REFLECTIONS

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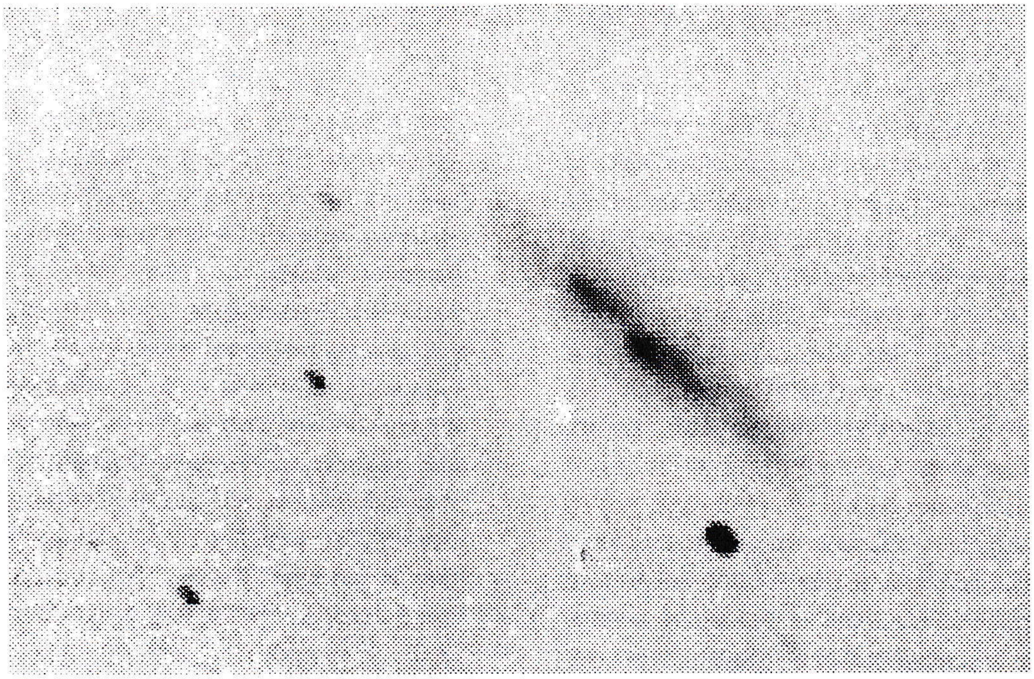
January, 1992

R. Tanner, ed.



This negative image of M82 in Ursa Major was taken by R. Tanner with a 6" f5 telescope and the SBI CCD camera with a 100 sec exposure.

University Lowbrow Astronomers

The University Lowbrow Astronomers is a club of astronomy enthusiasts which usually meets in the historic "Detroit Observatory" on the corner of Observatory and Ann Streets in Ann Arbor. The meetings start at 7:30 on the third Friday of each month and are open to the public. For further information, call Fred Schebor at 426-2363.

This Month:

January 17 - Meeting, At the **Detroit Observatory in Ann Arbor**. A special meeting, **Tony England**, former **NASA astronaut**, now a U of M professor will talk on the politics required to get science done.

January 28 - February 1 - Winter Star Party held in the West Summerland Key in Florida by the Southern Cross Astronomical Society. This is the southernmost dark sky observing site in the continental U.S., at 24.6 degrees north latitude. Unfortunately, at press time, the camp is full and there is a waiting list to get in. Next year the registration will be sent out in October so if you are interested, mail early !

Next Month:

February 1 - Club Observing Session, Peach Mountain Observatory.

February 6 - Computer Subgroup Meeting at **Stuart Cohen's house**, **7:30 pm**. Stephen Musko will present a rought draft of the interface specification for the computer to be added to the 24" drive controller, (see the Subgroup Reports). There will also be a discussion and maybe demonstration of what useful astronomical calculations can be done with only 32K of memory or a programmable hand calalulator. Note that this date is a **Thursday.**

February 8 - Club Observing Session, Peach Mountain Observatory.

