



# REFLECTIONS AND

# REFRACTIONS

OF THE UNIVERSITY LOWBROW ASTRONOMERS

February 2004

## Upcoming Events

February 2004

- Friday, February 20, Starting at 7:30. Monthly Club Meeting held tentatively in room 170 in the Dennison Building.
- Saturday, February 21, (Starting at Sunset) Regular Scheduled Open House and Star Party at the Peach Mt. Observatory. Weather permitting.
- Saturday, February 28, (Starting at Sunset) Regular Scheduled Open House and Star Party at the Peach Mt. Observatory. Weather permitting.
- Saturday, March 13, (Starting at Sunset) Regular Scheduled Open House and Star Party at the Peach Mt. Observatory. Weather permitting.
- Saturday, March 19, (Starting at Sunset) Regular Scheduled Open House and Star Party at the Peach Mt. Observatory. Weather permitting.
- Saturday, March 20, (Starting at Sunset) Regular Scheduled Open House and Star Party at the Peach Mt. Observatory. Weather permitting.



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# The Mars Scope Cometh

by Doug Scobel

Yes, the Mars scope is done! I had to drag it, kicking and screaming, but yes it is finished. I won't bore you again with the storied earlier history of this project, but if you wish you can read about it yourself in my article *Some People Never Learn*, in the February 2003 issue of *Reflections*. But bringing this project through to fruition, while challenging and frustrating, has also provided some satisfying rewards.



## Of Primary Importance

Getting the primary mirror done proved to be more difficult than I envisioned. I scrapped the idea of finishing it spherical and making a flex-cell for it to warp it into a paraboloid. I felt that it would have taken way too long to get a working (emphasis on "working") version of the cell, plus polish out the mirror to a good sphere. I did not want Mars to come and go again and not have the scope finished in time, so I decided to try to make as good a paraboloid as I could. I started on it late in April (honeydo's must come first!), expecting it to take no more than a month to figure the already polished out surface. Wrongo! Try twice that long. There was plenty of both trial and error, and many sleepless nights trying to figure out what had gone wrong during the previous evening's polishing sessions.

I think that now would be an appropriate time to recognize and thank a couple people who were key in completing this project. First, I would like to thank fellow Lowbrow Tom Ryan, without whose expertise and advice I might still be trying to get the figure right. But even more importantly, I must remember to thank Debi, my wife, who exhibited great patience and understanding while I took over her kitchen for a month. Not to mention putting up with my grumpiness when things weren't going well, which was most of the time! What a gal!

Finally, on June 20, after extensive bench testing and star testing it uncoated in my old optical tube assembly, I deemed the mirror "done". Perseverance paid off and I managed to get a decent figure on it, about as good as I had hoped when I started. It has a wavefront error of at worst one-tenth wave, and likely better. This was a watershed; prior to this I was *hoping* that I would complete the project, but now I *knew* that I would! I carefully packed up the mirror and it's matching sec-



ondary and sent them off to the coating service, namely Spectrum Coatings, Inc., in Florida. With the major hurdle of completing the primary mirror out of the way, it was now time for the “easy” part – the construction of the rest of the scope.



### Putting It All Together

Some of the components I already had on hand from the first incarnation of this scope, including the primary mirror cell (by Novak), the 1.3-inch minor axis diagonal that I “stole” from my 6-inch f/8, and the focuser, a low-profile helical unit made by Lumicon. The rest is new, including a four-vane spider and secondary holder, both also from Novak (can you tell that I like Novak components?), a Rigel Quikfinder 1x reflex sight, a used 3.5-inch computer fan, and a 6-foot long, 10-inch diameter Sonotube in/on which to mount everything. I was originally planning to use a 1-inch minor axis diagonal that I used in the original version of the scope. But after analyz-

ing the optical layout in the program NEWT, it looked like the 1-inch was a little too small, so I opted for the 1.3-inch. It’s still well under 20% of the primary’s diameter, which is generally regarded as the point at which contrast and resolution degradation begins to occur. (NEWT is a freeware program for Windows for laying out Newtonian reflectors. It is readily available on the Internet. Let me know if you are interested and I can direct you to where you can find it.)

