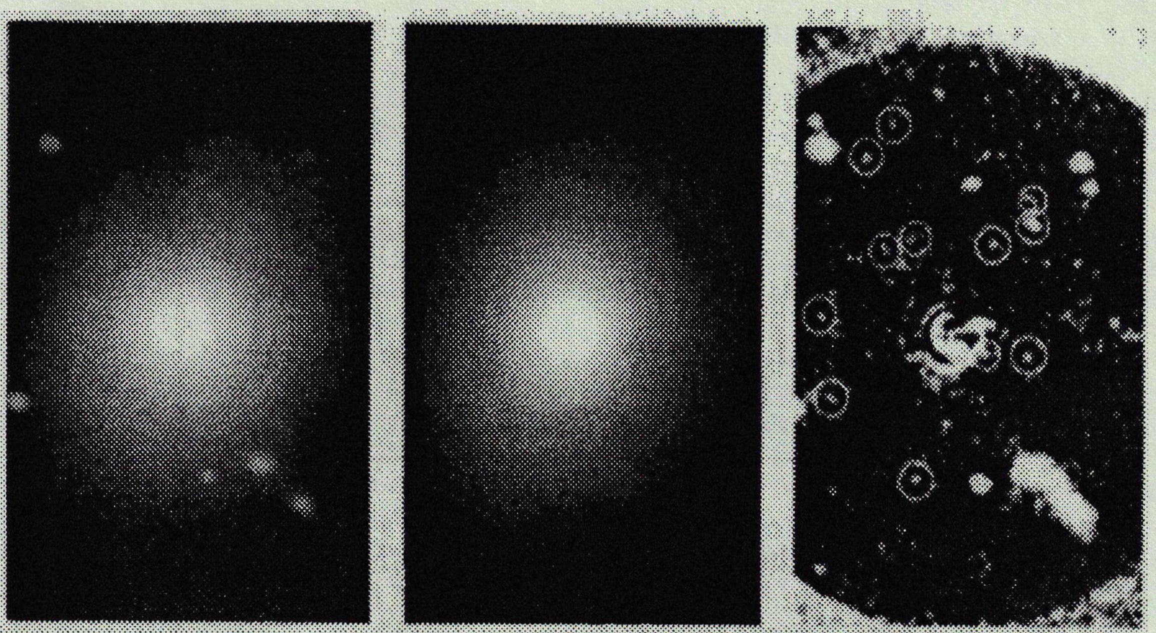
REFLECTIONS



REFLECTIONS

April , 1992

On the left Christian Buil has taken an image of M87 with a 20 minute CCD exposure and a 280 mm telescope. The center image is the brightness model of the galaxy. The right image is the subtraction of the middle from the left showing the globular clusters around M87 and the jet from the core.

R. Tanner, ed.

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:

April 17 - Meeting, at the **Detroit Observatory in Ann Arbor. Elections!** There will be a discussion of the duties for the various offices and then nominations and voting. This is everyone's chance to help out the club and put your ideas to work.

April 25 to May 7 - Texas Star Party held at the Prude Ranch near Fort Davis in south west Texas. Premier star party for dark sky observing and photography.

Next Month:

May 1 - Computer Subgroup Meeting at **Tom Ryan's** house, 7:30 PM, (a Friday). The computer subgroup will discuss the plans for the addition of setting circles to the 24" in light of the recently donated IBM clone computer. For more details, see the computer subgroup reports.

May 2 - Public Open House at the **Peach Mountain Observatory.** This is the start of the public open houses for the 92 season. The open houses are held on the two Saturdays nearest to the new moon. The club members are requested to bring their scopes. It is usually a lot of fun to show the public the objects they never thought could be seen with a amateur scope, or any telescope.

May 9 - Public Open House at the **Peach Mountain Observatory and Astronomy Day.** The second open house will be on Astronomy Day and this will probably mean a a big crowd if it is clear. All club members should bring scopes or just themselves to help out.

