sunset). Open House at Peach Mountain.
- **Friday, March 18, 2005.** (7:30 pm). Monthly Club Meeting. Fred Schebor (University Lowbrow Astronomers): "Artsy, Meaningless Slide Show."
- **Saturday, April 2, 2005.** May be cancelled if it's cloudy or too cold. (Starting at Sunset). Open House at Peach Mountain.
- **Saturday, April 9, 2005.** May be cancelled if it's cloudy or too cold. (Starting at Sunset). Open House at Peach Mountain.
- **Friday, April 15, 2005.** (7:30 pm). Monthly Club Meeting. Election and Swap Meet.
- **Saturday, May 7, 2005.** May be cancelled if it's cloudy or too cold. (Starting at Sunset). Open House at Peach Mountain.
- **Saturday, May 14, 2005.** May be cancelled if it's cloudy or too cold. (Starting at Sunset). Open House at Peach Mountain.

Shudda Planned Better ...

The Making of a Newtonian Telescope

by John Horton

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'Saturday Morning Physics'

Complete Schedule

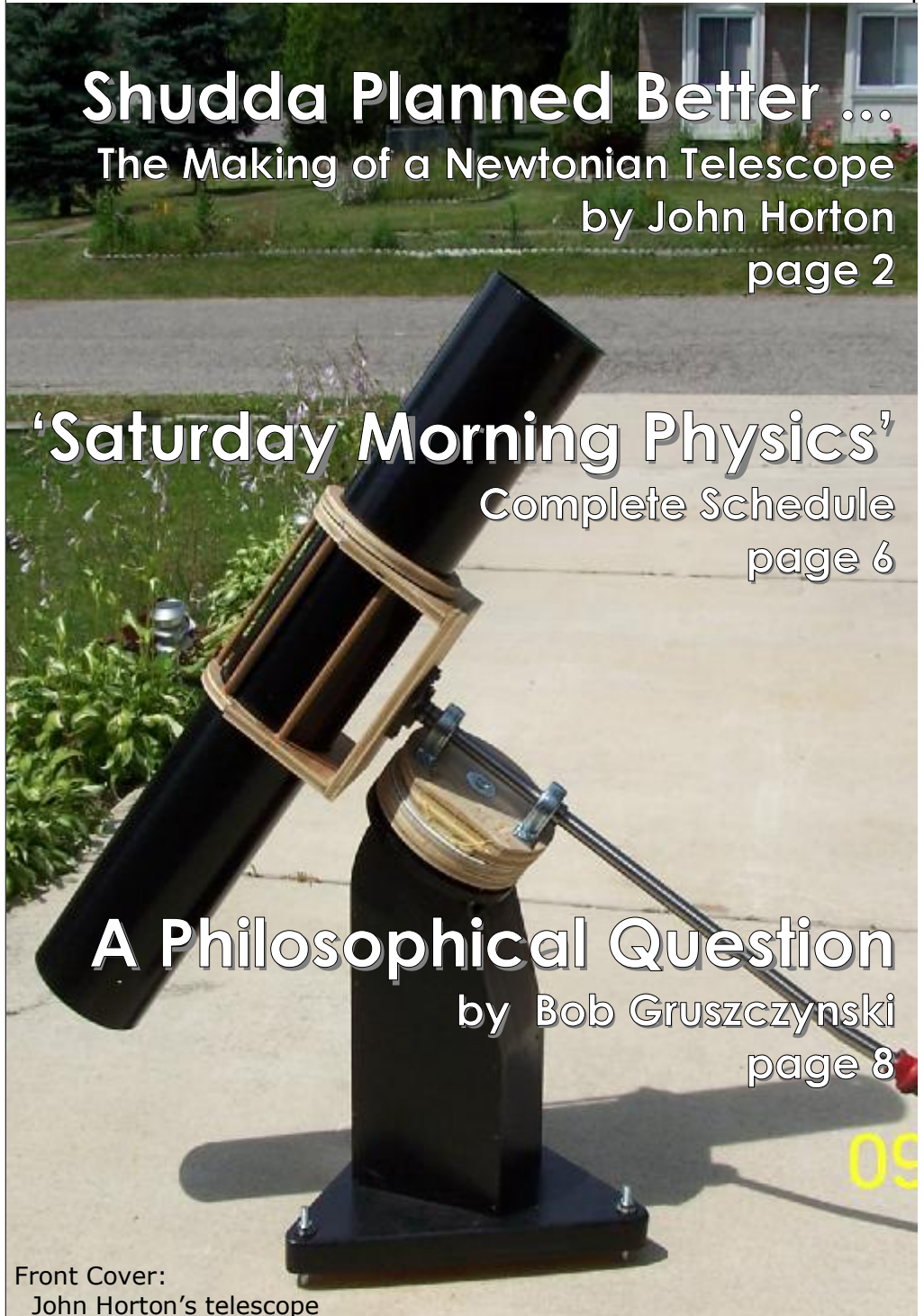
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A Philosophical Question

