REFLECTIONS

of the University Lowbrow Astronomers

June 2002

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-Pinkney 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 (313) 480-4514.

This Month:

June 8th Public Open House and Star Party at the Peach Mt. Observatory
June 15th Public Open House and Star Party at the Peach Mt. Observatory

June 21st Lowbrow Meeting and Open House at Leslie Science Center for time and directions call Bernard Friberg

Also note that our web site has a new URL: **www.umich.edu/~lowbrows/** Thanx Dave!!

Next Month:

July 6th Public Open House and Star Party at the Peach Mt. Observatory
July 13th Public Open House and Star Party at the Peach Mt. Observatory
July 19th Lowbrow Meeting at 7:30pm in Rm. 130 of Dennison Hall.
Also note that our web site has a new URL: **www.umich.edu/~lowbrows/** Thanx Dave!!

Mark Vincent, Ph.D. reviews Image Stablizing Binoculars

Tom Ryan is back with more Telescope Topics

Doug Warshow Goes Back to School

Clayton Kessler on Film Development in the Field

And a Little Look at Lyra

Right: M51, a photo from HST used with permission. For the next couple of months it well placed in the night sky.

A Review: IS Binos

By Mark Vincent, Ph.D.

How many of you drooled over the Sky & Telescope reviews of the image stabilized binoculars? Come on admit it, you're LOWBROWS. I ***KNOW*** you slobbered all over those pages. If you didn't salivate over the thought of owning a pair, you're NOT a self-respecting Lowbrow. (OK, self-respecting and Lowbrow may just be an oxymoron.) As I understand, you already have the good fortune to use a pair of Canon 15x50 image stablized binoculars.

Well, I did too. I liked my pair of Canon 12x36's so much, that somehow a pair of 15x50's recently acquired me as an owner...

That said, I suppose you'd like to read a real rocket scientist, Prez Emeritus's review of these image stabilized acquisitions. Such a review does require a dark sky - an hour's drive east-north-east of Broomfield get skies dark enough for the winter Milkyway to standout nicely. To judge the optical performance of the 15x50's, I compared them to my trusty, but old 1988 vintage Meade 11x80's. To be fair, I wore my thick "Coke bottle" glasses with both. The 11x80's cannot provide the -11 diopters of correction required by my nearsightedness (ya'all remember all those out of focus telescopes that I've walked away?). Both the Canons just accommodate my myopia. The true field of view for both encompassed Orion's belt - 11x80's easily, a bit of vignetting with the 15x50's. Orion nebula appeared larger and much contrastier with the latter, as expected. It is nice that a 15 power binoculars has just enough eye relief to accommodate eyeglasses. Without eyeglasses, the 15x50's has a true field of view equal to the 11x80's - kudos to the stunning 67 degree apparent field of view.

Now the ultimate test under a dark sky. I looked around the southwest corner of the big dipper while it was at about 40 degree elevation (now without glasses). Would you believe that M97 is faint, but easy!? I'd be stretching it if I claimed that the Owl eyes were visible, so I won't. M108 is harder to view, but still there as a nice, small faint n' fuzzy. I then tried for M109, but no joy. Either M109 is too faint, or I forgot where to look. Probably the latter, since I would have missed M97 had I not remembered its exact location. By the way, I didn't even try for these objects with the 11x80's.

For the big, not so faint and definately fuzzies: M31 goes on for one and a half fields with the 15x80 (no glasses), but barely one field with the 11x80's. M33 was obvious with the 15x50. I got the impression that had I looked at M33 longer, I might have even seen some structure. M33 was just a faint fuzzy that blended into the background through the 11x80's. The 15x50's high power, small exit pupil and excellent optics made for nice large, high contrast images8-)

On the small and/or bright, the image stabilized binocs do a pretty good job on those too. Would you believe that a dark space between Saturn's disk and its ring is just visible with the 15x50's? I suspected it, but my slight astigmatism made it difficult to be sure. A Longmont Astronomical Society member happily confirmed the detection. During the November occultation of Saturn by the gibbous Moon, the 12x36 revealed the rings and the disk, but not quite separated. Later, when the Moon was nowhere nearby, Saturn appeared as just a bright, oblong blob. For probably the first time and only time, I was praising the light pollution from the Moon. The Moon's light had reduced the contrast between the planet and sky to the level where Saturn was not saturating my retinas. With both IS binocs, Jupiter's disk is resolved, but saturated. The Galilean satellites are easily visible, even close-up to the disk.

