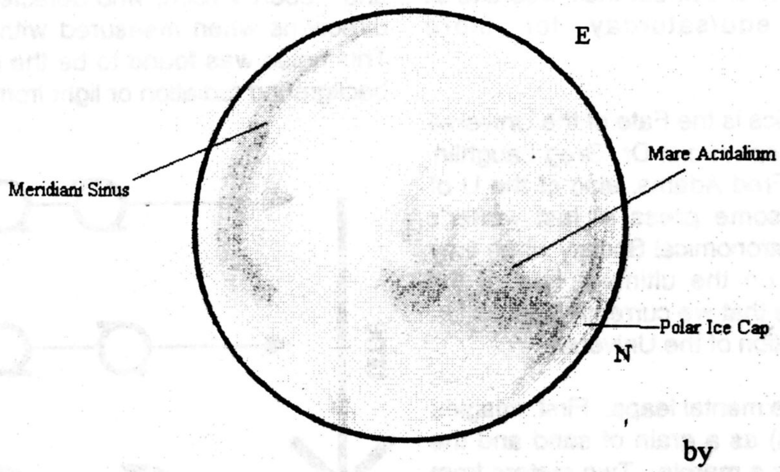
REFLECTIONS

of the University Lowbrow Astronomers

November 1997



MARS

by
Mark Deprest

The University Lowbrow Astronomers

is a club of 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 also held twice a month, weather permitting, at the University's Peach Mountain Observatory on North Territorial Road (1.1 miles west of Dexter-Pinkney Road; see inside for directions) on Saturday evenings before and after the new moon. The event may be cancelled if it is cloudy or very cold at sunset. For further information, call (313) 480-4514.

This Month

November 1	Open house at Peach Mountain.
November 21	Meeting at 807 Dennison. Dr. James talk about Mars
November 22	Open house at Peach Mountain.
November 23	ATM meeting. Time and location TBA.
November 29	Open house at Peach Mountain.

Next Month and Beyond

December 19	Meeting at 807 Dennison. Speaker TBA.
December 21	ATM meeting. Time and location TBA.
December 27	Open house at Peach Mountain.
January 3	Open house at Peach Mountain.

Saturday Morning's Strange Realities

by Christopher Sarnecki

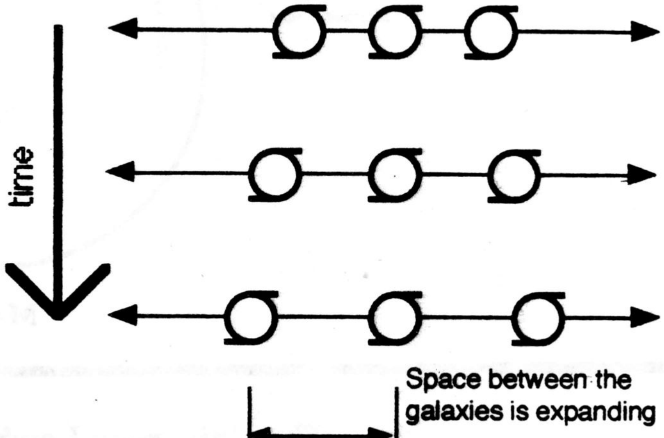
For the third year in a row the University of Michigan's Department of Physics is hosting Saturday Morning Physics at 10:30 am in the Dennison Hall Auditorium. This year's effort is billed as "multimedia presentations for the passionately curious". Well, I don't know about the passion part, but I loovvvee physics! Contact U of M Physics at (313)764-4437 or check out their web site at www.physics.lsa.umich.edu/saturday for more information.

This year's first of three topics is the Fate of the Universe and was presented by astrophysicist Dr. Greg Laughlin. Together with his college Fred Adams, also of the U of M, Dr. Laughlin created some press at last winter's meeting of the American Astronomical Society when they presented their research on the ultimate fate of the cosmos. Using the science that we currently posses Dr. Laughlin explores the evolution of the Universe.

