



## Catskills Astronomy Club News

March, 2007

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### Club News:

The latest indoor movie and dinner meeting was held on February 3rd at Morgan Outdoors in Livingston Manor. A group of over twenty people gathered to see the recent PBS Nova program entitled "Monster of the Milky Way". The program showed the latest information on black holes that inhabit the center of galaxies including the Milky Way. The program was well received and generated some interesting discussion during the questions and answer sessions that were held midway through the movie as well as after it was over.

The observation sessions for February were canceled due to poor weather and snow conditions at Walnut Mountain Park.

The March observation sessions are scheduled for the 17th and the 24th.

The club has selection of astronomy books, DVDs, Stardate audio CDs, and a Meade 8 inch reflector for members to borrow. Please contact John at 791-5240 or [kocis@verizon.net](mailto:kocis@verizon.net) if you are interested in borrowing any of these.

Thanks to Alan Chao our website has recently been redesigned. Check it out when you get a chance at [www.catskillsastro.org](http://www.catskillsastro.org). The image [left] shows what part of the new homepage looks like. A club mission statement will be added in the near future. Anyone with any ideas on what it should say can contact John at [kocis@verizon.net](mailto:kocis@verizon.net).

The observation sessions on January 13<sup>th</sup> and 20<sup>th</sup> were not held due to poor weather.

The February observation sessions at Walnut Mountain Park are scheduled for the 10<sup>th</sup> and 17<sup>th</sup>.

The club has selection of astronomy books, Stardate audio CDs, a Macintosh computer with astronomy software, and a Meade 8 inch reflector for members to borrow. Please contact John at 791-5240 or [kocis@verizon.net](mailto:kocis@verizon.net) if you are interested in borrowing any of these.

## **Astronomy News:**

Here are some articles from various NASA sources that might be of interest.

Image Advisory: 2007-016

Feb. 13, 2007

### **The Colorful Demise of a Sun-Like Star**

A new image from NASA's Hubble Space Telescope shows the colorful "last hurrah" of a star like our sun. The picture was taken on Feb. 6, 2007, by Hubble's Wide Field and Planetary Camera 2, which was designed and built by NASA's Jet Propulsion Laboratory, Pasadena, Calif.

The star is ending its life by casting off its outer layers of gas, which formed a cocoon around the star's remaining core. Ultraviolet light from the dying star makes the material glow. The burned-out star, called a white dwarf, is the white dot in the center. Our sun will eventually burn out and shroud itself with stellar debris, but not for another 5 billion years.

Our Milky Way galaxy is littered with these stellar relics, called planetary nebulae. The objects have nothing to do with planets. Eighteenth- and nineteenth-century astronomers named them that because through small telescopes they resembled the disks of the distant planets Uranus and Neptune.

The planetary nebula in this image is called NGC 2440. The white dwarf at the center of NGC 2440 is one of the hottest known, with a surface temperature of nearly 200,000 degrees Celsius (400,000 degrees Fahrenheit). The nebula's chaotic structure suggests that the star shed its mass episodically. During each outburst, the star expelled material in a different direction. This can be seen in the two bow tie-shaped lobes. The nebula also is rich in clouds of dust, some of which form long, dark streaks pointing away from the star. NGC 2440 lies about 4,000 light-years from Earth in the direction of the constellation Puppis.

The colors in the image correspond to material expelled by the star. Blue corresponds to helium; blue-green to oxygen, and red to nitrogen and hydrogen.

For images and additional information on NGC 2440, visit <http://hubblesite.org/news/2007/09> . The Hubble Space Telescope is a project of international cooperation between NASA and the European Space Agency. The Space Telescope Science Institute in Baltimore conducts Hubble science operations. The Institute is operated for NASA by the Association of Universities for Research in Astronomy, Inc., Washington. The California Institute of Technology in Pasadena manages JPL for NASA.

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News Release: 2007-014

Feb. 12, 2007

## Comets Clash at Heart of Helix Nebula

A bunch of rowdy comets are colliding and kicking up dust around a dead star, according to new observations from NASA's Spitzer Space Telescope. The dead star lies at the center of the much-photographed Helix nebula, a shimmering cloud of gas with an eerie resemblance to a giant eye.

