

REFLECTIONS

REFRACTIONS

of the University Lowbrow Astronomers

March 2001



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 130 or 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.



A Space Station Meets its Destiny

Photo & Text Credit: STS-98 Crew, NASA

Explanation: The International Space Station (ISS) had a date with Destiny earlier this month. More specifically, the crew of the Space Shuttle Atlantis installed the science laboratory named Destiny on the ISS. Destiny, pictured here, will also serve as a control center for the Earth orbiting space station. To help install this module, space shuttle astronauts conducted the 100th space walk by an American, an event that occurred nearly 40 years after Ed White first ventured outside of his Gemini 4 spacecraft. The space shuttle's crew took the above picture after their spacecraft had undocked from the space station. Over two hundred kilometers below lies the Rio Negro region of Argentina.

This Month:

March 16 - Meeting at 130 Dennison - Long time Lowbrow Jim Abshier presents a talk on Amateur Radio Astronomy, which if you know Jim, it is his corner of this thing we call amateur astronomy.

March 17 - Public Star Party at Peach Mountain Observatory - Jupiter and Saturn are now well into the western sky at dusk. Enjoy 'em while you can.

March 24 - Public Star Party at Peach Mountain Observatory - Night of the new Moon, so it's guaranteed to be dark.

Next Month

April 20 - Meeting at 130 Dennison - CLUB ELECTIONS - Anyone having delusions of holding a position of unlimited power is encouraged to throw your hat in to the ring. Your club needs you!

April 21 - Public Star Party at Peach Mountain Observatory - Perfect observing weather expected with Orion setting and Virgo rising.

April 28 - Public Star Party at Peach Mountain Observatory - Still time to observe those winter constellations.

Constellation of the Month: Cancer: The Crab

By Mark S Deprest

Cancer, the crab seems to have been put into the sky to help fill in the 12 signs of the Zodiac and to sort of tie these 12 signs to the story of the 12 labors of Hercules. The Crab played a bit part in the second labor. Where Hercules is to kill the Hydra, a multi-headed, giant water serpent. The Hydra lived in the marshes Lerna in Greece. Now there are a number of different versions to just how Hercules finally managed to overcome the Hydra, which seem to have a rather unique ability to grow two heads back each time our hero would lop off one. Hercules finally figured out that if he put fire to the wound it would sear and seal it shut, so that new heads could not grow up through the old wound. The Hydra was also renowned to have an extreme case of halitosis (breath that could kill), possibly caused by all that Greek food and the absence of dental floss. While the battle raged, Juno sent a large crab to attach Hercules' flank, possibly the first recorded case of a woman getting one of her friends to pinch the cute guy's butt. Hercules quickly disposed of the crab and cut off one its claws which he then used to kill the last remaining head. Hercules dipped the tips of his arrows into the festering wounds and coated them with the Hydra's deadly juices, so that even the smallest scratch from one of his arrows would result in death.

Transit at Midnight of Alpha Cancer: February 13th

The constellation is situated from 6 degrees North to 33 degrees North declination and is bordered on the East by Leo at 9 hours and 22 minutes Right Ascension, and to the west by Gemini and Canis Minor at 8 hours Right Ascension. Most of the stars that make up Cancer are rather faint to the naked eye. Alpha Cancrī; Acubens is a 4.26 magnitude A3 spectral class star. Beta Cancrī; Altarf is a 3.52 mag. K2 spec. Star. Delta Cancrī; Asellus Australis is a K0 spectral class star that shines at 3.93 magnitude and Gamma Cancrī; Asellus Borealis shines at a meager 4.67 magnitude. Zeta Cancrī; Tegmen is a very nice triple star system where Zeta A is a 4.67 magnitude G0 class star.

Things to Check Out in Cancer:

Multiple Star Systems

Zeta Cancrī; STF1196; ADS 6650

RA (J2000): 08h 12'12.71" declination: +17d 38'53.3"
Included in the Astronomical League's certificate list of 100 double stars. Included in the Saguaro Astronomy Club's list of 110 best multiple stars. Visual binary star. Included in Michael R. Feltz's list of the widest

visual binaries. Orbital elements and diagram available on Richard Dibon-Smith's website: (<http://www.dibonsmith.com>)

Component A: magnitude +5.6 spectral type F8V

Component B: magnitude +5.9 spectral type F9V

Component C: magnitude +6.0 spectral type G5V

Separation AB: 0.8" at position angle 83

Separation AC: 5.9" at position angle 73

Discovered by Mayer in 1756. Thought to be a double star until 1781, when Herschel discovered the third component. The three stars are sometimes said to be yellow, orange and white, although the spectral classes do not really bear this out. Muirden (1988) adds that the unsplit AB appears golden yellow.