by Bob Gruszczynski

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Front Cover:
John Horton's telescope



I Shudda Planned Better The Making of a Newtonian Telescope

by John Horton

Once upon a long time ago, actually 1969. I bought a 6-inch mirror making kit from Edmund Scientific for an amazing price of \$19.95. I got a 55-gallon drum. Filled it with water. Following directions as I remember. I started grinding and had to place the drum on three pieces of wood to keep the drum from tipping. From what I remember the drum kept tipping anyway. So I reduced the pressure I was placing on the mirror and the tool. After an hour I had about an area the size of a half dollar (remember those!) scratched up in the center of the glass. Lots of work. Lost interest very fast! I put the mirror kit away and thought some day that I may get back to it. That day never came due to living life!

Now 35 years later I WANT TO MAKE A TELESCOPE again! I got Berry's book on How to make a telescope. I decided to make a Newtonian type. So I took a short cut and ordered the optics, focuser, spider on Ebay. Mirror cell from University Optics. Tube and wood from Home Depot So far I have about \$200.00 into this project. Could I buy a 6" scope for this price? Nope sure can't. Go John, Go. Reading Berry's book I decided to make the German mount type.

It works and is functional, 'taint pretty.

I bought some good 3/4 inch Birch plywood that Home Depot cut in two by four strips for me. I took the wood home and put in the garage. I got out a tablet and started drawing out the pieces of plywood needed to make the pier and polar head. Woops I forgot the Teflon and the Formica! Ordered the Teflon thick from a vendor on the Internet. The thinnest I could find was a 1/16 and bought it. Formica more about that later. I started laying out the Tube and did a 1 to 1 scale drawing. Measuring the parts and figuring the placements was easy. Assembly will tell if it was easy or not.

Start woodworking. Marked off the parts to maximize the use to the plywood. Lots of angles and curves. Many inside the edges straight lines that I may be able to cut using a circular power saw. Nope not that good. Go buy a nice table saw, yea a table saw and I can use it

for other things too. Go John, go. To Lowe's and get a table saw and a table drill press 'cuz you'll need it too. Uh huh. Well there is at least two hundred dollars more into this homemade scope. (Your going to spend more, bet on it.)

I started cutting out the wood that I laid out. Saw dust every where! Since I just purchased a ShopVac that suited this purpose quite well. What is 40 bucks among friends anyway? The pier turned out not to be to bad. Now, to drill the holes for the threaded rods. What threaded rods? Consult Berry's book again. Oops Hardware! Back to Lowe's because I did not remember or list the things I needed. Took Barry's book with me and I set out for Lowe's fortunately only a couple of miles away. What's another 25 or 30 Dollars? Keep on spending its needed anyway since I did not have the necessary stuff.

All these pieces don't quite fit. They need to be modified somewhat. Ah huh a belt sander would work nicely since I didn't have one! What is another 80 Dollars (El Cheapo too. I will pay for that later too.) Where in the hell am I going to put that thing! Well the drill press is setting on a roll-a-round cart. Good I just turned the top tray upside down and place the sander on it. Fine sawdust every where! By this time the leaves started falling and there were plenty too. Man leaf raking is lots of work. Hey a Leaf blower would fit the bill and could blow away all that dust too. Oh well there goes an other hundred dollars.