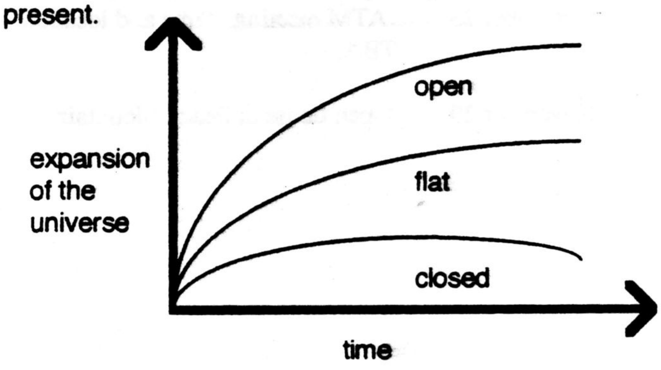
We are asked to make three mental leaps. First, imagine the Earth (dia. 7,500 miles) as a grain of sand and the Sun (dia. 865,000 miles) as a marble. Two meters from the Sun is the Earth in this scale model. Second, then imagine the Sun as a grain of sand centered in Ann Arbor. The nearest grain of sand, I mean star, Alpha Centauri is in Ypsilanti, with the closest bright star Sirius in Dexter. Again, with the Sun as a grain of sand our galaxy, the Milky Way (dia 100,000 light years), would be the size of the Moon's orbit or about 477,700 miles. Ten billion stars make up the Milky Way. The final mental leap would scale the Milky Way at the size of a 6 inch disk and the nearest significant galaxy Andromeda would be about 11 feet away in this scale model. If this 6 inch model of the Milky Way was placed at the center of Ann Arbor the Universe (dia. 15 billion light years) would be the size of the city (dia. 14 miles). The number of galaxies is approximately equal to the number of stars in our galaxy or about 10 billion! We can imagine the Universe is a very big place by making these three mental leaps.

To look at the cosmos is to look into the past. Our Moon is 1 light second away. The image of the Moon we see is 1 second old because it takes the reflected light of the Moon that long to travel through space and reach our eye. The Sun is 8 light minutes away. The Solar System is several light hours across. Alpha Centauri is 4 1/2 years away if you travel at light speed. The Andromeda galaxy is over 2 million light years away. Stephan's Quintet, a five galaxy cluster in Pegasus, is 100 million light years away. The Hubble Deep Field view looks into the past of the universe as it appeared 4 1/2 billion years ago or longer that the Earth has existed!

The Astronomer Edwin Hubble discovered what galaxies are and that they are receding from our position in space. This challenged our preferred notion that we are the center of the Universe. Hubble showed us that there is nothing special about our galaxy or our position in space. The space between the galaxies is getting further apart and the Universe is getting larger with each passing moment. This would imply that at the moment of the Big Bang everything was at the same place and time. The expansion of the universe was confirmed in 1964 by two Bell Lab radio astronomers, Arno Penzias and Robert Wilson, who detected static coming from all directions when measured with a radio horn antenna. This noise was found to be the conformation of cosmic background radiation or light from the Big Bang.



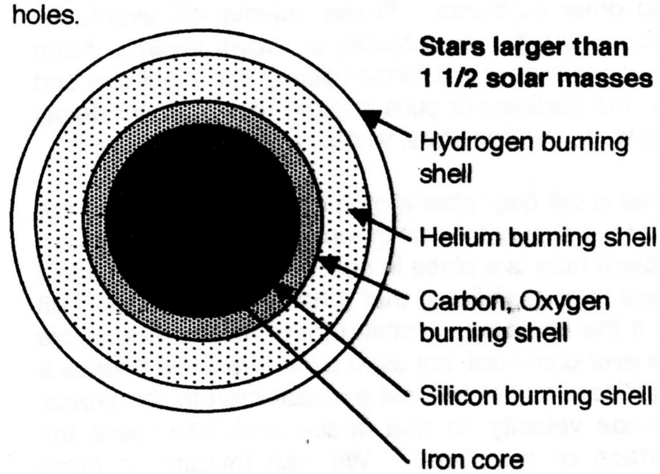
We live in a time of the expansion of the Universe. The expansion of the space between the galaxies is the result of the Big Bang. If we throw a ball up into the air gravity tells us that the ball will come down. The same logic suggest that if galaxies are expanding could there be a time in the future were all the galaxies could be receding. Sufficient gravity or mass is need to pull the galaxies back. Cosmologist call this type of universe "closed". The Universe will close back on itself if there is the necessary mass to pull itself back after an initial period of expansion. If insufficient mass is present the universe it will expand forever. This is called an "open" universe. A "flat" universe has neither enough mass to close back on itself or expand forever. The long term fate of the Universe is determined by how much mass is present.



Dr. Laughlin borrows the method geologist use to divide up past time or eras and uses this tool to divide up future time. Eras are segmented in to cosmological decades defined as Time = 10 to the "n" power. Using a closed universe the speaker presented the fate of this type of universe. "Science tells us what is going to happen" explains Dr. Laughlin. Our time is termed the Stelliferous era, or star-filled era. Written in cosmological decades this is 10 to the 6th to 14th power. This era is a time were stars are born, live, and die; and life is possible. The Degenerate Era is from cosmological decades 10 to the 15th to 37th power. Stars are extinguished. Left behind are white dwarfs, neutron stars, and black holes. At cosmological decade 38th the Black Hole era begins. At cosmological decade 10 to the 100th power the Dark Era begins as black holes have radiated away all matter and the universe consist of electrons, positrons, neutrinos and radiation.

