University Lowbrow Astronomers
Ann Arbor, Michigan

REFLECTIONS REFRACTIONS

of the University Lowbrow Astronomers

February 2003

Upcoming Events

February 2003

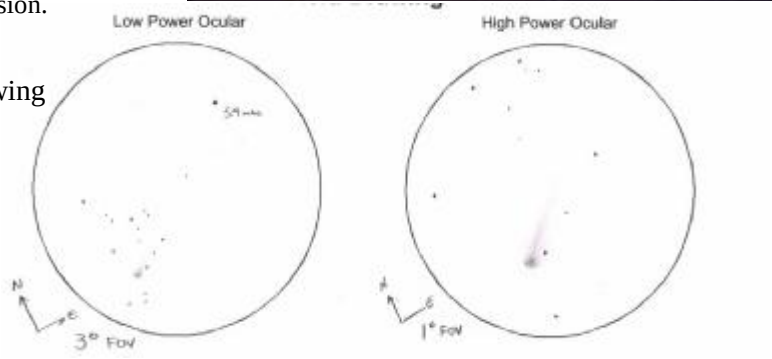
- **Saturday, February 1** (Starting at Sunset) Regular Scheduled Open House and Star Party at the Peach Mt. Observatory.
- **Saturday, February 8** (Starting at Sunset) Regular Scheduled Open House and Star Party at the Peach Mt. Observatory.
- **Friday, February 21** (Starting at 7:30pm) University Lowbrow Astronomers' Club Meeting held in either room 130 or 807 in the Dennison Bldg. **Speaker or Topic TBD**
- **Saturday, March 1** (Starting at Sunset) Regular Scheduled Open House and Star Party at the Peach Mt. Observatory.
- **Saturday, March 8** (Starting at Sunset) Regular Scheduled Open House and Star Party at the Peach Mt. Observatory.
- **Friday, March 21**(Starting at 7:30pm) University Lowbrow Astronomers' Club Meeting held in either room 130 or 807 in the Dennison Bldg.

Comet C/2002 VI NEAT

Description and Notes

Very nice comet, comparing comet to 5,9 mag star about 1 degree ENE of comet (just out of field on high power) out of focus is very close. The comet appeared bluish in comparison to field stars. Overall size: 5'. Tail: thin, wispy, and about 30' in ENE direction. Estimated magnitude: 6.0 or brighter (VSS). The coma area was slightly elongated ENE. I spent a long time studying this comet, and I hope that Clayton gets a good shot of this one. The tail is only just visible with averted vision.

Field Drawing



Inside

Talking to Sixth Graders

by Collin McClain

Last fall at my son's 6th grade open house, we met his teachers and found out that the first unit they were doing in science class was astronomy. My wife quickly volunteered me to bring my telescopes into class and give a talk. That thought was crossing my mind also but my wife is just quicker at the draw. I told the teachers that I had a solar filter so I could set up a scope to look at the sun. We arranged for me to come in and give about a 20 minute talk and then set up outside and have the kids take a look at some sun spots.

I brought in three telescopes; Intes' MK66 Maksutov-Cassegrain, a short tube 80 refractor, and Orion's XT8 dob. I had a glass solar filter for the XT8 but decided to adapt it for the MK66 since I had a drive for the mount and it would be a lot easier to keep the sun in view with it than using the dob. I also decided to get the BAADER solar material and build a filter for the short tube 80. The dew shield cap for the ST80 has a built in aperture mask; just leave the cap on and take off the little cap. It reduces the aperture to about 42 mm or so, and since the sun is nice and bright, you don't need a lot of aperture to look at it. I thought I'd just fashion a simple solar filter using the material and some cardboard that would fit snugly inside the cap. As luck would have it, the material came the morning I was to go into class, and so I was able to build the filter and I would have two scopes for the kids to look through.