May 15 - Meeting, at the **Detroit Observatory in Ann Arbor.** Dr. Kenneth Gibbs of the Enrico Fermi Institute in University of Chicago will talk on the Chicago Air Shower Array (CASA). The CASA detects cosmic ray interactions with the atmosphere.

Astronomy Day is May 9th

Since Astronomy Day happens to fall on the second Open House in May, the Lowbrows should take advantage of this and make the Open House a memorable experience. One idea would be to make up a one page handout with a star chart like the newsletter and some interesting information on the back about some of the objects they would see. Also some information about the Lowbrows could be included to interest new members. After I invited some friends to come out and observe with me, they were always calling me up to remember the name of the galaxy or nebula they looked at and how far away it was. I eventually made up an information sheet, which one person called a 'bragging sheet'. This kind of thing could get Astronomy and the Lowbrows a lot of free publicity. This could even be done for all of the Open Houses.

A 2m-Space Theory

by Alan C. Wilde

1. World-lines. The paths of particles through space-time are sometimes called world-lines. As an example, suppose an observer on the sun watches the earth move in its almost circular orbit about the sun. Suppose the observer takes the two space dimensions of the plane of the orbit and uses the z-axis as a time axis, and plots in this three-dimensional space-time the position and time of the earth. Then the world-line of the earth is a spiral.

A straight world-line in space-time is that of a particle moving with a constant velocity in a straight line in space.

It is customary to label the speed of light as c; and the set of world-lines of light-rays through a point in space-time is called the light cone. Most physicists believe for several reasons that no particle can move faster than light, based on Einstein's theory of relativity.

Many science fiction writers predict that some ideas in relativity are wrong, and that faster-than-light (FTL) travel is possible. They come up with FTL theories like hyper-space, space-time distortion, n-space, hyper atomic jumps, Cherenkov drive, and tachyon theory. This article presents a theory (leaving out the formulas) of 2m-space (or 2m-dimensional space-time, m odd) similar to that of Heinlein's Methuselah's Children and Time Enough for Love. This theory has the 4-dimensional space-time of special relativity embedded in a multi-dimensional space-time.

2. Dimensions affected by motion. The Fitzgerald contraction is the phenomenon that moving bodies contract in the direction of motion, becoming flat at the velocity of light. Time dilation is the phenomenon of clocks in motion slowing down to rate zero at the velocity of light. Thus two dimensions in space-time are affected by motion: the space dimension in the direction of motion (through space) and time.

In 2m-dimensional space-time, or 2m-space for short, there are m space dimensions and m time dimensions affected by motion, including the two dimensions affected by motion, in our space-time. We define speed as the speed of a particle (in 2m-space) parallel to our space-time. If the particle's world-line in 2m-space is straight, its speed is constant.

Time as measured by a particle along its world-line will be called proper time, particle time or ship time depending on context (or whether it is a particle or rocket ship).

3. "Going into hyperspace." Most science fiction predicts that a ship speed up to just under c, and then jumps FTL into n-space or hyperspace. The fact is that at any instant before the jump, there is an observer in space-time seeing that the ship is at rest; and the velocity of light is constant c in all directions. Thus in my theory, ships accelerate from rest directly into 2m-space, even with respect to the earth.

4. Uniform acceleration. One gravity acceleration is defined to be 980.665 centimeters per second squared. But one year is 31,556,925.9747 seconds and c is 299,792.458 kilometers per second. So one gravity is 1.03227 light-years per year squared.

In Newton's theory, uniform acceleration is a parabola in space-time. Thus at one gravity a ship can attain c in 0.97 years. In Einstein's theory, however, uniform acceleration is hyperbola in space-time, asymptotic to the light cone. The accelerating ship thus approaches the velocity of light as limit in infinite earth time and ship time. By time dilation, the ship's clock slows down more and more as its speed increases.

