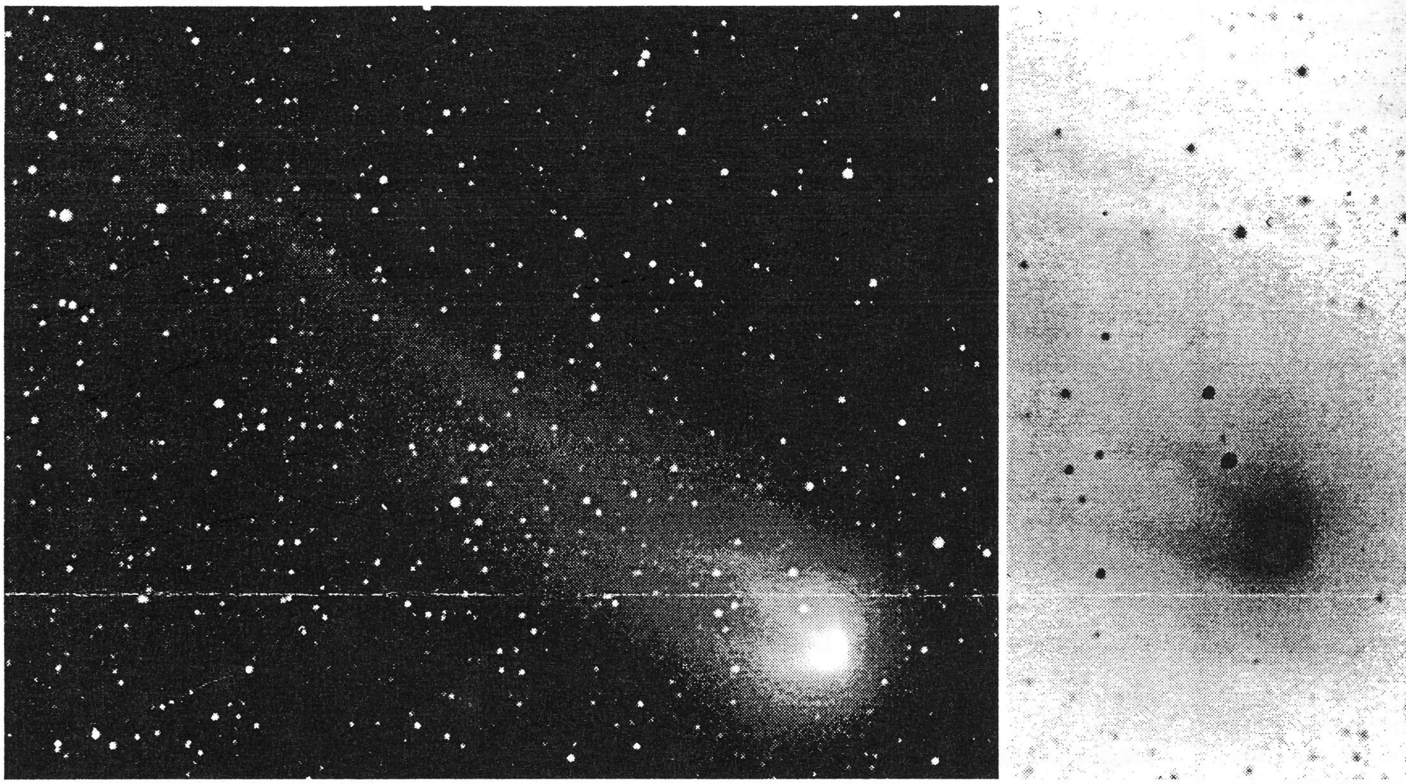
Reflections

of the University Lowbrow Astronomers

January 1997



Comet Hyakutake. Photo by Kurt Hillig from Peach Mountain, March 25, 1996. This 5 minute exposure was made with a 300 mm telephoto lens. The negative image on the right has been processed to enhance detail near the nucleus.

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:

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

Jan 17 - **Meeting** at 807 Dennison: Doug Warshow will talk about the flight of JASPR IV.

All Month: The comet Hale-Bopp will be rising in the east-northeast shortly before sunrise. Close to the sun early in the month, it reaches its greatest elongation in mid March. Look for it an hour or so before sunrise (that is, if the clouds ever go away).

Next Month and Beyond:

Feb 1 - **Public Open House** at Peach Mountain Observatory

Feb 8 - **Public Open House** at Peach Mountain Observatory

Feb 21 - **Meeting** at 807 Dennison

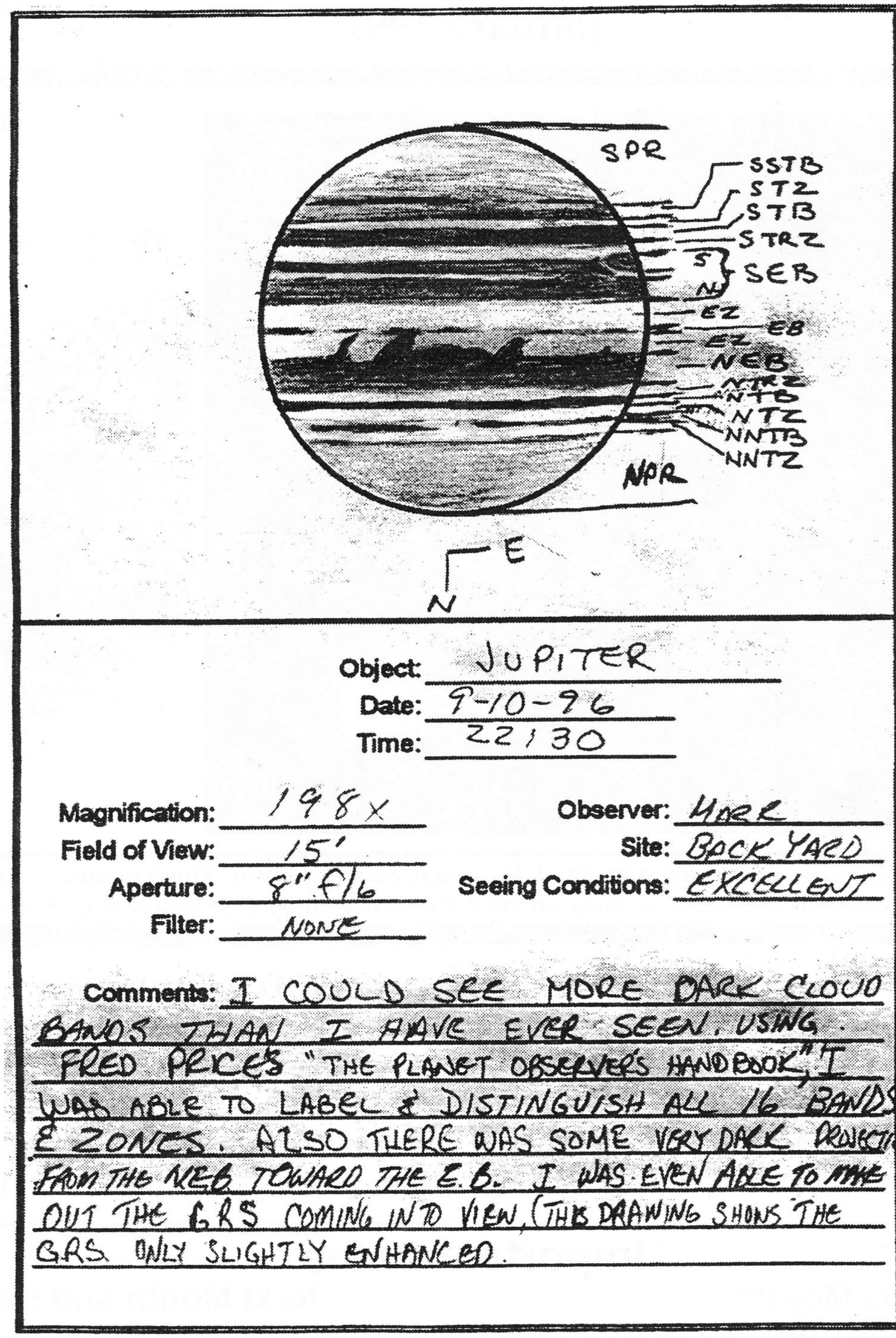
Mar 1 - Southern Michigan Amateur Astronomers Convention at Eastern Michigan University. See inside for details.

Mar 8 & 15 - **Open House** at Peach Mountain Observatory

Sketch the Skies and Improve your Eyes

Mark Deprest

I have been sketching my observations at the telescope for almost as long as I have been observing – which, by the way, has only been about two years. In this time I've made about 85 drawings, of planets, globular and open clusters, planetary, diffuse and reflection nebulae, galaxies, double stars, comets, and sunspots. My earliest drawings are a bit on the crude side and lack detail, but they are still a good representation of just what can be seen through the eyepiece of my scope (a Meade 8" f/6 Newtonian on a simple Dobsonian alt-az mount).



The reason for the title of this article is simple: I've noticed that as I try to sketch what I see in a given field of view (FOV), I begin to notice more details that I'd originally missed. Because my telescope doesn't track the sky, I have to gather as much as I can during the time it takes an object to drift across the FOV – and as most of you know, the rule is that the higher the magnification, the smaller the FOV. So I have developed a number of helpful sketching techniques that have resulted in an overall improvement in my general observing skills, and in an off-hand way improved my eyes (or perhaps my brain) in their ability to pick out fine detail quickly.

Here are some of the tips and techniques I've learned while sketching what I see through the eyepiece:

• Collimation – a properly aligned mirror makes for sharper images. I check and recollimate my scope at least three times a year.

• Cooldown time – scopes need time to reach the same temperature as the surrounding air for two reasons. First, the figure of mirrors and lenses will change due to thermal contraction as they cool. And second, warm air rising from a warm scope will produce convection currents inside the telescope that distort the images.

