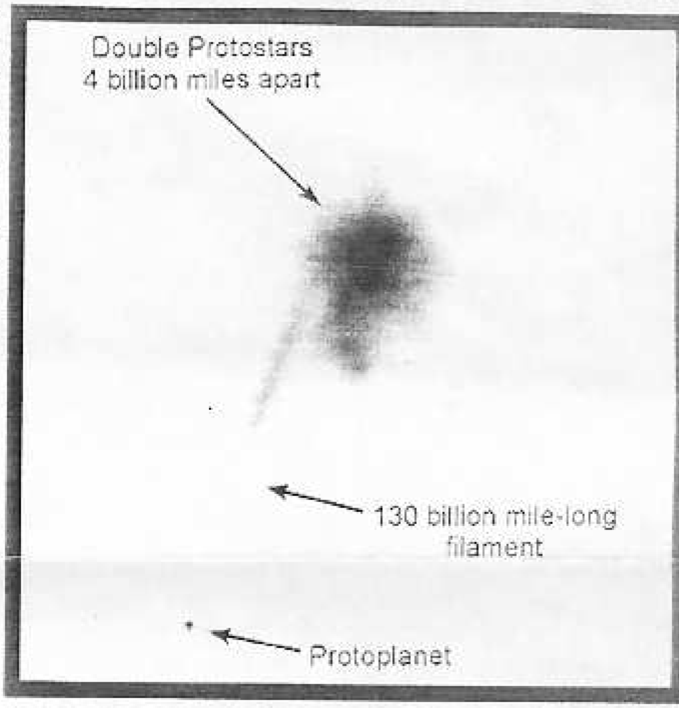
Reflections Refractions
of the University Lowbrow Astronomers

June, 1998

TMR-1C - This is an illustration of an image from the Hubble Space Telescope that scientist suggest may be the first visual evidence of a extrasolar planet or protoplanet. At 2-3 Jupiters in size this protoplanet appears to be located at the end an unusual light filament and may have been flung away from the binary star system of its origin. This object is located in the direction of the constellation Taurus and is approximately 450 light-years away. Hubble's Near Infrared Camera and Multi-Object Spectrometer was used to image the protoplanet.

Credit: Susan Terebey of Extrasolar Research Corporation and AURA/STSI

The Space Telescope Science Institute (STSI) is operated by the Association of Universities for Research in Astronomy, Inc. (AURA), for NASA, under contract with the Goddard Space Flight Center, Greenbelt, MD. The Hubble Space Telescope is a project of international cooperation between NASA and the European Space Agency.



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 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-Pinkney Road; further directions at the end of the newsletter) on Saturdays before and after the new Moon. The party is canceled if it's cloudy or very cold at sunset. For further information call (313)480-4514.

This Month:

June 19- Meeting at 807 Dennison - Mark Vincent will present - Ultraviolet Observations of Jupiter:

June 20 - Public Star Party at Peach Mountain Observatory - Summer Solstice tomorrow means tonight's astronomical twilight comes very late !

June 21 - ATM Group - Start telescope making with Karl Muller. See Kurt Hillig's article inside for details.

June 23 - New Moon - 11:50 pm EDT

June 27 - Public Star Party at Peach Mountain Observatory - Four day old Moon.

Next Month:

July 17 - Meeting at 807 Dennison - Mr/Ms/Dr/Prof ? will speak on TBD. Don't miss it !

July 18- Public Star Party at Peach Mountain Observatory - Planetary drought continues.

July 19 - ATM Group - Meeting time and location TBD.

July 23 - New Moon - 9:44 am EDT

July 25 - Public Star Party at Peach Mountain Observatory - Do you know were your Mosquito repellent is ?

ATM GROUP REPORT

by Kurt Hillig

First, an important announcement: The next gathering of the ATM group will be on Sunday, June 21 at 2 PM. We will meet at Technological Research Inc. (TRI) - the optics fabrication shop of Karl Mueller - on the north side of Ann Arbor at 2242 Pontiac Trail.

