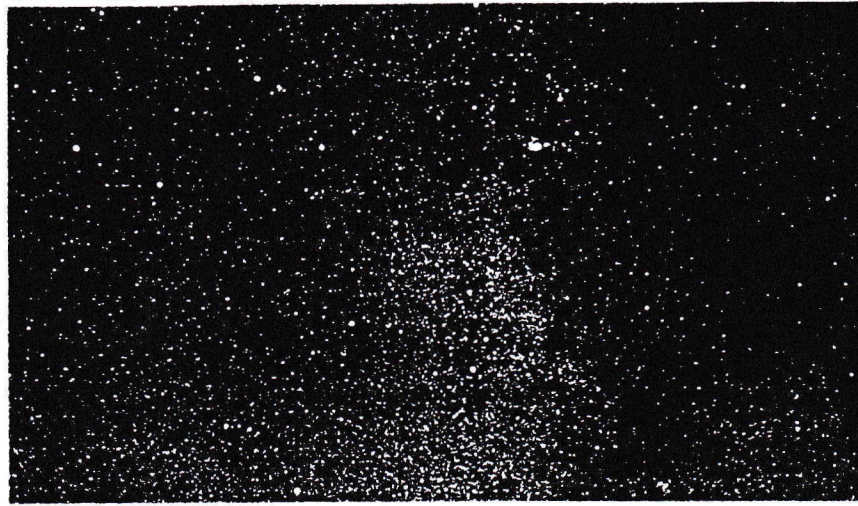


REFLECTIONS



REFLECTIONS

**August  
1995**

The Sagittarius star field showing M22, the Lagoon, and Trifid  
Nebulas. Also seen are dark nebulas and Sagittarius star clouds.  
Photographed by Aaron Kiley

**Chris Sarnecki  
Editor**

## Of the University Lowbrow Astronomers

The University Lowbrow Astronomers is a club of Astronomy enthusiast 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 Bill Razgunas at (313) 995-0934.

### This Month:

**August 18 - Meeting at Peach Mtn - Picnic/Star party at Peach mountain.** The gate opens at 6:30 pm. More about this inside.

**August 19 - Public Star Party at Peach Mountain Observatory.** Comet d'Arrest is approximately six degrees west of Beta Ceti (Cetus), 20 degrees below Saturn, and well placed for viewing just after midnight. Even S&T is reporting this comet at mag 6.4 !!!

**August 25 - 27 -** The Warren Astronomical Society is camping out at Lake Hudson. The Astronomical Societies of Lenawee and Hillsdale Counties (contact: Wes Boyd, 517-547-7402) will have a campsite also. Any Lowbrows for crashing this star party?

**August 26 - New Moon at 12:31 am EDT AND Public Star Party at Peach Mountain Observatory**

**August 29 -** Computer Subgroup Meeting at 7:30 pm at Doug Warshow's place. Call Doug at 998-1158 for directions.

**August 29 - Close conjunction of a young Moon, Spica and Mars -** Early dusk.

### Next Month:

**September 2 - Island Lake Star Party.** A Star party, near, Brighton, is sponsored by Ford Amateur Astronomy Club (313)390-5456 and City Camera.

**September 15 - Meeting at 807 Dennison - -** Jim Abshier will be speaking on "Home Made Radio Telescopes".

**September 15-17 - Astrofest 95** The midwest's biggest annual gathering of Amateur Astronomers in Kankakee, Ill.

**September 23 - Public Star Party at Peach Mountain Observatory.** Fall is officially here at 8:13 EDT.

**September 24 - New Moon at 12:55 pm EDT**

**September 30 - Public Star Party at Peach Mountain Observatory**

**September 30 - October 1 - Third Midwest International Amateur-Professional Photoelectric Photometry Symposium.** Co-sponsored by the American Association of Variable Star Observers this event is held in Williams Bay, Wisconsin, adjacent to Yerkes Observatory ( a tour is part of the deal :-)



# SSTO: Horizontal Vs. Vertical Take Off

by Doug Warshow

Building space colonies is a nice idea, but the point remains moot unless one has cheap access to space. The Space Shuttle is a (mostly) reusable rocket system, but is actually about half again more expensive than an expendable rocket to launch each kilogram of payload. The time between launches for checking and maintenance does not help matters any. (The media made a big deal about the five-day period between the recent Discovery and Atlantis missions. While this is the shortest time between shuttle flights, it only occurred due to the continued delay of the Discovery mission, which was originally to launch \*before\* Atlantis).