The Moon itself resolves beautifully into a mass of craters with very little aberrant color against a dark background! Both binoculars display ghost images when viewing about 1.5 fields of view away the Moon. Internal reflections within 12x36's generate a complete circle around the Moon with a radius of about 1.5 fields of view. Generally, only minimal ghosts and minor flares appear through the 15x50's except for when the full moon is placed off to the side. Overall, both perform pretty darn well.

Now the downsides of the 15x50's. Three words about the eyecups - painfully over-sized! There is a rim that sticks out from the edge which cuts into one's eyesocket and prevents one from pressing it back far enough to block light from coming in around sides. I wish Canon had used the better eyecups from the 12x36's. Neither pair comes with objective lens caps. It was suggest to me that ordinary camera sky filters work well to protect the objective lenses. 58 and 43 mm diameter filters fit the 15x50 and 12x36's respectively.

As for the image stabilization, the 12x36's can easily correct for most jitter and noticeably reduces the sway introduced when one shifts back and forth on your feet. The 15x50's doesn't quite correct for all the jitter and does little for sway. Shiver in a cold wind, and you're almost back to having no image stabilizing with the 15x50's.

To activate the image stabilization, one must constantly hold down a button on the 12x36's. After a few hours of button holding, one better have a real muscle builder's finger. Fortunately, the button on the 15x50's can be pressed briefly to get 5 minutes of finger-free stabilization. In return for the finger-free stabilization, the extra weight of the 15x50's requires muscle builder's arms for hours of observing.

As you might imagine, both binocs depend on batteries. Most of the time I used rechargeable alkaline batteries which usually hold up for several hours of "normal" observing (i.e. well less than 50% duty cycle). The batteries last longer if one keeps off the button. With nearly dead batteries, one gets a weird double vision through the 12x36's, the stars appear one above the other. The 15x50's do keep trying to stabilize right up until the batteries are dead, but then one must hold the button down. The 5 minute auto-on feature stops working when the batteries are nearly dead.

Many people have enjoyed a looksee through these binoculars. All have been very impressed with their performance, well all but one. A grad student at NMSU was not at all impressed by the image stabilization of the 12x36's. Afterwards, I spoke with him. Since then I've stopped saying "press down the button" and started saying "HOLD down the button" - that helps. Once he got the word, he was duly impressed.

Between the two, my choice is the 12x36 for their lower cost, lighter weight and better image stabilization. The 15x50's would come out on top if the eyecups were better and the stabilization system corrected for a wider range of shake and sway. Given that, I'll still probably end up taking the 15x50's out to Hawaii in August to get the extra magnification on those southern sky objects.

Next time you're out in the Denver area, please drop by and compare the two for yourself. Afterall, if one pair is good, then two pairs are even better. You are Lowbrows, and by now are ready to take out a second mortgage on your house to get yourself pair8-))

Mark Vincent, Ph.D. Former President of the University Lowbrow Astronomers, and self-proclaimed "Prez-Emeritus" stands at the South Pole all set for a swim? Is that a snorkel and are those boots or swim fins on his feet. There is a nice article on the Lowbrows web page about his trip to the South Pole. Mark is currently working in Colorado on a new design for a near infrared camera and preparing to go to Hawaii for his third paid vacation there.

Telescope Topics
By Tom Ryan
"Optical Testing and Your Credit Card"

This article is not actually about the high cost of optical testing equipment (although a good laser interferometer can certainly melt down an ordinary credit card). Rather it's about testing optics by using your credit card as part of the test equipment.