TRI is about three and one half blocks North of Barton Drive (the traffic light on Pontiac Trail); the driveway is five feet past the first 30 mph speed limit sign on the east side of Pontiac Trail, between a cobblestone house and a house with a green roof. About 50 yards up the driveway on the right is a commercial building with TRI located at the near end. (Call Karl, at 734/663-9011, if you get lost!).

Now, here's an update on ATM happenings. There are at least two categories of ATM's in the Lowbrows:

Some of us are interested in technical perfection (or as close as we can come) - something which is generally not attainable in an affordable scope. These ATMs tend to spend a lot of time making plans, but usually find that they don't have the skills or resources to carry them out. A second category are the nuts-and-bolts guys - they're out to make scopes that are cheap, easy, and usually imbued with a rather rustic look.

Now, the ATM group members - and a number of potential members - want to hunker down and build some scopes; and at our last meeting we kicked around some ideas on how to do this. But things are getting off to a rather slow start (and my disappearing for three weeks to China didn't help any).

So here's where I think we are and where we can go. First, Karl Mueller - a professional optician in Ann Arbor - would like to work with people to train them in the art of mirror making. With him, we (individually, or at most in groups of two or three) would start with a Pyrex blank, with the back and edge ground true, and the "hogging out" done on Karl's curve-generating mill. We'd take this through fine grinding (by hand) and polishing (by machine). Then with Karl's guidance would come the figuring (again by hand) and testing (with his interferometer). The total time invested would be about two days, and the end product is a mirror as close to perfection as you care to get.

However, this might not satisfy the second category of ATMs, as we're estimating the cost to be around $300 to end up with a coated 6" (or was it 8"? Sorry, Karl, I can't find my notes right now) mirror. This isn't a bad price, though it's a bit more than you'd pay for one from Orion; but, here you end up with the best mirror you can get - and you have the interferograms to prove it.

What about the folks who want a scope, but for various reasons can't afford to "go fancy"? Well, we'll take care of them as well! I haven't worked out all the details yet, but I expect to run some glass-pushin sessions out in my own shop (as soon as I get it built!) later on this summer. Here people can learn how to do it the old, slow - but dirt cheap - way, using elbow grease rather than milling machines. (And maybe I can finally get the polishing machine now collecting dust in my basement up and running.)

And remember, after the optics are made, there's the whole rest of the scope to build; so once we've got some mirrors ready to go, we'll set up the assembly line and get to work on mounts.

Doing it the old fashioned way, will definitely be cheaper, though maybe not as much as you might hope, unless you've got lots of old plywood lying around, and have the Pyrex blank already on hand.

So, what about the schedule? Well, I know from long experience that I'm *not* a good organizer, so if someone wants to lend a hand I'm more than willing to follow along. (Was there any discussion of this at the May meeting, while I was away? Anyone care to volunteer to be our ATM czar?) However, the June ATM group gathering will be on the 21st at Karl Mueller's shop (see the announcement above) where we can get a first-hand look at the tools the pros use, and start scheduling people who are interested in running through his training; and we can settle plans for some sessions of old-fashioned glass pushing for the folks who want to go that route.

Hope to see you all there!

Hubble Takes First Image of a Possible Planet Around Another Star and Finds a Runaway World

Space Telescope Science Institute press release

NASA's Hubble Space Telescope has given astronomers their first direct look at what is possibly a planet outside our solar system -- one apparently that has been ejected into deep space by its parent stars. The discovery, made by Susan Terebey of the Extrasolar Research Corporation in Pasadena, CA, and her team using Hubble's Near Infrared Camera and Multi-Object Spectrometer (NICMOS), further challenges conventional theories about the birth and evolution of planets, and offers new insights into the formation of our own Solar System.