I was quoted a 30-day turnaround by the mirror coating service, so I expected that I would have the optical tube assembly done by the time the mirrors arrived, but alas, I did not. While the mirrors arrived right on schedule, almost to the day, I underestimated how long it would take to construct and finish the tube, fan assembly, and wood parts, and assemble it all. So it was another couple weeks after the mirrors arrived before it was finished.

I painted the exterior of the tube with three coats of Krylon polyurethane (brush-on) enamel, which provides a completely waterproof, plastic-like coating. To finish the inside of the tube, I first peeled off the smooth plastic-like lining, leaving a fuzzy, bare cardboard surface. I then sealed it with two coats of shellac, and then blackened it with Krylon ultra flat black spray. The result is a moisture resistant, rough, and very black interior that has very low reflectance even at grazing angles of incidence. The front of the tube extends about 10 inches past the focuser to reduce stray light and to provide some dew resistance for the secondary mirror during those dewy Midwest nights. All mounting hardware throughout is stainless steel, to prevent corrosion from dewy nights as well. I “machined” fore and aft trim/reinforcing rings out of 3/4 inch birch veneer plywood using a router. The rear trim ring has a 7.75-inch aperture that does double duty as an annular baffle to block stray light from the ground sneaking around the primary. Similarly, the front trim ring has a nine inch aperture to provide a little bit of baffling (the tube ID is ten inches). The cooling fan blows across the face of the primary mirror, and out vent holes in the opposite side of the tube. This kind of fan setup is the most effective at breaking up the boundary layer of warmer air in front of the primary, and helps improve the image during cool down. A shield keeps unwanted light, dew, and dirt entering the vent holes and ending up on the



mirror. A rheostat lets me control the fan's speed to "tune out" any unwanted vibration.

The mounting is an old homemade pipe mount that was given to me when I was 14. It has very nicely machined brass sleeve bearings. It is very heavy and solid, even for a heavy and long OTA like this scope. It passes the "standard bonk" test nicely. The only thing it really lacks is a right ascension drive. At 300-400x objects don't stay in the field of view for very long, and I constantly have to nudge the scope to keep up with the earth's rotation. Perhaps one of the machinist types in the club could give me a hand at adding an inexpensive drive to it, hint hint!

I also made a solar filter for the scope. The filter consists of Baader solar film sandwiched between two layers of 3/16" foamcore board. I put three threaded inserts into the face of the front plywood trim ring so that I could securely attach the filter without any fear of it accidentally coming off while observing the sun (which could have devastating consequences). An "ear" on the

filter shades the eyepiece and your eye when the scope is pointed towards the sun.

### The Pudding

If "the proof of the pudding is in the eating", then I must say that the pudding has been very tasty indeed! First light was on the evening/morning of August 6-7, 2003, and I was not disappointed. It was somewhat hazy, but what the sky lacked in transparency it made up for in steadiness. The double double was nearly straight overhead, so I went there first. Wow, it was a really clean split! The air was steady enough that I could "over drive" the scope up to 570x, and the airy disks were perfectly clean, along with their first-order diffraction rings. There was a ton of black, empty space between each pair. I also went over to Zeta Bootis, a close double with components of magnitude 4.5 and 4.6, and a separation of 0.8 arc seconds. It split it, not easily, but split it, even with a little black space in between when the air would settle momentarily.

Later, about three o'clock the following morning, I went on to Mars, which was hovering near the meridian about 30 degrees up. The detail was amazing, at least to me. I had never seen it look so good! My earlier observations were with my 13", which has an average mirror and is more adversely affected by atmospheric seeing conditions and tube currents. And on previous oppositions with my 6-inch Newtonian, when the Martian disk was much smaller. The south polar cap was brilliant white, with a very sharp edge. The darker markings in the southern part of the Martian globe were also crisply defined, contrasting nicely with the brighter northern hemisphere. I decided to sketch it, which was something of a challenge, because of the amount of detail to record. Throughout the great Mars opposition of 2003, I ended up sketching Mars at least a dozen times, and observed it many more times when conditions didn't allow for sketching. Yes, my new "Mars Scope" definitely lived up to its expectations!