The Formica was given to me by a counter top and cabinet shop out on Carpenter Rd. It was 2 feet by 8 feet sheet of Formica and I mounted it on the plywood and proceeded to cut out the polar mount circles. I still have plenty left for other projects.

I did the polar head twice for several reasons. My first attempt to cut circles was with a power hand jigsaw and the circle was not too smooth at the edges. They slightly resembled circles that I tried to use the sander on and came close. I will take that. Now to drill the holes. I needed a half-inch drill and did not have one

and went to Harbor Freight and purchased a set of drill that went up to a half inch. The drill press could not take the 5-inch radius I needed for the polar headboards. I went back to Harbor Freight and purchased a drill guide to drill the holes straight. Ha! Holes drilled, edges sanded and Teflon cut lets partially assemble this puppy! What is this wobble when I spin the wooden disk around. Hole not perpendicular to the plane of the wood. How could that be I used a drill guide! Anyway to make this work, yes re-drill the holes. I cut some half-inch wood dowels and glued them in and sanded them off since I have a sander now. I know why they call them craftsmen who do this kind of work. Preparation is the biggest help. If your careful.

The polar head was assembled and seemed to work ok. Mount that puppy to the pier. Some of the hardware was hard get sockets on as the pier base was off some what due to my estimation on how wide to make the pier box that stood upright. Too wide. It kind of worked. I accepted that and started on the rest of the polar head and cradle parts I made the pillow blocks in Berry's book. Tried to mount the polar head and the cradle and needed at least 3/8 of more height on the V's on the base side to align up properly. Also this did not rotate properly. The two-inch pipe and the mounting flange were not square and would wobble and could not be used even if the pillow blocks were made properly. I scrapped this idea and decided to redesign the cradle mount and pillow block arrangement. I needed some kind of rod to mount to the head to be 90 degrees from the North Star. I looked for several things that would work and finally settled on a one-inch drill rod for the polar axis. Boy, that was heavy. I should have had a clue then. I purchased the pillow blocks at Granger one a panel mount and two standard pillow blocks to fit the drill rod. And that worked nicely, kind of. I won't tell that cost me.

Mounted the tube to test the cradle and it was too tight. Some of the circular part of the cradle needed to be in large. My sander provided the instrument to do that. I promptly enlarged one end too much and had glue some thick felt to work properly.

The second set of the polar circles I used my router and made a circle guide out of some 18-gage stainless steel that I had. Several holes later and some counter sinking I had made my circle cutter. I worked well and I had cut them to go with the drill press that I had. I used forester bits with my drill press to do the

½ inch holes for the polar mount. (Thanks Costco) Oh well. I used the forester bits for the other holes in the polar and cradle mount.

I had to knock of the old pillow blocks and Gorilla Glue works great. Too great in this case. I should have used screws to mount them. I mounted the pillow blocks on their respective places. I had to re-mount the panel pillow blocks and drill new holes in the cradle base. With this done this arrangement seemed to work fine. I should have known that Murphy was lurking in my garage.

I decided to modify the base as to adjust for the polar alignment. I purchased some ½-threaded rod and cut them into 8-inch lengths. I drilled the pier base to accept them and added the hardware to hold them. I could at least have some minimal adjustment for the polar axis. This work well, especially if moving to a hard area that is fairly level. I may have several degrees to play with.

The cradle was mounted to the pier. The tube was mounted to the cradle after it was painted. The polar mount was adjusted so that I had it aimed at Polaris. After I modified the pier base to give me a much better chance of seeing Polaris. I was off by about 15 degrees and could not adjust the pier and polar mount to see Polaris. Several other problems appeared at this point. Anybody ever heard of balancing the scope. I had an opportunity to learn it by practicing on keeping my in the cradle and on looking at a star field. I think I will modify the tube to get weight at the mirror end as to offset the focuser, eyepiece and view finder(s) that I may add.

Balancing is a dynamic process to keep every thing in its proper place. I had the scope start moving as soon as I found something to look at. How annoying!

Finally I had to change the drill rod for something lighter. I spent several days going places to look for something that would work. I found an aluminum paint extension handle at Lowe's that would fit the pillow blocks. Then the cradle kept moving as some misalignment is allowed for panel mounted pillow blocks. The answer to this was to drill a 1-inch hole in the cradle base and to pin the declination axis rod to the cradle base. This worked well. I needed some kind of brake to prevent the tube rotating on the polar axis. I came up with clamp made of wood and installed behind the first pillow block that I could tighten at will. This arrangement works well at present.