• Clean optics – for all the obvious reasons! Fingerprints on the eyepieces are death to sharp images, and dust scatters light and reduces the contrast that you can see. (A little dust is better than a scratched mirror, though – don't ruin your mirror by over-enthusiastic cleaning!)

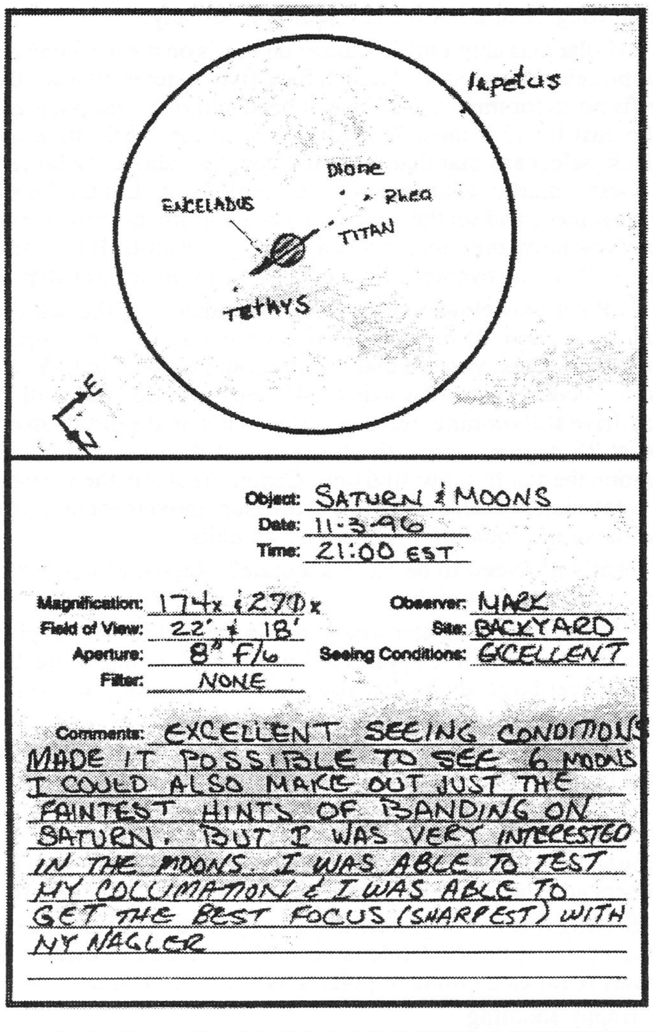
• A stable mount – it's tough to see much detail in a wobbly image. A good observing chair or stool can make a big difference.

• Good skies and patience – clear skies are critical when looking for faint objects. Just as important are steady skies, at least when you're looking for fine detail. If the stars are twinkling like a disco mirror ball, you can put the drawing equipment away, as the views just won't stand up under the higher powers needed for great detail. But don't give up for the night if the seeing is bad when you first look; I've started some nights when the upper atmosphere turbulence was just horrible, and in a matter of hours – and sometimes minutes – the disturbance would move out and everything would become tack sharp.

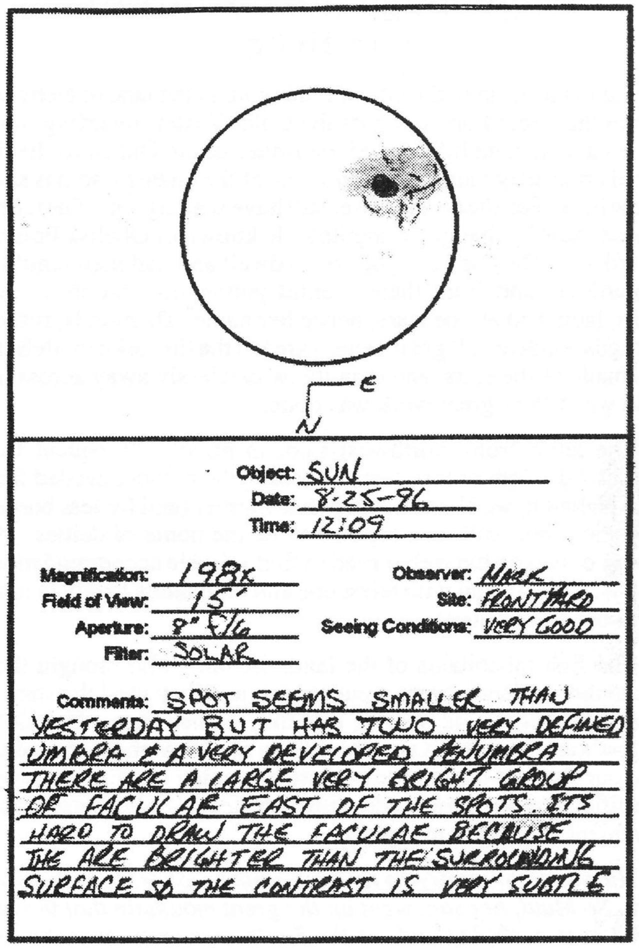
• A dark site – you can't draw what you can't see, at least if you're looking for the real "faint fuzzies". Of course the faintest ones you'll be able to see (and draw) will still be a fuzzy smudge, with the surrounding star field (i.e. rather boring, at least for me). I prefer to draw things that have a lot of visible detail, so I generally go for the brighter ones – which means I can do a lot of drawing right in my back yard!