February 21 - Meeting at the **Detroit Observatory in Ann Arbor**. This meeting will be a demonstration of astronomical image processing on the PC by Roger Tanner. Doug Nelle will try to bring a LCD projection plate for the overhead projector so that a large image of the screen can be projected on the wall for all to see.

Major progress on the 24" restoration !!

D.C. Moons and a crew of clubmembers did some heavy duty work during a long Saturday and made very significant progress on the 24" restoration project, for more details see Club News. The Computer Subgroup is discussing adding a computer to the telescope to add some capabilites to the drive controller, for more information see Subgroup News.

Club News

Update on the 24" Renovation.

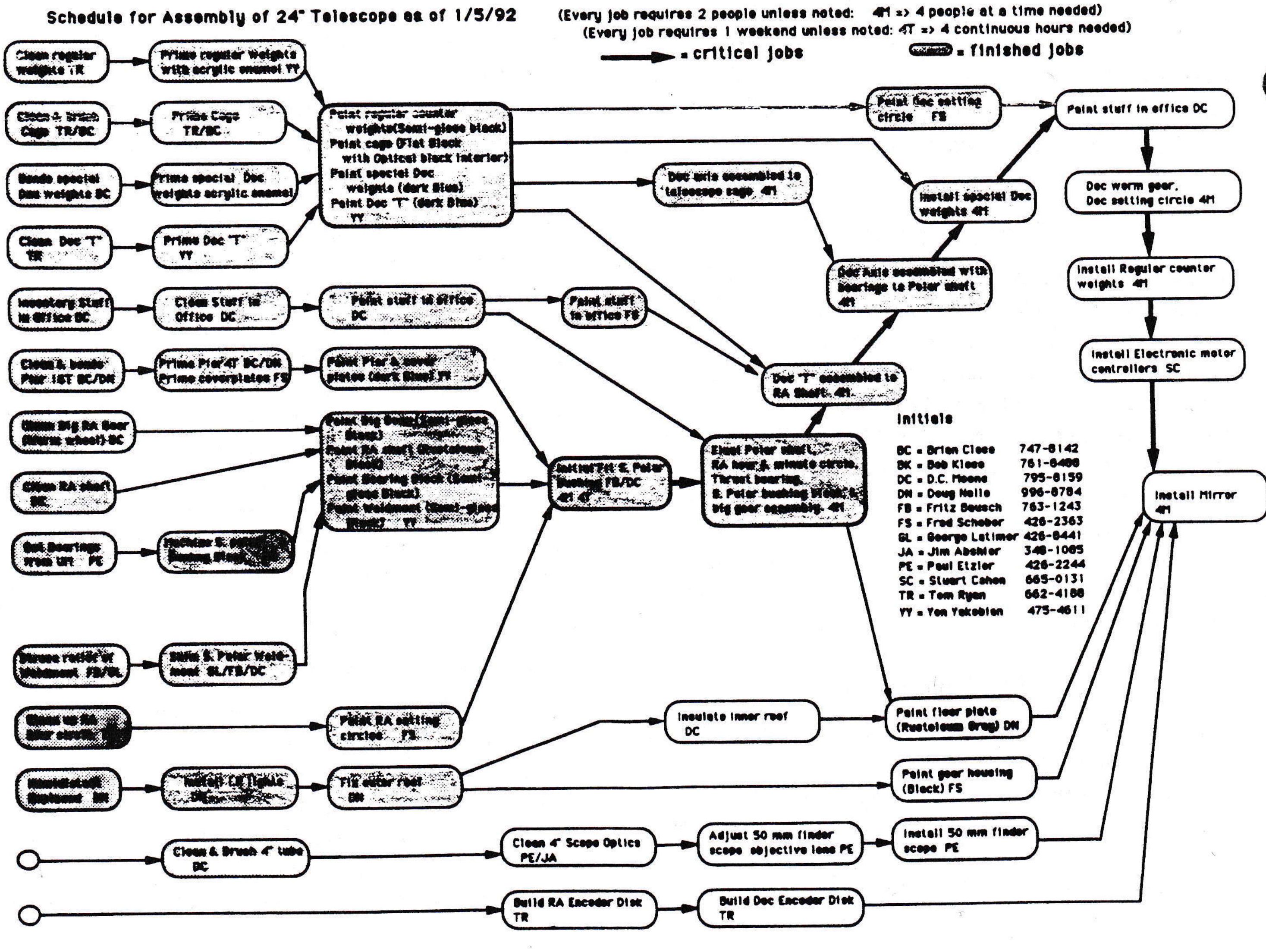
Due to the inspired leadership of D.C. Moons and a team of club members, a significant amount of heavy work has been done on the telescope. On the Saturday of January 4th, Tom Ryan, Stuart Cohen, Dick Sider, Bernard Friberg, and Doug Nelle spent many hours out at the telescope assembling, cleaning, lubricating, and touching up the paint. At present the Declination axis is on, along with the cage, and the special declination counterweights. The installation of several of the components required all of the planning and strength of the 6 members to assemble.

