Reflections

of the University Lowbrow Astronomers

December 1997

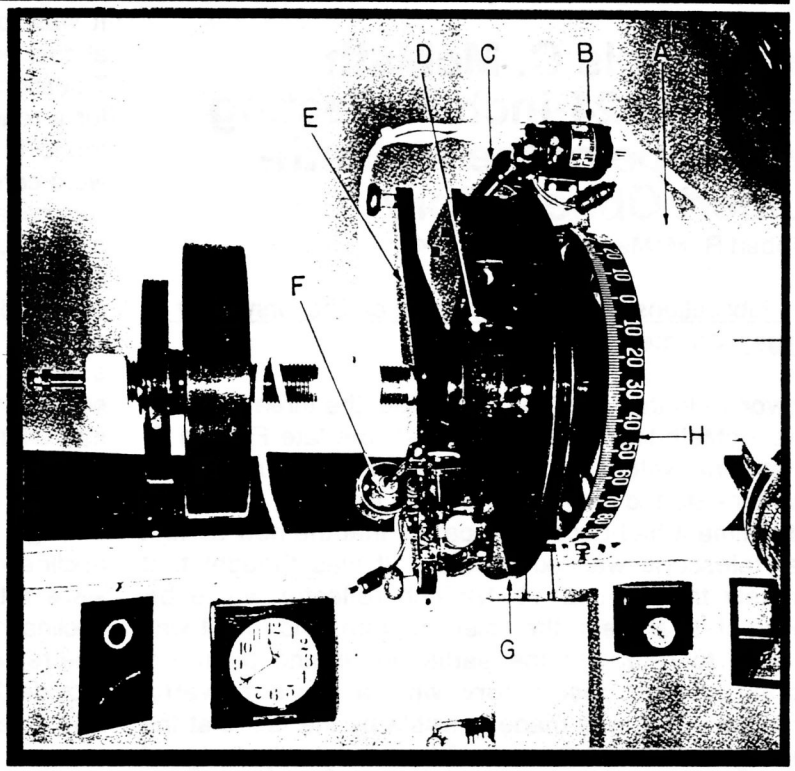

Plate 4 - View of the Declination Drive Assembly for the 24-inch McMath telescope. Reprinted with the permission of The University of Michigan, Bentley Historical Library.

The University Lowbrow Astronomers

The University Lowbrow Astronomers is a club of Astronomy enthusiasts which meets on the third Friday of each month in the University of Michigan's Physics and Astronomy building (Dennison Hall, Room 807). Meetings begin at 7:30 pm and are open to the public. Public star parties are held twice a month at the University's Peach Mountain Observatory on North Territorial Road (1.1 miles west of Dexter-Pinkney Road; further directions at the end of the newsletter) on Saturdays before and after the new Moon. The party is canceled if it's cloudy or very cold at sunset. For further information call (313)480-4514.

This Month:

December 19 - Meeting at 807 Dennison - Speaker: Dr. Michael Combi from The University of Michigan, Space Physics Research Laboratory - Comet Research at the University of Michigan

December 27 - Public Star Party at Peach Mountain Observatory - After you can't stand spending any more time with the relatives - come on out and spend some time under the stars.

Next Month:

January 16 - Meeting at 807 Dennison - First meeting of the year 1998! Speaker: TBD

January 24 - Public Star Party at Peach Mountain Observatory - After all the cancelled star parties in the fall perhaps we will now get some fine views of the winter constellations.

January 28 - New Moon at 1:01 am EST

January 31 - Public Star Party at Peach Mountain Observatory - Four day old Moon.

Star Party Jan 3

[The Lowbrows have been fortunate to be permitted to use the fine 24-inch McMath telescope for many years. Dick Sider and David Snyder are currently working on a project to document the history of The University of Michigan's observatories. Dick Sider discovered this article on the 24 when it was still young and camped out at the McMath-Hulbert Observatory on Lake Angelus, in Pontiac, Michigan. The following is the first of a two part article. This article and the accompanying photographs are reprinted with permission granted to The University Lowbrow Astronomers c/o Bernard Friberg by the University of Michigan, Bentley Historical Library. - Ed]

The Francis C. McMath Memorial 24-inch Reflecting Telescope of the McMath-Hulbert Observatory

by Robert R. McMath, February, 1941

from Publications of the Observatory of The University of Michigan Volume VIII, No. 6

Foreword - In the fall of the year 1936, the three founders of the McMath-Hulbert Observatory - the late Francis C. McMath, the writer's father; Judge Henry S. Hulbert; and the writer - started plans for a 24-inch reflecting telescope. By that time it had become apparent that the new 50-foot tower telescope was successful. It was thought that ultimately the original 10 1/2-inch reflector would be relieved of its share in the solar program, and that it was desirable to return to the earlier lunar and planetary program of the observatory with a more powerful instrument. This was made possible by the fact that the mounting for the 10 1/2-inch had been originally designed to carry a twenty-inch mirror.