" We were surprised to see so much dust around this star, " said Dr. Kate Su of the University of Arizona, Tucson, lead author of a paper on the results appearing in the March 1 issue of *Astrophysical Journal Letters*. " The dust must be coming from comets that survived the death of their sun."

Spitzer's spectacular new view of the Helix nebula shows colors as seen in infrared and is online at <http://www.nasa.gov/spitzer> and [www.spitzer.caltech.edu/Mediaand](http://www.spitzer.caltech.edu/Mediaand) . The dusty dead star appears as a dot in the middle of the nebula, like a red pupil in a green monster's eye.

The Helix nebula, located about 700 light-years away in the constellation Aquarius, was formed when a star much like our sun died and sloughed off its skin, or outer layers. Radiation from the dead star's hot core, called a white dwarf, heats the expelled material, causing it to fluoresce with vivid colors. This cosmic beauty, termed a planetary nebula, won't last long. In about 10,000 years, its shiny clouds will fade, leaving the white dwarf and its circling comets to cool down alone in empty space.

Astronomers have long studied the white dwarf at the center of the Helix nebula, but nobody had detected any dust close to it until now. Spitzer, an infrared space-based observatory, was able to pick up the glow of a dusty disk circling around the stellar corpse at a distance of about 35 to 150 astronomical units (an astronomical unit is the distance between our sun and Earth, which is 150 million kilometers or 93 million miles).

At first, Su and her team were shocked to see the dust. They said that when the star died, expelling its outer layers, dust in the system should have been blown away. The team then obtained more detailed data, which again pointed to the presence of a dusty disk.

Where is the dust coming from? According to the astronomers, it is most likely being freshly churned up by comets smashing into each other in the outer fringes of the white dwarf's system. A few million years ago, before the white dwarf formed, when it was still a lively star like our sun, its comets and possibly planets would have been in stable orbits, harmoniously traveling around the star. But when the star died, any inner planets would have burned up or been swallowed as the star expanded. Outer planets, asteroids and comets would have been jostled about and thrown into each other's paths.

Our own solar system will undergo a similar transformation in about five billion years. Like the Helix nebula, it will sparkle with colors. Our sun, which will have become a white dwarf, will be circled by a band of surviving outer planets and frenzied comets.

Spitzer has seen evidence before for such comet survivors around dead stars. In January of last year, astronomers reported using the observatory to find a dusty disk around a white dwarf, only the disk was much closer in, circling at a distance of only .005 to .03 astronomical units (<http://www.spitzer.caltech.edu/Media/releases/ssc2006-04/index.shtml>).

"Finding evidence for planetary activity around a white dwarf is a surprise," said Dr. George Rieke of the University of Arizona, a co-author of the paper. "Finding it twice with such different properties is a shock!"

The Spitzer data might also help explain a mystery surrounding the Helix nebula's white dwarf. Previous observations with the German X-ray telescope Röntgensatellit and NASA's Chandra X-ray Observatory indicated that the white dwarf was throwing out highly energetic X-rays. While the white dwarf is hot, about 110,000 Kelvin (nearly 200,000 degrees Fahrenheit), it is not hot enough to explain the energetic X-rays. Astronomers thought that perhaps the white dwarf was accreting matter onto itself from a hidden companion star.

But the Spitzer observations point to a different answer. According to Su's team member Dr. You-Hua Chu of the University of Illinois at Urbana-Champaign, material in the newfound disk surrounding the white dwarf might be falling onto the star and triggering the X-ray outbursts. "The high-energy X-rays were an unsolved mystery, said Chu. " Now, we might have found an answer in the infrared."

Other authors of this work include Drs. Patrick J. Huggins of New York University, New York; Robert Gruendl of University of Illinois at Urbana-Champaign; Ralf Napiwotzki of University of Hertfordshire, United Kingdom; Thomas Rauch of University Tübingen, Germany; William B. Latter of NASA's Herschel Science Center, Pasadena, Calif.; and Kevin Volk of Gemini Observatory, Hilo, Hawaii.

NASA's Jet Propulsion Laboratory, Pasadena, Calif., manages the Spitzer Space Telescope mission for NASA's Science Mission Directorate, Washington. Science operations are conducted at the Spitzer Science Center at the California Institute of Technology, also in Pasadena. Caltech manages JPL for NASA.

