University Lowbrow Astronomers
Ann Arbor, Michigan

REFLECTIONS AND REFRACTIONS

OF THE UNIVERSITY LOWBROW ASTRONOMERS

November 2003

Upcoming Events

November 2003

- **Friday, November 7, Cosmic Origins Public Lecture Series. "Future of Life, Universe, Everything." 7:30 p.m. Angell Hall.**
- **Friday, November 21. (Starting at 7:30) Monthly Club Meeting held in either room 130 or 807 in the Dennison Building.**
- **Satuday, November 22, (Starting at Sunset) Regular Scheduled Open House and Star Party at the Peach Mt. Observatory. Weather permitting**
- **Saturday, November 29, (Starting at Sunset) Regular Scheduled Open House and Star Party at the Peach Mt. Observatory. Weather permitting**
- **Friday, December 19, Monthly club meeting at 7:30 p.m.**

Attack of the Invading Sagittarius Dwarf

by Lorna Simmons

Poor, poor Sagittarius Dwarf Galaxy. Poor, poor little desperate thing. It has been grabbed, chomped, scrunched, gobbled up, only to be then disgorged by our naughty-bad, vicious, Milky Way Galaxy (sometimes known in polite society as "The Galaxy.")

Although the Sagittarius Dwarf Galaxy is, indeed, the invader of our most honorable Milky Way Galaxy, it is being consumed alive and violently shredded in the process. On the bright side, the Sagittarius Dwarf Galaxy is indeed a pleasant surprise for our astronomers and Astrophysicists to study and, as part of our Local Group of Galaxies, it offers a glimpse of stars from somewhat distant environments compared to those of our own Milky Way Galaxy.

The Sagittarius Dwarf galaxy was somewhat recently discovered on one of our Milky Way Galaxy spiral's sides -- but opposite from that of our little Solar System. After some careful study, it has been discovered that the Sagittarius Dwarf's Red Giant stars, within the past few billions of years, have extended into huge arc-streams, hundreds of thousands of Light Years long above and below the Milky Way's plane, as the Sagittarius Dwarf's arc-streams passed into our Milky Way's violent gravitational field. The Sagittarius Dwarf galaxy is being shredded right before our very eyes with its swooping tidal tails whipping around in large arcs, above and below, and far from the center of our Milky Way. Because of the Sagittarius Dwarf's disintegration, very little Dark Matter has been found in these tidal tails.

The Sagittarius Dwarf Galaxy seems to be nearing its Galactic "End Time." Poor, poor, dear little Sagittarius Dwarf Galaxy. Then again, lest we forget, the Andromeda Galaxy is fast (by Galactic standards) approaching the Milky Way Galaxy, so a spectacular multi-galactic battle is also on the distant horizon for us. Quick, pass the tranquilizers....

All of this makes for a good "Local Group" bedtime story. Pleasant dreams....

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.

Lunar Eclipse, Taken on November 8th from Tom Ryan's backyard with a Canon EOS 300D Digital Camera coupled to a Maksutov 1000mm f/10 mirror lens. Separate photos were merged together in Photoshop to form this image. Exposures were 1/200 sec. f/10.

Photo by John Ryan

The Seventh Annual "Astronomy at the Beach."

by Dave Snyder

The 7th Annual Astronomy at the Beach was held this September. This event is held on Martindale Beach on the shore of Kent Lake. Martindale Beach is part of Kensington Metropark.

Each year amateur astronomers from several clubs in Southeast Michigan, including the Eastern Michigan University Astronomy Club, the Ford Amateur Astronomy Club, the University Lowbrow Astronomers and the Warren Astronomical Society (among others), set up telescopes on the lawn near Kent Lake. As many as a thousand visitors show up to look through telescopes and attend other activities.