All of the bearings are lubed and so far the motion of the axes is very good. The true test of the bearing alignment will come when the mount is fully assembled with the test weight and all of the attachments and is up to full weight. The major (heavy) elements left to assemble is the Declination gear and the Declination counterweights.

The next steps are to clean up the observatory, and touch up all of the paint. Than the floor will be painted. Then the lead weight (to simulate the mirror weight) and the drive motor will be installed. After the system passes the test of driving the scope with out problems the place will be cleaned up again and the mirror installed.

D.C. reports that the with the new bearings, proper lubrication and paint on the telescope he feels that the stiff motion and corrosion problems will be solved for a long time. D.C. also requests that people stay out of the observatory until the restoration is completed because with all the parts around, someone could get hurt or just track in dirt after they just cleaned up for painting. D. C. also calls dibs on First Light. The revised workplan showing the work done and what's left is shown below.

Schedule for Assembly of 24" Telescope as of 1/5/92



Mathematical Analysis of Time For The Stars

by Alan Wilde

Editors Note: this article is a continuation of the articles Alan wrote in the past newsletters and there will be more parts of the article in future Issues.

In Time For the Stars, Robert A. Heinlein tells a story of a pair of twins: one who travels to the stars and one who stays on earth. They can communicate by telepathy instantaneously over light years.

The twin who travels slows in reaction time so that he ages less than the twin on earth. In relativity, the time dilation factor (or degree of slowing down) varies with his velocity. However, while traveling, the twin's ship accelerates halfway between stars and decelerates the other half. Thus velocity varies from rest to just below c (the velocity of light). A method by Sebastian von Hoerner enables us to compute the effect by calculus. We shall do a mathematical analysis of the trip.

With out showing the formulas, we have the table below for the three trips: earth to Tau Ceti, Tau Ceti to Beta Hydri, and Beta Hydri to Beta Ceti (the twin returns faster than light back to earth, but we will deal with that later). Given in the table are the acceleration rates, the trip distance, the time for earth, the ship time (for the traveling twin), the maximum velocity attained, the greatest time dilation factor (ratio of earth time rate to ship time rate), and the minimum mass ratio (ratio of initial mass of ship to mass after burnout) needed for the trip.

	1st trip	2nd trip	3rd trip
Acceleration (gravities)	1.24*	1.24*	1.5*
Distance (light years)	11*	22.5	34.7
Earth time (years)	12.5	24*	36*
Ship time (years)	4.3	5.4	5.2
Max velocity (fraction of c)	0.9922	0.9979	0.9994
Time dilation	8.04	15.4	27.9
Mass ratio	256	946	3109

The starred quantities are those given in the book. The rest are computed.

The ship could convert 100% of the fuel into energy and emit it is as photons, and the fuel was gotten from the planets. As computed in the table, the ship must have been a large percentage fuel.