I gave the talk after lunch, and as the kids came into the room, most were pretty impressed with the XT8; a few oohs and wows. I asked how many had telescopes and I was surprised that probably about a third of the class raised their hands. I then ask how many had used them recently and there were only a few hands up. Since I had an example of all three basic types of telescopes, I thought I would give a very quick explanation of the differences between them, lens versus mirrors and such. Next, I told them about the Lowbrows and the open houses we have at Peach Mountain on Saturdays and invited them out.

My plan was to give a quick overview of the different types of objects you could see in a telescope and what to expect. I started out by saying that if they did come to an open house, someone would probably say something like "That's M13 you're looking at". I explained who Charles Messier was and how he started a catalog of deep space objects that weren't comets and that most amateur astronomers start out by tracking down and viewing these objects. I then explained about the different types of deep space objects, followed by the planets and then the sun. I had a quick question time after my talk before we headed outside. "What's the largest telescope?," which I actually looked up before my talk, was one of the questions.

I mentioned the Arecibo radio telescope in Puerto Rico, which is 305m in diameter, Keck & Keck II in Hawaii, and the VLT in Chile, which has all four units operational now. I also came across a web site about European Southern Observatory's OWL (OverWhelmingly Large) 100 meter optical telescope which is just in the concept phase. It's on their website: www.eos.org A hundred meters... wow... now that might cure some people's aperture fever.

Of course a student about if there's extraterrestrial life, another wanted to know how much my telescopes cost, and someone asked if they were going to be able to see the sun's corona, which I thought was a well informed question for a sixth grader.

Having the two scopes worked well. The BAADER filter worked quite well and I used it on the short tube 80 and had a low power view of the entire sun. I then had the MK66 zoomed in a bit more at some of the sun spots. There were about 60 kids (2 classes), so the teachers decided to sent out about four at a time to look through the scopes. This was a very good idea. The vast majority of kid's reactions were "Oh cool!" Others commented, "Is that the sun? It's just ball." Only a few students weren't that interested, with one saying "Where's the flames? I don't see any flames" and I don't think he was referring to coronal mass ejections. A couple were more interested and asked what causes sunspots and if they moved or changed. Even the principal and the music teacher of the school stopped by and had a quick look.

It was a fun time and I'm glad I volunteered to do it, which was good because one of the other science teachers noticed us out there, and so I got to do it all over again the following week for the other two sixth grade classes doing astronomy. The following Peach Mountain open house (which was in October) I didn't notice if any of the students had come out, but hopefully some will make it this spring. Later in the fall we went in for conferences and the teachers told me they were planning to come to our open house for the Leonid meteor shower. Don't know if they tried to make it or whether they decided not to go because of the weather. One note, I had read that it is possible to view Jupiter during the day so I had made an attempt to find it. From what I read it seemed that it was easiest to find if it was somewhat close to the moon. But unfortunately it wasn't close to the moon the day I was at the school. I tried first lining up the scope on the sun, and then using the mount's setting circles to move the scope to where Jupiter should have been, and scanned around. I did this before I gave the talk, which was a good thing, because after 15-20 minutes I couldn't find it and gave up. If anyone has ever located and seen Jupiter or Saturn during the day I'd like to hear about it.

The Perfect Scope

By Joni Gruszczynski

Word gets around. "I hear you and Bob are getting a new 'scope. How did that come about?" I'm thinking, "Hmmm, how did that come to be?" After all, we already have three fine telescopes. One is the perfect starter-portable-GoTo scope. Its only flaw is that it will find objects that I can't see - even at the Black Forest Star Party (BFSP)! Then we have a wonderful Celestron G-5. Great optics and portable. I still need more star hopping experience, but…if I can find it, it looks great! Then the "Space Cannon", an Orion 10" reflector Monster Dob. As portable as Bob wants it to be, and I could gaze at nebulas (my favorite objects) all night with it. But I do have to wait for Bob to set it up - not that he needs much prompting. However, Bowling has been known to occur on clear nights, phenomena I can't quite explain…