I had been watching the ATM list and had followed the thread on columniation of Newtonian scopes.

I calumniated the scope. And that night I saw 'first light' and was thrilled to be using My Scope. I sure have learned a lot about telescopes and craftsmanship during this year.

Pictures are of an earlier stage of the scope as the tube had been painted and all the optical equipment was removed before painting. Also a new polar head and declination axis has been added. Also a star finder thingie more to balance!

Would I do it again? Now that I have most of all the tools needed to do the job, a resounding yes! I have been toying with the idea to grind my own mirror

perhaps a 6 or 8 inch. Perhaps silvering my own mirrors. Why, just because I can. I would like to try anyway just to see if I can. If James Lerch can so can I. I don't have all the equipment he has and it will be a task of unending scrounging and yard sal-eing and possibly making a lot of mistakes. But the pride I felt looking at the heavens for the first time with my scope was indescribable.

The cost is well over \$600 now and I could have bought a nice scope for that and not used up a lot of time having the fun of doing my own scope.

Well, what do you want from an Amateur? Perfection?
Dark Skies to you. ●

Figure 1 Cradle, declination axis pillow blocks on old polar head



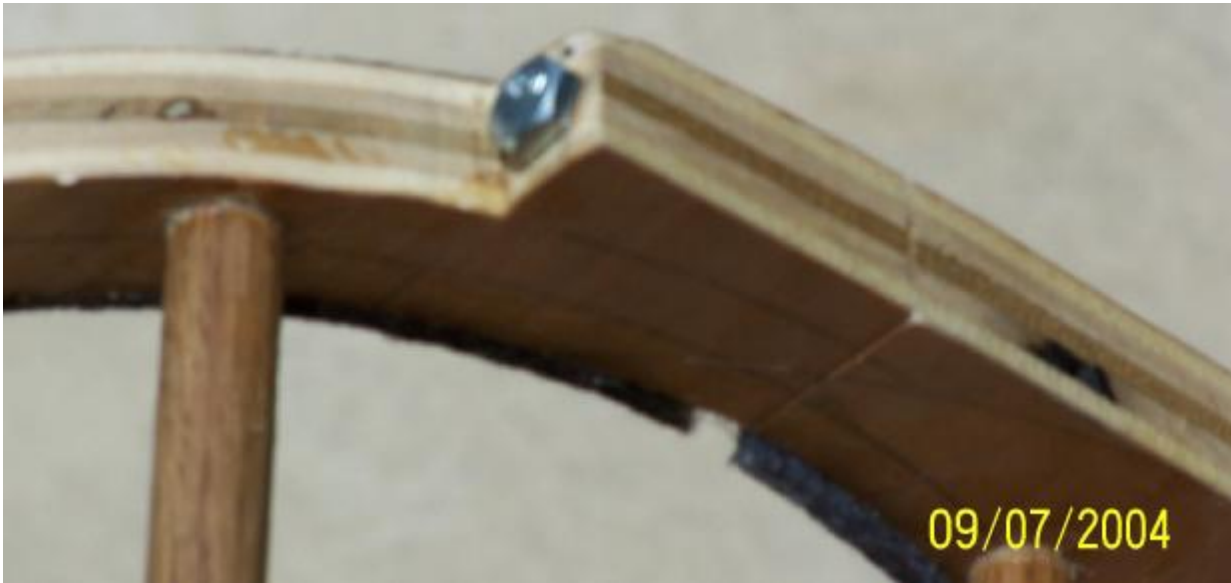


Figure 2 Felt ring to allow the tube to be turned in the cradle.



Figure 3 Polar alignment and or leveling screws.



Figure 4
Bubble
level



Figure 5 First picture of the moon hand holding my new digital camera just back from my 25 mm eye-piece.

Saturday Morning Physics

The following information was taken from <http://www.physics.lsa.umich.edu/nea/smp/> (go there for more information).