Uniform acceleration in 2m-space is defined in such a way as to make calculations of ship time easy. Also, an observer moving along a path of uniform acceleration sees no change in the shape of the path as it moves. The ship clock slows down or speeds up as its direction in 2m-space changes.

By accelerating in 2m-space, a ship's speed can increase continuously from rest to FTL speeds. In special relativity, if one observer sees that two events A and B are simultaneous, then other observers in our space-time say that A occurs before B, and still others say that A occurs after B. Similarly, an FTL ship in 2m-space is moving at infinite speed relative to some observers; and others say it is moving backwards in time.

What happens to a ship in acceleration in 2m-space depends on certain parameters. In some parameters, the ship accelerates from rest to a maximum speed; since it slows down on further acceleration, it should go straight near maximum speed to go far fast. By computer, we see that a ship should go from rest to near maximum speed, go straight, decelerate to rest in a parallel space-time, accelerate, go straight, and decelerate to rest back in our space-time. Since our space-time is infinitely thin in other dimensions, timing is important for getting back. A computer was used to find a world-line of this type to the Andromeda galaxy (2,000,000 light-years away) in an earth time and a ship time both equal to about 9.62 days. The time rate on the ship is slower than earth sometimes and faster other times; but the total ship time and total earth time are about equal for this world-line.

5. Masses and momenta. Corresponding to the m distance and m time dimensions, a particle in 2m-space has m masses and m momenta. If it moves only in our space-time, m-1 of the masses and m-1 of the momenta equal zero. As the particle accelerates to light speed, the non zero mass and momentum both approach infinity. But if the particle moves in 2m-space, the other m-1 masses and m-1 momenta will be non zero. Also, the particle can accelerate from rest to FTL speeds with all m masses and m momenta remaining finite.

If the masses and momenta of a particle are constant for one observer in 2m-space, then they are constant for all observers of the inertial frame of 2m-space.

Note that in 2m-space, a light-ray moves along a path such that each space dimension equals c times a corresponding time dimension, obeying the Michelson-Morley experiment. Also, 2m space dimensions not affected by motion are needed to generalize the equations of electro-magnetism.

6. Going backward in time. Note that the parameters of acceleration in 2m-space can be chosen so that a ship can go backward in time while moving in other dimensions, just like in Time Enough for Love. As in the book, a ship can accelerate while traveling several light-years, going back several years and aging just a few days. By computer, I found a world-line for m=3 when the ship time is 0.0833333 years, the earth time is -1,455,380.0 years, and earth distance is -1,455,380.0 light years.

It is also possible to go forward in time. The computer found a world-line for m=3 in which the ship time is 1.66666 years, the earth time is 1.62471 X 10^{15} years, and earth distance is 1.62471 X 10^{15} light years.

7. Conclusion. The 2m-space theory outlined here without formulas is consistent with Einstein's special theory of relativity. The mathematics of the latter is contained in the former. Gone is the notion that Einstein must be wrong somewhere. Time is not absolute, and simultaneity is not the rule as it is in James Blish's cities-in-flight novels. It is possible for Lazarus Long to travel 2,000 years back in time while traveling a large distance in the galaxy and aging only a few weeks.

The formulas in the 2m-space theory get so complicated that computers are necessary. Steve Andre helped me with some of the programming and running the programs on computer.

Unlike string theory, 2m-space theory allows motion further than 10 $^{-33}$ centimeters into 2m-space. Though it seems mathematically possible, no one has figured how to physically accelerate from our space-time into 2m-space.

Subgroup Reports

Computers in Astronomy Subgroup

The fourteenth meeting of the computers in astronomy subgroup was held at Roger Tanner's house with a turnout of 5 members. The meeting started with a demonstration of the Voyager program for the Macintosh by Ryad Matti of the Warren Astronomical Society. Ryad brought over his Mac II Si and color monitor which gave a very impressive display of the program even if only in black and white. Voyager was demonstrated at the Eastern Michigan club's Freezout and caused several members to express an interest in seeing this program up close.