Reusable single-stage-to-orbit (SSTO) designs are currently being pursued by a number of aerospace contractors, such as McDonnell-Douglas with their Delta Clipper program. These experimental vehicles are grouped together under NASA's X-33 program. A key question for the various designs is whether the vehicle should be launched vertically like a standard rocket or horizontally like an airplane. Gordon Woodcock of Boeing examined this problem at the International Space Design Conference last May.

Two vertical-take-off-and-landing (VTOL) vehicles were proposed several years ago. One was called "Big Onion" since it was a huge, but squat, rocket; plenty of room was required at the base of the rocket in order to house the large number of engines for launching and landing. The "pad" for the vehicle was to be a large, artificial, fresh-water pond. The other VTOL was called Phoenix; it was proposed by Gary Hudson and designed by Max Hunter. No other details about this rocket were given at the lecture. But is the VTOL design inherently better than a horizontally launched rocket? What factors should be when planning a SSTO?

First, let me point out some facts that apply to both designs. No matter which type of SSTO

one considers, each will require 90% of its mass to be fuel, part of which is an emergency supply. Both vehicles would be tail heavy, but this would be countered by the wing for a horizontal-take-off-and-landing (HTOL) design and by avionics for the VTOL.

Let us consider the vehicle's weight. The HTOL craft would require less fuel for take-off since the vehicle's wing would provide lift. The weight of saved fuel (as compared to the VTOL design), however, would be close to that of the weight of the wing itself (in a first-order approximation). The wing is fairly massive since it must be strong enough to withstand deceleration forces (up to three times that of Earth's gravity) during re-entry. The difference in vehicle performance would be small. There is no clear winner here. As far as aerodynamic considerations are concerned, the HTOL design suffers a 50% drag loss as opposed to VTOL which only has to deal with a loss of 10% due to drag. This is because the VTOL shape is "cleaner," especially since it is not sporting a large wing.

How about propulsion? The VTOL design requires a great range of thrust values, or what is referred to as "deep throttling". Large thrust values are used for take-off and landing, and small ones are used for orbital maneuvering. The HTOL, however, does not need such a wide span of thrusts since the vehicle wing augments the engines during take off. This means that the HTOL does not need as many engines as does the VTOL. (Eight engines are needed for VTOL, and two are needed for HTOL. So many more are required for the former for redundancy purposes; VTOLs cannot glide back if some engines fail just after lift off). In addition, the HTOL can start its engines before launch for a preflight check. With the VTOL engines, once they are lit, that's it; the SSTO will either fly or just sit on the pad. The HTOL will, therefore, have fewer engine starts, making the vehicle more reliable. Another plus is that wings are less costly than engines. It should be noted, however, that air-breathing engines have a poor thrust/weight ratio in comparison to rockets. In spite of this, the HTOL design wins in this category.

The launch conditions are interesting. All payloads to date have been designed to be



launched in a vertical configuration, that is, the force produced from the acceleration during lift off (in addition to the Earth's gravitational force) are directed towards the "bottom" of the cargo. This presents a problem for the HTOL; the arrangement of the cargo bay is 90 degrees off (in the launch configuration) from the industry standard. This problem could be solved by using a vertical-take-off-horizontal-landing (VTOHL) design. (There is no sound reason to employ a horizontal-take-off-vertical-landing scheme). There is a problem with this plan. If the vehicle should have to abort after lift off, the craft would have to land horizontally with the payload still aboard. The payload would then experience transverse forces which could damage it. Another problem with the HTOL concept is its shape. Consider: we have a vehicle weighing more than 2 million pounds at takeoff; this is partially due to landing gear take up 30%-40% of the total vehicle weight. In addition, the wing is scaled to \*landing\* conditions, so it is smaller than required for normal take off. In order to launch from a standard runway (length = 10,000 ft.) at 400 mph, JATO (jet-assisted take off) or RATO (rocket-assisted take off) propulsion units would have to be strapped to the craft. An existing standard strips cannot be employed, however, since too many airport support structures (especially fuel storage tanks) are too close for comfort when accommodating a craft which is returning from orbit. A specially made runway would have to be made for the HTOL. VTOL, obviously, does not need such a facility. (As a side note, HTOL craft should take off at an angle less than twenty degrees with respect to the horizon).