We were at our second BFSP. The sky was nearly perfect - a bit of moisture fuzziness. I was using our GoTo Scope to find everything in its database, and getting Bob to point the "Space Cannon" at Sagittarius. The Lagoon Nebula was sparkling in the southern sky. This was Friday, the first official day/night of the BFSP. I remember the occasion because it was so special - the young people who set up next to us were trying to get their 28" Obsession going. Doubtful they had ever set one up, but an experienced Dob user stopped by and helped them out. Helpful people, astronomers. Bob and Gary were trading views on their Dobs. It's always interesting to compare views on the different scopes, and one of the ways we learn more.

Bob decides it's time for a powder. He heads for the Port-a-Jons in the dark. I commandeer the "Space Cannon". Then I wander over and check out the views in Gary's scope. Bob finally returns, of course with an adventure story. He met up with someone we camped next to at last year's BFSP - the owner of a 10" Star Master. This year, he now had upgraded to a 12.5" Starmaster with Zambuto optics. Bob was impressed. Now as he sights in the same object he viewed through the Starmaster, he doesn't seem as happy with the views through the 10" Orion. I note this reaction. Is this a variation of the well-known "aperture fever"? Well, he will need to be under observation for 24 hours…

Well, within this 24 hour period, we wander over to the Mag One display, just as Peter Smith is taking the display down before dusk. We talk about the different sizes available. It seems Zambuto optics are part of this scope line, and it seems very portable for a 12.5". We gather information sheets and thanked Peter for his time. This night we're treated to a magnificent aurora display and good seeing!

During the next day, Bob and I exchange a few words of discussion concerning the possible acquisition of the 12.5" Mag One scope. I see this as a logical progression into the next astronomy tool, And one that makes it possible to move a great light-gathering scope around. Maybe even I can move this one! The 10" Orion isn't light as a feather. And we haven't fabricated a cart for it. The new scope get further discussion after the Star Party, and once I'm convinced it's suitable for extending our hobby to the next level- we order it.

I'm sure Bob has a different story. And that's fine. Astronomy is a hobby, and like everything else, it's constantly changing - tools improve, yet the basics remain the same. The scope that brought us into the hobby still has as niche, but we've learned its limits, and still yearn to see more of the deep sky. We're learning our limits, our likes, and tailoring our equipment to suit us and inspire us.

You'll see us at the BFSP this fall with the "New One" and who knows which other scope.

Clear skies.

So many scopes, so little time.

Gee, I wonder what's under *that* tarp?

Fred Schebor's prototype for the Starmaster.

Some People Never Learn

by Doug Scobel

Ever notice how some people never seem to learn from experience?

Set your Wayback machine to 1985, Mr. Peabody, to the time when I had been using my new, home-built 13.1 inch f/4.5 Dobsonian for about a year. Although it was good for low power deep sky observing, I needed ("needed"?) a telescope specifically for high magnification planetary and double star observing. So, I decided to build a new planetary scope, to be completed in time for the favorable opposition of Mars that was coming up in 1986. It was to be an 8 inch f/8, with a tiny secondary to minimize diffraction, and optimized for high magnification viewing. I made the mirror myself, and achieved a pretty good figure on it, but Mars had come and gone by the time I finished it. Still, once the scope was finished I was quite happy with it, as it gave some darn good views of the planets and close doubles. I remember one December night when the air was as steady as I have ever seen it, and Jupiter was simply astounding! At over 300x I could see all the festoons and details that, prior to that, I had only seen in photographs in magazines. It was a pretty good scope with a pretty good mirror, I thought to myself proudly.

Unfortunately, two events conspired to make that a temporary situation.

