Reflections Reflections

of the University Lowbrow Astronomers

November 1996

The University of Michigan's radio and optical observatories at Peach Mountain. Aerial photo by Kurt Hillig.

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 each month, weather permitting, at the University's Peach Mountain Observatory on North Territorial Road (1.1 miles west of Dexter-Pinckney Road; see inside for directions) on the Saturday evenings before and after the new Moon. For more information call (313) 480-4514.

Important Dates

This Month:

Nov 9 - **Public Open House** at Peach Mountain Observatory

Nov 15 - **Meeting** at 807 Dennison: Five speakers, five topics! Mark Cray on Eyepieces, Chris Sarnecki on Double Stars, Doug Nelle on Unique Telescopes, Dave Snyder on the Internet, Tom Ryan on Laser Testing of Optics

Nov 16 - **Public Open House** at Peach Mountain Observatory

Next Month and Beyond:

Dec 7 - **Public Open House** at Peach Mountain Observatory

Dec 14 - **Public Open House** at Peach Mountain Observatory

Dec 20 - **Meeting** at 807 Dennison. Speaker and topic TBA

Jan 4 - **Public Open House** at Peach Mountain Observatory

Jan 11 - **Public Open House** at Peach Mountain Observatory

Jan 17 - **Meeting** at 807 Dennison

The Heart of the Ring

Al Kelly <akelly@ghgcorp.com>

Q I just got done with a visual observing session, but I seem to be having trouble seeing the central star in M57, the Ring Nebula in Lyra. I have even run the magnification up to about 600X with average seeing conditions under a 5.5 mag sky (using a 22" Newtonian). I can see a couple of stars on the side of the ring that are supposedly about the same magnitude as the central star, but have not as yet been able to see it. How difficult is it visually, and what kind of site and scope did you use if successful?

A The M57 central star is fairly easy with scopes 16" and larger under the following conditions:

1. Dark sky
2. Good to excellent seeing
3. Good quality, well collimated optics
4. Careful focus
5. Careful observing

The central star is bluish-white (see my tricolor shot at www.ghgcorp.com/akelly/) and under the above conditions will first reveal itself to averted vision and then will allow the careful observer (which I know you are, right?) to study it directly. With smaller scopes, it frequently will vanish and reappear as the seeing changes. When trying to pick it up with averted vision, start by looking about 20 degrees above and to the right of the object.

I have looked at the CS in M57 dozens of times in my 38 years in this hobby. The best views I have seen have been with magnifications of at least 10X per inch of aperture, so you are correct to use higher powers, but be careful that you are not overpowering the seeing conditions for this pinpoint of an object.

A Few New Web Sites

Rather than bore you all with a long list of web sites that I've visited (most of which are probably obsolete by now anyway), this month your Editor-in-chief brings you a few brief announcements. Happy web crawling!

I just wanted to announce that I've updated/completed my webpage on Deep-Sky sketching. It contains info & examples on "how to" sketch, along with photos of the various telescopes I've used. The main component of the page is a table of hyperlinks pointing to scanned images of sketches all 110 Messier objects, numerious NCG & IC objects, and Comet & Lunar/Planetary objects. The webpage was designed using Netscape HTML extensions, so some parts may not work very well for other web browsers. You can find my sketching webpage at http://www.city-net.com/~LSMCH/SKETCH1.HTML.

I hope everyone enjoys my sketching webpage, and maybe perhaps it'll inspire others to try sketching deep-sky objects. I will appreciate any comments, pro's or con's.

– Larry McHenry (LSMCH@city-net.com)

I've added an Amateur Radio Astronomy section to my Web Page. Please drop by at: http://www.trucom.com/ppages/marty

– Marty Albert (marty@ trucom.com)

Researchers Seek Meteorites In Coal Mines

A'ndrea Elyse Messer
(aem1@psuvm.psu.edu)

Looking for a meteorite is like looking for a needle in a haystack. Looking for fossil meteorites, which fell in the distant past and are now embedded in sedimentary rock, is even more difficult, but Penn State researchers think they have a way to pare down the haystack.