#### Never Done

Most homemade telescopes are never done, and this one is no exception. One of the first things I have planned is to put a really good secondary mirror in it. As I said earlier, the one I'm using now was in my 6-inch, and I don't remember where I bought it. Knowing that I did not pay a whole lot for it, it is probably just your usual run-of-the-mill diagonal. So, if it's peak to valley deviation is 1/8 or 1/10 wave (1/4 - 1/5 wave at the wavefront), then it is probably inferior to my primary, and it may be degrading the image. Antares sells 1/20 and 1/30 wave diagonals, so I'll be ordering one of those some time soon.

Something else I want to experiment with is a curved-vane spider. The diffraction spikes from the straight spider vanes are a little distracting, and a well-designed curved-vane spider (Protostar makes some really nice ones) will eliminate them, while actually *decreasing* the total amount of diffraction. I think that it's worth trying.

I've already added a magnifying finder, but I also want to add some baffling, and/or black flocking to reduce the amount of stray light bouncing around inside the tube. And add some tube counterweights. And add a drive to the equatorial mount to make visual observations at high power easier. And shorten the pedestal or make a new one to get the eyepiece a little lower when pointing near the zenith. And... well, you get the picture. There are always *some* improvements that can be made!

#### Was It Worth It?

In a word, yes! Overall, I'm *very* happy with the scope. It performs as well as I had hoped when I started it, and I'm sure it will bring me and others a lot of viewing pleasure in the future. It is difficult to describe the feeling of accomplishment one feels when seeing excellent images in an instrument you have built yourself.

Mars may be fading into memory, but that was only a foretaste - Saturn and Jupiter are coming. So bring them on - I'm ready!

## About the University Lowbrow Astronomers

The University Lowbrow Astronomers is a club of Astronomy enthusiasts which meets on the third Friday of each month in the University of Michigan's Physics and Astronomy building (Dennison Hall, Room 130 or 807). Meetings begin at 7:30 PM and are open to the public. Public star parties are held twice a month at the University's Peach Mountain Observatory on North Territorial Road (1.1 miles west of Dexter-Pinckney Road; further directions at the end of the newsletter) on Saturdays before and after the new Moon. The party may be canceled if it's cloudy or very cold at sunset. For further information call (734) 480-4514.



# I Bought on eBay

*By Tom Ryan*

*With apologies to Weird Al Yankovic*

Believe it or not, the first song I ever heard by Mr. Yankovic was his eBay song, when it was played on NPR recently. It is a classic, although neither I nor the show's host are sure about just what kind of a classic it is. I still remember the host asking Weird Al whether he altered popular songs because he loved them or he hated them, and Weird Al didn't give him a straight answer. He might not know the answer himself.

Weird Al's lyrics to the song detail the simple, commonplace experiences of buying things on eBay, but they are set to the music of a popular song whose sweeping melodies and breathless words are designed to appeal to the more brain-dead members of our popular culture. Is Weird Al making a comment here, possibly about the way manipulative merchandising has caused many (most?) in our society to confuse love with buying things? Or is it just a Weird Al kind of song? I'll be darned if I know. The song is, however, a classic.

I try to learn something from every company for which I work, and one of the things I learned from a start-up company was that they buy on eBay. I had never imagined that a real company would buy second hand electronics and machinery on eBay. I knew that the girlfriend of one of my oldest friends had a collection of old bottle tops or cracked teacups or something like that, which she had acquired by diligently searching eBay auctions, but that was hardly a recommendation. Moreover, all of my previous experience pointed to the fact that buying second hand stuff usually ended up costing far more than buying new. Used stuff is often broken in extremely mysterious ways, ways in which even the factory technicians, at \$200/hr, often can't iron out. People who buy used equipment are the godsend of many, many companies. I once worked at a machine tool company that lost money on every machine they sold, but made a fortune on servicing old machines. The parts! The labor! Once a guy has some piece of equipment, it's awfully costly to throw it away and start anew. First, he would have to admit that buying that piece of junk might not have been the great idea it seemed at the time. Much cheaper, he thinks, to just repair it. Our service department rejoiced, and the cash rolled in. The incredible cost of repairs is the reason people are willing to pay \$30k for a car which is worth only about \$3k a little beyond its warranty date. So buying used did not strike me as a smart thing to do, if a company valued its time at all.

However, this equation only holds true if the company's workers are more productive working than

looking for deals, and if the stuff that they are buying is broken. On eBay, most of the stuff on sale (at least the stuff I see) is incredibly cheap, and is not broken.