The long term fate of the Earth is determined by the fate of the Sun. Our Sun is currently on main sequence burning hydrogen in its core. This process uses 4 hydrogen atoms and yields 1 helium atom and releases heat in the process (4H = 1He + energy). The fusion process creates pressure that counters the gravitational pressure on the Sun and keeps it from collapsing in on itself. In five billion years from now the Sun will experience difficulty in supporting itself from the force of gravity as the reduced pressure from burning hydrogen diminishes. As the pressure from gravity increases the temperature in the core will increase. This increased core temperature will cause helium to begin fusing. As the Sun's helium core heats up the Sun will get bigger, redder, and hotter. Mercury will be consumed by the Sun. Helium will then fuse to create carbon. The Sun will become a red giant and the Earth's oceans will boil. So much gas will be released from the oceans and surface of the Earth that a run away greenhouse effect will take over our atmosphere. All life on Earth is extinguished. Carbon fuses to oxygen. The Sun's outer hydrogen burning shell expands outward. Venus' orbit decays and spirals into the Sun. The Sun becomes a planetary nebula and blows its outer shells into space. When the Hydrogen and helium envelops are cast out into space the Sun becomes a super dense dying star or white dwarf. A cubic foot of white dwarf matter equals 5760 tons. With the Earth as the Sun's first planet all former signs of life on our planet disappears as the Earth becomes a molten ball of lava. *[intermission; Atwater Pils - en goed damer's bier; Krausen Dunkel - Salieri's favorite; K. Hell - bright, three thumbs up !!!; K. Rost - unmemorable]*

For stars larger than one and a half solar masses the fate will be somewhat stranger. Instead of fusion stopping at carbon and oxygen; the star continues to fuse heavier elements. Like the shells in an onion larger stars burn hydrogen in its outer layer, then helium, carbon, oxygen, silicon, and finally iron. Iron will no longer permit fusion to take place and the center of the star collapses in on itself. In a brief moment the massive amount of in falling matter recoils on its center and creates a super nova. A star with several solar masses is reduced to a neutron star with the size of the City of Ann Arbor. The density of a neutron star is so immense that even electrons are striped from their atoms so that the core of a neutron star is composed of only neutrons. Stars more massive yet end their lives in super novae that may completely annihilate the star or leave behind a black hole. All over the universe stars are born and dying leaving behind white dwarfs, neutron stars, and black holes.



Most of the stars in the Universe are low mass red dwarf stars with masses less than 15% of our Sun. These are the real story of the Universe. These stars will far out live more massive stars because they spend their limited energy more wisely. A red dwarf with 10% the mass of the Sun is only 1/10,000 as luminous. As time moves forward these stars become more important. Red dwarf stars will last ten trillion years.

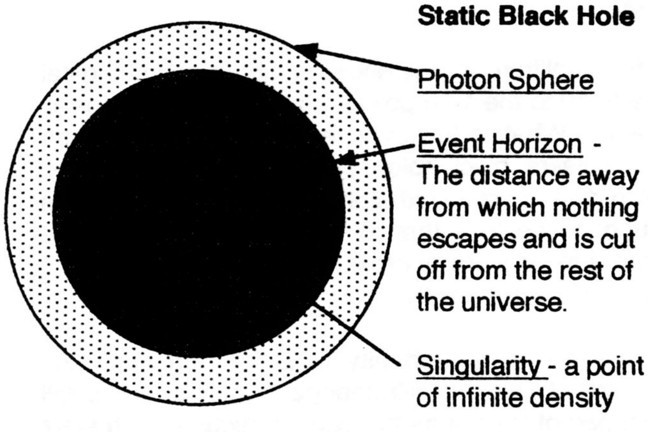
As the Stelliferous era ends, at about cosmological decade 10 to the 14th power, star formation comes to an end. What is left over is white dwarfs, neutron stars, pulsars, black holes, planets and brown dwarfs. Brown dwarfs are failed stars; suns whose masses is thought to be less than 0.08 solar masses. If the planet Jupiter were approximately 10 times bigger it would be a brown dwarf.

If you wait long enough, say 10 to the 19th years, the structure of galaxies will change. Solar systems will be striped of their suns through interactions with stars in their vicinity. Approximately 10% of the stars will be sent to the center of the galaxy. The other 90% will be flung out into intergalactic space. Galaxies will dissipate with only their cores remaining.