"There are very few known fossil meteorites," says Andrew A. Sicree, Penn State graduate student and curator of Penn State's Earth and Mineral Sciences Museum. "In collections worldwide, there are less than 20 meteorites that fell to Earth more than two million years ago. Many meteorites are recovered from Antarctica, but almost all fell in the last million years." Sicree, Dr. David P. Gold (professor of geosciences), and Kevin Hoover of EES Environmental Group suggest that working coal mines might be the place to find fossil meteorites in good condition. Tramp-iron magnets already in use at coal mines could already be picking up iron meteorites, the researchers told attendees at the Geological Society of American conference in Denver (Oct. 28, 1996).

Coal mines use large magnets to remove iron from the coal stream to protect equipment down the line. Most of the iron removed is from hardened steel tools that break or otherwise fall in with the coal. "We thought, maybe the magnets are already doing the job and we just don't know about it," said Sicree. "Hopefully, all we have to do is look in the tramp metal bins next to the magnets."

After they began visiting coal mines and talking to miners in Wyoming and Montana, they realized that often there were no bins next to the magnets and the iron removed from the coal stream was immediately thrown out or, if it was stored, was not sorted before it was sent to a reclaimer. "So far, no iron meteorites, or other types of meteorites have been found in coal mines," says Sicree. "However, as we talk to miners and mine owners, they seem willing to save whatever the magnets collect."

Meteorites come in three general types — stones, stony-irons and irons. Only 5 percent of meteorite falls are strongly magnetic and many of these begin to rust away once they hit the Earth's surface. The researchers believe that iron meteorites that fell during the Pennsylvanian age, 275 to 310 million years ago, and were incorporated into coal seams might be better preserved because they were sealed off from the atmosphere when they fell into the swamps that eventually became the coal beds.

The researchers hope that miners and mine owners will send them any objects which are picked up by their tramp metal magnets, yet are obviously not man-made. To this end, the researchers are contacting mining professionals and distributing information, including a poster, on this project which is funded by the NASA's Pennsylvania Space Grant Consortium. "Like other people, miners bring things they've found to the museum, thinking they are meteorites," says Sicree. "We haven't found meteorites yet, but we've only just begun to search."

The Anomalous Rotation of Pluto and Charon

Dr. David Tholen
(tholen@hale.ifa.hawaii.edu)

Pluto and Charon are unique in our solar system in that they are *doubly* tidally locked. Not only does Charon always keep the same face toward Pluto (as the Moon does to the Earth) but so too does Pluto always keep the same face toward Charon (as if the two were connected by a rigid rod). However, the rotation and revolution periods don't quite match; there's a difference in about the fifth or sixth decimal place. This seems very odd – how can you explain such a thing physically? Surely the easiest explanation is that there is an error in the observation. Or perhaps there is something like the Moon's libration messing up the measurements? Here's what Dr. Dave Tholen has to say:

This isn't exactly something that can be addressed in twenty words or less. We've got a whole paper coming out in Icarus in early 1997 that describes the status of Charon's orbit But here's a brief overview.

Yes, tidal dissipation should make Pluto-Charon completely tidally locked on a time scale of ten to a hundred million years. That's theory. What do the observations say?

First, let me say something about the periods. We measured the rotation period of Pluto from the light curve. If I remember correctly, the result was 6.38726 ± 0.00007 days (it's in the 1994 April issue of Icarus). The problem is that the light curve depends on the albedo distribution. Not only could the albedo distribution be dynamic, but if the sub-Earth longitude of minimum light is a function of sub-Earth latitude, then you won't be able to extract the true period from light curve observations. (Imagine a dark stripe cutting diagonally across the equator, and that'll help visualize how the period could be affected as the sub-Earth latitude goes from south to north).

Then there's the difference between sidereal and synodic periods, which requires knowing where the pole is. At the moment, we have to assume that the spin axis coincides with the orbit angular momentum vector for Charon. So we can remove this effect, but it hasn't been done yet. Charon's rotational period hasn't been measured, but our HST light curve observations (also due out in Icarus back-to-back with the orbit paper mentioned above) at least show consistency with synchronous rotation. The orbital period has been measured from mutual event timings, and they yield 6.387246 ± 0.000011 days, as well as from our HST images, which yield 6.387223 ± 0.000017 days. So, as you can see, the observations are consistent with theory — so far. The subject of my presentation at the DPS meeting last week was an effort to merge our HST data with George Null's HST data. He has two sets of observations from 1991 and 1993, but when I combine them, the resulting period is 6.3875 days, which is clearly a problem, and I haven't been able to resolve the problem yet.