Located in the sky within a star-forming region in the constellation Taurus, the object, called TMR-1C, appears to lie at the end of a strange filament of light that suggests it has apparently been flung away from the vicinity of a newly forming pair of binary stars. At a distance of 450 light-years, the same distance as the newly formed stars, the candidate protoplanet would be ten thousand times less luminous than the Sun. If the object is a few hundred thousand years old, the same age as the newly formed star system which appears to have ejected it, then it is estimated to be 2-3 times the mass of Jupiter, the largest gas giant planet in our Solar System. Also possible is that the object is up to ten million years old, the same age as other young stars nearby, in which case it may be a giant protoplanet or a brown dwarf star. A brown dwarf star is a small star that has failed to sustain nuclear fusion.

The candidate protoplanet is now 130 billion miles from the parent stars and predicted to be hurtling into interstellar space at speeds up to 20,000 miles per hour (10 kilometers/sec) -- destined to forever drift among the Milky Way's starry population. Hubble researchers estimate the odds at two percent that the object is instead a chance background star.

"If the results are confirmed, this discovery could be telling us gas giant planets are easy to build. It seems unlikely for us to happen to catch one flung out by the stars unless gas giant planets are common in young binary systems," said Terebey. "The results don't directly tell us about the presence of any terrestrial planets, like Earth," she adds. "However, we believe gas giants do influence the formation of much smaller rocky planets."

Current models predict that very young giant planets are still warm from gravitational contraction and formation processes. This makes them relatively bright in infrared light compared to old giant planets such as Jupiter. Even so, young planets are difficult to find in new solar systems because the glare of the central star drowns out their feeble glow. Young planets ejected from binary systems would therefore represent a unique opportunity to study extrasolar planets with current astronomical technology.

The discovery also challenges conventional theories that predict gas giant planets take millions of years to coagulate from dust in space. Instead, it favors more recent ideas that large, low-density planets may condense out of gas very quickly, at the same time their parent star does.

"This observation pushes back the clock on planet formation and offers short time scales which allow us to see how things form. This provides valuable new clues to the origin of our Solar System," says Terebey.

The candidate protoplanet was accidentally discovered by Terebey and colleagues while studying Hubble infrared images of newly formed protostars in a molecular cloud in Taurus. The exquisite sensitivity and sharpness of NICMOS clearly revealed the object's pinpoint image. However, it might have been dismissed as a background star if not for the presence of a bizarre 130-billion-mile-long filamentary structure that bridges the space between the binary pair and the candidate protoplanet.

"I said to myself, 'This is really weird, what in the world could it be?'" recalls Terebey. She speculates it could be a tunnel the runaway object burrowed through a dust cloud surrounding the stars. This created a "light tube" which channels light from the stars deep inside their dusty cocoon - like a light beam traveling through a length of fiber optic cable.

This brought Terebey to the tantalizing possibility that the planet had been flung into deep space by a gravitational "slingshot" effect from its parent stars. This could have happened if the planet's orbit allowed it to rob momentum from the stars and pick up so much speed that it escaped the system, similar to the way spacecraft perform gravitational "slingshot" maneuvers to pick up speed by flying close by a planet.

"We know that many triple star systems eventually toss out the lowest mass star. And we can predict the speed at which the object should be moving, based on the separation of the binary stars," said Terebey.

Future observations call for images taken at a later date, to confirm the object's predicted movement across the sky. In addition, the spectrum of the object will tell whether the object is a background star, brown dwarf, or something whose spectrum is less easy to predict, such as a giant protoplanet.

"We will just have to wait and see if future observations confirm this picture," said Terebey. "However it turns out, we have come to appreciate that protoplanet ejection by young binary stars ought to happen, and it offers a new way to search for giant planets." "These future observations will be critical in verifying that this object is truly a planet and not a brown dwarf," said Dr. Ed Weiler, Director of the Origins Program at NASA Headquarters, Washington, DC.

"We are sharing this preliminary data with the public at a very early stage in the research process because of its potential importance and because of the compelling nature of the image. If the planet interpretation stands up to the careful scrutiny of future observations, it could turn out to be the most important discovery by Hubble in its 8 year history".