Francis C. McMath and Judge Hulbert had been present during the pouring of the second 200-inch mirror and were much interested in the low coefficient of expansion pyrex which the Coring Glass Company had succeeded in obtaining for the great mirror. Accordingly, Mr. McMath suggested the we ascertain from the Coring Company the availability of their special pyrex for our proposed new telescope. This inquiry resulted in the purchase of a ribbed 24 1/2-inch primary mirror blank, together with the two secondaries and a plug for the optician's use when figuring the primary.

During the years 1937-38, the 10 1/2-inch and its spectroheliokinematograph were in use making simultaneous records with the solar tower; and, in 1938 especially, Sawyer and Malesky employed the instrument in exploring the methods and techniques of the prominence radial velocity program. A generous gift by Julius F. Stone in July, 1938, made possible a new spectroheliograph in the solar tower for the radial velocity program, and plans for this instrument were started the following September. This combination of circumstances made it possible for the writer at this time to suggest to his associates the idea of a memorial telescope to Francis C. McMath, who had died February 13, 1938. The new telescope was to make use of the pyrex mirror blanks purchased by the three founder during Mr. McMath's lifetime. The names of the donors are shown on Plate 1 *[see back page - Ed]*, which is a photograph of the bronze plaque attached to the west side of the pier of the telescope.

It was found, upon investigation, that the dome needed almost no alteration in order to house the new telescope. Telescope clearances were carefully laid out and, except for a rearrangement of the shutter operating cables, were found to be close but adequate. Floor clearances also were carefully studied, and, as a result, the observing floor was raised two feet, giving the observer easy access to the guiding eyepiece. A tunnel was excavated and lined with masonry in order to provide access to the hollow part of the pier, and the electrical circuits between the control room, observer's control box, and telescope were rearranged and somewhat simplified. Practically all of the electrical equipment used for the 10 1/2-inch was also used for the new 24-inch telescope.

General - Plate 2 is a general view of the telescope, taken through the open shutter of the dome. The old pier, declination axis housing, declination axis, and polar axis were retained in the new instrument, and the original declination and hour circles were again mounted as before. The remainder of the telescope is new. It was decided to provide three motions in right ascension and follows: First, a fast-setting motion of 45 degrees per minute of time; second, a slow-setting motion of 90 minutes of arc per minute; and, third, a guiding motion of 45 seconds of arc per minute. The first two of these motions, together with the slow-setting motion in declination, are controlled by push buttons located on the auxiliary control box. The 4 1/2-inch refractor which originally was employed as a guide telescope is now mounted on the 24-inch as a finder.

The tube center section and mirror cell were built up of 3/16-inch rolled steel, reinforced with ring flanges. This entire assembly was welded together and thrice annealed before machining, resulting in a very adequate mirror ventilation. To this end, the mirror cell was provided with large ventilating holes, through which the mirror can be seen in the photograph.

In order to avoid "dead air" in the tube, the open or skeleton type of design was chosen. The longitudinal struts were made of 13-gauge steel formed into box sections which extend the full length of the tube. These boxes were completely welded together and then welded to the center steel section and stiffening rings. The center circular strut,

