REFLECTIONS

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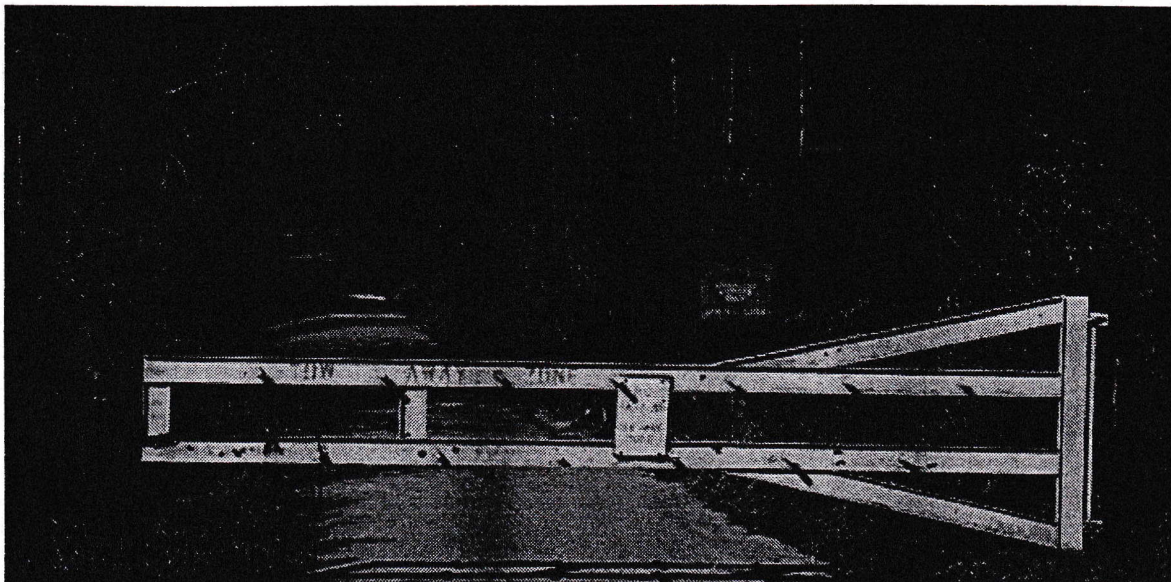


February 1994

Believe it or not, there are members of the Lowbrows who've never been to the Peach Mountain Observatory. For their benefit, this month we have a picture of the front gate. For information on how to open this gate, contact the Observatory Director.

Kurt Hillig
Editor

Of the University Lowbrow Astronomers

The University Lowbrow Astronomers is a club of astronomy enthusiasts which meets on the third Friday of each month in the University of Michigan's Detroit Observatory at the corner of Observatory and Ann Streets in Ann Arbor. Meetings begin at 7:30 PM and are open to the public. Public star parties are also held twice a month, at the University's Peach Mountain Observatory on North Territorial Road (1.1 miles west of Dexter-Pinkney Road; map on page 7) on the Saturdays before and after the new moon; the star party is cancelled if it's cloudy or below 10°F at sunset. For further information, call Stuart Cohen at 665-0131.

This Month:

February 5 - Open House at the **Peach Mountain Observatory**. Well, if you weren't there you should have been; it was mostly cloudy, but we still put on a show for a couple dozen visitors.

February 12 - Public Open House at **Peach Mountain.**

February 18 - Meeting at the **Detroit Observatory** in **Ann Arbor**. Dr. Nick Steneck, Professor of History at the University of Michigan, on "The History and Preservation of the Detroit Observatory". Here's your chance to learn about the place we hold our meetings – where it came from, and where it's headed.

Next Month and Beyond:

March 1 - Computer Subgroup Meeting at **Doug Nelle's** house (a Tuesday). On the agenda: how to broadcast an eclipse. Call him at 996-8784 for directions.

March 5 - Open House at the **Peach Mountain Observatory**.

March 12 - Public Open House at **Peach Mountain.**

March 12 - Messier Marathon at the Lake Hudson State Recreational Area. See the ad in the next column for details.

March 18 - Meeting at the **Detroit Observatory**. Prof. Emeritus Richard Teske, on SETI – the Search for Extra-Terrestrial Intelligence; its problems and its prospects.

March 19 - Public Open House at **Peach Mountain.**

April 1 - Computer Subgroup Meeting

April 9, 16 - Public Open House at **Peach Mountain.**

April 15 - Meeting at the **Detroit Observatory**. Club elections!

March 12 – Messier Marathon!