The first was that after learning how to test and figure a telescope mirror the "right" way (I had made two six inch mirrors previously), I decided to test the figure on my 13 inch Coulter mirror, because it never gave me satisfactory images. Much to my chagrin, I discovered that it had about a one wave error at the wavefront! Way, way more than the quarter wave standard that is considered to be the worst you should settle for. But I had used it for a couple of years already, meaning it was too late to return it to Coulter. So I decided to refigure it myself, thinking that I could not make it worse than it already was. After a few months work I was reasonably successful in fixing it, and I have been very happy with the images it produces ever since. The added benefit was that refiguring the 13 inch, which was at least triple the difficulty of figuring the 8 inch, taught me a *lot* about mirror figuring and more importantly mirror testing. With newfound confidence I made the fatal mistake of going back and retesting my 8 inch, and found that it was a pretty mediocre mirror – maybe a quarter wave at best.

The second conspirator was that the coating on the 8 inch deteriorated tremendously in about a year. It became very thin and semi-transparent. I think that it was the fiberglass tube in which it resided, which always stunk like fiberglass resin. I think that whatever was being outgassed from the tube attacked the mirror coating. But regardless of why the coating went bad, the mirror would have to be recoated.

But why recoat a mediocre, quarter wave mirror? Now that I'm such a great mirror maker (ha ha), why not refigure it to say, 1/10 wave, and *then* have it recoated? Yeah! Great idea! *NO! BAD IDEA!!!* I'll spare you all the details, but that mirror has never seen a figure even resembling a paraboloid ever since. It was as if I developed mirror making amnesia. I'd work on it for several weeks, get nowhere, or make the figure worse, get frustrated, and put it away for a year. After a few cycles of this, I put it away "for good", and now have a polished chunk of Pyrex that is totally useless for any astronomical purpose. More than once I thought of having it coated and using it as a magnifying shaving mirror.

Fast forward to today. I've got the bug to give it one more try. So why would I want to resurrect this project again, especially with all the difficulty I've had in the past? Two reasons - a most favorable Mars opposition is fast approaching late August this year, and I've never totally given up on building a really good planetary scope. In the past few years Sky and Telescope magazine has run numerous articles on improving the basic Newtonian reflector, and I'd like to incorporate many of these ideas into one new scope. Of primary (pun intended) importance will be to create a very good primary mirror. If I had my druthers, I'd make a flex cell for it. This is where you use a relatively thin, spherical primary, and the cell is designed to pull the center of the mirror back, flexing it into a paraboloid. Mirror making amnesia notwithstanding, I *know* that I can create a sphere, and probably in short order. But, given the time (gotta get those honeydo's done first so that my wife doesn't make me sleep on the couch) and money that I have to work on it, I'm not sure that I can make a new, thin mirror, *and* create a working (emphasis on "working") flex cell, *and* the rest of the scope, all before August. I really don't want to miss another favorable Mars opposition, so, I'll probably take one more stab at getting a decent paraboloid on what I have*. Once I have a good primary, then I can "throw" the rest of the scope together in short order, hopefully before Mars is at its best. All the other fancy features, including a flex cell, I can add later.

So, can I pull it off? I don't know, but I'll keep you posted.

*[*Footnote: I have since discovered what my difficulty was while attempting to refigure the 8 inch. I now know that my basement has extremely low humidity in the winter, which it always was when I was doing my refiguring work. Low humidity can cause all kinds of figuring difficulties due to evaporative cooling effects on the exposed portions of the mirror and lap, especially during long, overhanging parabolizing strokes. All I should have to do is deal with the low humidity and things will go much better, but please don't quote me on that! Stay tuned.]*

Proposal for the Peach Mountain Open House Schedule

By Lorna Simmons

I often have worried about the excellent Lowbrow astronomers who bring their telescopes up to the Public Open Houses on Peach Mountain, and I have wondered about how they and the public could best be served. I believe that many of the astronomically avid Lowbrow astronomers would be bored with serving up the same schedule, month after month: crescent moon, available planets, star clusters, and near celestial objects. Some of our most experienced astronomers might prefer to take the challenge and find some imperceptible (almost impossible-to-view) beauty, or some smudgy deep-sky marvel, even though the regular visitors to our star parties might not be much interested in viewing the deep denizens of the night sky.