The members of the research team include Susan Terebey (Extrasolar Research Corp.), Dave Van Buren, Deborah L. Padgett, Jet Propulsion Lab, Pasadena, CA (JPL), Terry Hancock (Extrasolar Research Corp.), and Michael Brundage, JPL.

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Star Dates

June 26-28 The Warren Astronomical Society and Ford Amateur Astronomy Club, will host the 15th annual Summer Solstice Star Party at Doug Bock's Northern Cross Observatory in Fenton. Call Doug at 810-750-0273 or E-mail to dougbock@kode.net for further information.

July 23-26 Southern Michigan Unorganized Regional Festival of Stargazers (SMURFS), will be sponsored by the Genesse Astronomical Society near Hillman. Contact : SMURFS, c/o Longway Planetarium, 1310 E. Kearsley St., Flint, MI 48503

Get A 60 INCH TELESCOPE FOR $100.00 !

by Doug Scobel

[This is an encore publication of Doug's fine article from the December 1995 REFLECTIONS. I enjoyed it then and again now. Perhaps now I will get that filter - Ed]

Well, not exactly. But, if you like to go after faint nebulae, you CAN get your telescope to perform like a 60 inch with a little, $100.00 (or less) accessory called a Nebular filter. With it you'll be able to see things through your telescope that you never thought were possible.

What They Do - Without going into a lot of detail, the way these filters work is to block out most wavelengths of light except for those which are commonly emitted by gaseous nebulae. The net effect is to let the light of the nebula pass through unattenuated, while the background is darkened. So, although the object is not made any brighter, it is the resulting increase in contrast of the nebula against the background that makes the nebula become much more visible. For me, the enhancement was so dramatic that when I tried mine for the first time, it felt like suddenly I had quadrupled the aperture of my telescope !

There are actually two classes of filters currently available. So-called Light Pollution Rejection (LPR) filters are designed to reject wavelengths from certain artificial lights and natural sky glow, and allow the rest to pass through. LPR filters are sometimes called broadband filters, because they pass a wide range of wavelengths. Nebular filters, on the other hand, are actually specialized LPR filters, passing only the narrow portion of the visual spectrum that brackets the desired emission lines and rejecting the rest. For this reason nebular filters are sometimes called narrowband filters.

One thing to keep in mind is that these filters work better with certain classes of objects than others. They work the best with most emission and planetary nebulae, and not very well with galaxies and star clusters. The reason is that emission and planetary nebulae emit light at certain wavelengths, namely hydrogen beta at 486.1 nanometers (nm), and doubly ionized oxygen (O III) at 495.9 and 500.7 nm. In this case, it is easy to design a filter that passes these wavelengths and rejects the rest. However, stars, galaxies, and reflection nebulae emit light pretty much across the entire spectrum, so there are no wavelengths that can be "singled out", and the contrast gain is modest at best.

How to Use Them - Usually you simply screw the filter into the rear of the eyepiece you are using. It can get to be a pain unscrewing and rescrewing the filter if you switch eyepieces often. If you own a Schmidt-Cassegrain telescope you can get filters sized to screw into the rear cell of your telescope, in front of the star diagonal. This will let you change eyepieces without replacing the filter. If you have an eyepiece with enough eye relief, you can even hold the filter between the eyepiece and your eye. However, with narrow bandpass filters, you have to be careful to keep the filter exactly normal to the optical axis. If you don't, the angle will cause the bandpass to "shift" off the desired wavelengths dimming the nebula.

In any case, I have found it to be important to keep stray light from hitting the filter from the "eyeball" side. Nebular filters act as mirrors, reflecting the rejected wavelengths rather than absorbing them. So, if any stray light (even sky glow) enters the eye lens of your eyepiece, it will reflect off the filter and back into your eye, reducing contrast. Use a shroud, or at least cup your hands around the eyepiece to keep all stray light out. Try it and you'll see a big difference.