Distance: 83 light-years

Projected orbital separation: 15 AU between A and B; 150 AU between AB and C

Luminosity (Sun =1): A 3 B 2.1 C 1.7

Diameter (Sun =1): A 1.5 B 1.3 C 1.4

Iota Cancrī; STF1268; ADS 6988

RA (J2000): 08h 46'41.83" declination: +28d 45'36.0"

Included in the Astronomical League's certificate list of 100 double stars. Included in the Saguaro Astronomy Club's list of 110 best multiple stars. Components show no relative motion. Components display common proper motion. Colorful double star.

Component A: magnitude +4.2 spectral type G8III

Component B: magnitude +6.6 spectral type A3V

Separation AB: 30" at position angle 301

The color contrast is usually described as yellow (or orange) and blue.

Distance: 300 light-years

Projected orbital separation: 2750 AU

Luminosity (Sun =1): A 145 B 16

Diameter (Sun =1): A 20 B 1.6

Phi 2 Cancrī; STF1223; ADS 6815

RA (J2000): 08h 26' 47.08" declination: +26d 56' 07.7"

Included in the Saguaro Astronomy Club's list of 110 best multiple stars. Components display common proper motion.

Component A: magnitude +7.0 spectral type F0III

Component B: magnitude +7.9 spectral type A3V

Separation AB: 5" at position angle 217

First observed by Struve in 1822. Star A may be a variable.

Described by Muirden (1988) as "a fine white pair".

Distance: 250 light-years

Projected orbital separation: 383 AU

Luminosity (Sun =1): A 7.6 B 3.3

Diameter (Sun =1): A 1.8 B 0.8

Deep Sky Objects

M44; NGC 2632; Beehive Cluster; Praesepe (latin) meaning also crib or manger.

Right ascension: 08h40'00.0" Declination: +19d 58' 59"
 Magnitude 3.1 Angular diameter: 95' Distance: 586.8
 light-years. Brightest star is 6.0 mag. Age 660,000,000
 years. Contains over 300 members. Galileo was one
 of the first to study this open cluster with optical aid
 and counted forty stars. Over one hundred of the
 stars in this cluster are much brighter than our own
 sun. In fact if our sun were place in the center of this
 cluster it would be visible only in a telescope at a
 magnitude of 10.9.

M67 -- Credit NASA



M67; NGC 2682; open cluster.

Right ascension: 08h50'24.0" Declination: +11d 48'
 59" Magnitude 6.9 Angular diameter: 29' Distance: 2347
 light-years Brightest star is 9.0 mag. Age 3,900,000,000
 years. Contains 500 members NGC 2682: remarkable
 cluster, very bright, very large, extremely rich in stars,
 little compressed, stars 10th to 15th mag.

NGC 2775; Caldwell 48; spiral galaxy

J2000 RA: 09h10.3' dec.: +07d 02' Magnitude
 11.4 Considerably bright, considerably large,
 round, very suddenly much brighter in middle,
 resolvable. Angular size 5'x 4' with a Position
 Angle of 155d. Face on view makes this a
 rather difficult object. The supernova 1993Z
 was found in this galaxy on Sept. 23, 1993 at
 RA 09h 07.7' declination +07d 14' (epoch
 B1950), magnitude 13.9.

Variable Stars

R Cancri; Mira-type

Right ascension: 08h16' 33.8288" Declination:
 +11 43' 34.450" Period of 361.6 days. Periodic
 variable with a magnitude range from 6.07 to
 11.8. In 2001 it should reach its maximum at the
 beginning of October.



M44 -- Credit NASA



ASTRONOMY and SPACE EVENTS

(All times in EST/EDT)

Submitted by Doug Warshow

Mar 16 - 15:45 Last Quarter.

- AM: Moon has passed ~ 7 deg. E of Mars; Antares 7 deg. to Mars' lower right.

Past Events: 1926 - Robert Goddard launches first successful liquid fuel rocket.

1966 - Gemini 8 launched.

1975 - Mariner 10 performs third Mercury flyby.

Mar 17 - 4:43 Great Red Spot at Jupiter's central meridian.

- 10:00 Mercury at aphelion (0.4667 AU).