I hereby suggest that one pertinent possibility might be to schedule the first and darkest clear Saturday night of the month at the Observatory for the viewing of objects which cannot be seen at other times and to schedule Moon and planets for times of the month when little else can be effectively viewed. The public could select the nights which would be of greatest interest to them and the neglected astronomers could select those nights when they may possibly get a chance for some serious viewing.

On the other hand, it might be feasible to have some sections of the viewing site at all Public Open Houses reserved for serious astronomical viewing tastes and other sections of the viewing site selected to cater to the general public's astronomical viewing wishes. Everybody would be served, astronomers and visitors alike. The members of the public who would enjoy viewing deep-sky objects would then be satisfied without taking away from the astronomy newcomers the pleasure of viewing familiar objects through our other telescopes.

Another possible idea would be to use the 24-inch McMath Cassegrain telescope to entertain the public while the rest of the astronomers could decide for themselves what they would like to dish up for the public and for themselves. However, sadly, this might not be a good idea for those who would like to take full advantage of the McMath Cassegrain and its wonderful attached Mark Cray refractor.

These suggestions would make no difference for me, but I firmly believe that there are a number of serious Lowbrow astronomers who might enjoy the chance to view the grandeur of the deep sky without the visitors' constant nagging about turning their scopes back upon the Moon or planets instead. Faint fuzzies should be a part of the open houses if only for the astronomical education of our visitors.

Then again, the Lowbrow astronomers could decide for themselves to observe whatever their hearts and minds desire when they visit Peach Mountain. In this way they could truly educate the public on the delights of real astronomical viewing. After all, I assert that serious astronomical viewing should be first among our contributions to the public's astronomical education. It hardly takes much astronomical knowledge to find and observe Moon and planets.

I believe that Lowbrow astronomers are there to educate the public about astronomy. If Lowbrows are merely entertaining the guests, they are preventing those guests from acquiring a greater understanding of real celestial viewing.

NOTE: I am suggesting all of the above so that EVERYBODY will be served -- the guests AND the Lowbrow astronomers. Of course, none of this will affect my viewing pleasures, since my little 3-1/2 inch (89 mm) Questar gem does exceptionally well with Moon and planets and other NEARBY celestial delights.

Steve Musko, Brian Close, and Doug Nelle.

Maintenance Lowbrows at Peach Mountain.

Equipment Review
The New Hewlett Packard Photo-Smart Printer with PhotoRet IV
by Clayton Kessler

Almost six years ago I started using the Hewlett Packard "PhotoSmart" printer to print my astrophotos. This has been a great printer and has printed literally hundreds of 8 ½ X 11" photographs over the years. One of the keys to its success is the 6 color printing that this machine uses – no other HP printer used 6 color printing, not even later model "PhotoSmart" printers. Unfortunately, the original "PhotoSmart" paper has been unavailable for several years and I cannot find another paper that I like as well. In addition, the ink cartridges – while still available – are getting harder to find.

Every so often I run into a Hewlett Packard Factory Representative at a computer or office supply store. I always ask "When will you produce another premium quality, six color printer like my original "PhotoSmart"?" The answer I consistently get is "All the current models use 'PhotoRet III' – wait until you see 'PhotoRet IV'."

PhotoRet IV was "vaporware" for about three years. A month or so ago I was in an office supply store looking for ink cartridges. The salesman did not have any PhotoSmart cartridges for me but he asked "Had I seen the new printers?" I replied – "I will not buy a new photo printer unless it is a six color process". The salesman replied – "These are new from HP, they are six color and they use the new PhotoRet IV"! Oh man – the long awaited PhotoRet IV! I looked at a sleekly designed printer, and it did indeed use a tri-color ink cartridge and a second tri-color photo cartridge. The only problem that I saw was the photo cartridge had to be loaded in place of the black cartridge in order to print photos. I successfully worked my way out of the salesman's grasp with my wallet intact but as I left the store the seed was planted.