The Astronomical Societies of Lenawee and Hillsdale Counties are pleased to announce their third annual Messier Marathon on March 12, 1994, at the Lake Hudson State Recreational Area. One of the darkest locations in southeast Michigan, the entrance is located on M-156 about 1.5 mi south of Clayton, which is 11 mi west of Adrian (i.e. 6 mi east of Hudson) on M-34. The park fee is $3.50 per vehicle; there's no charge for the main event.

No talks, no swap meet, just a full night (weather permitting) of observation, and a chance to spot every object in the Messier catalog in a single night! Certificates will be awarded to those spotting 75 or more objects, with plaques for the top two observers; coffee will be provided to all, regardless of their success!

Electricity may be available, depending on the weather.

For more information, call 219/495-9991 or 517/547-7402.

Cheaper than Truth!

Doing some experiments that require an interstellar vacuum, and your old Hoover just isn't up to the task? Desperate enough to try harnessing your daughter's pet hamsters to a bicycle pump? Despair no longer! Just go to the U of M's Property Disposition center (on the north campus), where old experiments are sold to the public for a song. Last week's haul included some biological incubators, an x-ray scanning device, several PDP-11 computers, and a 20" vacuum diffusion pump for $50. Get some real return on your tax dollars! (Of course, you will need a 30 amp, 416 volt, 3-phase power linep, but we'll cover that next month.)

Fun Facts

A Forum in which Bias and Innuendo take on the Respectability of the Printed Word

Conducted by
Martin Chuzzlewitz
and Dr. Phineas Buzfuz

Q. My mirror is getting pretty dusty. How often should I clean it, and how should I go about it?

A. Mirrors shouldn't be cleaned very often. The dust on the mirror is usually less harmful to the image than the damage that cleaning does to the coating. So first, check the mirror by looking at your reflection in it. If you can't see your reflection, then you're probably a vampire and should consult a priest. If it merely looks like you haven't shaved for a few years, or perhaps like your cat has been using your telescope for purposes other than it was intended, or maybe it's just been four or five years since you last cleaned it, you can do the following:

1) Shoot the cat. Throw its body over the fence, (pick the side toward your least favorite neighbor, or the one with the brightest yard light). This won't improve the scope any, but should keep it from deteriorating further – unless you forget to remove the kittens also.

2) Remove the mirror from its cell and soak it for 30 to 60 minutes in a solution of 1 gallon of warm distilled water to 2 teaspoons of pH-neutral baby shampoo. Use a clean container and line it with several clean, lint-free dish towels. Do not use paper towels, as they will leave a residue. Be careful never to touch the coating with your fingers.

3) Remove the mirror from the water. Use a spray bottle filled with pure warm distilled water to forcefully dislodge any dust.

4) Tip the mirror on its side, rinse the mirror well with distilled water, and let the water run off. Water will not bead up on a really clean surface. Use a roll of surgical sterile cotton from the drugstore (not cotton balls) to blot, not wipe, any remaining water from the mirror.

If the mirror doesn't look shiny enough, return it to the warm solution of water and shampoo. When it is completely immersed, use a new piece of cotton to very gently rub across the parts of the mirror where the water beaded up. This will almost certainly put fine scratches in the mirror's coating, but we already warned you about that.Then repeat step 4.

You should now have a very clean mirror. On the other hand, if the coating is now totally scratched up, or if cleaning has revealed lots of dull splotches where the aluminum coating oxidized through a pinhole in the overcoat, or if you can see through the coating, then get the mirror re-aluminized.

Q. In a previous FUN FACTS, you said I only needed to buy two eyepieces, but I should buy the best. Which two should I buy?

A. You should buy the ones you like the best, but try them before you buy them. Sometimes you can find someone in your club who has an eyepiece you're considering. This works best if you're sure you won't get caught, though you could try explaining that you were only borrowing it for testing purposes. Alternately, you can examine spot diagrams. Diagrams for some common (not brand-specific) types were published in *Telescope Optics - Evaluation and Design* published by Willmann-Bell, and available in libraries. Also, *Reflections* will publish spot diagrams of some commercial eyepieces in a future issue [I'm gonna hold you to this promise! - Ed.], compare them to common types, and explain which eyepieces work best with which telescopes.

Q. I've always wanted to make a pair of binoculars out of two telescopes. Will you explain some of the difficulties involved, such as alignment and focal length tolerances, and how far apart they need to be to get true binocular vision?

A. No. But any good psychiatrist should be able to provide you with some nice Rorschach spot diagrams to look at.

Q. My telescope tube is too heavy. I'd like to replace it with something lighter. Also, I might want to take pictures or use a CCD camera in the future. Would a truss be better?