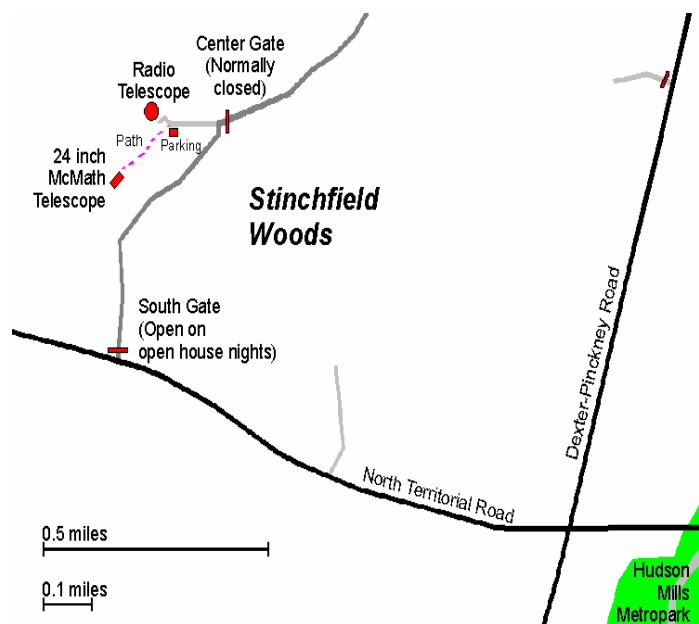
There is a book with which I'm sure many of you are familiar, called "Crossing the Chasm". It describes the range of customers to which a company, if it is to survive and prosper, must market its products. The customers fall into a bell curve, with a few being innovators and early adopters of a product (like iPods), more being an early majority (cell phones), about the same number a late adopting majority (old computers), and finally, a few laggards (buggy whips). I'm a natural late adopting majority type, so I miss all of the new trends, and I missed the start of eBay. However, I'm making up for lost time now.

eBay, for all of the fun that Weird Al may poke at it, is actually a significant step forward in the development of perfect markets, and a potentially terrific source of created wealth. Items which previously would have been thrown away due to a lack of buyers, can now have still more value extracted from them by being sold. This is the creation of value which didn't exist before eBay. Moreover, the sale of used items on eBay does not significantly reduce the selling price of new products, because the high cost of the inconvenience of not being able to get exactly what you want, when you want it, still causes people to buy new. Buyers who could afford to buy new will still do so, because they can't afford to buy used. Buyers who previously couldn't afford to buy at all, can now have more than they did before.

eBay is not just fun, it's an economic miracle. I recommend that you take a look at it, especially if you are a start-up, especially if there is some item which you have always wanted, but just never got around to buying, or couldn't find, or couldn't afford. In the past six months, I've saved more than a year's income by buying things on eBay (OK, on my income, that isn't so much, but I did save, and I bought some things which I previously couldn't have afforded at all). There's telescope equipment, tools, glass, test equipment, pink bathrobes, and dirt for sale. All at a price that you want to pay. (Or not, if someone wants it more). Why, there's even that 20 year old Noritake china teacup I admired way back when. I was too dumb to buy it then, but I'm older now. And that's good, right?

## 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:

Mike Garrahan  
7676 Grand Street  
Dexter, MI 48130

## Magazines

Members of the University Lowbrow Astronomers can get a discount on these magazine subscriptions:

Sky and Telescope: \$29.95 / 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 john\_edward\_ryan@hotmail.com to discuss length and format. Announcements and articles are due by the first Friday of each month.

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



Photo by Doug Nelle

Several families gathered at Abbott elementary school Saturday, November 8, to view the eclipse. I got there at sunset w/ my 5' f/5 refractor. The "civilians" showed up after 6. First caught sight of the moon at 5:30 through the trees at the far end of the field.

My son saw a very bright meteor, possibly a bolide, in the north between 5:30 and 6. A couple walking their dog came around the corner and said they saw it too. Just my luck to be watching the moon!

I used a 2x telephoto extender for an effective f/10 with 1600 ASA film. the scope was undriven. Photo was taken just at about 8:18 p.m. at 1 sec. and shows some penumbral darkening



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