Of greater concern is the non-zero eccentricity we detected in our HST data: 0.0076 ± 0.0005, but in this case we're measuring how the center of Charon's *light* moves around the center of Pluto's *light*, which may not necessarily coincide with the centers of *mass* due to albedo effects again. We tried taking the best available maps to compute a correction, and we can get rid of approximately half of the eccentricity, but not all of it. We have hypothesized a recent impact being responsible for disrupting synchronicity, while Hal Levison has proposed random-walking the eccentricity up to the observed value via perturbations by close approaching trans-Neptunian bodies. Either way, we're seeing a direct tie-in to the trans-Neptunian population, which is another hot topic of research. I like the impact hypothesis because it offers a way to also produce some of the surface contrast we see on Pluto. (Pluto shows more large-scale contrast than any other Solar System body besides Iapetus, though some people wonder about the Earth.)

So, yes, we've found some evidence that Pluto and Charon are not completely tidally locked, but the evidence is from the orbital eccentricity, not the periods, and the effect is rather small. Half the population of Pluto still can't see Charon. (I have not previously commented on the 6.3875 day period I got when I combined Null's 1991 and 1993 observations, because this is a brand-new result; at any rate, it shouldn't be used as evidence for lack of synchronicity. I need to investigate further before even convincing myself that some mistake wasn't made in the orbit solution process.)

The best way to resolve the matter is to observe Pluto-Charon astrometrically at the same time as spatially resolved images are made of its surface. We've proposed an HST project for Cycle 7 to do just that: image Pluto with the Faint Object Camera during one orbit, then in the following orbit, do the astrometry with the Planetary Camera, then repeat the FOC image at a different roll to help remove PSF [point-spread function] effects. It needs a lot of HST time; we've asked for 36 orbits to do 12 distinct longitudes, which may not sound like a lot of time (each orbit is only 90 minutes, so it's a total of 54 hours of telescope time, which is like five nights on a ground-based telescope), but all of planetary science might get 100 to 150 orbits on HST in Cycle 7. That makes it tough, but I think we have a solid and exciting proposal.

Telescope Topics I

Tom Ryan

So you bought this triangular piece of CerVit for $6.00 at a swap meet, and you want to make it into a round telescope mirror. Or you heard that cutting facets in your glass tool cuts grinding time in half (it does), and you're wondering how to do it. The answer is, sawing!

Twyman, in his 1955 edition of Optical Glassworking (compiled for those actually engaged in making optical work), states that there are three methods for sawing glass. The first uses a diamond charged cut off wheel. (They're about $60.00 each from Universal, when they're available.)

The second uses a carborundum cutting disk. He says that it is important that the grit and bond be suitable, and I can testify to the truth of that statement. I used a cut off wheel in a die grinder to groove a 10" tool, and could have gotten the same results if I had tried to groove it with a hammer.

The third method is to charge a hacksaw blade with a mud made from carborundum and water, and to stroke away. He states, "Regarding the respective merits of the three methods, it can be said that the hacksaw method, although slow, is for this reason fairly safe in unskilled hands."

That's the one I use.

Excerpts from the Galileo FAQ

Ron Baalke (baalke@kelvin.jpl.nasa.gov)

Here's the latest set of Galileo Frequently Asked Questions. For the entire Galileo FAQ set, see the Galileo home page: http://www.jpl.nasa.gov/galileo/faq_top.html

What is Galileo going to examine besides Io, Europa and Ganymede?

Take a look at the orbital tour overview at http://www.jpl.nasa.gov/galileo/tourhilites.html, and the Galileo tour guide at http://www.jpl.nasa.gov/galileo/tour/

How fast are Galileo's computers compared to a 486 or other home computer?

As you might expect, the 32-bit 486 processor is much more powerful than Galileo's 8-bit processors. A commercial equivalent to Galileo's processors would be the 6502 processors that were used in the Apple II computers in the 1970's. They are both 8-bit processors.