A. A truss only alleviates the symptoms; usually surgery is needed, though a hydraulic jack or a lighter scope can help too. To lighten up scopes, Seurrier trusses are sometimes used. These appear on many Dobsonians, and are simple and convenient to use if you disassemble your scope frequently. They were originally designed to achieve equal gravitational sag of the primary and secondary mirrors in large telescopes. But to do so, they require a large diameter tube truss going to the secondary, and a small diameter tube truss going to the primary. Dobs usually lack the high-deflection primary truss, and therefore miss this advantage. Furthermore, the Seurrier truss itself is also the <u>most</u> flexible design for any given weight, because it has a single truss bay. A much stiffer design would use multiple bays, each one as close to a cube as possible, given the distance to be bridged. Multiple bays would be a practical problem, though, if you ever wanted to disassemble your scope.

For photography, stiffness counts. The following construction methods are listed in order of decreasing stiffness: Cut from a solid blank; Casting; Weldment; Riveted; Bolted; Glued. Now most people aren't willing to take a hacksaw and tinsnips to a block of stainless steel that's eight feet long and 18" in diameter, and surprisingly few have access to a Bessemer converter, but the last four aren't too bad for home construction.

But if you think of the way the tubes are connected in the average Dobsonian, and think of how little deflection is necessary to blur an image, and then look at the list again, I think you'll agree that photographic telescope tubes should probably not be able to be taken apart.

Q. Should I pay extra for enhanced aluminum or silver coatings? Are they really worth it?

A. If it's for your wife's birthday, you should probably spring for real sterling. If it's for your scope, and if you live in the Midwest or Northeast, where it rains battery acid from the sky, then silver coatings will be a real disappointment after the first week or two. But if you are sure that your mirror has a good figure, or if you have more than two mirrors in your system, then yes, enhanced aluminum coatings are worth it. They improve image brightness and contrast, and make your reflector think its a refractor.

Q. I want to buy a starter telescope for my nephew, who is just starting out in astronomy. I've read the ads, but can you tell me the real, practical differences between a 6" f/8 and an 8" f/6?

A. The 8" f/6 might be a little heavier, but they're both about the same size overall. To notice a difference between aperture sizes, you usually have to make a 4" jump. Of course, that's not true for small scopes – a 3" is noticeably brighter than a 1" scope – and the 8" will gather about 70% more light than the 6", so you'll see somewhat fainter stars . And an f/6 scope will give 70% brighter images of extended objects than an f/8. So, if the little brat lives in a good dark-sky location, the 8" is a good choice, but if he won't have good skies anyway you should go for the cheaper one. Of course, I've got this old Tasco 742-power refractor I can let you have cheap....

Minutes of the 135th Meeting of The University Lowbrow Astronomers

Jan. 21, 1994

By Bill Razgunas and Bill Durrant

After a brief exchange of club business, Bill Durrant gave his presentation, titled "Particles in Space". The entire presentation is not summarized here. However, I contacted Bill Durrant to re-examine the main areas of interest as indicated by the question and answer time following his presentation. Two of these are covered:

1) Electron microscope operation and Interplanetary Dust Particle (IDP) preparation

The type of microscope being used for most of the work which Bill was describing was a scanning electron microscope (SEM). This is different from the transmission electron microscope (TEM), the scanning transmission electron microscope (STEM) and the field emission microscope (you get the idea). The TEM requires a sample preparation which makes a replica of the surface to be viewed, by coating the surface with cellulose acetate, letting it 'dry' and stripping it off. The replica face is then coated with carbon and the remaining acetate is dissolved. The carbon face is then shadowed with chromium. Preparation of this replica is quite a time consuming operation. The beauty of the SEM is that, provided that the sample is small enough to fit into the specimen chamber, you can look at the actual object.

One problem that Bill was describing was that the staff involved with analysis of U/M's sample panel (from the LDEF experiment) weren't free to cut the panel up. NASA wouldn't have liked that, since the panel belonged to NASA. Instead, Bill described the process that they used to view a localized area of the U/M test panel. As for the TEM, this was done by coating the sample area with cellulose acetate and waiting for it to dry. The acetate was stripped off and the replicated surface then coated with gold. This was necessary because the acetate alone is not electrically conductive; adding the conductive coating makes the replica suitable for viewing with the SEM.

One of the advantages of the SEM (there are several types) compared to the TEM is that all of the energy of the electron beam is concentrated at one small area. This point scans the whole specimen surface, in the same way that the electron gun scans the face of a television picture tube.

Since the electron beam scans a point at a time along its path, it requires much less energy than the TEM. The TEM requires more energy because the whole working surface of the replicated specimen is illuminated by the electron beam constantly, while the image is examined. The viewed image of the SEM is produced on a television screen (CRT) by means of the CRT's scanning gun which operates in synchronization with the scanning electron beam. As the electron beam strikes the surface of the specimen being examined, the detection system counts the number of secondary electrons which it sees during the scanning motion of the beam. This varying signal is sent to the CRT, and produces a remarkably detailed picture of the surface being examined.