The event took place on two evenings, Friday September 5 and Saturday September 6. On Friday, I arrived with Charlie Nielsen. By this point there were a number of amateurs with telescopes. I found Al Bates (from the Ford Club) with his camera (come to think of it I don't think I have ever seen Al without his camera). I had brought my camera as well. This was shortly after the Mars opposition; if we hadn't already known that, there were a number of clues. For one thing, people had been told to dress up as Martians. We saw a group of girls in colorful costumes complete with antennas. When we asked permission to take some photographs, one of them said "They want to take our pictures!" From the way she said it, it was clear they were happy to participate.

Several Lowbrows had assembled on the east lawn. John Causland brought his 60 centimeter telescope (he could have called it a 24 inch telescope, but then we already have a 24 inch telescope). Mike Radwick, Gary Perrine and Mark Deprest assisted John in setting it up. Also in attendance were (in no particular order) Paul Walkowski, Jim Forester, John Ridley, Clayton Kessler and Milton French (no doubt I'm forgetting someone, but this is from memory, I didn't take notes).

I walked to the Pavilion; the Ford Club had a table and in keeping with the Mars theme they had a green toy Martian sitting on the table, there was a sign explaining that donations to the club were welcome. George Korody (from the Ford Club) was behind the table (he attends most of the Kensington events). I spoke to him and then visited the concession stand. I wanted some filters; so I walked down to the Rider's Hobby Shop table. Sure enough they were selling a variety of filters for sale. I bought a set.

There were a lot of visitors. One of the most memorable was a young girl who was interested in my telescope. She had seen many larger telescopes, but was drawn to the small 4 inch scope. Apparently it was one of the most kid friendly scopes. I let her look at it for a while. As it got dark I had a chance to take a look at Mars both through my scope as well as some other scopes.

After a few hours of observing, we were thinking of leaving. John Causland noticed a problem. He brought his 60 centimeter scope in a trailer, and the tail lights weren't working. Without working tail lights, it might be dangerous driving home. Several of us (I, Jim Forester, Bernard Friberg, Charlie and Peter

Shefman) tried to find a Lowbrow solution to John's problem. Finally someone had the idea to mount a red light bulb on the rear of the trailer. Once the bulb was supplied with power it was a reasonable substitute for a working set of tail lights (though it was a little unusual). We all left, and John was able to get home.

I came back the next day. Lorna Simmons had brought her Questar. She doesn't bring it very often, so I asked her to pose next to it. In turn, she took a photograph of me with my scope. I also asked Doug Warshow and Doug Scobel to pose in front of their scopes.

Doug Scobel had ground the mirror in his telescope himself. As it happened, Doug's wife worked at the cafeteria where I eat lunch, and she gave me regular updates on Doug's progress while he was working on the mirror. His goal was to get it done so he could use it for the Mars opposition. This was the first time I had seen his scope. [For more about Doug's mirror read "Can You Do It? Make your own telescope mirror, that is?" by Doug Scobel, June 2003].

In the meantime, Clayton Kessler was busy entertaining visitors.

One of the scheduled events was Jerry Ross, an astronaut who had been on seven space shuttle missions (more than any other person). I attended his talk: I wasn't the only one. The room was crowded with people (much more than a typical Kensington talk). Jerry spoke about the International Space Station and showed some home movies taken during his stay. Afterwards, he answered numerous questions. I briefly spoke with him.

After the talk was over, I spoke with George who said we had 3000 visitors on Friday and 10,000 visitors on Saturday. 3000 for Friday seemed plausible, but 10,000 on Saturday seemed like a lot. On the other hand there were clearly more people than the night before; as I walked back to the east lawn, it was very crowded, much more than previous events. I saw Bob Hotaling (who works for the Metropark) and asked him about this. Based on a hand count of people visiting the trailer and some other information, they arrived at an estimate of 10,000. Since I don't have a better estimate, I'll have to go along with it.

We had a chance to do more observing. While a lot of time was spent on Mars, there were other objects to look at including Uranus.

It was a very nice event.