- 23:57 Moon at descending node.

- V Monocerotis at maximum.

Venus 20 deg. from setting Sun. Crescent is 1' across and 6% illuminated.

Past Events: 1958 - Vanguard 1 launched.

Mar 18 - 0:34 Great Red Spot at Jupiter's central meridian.

- 2:00 1 Ceres 0.5 deg. south of Moon.

- 4:26 Algol at minimum.

- 17:00 Pluto stationary.

- 20:26 Great Red Spot at Jupiter's central meridian.

Past Events: 1965 - Alexei Leonov makes first space walk (Voskhod 2, first 2-person crew in orbit).

Mar 19 - 6:22 Great Red Spot at Jupiter's central meridian.

Venus 18 deg. upper right of setting Sun.

Past Events: 1970 - First powered flight of X-24A lifting body.

Mar 20 - 2:13 Great Red Spot at Jupiter's central meridian.

- 3:00 Neptune 2 deg. North of Moon.

- 6:00 Moon at apogee (405,474 km).

- 8:31 Vernal Equinox (northern hemisphere).

- 14:14 Double shadow transit on Jupiter.

- 22:05 Great Red Spot at Jupiter's central meridian.

Venus 17 deg. left of rising Sun.

Mar 21 - 1:15 Algol at minimum.

- 9:00 Uranus 3 deg. north of Moon.

R Virginis at maximum.

V Bootis at maximum.

Past Events: 1965 - Ranger 9 launched.

Mar 22 - 3:53 Great Red Spot at Jupiter's central meridian.

- 13:00 Mercury 2 deg. north of Moon.

- 23:44 Great Red Spot at Jupiter's central meridian.

AM: Old Moon rising in ESE, 4 deg. right of Mercury.

Past Events: 1799 - Friedrich Argelander born.

1965 - Gemini 3 launched. (V. I. Grissom becomes first person in space twice.)

1982 - STS-3 Columbia launched.

1995 - Space endurance record of 438 days set aboard Mir space station.

1996 - STS-76 Atlantis launched.

1997 - Comet Hale-Bopp at closest approach to Earth.

Mar 23 - 19:36 Great Red Spot at Jupiter's central meridian.

- 22:04 Algol at minimum.

PM: Venus 13 deg. upper right of setting Sun.

Past Events : 1840 - First photograph of the Moon.

1912 - Werner von Braun born.

1965 - Gemini 3 launched.

Mar 24 - 5:32 Great Red Spot at Jupiter's central meridian.

- 20:21 New Moon.

Past Events: 1893 - Walter Baade born.

1992 - STS-45 Atlantis launched.

Mar 25 - 1:24 Great Red Spot at Jupiter's central meridian.

- 18:20 Young Moon very low in W., 14 deg. left of

Venus.

- 21:15 Great Red Spot at Jupiter's central meridian.

R Corvi at maximum.

Past Events: 1655 - Christiaan Huygens discovers Titan.

1996 - Comet Hyakutake closest approach to Earth.

2000 - IMAGE spacecraft launched.

Mar 26 - 5:35 Venus, just risen, 16 deg. N of E.

- 5:55 Venus 10 deg. upper left of Sun.

- 18:54 Algol at minimum.

Past Events: 1980 - Arianespace formed, first private company to produce and market a major satellite launcher.

Mar 27 - 2:00 4 Vesta in conjunction with Sun.

- 3:03 Great Red Spot at Jupiter's central meridian.

- 17:48 Double shadow transit on Jupiter.

- 19:50 85 Ceti occulted by the Moon.

- 22:54 Great Red Spot at Jupiter's central meridian.

Venus 9 deg. due N. of the Sun.

Past Events: 1969 - Mariner 7 launched. (Mars fly-by).

1972 - Venera 8 launched. (Venus lander.)

1999 - First Sea Launch mission. (PAS-9 satellite.)

Mar 28 - 23:00 Saturn 1.7 deg. north of Moon.

RT Cygni at maximum.

PM: Moon near Saturn and the Pleiades.

Past Events: 1749 - Pierre Laplace born.

1802 - Heinrich Olbers discovers 2 Pallas.

Mar 29 - 4:42 Great Red Spot at Jupiter's central meridian.

- 23:00 Venus in inferior conjunction (8 deg. north of Sun).

PM: Moon near Jupiter, Aldebaran and the Hyades.

Past Events: 1807 - Heinrich Olbers discovers 4 Vesta.

1974 - Mariner 10 first spacecraft to fly by Mercury.