• Drawing equipment – don't panic, all you really need is a clipboard with some white paper, a sharp pencil (I prefer a mechanical one with 0.5 mm HB lead) and an eraser, and a dim red light to see by. I've made up some forms on my computer with a blank circle for the edge of the field of view, and some spaces to fill in with information on what I'm drawing. As for the red light, you can buy or make an LED flashlight, or just use red nail polish on the bulb of a regular one – if it's still too bright, put a piece of brown paper from a grocery bag over the lens.

OK, if you've read all the advice above, you're ready to start drawing! (Well, OK, you do have to wait until the clouds move on...) It takes some restraint to keep from putting in details that you really haven't seen outside of photographs; but as you work on drawing what you see you'll probably find that you're noticing details that you'd missed on the first glance. I like to position an object just off the eastern edge of the FOV and let it drift into view – this gives me the most time to study the object and decide which features are the most significant. It's these outstanding features that I draw first; detail in the drawing is not as important as position and size at this point, so look to see the shape and how it relates to the



Object: SATURN & MOONS
Date: 11-3-96
Time: 21:00 EST
Magnification: 174x & 270x
Field of View: 22' & 18'
Aperture: 8" F/6
Filter: NONE
Observer: MARK
Site: BACKYARD
Seeing Conditions: EXCELLENT
Comments: EXCELLENT SEEING CONDITIONS MADE IT POSSIBLE TO SEE 6 MOONS I COULD ALSO MAKE OUT JUST THE FAINTEST HINTS OF BANDING ON SATURN. BUT I WAS VERY INTERESTED IN THE MOONS. I WAS ABLE TO TEST MY COLLIMATION & I WAS ABLE TO GET THE BEST FOCUS (SHARPEST) WITH MY NAGLER



Object: SUN
Date: 8-25-96
Time: 12:09
Magnification: 198x
Field of View: 15'
Aperture: 8" F/6
Filter: SOLAR
Observer: MARK
Site: FRONTYARD
Seeing Conditions: VERY GOOD
Comments: SPOT SEEMS SMALLER THAN YESTERDAY BUT HAS TWO VERY DEFINED UMBRA & A VERY DEVELOPED PENUMBRA THERE ARE A LARGE VERY BRIGHT GROUP OF FACULAE EAST OF THE SPOTS. ITS HARD TO DRAW THE FACULAE BECAUSE THE ARE BRIGHTER THAN THE SURROUNDING SURFACE SO THE CONTRAST IS VERY SUBTLE

stars in the FOV. Stars are drawn as dots, with their brightness indicated by the size and darkness of the spot (remember that by drawing with a black pencil on white paper you're creating a negative of what you're actually seeing – the brighter a feature is, the darker it appears in the drawing).

Once you've got the background stars and basic shape, go back for another long look to pull out more subtle details – changes in the brightness, faint wisps of nebulosity, dark lanes or festoons. You can use your fingertip or an eraser to smudge features that you've drawn too clearly – but study the object for as long as you can, let it drift all the way across the FOV, and you'll be amazed at how much detail you really can see! There may be moments when the turbulence dies down completely for a few seconds, and the view will become crystal clear and filled with fine detail; but these moments may come only every five or ten minutes. Patience really *is* a virtue for this job!

Don't worry too much if your first few attempts won't make it to the walls of a "highbrow' art gallery; remember that most amateurs are "lowbrow' just like us. If you want to start with something fairly easy, why not work on double stars? Chris Sarnecki has sketched dozens of them, and he's found that they don't need to be works of art to be accurate representations of what he's seen through his scope. I was recently surfing the web and found a site that has the entire Messier catalog in hand-drawn form (the address is in the November '96 *Reflections*).

So get out and try it! Trust me, the more you sketch, the better you'll get – and the more you'll see!

Pilgrimage (an editorial)

Kurt Hillig

Far to the north of the city of Lankhmar in the land of Nehwon, beyond the Great Forest, across the Cold Wastes, dwarfing those gnarled and ancient hills called the Bones of the Old Ones, lie the rugged crags they name the Mountains of the Giants – so it is said, for few have seen them, and fewer still have scaled them. The tallest of these, hard by that great granite stele known as Obelisk Polaris, is Stardock. They say the gods once dwelt and had their smithies on Stardock, and from thence, amid jetting fire and showering sparks, launched all the stars; hence her name. Diamonds, rubies, smaragds – indeed, all great gems – are but the tiny pilot models the gods made of the stars, and then threw carelessly away across the world when their great work was done.