Now for the re-entry. A nose-first re-entry of a slender cone (which would probably be used for VTOL) can generate almost as much lift as would a re-entering winged vehicle. The VTOL would re-enter at a higher speed and, thus, heat to a higher temperature. The fact, however, is countered by the fact that the VTOL would have less surface area to shield, reducing cost and weight. Incidentally, the VTOL can have two re-entry schemes: nose-first braking followed by a vehicle "flip" so

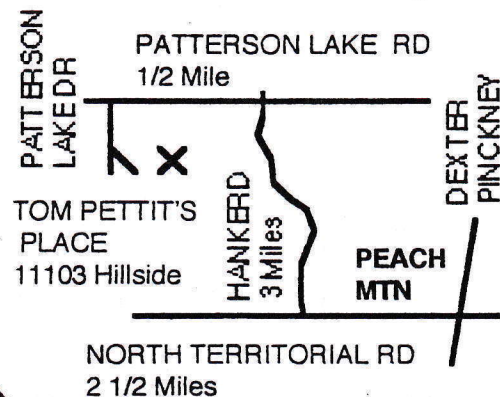
that the engines can finish the braking and then proceed to landing, or a fully tail-first approach. The latter plan is easier, but the engine bell nozzles would be subjected to higher temperatures. Cooling the engines with liquid hydrogen is not considered to be a comforting idea.

Someone in the audience asked about the use of aerospike engines for SSTO. Woodcock responded that aerospikes did not provide a high enough delta-v (change in velocity) to be considered for SSTO use. He did add that this was a strong personal bias of his.

So which will be the design of choice? Let us hope that we shall see soon.

### THIS MONTH'S MEETING OF THE LOWBROWS - PICNIC & OBSERVING AT PEACH MOUNTAIN

This Month's meeting takes place at Peach Mountain instead of Dennison Hall. The venue is a Picnic, general socialization, and OBSERVING ! Bring a dish (with food in it of course) to pass around. After words it's on to the telescopes. If it should be clouded out (heavens forbid) the picnic and socialization will take place at Tom Pettit's place, which is a short distance from Peach Mountain. See map below





# A Couple Day trips to Kitt Peak

by Ralph Seguin

On a recent vacation trip to Tucson, Arizona to visit my brother-in-law, I was able to indulge some of my astronomical interests. My wife and I flew down to Phoenix on June 2, 1995, into the arid, hot desert environment.

Even from the car, on our 2 hour drive down to Tucson, I could tell immediately that there was a world of difference in viewing conditions from my usual Michigan haunts; it was clear and very dark -- something we get little of in the light-polluted areas where I live. When we reached Tucson, I knew that I would definitely have to make a trip out to Kitt Peak. Fortunately, it turned out that I was able to get out there twice.

We drove southwest from Tucson, into the middle of the territory of the Tohono O'odham Nation, a strikingly beautiful desert land, where Kitt Peak reaches for the stars. The weather forecast called for a scorching 110F. Luckily, 110F in Arizona's humidity feels like an 80F day in Michigan. Furthermore, the summit of Kitt Peak is almost 5000 feet above the valley floor, causing a 20-degree temperature drop during the ascent.

When we arrived at the summit, I immediately raced around like a little kid on a playground, visiting several of the observatory buildings before making my way over to the visitor's center. Once in the visitor's center, I spent some time browsing through the small museum there. It has exhibits on the Tohono O'odham people, as well as the land and information about Kitt Peak and astronomy. I then hooked up with the next guided tour of the Mayall 4 meter telescope (the biggest scope at Kitt Peak).