Dave Snyder

To Zoom or Not to Zoom—and Why

By Charlie Nielsen

Over the years I have managed to collect a wide assortment of eyepieces. I believe the total is about 18 now. One for every occasion you might say. Some amateur astronomers might say this is overkill and you really only need about 3, and a good Barlow lens. But it was fun collecting them. And there really is something to say about having the right eyepiece for the job on hand. Sometimes I use two scopes at the same time, so I need an eyepiece in each. Well, I could go on making reasonable sounding excuses for buying eyepieces, but still, why would I need a zoom eyepiece? Beside the fact that I just plain wanted one, there was a practical reason. Once I locate an object that I want to study for a while I switch to an eyepiece (assuming it is not the one I located it with) that gives me that "just right" balance of magnification, contrast, and background star field. This optimum selection is also effected by the prevailing sky conditions. So the beauty of a zoom eyepiece is the ability to easily make this decision. You simply locate your object at the zoom's lowest power, then zoom in for the best view. My plan was then to find my fixed length eyepiece that best matched the setting I left the zoom on, and switch to it.

So in comes the Vixen Lanthanum 8-24 Zoom. I had read mixed reviews about this eyepiece, but I believed it would most likely be better than some less expensive models and I would have to spend a lot more money to get a noticeable quality improvement. Also, this model sports plenty of eye relief, which as a glasses wearer, I always appreciate. I purchased mine via the Internet for around $150. It arrived unharmed and showing no signs of defects. The coatings showed the reflection colors of a well multi-coated glass, but maybe not quite "fully multi-coated". The zoom action was very smooth and had just the right resistance down to about 10mm, then got a little stiff. This seemed to diminish after some usage and now the whole range is quite smooth. At one end of it's range there is a little movement of glass felt if one shakes the eyepiece vertically. I have noticed this with two other ones that I have examined, so this seems to be normal and harmless. However, I would not recommend using one as a tambourine.

I was anxious to try my new toy and only had to wait a couple of days for a clear night. The instant that I brought it to focus at the 24mm setting, I was stunned. This eyepiece is extremely sharp. In fact it is one of the sharpest eyepieces that I own. I did not expect this with so many glass elements involved. But I think it is sharper than any of my plossls, and gives up very little to my orthos. Contrast is good and star images are sharp to the edge of the field. I have read some reports that the image gets a little soft at the 8mm setting, and maybe that is true, but barely. Eye relief is very comfortable, with or without glasses. At the 24mm setting, I guess just short of 20mm and about 15mm at the highest power setting. At the 8mm setting I do need to roll down the rubber eyecup. The field of view varies from a very narrow looking 40 degrees at 24mm, to 60 degrees at 8mm. The unfortunate part is that the field does not really start to "open up" until you get down to about 10mm. At that setting I compared it to an Orion 10mm Sirius plossl that I used to own. The zoom is a bit sharper, has somewhat better edge correction, a wider apparent field of view, and much better eye relief than the plossl. This is why I traded the plossl.

The first complaint that I have is that the eyepiece is not parfocal. Going from one extreme to the other does require some minor refocusing. This is a hassle with a helical focuser. Then again, I notice the same thing with most eyepieces that claim to be parfocal. The second complaint that I have is the apparent field of view at the lowest power. At 40 degrees, it is considerably harder to find objects than I had anticipated, and sometimes I switch back to a low power, wider apparent field eyepiece. So as your low power, object locator type of eyepiece, one could do better. In the range of about 20mm down to around 12mm it is sharper than most plossls, but with an apparent field of view more like an ortho. At 12mm on down, the field of view grows rapidly, and it maintains that sharpness. I have not had the opportunity to do a side by side comparison to the fixed length Vixen Lanthanums, but from my memory of testing some of those a couple of years ago, I think they would be very close.