Telescope manufacturer's will always assure you, as a real or potential customer, that their optics will meet some standard, usually Rayleigh's criterion for resolution if the optics are 8" in diameter or smaller, or "a really good mirror that I know you'll be happy with" if the optics are larger than 8". They often seek to reassure the customer of the product's quality by offering to exchange the scope for a different one if the customer is not satisfied. But how can the ordinary person determine whether his optics are the envy of Perkin-Elmer, or whether they are candidates for a class-action lawsuit?

I can't really answer that question, because quite frankly, the only way that I know of to confidently evaluate a set of optics is with a well-understood laser interferometer. However, having said that, I can show you how to have some fun with your scope, and maybe learn a little about its optics at the same time.

The goal of a telescope's optical system is to bring all of the light that it collects from a single object point to the smallest focal point possible. Some telescopes do this better than others, and some kinds of telescopes do this better than other kinds. A telescope (or any optical system) will form an essentially perfect image when all path lengths from the object point, through the telescope, to the focal point, are exactly equal. When you have an infinite object like a star, and a focal point on the optical axis, this "equal path length" criterion is satisfied by bouncing the light off of a parabolic mirror. It is not satisfied as well by a spherical mirror, or by directing the light to a point off the parabola's axis.

When a telescope doesn't bring all of the light to a single point, it is said to have aberrations. These aberrations are functions of the telescope's aperture size "y" and the image height (or off axis angle) "h", and the aberration functions are classed into orders. The effect that these aberrations have on an image usually depends inversely on their order. For example, the largest and most apparent errors, first order aberrations, vary linearly with aperture or angle, and are defects of focus or lateral color. Fortunately, these large errors can be corrected either by refocusing the eyepiece, or by buying a reflector.

The next (third) order of aberrations include spherical aberration (y^3, dependent only on aperture, and not at all on field angle), coma (y^2h, varies directly with angle and with the square of aperture), astigmatism (yh^2, varies with aperture and the square of the field angle), and distortion (h^3, varies only with field angle, so stopping down your camera lens won't make those buildings look less like barrels or pin cushions).

Fifth order aberrations exist (y^5, y^4h, y^3h^2, y^2h^3, yh^4, and h^5), as do seventh, ninth, and so on. However, these higher level aberrations usually diminish quickly in magnitude. The third order aberrations are the ones most apparent.

Unless, of course, the largest aberration is the one put there by the mirror maker.

A cheap and easy way to tell how well your (or your neighbor's) optical system brings light to a point is to do a credit card test on it. Point the scope at a bright star, or a very distant street light. Center the light in the eyepiece. (You shouldn't be able to resolve the light if you're looking at a street light.) Take your credit card out, and remove the eyepiece from the drawtube. Look into the drawtube at the light, and then move your eye forward until the light expands to fill the drawtube. Lay the credit card against the opening of the drawtube, and slide it sideways (progressively covering up the drawtube) until the light that you are looking at seems to be getting cut off. With your eye focused on the light, sliding the credit card across the drawtube's endface will move a shadow of the card across the light, either left to right or right to left.

With the credit card still pressed against the drawtube's end, rack the drawtube into or out of the focuser. When the drawtube has moved far enough, the shadow's motion will appear to flip, left for right. If originally the shadow moved in the same direction as the credit card, now it will move in the opposite direction, or vice-versa. This tells you that you've moved the drawtube past focus. Since the thing that you want to see will appear at the point where you can't tell which side of the light that the "shadow" of the credit starts from, move the drawtube back a little bit and slide the credit card across the drawtube again. Eventually, you should reach the focus point, where you can't tell which side of the image the shadow of the credit card starts from.

You, of course, are doing a Foucault test of your optical system. If the system is perfect, and all of the optical surfaces direct the light into a perfect point, you should see the light area darken uniformly, from light to black, as the credit card is moved across the image. What is more likely, though, especially if your scope is larger

than 8", is that you will see a series of rings, or what looks like a giant doughnut, as seen from above, lit by the setting sun. If your scope is a large Schmidt-Cassegrain, made after about 1980, you may see more interesting shapes.

Briefly, non-uniform light and dark areas are produced by slope errors in the telescope's optics. Either the star is not in the center of the field, or the optics were not made perfectly. (But note that if the shadows move fast, they may simply be air currents. You may try to estimate what the constant features on the mirror are.) For a more complete discussion of interpreting these errors, I refer you to the ATM books, or to anyone who has tested mirrors.