The 1802 processors run at a clock speed of ~1.6 mHz, whereas a 486 will run at up to 66 mHz (typically). This would indicate that the 486 is approximately 41 times faster. Other factors found in the 486's newer technology (see the technical details below for more information) increase the 486's speed advantage over Galileo's 1802 processors to an estimated factor of roughly 200.

Galileo does have a much higher degree of redundancy (see the technical details below for more information) than is found in a home computer; though your home machine may be faster, it probably crashes far more frequently.

The Galileo Computers are all 8 bit processors, whereas the 486 computers are 32 bit processors. This means that the Galileo processors use data in 8 bit chunks, whereas the 486 uses 4 times that amount (32 bits) per instruction. Also, the 486 processors operate many times faster than the Galileo processors. So the 486 is much more powerful than the Galileo processors.

The advantage that Galileo has is that it has 6 of these processors working together. There are three processors that each have a different set of tasks that they are assigned to do, and the other three processors back them up. This way, if one fails, another one is available to take its place.

These processors talk to each other via a dedicated simplex serial data bus, that is shared by the processors and all of the spacecraft subsystems. This data bus is also redundant, so the loss of one component does not kill the data system.

The 486 uses pipelining and other tricks to approach one instruction per clock cycle, while the 1802 processors are old technology and can perform only one instruction every 4 clock cycles. So that means the 486 is an additional 4 times faster, or a cumulative 164 times faster than the 1802 processors.

An additional consideration is that the 486 implements high level commands in microcode, and has a much richer instruction set. High level actions such as division are available from the 486, whereas the 1802 does not do division, which requires additional code to implement.

Is there a chance that Galileo could return to Io later in the mission?

It is not feasible for the spacecraft to return to Io during Galileo's primary mission, which runs through the end of 1997. NASA is considering a follow-on mission with the Galileo spacecraft, called the Galileo Europa Mission or GEM. GEM would start immediately after the end of the primary mission of Galileo in December 1997 and would continue through 1999. Its objectives would be an intensive study of Europa, followed by in-situ study of the Io Plasma Torus, and ending with a close encounter with Io.

The key resources that Galileo must have to accomplish the GEM are money, propellant, radiation tolerance and general good health, and power, more or less in that order. If Galileo is healthy, and GEM is funded , there is a good prospect of there being enough propellant to navigate the return to Io; don't forget that gravity assists provide the majority of the trajectory change required! There is enough power left in the spacecraft for the required operations. While the spacecraft has been designed to survive Jupiter's hostile environment, returning multiple times to the high radiation environment near Jupiter during GEM could prove fatal to Galileo. Also, given NASA's limited resources, funding for GEM is by no means assured!

I'm delighted to see a new Galileo image on the web site every day, but Galileo press releases indicate that there are many more images that have been sent back to Earth. Why the delay in seeing those other images?

There are various reasons why images are not posted to the web immediately upon receipt here on Earth. For example:

To see a Galileo image using your web browser, you most likely just clicked on a link, and voila! the picture appears, along with descriptive text. However, Galileo's images don't come back to Earth in a nice, immediately-readable format. The data are "compressed" so that they can be sent to Earth more quickly, and each image has to be decompressed. Next, Galileo project personnel apply various image processing techniques, including applying calibrations to the image, eliminating radiation blemishes, bringing out details, proper contrast, and so forth. Finally, the science teams do some initial analysis (what are we looking at here?") and write captions to identify and help put the image into context. These steps delay release of a processed image on the WWW after receipt of 'raw' data on Earth.

A color image is built up by capturing the same image using several different filters, much like color separation at a commercial printing plant. The image from each filter initially looks like a black and white picture. It's only on combining the various filtered images that we can build up the total color picture. Thus, three separate "images" might combine to make one color image.

Some images are mosaiced (that is, individual frames are pieced together into a larger image mosaic so the viewer can appreciate the context of the individual piece within the larger target area). For example, Galileo's first released image of the Great Red Spot was made up of six individual pieces.

So, though it might seem that "only" five images are being posted a week, the great majority of images are being presented to the public ASAP. It might also help to know that much of the time required to prepare the images for WWW release is donated by project personnel, and must be done on a non-interfering basis with the ongoing operations.