What happens to the remaining planets and degenerate stars? Ordinary matter will decay into fundamental particles. More specifically the protons in atoms will decay. The time scale under which proton decay will occur is uncertain; but is thought to occur in 10 to the 35th to 40th years (The Degenerate Era). Physicist using large tanks of pure water have attempted to look for proton decay by observing what amounts to a significantly enormous amount of protons. Eventually proton decay will occur and dramatic changes will occur in the Universe. Looking at a white dwarf as an example we see what dramatic change will occur. A white dwarf consist almost of pure carbon. As proton decay occurs the carbon changes into other elements. These objects will eventually become Jupiter like objects, or brown dwarfs. From there the matter will further decay into electrons and gamma particles or pure energy. All matter will decay this way - neutron stars, white dwarfs, stars, planets.

What is left over after proton decay? Black holes are what is left over in what in termed the Black Hole Era. A black hole is a place in space were the gravitational mass is so significant that it has literally cut itself off from the Universe. Nothing that enters a black hole will ever come out, not even light. We know it takes a significant rocket to blast a space craft to the proper escape velocity so that space craft can leave the surface of the Earth. We can imagine a more significant rocket would be needed to accelerate the same space craft to a much higher velocity to escape a mass of the scale of the Sun. A space craft attempting to escape the surface of a neutron star would have to accelerate to half the speed of light, but the same space craft traveling at light speed will never leave a black hole because there is no escape velocity.

Static Black Hole



While we can not observe a black hole it is possible to observe the space around a black hole to verify its existence. This is what astronomers did when looking at a black hole, named X-1, in the constellation Cygnus. This black hole is thought to have a companion star. The X-1 system is a binary system with the black hole and companion star in orbit around a common center of gravity. The black hole is pulling matter from its companion and this matter rotates about the black hole and forms an accretion disk. X-rays originate from the area just outside the event horizon of the black hole and the presence for the black hole is thought to be confirmed by this process.

Stephen Hawking's claim to fame is his proof that black holes are not really black. In the vacuum of space pairs of virtual particles, consisting of a particle and antiparticle, come into existence by tiny quantum fluctuations in space. Normally the particle and antiparticle annihilate each other in an instant. If a pair of these particles and antiparticles come into existence adjacent to the event horizon and one of the members is pulled in to the black hole, the other member could escape the black hole because of its relativistic speed provided it is still on our side of the event horizon. One particle gets striped away from the virtual pair and gets sucked into the black hole while the other particle radiates away into space. This is called Hawking radiation.

Black holes come in sizes from stellar to galactic. As the mass of a black hole increases so does its size. A black hole with the mass of the Sun would be a few kilometers in size. A black hole with the mass of the Earth would be the size of a golf ball. In falling anti-mater from Hawking radiation evaporates away black holes. A black hole the size of a solar mass will decay in 10 to the 65th years. A galactic black hole will decay in 10 to the 100th years. Over an extensive period of time all the black holes in the universe will evaporate and so ends the Black Hole Era.

The fate of the universe ends in the Dark Era. The universe now consist of a sea of elementary particle - electrons, positrons, neutrinos, and photons. The Universe has become dark. The average distance between each individual particle is as big as our current Universe. Very interesting atoms could form strange chemistry in this environment. The Copernican principle states that the Earth occupies no special place in space. Postulating on a Copernican Time Principle indicates that the current cosmological epoch has no special significance. Dr. Laughlin believes interesting processes will occur in the future despite increasingly lower levels of energy available.

*The third and final presentation will be **Atoms in a New Light**given by Dr. John Yukich on November 22nd, December 6th, and 13th at 10:30 am in Dennison Hall.*

FROM THE DESK OF ROGER TANNER

(Mars Pathfinder Update as of mid October)

by Roger Tanner

I haven't forgotten about writing for the newsletter, I was waiting for the Super Pan to be finished to send the latest high res images with the text. I don't know if you have heard, but we lost contact with the lander on Sep 27. The battery died abruptly and dragged the power bus down to such a low voltage that the computer wouldn't run. The problem is the computer has to run to set the switch to disconnect the battery from the power buss. Kind of a catch 22. JPL had been sending the message to do that repeatedly at Mars local noon where the lander solar panels had the max power output and the computer had the best chance to restart. Monday Oct 7th, they got a LGA link for 20 minutes that didn't transmit any data but it turned off and on at the commanded times which indicated it ran the battery disconnect sequence.

The next step was to reconfigure the lander to run without the battery. This will mean that operation will only occur during the day when there is enough solar power to run the instruments and the computer and the data taken can be down linked to the earth before the sun sets. This is necessary because all the data is stored in dynamic ram. Meanwhile the rover has probably not been able to make contact with the lander and its default program in this case is to make a circle around the lander trying to reestablish contact. So who knows where the rover is?. This would be an autonomous traverse as the rover dudes call it. It would have to find its own way around any obstacles.