So did I accomplish that goal of having an eyepiece selection tool as I mentioned earlier? Well, not really. The biggest problem is that once I start using the zoom I do not usually pull it out. Again, the quality of the image is so good that I would most likely degrade it by switching to a fixed length eyepiece of the selected focal length. So the reason for switching really comes about because I want a wider apparent field of view. There is a redeeming factor though. They are called planetary nebulas. For example, the Blue Snowball. I had been frustrated with small planetaries many times. When I believe I have the little devil in the field of

view, the object is stellar due to using low magnification. But with the zoom you can just dial it up until you see that disk appear. If all the stars remain stellar than you did not locate it, but having this instant power range makes the search much easier. I first located the Blue Snowball using this eyepiece. For the same reason, I like this eyepiece for searching out Uranus. I look for that slightly blue-green star, center it, and zoom in. If I got the right one, Uranus becomes a planet right before your eye... a very nice effect.

So would I recommend the LV Zoom? Absolutely! I believe it serves a useful purpose, and is just plain fun to use. It also Barlows very well, so then you have a really wide range of focal lengths. It also is convenient for light travel. Just this eyepiece and maybe a 30 to 35mm wider field model, and you are good to go. Although I do not use the zoom every observing session, it does have its purpose and performs its job well. I certainly do not regret my purchase, and I think most observers would be very pleased also.

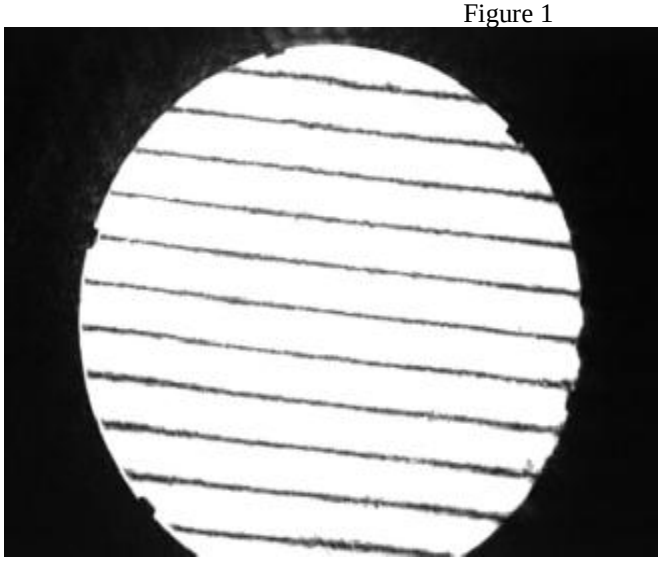
Telescope Topics
"Interferometry Revisited"

by Tom Ryan

A while ago I promised to talk about some of the problems opticians encounter while using interferometers. Interferometers are used to test all kinds of optics, including telescope mirrors. You probably know that when two waves of light encounter one another, they interfere with each other in a complex way to produce a new wave, very much like what happens to waves in the bathtub.

In an interferometer, one of the waves comes from a "reference" surface, ideally a plane or sphere, and the other from the optic under test. The new wave is the difference between the two, and if the reference wave is considered to be "perfect", then subtracting it from the test optic's wave produces a new wave that can be considered to be just the errors of the test optic.