The tour guide described many things about Kitt Peak, giving details on its history, the Tohono O'odham people, the land, the fauna and flora, ... the guides are good, and the tour well worth the time spent -- here are a few of the tidbits that I found interesting (though this

is not first hand information so i can't vouch for the accuracy)

o Kitt Peak is on a perpetual lease from the Tohono O'odham people. When the project was initially proposed to the Tohono O'odham people, they were extremely wary of the idea, since it is a sacred place to them, furthermore, it is right next to Bobiquivai (sp?) Peak, which is considered to be the center of the universe.

o Kitt Peak almost didn't get built. After construction began, the Tohono people had a change of heart about their consent.

o KPNO planners were obviously distraught, and in order to assuage any fears that the Tohono people had, they set up demonstrations of their intended use of Kitt Peak for the Tohono people, so that they could view through telescopes.

This was effective, and the Tohono people agreed to allow the project to continue. Apparently, KPNO is now referred to as The People With Long Eyes in the language.

o The Tohono O'odham native American reservation is the second largest reservation in land area in the United States. The largest is the Navajo.

o Kitt Peak has the most professional optical telescopes of any observatory in the world: 22 to date.

o The University of Michigan is one of the NOAO members, but for some reason, they refused to let me use the big scopes, even after showing them my UM ids.... :)

o I've been told that once a month, there is a star party at Kitt Peak.

o You are only allowed to go into three of the observatory buildings:

1. Mayall 4 meter
2. 2.1 meter
3. McMath/Pierce Solar Telescope

Once we made it into the Mayall observatory building, we spiraled our way up 90 feet off of the ground to the actual telescope dome. The



observatory building is a large complex, with dormitories, a machine shop, and a mirror coating lab with an elevator to move the 4 meter mirror back and forth (as necessary). The most interesting point that the tour guide made was that the entire 13 or so tons of glass that composes the 4 meter mirror is simply there to support a few grams of aluminum in a parabolic shape.

Once we made it into the actual dome, my jaw dropped, I was trying to take in the scale of things. The dome and telescope were enormous. I had never seen anything on this scale before. The telescope rides on an enormous pier, separated from the rest of the building to isolate it from building vibrations. Surely the building must vibrate and resonate when they rotated that titanic dome -- it weighs more than 300 tons. Unfortunately, they wouldn't allow anybody to go up onto the telescope walkway, so my photographs lack a referent. Trust me, IT WAS BIG!

On our second trip out to Kitt Peak, I decided to spend more time out there (they close at 4:00pm), so I packed up a picnic lunch, and we spent some time at the picnic area before heading up to the summit. Right next to the picnic area is a 25 meter radio telescope that is part of the VLBA. I snapped a couple of photos of this monster, and then off we went to the top.

I was determined to make a more thorough investigation of the area than last time when we got there too late in the day. Once again, I made my way to the Mayall scope, determined to get some better photographs of the beast (remembering to bring my flash this time). Once I was certain that I had captured the 4 meter on film, I decided it was time for me to pay homage to our club's namesake: the McMath/Pierce Solar Telescope.

Luckily, the public is allowed to go into the McMath/Pierce Solar Telescope building. Once inside, you'll find that it is a bit cramped, but very interesting. There is a series of mirrors on mobile platforms, so the optical path can be adjusted as necessary. It was a very neat experience to see this up close and personal.

If you are going to the Tucson area, I would

highly recommend making a trip out to Kitt Peak. I have a couple of pointers if you plan on doing so:

1. Try to make a day of it. The more time you spend there, the more you will see; just like astronomy.

2. Bring food and lots of water. It is in the middle of the Sonora Desert and even up high it is dry, dry, dry!

3. Spend some time observing the fauna and flora. This is a very beautiful and interesting site.

4. Go into the visitor's center. They have a small museum and gift shop, and the tours are worth taking.

5. Watch weather conditions, especially in winter. Remember that it is much cooler at the summit than it is on the valley floor.

6. Check out the petroglyphs.

7. Plan ahead: If you can help it, don't go to AZ during the full moon - my mistake :( The Grand Canyon Star Party started June 18th, the day after I left AZ to come home. I'm not certain when it will be next year, but remember that AZ is one of the best places for astronomy, amateur or professional.

8. If you have the trunk space, I would appreciate it if you could bring the 4 meter mirror back to my place.

9. When I visited Kitt Peak, they were in the process of building a visitor's telescope at the visitor's center. It should be operational soon.