1989 - First commercially-licensed U. S. rocket launched.

Mar 30 - 0:34 Great Red Spot at Jupiter's central meridian.

- ~3:00 Moon occults Hyades (80-minute durations).

- 20:25 Great Red Spot at Jupiter's central meridian.

Last day Venus sets after sunset.

Mar 31 Venus rises 15 deg. N. of E., 40 minutes before sunrise.

Past Events: 1966 - Luna 10 launched. (First lunar artificial satellite.)

1997 - Pioneer 10 mission officially ends.

Apr 1 - 2:00 Daylight Savings Time begins. Set clocks forward 1 hour.

- 3:13 Great Red Spot at Jupiter's central meridian.

- 23:05 Great Red Spot at Jupiter's central meridian.
 - 6:49 First Quarter.
 Past Events: 18,486,749,201 B. C. E. 15:37 - Big Bang occurs.

1960 - TIROS 1 launched. (Meteorology satellite.)
 1997 - Comet Hale-Bopp closest to the Sun.
 1998 - TRACE launched.

Apr 2 - 18:56 Great Red Spot at Jupiter's central meridian.
 Past Events: 1845 - First photograph of the Sun.

Apr 3 - 4:52 Great Red Spot at Jupiter's central meridian.
 - 22:48 Double shadow transit on Jupiter.
 Just Past Sunset: Jupiter nearly "moonless."
 U Ceti at maximum.
 S Pegasi at maximum.
 Past Events: 1966 - Luna 10 becomes first satellite to orbit the Moon.
 1973 - Salyut 2 space station launched.

Apr 4 - 0:44 Great Red Spot at Jupiter's central meridian.
 - 20:35 Great Red Spot at Jupiter's central meridian.
 Past Events: 1968 - Apollo 6 launched. (Last unmanned Apollo flight.)
 1983 - STS-6 Challenger launched.
 1997 - STS-83 Columbia launched.
 2000 - Soyuz TM-30 launched. (First commercial mission to Mir space station.)

Apr 5 - Moon at perigee (364,809 km).
 Past events: 1975 - Soyuz 18-1 experiences first in-flight launch abort.
 1990 - Pegasus launched. (First air-launched satellite.)
 1991 - STS-37 Atlantis launched.

Apr 6 - 2:23 Great Red Spot at Jupiter's central meridian.
 - 17:00 Mercury 10 deg. south of Venus.
 - 22:15 Great Red Spot at Jupiter's central meridian.
 Past Events: 1965 - Early Bird (Intelsat 1) launched. (First geostationary commercial communications satellite.)
 1973 - Pioneer 11 launched.
 1984 - STS-41C Challenger launched.

Apr 7 - 23:22 Full Moon.
 Past Events: 1991 - Compton Gamma Ray Observatory deployed.

Apr 8 - 4:02 Great Red Spot at Jupiter's central meridian.
 - 23:54 Great Red Spot at Jupiter's central meridian.
 RU Sagittarii at maximum.
 Past Events: 1964 - Unmanned Gemini 1 launched.
 1966 - First Orbiting Astronomical Observatory (OAO-1) launched.
 1993 - STS-56 Discovery launched.

Apr 9 - 19:46 Great Red Spot at Jupiter's central meridian.
 - 22:00 2 Pallas stationary.
 Past Events: 1959 - NASA selects original seven Mercury astronauts.
 1994 - STS-59 Endeavor launched.

Apr 10 - 4:00 Algol at minimum.
 - 5:41 Great Red Spot at Jupiter's central meridian.
 T Aquarii at maximum.

Apr 11 - 1:33 Great Red Spot at Jupiter's central meridian.
 - 21:25 Great Red Spot at Jupiter's central meridian.
 Past Events: 1960 - Project Ozma started.

1970 - Apollo 13 launched.
 1984 - Challenger retrieves Solar Max.
 1986 - Halley's Comet closest approach to Earth (62 million kilometers).

Apr 12 - Mars at descending node.
 - 22:00 Mars 1.3 deg. south of Moon.
 Past Events: 1961 - Yuri Gagarin becomes first human in space.
 1981 - STS-1 Columbia launched.
 1985 - STS-51D Discovery launched.

Apr 13 - 0:49 Algol at minimum.
 - 3:12 Great Red Spot at Jupiter's central meridian.
 - 23:04 Great Red Spot at Jupiter's central meridian.