I'd like to offer two cautions when doing this test. First, if you do this on someone else's optics, don't point out any problems that you might see, unless they specifically ask you first. No one becomes more popular by pointing out that someone else has crummy toys, especially if that person was happy with their scope before you came along.

Second, I'd like to say that while I think this test is neat and easy to do, I do not for one minute believe that it (as described above) tells me anything quantitative about a set of optics. I've been testing mirrors for 37 years, and the very real problems that I had with interpreting the magnitude of a mirror's errors from Foucault test data caused me to move to laser interferometers with carefully measured null optics. The Foucault test is one of the most sensitive tests known, and the fact that you can see defects does not mean that they amount to more than ¼ wave or that they significantly affect the image.

Many years ago, I bought an 8" Cave Astrola. It never showed an Airy disk, so I tested its optics recently. The primary mirror does not have any errors that I can measure, but the diagonal was over two waves out. I loved that scope then, and I still love it now.

A Demo at Whitmore Lake Middle School

by Douglas Warshow

In early April I received a call from Ron Loyd (remember this name; you may hearing it again soon) from the Whitmore Lake Library asking if the Lowbrows would mind giving a demo for the kids at the local middle school. The students had recently been studying the Moon, the planets and stellar evolution - a bit of input from some amateur astronomers could enhance their education.

After speaking with Shelly Lyon, our contact at Whitmore Lake Middle School, John Potts and I arranged to arrive on May 2nd to give a tag-team question-and-answer session and to show the children (and the adults!) the planets through our respective telescopes. As this was less than 2 weeks before the "grand alignment," the timing was almost perfect.

I say almost perfect because the time slot that we were given was from 8:00-9:00 PM (some parents not wanting their kids out too late, I suppose). Sunset was around 8:30 - not a lot of time for observing afterwards. We were going to be cutting it close.

John and I arrived with our equipment (a NextStar 5, a NextStar 8, a 400mm lens and all the support equipment) and set it up on the far side of the building. There was a little nervousness that the activity on the adjacent soccer field would get too near to us but, fortunately, that fear turned out to be groundless. Since I-23 ran right by the school, there was a fairly low horizon towards the west.

As we were setting up, I realized that I forgot once necessary bit of gear: a warm coat. The high winds made my experience a little more interesting.

I started out at the Q & A first while John guarded the equipment. The students asked some really good questions such as "How do astronomers actually observe objects in space?" and "What was the most exciting thing you saw in a telescope?" I hope that the content of my answers more than made up for my somewhat incoherent diction.

After John had his go at the Q & A, it was dark enough to see Venus and Jupiter. There was plenty "oohs" and "wows" from young and old alike. Venus a delight for everyone since they actually got to see that not only was it not just a point of light, but showed phases like our own Moon. Jupiter had its

distinctive equatorial belts and Galilean moons. I don't think that anyone just looked through the eyepieces only one time...

Some folks stayed long enough for Mars and Saturn to appear as well. Mars was a small, featureless dot in both John's telescope and mine (yes, the dust storms are still there), but when we showed Saturn to the remaining crowd, it was easy to tell that they were glad to have endured the cold for this object. Not only did they get to see the rings, but they got to see them at near maximum tilt towards the Earth. I had mentioned earlier that one of my favorite astronomical moments was the first time that I saw Saturn in a telescope; I don't think that I was alone in that sentiment.

Eventually it was time to go. Shelly helped us port the equipment back to our vehicles and extended her appreciation. I had a lot of fun, but the first thing that I did when I got home was drink a few rounds of cocoa.

I will end this article with a question for all of you - should we try to make this an annual event?

The Moon on 5/14/02 showing some nice Earthshine. This photo was taken using a 2x barlow lens and at prime focus on the 5" f/5 refractor belonging to Mark Deprest. This is a 1 second exposure using Fuji Superia 400 film. There were some high cirrus clouds that night but I think it adds to the picture.