What Kind to Get - If you can afford to buy only one filter, which one would I recommend? I own Lumicon's Deep Sky, UHC, and O III filters. The Deep Sky is a broadband LPR filter, while the UHC is narrowband and the O III is REALLY narrowband (the UHC passes both the Hydrogen Beta and the O III lines, as its name implies, the O III passes only the O III lines). At relatively dark sites, like Peach Mountain, the one I find myself using the most is the O III. It consistently provides the best "60 inch" results. A close second is the UHC. I have also heard that Orion's Ultrablock filter is very good, but I have never tried it in a side by side comparison with the O III or UHC. The filter I seldom use is the Deep Sky. It generally provides the least noticeable contrast gain, but sometimes helps with galaxies. Perhaps in a more light polluted environment it would work better due to the artificial sky glow. If I could only keep one, though, it would be the O III.

Another thing to consider is the kind of viewing you expect to do. If you intend to spend most of your time observing small, faint planetary nebulae at high magnifications, then you may wish to consider the Lumicon UHC or Orion's Ultrablock, instead of the O III. In my experience, the O III's extremely narrow bandpass lets so little light through that at high power (say, 200x or higher), the view is sometimes too dim and it's hard to see any detail. Whenever I go to high power I'll use the UHC and actually see more.

Observational Comparisons - Here is a sampling of objects that in my experience benefit greatly from the use of Nebular filters. Note that what I've listed here are only the big, bright, showpieces. There are many more smaller, fainter (mostly planetary) nebulae that benefit greatly from nebular filters as well. Also, note that my descriptions here are from the moderately light polluted skies of Peach Mountain, using my 13" Dob. Other sites and/or telescopes may let you see more or less, but the difference between observing with and without a filter should be similar.

Veil Nebula - This supernova remnant in Cygnus is notoriously difficult to observe. I had seen it before, but it had always been very faint, and with little detail. But with the O III filter it really comes alive ! The brighter portions, which are barely visible without the filter, are now bright and easily seen even without using averted vision. Fainter portions throughout the huge complex come into view. All the filamentary structure seen in photographs is now apparent - it's now obvious why it is called the Veil. I've considered making a sketch of it, but there's so much detail that I doubt that I could begin to capture it all. Just to see this nebula alone might be worth the price of the filter.

Dumbbell Nebula - The bright planetary nebula M27, is impressive enough without a filter. But, with the O III, it's even more impressive. Its entire oval outline is apparent, with the "dumbbell" shape superimposed on top of it. There are also fine details in the brighter portions.

Lagoon Nebula - Also known as M8, in Saggitarius, this cluster in nebulosity should be an excellent object if observed from a really dark site. But from Peach, it's low in the South, which is usually pretty murky. The nebulosity is pretty much washed out except for the brighter portions. But with the UHC or O III, the nebulosity expands to twice the diameter that is visible without it. Details that were hidden now pop out at you. The dark "lagoon" now is framed by glowing gas. It's a fantastic view.

Omega or Swan Nebula - M17, also in Saggitarius, is typically a pretty good sight, as portions of it have a fairly high surface brightness. With the UHC or O III nebulosity and detail that were previously hidden are now visible. Like M8, with the filter the nebula appears to be nearly twice as large as without it. The "swan" shape (it always looks like a "2" to me) is now very bright, and there is structure everywhere.

Trifid Nebula - You say you have trouble seeing the dark lanes that give M20 its popular name? With the UHC or O III they're a cinch - very inky black against the surrounding nebula. The reflection portion of the nebula nearly disappears, though, with the narrowband filters. To me it is enhanced slightly by using the Deep Sky filter.

Eagle Nebula - M16, in Serpens, is an open cluster embedded in nebulosity. Without a filter, I've only on the darkest of nights noticed any nebulosity at all. With the O III, however, the nebulosity pops into view, and the eagle shape is easily apparent.