Apr 14 - 18:56 Great Red Spot at Jupiter's central meridian.
 532 Herculina (mag. 9.0) 27' S. of Zeta Bootis
 Past Events: 1629 - Christiaan Huygens born.

Apr 15 - 0:00 1 Ceres 0.9 deg. S. of Moon.
 - 4:52 Great Red Spot at Jupiter's central meridian.
 - 11:31 Last Quarter.
 - 21:38 Algol at minimum.
 29 Amphitrite (mag 9.5) 28' S. of Psi Virginis.
 V Canum Venaticorum at maximum (?)
 Past Events: 1867 - Wilbur Wright born.
 1972 - Apollo 16 launched.
 1999 - Landsat 7 launched.

Apr 16 - 0:43 Great Red Spot at Jupiter's central meridian.
 - 10:00 Jupiter 5 deg. N. of Aldebaran.
 - 12:00 Neptune 3 deg. north of Moon.
 - 20:35 Great Red Spot at Jupiter's central meridian.
 Past Events: 1946 - First captured V2 rocket launched from White Sands, NM.
 1965 - First test firing of Saturn V first stage.

Apr 17 - 2:00 Moon at apogee (404,506 km).
 - 13:00 Venus stationary.
 - 19:00 Uranus 3 deg. north of Moon.
 Past Events: 1967 - Surveyor 3 launched. (Moon lander.)
 1970 - Apollo 13 crew return to Earth.
 1998 - STS-90 Columbia launched.

Apr 18 - 2:23 Great Red Spot at Jupiter's central meridian.
 - 18:27 Algol at minimum.
 - 22:14 Great Red Spot at Jupiter's central meridian.

Apr 19 - Past Events: 1971 - Salyut 1 launched. (First space station.)
 1982 - Salyut 7 launched.

Apr 20 - 4:02 Great Red Spot at Jupiter's central meridian.
 - 16:00 Venus 10 deg. north of Moon.
 - 23:54 Great Red Spot at Jupiter's central meridian.
 Past Events: 1920 - Shapley-Curtis debate on the nature and distance of spiral nebulae.

The End is Mir

by Dr. Tony Phillips (Permission to reprint received)

Space station Mir, the heaviest thing orbiting our planet other than the Moon itself, will return to Earth around March 20th.

March 10, 2001 -- When the space station Mir returns to Earth over the remote South Pacific later this month, it will be big news. And rightly so. The 135-ton Russian outpost is the heaviest thing orbiting our planet other than the Moon itself. During its 15-year stint in space, Mir has set endurance and space-adventure records that are going to be hard to beat.

But among scientists who monitor the near-Earth environment, an encounter with a 135 ton object from space is, well.... all in a day's work.

"Asteroids weighing as much as Mir hit Earth perhaps 10 times each year," says Bill Cooke, a member of the Space Environments team at the Marshall Space Flight Center's Engineering Directorate. "We know this because we observe the flashes of the explosions in the upper atmosphere via Department of Defense satellites."

Just last year a 200-ton asteroid startled Canadians with a sonic boom and a brilliant fireball as it disintegrated above the Yukon territory. Scientists later recovered a smattering of meteorites from nearby Lake Tagish, none larger than a few hundred grams.

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"If a [rocky] asteroid with the same mass as Mir hit the ground it would explode like a few kilotons of TNT, gouging out a crater about the size of a football field," noted Cooke. However, Mir will never make it that close to the ground. As Cooke explained, "the atmosphere is very good protection and it breaks up meteorites and other space objects well before impact."

Indeed, if Mir were an asteroid, it wouldn't merit classification as a potentially hazardous one. In the cosmic scheme of things, Mir is simply too small.

Nevertheless, scientists expect the space station to put on a good show when it returns.

Mir is put together much like an erector set. It's a beautiful but gangly-looking assortment of solar arrays, laboratories and living quarters -- obviously not designed for aerodynamic flight through the atmosphere. The station will quickly fall apart as it descends toward Earth.

"We expect Mir to break into six or more main pieces when it hits the atmosphere," says Nicholas Johnson, chief scientist and program manager for orbital debris studies at NASA's Johnson Space Center. Each piece will resemble a blazing meteor that spits smaller fireballs as the pieces crumble and burn.

Below: These computer simulated images of Mir's descent and breakup appear courtesy of Analytical Graphics, Inc., the mak

ers of Satellite Toolkit.