In the trip, the total distance traveled was 68.2 light years. (Heinlein gave the distance form earth to Beta Ceti to be 63 light years, here we are in good agreement.) The total earth time is 72.5 years. Since the twin on earth was 90 years old when the traveling twin returned, they must have been 17.5 years old when parting. The traveling twin must have aged 14.8 years wheras the book said he thought he had aged only 4 years (a difference).

A fundamental difference exists between the book and relativity over simultaneity. The book has the twins communicate instantaneously while one is moving. Relativity says that if one observer observers events A and B to be simultaneous, observers moving relative to him observe that A occurs before or after B depending on their relative velocities. Thus the two twins cannot agree with each other on what events are simultaneous while they are in motion relative to each other. Telepathy cannot be instantaneous to both while they are in motion relative to each other.

In the end of the book, Heinlein has a faster-than-light ship pick up the traveling twin and take him back to earth in weeks. Heinlein says simultaneity becomes the rule. However, the traveling twin aged less. do we believe the book or relativity? Perhaps the answer, as nearly stated in Heinlein's Mathuselah's Children, is: a physical theory of faster-than-light travel must be consistent with what experiments have verified in relativity.

(Source of formulas: Sebastian von Hoerner, "The General Limits on Space Travel", Science, Volume 137, Number 3523, July 6, 1962).

Subgroup Reports

Computers in Astronomy Subgroup

The eleventh meeting of the Computers in Astronomy Subgroup was held at Tom Ryan's house with a turnout of 6 members.

The meeting started out with John Laffitte describing the software he wrote to control his computer controlled Dobsonian telescope. He started by descibing the general steps of the software loop the computer goes through to control the telescope. The steps are as follows.

1. - Initialize

The first step is to initialize the scope. This tells the computer where it is pointing at that moment. For an alta-azimuth where the axes are perfectly perpendicular, and the vertical axis is truly vertical, just pointing the scope at one star and telling the computer which star it is is (where the computer "knows" the coordinates) is sufficient to initialize it. For an accurately aligned equatorial mount this is also enough. If the alignment is not accurate for either type of mount, the telescope can be pointed at additional stars to improve the computers knowledge of the telescope's position. In each case the scope is driven by hand to the star and the computer is notified which star is in the scope.

2. - Enter coordinates

Here you would enter the coordinates of a desired object to point the scope at.

3. - Corrections

Here the program would take the entered coordinates and correct for several problems to get to the actual angles to move the scope. The first problem is to consider your field of view of the eyepiece. On John's scope his typical eyepiece gives 16', so he does corrections to get the errors down to a less than 8 minutes. The first correction is for precession, i.e., the motion of the Earth's axis around the sky. The coordinates given in an atlas are for a particular time say Jan 1, 2000, which is different than the current date. This error can be as big as 40' (for 50 years of difference). The next error is to correct for refraction, the bending of light near the horizon. This error can be as big as 30' for objects near the horizon. The next is to compensate for alignment with the pole, non-perpendicularity of the axes, and, encoder errors if you have encoders on the axes. John's system uses stepper motors in an open loop system without encoders. His system must keep track of the number of steps to determine the current position of the telescope at all times.

4. - Compute Angle Difference

In this step, the computer computes the angle difference between where the scope is pointed and the new coordinates.

5. - Control Law

In this step, the computer determines the rate and direction to move the scope and whether the rate needs to be ramped up or down to avoid jarring the telescope or causing the drive to slip.

6. - Real World Signals

Here is where the computer converts drive rates and directions into real world signals, what ever is required to drive the scope. In John's system his computer generates a timing pulse and direction signal to drive a circuit he built which drives the amplifiers which in turn drives the stepping motors. The computer goes thru the loop several times a second. John has the computer only move the scope every fifteen seconds or so which is all that is necessary for visual use. The computer will then wait for a new set of coordinates.