Helix Nebula - NGC 7293, a very large, low surface brightness planetary nebula, is also situated low in the South in Aquarius. If you can find it without the filter, it just looks like a slight brightening in the background glow. With the O III, it now shows its true self, clearly nearly circular with a "hollow" appearance. Some portions of the ring appear to be brighter than others.

Rosette Nebula - This diffuse nebula surrounding the bright open cluster NGC 2244 in Monoceros has always been nearly invisible to me, only a couple bright portions being apparent. Low magnification and the O III really makes it pop out. With it the nebulosity surrounds the cluster like a wreath, with lots of structure and detail.

Great Nebula in Orion - You wouldn't think that the bright nebula M42/M43 should need any help. But the O III helps bring out the faint outer portions of the nebula. At low magnification, the entire fan shape is apparent, and details previously hidden can be seen. It also enhances M43 noticeably, which without a filter is rather unimpressive compared to its neighbor.

Owl Nebula - M97, a relatively low surface brightness planetary nebula in Ursa Major, has never impressed me much until I used the O III on it. The O III makes it look much brighter, with a much sharper edge. The "eyes", though, still elude me. I can tell that there are brightness variations, but had I never seen a photograph of them I doubt that I would ever describe them as looking like eyes. Perhaps they are more apparent from a truly dark site.

So, what are you waiting for? They're not that expensive, about $80.00 to $100.00 brand new, even less if you can find one used. Plus, like a Barlow lens, you can use it with any of your oculars. So, for about the price of a good eyepiece, you too can look through that 60 incher you've always dreamed about! Or at least you'll feel like you are.

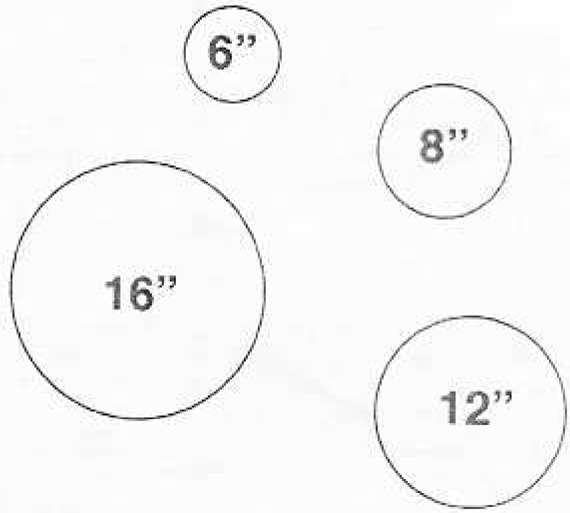
Got Glass ?