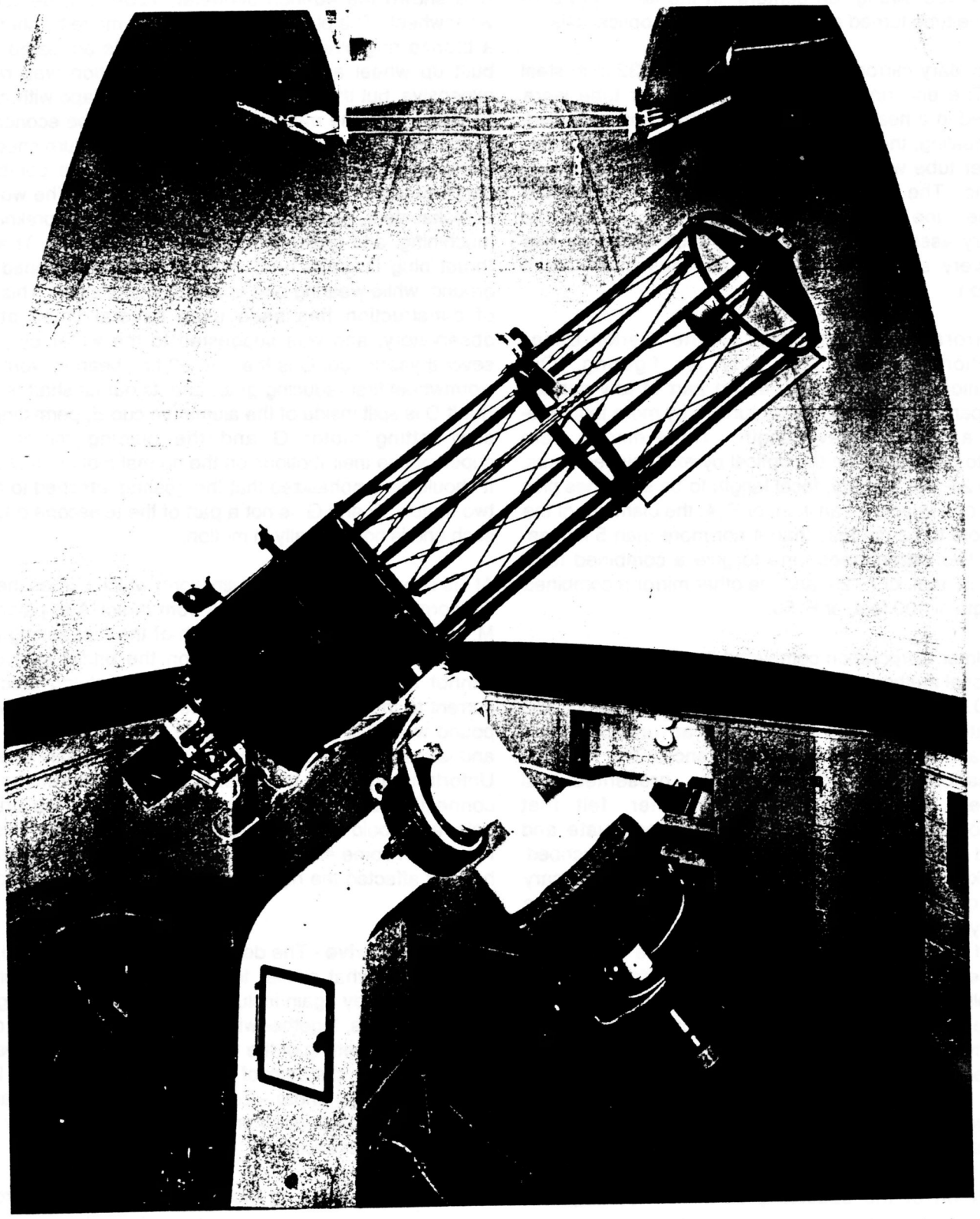

PLATE 2. General view of the 24-inch Francis C. McMath Memorial Telescope taken through the open dome shutters from the east side.

also of box section, was made in six pieces which, after individual welding, were welded between the longitudinal struts. The adjustable tie rods were added last. Altogether , the assembly is unusually rigid. It may be of interest to note here that a very large lathe was used as a welding jig and that, after welding, the tie rods were adjusted while the assembly was in the same lathe. Next, the entire tube assembly was swung "on centers" in the lathe and both ends of the tube turned at right angles to the optical axis.

The secondary mirror is supported by four 3/32-inch steel webs. The end ring, and secondary center tube were assembled in a heavy jig, welded together, and annealed. After annealing, the assembly was placed in the big lathe, the center tube was bored, and all faces made true and concentric. The outer ring was fitted into a recess in the telescope tube end in order to locate accurately the secondary assembly. The resulting tube assembly has proven very accurate and rigid, and has given entire satisfaction.

The mirrors were entrusted to the Perkin-Elmer Corporation of New York City for figuring. Our Specifications were exacting, as no part of any surface could depart from the theoretical surface by more than one-tenth of a standard wave-length. Three mirrors were ordered to be made from the optical pyrex furnished by us: First, the 24-inch primary, focal length to be 96 inches plus or minus one-quarter of an inch, or F: 4; the diameter of the central hole to be not less than 4 nor more than 5 inches. Second, two secondaries, one to give a combined focal length of 50 feet, or F: 25; and the other mirror a combined focal length of 100 feet, or F: 50.

Perkin-Elmer Corporation completed the primary mirror by conventional methods and it was tested at their shop by Dr. Heber D. Curtis, who pronounced it well within the specifications, Reported that it was an unusually fine surface, and recommended its acceptance. The two high magnification secondaries, however, presented real difficulties. McCarthy, of Perkin-Elmer, felt that conventional methods of testing were inadequate and proposed a new method, which he has recently described. The Perkin-Elmer Corporation made up the necessary auxiliary optical equipment, and our two secondaries were figured by the new method, which eliminates the combined testing of the primary and secondary. These two mirrors have been an unqualified success, both focal lengths being well within specifications, while the figuring is superb. Exposures for the disk of Jupiter are shorter by a factor of at least twelve when compared with our old 10 1/2-inch telescope.