The discussion then turned to what a computer could do to enhance the present drive controller and hand paddle unit that Tom Ryan and Stuart Cohen have built for the scope. This drive controller is planned to be able to move the scope in each axes entirely by the hand paddle for both slewing across the sky, centering an object in the eyepiece, and guiding for photography. The present system can do all of this except R.A. slew which needs some mechanical and electronic work. Additionally, there are encoders to provide electronic R.A. and Dec readouts.

The drive controller has been designed to be adaptable to remote control by a computer because all of the paddle signals are computer logic level signals. Additionally, the signals are all positive logic, i.e., they will not do anything unless a voltage is applied. This allows the system to operate fully if the computer is turned off. The first feature that the computer could add is to move the scope to an object either by coordinates or by name. After the computer moved the scope it would "let go" and the scope would be controlled by the paddle as before. The computer could also do other things like present simple star maps, computer planet positions, adjust drive rates for different parts of the sky and objects, and other things mostly limited by disk space and programming enthusiasm.

Stephen Musko volunteered to do the first step in the process of adding a computer to the drive; to write the interface specification which defines the connection between the computer and the drive system. There was some discussion about the way to protect a computer in the observatory environment. The best idea seemed to be to mount the computer in an enclosed box and leave it

(con't on next page)

on all the time.

IMAGINE-32

After that, I (R. Tanner) demonstrated a demo version of IMAGINE-32 an image processing program from CompuScope written by Dr. Philip Lubin (an astrophysics professor at a California University). This program is written in C and assembly and uses a Dos extender to run as a 32 bit protected program. What this means is that this program fully uses (and requires) a 386/486 processor and all of your memory (it needs at least 2 M) in the most efficient mode to give the highest possible performance. This program will read the popular amateur CCD camera file formats, the professional astronomy file formats (FTS), the Compuserve graphics format (GIF), and the format used on the Voyager CD ROM's (IMQ). It is many times faster than the ASTRO IP and SBIG software and handles images up to 1K x 1K and can have as many as 15 images on the screen at the same time. It also uses palette remapping to give very fast modification of the image on the screen, essentially real time. The program has a mode which will magnify a small section of your image and recalculate the optimal contrast and brightness for the magnified view in real time as you roam around your image. The program is completely mouse driven and is as quick as workstation programs. The program is planned to have Fourier processing and photometric analysis for finding star positions and their flux. The program costs $300 and doesn't require Windows.

Next Meeting

The next meeting will be on February 6, a Thursday at Stuart Cohen's house at 7:30. Stephen Musko will present a rough draft of the interface specification for the computer attachment to the drive controller. There will be a discussion of what useful computation can be done on a small home computer or programmable calculator and Stuart Cohen may have some example programs he has written or ported.

An Observing List for January

Bright Objects

Solar System Objects

Jupiter at -2.4 magnitude, rises at about 9:30 just underneath Leo.

Local objects in the Milky Way

M45 - The Pleiades is an open cluster in Taurus - 20 M years old, 470 LY (light years) away.

NGC 869 & NGC 884 - The Double Cluster in Perseus - 2 groups of stars 7400 LY away, each 70 LY in dia.

Outside the Milky Way

M31, The Great Galaxy in Andromeda - 2.2 M LY away, inclined 15 deg. from line of sight, 180,000 LY in dia., magnitude 3.5, 180' x 63' (yes that is 6 moon diameters).

M32 - the closer of the two easily visible dwarf companion galaxies of M31, 2,400 LY in dia., Mag 9.5, 7.6' x 5.8'.

NGC 205 - The farther away of the two companions to M31, 5,400 LY in dia., Mag. 10.8, 17' x 9.8'.

Medium Objects

Local Milky Way

NGC 457 - (RA 1h 19.1' DEC 58 deg 20') This open cluster in Cassiopeia is located about 10,000 LY away and is 30 LY in dia. with an apparent size of 13' and a magnitude of 6.2. The Arizona Database gives a name of the "Kachina Doll Cluster" ?.