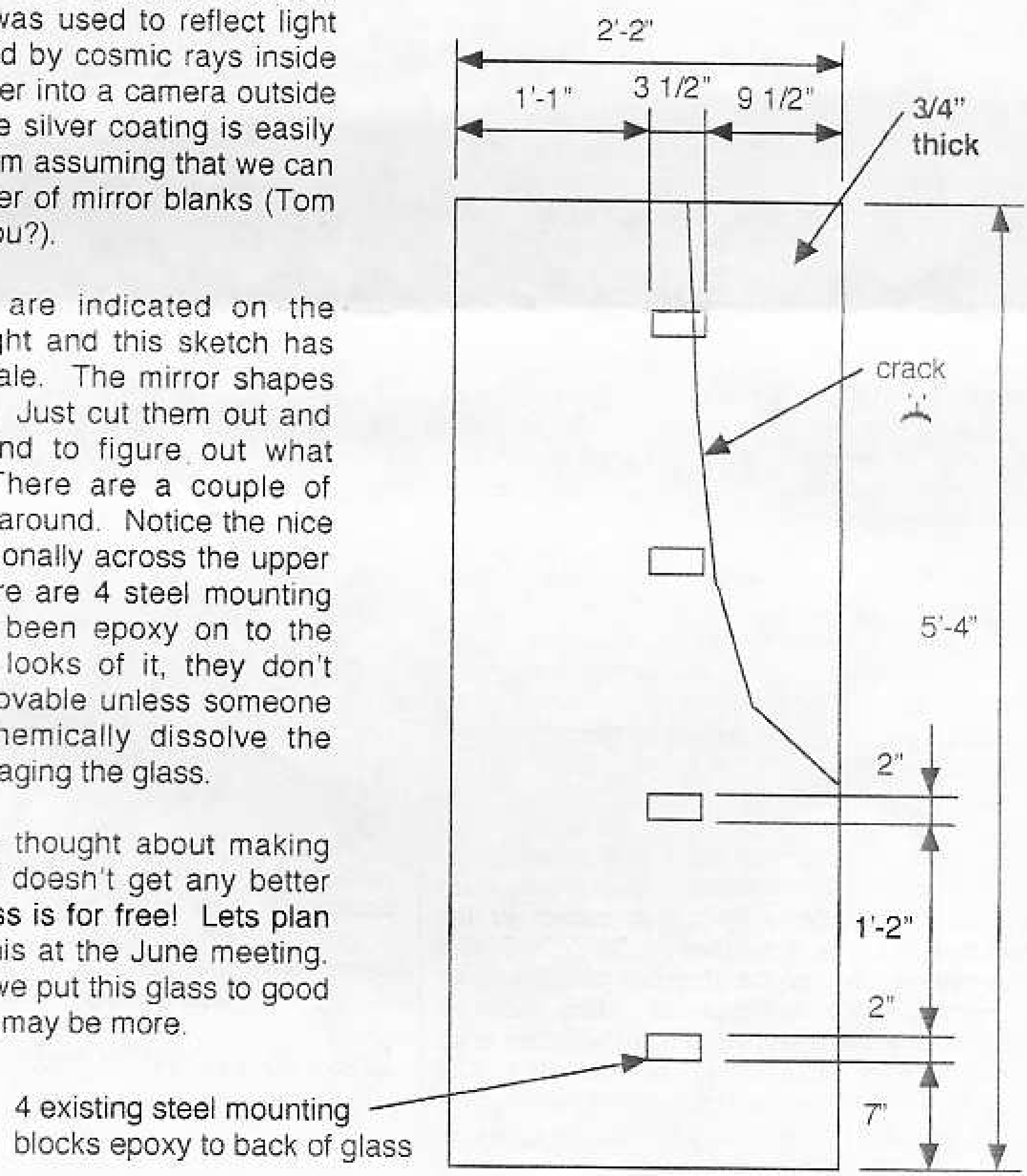
by Christopher Sarnecki

Got glass ? The Lowbrows do, that's who. We have recently been given a piece of "optically stable" (translation: It is not necessarily plate glass, but then it is not exactly determined just what it really is) **3/4" thick** glass from the Physics Department. This glass was destined for the dumpster when the department was cleaning up their warehouse this past spring. The glass comes with a bit of history. It was used to image cosmic rays as they interacted inside of a large bubble chamber. As such the front side is coated as a mirror and was used to reflect light from paths created by cosmic rays inside the bubble chamber into a camera outside the chamber. The silver coating is easily removable and I am assuming that we can carve out a number of mirror blanks (Tom Ryan - were are you?).

The dimensions are indicated on the drawing to the right and this sketch has been drawn to scale. The mirror shapes are also to scale. Just cut them out and move them around to figure out what makes sense. There are a couple of obstacles to work around. Notice the nice crack running diagonally across the upper corner. Also, there are 4 steel mounting blocks that have been epoxy on to the back. From the looks of it, they don't appear to be removable unless someone knows how to chemically dissolve the epoxy without damaging the glass.