For more information and graphics, visit <http://www.nasa.gov/spitzerand> [www.spitzer.caltech.edu/Media](http://www.spitzer.caltech.edu/Media).

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News Release: 2007-013

Feb. 7, 2007

## Spacecraft Set to Reach Milestone, Reports Technical Glitches

NASA's Mars Reconnaissance Orbiter spacecraft this month is set to surpass the record for the most science data returned by any Mars spacecraft. While the mission continues to produce data at record levels, engineers are examining why two instruments are intermittently not performing entirely as planned. All other spacecraft instruments are operating normally and continue to return science data.

Since beginning its primary science phase in November 2006, the orbiter has returned enough data to fill nearly 1,000 CD-ROMs. This ties the record for Mars data sent back between 1997 and 2006 by NASA's Mars Global Surveyor mission.

In late November 2006, the spacecraft team operating the High Resolution Imaging Science Experiment camera on Mars Reconnaissance Orbiter noticed a significant increase in noise, such as bad pixels, in one of its 14 camera detector pairs. Another detector that developed the same problem soon after launch has worsened. Images from the spacecraft camera last month revealed the first signs of this problem in five other detectors.

While the current impact on image quality is small, there is concern as to whether the problem will continue to worsen.

In-flight data show that more warming of the camera's electronics before taking an image reduces or eliminates the problem. The imaging team aims to understand the root cause of the worsening over time and to determine the best operational procedures to maximize the long-term science benefits. The camera continues to make observations and is returning excellent images of the Martian surface.

The second instrument concern aboard the Mars Reconnaissance Orbiter is related to an instrument designed to routinely scan from the surface across the atmosphere above Mars' horizon. The Mars Climate Sounder maps the temperature, ice clouds and dust distributions in the atmosphere on each of nearly 13 orbits every day. In late December, the sounder appeared to skip steps occasionally, so that its field of view was slightly out of position. Following uplink of new scan tables to the instrument, the position errors stopped and the instrument operated nominally.

In mid-January, the position errors reappeared. Although still intermittent, the errors became more frequent, so the instrument has been temporarily stowed while the science team investigates the problem.

The rate of data return is expected to increase over the coming months as the relative motions of Earth and Mars in their orbits around the sun shrink the distance between the planets. By the conclusion of its first science phase in 2008, the mission is expected to have returned more than 30 terabits of science data, enough to fill more than 5,000 CD-ROMs. Observations will be used to evaluate potential landing sites for future missions and to increase our understanding of Mars and how planets change over time.

The mission is managed by NASA's Jet Propulsion Laboratory, Pasadena, Calif., for NASA's Science Mission Directorate, Washington. Lockheed Martin Space Systems, Denver, Colo., is the prime contractor and built the spacecraft.

Additional information about the Mars Reconnaissance Orbiter is online at: <http://www.nasa.gov/mro> .

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News Release: 2007-012

Feb. 7, 2007

### **NASA-European Spacecraft Swoops Under Sun's Pole**

The 16-year-old Ulysses spacecraft reaches what could be considered a low point in its mission observing the sun today – and solar scientists could not be happier. The European-manufactured, joint NASA- and ESA-managed spacecraft, has reached maximum latitude in its exploration of the heliosphere, the bubble in space blown out by the solar wind.

" At max latitude we are actually passing below the sun looking almost directly up at its south pole from 329 million kilometers (204 million miles) away, " said Nigel Angold, Ulysses mission operations manager from the European Space Agency. " The trajectory provides a perspective of the sun no other spacecraft can equal."

This unusual perspective is courtesy of the spacecraft's one-of-its-kind 6.3-year-long orbit around the sun. An orbit that swings Ulysses both over and under the sun's polar regions and as far out as the orbit of Jupiter.

"Max latitude is the start of an important mission phase," said Dr. Ed Smith, Ulysses project scientist at NASA's Jet Propulsion Laboratory, Pasadena, Calif. " The spacecraft will soon begin accelerating as it transits from below the sun's south pole to its equator and then up and over its north pole. This trajectory provides us a ringside seat to all the solar processes we want to observe."