Right Ascension Drive - We were particularly desirous of building a fine drive for the 24-inch telescope because we planned to use the 100-foot focal length combination a large portion of the observing time. Fortunately, the thermionic tube control apparatus was available, and after due consideration, it was decided to drive the telescope directly with the inverted converter in order to secure DC motor starting characteristics in winter.

The converter can be seen at A, Plate 3, which is a photograph of the new right ascension drive assembly. At B is shown the 46-inch diameter, 720-tooth, 5-pitch LH wormwheel. The blank for this gear was made by shrinking a bronze ring over a welded and double-annealed steel built up wheel and hub. This construction was rather expensive, but the wheel will not change shape with aging; consequently, the methods was thought to be economical in the end. The firm of Hanson-Whitney furnished the worm and thrust bearing assembly, and the combined performance of these is practical perfection. The worm is of nickel steel, hardened and heat treated after preliminary machining, and finally ground to a mirror finish. The end thrust plug is glass hard high speed steel, lapped and ground, while wearing part is soft machine steel. This type of construction has been used several times at this observatory, and was suggested to the writer by Curtis several years ago. C is the 1 to 90 ball bearing worm and wormwheel first reducing gear, and its output shaft is at D. Shaft D is spilt inside of the aluminum cup E, permitting the slow-setting motor G and the guiding motor F to superimpose their motions on the normal motion of shaft H. It should be emphasized that the gearing attached to these two motors, F and G, is not a part of the telescope drive as such and is not normally in motion.

At I is seen the end of the main worm which carries the 1 to 57 worm and wormwheel drive from motor A to polar axis M. At N can be seen a few teeth of the fast-setting gear, but the motor, being mounted on the under side of B, cannot be seen. The commutator supplying electrical current to the fast-setting motor is seen at upper D. A 50-pound weight is attached to cable R underneath the floor and is fasten to the polar axis by means of pulley wheel P. Unfortunately, due to construction considerations, the connection between the wormwheel B and the original polar axis could not be made as large as desired. This has resulted in some elasticity of the telescope as a whole, but has not affected the right ascension driving qualities of the telescope.

Declination Drive - The declination drive motions are, in a sense, somewhat similar to those of the right ascension drive, since they again include coarse-and fine-setting and guiding motions, together with the straight declination drive. Fast or rough setting of the telescope is made by releasing a friction clamp, the back of which is shown at the D, Plate 4 *[see front page photo - Ed]*, and moving the drive arm E to the desired declination angle. This angle is easily read in the declination circle H.