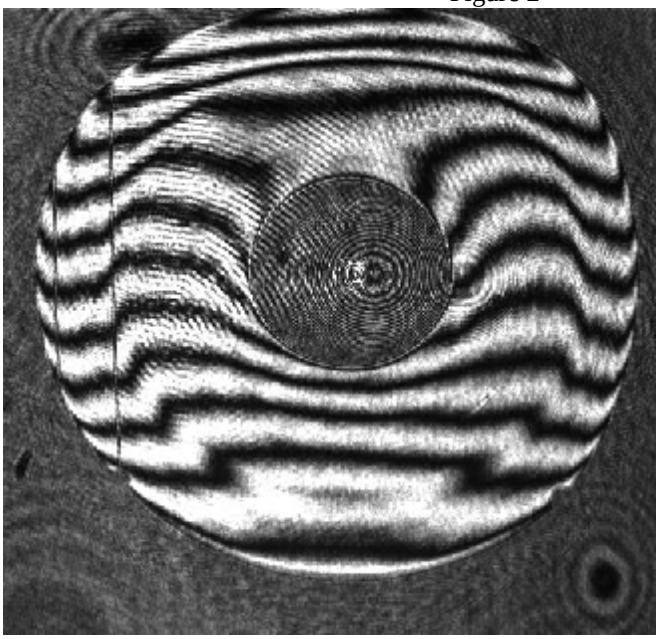
Figure 1



This test is surprisingly powerful and easy to interpret. If the two waves have the same wavelength, and they usually do, because they are usually split from the same laser source, then the resultant wave's "interference pattern" can be interpreted as a kind of topological map of the test optic, with the light and dark fringes representing constant steps in height. If the two wavefronts are planar, and are tilted with respect to each other, then, when they interfere, their difference is a wedge. Constant steps in height along a wedge are represented by a series of straight lines. Figure 1 shows 6" of an 8" diameter fused silica reference flat made by Karl Mueller, interfering against another of his flats. The lines are straight. They're both pretty good flats.

If one of the surfaces has a bump on it, then the straight lines will begin to resemble the National Geological Survey's maps of West Virginia. The beauty of these lines is that they represent measurable departures from a reference surface; usually each dark fringe is a step of half a wavelength of the laser light. There is no guessing about how far off from the reference wavefront the test optic is. You just stretch a line across the interference pattern and compare the straightness of the line to the fringes. If you tilt the test optic correctly, then a turned down edge shows itself as a fringe that turns down near the edge of the mirror. How much does the edge turn down? Just compare the amount to the half wave fringe spacing. Figure 2 shows a 14" f/2 Cervit mirror that is just starting its long departure from a sphere. The edge is turned up by a quarter wave, it has some rough zones just in from there (potentially very bad because of their high frequency), and the cen-

Figure 2



ter slopes down to the cut out core. What else do you need to know?

Now you have a tool that tells you not only what, but how much, correction you need to make in your next polishing session. You also can more easily figure out when to stop, and that is one of the differences between good and great opticians.

Of course, good results depend on the accuracy of the reference wavefront, and here, many things can go wrong. If the reference wave has a bump in the middle, then figuring the optic to perfectly straight lines will put a hole in it. This kind of thing can be avoided by testing a portion of a larger optic, and then "sliding" it sideways across the reference wavefront. If the bump stays put, then it's on the reference surface. Even if you have a very good flat or sphere to produce your reference wave, you may be making something that departs radically from that. Figure 3 shows the same 14" f/2 Cervit mirror, now well on its way to the 119 fringes of correction it needs. It's pretty hard to tell if those fringes are where they should be, to a tenth wave, just by looking at them.

For better accuracy, fringe analysis software is usually employed. It can remove errors produced by bad alignment and poor focus of the interferometer optics, can compensate for deep aspherics, and can give you a report on the "accuracy" of the wavefront, but it should be investigated carefully. Karl used fringe analysis software to evaluate his test flats, and it reported that the flats had an RMS error of about 1/100 wave, with a left edge turned up 1/14 wave, and the right edge turned down by the same amount. Karl, puzzled because he knew his flats were better than that, then evaluated a much smaller section of his flat, and the report was the same across the smaller area. The errors that the program reported were intrinsic to the program, residuals from the math.

Many opticians prefer to reduce the large fringe differences between a spherical reference and an aspheric optic by shaping the reference wavefront to become aspheric. This is done by auxiliary optics and is known as null testing. This kind of testing is not without peril; the Hubble telescope was (mis)made by incorrectly shaping the reference wave, then making the mirror to match it.

There are also problems meeting the mechanical requirements for sturdy, smoothly adjustable optical mounts that are stable to small fractions of the wavelength of light. There is a need to limit air currents, which can contribute significantly to fringe position error. Figure 4 shows some of the testing equipment used in interferometry. But even with all of these problems, interferometry is still much easier to use, and gives more believable results, than anything else.