They haven't made any more contact and they think problem now is the transmitters and receivers are not operating at the right frequencies because the crystals are getting much colder than planned with out heat from the battery at night. The battery also heated the computer at night and that has been getting down to -80 deg C (-112 deg F) instead of the -55 deg C it has been tested to. Our camera has been tested to -110 deg C and operates ok at this temperature. JPL has been trying wider and wider frequency sweeps on both transmission and recieving without success. The latest odds are only about 10% that we will regain contact.

When the Mars Global Surveyor reaches its final orbit and starts mapping the Pathfinder site, we might see the lander and a circular trench from the rover as it continously cruises around the lander. The Global Surveyor has 1 meter resolution, so the lander should be several pixels across and the backshell and parachute should also show up.

The two stereo images I sent are from the super pan with some resolution enhancement. Unfortunately the xerox copies don't do the images justice. The color image is from the presidental pan which is about 2:1 compressed in the red, blue, 4:1 in green. The super pan is the first pan with the red (670 nm) and blue (440 nm) filters uncompressed and all of the geology filters (11 filters in the visible and near IR) at 2:1 Jpeg compression. ~~This~~ results in a huge amount of data which took most of the downlink bandwidth until the battery failure. The result is more detail in the images and the possibility of a better superresolution result. Superresolution involves taking all of the images of one spot in each filter and processing them such that you get a monochrome image with about 2-3 times the resolution of our images. This will allow more resolution in distant objects like the apparent terracing in the hills.

I will write again, when I hear more.

Clear skies.

Roger

Sarah's Story

by Paul Walkowski

I had a memorable time with my new 10-inch Dob for a week at Long Lake North of Alpena, Mi. I could pick out most of Messier objects naked eye and find them easliy with a telrad. On July 5-7 it was essentially a New moon, the transparency, seeing, and weather conditions were perfect for 2 out of these 3 days. The skies were clear for 5 out of the 6 evenings of my stay. There was a slight cool breeze coming off of the lake and I set up the 10-inch Dob on a point of land that jutted out into the lake for the best Southern horizon. Venus was abrilliant disk in the east. Jupiter quickly rose over the trees on the other side of the lake and reflected brilliantly across the entire surface of the lake. I collected a fair number of curiosity seekers after the camp fire each night, but after a quick glimpse of Mars "that small round red thing?", the moon, "wow looks cold and empty, and I can see craters just like in the books" (a 3-year old exclaimed, "look daddy it has bubbles"), and Jupiter, "Oh, I can see 4 moons and those brown-line things, what are they?" they quickly went back to their cabins leaving myself, Sarah, and her dad Peter alone with the night sky.

Sarah is nine years old now, the hood of her jacket pulled tight to her face to keep out the cold night air, full of wonder and just the right touch of courage. Two weeks before vacation, when she heard that my family and I would be at Long Lake at the same time as her family, she reminded me that I needed to bring "my telescope" again this year.

The story began much earlier. Two years ago I bought a 2.5-inch Tasco refractor from a garage sale for $30 while at Long Lake. I soon tired of the planets and "not finding things" pronounced easilynson) so started coming to Lowbrow Meetings and open houses. I learned frustration with a poor telescope mount. The scope had to be incessantly tapped to bring in Jupiter for a 3 second zip past the optics which made focusing at anything but low power impossible. Easily embarrassed by the department store toy that I wound up with, I brought it to only one open house and brought it out only after all of the "paying customers" went home. But I looked through enough other scopes and talked to enough people to know that the skies contained the same awesome evidence of the might of God's arm that I saw when I first visited the Rocky mountains 20 years ago. Last summer I bought parts for a 10" dob and drew up meticulous blueprints, but vacation came quickly that summer. Not intending to be again disappointed, I borrowed Kurt's 4" SCT and saw Jupiter, Saturn, and a few of the brighter Messiers, and of course I was just learning how to star hop and where to look.

This is when I first met Sarah. To be sure she blessed her parents and siblings prior to this, but she had never seriously entered my conscious mind until then. Her parents were a long time friends, involved with the same church group and private school that I supported. Her dad had spent hours showing her the night sky through binoculars in previous years, and naming some constellations. The 4-inch Mead SCT opened up a whole new world for Sarah. She couldn't see enough of the stars and planets through Kurt's scope and neither could-I. Back then, I just couldn't answer most of the questions that an 8 year old "has to know" either. But I resolved to learn a few more answers for myself and others and be better prepared next year.

The 10 inch dob was finished hurredly in late March, so I could see the fleeting views of Hale-Bobb. The crowds at Peach Mountain and the large star party at Kensington Metropark demanded a steady diet of Hale Bopp. In the excitement to get out and look at the comet I forgot about the rest of the sky and got started star hopping in earnest just as the comet set. Of course Garfinkle's book "star hopping" was a great help, if not encyclopedic, but he just didn't have the same viewing priorities that I did. So much sky--so little time!