Cosmonauts assembled Mir piece-by-piece during a busy ten year period beginning in 1986. The station's modules include the voluminous Core, Mir's original 20-ton segment that harbors the crew's living quarters; plus Spektr, a 19-ton science laboratory famous for its 1997 collision with a Progress spacecraft; and the 19-ton Priroda Earth observatory, launched only five years ago.

Five of Mir's modules are still pressurized with air inside for humans. When they explode, sky watchers (mainly sea birds) could witness a once-in-a-lifetime display as incandescent fragments streak across the sky.

"Of Mir's 135 tons, the Russians say about 20 tons might reach the surface -- mostly in small pieces," noted Johnson.

Even now Mir is sinking 1.5 km each day because of atmospheric drag. Left to itself, the station would naturally plunge to Earth from its 250 km orbit no later than March 28th. But that would be an uncontrolled descent. Instead, Mir will be guided to its final resting place by a Progress spacecraft attached to the station.

On March 20th Russian ground controllers plan to fire the Progress's engines when Mir is at apogee -- its greatest distance from Earth. "The engine firing will move perigee [Mir's closest approach to our planet] to a point inside the atmosphere over the south Pacific," explained Johnson. "That's where the station's fragments will land."

"With a controlled deorbit it doesn't matter if 20 tons or the whole 135 tons reaches the surface -- the risk to people or property should be essentially zero," says Johnson. Mir's descent is certainly safer than the many uncontrolled encounters we experience with Mir-weight asteroids each year.

Above: Visit NASA Liftoff's JTrack to find out where Mir is now. The program should give accurate results until the Progress-guided descent of Mir begins on or about March 20th.

No one knows more about dumping spacecraft in the remote Pacific than the Russians. Since 1978 they've deorbited 80 Progress spacecraft and five Salyut space stations in the same area. "Two Progress spacecraft have gone down there already this year," says Johnson. "Mir, which is attached to a Progress, will be the third."

"The most recent space station to descend over the Pacific was Salyut 6," he added. "That weighed 40 tons and came down in July of 1982. The deorbiting technique is exactly the same -- Mir's just a bit bigger."

Below: On January 18, 2000, a 200 ton asteroid -- about the same mass as Mir -- left this smoky trail above Canada's Yukon territory. [more information]

Mir's dazzling finale won't be seen by many people, but perhaps that's just as well. The twenty tons of Mir-bits that scatter

across the Pacific will be traveling 100 to 150 mph when they reach the water -- a bit too fast for comfort!

Fortunately, there's still time to see Mir from the safety of your own back yard. The rapidly-moving space station reflects sunlight and if you're outside at the right moment -- usually near local dusk or dawn -- Mir will appear as bright as a streaking first or second magnitude star. Science@NASA's online satellite tracking utility, JPass written by Patrick Meyer, can tell you when and where to look.

Russia's fabled space station is easy to see, but don't wait -- because the end of Mir ... is near.

SEND THIS STORY TO A FRIEND

Editor's Note: NASA public affairs officer Kirsten Larson says she's been receiving plenty of phone calls asking about NASA's role in bringing Mir down. In fact, NASA is just a bystander. The Russian Aviation and Space Agency, Rosaviakosmos, is in complete control of the reentry procedure. However, noted Nicholas Johnson, the U.S. is providing tracking data to Rosaviakosmos as a courtesy. American radar data added to those of the European Space Agency and the Russians themselves, will help Rosaviakosmos make precision adjustments to Mir's orbit and land it squarely on target.

Web Links

Mir Trajectory Reports -- from the Russian Space Agency's Mir Control Center. (external link)

Orbital Debris -- from NASA's Johnson Space Flight Center, an overview of the many things orbiting Earth.

Mir is so bright that modest amateur telescopes equipped with CCD video cameras can make out the station's components. Astrophotographer Ulrich Beinert captured this image of Mir on March 5, 2001 using a QuickCam video camera and a Meade ETX telescope. [more images]

Mir Space Station over Earth -- 1995 Goddard Space Flight Center Astronomy Picture of the Day

Solar S'Mores -- Science@NASA article. As a result of the solar maximum, Earth's atmosphere is "puffed up" like a marshmallow over a campfire leading to extra drag on Earth-orbiting satellites.