Weeks went by (well – a couple at least) and I still had not found the ink cartridges that I needed. I stopped by the Ann Arbor Comp-USA one afternoon and there was the entire line of new HP PhotoSmart printers. A talk with the HP Representative (who just "happened" to be there) gave me the rundown on the printers. Several models were available ranging from about $150.00 (model 7150) to the "high end" machine – the 7550 at $399.00. This was the interesting one to me because it had a small color LCD display and the provision to accept all kinds of digital camera memory cards. You can print these without using a computer or you can download the card to your computer drive through the printer connection.

The high end machine also has 7 color printing – which means that two three–color ink cartridges and a third black cartridge reside in the printer permanently. Only the six color inks are used in photo printing but this has the advantage of requiring an ink change for text or photo printing.

I was much weaker this time and a printer followed me home! After using this for a few months I can say, without a doubt, this is the best printer I have used for photographs. Controls are simple to use, the printer is quite tolerant of different kinds of photo paper, I have been using Ilford and Kodak and the quality is outstanding! The software included with the package includes utilities to download and catalog digital photos and works very well.

As we approach the Christmas season I see the printer is being offered "on-sale" at $299.00 – a great bargain in my mind. I have been using my printer to make prints of my new home construction, taken with a small digital camera. In spite of the low resolution 1.3 megapixel images, the 8 X 10 prints are astonishingly good. Astrophotos are better than my old PhotoSmart and as a bonus the ink and paper seems much more resistant to humidity and moisture.

I cannot say how pleased I am with this printer. I can only quote what I said about the original HP PhotoSmart printer:

"Hewlett Packard has done it again - this PhotoSmart system is the real deal. They have transformed my computer into a darkroom and allow me to get the most from my modest astrophotographic efforts. No stinky chemicals, no fussy time limits and no fumbling around in the dark! A **digital** darkroom is the way to go for me."

Now all I need is a six-color tabloid sized (11 X 17) printer that uses PhotoRet IV … any takers Hewlett Packard?

Clayton with his excellent printer inputter.

Telescope Topics
Biscuit Cutting
By Tom Ryan

Sometimes it is necessary to cut a hole in a piece of glass. There are at least four ways to do this. The first involves the use of a diamond scribe and a hammer, but a detailed explanation of this method will not be presented here. (This is the method that I always imagined burglars using to break into houses, but when I had to break into my own house, I just used my elbow on the smallest pane I could find.) The second method uses a water jet cutter, but it will not be described, either. The third uses diamond impregnated tools and a drill press.

In this third method, diamonds are bonded either into or onto the forward edge of a metal tube. The tube is placed in a drill press chuck, and is drilled into the glass while being cooled by water or glycol. This method of drilling holes is pretty fast, but has the disadvantage of being expensive (the best, diamond-in-sintered-bronze, tools seem to have to be made up specially), and of leaving gas permeable fractures in the glass, which is bad for vacuum work.

The fourth method is one that is both relatively safe and is suitable to amateurs. It makes use of brass tubing, a drill press, free abrasive and water.

I'm sure that a description of this method appears in ATM I, II, or III, since I tried this when I was a teenager, and those were the only important books I had read by then. I wanted to make a 4" diameter Cassegrain - or maybe a Gregorian - and my father had a drill press. What more did I need? I quickly discovered that not every explanation emphasizes the things you really need to know. For example, the book didn't go into a deep discussion of the need to clamp everything down very, very well, and to stop applying pressure when the grinding sound turns to a squeak.