The letter from Northwest said, in effect: "Frequent flier coupons – use 'em or lose 'em." Lacking the number needed for a trip to Nehwon, we chose a somewhat warmer (and far less boreal) destination; but, still, one reputed to be the home of deities. An evening or two on the web served to find suitable accommodations (or so we hoped), and with telescope and binoculars firmly in hand we set out on our quest.

The first inhabitants of the land, the ones who brought their gods to those islands, were great sailors, and they used the stars to guide them across the oceans, and they named them: Hokule'a, Hokupa'a and 'A'a, Nâ Kao and Nâ Hiku and Nâ Mahoe. In modern times our ships of the air, too, use stars to guide them; but now we use artificial ones, no more accurate than the real ones, merely more convenient and easier to replace.

Hina had trouble drying her bark cloth because the day was too short. So Maui, her son, went up the great mountain that the Sun passed over each day and, as the Sun's rays crept over the top, snared them and held them fast with his ropes. "Give me my life," pleaded the Sun. "I will give you your life," said Maui, "if you promise to go more slowly across the sky." And to this day, the Sun has been careful to travel slowly across the heavens, keeping the promise that he made to Maui on the mountain called Haleakala – the House of the Sun.

We drove to the top of Haleakala (being on vacation, and therefore justifiably lazy); but being lazy we arrived just before sunrise, so the only star we saw that day was the one we treat so casually, though it's by far our closest and most powerful neighbor. But we walked across the roof of the House of the Sun, and it is a place of rare beauty, stark contrasts, isolation and desolation and color and – rarely – life.

Ten days later we visited a more modern temple to the stars: Mauna Kea. We had been living on its lower flanks for a week, and had watched the lifeblood of the earth flowing into the sea in the evenings, and had sat up long into the night, breathing the misty breath that it exhaled. But to the top – that's a pilgrimage that few make; and there reside the great stellar fanes of our age: Keck and Subaru, Maxwell and Gemini, SIRTF and VLBA. And, at last, an opportunity to use that humble instrument we'd so carefully carried so far from home!

Scorpius; Rigel Kentaurus and Omega Centauri, and the Zodiacal Light; Eta Carina and Crux; the Jewel Box, and night's own black Coal Sack; and Ara, the altar of the sky!

And clouds rolling in, far too early; and a long, long ride down through mist and cloud, fog, and warm rain; and a longer ride through sun and mist and cloud, and back to cold rain, and old friends, and home.

Reticle Eyepieces, Linear Scales and Polar Alignment

Tom Krajci
<krajcit@det5wg57.barksdale.af.mil>

Last night I worked out something on paper that may help many do polar axis drift alignment faster, and in a quantitative fashion. A real boon to evening comet photographers with mobile gear in a time crunch.

Whenever I'd heard/read discussions of the drift method it was only in qualitative terms. (Example: Locate a star that's both on the meridian and near the celestial equator. Track it for a few minutes and see if it drifts in declination. If the star drifts north move the polar axis east; if the star drifts south move the polar axis west, etc.) Sure, you have to move the axis. . .but by how much? If you could define it quantitatively you'd stand a good chance of getting good polar axis alignment in one iteration!

I'm not gonna work out the math here, but I'll say that instead of grappling with spherical trig you can approximate very well with plane geometry when small angles are used. Here is the one simple rule you need to apply:

Observe a star's drift for five minutes with some type of reticle eyepiece that has a linear scale. Orient the scale to measure declination drift. Note how many scale units/divisions the star drifted in those five minutes. <u>When moving the polar axis, you must move it 46 times the star drift value</u>.

Here's a full example (I'll assume the mount's polar axis is within a degree or so of the celestial pole already):

1) Polar axis azimuth: Locate a star that's on the meridian and near the celestial equator. Track it for a five minutes; you see that it drifts north for three units. You'll need to move your polar axis to the east by 138 units. To do this, with the clock drive still running, select any star that's about 25 degrees above the horizon – it doesn't matter what direction you look for it. Center the star in the eyepiece and set the linear scale to measure movement east/west. Now move the equatorial head east by 138 units. If this move is larger than one eyepiece field of view, do it in several steps.

2) Polar axis elevation. Locate a star that's on the celestial equator and about 25 degrees above the eastern horizon. Track it for a five minutes; you see that it drifts south for one unit. You'll need to elevate your polar axis by 46 units. To do this, with the clock drive still running, select any star that's on the meridian and at least 25 degrees above the horizon – it doesn't matter what elevation the star has, just find one. Center the star in the eyepiece and set the linear scale so that it will measure movement up/down. Now move the equatorial head up by 46 units.

That's it! Need to be more accurate? Repeat as needed. It worked just fine last night.

Note: It doesn't matter what your image scale at the eyepiece reticle is! The 46:1 rule applies as long as you are not doing drift analysis over large angles (ie. you're not measuring drift over an hour or more).

Don't have a reticle eyepiece? Edmund Scientific sells a wide variey of reticles for about $30. Stuff one in the barrel of a junky 12.5 mm eyepiece. $30 too much? Photograph a linear scale, develop the film, cut the film to fit in your junky 12.5mm eyepiece. (If you shoot negative film make your paper target black with white numbers and lines. White paper with black lines for slide film.)