Voyager, The Interactive Desktop Planetarium

Voyager is a general purpose astronomy program which will do an amazing variety of things most of which Ryad demonstrated. In fact this program can do some things that no other astronomy program can!

First Ryad started out by showing how you set your position on the planet so the program can draw the sky accurately. You can type in coordinates, choose a city from a list, or, it will draw a picture of the globe with continents and you can click on your position. If you want more detail there is an 8 X zoom mode to expand a particular area on the globe and then the program will show cities on the globe, very neat.

Next he showed the various sky views, it had all the usual ones, overhead, horizon, all sky and various zooms. You could also scroll around the sky using the scroll bars at the edge of the sky map. The program has a series of icons at the left of the screen to show your current position, time and which of the various features were turned on. Several of the features could be turned on or off by clicking on the icons. In addition you can draw your horizon profile and the program will plot the horizon in the maps accurately! This would be very handy for determining when an object will be visible.

The sky maps use different symbols for the various non-stellar objects, but, the program also uses different sizes symbols to give you some idea of the size of the object. After moving to an object on the sky , the program blinks the object so you can see it. Clicking on any object on the screen will bring up a list of information on the object including type of object, magnitude, position, alternate names, distance, altitude, azimuth, angular size, and many others.

The program can show the planets as objects with symbols or you can show them as actual discs with moons. In addition to the usual star catalog of 14,000 stars, and several thousand deep sky objects, the program has a selection of minor planets, variable and binary stars.

Another feature Ryad demonstrated is moving the point of view to a point in space up to 100 A. U. from the earth. Ryad moved to a point 50 A. U. out and looked back at the solar system. Then we moved to Mars and looked back at the earth. Then Ryad zoomed in to show the Earth with the moon. After setting the date, the phase of the moon was shown accurately as just a few days from new moon. Clicking on the Earth gave the information about the Earth, its angular size was 8.7 arc seconds as viewed from Mars.

Since the program can also plot comet orbits, we input the orbital parameters for a comet from a magazine article. After plotting it on a sky map, it compared very well to the map in the magazine.

The program has a orrery view to allow you to visualize the position of the planets as seen from the northern pole of the Sun. There is an option to view or print a table of the planet positions, size, and, magnitudes. The program will also plot the planet size and magnitudes over a selectable time period which gives you a good idea of the visibility of features and when the best time to observe them occurs.

The program has very powerful search features for conjunctions. You can select any number of planets, the Sun, the Moon, and even the shadow of the Earth for the conjunction search. You can select how close the conjunction must be and the time period over which to conduct the search. Ryad clicked on two planets and the Moon and set a period of 3 years and a circle of 3 degrees, the program found three conjunctions in about one minute. Selecting the shadow of the Earth and the Moon allows you to find Lunar eclipses, which is very clever. The program can also plot the positions of the planets over a period of time showing the movement of the planets in the sky. The plotting can be speeded up and set whether or not to leave trails. All of the displays can be dumped to the printer as a screen dump.

Ryad then showed a 3-D plot of the stars in the sun's neighborhood which was very interesting. The view could be rotated in each of the axes to view the star relationships from any angle. Another interesting view was to the all sky plot. This view shows the entire sky form + to - 90 degrees and 0 to 24 hours. It was interesting to display only just the globular clusters. The concentration of clusters around Sagittarius showed where the center of the galaxy was very graphically. Turning on just the galaxies showed the lack of galaxies in the plane of the Milky Way because of obscuration by the dust and gas in the plane of the disk.

<u>ST-4 Demo software</u>

Ryad then showed the version of the ST-4 CCD camera software available for the Mac. It was very much better than the PC version. The image display could be shown with the histogram and the other image data still on the screen and accessible. The brightness and contrast could be set via sliders with is much more interactive than the PC version. The software also used the full 256 colors available on the Mac II Si while the PC version restricts itself to the 16 color mode of the VGA display regardless of the display adapter's capability. The program uses dithering to get the additional colors, giving an inferior image.