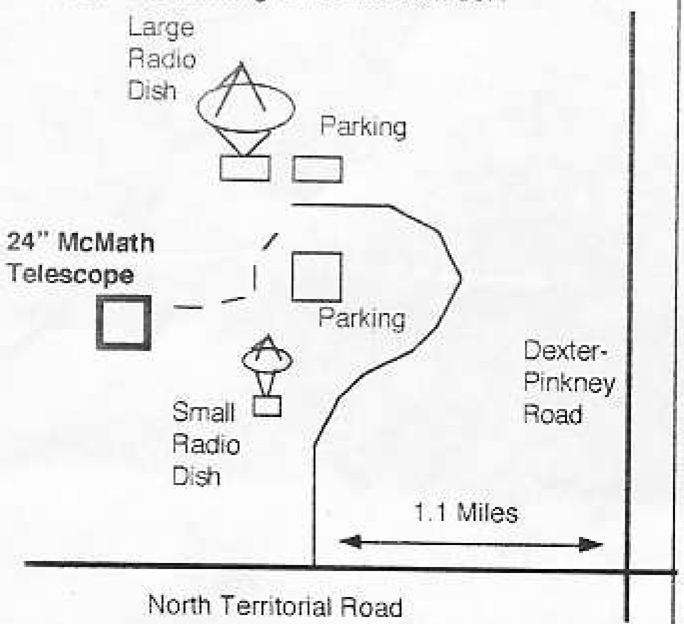
If you have never thought about making your own mirror it doesn't get any better that this. **The glass is for free! Lets plan** on talking about this at the June meeting. Oh, by the way, if we put this glass to good use I am told there may be more.





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 807.



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-Pickney 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.

Monthly meetings of the Lowbrows are held on the 3rd Friday of each month at 7:30 PM in 807 Dennison Hall. During the summer months, and when weather permits, a club observing session at Peach Mountain will follow the meeting.

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 mosquitos - 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.

Dues:

Membership dues in the University Lowbrow Astronomers are $20 per year for individuals or families, and $12 per year for students. 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 Doug Scobel at the monthly meeting or by mail at this address:

1426 Wedgewood Drive
Saline, MI 48176

Magazines:

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

Sky and Telescope: $27 / year
Astronomy: $20 / year
Odyssey: $16.95 / 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 E-mail to Newsletter Editors at:

Bernard Friberg (743)761-1875 Bfriberg@aol.com
Chris Sarnecki (734)426-5772 chrisandi@aol.com

to discuss length and format. Announcements and articles are due by the first Friday of each month.

Telephone Numbers:

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	Chris Sarnecki	(734)426-5772
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	Mark Deprest	(734)662-5719

Lowbrow's WWW Home Page:

http://www.astro.lsa.umich.edu/public lowbrows.html

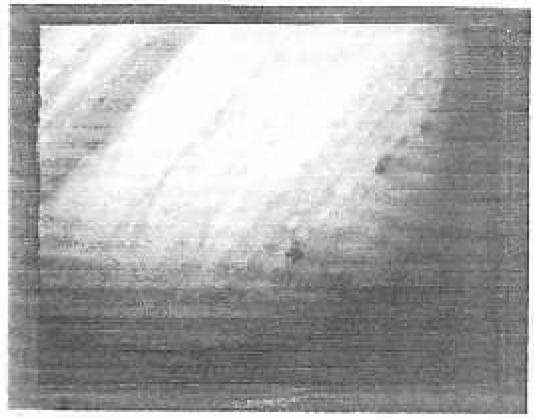
Monthly Meeting: June 19, 1998

7:30 pm

Room 807 Dennison Hall
Physics & Astronomy Building
The University of Michigan

"Doc" Mark Vincent Speaks on:

Ultraviolet Observations of Jupiter Wood's Filters, Latitudinal Bands, Polar Regions, and Sounding Rocket



Jupiter bears the blemishes from Comet Shoemaker-Levy 9's impact into the giant planet. This view was taken using the Hubble Space Telescope's Planetary Camera. Image courtesy Space Telescope Science Institute.

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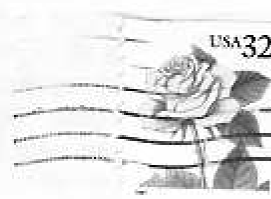

Check your membership expiration date on the mailing label !

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