Scaling rules! For greater accuracy you can drift analyze for 10 minutes, but the 46:1 rule is now 23:1 – 1 unit of drift in ten minutes requires 23 units of polar axis shift – and so on.

Happy shooting!

Drive Correctors & Angle Encoders

Del Stanton <sdl20@pacificnet.net>

There are two sources of error in a tracking drive that has a worm (a helix on a shaft, like the thread on a screw) driving a worm wheel (the large circular gear with teeth on its circumference that are engaged by the worm). The worm wheel is connected directly to the polar axis.

The most prominent error is caused by any eccentricity in the worm. That means that the thread on the worm is not perfectly concentric with the axis of the worms rotation. Thus, as the worm rotates the amount that its thread engages the worm wheel varies – sometime the thread is deeper into the teeth and sometimes the thread is not as deep into the teeth. This variation makes the worm wheel turn slightly faster and slower during each revolution of the worm. Since it repeats regularly in time (since the worm is rotating at a constant velocity) the error is said to be periodic.

Now suppose the telescope is set up and correctly aligned. If it was perfectly aligned and the drive was perfect (here I am ignoring atmospheric refraction) then if you pointed the telescope at a star and turned on the drive the star would remain perfectly centered in the scope. If the scope had a periodic error you would observe that the star would move ahead and fall behind in a regular pattern. If the worm was turning once every thirty seconds the star would move ahead slightly for 15 seconds and then fall behind for 15 seconds.

Note that *none* of this matters for visual observation, it only matters for photography or CCD imaging.

Now - suppose you "guided" the scope. That is, as the star moved ahead you made small corrections to keep it perfectly centered, and as it moved behind you made small corrections the other way. Next, suppose the telescope remembered all those corrections. That is it remembered them in relationship to the angle of the driving worm. Then it could automatically slow down the worm when it tended to drive the worm wheel too fast and speed up the worm when it tended to drive the worm wheel too slowly. This is periodic error correction, and Celestron calls it PEC. This correction can be stored in non-volatile memory (that keeps remembering when the telescope is turned off) and will compensate for the error from then on.

Encoders are essentially "electronic protractors" or setting circles that are read electronically. Suppose I had a shaft mounted on bearings and I had a thin disk of metal mounted on that shaft. The suppose near the edge of the disk I drilled 360 small holes, evenly spaced. Imagine that the space between the holes is equal to the diameter of the holes.

Then imagine I took a small LED and placed it on one side of the disk and photo detector on the other side. As the disk rotates the holes would let the light through to the detector once for every degree of rotation. Then I connect a counter to the detector and set the count to zero. Then rotating the shaft clockwise would send one pulse of light to the detector for every degree of rotation. After 30 degrees of rotation the counter would read 30 - and so forth. But if I stopped the rotation and then rotated the disk in the OPPOSITE direction the counter would merrily count upwards, because it is just counting the number of times the light blinks on. It has no way of knowing which way the disk is rotating.

Now suppose you fixed up another light/detector pair. It would be located about 5 degrees away from the first. But not exactly 5 degrees, I will mount it 5.25 degrees away. Remember that the holes and the spaces between the holes are equal in "width" so that the signal from the detector when the shaft is uniformly rotated is ON one half the time and OFF the other half.

Ok - we are slowly turning the shaft. The first detector turns on, then 1/4 of a degree later the second detector turns on, 1/4 degree later the first detector turns off - and 1/4 degree later the second detector turns off.

Below UP means ON and DOWN means OFF. As you follow the trace from left to right that is equivalent to the shaft rotating in one direction.

First detector

—_—_—_—_—_—_—_

Second detector

_—_—_—_—_—_—_—

Above the length of each segment represents 1/2 degree and the lower trace is shifted 1/4 degree to the right compared with the upper trace.

Now, if you reverse the rotation it can be detected. Because the overlap time will come in a different sequence. Suppose the two channels are represented by A and B. And "A" means A just turned on and "a" means A just turned off. The same for B. For one direction of rotation the sequence of letters will be:
ABabABab

For the reverse rotation the sequence of letters will be:
AbaBAbaB

No suppose the shaft stops and the rotation is reversed, I will represent that by a gap in the sequence of letters:
ABabABab BAbaBAba

You see - when you were expecting an "A" (the A channel coming ON) you got a "B" (the B channel coming ON). So you know the direction of rotation has been reversed. Therefore you will make the counter count down instead of up.

Whereever you reverse the rotation in the sequence you will be able to detect it, because what the encoder puts out will be different from what you expected if the rotation continued in the same direction. There are integrated circuits that do this job automatically. They watch the sequence of pulses and direct the pulses to the UP or DOWN input of a counter to give you the position of the disk.

What I have just described in an incremental encoder. It can tell you which way it is turning and how far. But if you turn off the system and start it up again it always starts with the counter at zero, thus whatever position the disk is in is read out as zero degrees. Many incremental encoders have an auxiliary channel that has a third light/detector pair that can detect a single hole in the disk. When the electronics sees that single hole it resets to zero and takes its count from there.