10. Astronomy contacts in Tucson:

Tucson Amateur Astronomy Association (in Tucson phone book)

Stellar-Vision & Astronomy Shop  
602-571-0877

Dean Ketelsen, ketelsen@as.arizona.edu,  
602-293-2855

Organizer of the Grand Canyon Star Party

University of Arizona SEDS  
(unknown)

For those people who have access to the World Wide Web (WWW), here are some URLs of interest:



<http://name-www.engin.umich.edu:8001/people/seguin/astronomy/>  
<http://name-www.engin.umich.edu:8001/people/seguin/astronomy/KittPeak/>  
<http://name-www.engin.umich.edu:8001/people/seguin/astronomy/MirrorLab/>  
<http://www.noao.edu/kpno/kpno.html>  
<http://www.noao.edu/>  
<http://astro.as.arizona.edu/www/MirrorLab.html>  
<http://garnet.acns.fsu.edu/~swingree/atm.html>  
<http://www.nrao.edu/>  
<http://www.nrao.edu/doc/vlba/html/VLBA.html>  
<http://www.skypub.com/>  
<http://www.yahoo.com/Science/Astronomy/>  
<http://seds.lpl.arizona.edu/>

## COMET NEWS

by Christopher Sarnacki

**Neat News** - On Friday July 28th and on the following Saturday's scheduled star party many Lowbrow's were enjoying the usual faint fuzzies. Someone, (guess who), suggested that we look for Comet d'Arrest rising along with Saturn after midnight on Friday evening. Before other observers were convinced to do so it was determined that Saturn would first have to be savored. The McMATH 24" was performing extremely well on this midsummer eve, better than I have ever witnessed it. It seems all that glass comes to equilibrium only on nights such as Friday's when the nighttime air temperature (70's) manages to stay at or near the daytime temperature. Saturn was showing a thin line shadow belt across the disk. After Saturn it was on to the comet. Comet d'Arrest was approximately 2 degrees west of Saturn. I had plotted it on my star atlas. It seemed like for ever before any one found it. Doug Scoble had the honor of first locating it. It was previously published in Astronomy magazine as approaching mag 7.5 on this night. When found the comet was much fainter than expected. Just at the eye's limit to detect the diffuse 10 arc-minute coma. Bernard Friberg estimated it a mag 9. A check of *American Online*, Don Machholz's Comet

Comments for August determined that for this date the comet should be mag 9.2. From *Sky & Telescope's* weekly E-mail news, comet expert John Bortle indicated that the bright light of Saturn did wash out some of the light from the comet on this close passage. In a recent article in September's *Sky & Telescope* magazine (page 66) is now in agreement with the more optimistic reports and predicts that this comet will reach mag 6.4 centered around August 23rd, just in time for dark skies. Obviously, more observations are in order.

**BIG News** - It appears that a new comet has been discovered by two Amateur Astronomers while both were looking at M70 from different states. Rather than write about it I will let the downloaded discussions speak for themselves. The first statement is from one of the co-discoverers:

"On the night of July 22, 1995 some friends and I headed out into the desert for a dark of the moon observing session. The site, which is west of Stanfield, AZ and a few miles south of Interstate 8 is about 90 miles southwest from my home.

My friend Jim Stevens had brought his 17-1/2 Dobsonian. We started the evening observing some of the Messier objects such as the Veil and North American Nebulae in Cygnus, when Jim said lets look at some of the globulars in Sagittarius. We started our tour with M22 and M28, observing at 50X and then at 180X. Around 11:00 local time, we had M-70 in the field when Jim went to the charts to determine the next object of investigation. I continued watching M-70 slowly drift across the field, when it reached a point 3/4 of the way across a slight glow appeared on the eastern edge. I repositioned the scope to center on the new object but was unable to resolve it. I called to Jim and asked him if he knew what it might be, after a visual inspection he stated he wasn't familiar with it but would check the charts. After determining the general position of the object he was unable to find it on either Sky Atlas 2000.0 or Uranometria.

The moment Jim said we might have something excitement began to grow among our group and I breathed a silent prayer thanking God for his wondrous creation. My



friend, Kevin Gill then took a position from his digital setting circles and estimated a magnitude.

At 11:15 I said that we needed to check the object for motion and should watch it for an hour. The group observed it change position against the star field over that period and at 12:25 I decided to drive home and report our finding.

Arriving at home initial attempts to send the telegram were unsuccessful due to an incomplete address I had. After searching my library I was able to locate the correct address and confirmation was requested.