Saturday Morning Physics is a series of talks held on selected Saturdays. They are held in room 170 of the Dennison Building (Physics/Astronomy Building) at 10:30AM on the indicated days. All talks are free and refreshments will be served from 10:00 to 10:30 AM before each talk begins. Each talk is illustrated with multimedia technology and live demonstrations. These presentations are for the passionately curious; each talk should be understandable even if you don't attend all the talks.

Most of Winter 2005 talks are astronomy related.

Saturday, February 12, 2005

Life Sciences Institute Dr. Jeanne Stuckey

Physics to Pharmaceuticals

Since 1895, X-rays have been used to peer inside matter allowing us to probe the mysteries of physical structures. One of their myriad uses is to examine diseased molecules to locate their area of malfunction. How can understanding these malfunctions lead to possible drug development? How do we find chemicals to fix a broken body?

Saturday, February 19, 2005

Life Sciences Institute Professor Daniel Klionsky

Supermarket Biology

Are you candy bar literate? Are Pop-Tarts high in sugar? Do you know anyone who is lactose-intolerant? Why is oil liquid and butter solid? You probably deal with more biological topics than you realize in your everyday life. Discover the biology you need to know to make your way safely through the supermarket.

Saturday, March 12, 2005

Physics Professor Fred Adams

Cosmic Genesis: How Physics Drives the Structure of the Universe

How do the laws of physics enforce the production of our universe and the subsequent formation of galaxies, stars, and planets, including some like our Earth? Starting with the laws of physics and the big bang event, we will see how this chain of creation ultimately produces the tiny chemical structures and vast celestial landscapes necessary for life to gain a foothold.

Saturday, March 19, 2005

Physics Professor Timothy McKay

How Do We Know the Big Bang Really Happened? Early Evidence.

During the first half of the 20th century, astronomical observations and physics theory combined to suggest that the universe began in a hot, dense, nearly uniform state. It has been expanding and growing more complex ever since. Determine the evidence which led to this extraordinary conclusion, ridiculed by opponents as the "big bang theory". Figure out some logical consequences of the big bang; the predictions of the theory.

Saturday, April 2, 2005

Physics Professor Timothy McKay

How Do We Know the Big Bang Really Happened? Case Closed.

In physical science, theories are often tested by predicting observations yet to be made. Correct predictions, when tested against observation, are evidence supporting the validity of the theory. A series of strong predictions for the big bang model of the origin of the universe have been confirmed, since 1990, firmly establishing it as the standard model of cosmology. What are these observations that are so convincing? What mysteries remain?

Saturday, April 9, 2005

Astronomy Professor John Monnier

The Quest to Discover new "Earths"

The discoveries of giant planets around other stars have changed the way we think of our solar system -- we no longer know what a "normal" planetary system is anymore. Astronomers are now debuting new observing methods to find out more. But with the new excitement comes a growing impatience: Where are all the Earth-like planets? How are we going to find them?

Saturday, April 16, 2005

Physics Professor Timothy Chupp

Solar Neutrinos

For 40 years, physicists have searched for solar neutrinos, the only direct evidence of nuclear reactions in the core of the sun. Solar neutrinos are detected in huge underground experiments, but were detected at rates much less than expected from the sun's power output. This deficit of solar neutrinos has finally been explained: the neutrinos disguise themselves before they are detected, and the nuclear reaction rate in the sun's core is indeed consistent with the current luminosity.

Saturday, April 23, 2005

Physics DemoLab Staff Mark Kennedy, Harinder Sandhu & Warren Smith

The Art of the Demonstration

Have you ever wondered how lecture experiments are invented? Observe a practical overview of demonstration presentation techniques, constructions and fabrication of apparatus. The young at heart, the curious experimenter and science teachers will especially find the presentation entertaining.

Saturday, May 7, 2005

Physics Professor Keith Riles

Gravitational Waves - Ripples of Space

Gravitational waves are minute disturbances of space itself, first predicted by Einstein. They are believed to arise both from violent events, such as the Big Bang or the collisions of black holes, and from quieter phenomena, such as the steady spin of a bumpy neutron star. Become familiar with the nature and sources of these tiny ripples of space, along with prospects for their direct discovery in the next few years.