Another kind of encoder is an absolute encoder that has many more tracks than the single track described above. It might have eight different light/detector pairs looking through different sets of holes in the disk. With such a system the holes and detectors can be arranged so that the output is a binary number representing the rotational position of the disk. Turn the system off, rotate the disk, turn it on. It reads which detectors are illuminated and tells you the new position of the disk. They are much more expensive and are not used in amateur telescopes.

SMAAC is coming!

The Eastern Michingan University Astronomy Club is pleased to announce that the Southern Michigan Amateur Astronomers Convention (formerly known as the "Freeze Out") will be held on March 1, 1997, on the campus of the Eastern Michigan University in Ypsilanti, MI. Activities will include:

- Speakers on a wide range of astronomical topics
- A swap meet
- Club displays and information booths
- Stories and Photos of comet Hale-Bopp
- See Mars, near opposition, through a 10" refractor
- Door prizes

For more information, contact Norbert Vance at 303 Strong Hall, Ypsilanti, MI 48197, or call (313) 487-3033.

Hipparcos Catalog out soon!

Hipparcos data will be released to the public next summer, but now is the time to order catalogs. Information and an order form are available at: http://astro.estec.esa.nl/SA-general/Projects/Hipparcos/hipparcos.html

A compressed binary CDROM along with software sells for US$50, while a set of six ASCII CDROM's goes for $100. The complete catalog in hard copy and CDROM is $400.

Ida, Toutatis Maps by FTP

Phil Stooke <stooke@sscl.uwo.ca >

A little Christmas Prezzy for the Net: I have just placed two new map files at my FTP site. These are public domain images available by anonymous FTP.

Toutatis.gif is a shaded relief map of Toutatis. A forthcoming paper will give all the details, but there is also a brief text file (toutatis.txt) to explain it. Ida.gif is a global photomosaic in four aspects... only about 30 % complete but offered as a work in progress. See Ida.txt for details. These join maps of Gaspra, Hyperion and many other small bodies.

The site is: ftp://Phobos.sscl.uwo.ca/pub/Space – see the file index.txt for details.

Super Black Spray for Baffling

Rusty <darksky@shore.intercom.net>

I obtained two cans of NEXTEL brand velvet coating 101-c10 black, made by 3M Corp. These were given to me by a friend when I mentioned baffling a newtonian tube. I sprayed this material onto the walls of my mirror box and directly on to the inside kydex wall of my upper cage.

This stuff is BLACK as can be and is said to be glare free. It emanated from the reflective products division of 3M and therefore must have been specifically designed to be anti-reflective. I haven't viewed yet but hit every surface that I could find that might bounce light around. I was concerened about flaking but the can says that it is washable without glossing and fingerprint resistant so I hope it is very stable and stays put.

Anyone out there using this? This made my flat black paint and black Kydex almost look grey!

Mars Bibliography Site Updated

Gene Alloway <cerebus@engin.umich.edu>

I have updated the Mars in the Mind of Earth Bibliography site (http://www.umich.edu/~cerebus/mars/) in all areas. Additions and Revisions to the site include:

60+ new & revised novel entries
60+ new short stories
35+ new & revised non-fiction book entries
360+ non-fiction (mostly research) articles almost all new
plus movies, cd-roms, & broadcasts.

AND... We won a Stellar Award from the Astrophysics Web folks as one of the notable sites on the web!!!! We also got a note from Ray Bradbury, which I transcribed and put in the 'What's New?' section.

So take a look, and please, if you have suggestions, corrections, or additions, let me know. I am especially looking to add popular and research articles on Mars. And to all those who have contributed so far, thanks, and keep it coming!

HAS Deepsky Atlas

Peter Besenbruch <prb@lava.net>

The Hawaiian Astronomical Society continues to move south in posting maps, descriptions and photographs of the Caldwell objects. We have added Columba and Vela to the list of constellations covered.

HAS home page:	http://www.aloha.net/~prh
Deepsky Atlas:	http://www.iwe.com/has/deepsky
Columba:	http://www.iwe.com/has/deepsky/col
Vela:	http://www.iwe.com/has/deepsky/vel

Optics 4 Sale

Looking to buy or sell almost anything astronomical? Just won a brand new computer a week after blowing $4000 on your dream system, so it's time to trade silicon for silica? Well, the internet as made this easier and faster than ever! Just fire up your favorite World-Wide Web browser and try some of the following superb services:

Astro-Ads
http://www.seds.org/Astro-Ads/

Astromart
http://www.astromart.com/index.html

Astronomy's Classifieds
http://www.kalmbach.com/Astro/Submissions/Classifieds.html

EPage Classifieds
http://ep.com/s/gm/pht.html

The On Line Astro Trader
http://members.aol.com/EPSweb/olat.htm

The Starry Messenger
http://ww1.starrymessenger.com/webpages/tsm/default.html

There are tons more out there, just use a good search engine such as http://www.altavista.com.