Outside the Milky Way

NGC 7662 - (RA 23h 25.9' DEC 42 deg 33') A very small planetary nebula in Andromeda, 32" x 28", 8.3 magnitude. Also called the "Blue Snowball Nebula". 5600 LY away, .8 LY in dia.

Dim/ Difficult Objects

Solar System

Comet Faye is about 11th mag, very tough object.

Local Milky Way

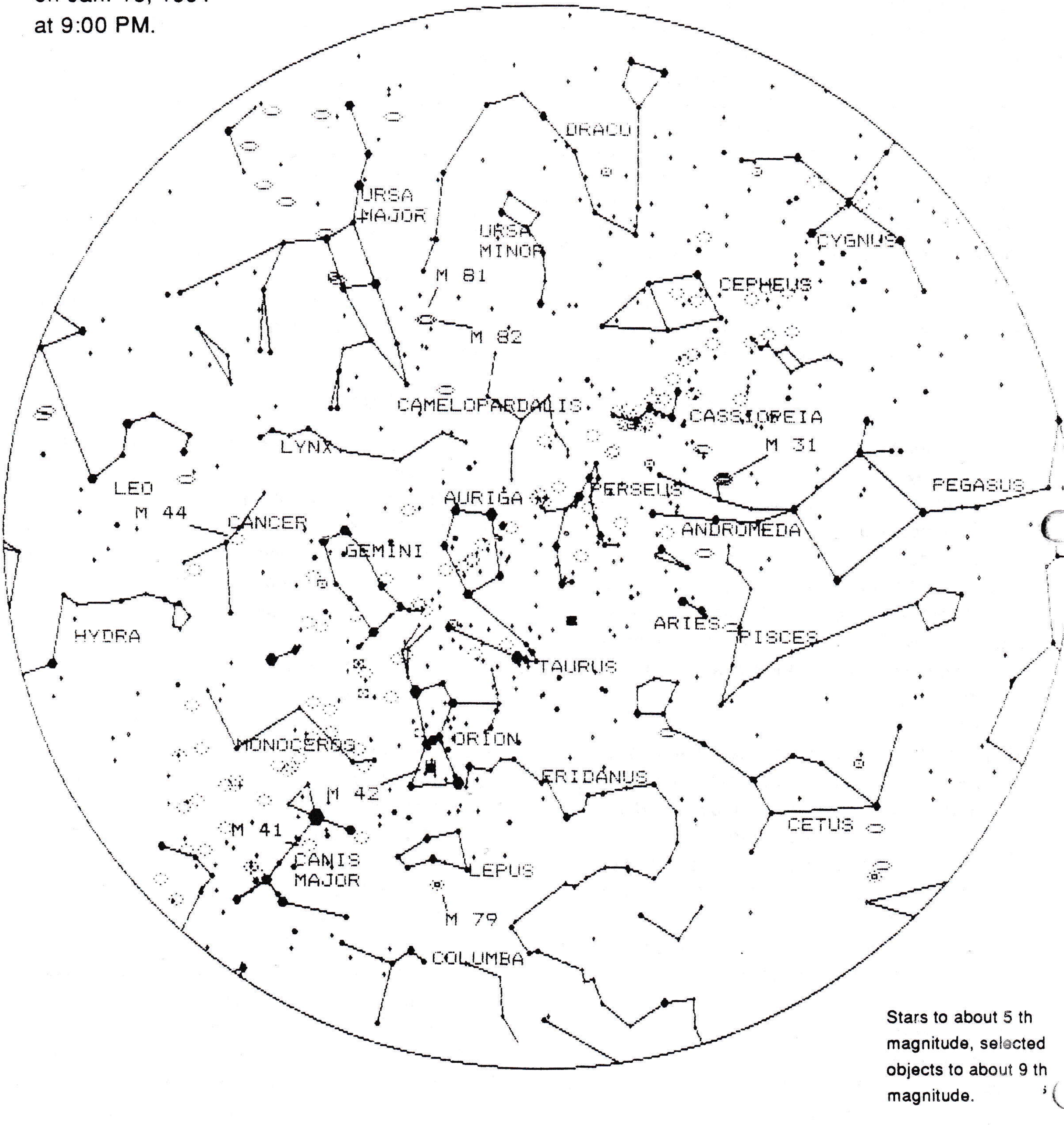
M76 - (RA 1h 42.3m DEC 51deg 34') This is a planetary nebula in Perseus, 1000 LY away, 10.1 magnitude, 2.7' x 1.8'. This planetary is typically called the "Little Dumbell" because it has a similar shape but is much smaller.