2) Long Duration Exposure Facility (LDEF): Lessons and Information

Early spacecraft experience led people to look into the area of interplanetary dust particles due to the question of what hazards were involved in space travel. Engineers designing spacecraft have benefitted greatly due to the significant amount of information which has become available from the LDEF. One of the significant lessons which has come from the LDEF is the methodology of collecting space particles (how do you catch a speck of dust which is traveling at 10 miles per second?). This knowledge promises to be valuable to those performing future experiments to collect additional information. In summary, the LDEF has provided an abundance of information. More information will be available to scientists and engineers as the analysis of the tremendous volume of data is completed. Later in 1994, there will be a conference presenting the final results which have come from the 57 different experiments which were on the LDEF.

Please note: Information on 'particles' obtained from most of the experiments was quite incidental to the purpose of the experiments themselves. For example: the U/M experiment was intended to provide information regarding the physical properties of graphite/epoxy composite materials in a space environment. The entire specimen and support structure was reviewed for any damage including damage caused by micrometeoroid particles. Those involved in the LDEF were very curious because, given 5.8 years in space, no one knew what to expect!

The AAE Wants You!

The Association of Astronomy Educators is dedicated to improving astronomy education at all levels, from kindergarten to college. Founded in 1977 as an outgrowth of a National Science Teachers Association task force, the Association's goal is to help our members by disseminating activities and information in order to enhance the scientific literacy of our students. We encourage the development and exchange of information about effective curricula, materials, facilities and groups as a means to enhancing the teaching of astronomy. Members receive the AAE newsletter, periodic special publications and announcements of regional, local and world-wide astronomy activities.

To join, contact:

Bart Wormington, Treasurer
Association of Astronomy Educators
12522 Binney
Omaha, NE 68164 USA

Dues are $12 per year (U.S.). Please add $1.50 for postage to Canada and Mexico, $2.50 for other non-U.S. locations.

Tubes 'N' Stuff

Technological Ramblings

by Tom Ryan

It's a known fact that if a part can be scrounged up cheaply enough, an amateur astronomer will try to make a telescope out of it. As a teenager, I bought a telescope that had a polar axis made from an inverted engine crankcase. The drive gear was the flywheel, the telescope tube a stove pipe, the leveling jacks were screws from lathe cross slides, and... well, you get the picture. Even Texereau, in his classic book *How to Make a Telescope*, shows some English mounts based on an old Chevrolet rear end.

This method of engineering (Hey, here's a neat part! I can make a telescope out of this!) has influenced my designs over the years far more than I care to admit. Fortunately, a real member of the engineering profession recently introduced me to the practical uses of the arcane ideas of *moment of inertia*, *vibrational frequency*, and *specific stiffness*. And, true to form (Hey, here's a neat idea! I can make this into a telescope!), designing for performance is the topic of this article.

For years I've wrestled with telescopes which were too jittery and too heavy to lug around. I knew, of course, that there was some optimum design for this stuff, but it seemed unlikely that I'd ever find it. Of course, testing by means of the Standard Bonk Method helped, but usually only to tell me I'd done something wrong, and not how to do it right. Then, two things happened.

First, *Sky and Telescope* published a formula in its Gleanings column that said "the frequency of vibration (in cycles per second) equals the square root of [9.8 / Deflection (in inches)]." Now, this was pretty neat, because it said that a telescope (think of it as a brick on a stick) is going to vibrate at a frequency that depends only on how much its own weight forces its mounting to bend. I don't know about you, but this was a lot simpler than I thought it would be – if I could measure or calculate the sag in something, I could tell how fast it would vibrate.

To figure out the deflection, my Machinist's Handbook (Seventeenth Edition) says that a beam supported on one end with a weight on the other (a pier, a counterweighted Dec axis, a fork arm, half a telescope tube, etc.) will deflect by an amount equal (in inches) to $W \cdot L^3 / (3 \cdot E \cdot I)$, where W is the weight of the brick, L is the length of the stick, 3 is the fudge factor (which changes when the beam is supported or loaded at points different from our example), E is the modulus of elasticity (stiffness) of the material the stick is made from, and I is the stick's cross-sectional moment of inertia – all in appropriate units, which I'm not going to explain here since it's all in the Handbook.

The *moment of inertia*, I, is a number which depends upon the stick's cross-section, and is different for tubes, boxes, triangles, bars, and I-beams. The Machinist's Handbook, being half a foot thick, fortunately lists all of them, so when we're thinking of making a square or triangular telescope tube, we can just look up the value of I for squares or triangles and plug it into the formula. Don't worry about the derivation of this stuff. Real engineers use this method, too, and their stuff hardly ever falls down.