Saturday, May 14, 2005

Physics Professor Keith Riles

How to Catch a Gravitational Wave

Scientists worldwide have constructed gigantic laser interferometers, kilometers long, to detect gravitational waves coming to us from our own galaxy and from very distant galaxies. These new instruments, including the U.S. LIGO and LISA interferometers, can detect distortions of space a thousand times smaller than a proton. Discover how these detectors work and their formidable technological challenges, along with results of first searches.

Saturday, May 21, 2005

Physics Professor Fred Adams

Into the Dark: The Long Term Future of Our Dying Universe

What will happen when the Universe burns out? We will examine the evolution of planets, stars, galaxies, and the universe itself over time scales that greatly exceed the current cosmic age. After several trillion years, the supply of interstellar gas grows depleted, and the galaxy loses its stars. As the galaxy disperses, dark matter particles annihilate keeping the old stellar remnants warm. On longer time scales, black holes lose their mass as they emit Hawking radiation. After the largest black holes have evaporated, the universe slowly slides into darkness. Or does it? ●

A Philosophical Question

By Bob Gruszczynski

After having purchased a new Orion StarBlast 4.5" f4 reflecting telescope as a "grab-n-go" to be used on nights when I'm too lazy to set up the PortaBall, I encountered an interesting set of situations to be pondered by deeper minds than my own. After getting back into the hobby a few years ago, starting with the purchase of a Meade ETX-70, Joni and I were slightly consumed with aperture fever, culminating in the purchase of a 12.5" Mag1 Instruments PortaBall. Along the way, the first upgrade from the ETX was a used Celestron CG5 5" SCT on a German Equatorial Mount. After several years, and a complete revamp of our scoping situation, we have the above-mentioned Orion 4.5" telescope. Here's the question:

Is it better to have great optics on a difficult to use platform with very little knowledge of the sky, or to have just good optics on an "easier to use" platform with good knowledge of the sky?

Here's the whole story as it plays out in my mind. It has been some 25 years since I had a department store telescope that wowed me with little views of Jupiter and Saturn and the Moon. I've got similar views in a new ETX goto scope, that are less than impressive to my wife – a newbie to the hobby, but with great interest in the sky. She suggests a larger SCT might show better views. I purchased the Celestron and proceeded to try to get to know it better.

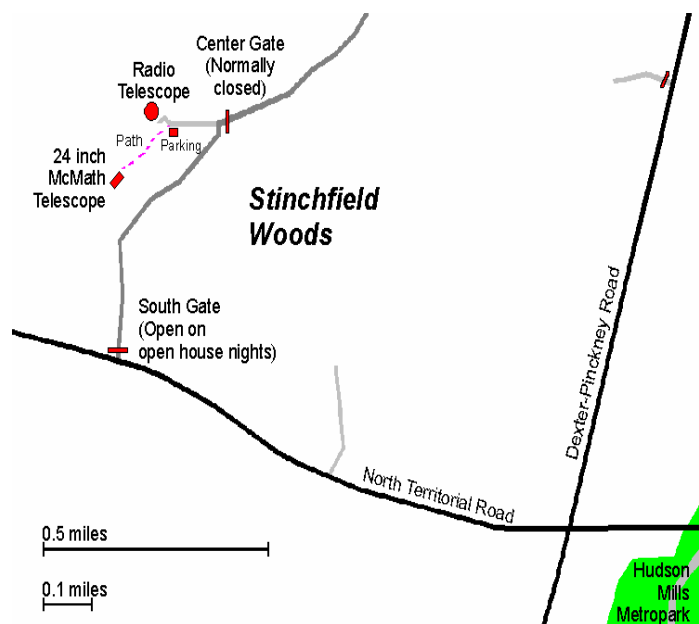
Firstly, there was the "used demo scope from Rider's" issue where it took me 3 hours in 20 degree weather to figure out that the focuser had been cranked to look at things a lot closer than a billion light years away. Secondly, and here's the heart of the first part of the question, was 2 hours in 10 degree weather scouring the "Realm of the Galaxies" trying to find one or two of those little suckers. Now all I have is Sky Atlas 2000 (the indoor version), a 5" f10 SCT, and the little 6x30 finder that comes with. All of this on a GEM that I know just enough about to be dangerous. I finally found what looked like a galaxy. I actually sketched the star field on a napkin to try to find out what it was. It turned out to be M100, my first-ever galaxy find on my own. I never did see another galaxy that night, and for many nights beyond. I had a lot of learning to do, both about the sky and about the telescope and mount.