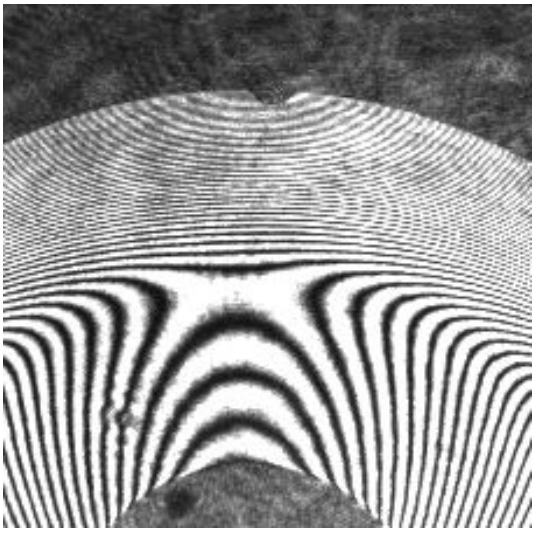


Figure 3

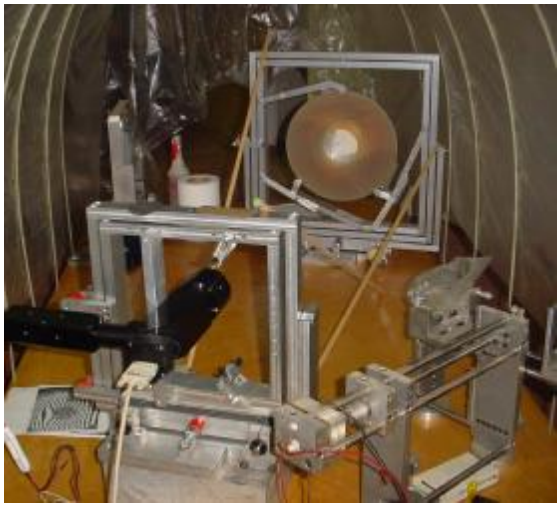
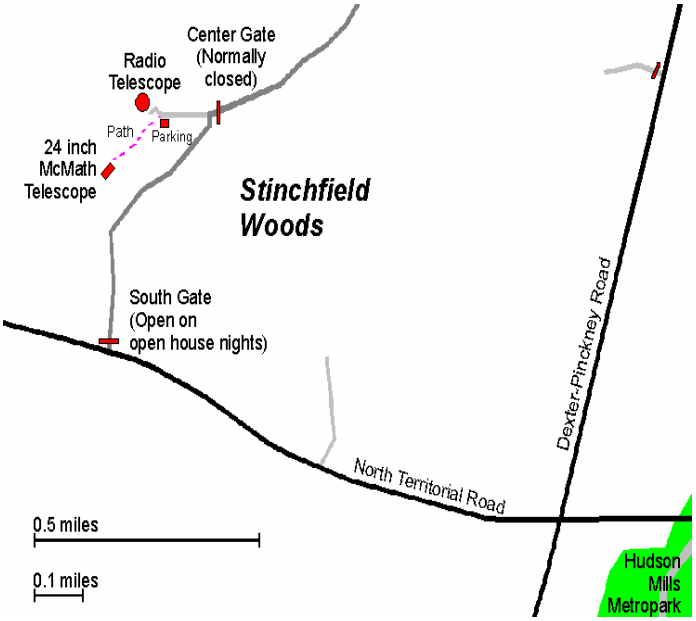


Figure 4

Places and Times

Dennison Hall, also known as The University of Michigan's Physics and Astronomy building, is the site of the monthly meeting of the University Lowbrow Astronomers. It is found in Ann Arbor on Church Street about one block north of South University Avenue. The meeting is held in room 130. Monthly meetings of the Lowbrows are held on the 3rd Friday of each month at 7:30 PM. During the summer months, and when weather permits, a club observing session at Peach Mountain will follow the meeting.



Peach Mountain Observatory is the home of The University of Michigan's 25 meter radio telescope as well as the University's McMath 24 inch telescope which is maintained by the Lowbrows. The observatory is located northwest of Dexter. The entrance is on North Territorial Road, 1.1 miles west of Dexter-Pinckney Road. A small maize-and-blue sign marks the gate. Follow the gravel road one mile to a parking area near the radio telescopes. Walk along the path between the two fenced in areas (about 300 feet) to reach the McMath telescope building.