The *modulus of elasticity* for most materials is also listed in the Machinist's Handbook (don't leave home without it!) Now we can design our fork arm or telescope tube and see what the deflection will be, and at what frequency it will vibrate. Here, we should shoot for 15 to 60 cycles per second. If we can't get that, we should go back and increase the moment of inertia, or change the material to one which has a higher modulus of elasticity.

The problem with increasing either the modulus or the moment is that they both tend to increase weight. Fork arms, piers, and tubes with higher moments of inertia are either bigger in diameter or thicker, and are thus heavier. Steel has a higher modulus of elasticity than birch plywood, but it too is heavier. So how can we get the most bang (stiffness) for the buck (weight)?

The material measure we really want is called the *specific stiffness*, and is defined as the modulus of a material divided by its density. Big numbers are good, small numbers are bad. Specific stiffness is listed for many materials, though I couldn't find a value for birch plywood in the Handbook. Thus I couldn't compare plywood construction to aluminum, steel, or fiberglass. The value can be experimentally determined, of course, but remember: I started out in astronomy, and astronomers don't do experiments.

So there the matter rested, until the second event occurred. In the January 1988 issue of *Kitplanes*, the following table appeared as an explanation of why airplanes aren't built out of prestressed concrete:

MATERIAL	E	D	E/D
Balsa	0.625	0.0067	93
Sitka Spruce			
(along the grain)	1.9	0.018	105
Sugar Maple (ditto)	1.8	0.022	82
Birch plywood	1.5	0.025	60
Masonry	2.2	0.065	34
Magnesium	6.0	0.065	93
Fiberglass/epoxy			
Unidirectional	8.0	0.072	111
Bidirectional	3.5	0.072	49
Aluminum	10.5	0.10	105
Titanium	16.5	0.164	101
Steel	30	0.30	100

This table shows that if you build your telescope tube or fork arm for a certain deflection or frequency of vibration, which is what you should be doing, its weight will be about the same whether it's built from Sitka spruce (or balsa!), unidirectional fiberglass and epoxy, aluminum, titanium, or steel, but that it will weigh 75% more if built from birch plywood, 100% more if built from bidirectional fiberglass, and 200% more if built from concrete.

As an example, if you have a box made of 3/4" plywood (and who doesn't?), you can replace it with a box made out of 2" balsa, 0.107" thick aluminum or 0.036" steel. The new box will have the same stiffness, but will have 60% of the weight.

Lest you trade in your saber saw for a cutting torch, however, there are other things to consider when building something. For one thing, when structures get thin, as in the case of a light steel structure, it's harder to attach stuff to them, although this is sometimes hard to remember when you're dragging 500 pounds of telescope out to the back yard. Bidirectional fiberglass, a bad performer in both the strength / weight area and thermal expansion area (refocus that astrophoto!), makes the prettiest tubes when in the form of a Parks telescope tube, and your hands won't freeze to it in cold weather. Plywood is cheap, easy to work with, looks good when sealed, and dampens vibrations faster than metals. Strips of Sugar Maple, glued together lengthwise, would make a tube that is only 28% heavier than its aluminum counterpart, but with a thermal coefficient of expansion along the grain that is 2/3 that of Pyrex, or 1.7 times that of Invar – as long as it stays dry. (Guess what my next tube will be made from.)

Clearly, weight and stiffness are important, but cosmetic and practical construction considerations count, too. Good design is often just good compromise.

Computer Subgroup Report
by Doug Nelle

On February 1, the computer subgroup held its monthly meeting at Tom Ryan's house. The main emphasis was on our plans to televise the annular solar eclipse on May 10.

The group worked for about an hour on a tentative script for taped segments that will be interspersed between live shots (we hope) of the eclipse. If clouded out the idea is to show just the tapes.

The program will consist of 2 main topics: what an eclipse is, and how to safely observe an eclipse.

The first topic will go through the mechanics of how various types of eclipses occur. Both solar and lunar eclipses will be covered, and of course we will show what causes an annular eclipse. Computer graphics (again "we hope") should enhance the program. At the end a little folklore and what can be learned from an eclipse will be discussed.

How to observe an eclipse will open with the same thing that the entire show did, DON'T LOOK DIRECTLY AT THE SUN!. This message will repeat periodically throughout the the show – hopefully as scrolling text across the bottom of the screen. Different methods for observing the sun will be shown, along with what to look for during both solar and lunar eclipses. At the end of this segment, information about the partial lunar eclipse two weeks later will be given.