RussianSpaceWeb.com-- Current news about the Russian space program and a history of astronautics in the former Soviet Union. (external link)

Mir's Close Calls-- The Russian Space Web presents a recap of Mir's most perilous situations, a reminder that space exploration is not routine! (external link)

Irreversible Mir deorbit operations under way - official

Source: *ITAR-TASS News Wire*

Publication date: 2001-01-29

Arrival time: 2001-02-05

MOSCOW, January 29 (Itar-Tass) - The ditching of Russia's space station Mir is scheduled for March 6, but the date can be shifted a day or two, deputy mission director Viktor Blagov told Itar-Tass on Monday.

He said the date would depend on data of ballistics experts who are to set an optimal time for Mir deorbit with account for the condition of Earth atmosphere in which most of the station will burn. Its debris will fall in the southern Pacific in a out-of-way area.

"Irreversible ditching operations began on Saturday when a cargo ship with fuel came to the station," Blagov said.

He added that the Mission Control centre would not make additional moves in the coming days,

"The station is flying normally, all equipment has been already checked," Blagov said.

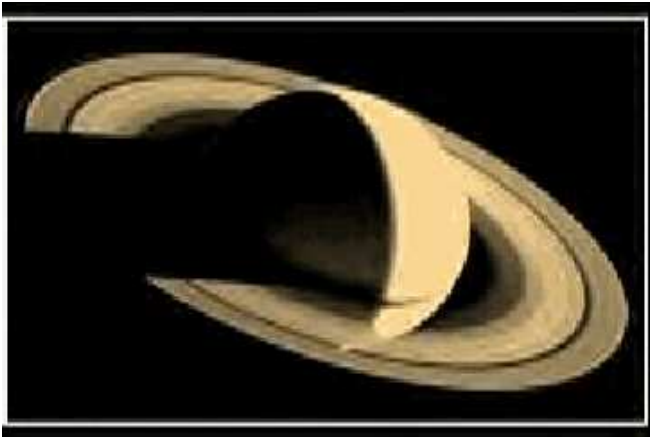
The Progress cargo ship will give Mir two initial pushes to send it into lower orbits, an operation to be carried out in late February and early March. Last momentum will be given to Mir to plunge it down. A cosmonaut crew stands by for a mission to Mir for manual deorbit in case the ditching operations go wrong, but most likely the launch will not be required, Blagov said.



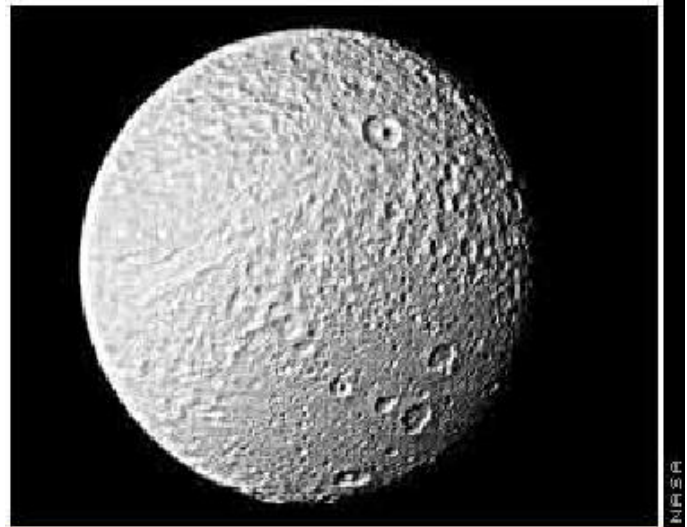
Saturn and Its Rings ----- Triple Vision

Credit: NASA

Three separate frames -- taken through ultraviolet, clear and green filters -- were used to create this image of Saturn's rings. More than 60 bands are visible in this picture, captured by Voyager 2 about 1.7 million miles (2.7 million kilometers) from Saturn.



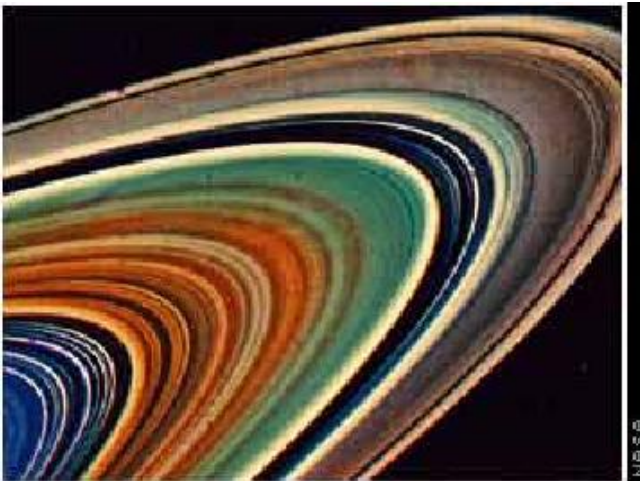
Saturn and Its Rings ---- Night Version Credit NASA
 The Voyager spacecraft captured this picture of Saturn's nightside in November 1980. The giant planet's shadow is cast across its bright rings. Since only the dayside of Saturn is visible from Earth,



Deep Impressions

Credit NASA

This photo, imaged by Voyager 2, highlights a boundary between heavily cratered regions (top right) and more lightly cratered areas (bottom right) on Saturn's satellite Tethys.