The slow or fine-setting motion of 50 minutes of arc per

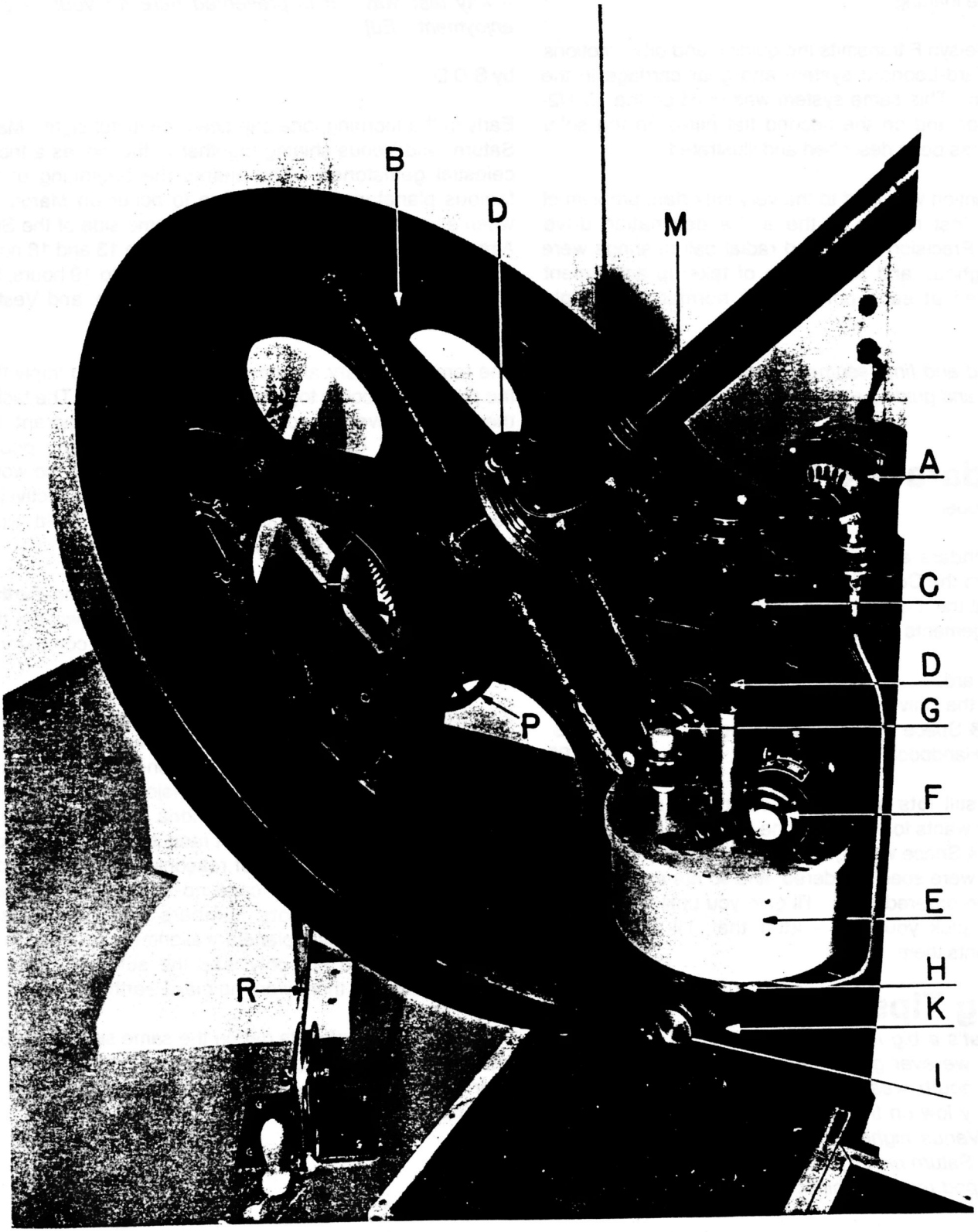

PLATE 3. View of the New Right Ascension Drive.

minute of time is obtained through the drive motor B, 9-pitch worm C, and 680-tooth wormwheel G. Worm C was made in two pieces and has a special spring adjustment in order to eliminate all lost motion at this point in the assembly. The slow motion motor support bracket A purposely is a very heavy casting to act as a counterweight about the polar axis . This was done to avoid adding to the already heavy stress imposed upon the declination axis by the new tube loading.

The slave Selsyn F transmits the guiding and drive motions from the Ward-Leonard system and gear carriage in the control room. This same system was used on the 10 1/2-inch reflector and on the second flat mirror in the solar tower, and has been described and illustrated.

Special attention was paid to the very important problem of eliminating lost motion in the entire declination drive assembly. Precision thrust and radial ball bearings were used throughout, and some form of take-up adjustment was provided at each point where normal wear might occur.

[The second and final segment of this article will present the camera and guiding eye piece assembly. - Ed]

Calendars Are In

by Doug Scobel

All the calendars and observer's handbooks are in. I'll bring them to the December meeting. If you know that you will not be at the meeting, then let me know and we'll make other arrangements for you to pick yours up.

Final prices are:

Wonders of the Universe monthly wall calendar	$ 9.00
Astronomy & Space weekly desk calendar	$ 8.95
Observer's Handbook	$17.95

There are still lots of the wall calendars available for anyone that wants to purchase one or more. However, the Astronomy & Space weekly desk calendars and Observer's Handbooks were special ordered, and so are available only to those who ordered them. I'll give you until the January meeting to pick yours up - after that, I'll sell them to whoever wants them.

Feeling Tipsy Lately ?

[If (and that's a big IF here in Michigan in the month of December) we ever get a clear evening sky look to the south and south west and you will see at mid-month Mercury very low on the horizon (yea, right!) followed by Mars and Venus higher up, with Jupiter up higher yet, followed by Saturn nicely placed in the southern sky. With a pair of tripod mounted binoculars, or better yet a small telescope, you'll find Neptune and Uranus either side of Venus. Lastly, Pluto is so close to the Sun it is impossible to see. So there you have it all nine planets, and that includes the one you are standing on are in the same part of the sky - all within 8 1/3 hours of right ascension (125 degrees). This made me think of a former Lowbrow's article on planetary alignment that was handed out at a presentation of the history of the Lowbrows given by Peter Alway last May. It is presented here for your reading enjoyment. - Ed]

by S.D.D.

Early in the morning, one can see a beautiful sight - Mars, Saturn, and Venus shining together in the sky as a trio of celestial gemstones. This marks the beginning of the famous planetary alignment due to occur on March 10, when all nine planets will be on the same side of the Sun. Already all of the outer planets lie between 13 and 18 hours right ascension. If one extends this region to 19 hours, the original four asteroids - Ceres, Pallas, Juno, and Vesta - will also be included.

The term "planetary alignment" is not meant to imply that the planets will come together in a straight line. The fact is, they will not ever be contained in a single quadrant, but span over 95 degrees. Never less, as many people shrewdly realize, this event will mark the end of the world. In my meager attempts to present this issue objectively, I have listed three arguments for the end of the world, along with three respective refutations:

1. - "The tidal forces from the planets will rip the Earth to shreds." As every Astronomy 221 student knows, the tidal influence of the planets is totally insignificant compared to that of the Moon.