We have a computer !

Steve Musko announced that he has an IBM XT clone donated to the club for the telescope project. The computer was donated by Steven Rowe at the U of M Space Physics Research Lab. The computer has 256K of ram, a floppy drive, and a monochrome monitor. This prompted some quick discussion on how best to utilize it. Steve also has a schematic for a cheap card which could be set up to read the quadrature output of the shaft encoders and count pulses for the PC. This makes the position readout project very simple.

The ensuing discussion centered on using the PC as the digital position readout and to add features to the software to perform the other features discussed for the computer such as eventually controlling the scope. This has the advantage that the computer can be installed just as a intelligent readout. Later, the software could be enhanced to have a small database of objects and to direct the user to move the scope to the object in kind of a Astromaster mode. Later still, the interface to the motor controller could be added and the computer control the scope. The computer has empty bus slots for the drive controller interface cards. In addition, the whole project could be done in Basic, which would make maintenance and upgrades very easy. And if the motherboard or any part of the computer dies, replacement parts are $30 to $60.

The discussion moved on to housing the PC. The thought was to build a box for the computer and screen which has a heater (maybe just a light bulb) to keep it warm and prevent condensation. The box would need a fan to keep it cool in the summer. A filter would keep the bugs out of the drive. The keyboard would be in the box and only taken out to program the system. The main interaction with the computer would be through a row of maybe eight buttons below the screen. This would allow the user to set the RA and DEC when the object was pointed at a known star. The labels for the keys could be text displayed on the bottom of the screen which would allow the program to change key functions, and to add features easily. The display could have the RA and DEC displayed in big characters on the screen which could be read across the room. Selection of the calibration star would be done by stepping through a list of 30 or so bright stars.

Enthusiasm was very high and Steve mentioned he even had an offer of programming help from Steven Rowe who thought it would be an interesting exercise!

Next Meeting

The next meeting will be at Tom Ryan's house on may 1 at 7:30 which is a Friday. If you need directions to Tom's house in Ann Arbor, call him at 662-4188. The topic will be the donated computer and the details of the digital setting circle implementation. All interested people are invited to attend and input their ideas. As always, anyone is welcome to bring any interesting software out to demonstrate, just make arrangements with Tom and bring it over.