Field Photo Processing - A Simple Alternative

By Clay Kessler

I feel a little like Andy Rooney: *"Have you ever gotten your negatives back from processing and found lots of scratches? Don't you just hate that?? What do they do with them - drop them on the floor and dance the Fandango?"*

Well, I cannot type in that nasal voice for very long - it makes my fingers ache. I have, however, had an increasing number of problems getting my negatives processed. I am not talking about odd color balance, I can correct that after the negatives are scanned. In fact, I am probably one of the easiest customers that any one hour photo shop could have. I always give very precise instructions on negative handling and I don't care how the prints look. I never argue about "I don't like this print so I won't pay for it". You would think that these places would be overjoyed to see me wouldn't you? Why is it then that my simple instructions are not followed?

Maybe I am just getting pickier as I do this more but it seems that I have suffered increasing negative damage over the last 8 months or so. It came to a head after the Texas Star Party. None of the prints looked scratched but when I got out the negatives to scan them there was a huge amount of scratches on some of them. Some negatives were rendered unusable! It actually looked as though some were dropped on the floor and walked on - and I paid a "premium" because these were astrophotos and required "extra handling". Thanks a bunch!

Even my regular one hour photo at the local Meijers has given me problems lately. Several times I have picked up a "wad" of negatives and received the explanation that "nothing came out". When I straightened out the wad and pointed out the Swan and Dumbell nebulas I got a blank look and a "Oh! Is that why you didn't want us to roll the negatives - I forgot!"

So - what do you do about all this? Start taking CCD images maybe? Nothing that drastic I hope. I started to get some ideas on this while at the TSP. Our neighbor would hand process his negatives in the sink of his camper every day. I always thought

that there were very precise timing and temperature requirements for color negative processing. These are open enough to allow processing under fairly primitive field conditions. After a couple of conversations with this gentlemen I found that he loaded his negatives onto reels in a changing bag. Once the reels were loaded into a tank and the tank sealed the rest of the process could be carried out in daylight. Hmmmm…… Temperature control? He filled his sink with warm water and had a thermometer in his developer fluid. When the thermometer hit 100 degrees he poured into the tank. HMMMMMM!!!

Well - when I decided to do this I went to a local photo equipment shop. Adrays seemed to have a large array of equipment - a confusingly large array! I talked to the "Processing Expert", a young fellow named Justin. Justin explained how the process worked and just what equipment was necessary for a small system. "Of course," he told me "what you really want is a Jobo!" I asked "What the heck is a Jobo?" He showed me a semi-automated processing machine that is designed to handle the temperature control and the agitation. This is the exact setup that Justin uses in the field to process his nature photographs. "$650.00 !!!! I don't want to spend that kind of money! Heck, that is two or three Nagler eyepieces!" "No! no!" Justin told me - "you don't want to buy a **NEW** Jobo - get a **USED** one!" "Just where do I find a used Jobo?" Justin said "Try eBay!"

Nope - not going to spend that much just to process negatives. I will just get a hand process tank, a changing bag, a thermometer and some chemicals. I can hand agitate and keep the temperature fairly constant in the sink. Yep, that's what I'll do……. Well it probably wouldn't hurt just to **LOOK** up on eBay - just to see what is available you understand - not to buy anything. Well, to make a long story short, I was the high bidder on the second Jobo that I bid on, a Jobo CPE-2 to be exact.

For those of you who have not been to eBay, this is an on-line auction service. For a fee you can list an item that you want to sell. People that want to buy the item bid on it. High bidder wins and everyone goes away happy. I found eBay an interesting new way to spend money and I now check it regularly to see what else I cannot live without.
I obtained the correct chemistry and a tank and gave the system a tryout after the Kensington Metropark Star Party. By golly, it seemed to work well! It took less than a half hour to process two rolls of film and in the end I had clean, scratch free negatives to scan and print. Of course, doing this in my kitchen is not much of a challenge, the real test will be in the "field". I carried the system down to Harry Kindt's home in northwest Ohio for a Labor Day star party weekend he was having. We processed five rolls of film that weekend with no problems at all! I think that this just might work out very well!