After I had cleaned away the pieces of the first blank, I proceeded more cautiously on the second. Since that time, I have cut many holes in many pieces of glass (most of them successfully), and here is what I have learned:

The brass tubing should have very little run-out. You can mount it on a machined hub or a wooden dowel with a drill bit drilled and glued through the center, but when you spin it in the drill press, it shouldn't wobble very much.

The brass tubing needs to have slots cut up the length of it, preferably to a point above the top of the glass, when the leading edge breaks through. It won't cut very fast without slots.

The glass needs to be fixed rigidly to the drill press table. This is very important. Clamping glass with your ordinary C-clamps is not a good solution, since glass tends to break abruptly. The best solution is to glue the glass to a firmly clamped aluminum plate with Optician's Stickum, which was described in Telescope Topics - Rapid Prototyping. The worst solution is to hold it with your hand; a sure path to a Darwin award.

You should run the cutter at low Rpm's. While it's true that the faster it turns, the faster it cuts, there's still plenty of excitement available at sixty to a hundred RPM.

Before everything gets wet, build a dam out of modeling clay around the marked cut line. This will somewhat confine the mess.

If you are drilling into a surface that is polished, you need to cover and protect that surface very, very well. The best method is to glue (again, with Optician's Stickum) a ¼" thick glass cover plate to the surface, and drill through it first. (For a cut with straight walls all the way through, glue one to the bottom side, too, since the cut narrows toward the leading edge.) I cored a 16" Cassegrain mirror after painting the surface with three layers of shellac and covering the shellac with four layers of masking tape. The resulting scratches on the face of the mirror only extended a quarter inch or so out from the cut.

Pour a tablespoon or less of abrasive onto the glass, add water from a spray bottle, and begin grinding. Push unused abrasive into the cutter's path as needed with a small brush. Don't wear long sleeves or gloves that can get snagged by the rotating glass drill.

Start applying pressure to the cutter very slowly, and stop cutting before the brass starts to squeak. Let the abrasive do the work. You can generally tell when the abrasive has broken down by the sound, and trying to wring every last bit of action out of an abrasive charge is a waste of your time and a menace to your mirror, from heat generation and the danger of jamming. A wet may last a minute or so.

Use enough water to keep everything cool and wet. The cut will eventually fill with water. When an abrasive charge is spent, retract the cutter, fill the slot with water, then momentarily press the rotating cutter back into the slot. This will displace most of the ground glass and spent abrasive, so the next charge will cut more cleanly.

Use weak paper, not cloth, towels to clean away the ground glass and spent abrasive. They tend to tear rather than wrap, if snagged by the drill.

If the glass is glued to an aluminum plate (and it should be), the cutter will have no problem grinding into the plate. It's actually hard to tell when this happens. Don't cut into the drill press table. Among machinists, this is considered a sign of an amateur.

The abrasive size is not critical. I've used #45 and #120 silicon carbide, and both grades cut equally fast and, surprisingly, cut holes over the tubing's diameter by an equal amount, which is 0.025"/side. Of course this overcut will increase if the drill wobbles a lot.

The brass tubing thickness is not too critical. I've used 0.030" to 0.060". Wider than the grit.

Brass tubing will wear away at a rate of about 13% to 15% of the work it does. That is, cutting one inch of glass will shorten the brass tube by 0.150".

If you can't find a tube with the diameter you need, you can wrap a brass sheet around a correctly sized mandrel, and screw it in place.

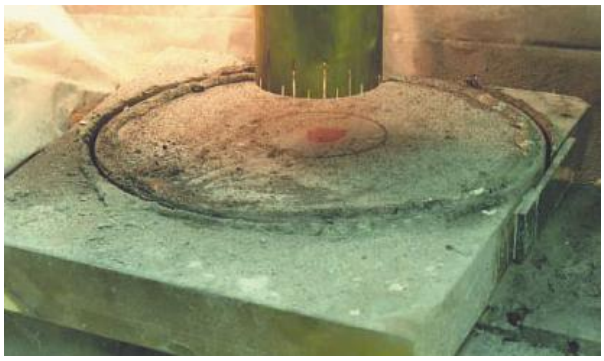
You can cut a whole telescope mirror out of a sheet of glass, if you have enough horsepower. This is normally done by a waterjet cutter, after freeing the company from all liability for what might happen to your blank when it is hit by an abrasive-laden jet of water traveling at three times the speed of sound. But you can do it, too, using brass sheet or tubing.