Next, enter the Orion StarBlast. It has been several years since that fateful early time and my knowledge of the sky and of the equipment has grown immensely. I have since sold both the ETX and the Celestron, and have replaced them with the StarBlast. On the first night (temps in the teens), I actually managed to stumble across M81 & 82 while fumbling around with some of the quirks of the new scope. On the second night (also temps in the teens), however, with some work having been done to refine the telescope, I managed to find (not stumble upon) over a dozen galaxies in the Realm, along with M81 & 82 again. M100 was a piece of cake, along with M65 & 66. All in less than half an hour. I can't say that the size or quality of optics is even close to the SCT, but, boy it was a whole lot easier finding the faint fuzzies this time.

How do I explain this phenomenon? I leave the answer as an exercise for the reader...
...and when you find it out, please feel free to let me know. ●

Places and Times

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

Public Star Parties

Public Open House/Star Parties are held on the Saturday before and after each new Moon at the Peach Mountain Observatory. Star Parties are canceled if the sky is cloudy at sunset or the temperature is below 10 degrees F. Call 4332-9132 for a recorded message on the afternoon of a scheduled Star Party to check on the status. Many members bring their telescopes and visitors are welcome to do likewise. Peach Mountain is home to millions of hungry mosquitoes - bring insect repellent, and it does get cold at night so dress warmly!

Amateur Telescope Making Group meets monthly, with the location rotating among member's houses. See the calendar on the front cover page for the time and location of next meeting.

Membership

Membership dues in the University Lowbrow Astronomers are \$20 per year for individuals or families, and \$12 per year for students and seniors (age 55/+). This entitles you to the monthly REFLECTIONS newsletter and the use of the 24" McMath telescope (after some training). Dues can be paid at the monthly meeting or by mail to this address:

Kathy Hillig
7654 W. Ellsworth Road
Ann Arbor, MI 48103

Magazines

Members of the University Lowbrow Astronomers can get a discount on these magazine subscriptions:
Sky and Telescope: \$32.95 / year
Astronomy: \$29.00 / year

For more information contact the club Treasurer. Members renewing subscriptions are reminded to send your renewal notice along with your check when applying through the club Treasurer. Make the check payable to "University Lowbrow Astronomers".

Newsletter Contributions

Members and (non-members) are encouraged to write about any astronomy related topic of interest. Call or Email to Newsletter Editor at: John Ryan (734) 662-4188 allegheny@mac.com to discuss length and format. Announcements and articles are due by the first Friday of each month.

Telephone Numbers

President:	Charlie Nielsen	(734) 747-6585
Vice Presidents:	Jim Forrester	(734) 663-1638
	Bernard Friberg	(734) 761-1875
	Jim Wadsworth	(734) 529-2766
	Doug Warshow	(734) 998-1158
Treasurer:	Kathy Hillig	(734) 663-8699
Observatory Director:	Mike Radwick	(734) 453-3066
Newsletter Editor:	John Ryan	(734) 662-4188
Keyholders:	Bernard Friberg	(734) 761-1875
	Charlie Nielsen	(734) 747-6585
	Mike Radwick	(734) 453-3066
	Fred Schebor	(734) 426-2363
Webmaster	Dave Snyder	(734) 747-6537

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



I saw the Moon rising as I walked out to get the paper and I figured it was time to give the T-mount adapter for the new digital camera a test; so Kathy and I bundled up and got out the old 4" f/15 refractor (objective of unknown origin), set it up on the freshly-shoveled deck, ran a few quick test shots to check the exposure and then went inside to warm up while it cooled down.

For the technically minded of you, here are the details:

Effective ISO: 400
Shutter: 1/200 sec.
Camera: Canon EOS 20D
Optics: 4" f/15 achromat, prime focus, no diagonal

The scope was mounted on a Mark Cray polar mount/tripod (no drive).

- Kurt Hillig



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ASTRONOMERS

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