This brings us back to Long Lake. This year Sarah had more patience and followed the lead of her dad and I well into the night, missing nothing , and drinking deeply of everything. The questions were more focused --what is a "plabnetary nebula and are there other kinds?" and "how big is the Whirlpool and how far away, and how do you know?" The only complaining was of the predictible good natured variety when bed time drew near. Each night she asked for a favor or two, "just look at Jupiter again, can't we, before I go to sleep", or "let's show mom Alberio, the yellow and blue double is my favorite" and grew a touch bolder in asking and learning to aim the telescope.

On the last night the air was thick with the sense of something good that should go on for ever coming sadly to an end. Sarah captured the sense of urgency and asked to aim the scope at the moon for the campfire people. She startled from the brightness of the first quarter moon and reached for the cardboard stop down aperture without being reminded. Satisfied with her work she took a long drink of the moon while other children, older than her, engage in horseplay in the line now forming. She wanted to know what crater she had centered in the eyepiece at the terminator but my faded photocopy of the moon map is inverted and backwards from the telescope view and we never figured it out. She raced on to Mars, the moons of Jupiter, the cloud bands of Jupiter, I start to bring up the Lagoon Nebula but time is running out and she can't wait for me to clear the heavy dew off the telrad finder, so she gently wrestles the scope from my hands and finds it by instinct. As the evening rushed faster and faster to a close, her dad and I stood back in awe of the little girl turned astronomer before us. We joked nervously about being muscled away from the telescope by Sarah's exuberance to see it all in one night, but didn't want to discourage her in the least. "Oh look, Saturn is up. I want to see the rings again." she chattered without the least hint of sleepiness. One more drink of Alberio, a last look at the Ring Nebula, "What's this bright globular cluster near the point of the teapot of Sagitarius and how come its so much brighter than the one I found at the bottom of the handle? Is that one further away or just fainter?" Sarah was dashing on to the double cluster, and the globular and multiple open clusters at the tail of Aquila, the Galaxy in Andromeda all found on previous nights. The wind gusted more sharply now and her windbreaker rattled in the breeze without her noticing it. The Whirlpool Galaxy, the Spiral galaxy, and M-13 were a reach from the top of the stepladder, but such obstacles were overcome without hesitation. Finally the evening came to an end. Sarah and Peter helped me load the scope into the van. Everything was cold and slippery with dew. Peter and I talked about visiting Peach Mountain, about encouraging Sarah, and someday getting her a telescope of her own. I watched those two walk back to their cabin in silence. Peter looking down, I imagine, sharing my own resignation that vacation was over and wondering where all this would lead, Sarah looking up for one last glimpse of the new friends she had made-- she knew many of them by name. Its an astounding thing to watch a child blossom before your eyes. Maybe vacations force things to happen on compressed schedules. A flicker and a spark turn into a roman candle.

So if on some cool night on Peach Mountain a little wind breakered ,sandy blond haired, nine year girl old asks you the distance to the Double Cluster, and how it was measured; and just say while you are distracted that she steers your telescope for the next few hours; say hello to Sarah. She'll treat your scope with all the gentleness of a newborn baby. And she does really want to know. Pause and remember the excitement of your own "First Light" experience. Then move over--the next generation of astronomers are here to learn from us as much as they can before they fill our shoes

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PUBLIC INFORMATION OFFICE
JET PROPULSION LABORATORY

CASSINI MISSION STATUS

October 29, 1997

The Cassini spacecraft continues its journey through space in excellent health on its way to the planet Saturn while ground controllers perform checks on various flight systems. "The spacecraft is operating beautifully," said Cassini Deputy Program Manager Ronald Draper.

Cassini's three plasma wave antennas have been deployed successfully. In addition, controllers verified that the Langmuir probe deployment during Cassini's launch phase was successful. The probe, which measures electron density and temperature, is part of the radio and plasma wave science instrument that will conduct investigations of Saturn's magnetic environment.

Controllers successfully transitioned from low-gain antenna number one to low-gain antenna number two, increasing signal strength by several decibels. This change between the two low-gain antennas on the spacecraft was planned due to changing geometry requirements caused by the relative movement of Earth and the spacecraft. Several transitions between the two antennas will be accomplished during the mission. Data from the first instrument maintenance sequence that were stored onboard the spacecraft were transmitted to Earth; early indications show good information.

The spacecraft's velocity relative to the Sun is at about 26.5 kilometers per second (about 59,400 miles per hour). Cassini is now more than 4.7 million kilometers (more than 3 million miles) from Earth.