At 8:25 AM July 23, 1995 Daniel Green of the Harvard Smithsonian Astrophysical Observatory telephoned and said, Congratulations Tom, I believe you discovered a new comet, and that was one of the most exciting moments of my life." - Thomas Bopp Submitted by Kevin Gill - Black Mountain Astronomy.

"Comet 1995 O1 (Hale-Bopp): Alan Hale of Cloudcroft, New Mexico and Thomas Bopp of Glendale, Arizona discovered this comet while observing M 70 on July 23. Hale is a well-known comet observer who has done some comet hunting but was not actually searching for comets when he found this. At that same hour Bopp was observing M 70 through his friend's (Jim Stevens) 17" telescope when he noticed the comet nearby. He promptly drove home (90 miles) to report it. Bopp doesn't own anything bigger than a spotting scope, but has been involved in astronomy for some 25 years, mostly in Ohio. Two days later Gerry Rattley of Gilbert, Arizona also discovered it. The orbit of this new object is difficult to determine, but the positions below should help you follow it through September. Early indications are that the comet is distant and will be around for a long time.

#### EPHEMERIDES -1994 O1 (HALE-BOPP)

DATE(00UT)	R.A.(2000)	DEC	EL	SKY
08-16	18h28.3m	-31d19m	132d	E 10.4
09-25	18h17.4m	-29d28m	91d	E 10.3

08-21	18h25.8m	-31d07m	127d	E 10.4
09-30	18h17.5m	-29d14m	86d	E 10.3
08-26	18h23.7m	-30d53m	121d	E 10.4
10-05	18h17.9m	-28d59m	81d	E 10.3
08-31	18h21.8m	-30d40m	116d	E 10.4
10-10	18h18.6m	-28d45m	77d	E 10.3"

Posted by Don Machholz's Comet Comments for August

"For all interested, there's a great home page on comets, with all the latest info. Here's the address:

<http://encke.jpl.nasa.gov/>" - From: Mr Astro (aka Stuart Goldman)

"An IAU Circular was issued today with a preliminary orbit of Comet Hale-Bopp. The gist is that the comet will pass 0.75 astronomical units from Jupiter on April 5, 1996, and come 1.32 a.u. from the Earth on March 23, 1997. (That's right, 1997, so start preparing!) How bright it will be when it reaches the inner solar system is up in the air. It is relatively bright now, but the nucleus could just have had an outburst.

Here are the orbital elements:

T = 1997 Apr. 1.810 TT  
Peri. = 129.956  
Node = 282.339 (2000.0)  
q = 0.92819 a.u.  
i = 89.779"  
From Mr. Astro.

"According to a CIS member: "Rob McNaught found a 1993 image of Hale-Bopp on a UK Schimdt, about mag 19 at the time.( 13 au from Sun) This rather sets the orbit in concrete., and adds weight to the view it is a large comet. The orbit is also now elliptical, with a period of about 3250 years ( + or -250). This says it can't be a first time comet., and that about 1250 BC somebody should have seen something. Perhaps when the orbit is refined we will be able to calculate that previous perihelion to the decade and start looking at the clay tablets." - From Russ Sipe.

"Latest news from comet home page on WWW states that southern observatory photographed comet some time ago (9/93 is date I recall but not sure). Comet's inherent



brightness was the same as those observed recently. This may indicate the present brightness is not due to flare up. If so, current estimates of comet being naked eye object (mag +0.4 is current mag estimate on 1 April, 1997) are looking better. HOWEVER, I expect the next few months may tell a more accurate story. Keep your fingers crossed." - Submitted by TPrinty.