This is one of the most heavily cratered regions on the Saturnian moon Rhea. Credit NASA



Aurora Astern

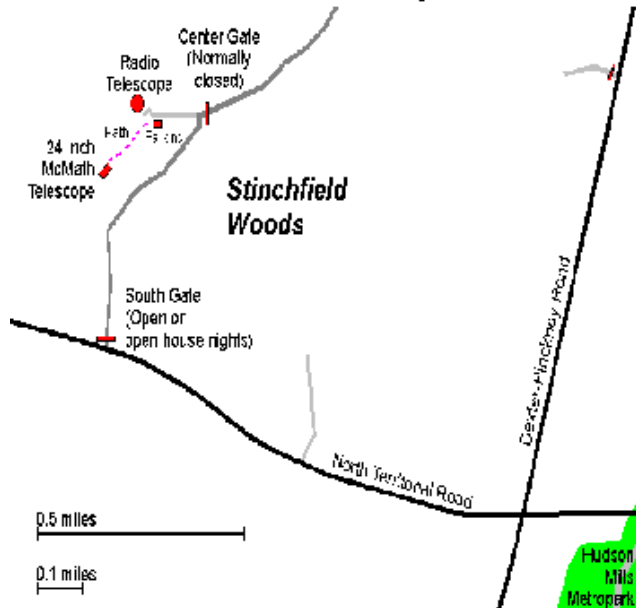
Credit: STS-68 Crew, NASA

Explanation: Sailing upside down, 115 nautical miles above Earth, the crew of the Space Shuttle Endeavour made this spectacular time exposure of the southern aurora (aurora australis) in October of 1994. Aurora, also known as the northern and southern lights, appear as luminous bands or streamers of light which can extend to altitudes of 200 miles. They are typically visible from the Earth's surface at high latitudes and are triggered by high energy particles from the Sun. The delicate colors are caused by energetic electrons colliding with oxygen and nitrogen molecules in the upper atmosphere. In this picture, the rear structure of the shuttle Endeavour is in the foreground with the vertical tail fin pointed toward Earth. Star trails are the short streaks above Earth's horizon.



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



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.



Public Star Parties:

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 mosquitoes - 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.

Membership:

Membership dues in the University Lowbrow Astronomers are \$20 per year for individuals or families, and \$12 per year for students and seniors (age 55/+). This entitles you to the monthly REFLECTIONS newsletter and the use of the 24" McMath telescope (aftersome training). Dues can be paid to the club treasurer Charlie Nielsen at the monthly meeting or by mail at this address:

6655 Jackson Road #415

Ann Arbor, MI 48103



Magazines:

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

Sky and Telescope: \$29.95 / year

Astronomy: \$29.00 / 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. Make the check payable to "University Lowbrow Astronomers".



Newsletter Contributions:

Members and (non-members) are encouraged to write about any astronomy related topic of interest. Call or E-mail to Newsletter Editors at:

Bernard Friberg (743)761-1875 Bfriberg@aol.com

Chris Samecki (734)426-5772 chrisandi@home.net

to discuss length and format. Announcements and articles are due by the first Friday of each month.



Telephone Numbers:

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Vice Presidents: Dave Snyder (734)747-6537

Paul Walkowski (734)662-0145

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Lowbrow's Home Page:

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

Dave Snyder, webmaster

<http://www-personal.umich.edu/~das/lowbrows/>

Monthly Meeting
March 16th, 7:30 pm
Room 130 Dennison Hall
Physics & Astronomy Building
The University of Michigan

This month's meeting:

Jim Abshier presents
Amateur Radio
Astronomy



The 16 inch cassegrain telescope from Angell Hall decommissioned in 1994.
Photo: Chris Sarnecki



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Lowbrow's WWW Home Page:
www.astro.lsa.umich.edu/lowbrows.html

Check your membership expiration date on the mailing label!