The speed of cut is about 0.44" to 0.50" per hour. It's slow, but not as slow as waiting six weeks for a diamond core drill to be made for you, and as a method, it's more certain than the diamond scribe and hammer method.

Cut the blank from a bigger slab.

Glue the glass to the aluminum plate.

Cut the outside diameter.



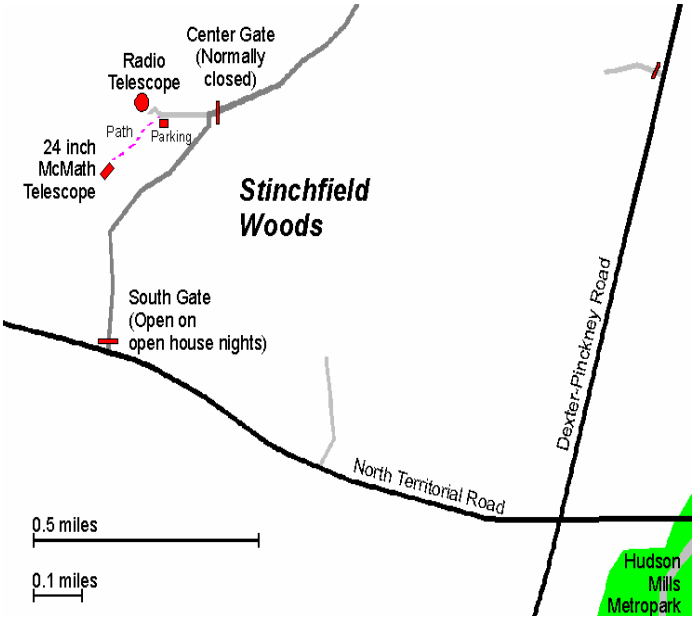
Cut the inside diameter.

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.

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 480-4514 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 to the club treasurer Charlie Nielsen at the monthly meeting or by mail at this address:

6655 Jackson Road #415
Ann Arbor, MI 48103

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 Editors at:

John Ryan (734) 662-4188 john_edward_ryan@hotmail.com
Bernard Friberg (743) 761-1875 Bfriberg@aol.com to discuss length and format. Announcements and articles are due by the first Friday of each month.

Telephone Numbers

President:	D. C. Moons	
Vice Presidents:	John Causland	(734) 747-8437
	Dave Snyder	(734) 747-6537
	Doug Warshaw	(734) 998-1158
Treasurer:	Charlie Nielson	(734) 747-6585
Observatory Director:	Bernard Friberg	(734) 761-1875
Newsletter Editor:	John Ryan	(734) 662-4188
Keyholders:	Chris Sarnecki	(734) 426-577222
	Fred Schebor	(734) 426-2363

Lowbrow's Home Page

http://www.umich.edu/~lowbrows/
Dave Snyder, webmaster

A beautiful photo of the moon by Brian Ottum using his tiny Sony Digital camera held up to the eyepiece.

Photo on front cover of Comet C/2002 V1 NEAT by Clayton Kessler is a composite of two 5 minute stacked. Taken on January 21, 2003 at about 19:00 EST.

Drawing and notes of the same comet by Mark Deprest done at the same time as Clayton Kessler's photo.

Note the thin tail in both.

University Lowbrow Astronomers
Ann Arbor, Michigan

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ASTRONOMERS
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Ann Arbor, Michigan 48105

Lowbrow's WWW Home Page:
www.umich.edu/~lowbrows.html

Check your membership expiration date on the mailing label.