This table lists information for selected objects on the sky map. The dashes show when the object is above the horizon for the hours of darkness, and the equal signs show when the object is twenty degrees above the horizon. The table also lists the other information given in the NGC catalog, such as, the magnitude, the size, position angle, and other names for the object. In addition, the cryptic shorthand description of the visual appearance in the NGC/IC is given. After the dashes visibility plot, the object is noted if it is in the Messier or Herschel 400 list. Doug Nelle put this table together.

```
 NGC 6543        Planetary Nebula      17hr 58m35s  66 dgr38' 3"  DRA
 H IV 37         MAG: 8.3   0'22" X  0'16"  PA (dgr):n/a  CLASS:3a(2)
vB,pS,sbMvSN
Cat's Eye Nebula,PK96+29.1
     ========-------================================================
     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
[*]"Herschel 400"

 M 3             Globular Cluster      13hr 42m12s  28 dgr23' 3"  CVN
 NGC 5272        MAG: 6.4  16'12" X 16'12"  PA (dgr):n/a  CLASS:6
!!,eB,vL,vsmbM,st 11..
Lord Rosse-sev dark marks within 5' of center
                -------===============================------
     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
[*]Messier

 M 104           Galaxy                12hr 39m53s  -11 dgr36'56"  VIR
 NGC 4594        MAG: 9.3   9'54" X  4' 6"  PA (dgr):n/a  CLASS:Sa
!vB,vL,eE92,vsmbMN
H I 43,dark equatorial lane,Sombrero Galaxy
                 -------======================
     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
[*]Messier       [*]"Herschel 400"

 NGC 2264        Cluster w/Nebulosity   6hr 41m 6s   9 dgr52'57"  MON
 H V 27=H VIII 5  MAG: 3.9  20' 0" X 20' 0"  PA (dgr):n/a  CLASS:IV 3 p n
# of stars: 40    brightest star: 5.00
eL neb,3 deg diam,densest 12' sp 15 MON
Near Cone nebula (60'X30'),20 * mags 6...10 w neby