Public Star Parties

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

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

Membership

Membership dues in the University Lowbrow Astronomers are $20 per year for individuals or families, and $12 per year for students and seniors (age 55/+). This entitles you to the monthly REFLECTIONS newsletter and the use of the 24" McMath telescope (after some training).

Dues can be paid at the monthly meeting or by mail to this address:

Mike Garrahan
7676 Grand Street
Dexter, MI 48130

Magazines

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

Sky and Telescope: $29.95 / year
Astronomy: $29.00 / year

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

Newsletter Contributions

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

Telephone Numbers

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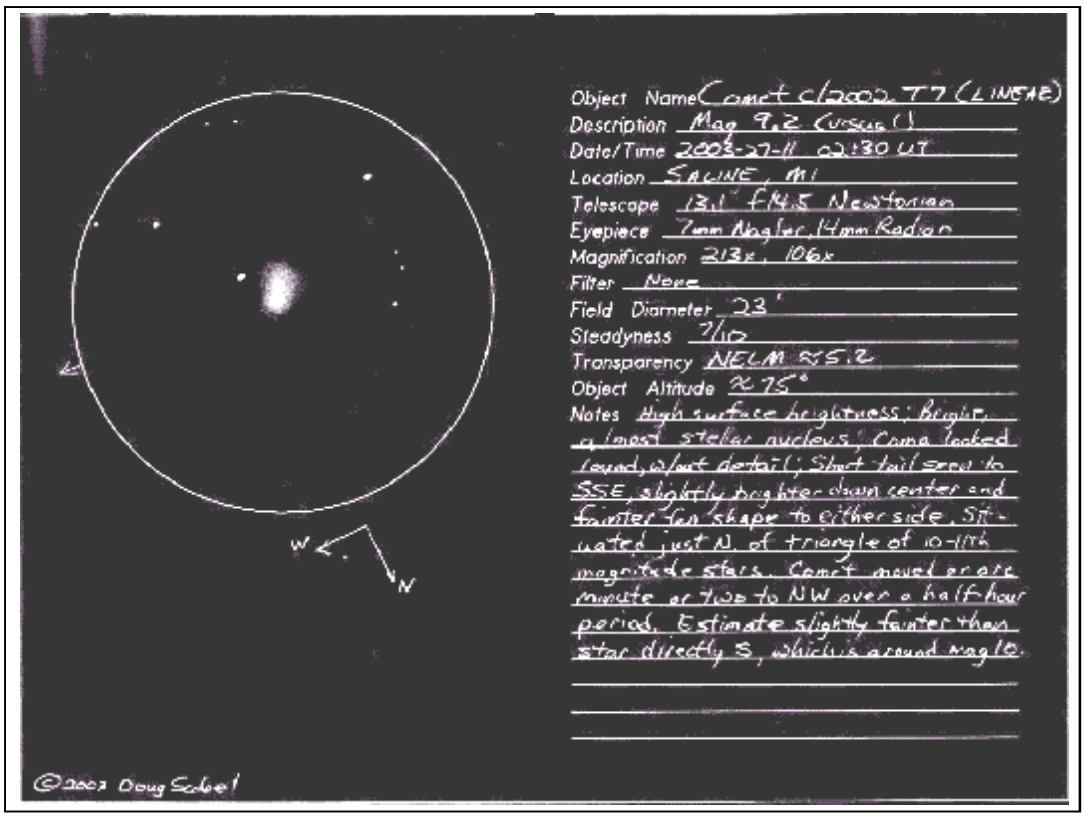
Webmaster	Dave Snyder	(734) 747-6537

Lowbrow's Home Page

http://www.umich.edu/~lowbrows/



Comet seen by Doug Scobel with his 13.1 inch refigured Dobsonian. Next Month's edition will feature an article on how Doug constructed his new Mars Scope.

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