This phase of the mission is expected to return high priority scientific observations revealing the changing sun and its effect on space during the ongoing minimum in the 11-year sunspot cycle. During this portion of the mission, Ulysses will rapidly scan the sun's magnetic field, solar plasmas, solar radio noise, energetic particles, galactic cosmic rays and cosmic dust between the poles and the equator – imparting a more complete perspective of the sun's atmosphere.

Understanding the Earth's nearest star and its processes is paramount, as the space weather created by the sun has a huge effect on the third rock from it and its inhabitants. The sun's gaseous outer atmosphere can create huge space storms. This violent space weather, in turn, can affect Earth's

electrical grid, cell phone communications, the functioning of satellites and the operation of astronauts in orbit.

This passage between the sun's poles is the third in the 17 years of Ulysses operations. The first transit occurred during the previous sunspot minimum in 1994 to 1995, and the second during sunspot maximum in 2000 to 2001. The opportunity to repeat the scientific investigations during the ongoing solar minimum is important because the sun's magnetic field has changed significantly since the previous minimum.

The Ulysses spacecraft was carried into Earth orbit in the cargo bay of the Space Shuttle Discovery on Oct. 6, 1990. From Earth orbit it was propelled toward Jupiter by solid-fuel motors. Ulysses passed Jupiter on Feb. 8, 1992; the giant planet's gravity bent the spacecraft's flight path downward and away from the ecliptic plane. This put it into a final orbit around the sun that would take it past the sun's north and south poles.

The spacecraft was built by Dornier Systems of Germany for the European Space Agency. NASA provided the launch via space shuttle and the upper stage boosters. The U.S. Department of Energy supplied a radioisotope thermoelectric generator which powers the spacecraft; science instruments were provided by both U.S. and European investigators. The spacecraft is operated from JPL by a joint team from the European Space Agency and NASA.

More information about NASA's Ulysses mission is available on the Web at <http://ulysses.jpl.nasa.gov> .

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Image Advisory: 2007-010

Feb. 1, 2007

### **Cassini Images Mammoth Cloud Engulfing Titan's North Pole**

A giant cloud half the size of the United States has been imaged on Saturn's moon Titan by the Cassini spacecraft. The cloud may be responsible for the material that fills the lakes discovered last year by Cassini's radar instrument.

Cloaked by winter's shadow, this cloud has now come into view as winter turns to spring. The cloud extends down to 60 degrees north latitude, is roughly 2,400 kilometers (1,490 miles) in diameter and engulfs almost the entire north pole of Titan.

The new image was acquired on Dec. 29, 2006, by Cassini's visual and infrared mapping spectrometer. Scientific models predicted this cloud system, but it had never been imaged in such detail before.

The cloud image is available at: <http://www.nasa.gov/cassini> , <http://saturn.jpl.nasa.gov> , and <http://wwwvims.lpl.arizona.edu> .

“We knew this cloud had to be there but were amazed at its size and structure,” said Dr. Christophe Sotin of the University of Nantes, France, a member of the visual and infrared mapping spectrometer team and distinguished visiting scientist at NASA’s Jet Propulsion Laboratory, Pasadena, Calif. “This cloud system may be a key element in the global formation of organics and their interaction with the surface.”

The same cloud system seen on Dec. 29, was still there two weeks later during a Jan. 13, 2007, flyby, even though observing conditions were slightly less favorable than in December.

The Cassini radar team reported last year that the lakes at the north pole are partly filled, and some appear to have evaporated, likely contributing to this cloud formation, which is made up of ethane, methane and other organics. These findings reinforce the idea that methane rains down onto the surface to form lakes and then evaporates to form clouds. Scientists compare this methane cycle to the hydrological cycle on Earth, dubbing it “methane-ologic cycle.”

Ground-based observations show this Titan cloud system comes and goes with the seasons. A season on Titan lasts approximately seven Earth years. Based on the global circulation models, it seems that such cloud activity can last about 25 Earth years before almost vanishing for four to five years, and then appearing again for 25 years.

Scientists expect this cloud to be around for several years. As the seasons change, scientists expect a shift of these clouds and lakes from the north pole to the south pole. On Titan’s south pole, scientists have seen only one kidney-shaped lake with Cassini’s imaging cameras.