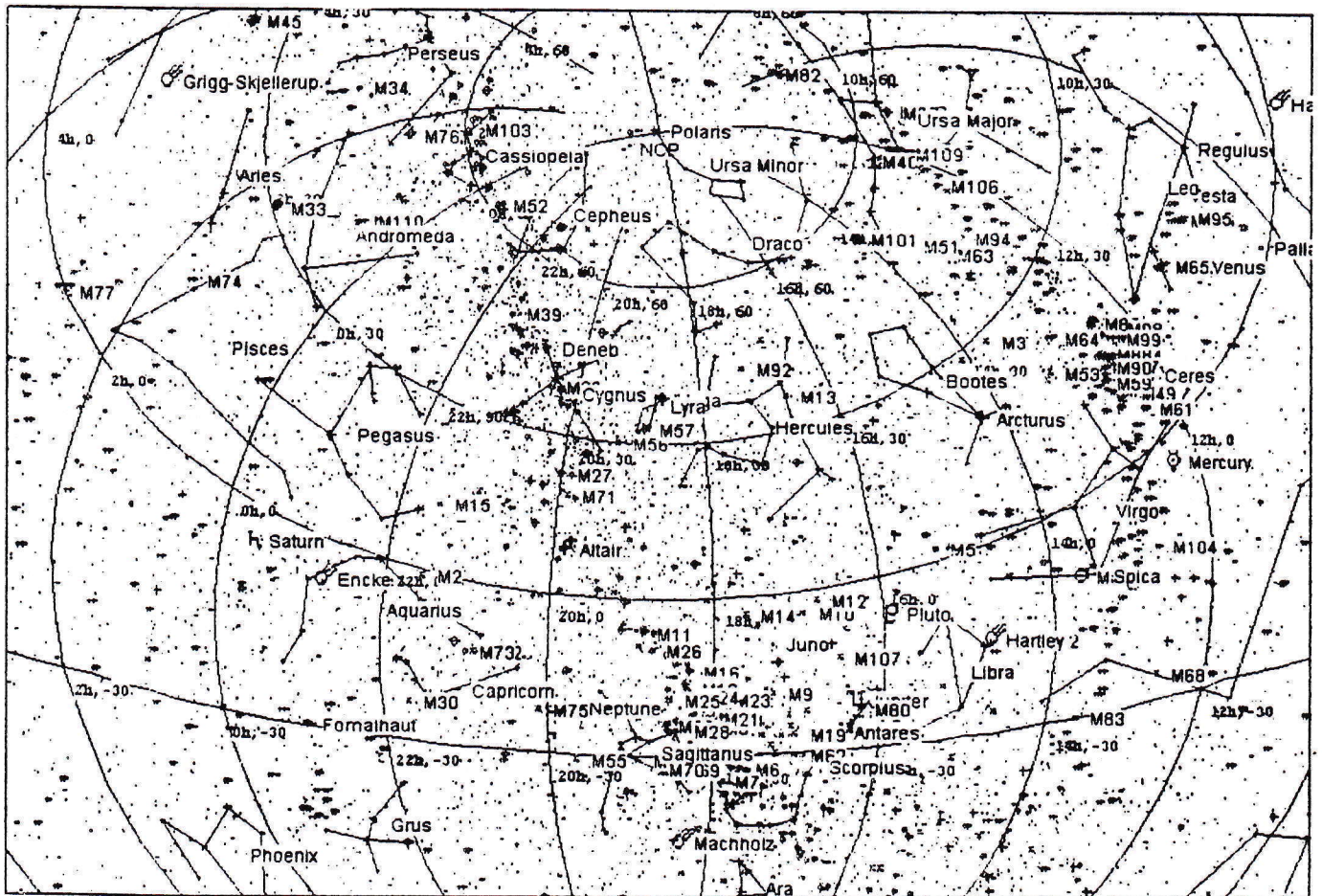
"I'll bite, if no one else will. April 1, 1997 ??? I'm suspicious. Not the date, but the mag estimate. Khoutek, here we come!" - Submitted (for your amusement I think) by M104.

"Well, folks, we may need to hold onto our hats. Roger Sinnott of *Sky & Telescope* has posted a message on CIS which was entitled HALE-BOPP UPDATE: WOW!. That title sets the tone for the message which, given Roger and *S&T's* conservative approach to these things (as they should be), reveals that the professional community is getting VERY excited about this comet. According to Sinnott, Dr. Brian Marsden has announced that Hale-Bopp may indeed be a spectacular comet in

late March or early April 1997. Marsden goes on to say that several features of Hale-Bopp's orbit are similar to the Great Comet of 1811 which was visible (naked-eye I presume) for 17 months! " - Posted by Russ Sipe.