After this discussion Fred Schebor passed out portions of the NASA report on the eclipse showing the path and weather predictions along the path.

At this point Stuart Cohen showed up with some good news. He had contacted Ann Arbor Public Access and arranged a training session for those of us who will be using their equipment to tape the various segments to be televised. People who are interested should call Stuart about time and openings. The number of participants is limited.

And in case anyone was wondering if the computer subgroup actually does anything with computers at the meetings, Fred brought a demo disc of the Willmann-Bell star chart producing program *HyperSky* for viewing, and we spent a while playing with our favorite toy for scope designers - *Zemax*.

Next month's meeting time and place will be announced at the general meeting on Feb. 18.

Plans for Research On Space Station
A NASA Videoconference

NASA will host a videoconference on their plans for research on the space station on Thursday, Feb. 17 from 1PM to 3 PM EST. The University of Michigan and the Michigan Space Grant Consortium will be presenting this live via satellite in the auditorium of the Chrysler Center (note: not the Chrysler Arena), next to the Commons on the University of Michigan's North Campus. Topics include the life and microgravity sciences, engineering research, technology and the commercial development of space, as well as funding mechanisms and how to get involved in NASA-supported research. Pre-registration is not required.

Auroras Star in Video

Q. I recently caught a segment on the show "Invention" on the Discovery channel about a special video camera that was developed by a university in Alaska to film the Aurora Borealis. It was a joint project sponsored by the NSF and utilized technology supplied by a Japanese company. The report concluded by mentioning that the university was making copies available for sale. I guess my question is, does anyone have any info about this video and where one may get a copy of it?

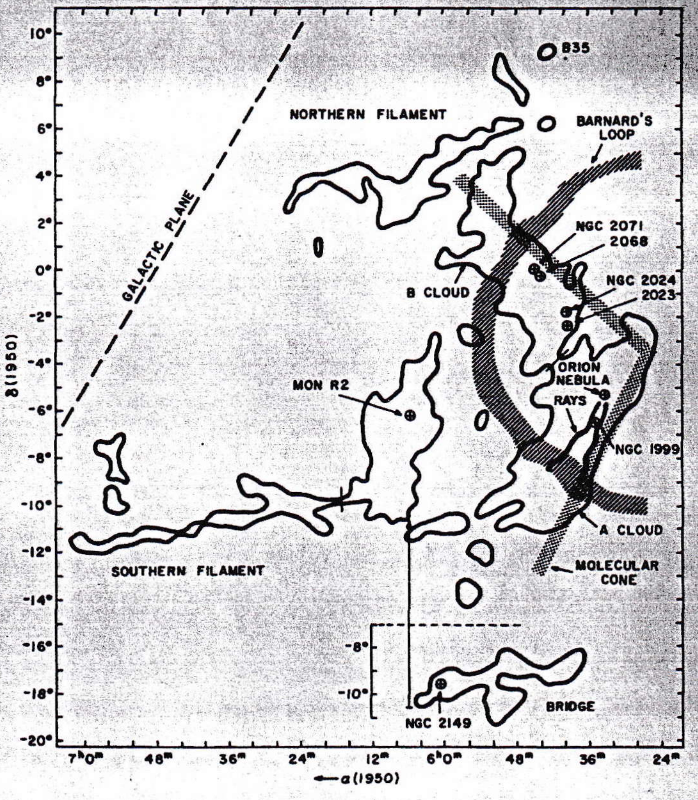
A. There are two aurora videos produced by the University of Alaska: "Aurora Color Television Project" (filmed during 1987-1988), and "The Aurora Explained" (which just came out this past year)

The "Aurora Color Television Project" video is probably still available from the U. of Alaska. The price (as of 1990) is $32.95. Write to

Aurora Color Television Project
Geophysical Institute
Room 413
University of Alaska
Fairbanks, Alaska 99775