Bent Twigs

Tom Ryan

I'm sure that, despite your best efforts, many of you remember what it was like to be a teenager. Impressions that were formed when your brain still worked the way it was designed to are very clear, unlike the details of that phone conversation you just had ten minutes ago with one of your customers.

For myself, my teenage years were spent in frustration and planning. I spent hours imagining what my life would be like when I was an adult, planning the path that would lead me to my goals, and was constantly stonewalled in my efforts to make my plan a reality. Teenagers, especially young ones, aren't trusted to actually do a lot of things. My plans for an elaborate HO train layout were stymied by the fact that my father kept a lock on the workshop door, and another one on the plug to the table saw. (I'll bet you never knew why some electrical plugs had little holes in them. Well, I did.)

At high school, I was tracked into the Honors program, which included heavy doses of chemistry, physics, math, and classical reading. When I went to the school counselor to take a class in auto mechanics and welding, I was told that the only way to do that would be to give up all my other classes and jump tracks. I liked physics, so I gave up my plans to actually do something, and went back to abstract planning.

Planning became a way of life. Doing was not allowed.

I got to thinking about this recently when I ran across a book called 'The E Myth', by Michael E. Gerber. The author talks about the problems of running a small business, and why so many small businesses close after five or ten years. One of the author's points was that the owner typically tries to do everything himself. He sells, he builds, he plans, he pays the bills, he answers the phone, and while he's doing one thing, he's not doing any of the others.

The business owner got into business because the Entrepreneur in him had a better plan for his life. The Technician part of him knew he could do the work (hell, he was doing it already while working for someone else), and the Manager inside felt that he could learn the business as he went along.

Small businesses get into trouble when one of these characters spends too much time dominating the other two, and because this approach is absolutely the wrong way to run a business. The solution, not commonly taught to people, teenagers or otherwise, is simple and is in the book. (Border's, $15.00.)

You may be wondering by now what all this has to do with Astronomy. Gerber claims that people with a strong Entrepreneurial bent live in the future, never in the past, rarely in the present, and work "in the most abstract and least pragmatic areas of particle physics, pure mathematics, and theoretical astronomy." Does this hit a little close to home?

After being told for the umpteenth time that I couldn't actually make anything, because I would doubtless cut off both of my arms if I used the table saw, I discovered telescope making. The Technician in me finally found his place; an area of calm competence and confidence that hadn't existed before. And in making a parabolic surface that was as perfect as the hand of man could make, I discovered the juncture of mathematics and God.

(Development of the Manager had to wait another decade.)

Now, recent studies indicate that if people take up smoking in their 20's, they do it for a few years and then stop. But if they start smoking in their teens, they're hooked for life. I'm not saying that astronomy is the same as smoking. Its not. One is bad, the other good. But teenagers are rarely shown, much less allowed to practice, the skills they will need as adults. Usually, this is because the parents themselves are struggling with unlearned lessons.

For bad or good, the habits formed as a teenager are permanent. I know. I started making telescopes then, and I'm hooked for life.

Telescope Topics II

Tom Ryan

I'm going to let you in on a little secret. Its not something that I thought of, nor did I come across it in thirty years of reading everything I could get my hands on about the subject. Instead, it was discovered (as far as I know) by Karl Mueller. It's called underwater polishing, and it's used to put the final figure on a mirror.

Karl had spent years polishing glass, and encountered the same problems that are described in the writings of Isaac Newton; turned edges and bad control of the surface's form from the heat and pressure of polishing. Karl made the simple change of bolting an epoxy painted tub to his polishing post, filling it with room temperature distilled water, and doing his final figuring with the glass completely submerged.

The figure suddenly was sharp to the edge. It could be controlled by local pressure on the glass. And no time was lost in waiting for the glass to cool down before testing. (In the telescope making class of my youth, we waited at least 30 minutes after each five minute figuring spell before testing the Pyrex mirrors.) This takes final figuring from about three days to about one hour.