     ===========================------                         -------=
     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
[*]"Herschel 400"

 M 68            Globular Cluster      12hr 39m29s  -26 dgr44'59"  HYA
 NGC 4590        MAG: 8.2  12' 0" X 12' 0"  PA (dgr):n/a  CLASS:10
L,eRi,vC,iR,rrr,st 13...
                        ---------===----------
     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
[*]Messier

 M 67            Open Cluster           8hr 50m24s  11 dgr48'58"  CNC
 NGC 2682        MAG: 6.9  30' 0" X 30' 0"  PA (dgr):n/a  CLASS:II 2 m
# of stars: 200  brightest star: 9.69
! Cl,vB,vL,eRi,lC,*10...15
500 memb to 16 mag,Mallas-dark spot near center
     ------===========================------                        --
     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
[*]Messier

 M 108           Galaxy                11hr 11m30s  55 dgr40' 0"  UMA
 NGC 3556        MAG:10.7   9'48" X  2'12"  PA (dgr): 80  CLASS:Sc
cB,vL,vmE 79,pBM
PA 80,H V 46,M 97 is 48' SE,nearly edge-on
     ---===========================================-------------
     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
[*]Messier       [*]"Herschel 400"

 M 97            Planetary Nebula      11hr 14m48s  55 dgr 0'57"  UMA
 NGC 3587        MAG:11.0   3'22" X  3'16"  PA (dgr):n/a  CLASS:3a
!! vB,vL,R,vvg,vsbM
Owl Nebula,PK148+57.1
     ----==========================================------------------
     :  :  :  :  :  :  :  :  :  :  :  :  :  :  :  :  :  :  :  :  :  :  :  :  :
     [*]Messier

 M 61            Galaxy                12hr 21m60s   4 dgr28'57"  VIR
 NGC 4303        MAG:10.9   7'36" X  6'24"  PA (dgr):n/a  CLASS:Sc
vB,vL,vsbM*,biN
SN 1926,1961,1964,NGC 4301 @ 10.0',H I 139,L face-on spiral
                 -------=========================------
     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
[*]Messier       [*]"Herschel 400"