“With 16 more flybys to come this year, we should have the opportunity to monitor the evolution of this cloud system over time,” said Dr. Stephane Le Mouelic, working with the Cassini visual and infrared mapping spectrometer team, and also at the University of Nantes.

The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. JPL, a division of the California Institute of Technology in Pasadena, manages the Cassini-Huygens mission for NASA’s Science Mission Directorate, Washington. The Cassini orbiter was designed, developed and assembled at JPL. The visual and infrared mapping spectrometer team is based at the University of Arizona, Tucson.

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### **Mid Evening Observing Highlights for March**

Saturn can be found in the eastern sky next to the Sickle of Leo. There are many open clusters that can be viewed in the southern sky east of Canis Major. Some are M46, M47, M48, and M50. The

open cluster M41 can be found within Canis Major just below the bright star Sirius. Leo and Virgo are rising in the eastern sky. The Big Dipper is standing on its handle in the northeastern sky. The bright star Arcturus can be seen rising in the east just above the horizon. Orion is in the southwestern sky. Taurus and the Pleiades are in the western sky. Full moon is on March 3rd and new moon is on March 19th.

On March 3rd a lunar eclipse will be visible for our area. The full moon will be in total eclipse as the moon rises at 5:44 EST. Greatest totality will be at 6:21. Totality will end at 6:58 and partial eclipse will end at 8:12.

The image below was taken from the following NASA website.

<http://sunearth.gsfc.nasa.gov/eclipse/LEplot/LEplot2001/LE2007Mar03T.GIF>

# Total Lunar Eclipse of 2007 Mar 03

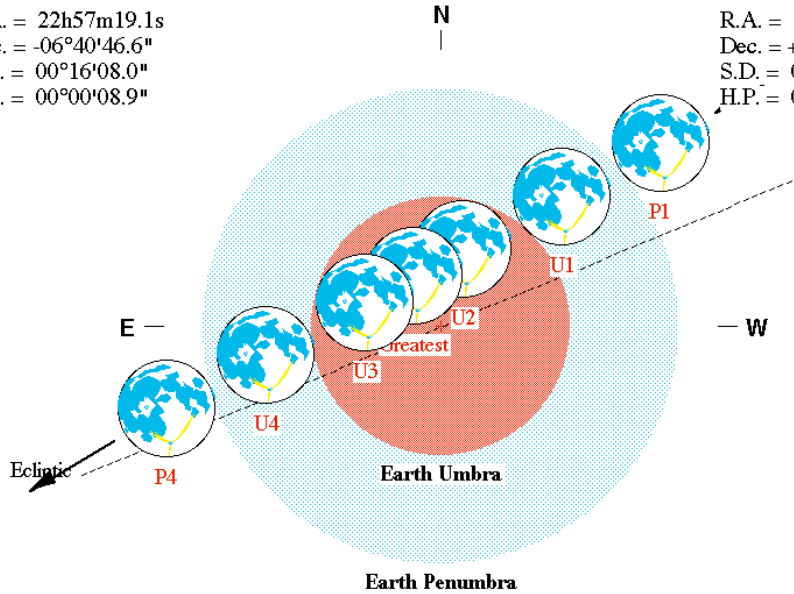
Geocentric Conjunction = 23:00:47.6 UT    J.D. = 2454163.45888  
 Greatest Eclipse = 23:20:55.8 UT    J.D. = 2454163.47287  
 Penumbral Magnitude = 2.3452    P. Radius = 1.2020°    Gamma = 0.3174  
 Umbral Magnitude = 1.2375    U. Radius = 0.6535°    Axis = 0.2883°  
 Saros Series = 123    Member = 52 of 73

**Sun at Greatest Eclipse**  
(Geocentric Coordinates)

R.A. = 22h57m19.1s  
 Dec. = -06°40'46.6"  
 S.D. = 00°16'08.0"  
 H.P. = 00°00'08.9"

**Moon at Greatest Eclipse**  
(Geocentric Coordinates)

R.A. = 10h57m52.2s  
 Dec. = +06°56'00.6"  
 S.D. = 00°14'51.3"  
 H.P. = 00°54'31.1"