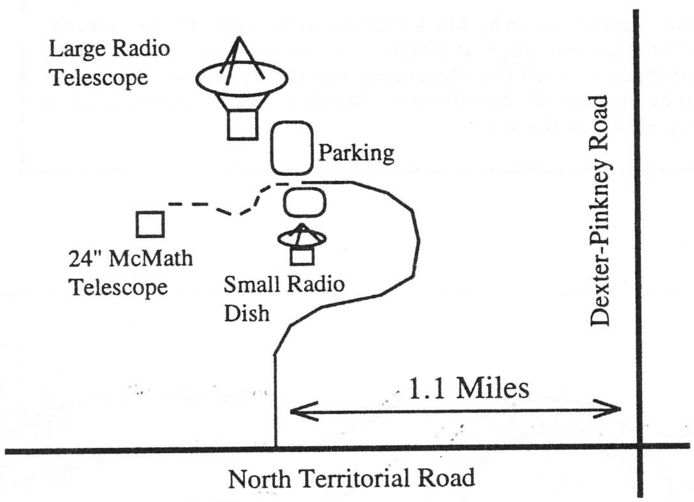
Classified:

Wanted to Buy: a <u>cheap</u> eyepiece, 1.25", 20-30 mm focal length, for a finder scope. Call Paul Walkowski, (313) 662-0145.

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

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	Tom Pettit	878-0438
	Fred Schebor	426-2363
	Mark Vincent	663-7813
Treasurer:	Doug Scobel	429-4954
Observatory Director:	Bernard Friberg	761-1875
Newsletter:	Kurt Hillig	663-8699
Publisher:	Lorna Simmons	525-5731

Peach Mountain Keyholder:
Fred Schebor 426-2363

Visit our Home Page:

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

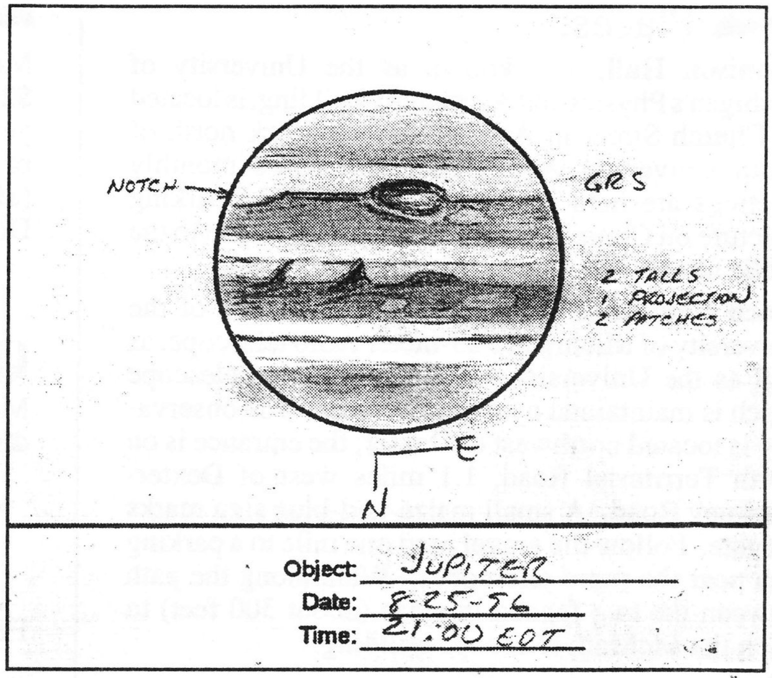
Monthly Meeting:

Doug Warshow:

"My Other Vehicle is a Black Brant IX"

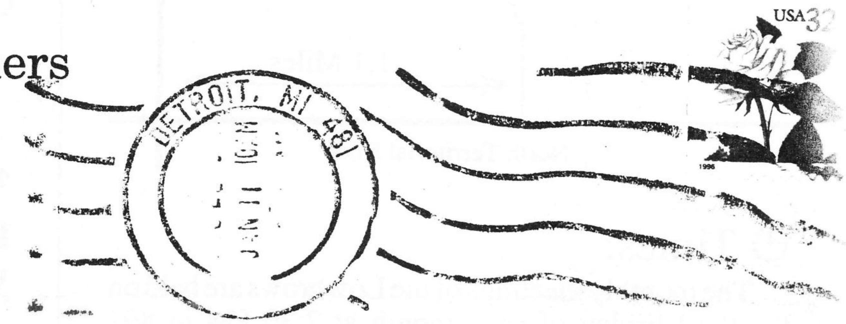
Jan. 17, 1997 at 7:30 PM

Room 807 of the Dennison Building on the UM Campus



A sketch of the Jupiter, made by Mark Deprest using an 8" f/6 Dobsonian-mounted Newtonian telescope at 198X, with an 82A (pale blue) filter. Although the moon was 3/4 full, the seeing was steady, allowing substantial detail to be elucidated. See the story inside for more information on how and why to sketch the sky!

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



Check your membership expiration date on the mailing label!