2. - "Various planetary forces will increase the number of sunspots, which will influence the climate of the Earth, which will shift the winds in the atmosphere, which will alter the Earth's rotation rate and trigger major earthquakes." As I understand it, this is the basic idea behind The Jupiter Effect, although I admit I haven't read it. (I don't need to. I know everything.) The line of reasoning here seems long and tenuous, and in any case no correlation has been found between sunspots numbers and earthquakes. Besides,an even closer planetary alignment occurred in the early 1800's, and not only was the sunspot maximum unusually low, but there were no major earthquakes.

3. - "When all the planets get on the same side of the Sun, the solar system will get too heavy on one side and fall over." This is the argument that convinced me. And I'm sure it will convince you.

Sky & Telescope's Weekly News Bulletin - *

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* - available via SKY Online on the World Wide Web at http://www.skypub.com/.

Minicomet Debate Continues - More than a decade ago Louis A. Frank and John B. Sigwarth (University of Iowa) came to the conclusion the Earth is pummeled by house-size comets many thousands of times each day. They have fought an uphill battle to support it ever since. Last May Frank brought forth new evidence from NASA's Polar spacecraft, whose ultraviolet-light images of Earth's atmosphere show what Frank purports to be water-induced "holes" from minicomet impacts.

The theory took more hits this past week with results presented at a meeting of the American Geophysical Union in San Francisco. Among the naysayers at the December 9th press conference, were George Parks, who, with his University of Washington colleagues, reexamined the Polar data and concluded that the spots that are presumed to be atmospheric holes are instrument artifacts. Bashar Rizk and Alex J. Dessler of the University of Arizona explain that the incoming comets would be easily visible from Earth's surface -- but no one is seeing them. Fellow Arizona researchers Jennifer A. Grier and Alfred S. McEwen also note that such a comet bombardment would litter the surface of the Moon with 50-meter-wide craters with bright halos of debris. They have found none. These and other independent studies are published in the December 15th issue of Geophysical Research Letters.

Frank counters these criticisms by saying that Parks' new analysis is fundamentally flawed. He supported his theory by presenting new Polar images that show that there are fewer holes seen the farther the spacecraft is from Earth, thus contradicting the instrument-noise view.

Giant Mirror Reaches Chile - The first mirror for the European Southern Observatory's Very Large Telescope has arrived at the foot of 2,640-meter peak Cerro Paranal. The 8.2-meter mirror reached the Chilean port of Antofagasta on December 6th. A convoy started out the next day for a two-day trip to transport the giant piece of glass to the base of the mountain where the four telescopes and enclosures are being prepared. Engineers will inspect the mirror at the lower-altitude observatory facility. Currently, one telescope is being erected atop the mountain, a second is being fully tested in Milan, Italy. The first telescope is expected to achieve first light in early 1998.

AXAF Needs Testing - Launch of the Advanced X-ray Astrophysics Facility (AXAF), one of NASA's "Great Observatories," will be delayed slightly because testing is behind schedule. Although the observatory itself is almost completely assembled, and its performance was checked out extensively in calibrations last year, more tests are needed to ensure that the satellite will carry out commands correctly. Builder TRW contracted to deliver AXAF in June prior to launch aboard the Space Shuttle Columbia at the end of August 1998. But delivery may now be a couple of months later than planned. NASA has not determined what effect this will have on the launch date, but the project's astronomers are still optimistic that they will be seeing data from AXAF by the end of next year.

Pinning Down Uranus' New Satellites - Additional observations of the objects first spotted in the vicinity of Uranus in September reveal that they are indeed in orbit around the planet. Orbital computations by Brian G. Marsden and Gareth V. Williams, of Harvard-Smithsonian Center for Astrophysics, and announced on a November 29th IAU Circular, also show that they orbit "backward" (retrograde) with respect to Uranus' orbit around the Sun. (The planet itself has a retrograde spin because its rotational axis is tipped more than 90 deg. from ecliptic north.) Since the moons are several millions of kilometers away from Uranus, their orbits are greatly influenced by gravitational tugs by the other planets.

Mars Pathfinder Signs Off

The Sagan Memorial Station on Mars has succumbed to the cold of the red planet's nights. The last full transmission from the Mars Pathfinder lander came in on September 27th; since then only faint, brief signals on October 2nd and 7th have broken the silence. Since the rover Sojourner communicates to Earth via the lander, it too is now out of touch. Still, Mars Pathfinder lasted much longer than its modest one-month goal. To commemorate the mission's successes, on December 10th the U.S. Postal Service will unveil a new $3 stamp featuring one of the first color images returned to Earth by the spacecraft.