Karl further wondered if the better dissipation of heat was the key to his successful method, so he tried working a blank of Zerodur (size invariant with temperature) outside the bath. The old problems returned in the form of a turned edge. Back in the bath, the edge turned straight. Karl thinks these edge effects are due to thermal changes of the pitch lap from evaporative cooling of the polishing slurry. (For arcane advice on when to polish your mirror, and where to polish your mirror, to minimize these effects when polishing out of a water bath, I refer you to the literature.)

The most amazing thing about this method is that I have never read about it before. But I've tried it, and Karl's method works.

JASPR IV Parachute Party!

Mark Vincent <mvincent@ umich.edu>

JASPR IV was successfully launched on Monday, 28 October. We did get enough data to call the flight a success and the payload was recovered in one piece. Now, I have my third parachute and need a place to properly fold and store it. This requires a high ceiling, 10 foot minimum, hopefully much higher. What I have done in the past with the previous chutes is to hoist them into my parent's polebarn with the help of the Sunset Astronomy Society during a 'parachute party'. If anyone would like to host a parachute party, please contact me at home (663-7813) or email me.

Springtime Dust Storm Swirls At Martian North Pole

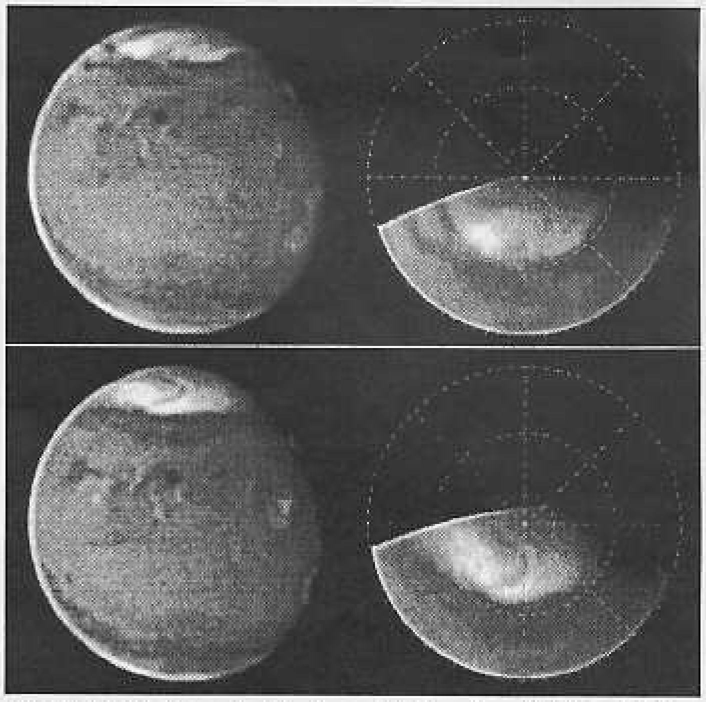
Press Release STScI-PR96-34

Two Hubble Space Telescope images of Mars, taken about a month apart on September 18 and October 15, 1996, reveal a huge dust storm churning near the edge of the Martian north polar cap. The polar storm is probably a consequence of large temperature differences between the polar ice and the dark regions to the south, which are heated by the springtime sun. The increased sunlight also causes the dry ice in the polar cap to sublime and shrink.

Mars is famous for large, planet-wide dust storms. Smaller storms resembling the one seen here were observed in other regions by Viking orbiters in the late 1970s. However, this is the first time that such an event has been caught near the receding north polar cap. The Hubble images provide valuable new insights into the behavior of localized dust storms on Mars, which are typically below the resolution of ground-based telescopes. This kind of advanced planetary "weather report" will be invaluable for aiding preparation for the landing of NASA's Pathfinder spacecraft in July 1997 and the arrival of Mars Global Surveyor orbiter in September 1997.

Top (September 18, 1996) - The "notch" in the white north polar cap is a 600-mile (1,000 kilometer) long storm — nearly the width of Texas. The bright dust can also be seen over the dark surface surrounding the cap, where it is caught up in the Martian jet stream and blown easterly. The white clouds at lower latitudes are mostly associated with major Martian volcanos such as Olympus Mons. This image was taken when Mars was more than 186 million miles (300 million kilometers) from Earth, and the planet was smaller in angular size than Jupiter's Great Red Spot!