Cost you ask? Well consider that I did not get the Jobo to save money but rather to save negatives. The cost for the chemicals involved is about $2.50 per roll. Probably about what a photo process service would charge to develop the negatives. The real savings is in time! For example, at the TSP the photo process place was in Alpine, a 60 mile round trip - and you had to return hours later to get your photos. Most good observing locations are not very close to a one hour photo so an hour or more of driving and a one to two hour wait for photos is not unusual. This Jobo seems to work very well and can be done at the observing site, as long as you have electricity.

I like this very much and I think it will work well in the long run. Now all I need to do is to get out in the field and take some more astrophotos - oh, and stop spending so much time up on eBay……..

FOR SALE

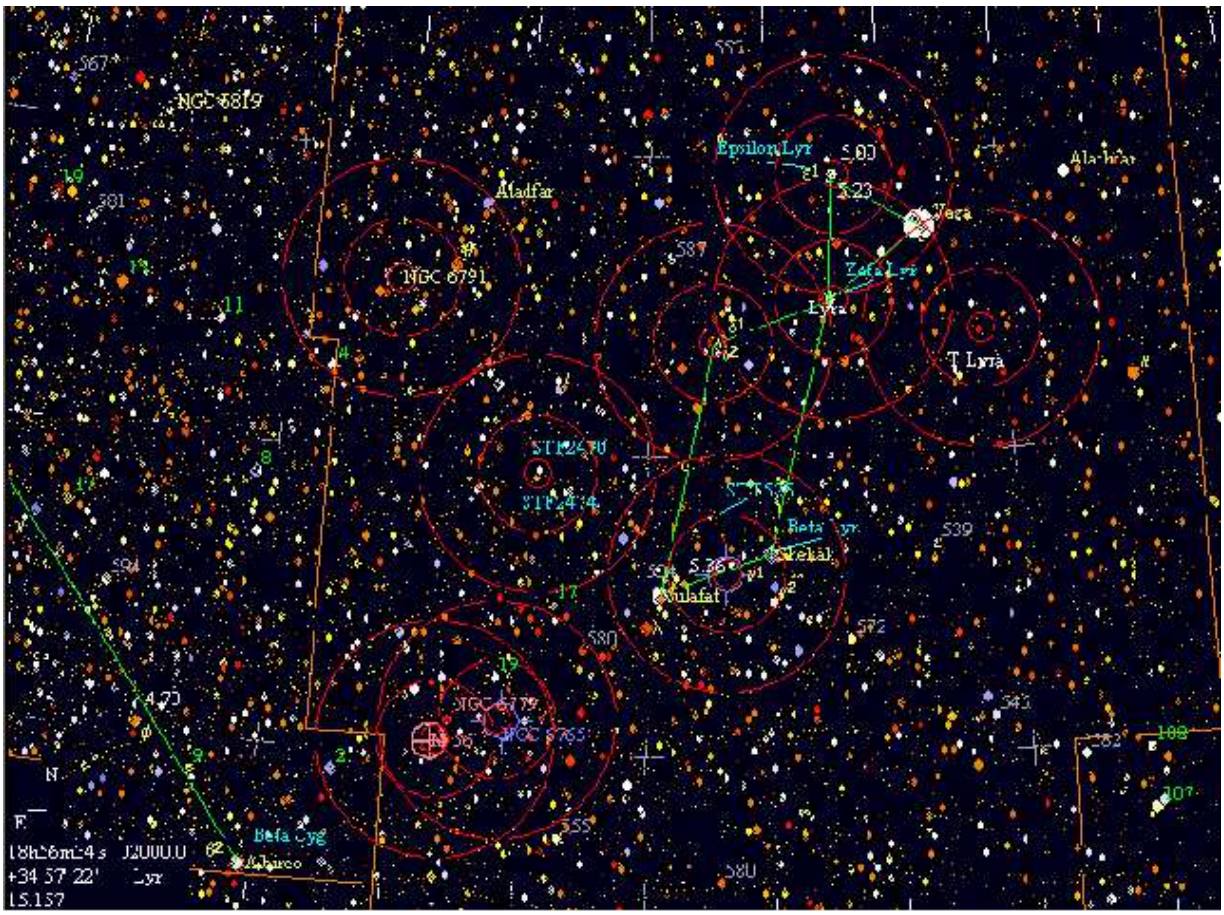
Orion Sirius Plossl Eyepieces:

26 mm, Good condition, $30.00
10 mm, Excellent condition, $35.00
Both eyepieces are fully coated, have fold-down eyecups, original price $49.95 ea.