The Cassini spacecraft was launched from Cape Canaveral, FL, at 4:43 a.m. EDT on October 15.

About our speaker and his topic

Philip James (Planetary Astronomy)
Professor and Chair
Ph.D., 1966, University of Wisconsin

Although Mars received intense scrutiny from spacecraft during the 1970s, many significant questions remain unanswered. The questions of primary interest to us concern the seasonal cycles of carbon dioxide, water, and dust on the planet, especially the degree of interannual variability in these cycles. Phenomena which are currently studied include dust storms, the polar caps and hoods, and condensate clouds.

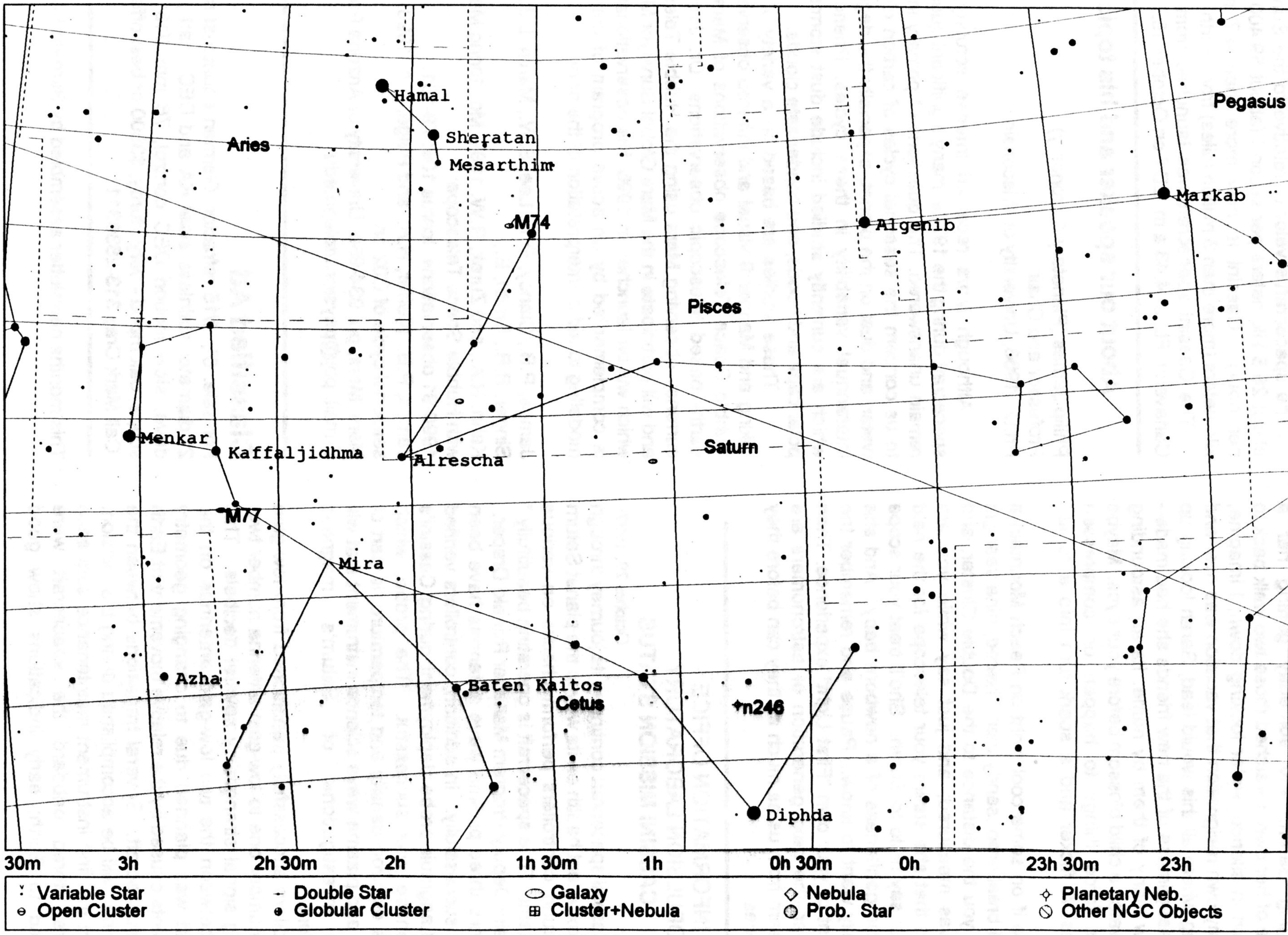
These studies are based on a variety of data: Viking and Mariner 9 visual and infrared observations, Hubble Space Telescope observations of Mars, and earth- based telescopic observations. Dr. James is currently observing Mars using the Hubble Telescope and will participate in the Mars Global Surveyor Mission which will be launched in 1996. His observational work is complemented by an active program of computer modeling to aid in interpretation of the data.