Outside the Milky Way

NGC 891 - (RA 2h 22.6m DEC 42deg 21') A large but low surface brightness edge on galaxy in Andromeda, 43 M LY away, 12 th magnitude, 12' x 1'. This galaxy shows a dark lane running down its entire length, photographs of this galaxy look like wide field pictures of the Great Rift in the Milky Way which runs from Cygnus through Sagittarius. This object is difficult because of the light pollution at Peach Mountain.

Sky Map

Peach Mountain
on Jan. 18, 1991
at 9:00 PM.

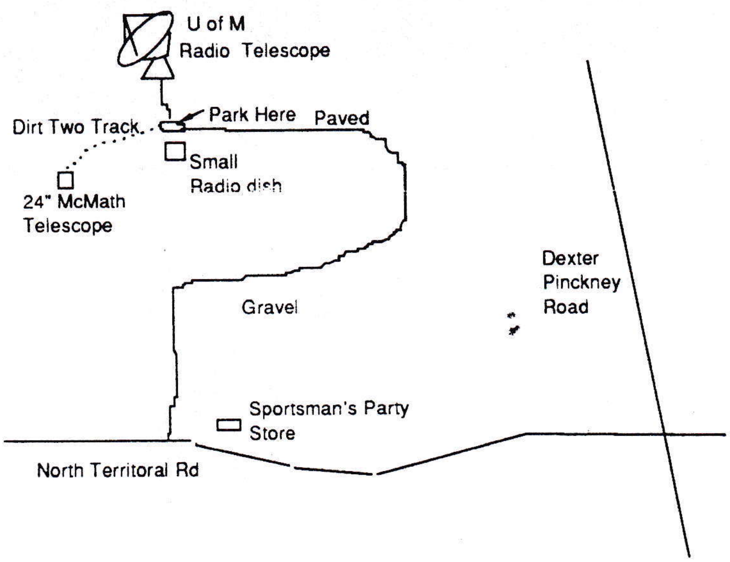


Stars to about 5 th magnitude, selected objects to about 9 th magnitude.

☞ Places:

The *Detroit Observatory* is at the corner of Observatory and Ann Streets in Ann Arbor, across from the old U of M Main Hospital. The Detroit Observatory is an Historic Building which houses a 19th century 12-inch refractor and a 6-inch transit instrument.

The *Peach Mountain Observatory* is the home of the U of M radio telescope and the 24-inch McMath telescope used by the Lowbrows. This observatory is located northwest of Dexter, off North Territoral Road, West of Dexter-Pinckney Road. The entrance is just west of Sportsman's party store and is marked by a small maize and blue university sign. Go through the gate and follow the gravel road. Once parked at the observatory parking lot, follow the path away from the radio telescope and around the fenced in compound to the telescope, see map below.



☞ Times:

The monthly meetings are held on the 3rd Friday of each month at 7:30 pm. Meetings are either at the "Detroit Observatory" in Ann Arbor or at the Peach Mountain Observatory. Meetings held at Peach Mountain are cancelled if the sky is not clear at sunset.

Public Star parties (Open Houses) are held on the Saturdays before and after the new moon at the Peach Mountain Observatory. Star parties are cancelled if the sky is not clear at sunset. Many members will bring their own telescopes. Your scope is welcome. Wear warm clothes for the season and bring insect repellent. The next scheduled Open Houses are listed on the front page.