Prospects for Prospector - NASA hopes there will be no further delays to preclude the January 5th launch of Lunar Prospector, already postponed twice because of delays preparing its new Athena 2 rocket. Prospector will survey the Moon from orbit and hunt for water at the lunar poles. Its data will complement the global mapping done in 1994 by the Clementine 1 spacecraft. Meanwhile the Clementine 2 mission, which would have explored several near-Earth asteroids, recently fell victim to President Clinton's line-item veto.

Field Guide To The ATMs

by Val Germann
Central Missouri Astronomical Association
submitted by Kurt Hillig

I came across this back in the musty old stacks of the MU library annex, in the "Unknown Edition" of ATM-1:

Scientific Name: Amatis Telescopis.

Common Name: Amateur Telescope Maker (and others, not printable).

Status: Not rare, but not common. Some say endangered.

Range: Worldwide, highest concentration in North America, W. Europe.

Description: The Amateur Telescope Maker is usually male, has a technical occupation and belongs to an astronomy flock of one kind or another. Rather drab in coloration, the ATM spends a lot of time out of the sun, which does not help. Oddly, many ATMs make and acquire large numbers of telescopes and then never use them!

Subspecies:

1) THE NOVICE: The reproduction methods of ATMs are as yet unstudied but THE NOVICE is involved, somehow, since he is by far the youngest, on average. Given to pocket protectors. Call: "Hey, guys, what the heck is going on here?" Many ATM flocks encourage and nourish THE NOVICE while others all but drive him away. Exactly why is not known.

2) THE FREE SPIRIT: Largely a western North American ATM, this fellow furiously attacks any project, attempting to finish it yesterday. Call: "Let's do this 20-inch by lunch!"

3) THE GAMER: Found world-wide, this fellow is highly competitive and territorial. Constantly compares his nest, er, telescope, to those of other ATMs. Call: "Well, this is pretty good but you ought to see the one I have at home!"

4) THE WORRYWORT: Fairly common among ATMs, this fellow is excessively concerned about minutia that might go wrong, the polar opposite of 2) above. Call: "Gee, I touched the surface with my finger! Do I have to go back to fine grinding?"

5) THE TECHNOCRAT: Also common, this guy rates all products of other ATMs strictly on difficulty of execution and complexity. Has a chartered 18-wheeler for his telescope and accessories. Call: "But is that polar axis double-shot-peened AND hardened?"

6) THE DWEEB: Comes in two sub-sub species, namely, with and without talent. Neither have any social skills and are totally self-absorbed. They will tell you everything about themselves if you let them, including things about their fantasy lives. Call: "Do you guys have the same trouble getting girls I do?"

7) THE PRETENDER: Like the cowbird, who lays her eggs in the nests of other birds, this subspecies pretends to be an ATM but has never actually done anything, in hope of gaining some perceived self-esteem with little effort. If combined with elements of 6) above, this fellow can wreak havoc on ATM flocks, sending them scattering in all directions. Call: "Hey, have any of you guys ever figured a Schmidt corrector during an earthquake." Thought by many to be on the increase worldwide.

8) THE SNOB: Rates all ATM products according to whether or not they resemble what he currently is using, which is either the current "hot"
item or something difficult to make. Puts down other types of instruments even though the chances are small that what he has actually works real well. Call: "Well, I suppose you have to have SOMETHING if you can't have an XXXX."

[There is some debate over whether the following are true subspecies or simply hybrids that occur where breeding ranges overlap - Kurt Hillig]

9) TECHNOCRAT x WORRYWORT: Never gets anything done, but it is very, very complicated. Call: "Boy, just wait until I get this double-reversed Schmidt/Houghton underwater corrector finished!"

10) TECHNOCRAT x SNOB: Some think this bird, with his colorful and elaborate plumage, and beautiful telescope, is the height of the ATM species. Others think him an overblown windbag with delusions of grandeur. Call: "My way or the highway."