Additional information was uploaded from a *Sky & Telescope* file with a strict warning not to publish it so I will plagiarize... er, I mean paraphrase it:

IAU's Central Bureau for Astronomical Telegrams now obtained hundreds of positional observations, calculations that show Comet Hale-Bopp to be a over 7 astronomical units from the Sun - well beyond Jupiter. The comet appears to be experiencing an outburst, which may make it appear 5 to 10 magnitudes brighter than normal. A New Mexican neighbor of Hale, Warren Offutt, used a 24-inch reflector and CCD to record a "spiral coma". This is thought to resemble that of Comet Schwassmann-Wachmann 1 after a similar outburst. Offutt indicated that the new comet has dimmed recently after the original image was taken.





### Places:

**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 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.

### Times:

**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.

**Computer subgroup meetings** are held on the first of each month, rotating among member's houses. See the calendar on the cover page for the location of next 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 !

### 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 either at the monthly meeting or by mail at:

Doug Scobel  
1426 Wedgewood Drive  
Saline, MI 48176

### Magazines:

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

*Sky and Telescope*: \$24 / year

*Astronomy*: \$18 / 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.

### Monthly Sky Map:

The sky map in this issue of *REFLECTIONS* was produced by Bernard Friberg using EARTH CENTERED UNIVERSE astronomy software by Nova Astronomics.

### Newsletter Contributions:

Members and (non-members) are encouraged to write about any astronomy related topic of interest. Call the Newsletter Editor Chris Sarnecki at 426-5772 or e-mail to [chrisandi@aol.com](mailto:chrisandi@aol.com) to discuss length and format. Announcements and articles are due by the first Friday of each month. Articles should be mailed to:

Christopher Sarnecki  
4835 Holly Way  
Ann Arbor, MI 48103

### Telephone Numbers

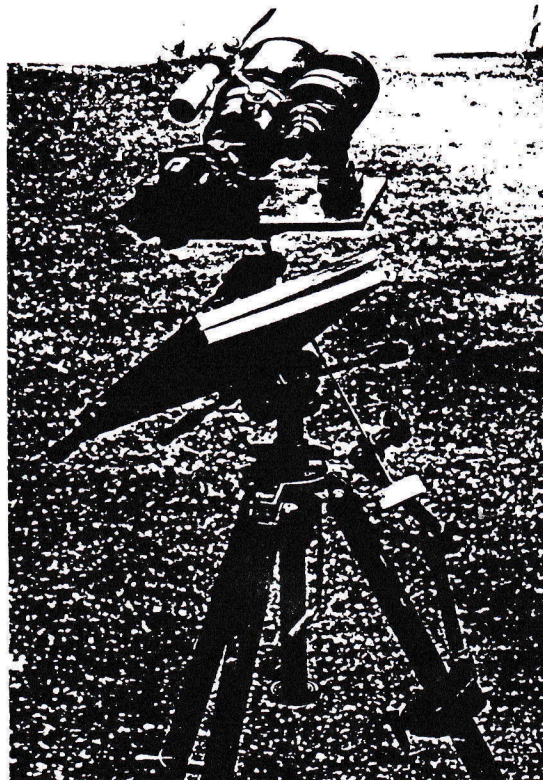
President:	Bill Razgunas	995-0934
Vice Pres:	Mark Cray	283-6311
	DC Moons	254-9439
	Tom Pettit	878-0438
	Tom Ryan	662-4188
	Randy Stevenson	429-5099
Treasurer:	Doug Scobel	429-4954
Observatory		
Director:	Bernard Friberg	761-1875
Newsletter:	Chris Sarnecki	426-5772
Peach Mtn		
Keyholder:	Fred Schebor	426-2363



## **MONTHLY MEETING:**

**August 18 - PICNIC AT  
PEACH MOUNTAIN -  
THE GATE WILL BE  
OPEN AT 6:30 PM**

This month's Reflections photographs are by Aaron Kiley, one of the Lowbrow's newest members, who just happens to be a photographer by trade. Shown here is Aaron's "barn door" camera mount. The plywood platform has a gun scope (lower left next to piano hinge) mounted directly on the platform to assure accuracy. The "magic arm" (lower right) is mounted from the tripod leg to the turning knob which manually tracks the sky. An additional gun scope and camera lens are used as finder/guide scopes.



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Check your membership expiration date on the mailing label !