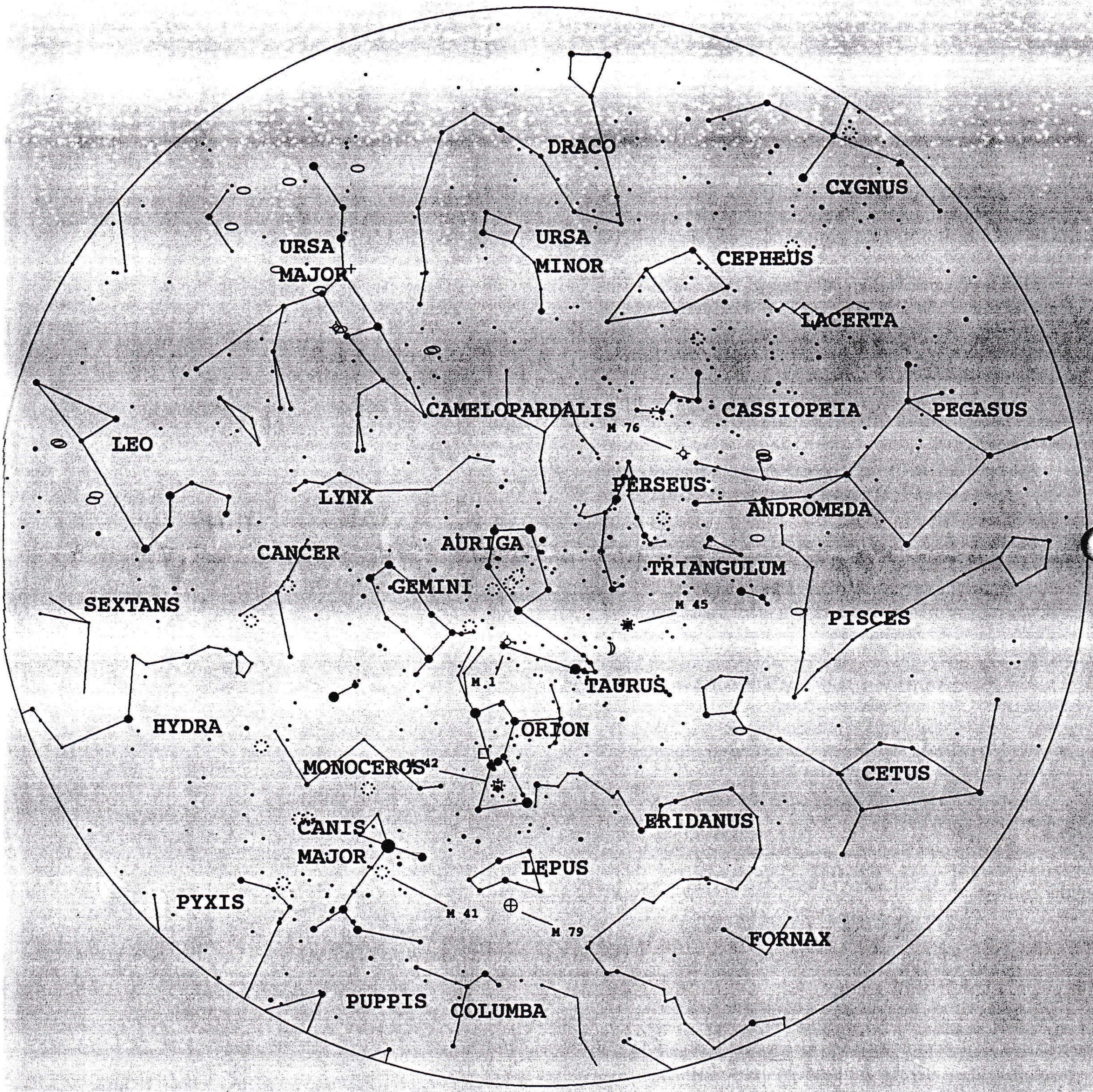
The "Aurora Explained" video is available from Sky Publishing for $29.95 (catalog #10336). Their toll-free number is 800/253-0245.

OMC-1 Update



For those who had trouble interpreting the map on the back cover of last month's *Reflections*, we provide here a schematic illustrrating the major CO features found in the Orion-Monoceros molecular cloud complex.

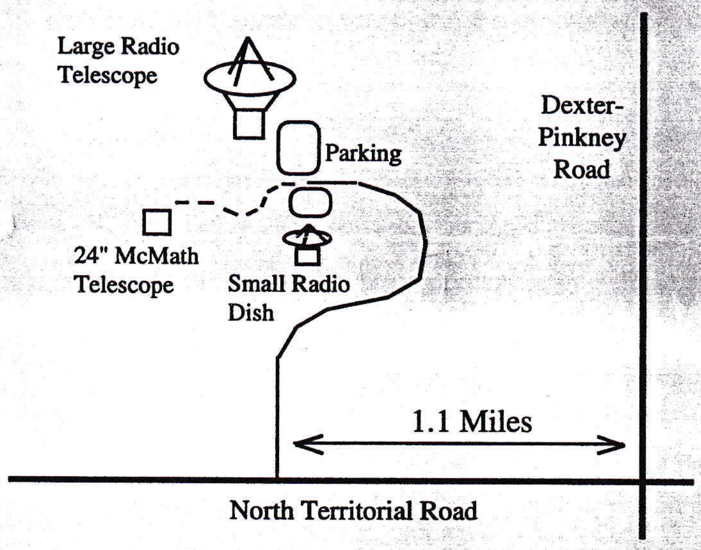
2/18/94 7:46pm EST stars to 5th mag



☞ Places:

The Detroit Observatory is in Ann Arbor, at the corner of Observatory and Ann Streets, (across from the old University of Michigan hospital and between the Alice Lloyd and Couzens dormitories on the UM campus). The Detroit Observatory is an historic building which houses a 19th century 12-inch refractor and a 6-inch transit telescope.