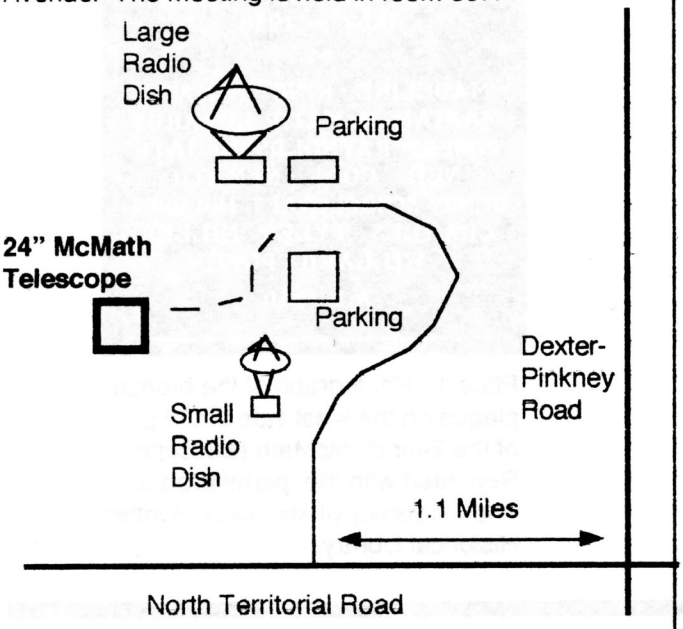
For Sale

- Sirius Plossl eyepieces - as new and in original boxes. 1.25" - 7.5mm; 1.25" - 10mm; 1.25" - 17mm; $35.00 each.
- Vixen Lanthanum eyepiece - as new, in original box. 1.25" - 6mm; $100.
- Orion 2x Shorty Barlow - as new, in original package. 1.25"; $35.00.
- Orion small eyepiece and accessory case; $15.00.
- Meade 6x30 white body finder scope with caps and dual ring mount; $30.00 - as new.
- Meade 4500 114mm (4.5 inch) f8 reflector metal tube telescope with 1.25 inch rack and pinion focuser and 6x30 finder. On an aluminum tripod equatorial mount and includes a Meade MA 25mm eyepiece; $225.00.

I will have all these items except the Meade 4500 available for inspection and purchase at the December19th meeting. Tom Stoner (734) 663-3233. tgstoner@umich.edu

Places and Times:

Dennison Hall, also known as The University of Michigan's Physics and Astronomy building, is the site of the monthly meeting of the University Lowbrow Astronomers. It is found in Ann Arbor on Church Street about one block north of South University Avenue. The meeting is held in room 807.



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

Monthly meetings of the Lowbrows are held on the 3rd Friday of each month at 7:30 PM in 807 Dennison Hall. During the summer months, and when weather permits, a club observing session at Peach Mountain will follow the meeting.

Public Open House/Star Parties are held on the Saturday before and after each new Moon at the Peach Mountain Observatory. Star Parties are canceled if the sky is cloudy at sunset or the temperature is below 10 degrees F. Call 480-4514 for a recorded message on the afternoon of a scheduled Star Party to check on the status. Many members bring their telescopes and visitors are welcome to do likewise. Peach Mountain is home to millions of hungry mosquitos - bring insect repellent, and it does get cold at night so dress warmly !

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

Dues:

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

1426 Wedgewood Drive
Saline, MI 48176

Magazines:

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

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

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

Newsletter Contributions:

Members and (non-members) are encouraged to write about any astronomy related topic of interest. Call Newsletter Editor Kurt Hillig at (313)663-8699(h) or (313)647-2867(o) or e-mail to khillig@umich.edu to discuss length and format. Announcements and articles are due by the first Friday of each month. Articles should be mailed to Kurt at:

7654 W. Ellsworth Road
Ann Arbor, MI 48103

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Lowbrow's WWW Home Page:

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

Monthly Meeting : December 19, 1997, 7:30 pm

Room 807 Dennision Hall (Physics & Astronomy Building) at The University of Michigan

Speaker: Dr. Michael Combi from The University of Michigan, Space Physics Research Laboratory

Comet Research at the University of Michigan

After a 20 year hiatus, we have had two spectacular naked-eye comets during the last two years: Hyakutake and Hale-Bopp. Some of the latest results of comet research being performed at the Space Physics Research Laboratory on North Campus will be presented at the December 19 meeting by Dr. Michael Combi. These include observations with the Hubble Space Telescope and an explanation for X-ray emissions discovered in Hyakutake.

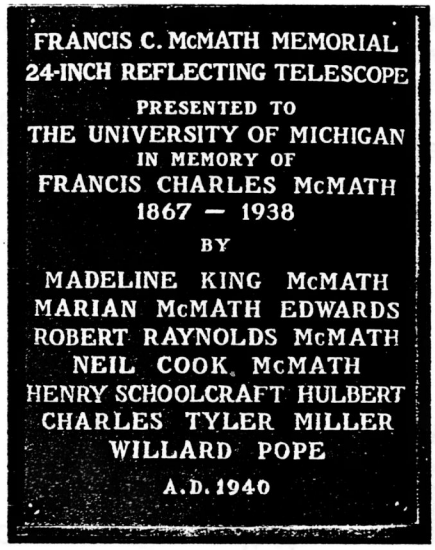

Plate 1 - Photograph of the bronze plaque on the west side of the pier of the 24-inch McMath telescope. Reprinted with the permission of The University of Michigan, Bentley Historical Library.

University Lowbrow Astronomers
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Check your membership expiration date on the mailing label !