 M 85            Galaxy                12hr 25m31s  18 dgr11'58"  COM
 NGC 4382        MAG:10.2   7'24" X  6'30"  PA (dgr):n/a  CLASS:
vB,pL,R,bM,* np
SN 1960r,P w NGC 4394 @ 7.8' foll
               -------================================------
     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
[*]Messier

 NGC 2527        Open Cluster           8hr  5m18s  -28 dgr10' 1"  PUP
 H VIII 30       MAG: 6.5  22' 0" X 22' 0"  PA (dgr):n/a  CLASS:III 1 p
# of stars: 40   brightest star: 8.59
Cl,vL,pRi,lC,*10..15
          -------------------------
     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
[*]"Herschel 400"

 M 1             Planetary Nebula       5hr 34m31s  22 dgr 1' 2"  TAU
 NGC 1952        MAG: 8.4   6' 0" X  4' 0"  PA (dgr):n/a  CLASS:E
vB,vL,E135,vglbM,r
Crab Nebula,Rosse saw filaments,cent pulsar 16 mag,3C144
     ===========================------                         ------=======
     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
[*]Messier
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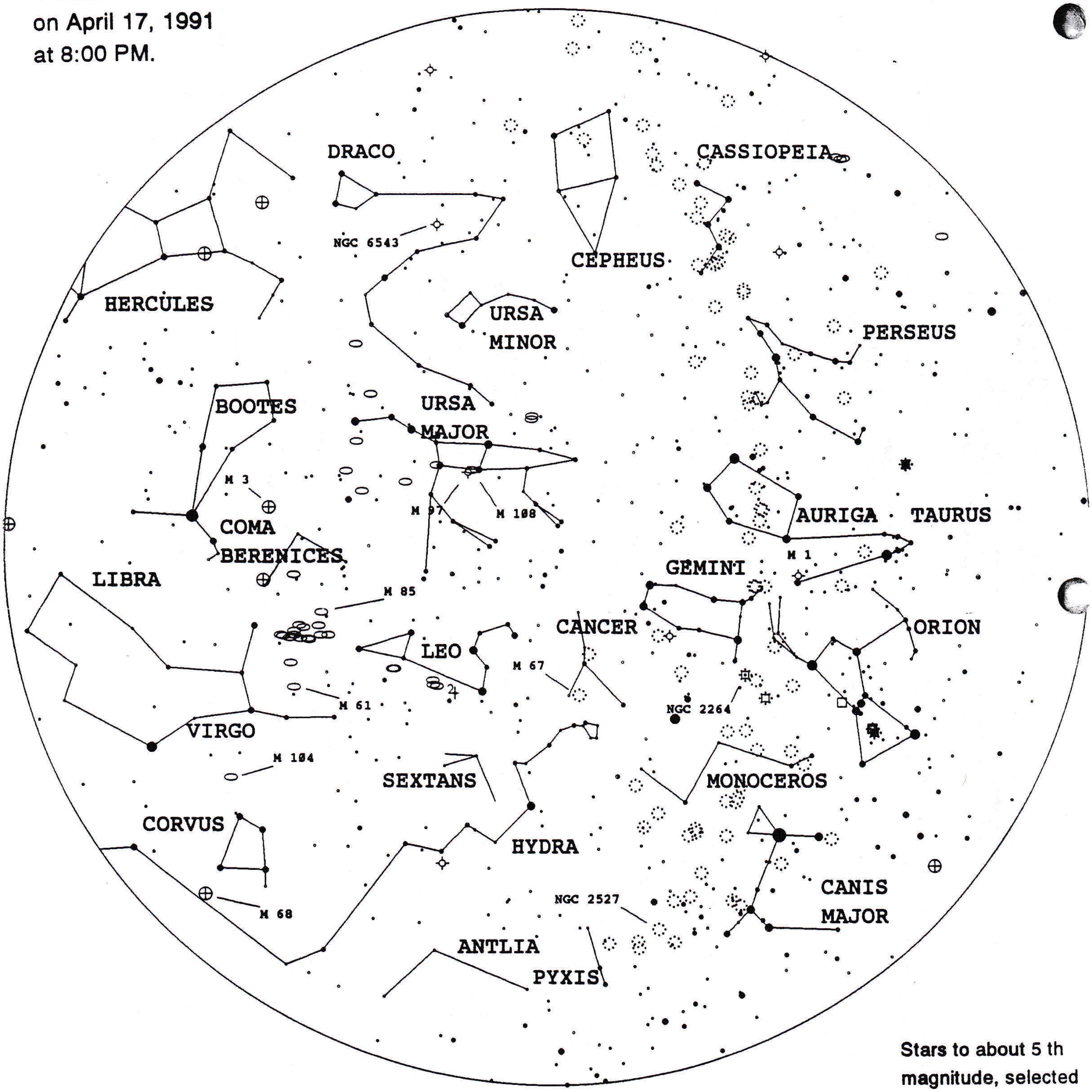
Sky Map

Peach Mountain
on April 17, 1991
at 8:00 PM.

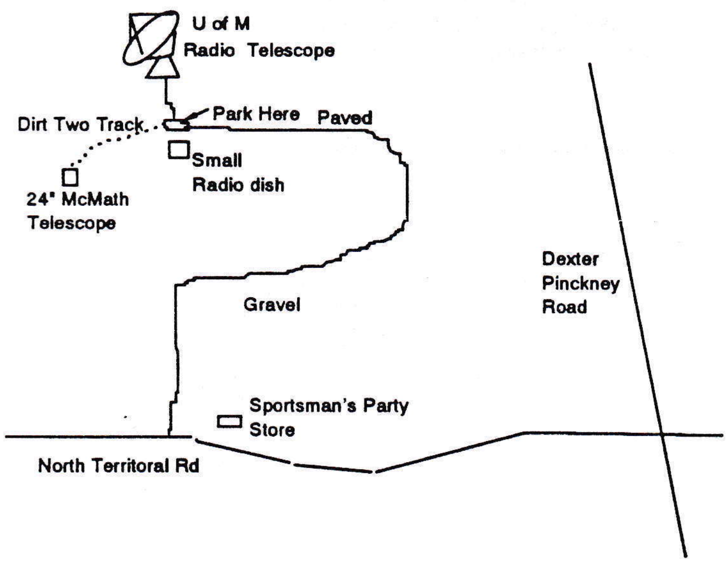


Stars to about 5 th magnitude, selected objects to about 9 th magnitude.

☞ 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:

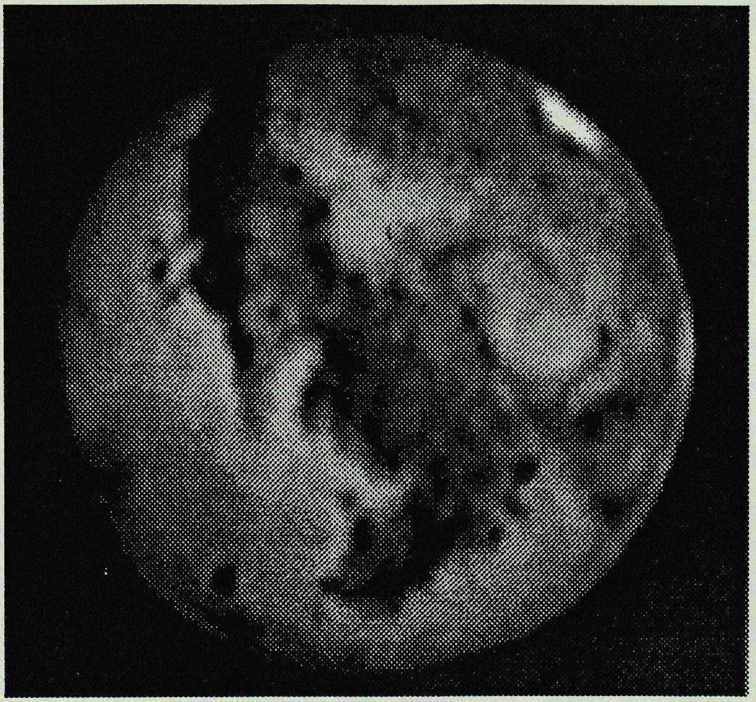
President: Fred Schebor 426-2363
VicePres: Stuart Cohen 665-0131
Doug Nelle 996-8784
Paul Etzler 426-2244
Treasurer: Richard Sider 663-3968
Observatory: D.C. Moons 254-9439
Newsletter: Roger Tanner 981-0134
Membership: Ron Avers 426-0375

Peach Mountain Keyholder:
Fred Schebor 426-2363

Monthly Meeting:

Elections

At the
Detroit Observatory in
Ann Arbor



This is an image of Mars taken at the 1988 opposition by Christian Buil with his home made CCD camera and the one meter telescope at Pic du Midi.

University Lowbrow Astronomers
9287 Chestnut Circle
Dexter, MI 48130