Orion "Shorty" Barlow Lens $25.00

Excellent condition, 2X, fully coated, with plastic storage case, new is $39.95

Contact: Charles Nielsen
734-747-6585
cdnielsen1@aol.com



Explore Lyra

Well worth a look with any size telescope Lyra's deep sky object are many and varied.

With double stars such as Epsilon 1 and Epsilon 2 (The double-double), Struve 2470 and Struve 2747 (The double-double's double), Delta 1 and Delta 2, Otto Struve 525, Beta Lyra, and Zeta Lyra listed in the AL's 100 doubles, binary star searchers have a lot to look at.

Deep sky observers with medium aperture scopes have two Messier objects to study. The Ring Nebula (M 57), a planetary nebula looking a lot like a celestial smoke ring, and the Globular Cluster (M 56), a sometimes overlooked object that resolves very nicely in most scopes.

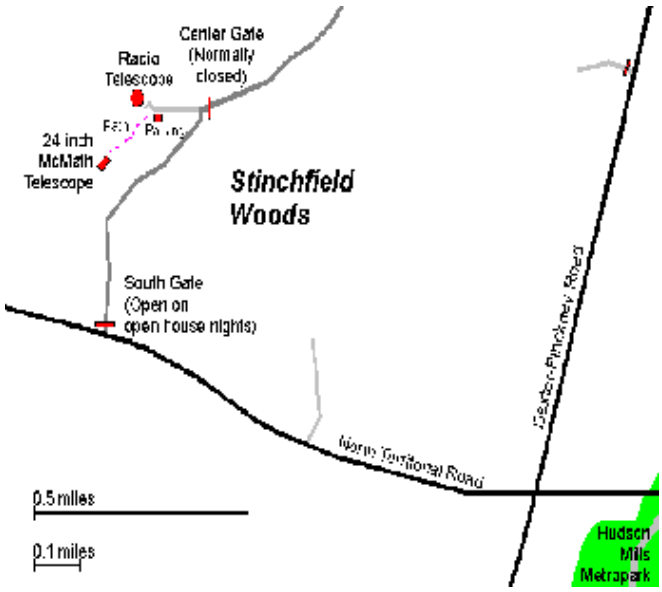
Those of you with larger aperture scopes will find the Planetary Nebula NGC 6765, a nice challenge. The Open Cluster NGC 6791 lists out as a rich cluster of faint stars covering 16' of this part of the night sky.

Now everyone with any size scope should find there way over to T Lyra arguably the reddest star in the sky!

For more information regarding Lyra or any of the 88 constellations in the night sky, I suggest: the two volume set "The Night Sky Observer's Guide" by George Robert Kepple and Glen W. Sanner.

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 E-mail to Newsletter Editors at:
Mark Deprest (734)223-0262 msdeprest@comcast.net
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:

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	John Causland	(734)747-8437
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Observatory Dir.:	Bernard Friberg	(734)761-1875
Newsletter Editors:	Mark Deprest	(734)662-5719
	Bernard Friberg	(734)761-1875
Parking Enforcement	Lorna Simmons	(734)525-5731
Keyholders:	Fred Schebor	(734)426-2363
	Mark Deprest	(734)662-5719

Lowbrow's Home Page:

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

Photo by Clayton Kessler taken on 6/7/02 which turned out to be a very humid "smudgey" night. Featured in this photo are: Antares: the Rival of Mars, M 4: the Barred Globular Cluster, and NGC 6144: the often overlooked Globular Cluster.

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Lowbrow's WWW Home Page:
www.astro.lsa.umich.edu/lowbrows.html
Check your membership expiration date on the mailing label !