Bottom (October 15, 1996) - Though the storm has dissipated by October, a distinctive dust-colored comma-shaped feature can be seen curving across the ice cap. The shape is similar to cold fronts on Earth, which are associated with low pressure systems. Nothing quite like this feature has been seen previously either in ground-based or spacecraft observation. The snow line marking the edge of the cap receded northward by approximately 120 miles (200 kilometers), while the distance to the Red Planet narrowed to 170 million miles (275 million kilometers).



HST WF/PC2 Image by P. James (University of Toledo), S. Lee (University of Colorado) and NASA

Technical notes: To help compare the polar features, map projections (right of each disk) are centered on the geographic north pole. Maps are oriented with 0 degrees longitude at the top and show meridians every 45 degrees of longitude (longitude increases clockwise); latitude circles are also shown for 40, 60, and 80 degrees north latitude. The original color images were assembled from separate exposures taken with the Wide Field Planetary Camera 2, and can be found at the STScI web site www.stsci.edu.

Calendars for Sale!

Doug Scobel, Treasurer

It's getting to be that time of year again - time to think about 1997 calendars.

I have ordered Hansen Planetarium "Wonders of the Universe" 1997 wall calendars. These calendars have excellent photos, but even better is the daily notes on the sun, moon, planets, meteor showers, eclipses, and other astronomical phenomena. Prices will be eight dollars for club members and nine (or more if you can get it!) for non-members. That's FOUR years in a row at the same low price!!! I only ordered 50 of them (I ordered 60 last year) to avoid having a bunch left over. Start thinking now about possible Christmas/holiday gifts or selling them where you work.

We also have available to us the "1997 Astronomy & Space" weekly desk calendar. These are very nice as well, have similar information, and exhibit 52 photos instead of twelve. They are slightly more expensive, so I will only order one for you if you specifically ask me to. If I get requests for between 2 and 4 calendars, the price will be $10.95 each; 5-9 copies will be $9.95 each; 10 or more will be only $8.95 each. I will be ordering them shortly after the November meeting, so make your request known to me ASAP. I'll be bringing a copy of the calendar (thanks, Fred!) to November's meeting for you to examine.

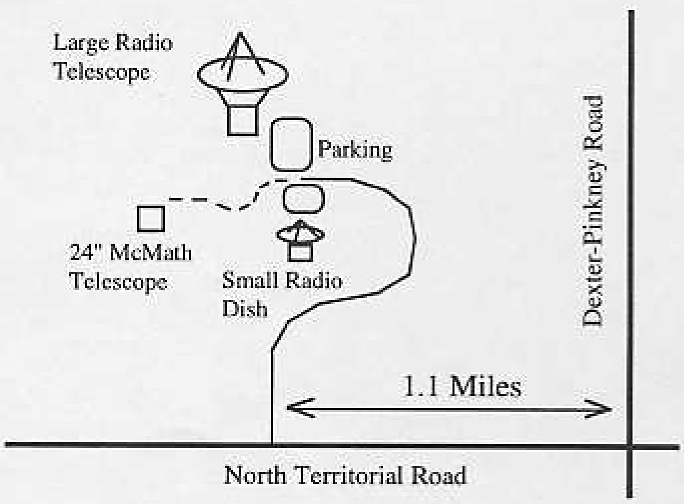
Also, if you are interested in purchasing a 1995 Observer's Guide, published by the RASC (Royal Astronomical Society of Canada), or anything else from Sky Publishing, let me know ASAP. These Observer's Guides have all the astronomical data the serious or casual observer will ever need in 1997, and are highly recommended! I have not checked their prices, but I imagine it will be similar to last year, around 17 or 18 dollars. While any club member is entitled to Sky's 10% discount (simply write "University Lowbrow Astronomers" in the appropriate place on the order form), if a number of you order through me at the same time I may be able to pass along a little savings in shipping costs.

Again, I will be ordering everything shortly after the November meeting, so let me know ASAP if you intend to order a "1997 Astronomy & Space" weekly desk calendar, or anything from Sky Publishing (including a 1997 RASC Observer's Guide).

Places:

Dennison Hall, also known as the University of Michigan's Physics and Astronomy building, is located on Church Street in Ann Arbor one block north of South University Ave. The Lowbrow's monthly meetings are held in room 807. The UM parking structure on Church Street is nearby and is open to the public after 6 PM.