☞ Dues:

Membership in the Lowbrow Astronomy Club is $20 per year for individuals or families, and $12 per year for students. Among other things. this entitles you to use the club telescope after some training. See Dick Sider at the meeting or send your dues to his address below.

☞ Magazines:

The Lowbrow Astronomy Club offers discount subscriptions to popular astronomy magazines:

Sky and Telescope : $18/yr.
Astronomy : $16/yr., 12 issues.
Odyssey : $10/yr., 12 issues.

Contact Dick Sider (663-3968) for more information or write to him at the address below:

Dick Sider
902 Pauline Blvd.
Ann Arbor, Mich. 48103

❐ Sky Map:

The *Sky Map* section in this issue of *REFLECTIONS* is produced by Doug Nelle using the program Deep Space 3D.

Newsletter Contributions:

Please send any information, short articles, or drawings to the address below. The closing date is 7 days before the meeting.

University Lowbrow Astronomers Reflections
1770 Walnut Ridge Circle
Canton, Mich. 48187

☎ Important Numbers:

President: Fred Schebor 426-2363
VicePres: Stuart Cohen 665-0131
Doug Nelle 996-8784
Paul Etzler 426-2244
Treasurer: Richard Sider 663-3968
Observatory: D.C. Moons 254-9439*
Newsletter:Roger Tanner 981-0134
Membership: Ron Avers 426-0375

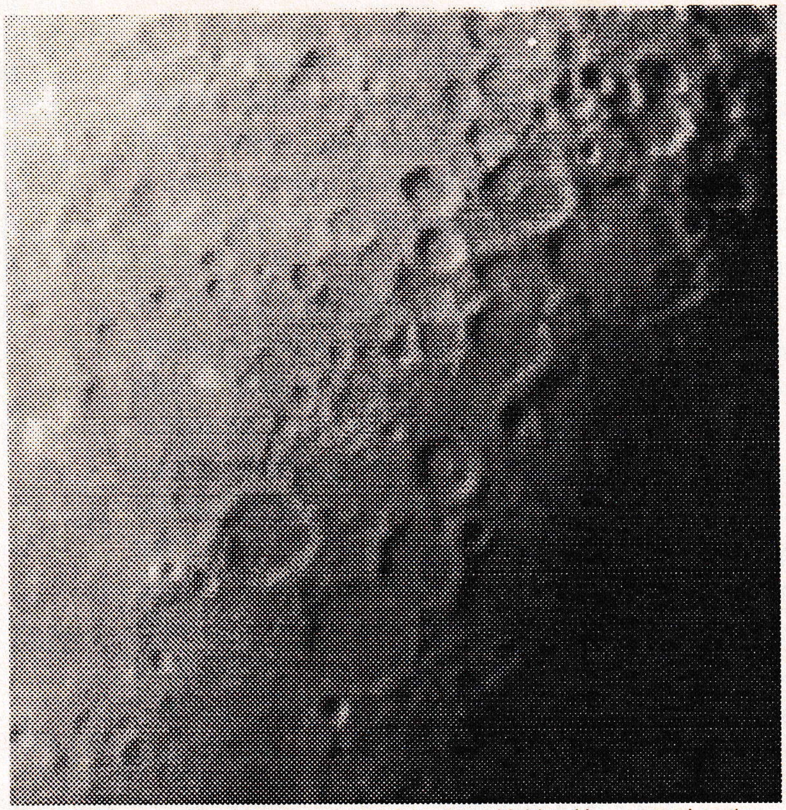
* New number

Peach Mountain Keyholder:
Fred Schebor 426-2363

Monthly Meeting:

The Politics of Science by Tony England

At the
Detroit Observatory in
Ann Arbor



This CCD image of the Moon's createred southern highland is centered on the walled plain Hell. This image was taken by Richard Berry with a Meade 2045, a 100 mm f/10 SCT and a Lynxx camera with a .01 sec exposure. ASTRO IP was used with exponental scaling to try and bring out detail in the darker parts.

University Lowbrow Astronomers
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