The 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 and used by the Lowbrows. The observatory is located northwest of Dexter; the entrance is on North Territorial Road, 1.1 miles west of Dexter-Pinkney 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 at the Detroit Observatory. 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 p.1 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 are cancelled if the sky is cloudy or the temperature is below 10°F at sunset – call 426-2363 to check on their status. Many members bring their telescopes; visitors are welcome to do likewise. Peach Mountain gets cold at night, so dress warmly – and bring mosquito repellant!

☞ Dues:

Membership dues in the Lowbrow Astronomers are $20 per year for individuals or families, and $12 per year for students. This entitles you to use the 24" McMath telescope (after some 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: $20 / year
Astronomy: $18 / year
Odyssey: $16.95 / year

For more information, contact the treasurer.

❒ Sky Map:

The sky map in this issue of *REFLECTIONS* was produced by Doug Nelle using *Deep Space 3D*, drawn for the end of twilight on the monthly meeting date.

✎ Newsletter Contributions:

Members (and non-members) are encouraged to write about any astronomy-related area in which they are interested. Call the editor (Kurt Hillig) at 663-8699(h) or 747-2867(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 should be mailed to:

Kurt Hillig
1718 Longshore Dr.
Ann Arbor, MI 48105.

☎ Telephone Numbers:

President:	Stuart Cohen	665-0131
Vice Pres:	Doug Nelle	996-8784
Moved to Las Vegas: Gone, but not forgotten!	~~Paul Etzler~~	~~426-1939~~
	Fred Schebor	426-2363
	Tom Ryan	662-4188
Treasurer:	Doug Scobel	429-4954
Observatory:	D. C. Moons	254-9439
Newsletter:	Kurt Hillig	663-8699
Membership:	Steve Musko	426-4547
Open House:	Keith Bozin	810/435-8964

Peach Mountain Keyholder:

Fred Schebor 426-2363

Monthly Meeting:

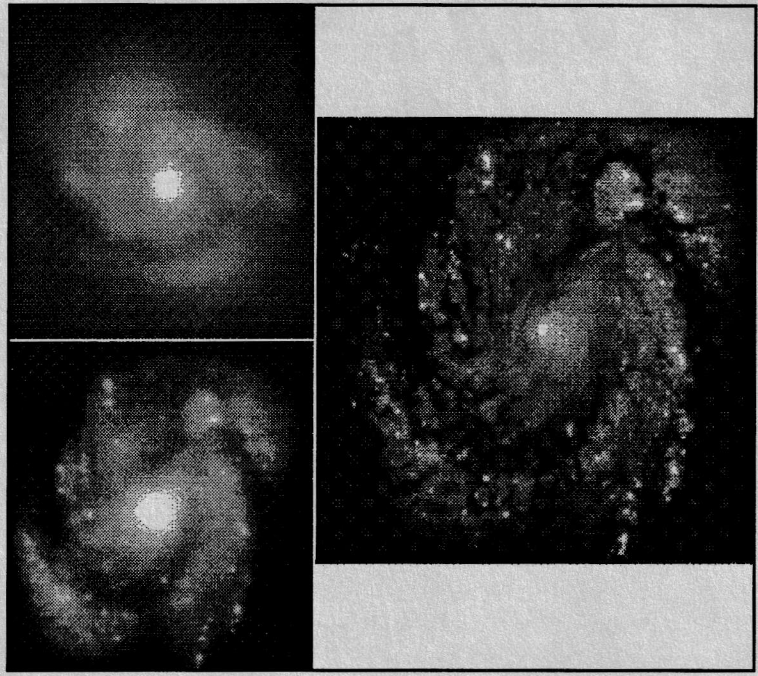
Dr. Nick Steneck

on

The History and Preservation of the Detroit Observatory

Feb. 18, 1993 at 7:30 PM

At the
Detroit Observatory in
Ann Arbor



The core of the galaxy M100, as seen by the 2.1m telescope at Kitt Peak (top left), and by the Hubble Space Telescope, with the old WF/PC (bottom left) and the new WF/PC II. (The Kitt Peak image is rotated about 70° relative to the HST images; all images are 30" across.) The improvement is very impressive!

University Lowbrow Astronomers
840 Starwick
Ann Arbor, MI 48105

Check your membership expiration date on the mailing label!