James, P.B., Clancy, R.T., Lee, S.W., Martin, L.J., Singer, R.B., Smith, E.,
Kahn, R.A., and Zurek, R.W. 1994. Monitoring Mars with Hubble Space Telescope:
1990-91 observations. Icarus 109: 79-101.
James, P.B., Kieffer, H.H., and Paige, D.A. 1993. The seasonal cycle of C02 on
Mars. Mars, pp. 934-968. University of Arizona Press.
E-mail: pbj@physics.utoledo.edu

Classified Ad

This months newsletter assembled by Bernard Friberg

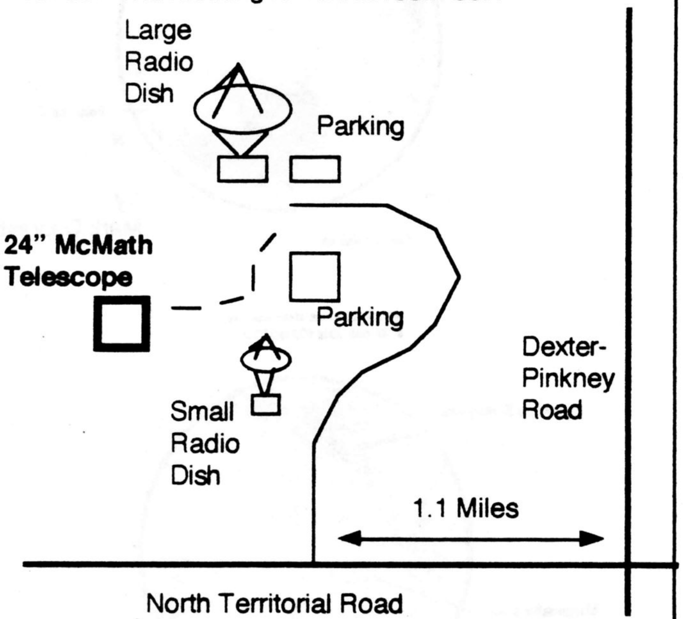
TheSky Astronomy Software © 1984-1994



Center RA: 1h 6m Dec: 3d 59m N Date: 11/22/97 Time: 10:00 PM Width: 100d

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: November 21, 1997 @ 7:30 pm

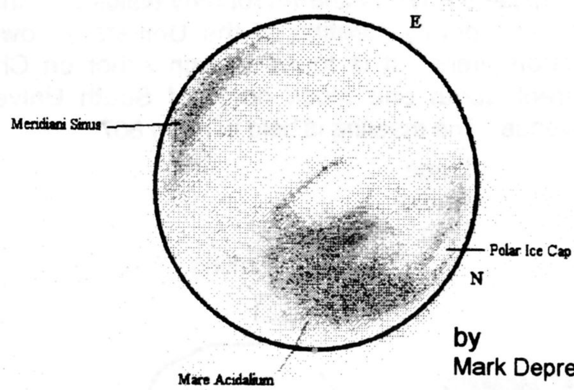
Room 807 Dennison Hall at the University of Michigan

Dr. Philip James will speak on the topic of observing Mars

Mars has been a prime target for the Hubble Space Telescope ever since it began acquiring scientific data. We have observed Mars with the WFPC I and II, with FOS, and with the new STIS and NICMOS instruments. These observations have revealed unexpected aspects of the Martian climate which will be studied during the several Mars Surveyor missions of the next decade. Results to date and future plans for the Mars Global Surveyor spacecraft will be discussed.

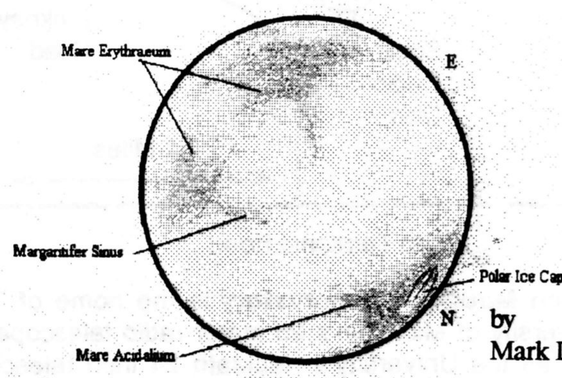
Mars

4/19/97 22:00 est clear excellent
8" f/6 254x & 508x stacked #11 & #82a filters



by
Mark Deprest

4/13/97 22:00 est clear excellent
8" f/6 dob 254x #25 red filter



by
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