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.



Times:

The monthly meetings of the Lowbrows are held on the third 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 group meetings are held on the first of each month, rotating among members' houses. See the calendar on the front cover for the location of the next meeting.

Public Open House/Star Parties are held on the Saturdays before and after each new Moon, at the Peach Mountain Observatory. Star Parties may be cancelled if the sky is cloudy at sunset or the temperature is below 10°F – call 480-4514 to check on the status. Many members bring their telescopes; visitors are welcome to do likewise. Peach Mountain gets cold at night, so dress warmly – and bring insect repellant!

Membership:

Membership dues in the Lowbrow Astronomers are $20 per year for individuals or families, and $12 per year for students. This entitles you to monthly issues of *Reflections* and the use the 24" McMath telescope (after training). Dues can be paid to the club treasurer, Doug Scobel, at any meeting or by mail at this address:

1426 Wedgewood Dr.
Saline, MI 48176

Magazines:

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

Sky and Telescope: $27 / year
CCD Astronomy: $20 / year
Astronomy: $20 / year
Odyssey: $16.95 / year

For more information, contact the treasurer.

Newsletter Contributions:

Members (and non-members) are encouraged to write about any astronomy-related topic in which they are interested. Images, whether photographs, sketches, or in electronic form (GIF, TIFF or JPEG) are also welcome. Call the editor (Kurt Hillig) at 663-8699(h) or 647-2867(o), or send e-mail to khillig@umich.edu, to discuss length, format, etc. Announcements and articles are due 14 days before each monthly meeting. Contributions can be mailed to:

Kurt Hillig
7654 W. Ellsworth Rd.
Ann Arbor, MI 48103

Telephone Numbers:

President:	D. C. Moons	254-9439
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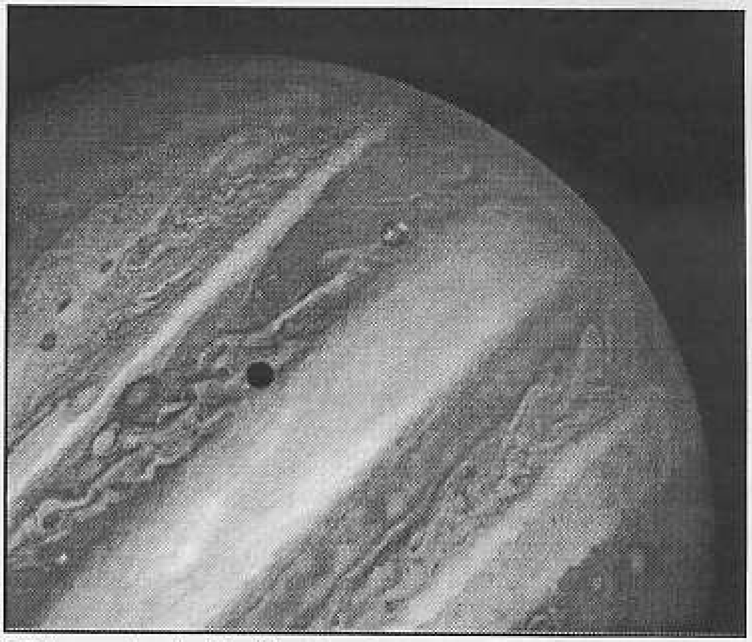
Monthly Meeting:

Five Speakers, Five Topics

The only way to find out is to come to the meeting – we hope to see you there!

Nov. 15, 1996 at 7:30 PM

Room 807 of the Dennison Building on the UM Campus



This image, taken in violet light, shows Jupiter's volcanic moon Io passing above the turbulent clouds of the giant planet, on July 24, 1996. The smallest details visible on Io and Jupiter are about 100 miles across; Io is roughly the size of Earth's moon, 3,640 kilometers in diameter. This is one of a series of images of Io taken by Hubble to complement those currently being taken by the Galileo spacecraft now orbiting Jupiter. Image by J. Spencer (Lowell Observatory) and NASA.

University Lowbrow Astronomers
1740 David Ct.
Ann Arbor, MI 48105

Check your membership expiration date on the mailing label!