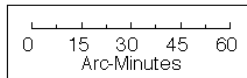
**Eclipse Semi-Durations**

Penumbral = 03h04m29s  
 Umbral = 01h50m51s  
 Total = 00h37m06s

Eph. = Newcomb/ILE  
 ΔT = 65.0 s

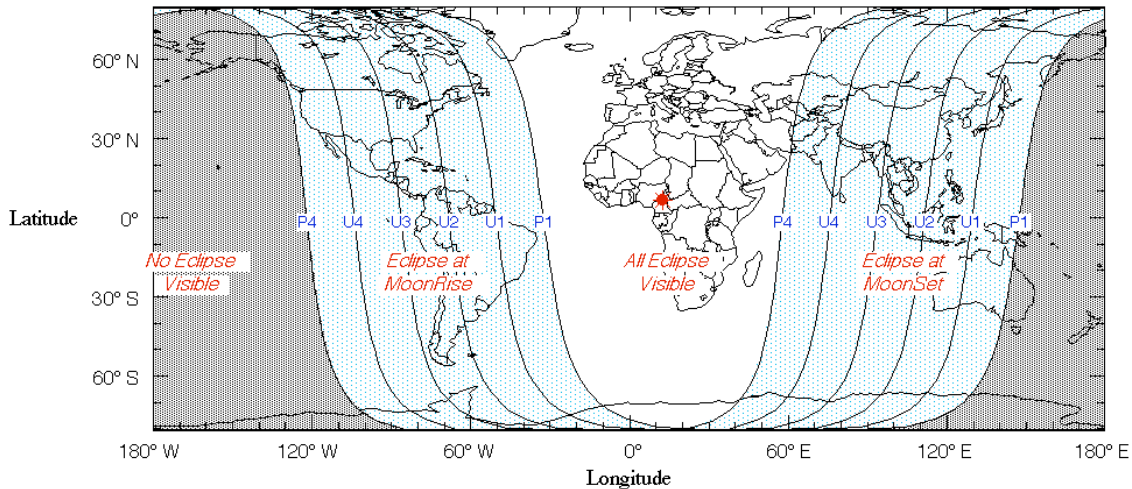
**Eclipse Contacts**

P1 = 20:16:29 UT  
 U1 = 21:30:04 UT  
 U2 = 22:43:49 UT  
 U3 = 23:58:01 UT  
 U4 = 01:11:46 UT  
 P4 = 02:25:27 UT



F. Espenak, NASA's GSFC - 2004 Jul 07

<http://sunearth.gsfc.nasa.gov/eclipse/eclipse.html>



## **Even Solar Sails Need a Mast**

by Patrick L. Barry

Like the explorers of centuries past who set sail for new lands, humans may someday sail across deep space to visit other stars. Only it won't be wind pushing their sails, but the slight pressure of sunlight.

Solar sails, as they're called, hold great promise for providing propulsion in space without the need for heavy propellant. But building a solar sail will be hard; to make the most of sunlight's tiny push, the sail must be as large as several football fields, yet weigh next to nothing. Creating a super-lightweight material for the sail itself is tricky enough, but how do you build a "mast" for that sail that's equally light and strong?

Enter SAILMAST, a program to build and test-fly a mast light enough for future solar sails. With support from NASA's In-Space Propulsion Program to mature the technology and perform ground demonstrator tests, SAILMAST's engineers were ready to produce a truss suitable for validation in space that's 40 meters (about 130 feet) long, yet weighs only 1.4 kilograms (about 3 pounds)!

In spite of its light weight, this truss is surprisingly rigid. "It's a revelation when people come in and actually play with one of the demo versions—it's like, whoa, this is really strong!" says Michael McEachen, principal investigator for SAILMAST at ATK Space Systems in Goleta, California.

SAILMAST will fly aboard NASA's Space Technology 8 (ST8) mission, scheduled to launch in February 2009. The mission is part of NASA's New Millennium Program, which flight tests cutting-edge technologies so that they can be used reliably for future space exploration. While actually flying to nearby stars is probably decades away, solar sails may come in handy close to home. Engineers are eyeing this technology for "solar sentinels," spacecraft that orbit the Sun to provide early warning of solar flares.

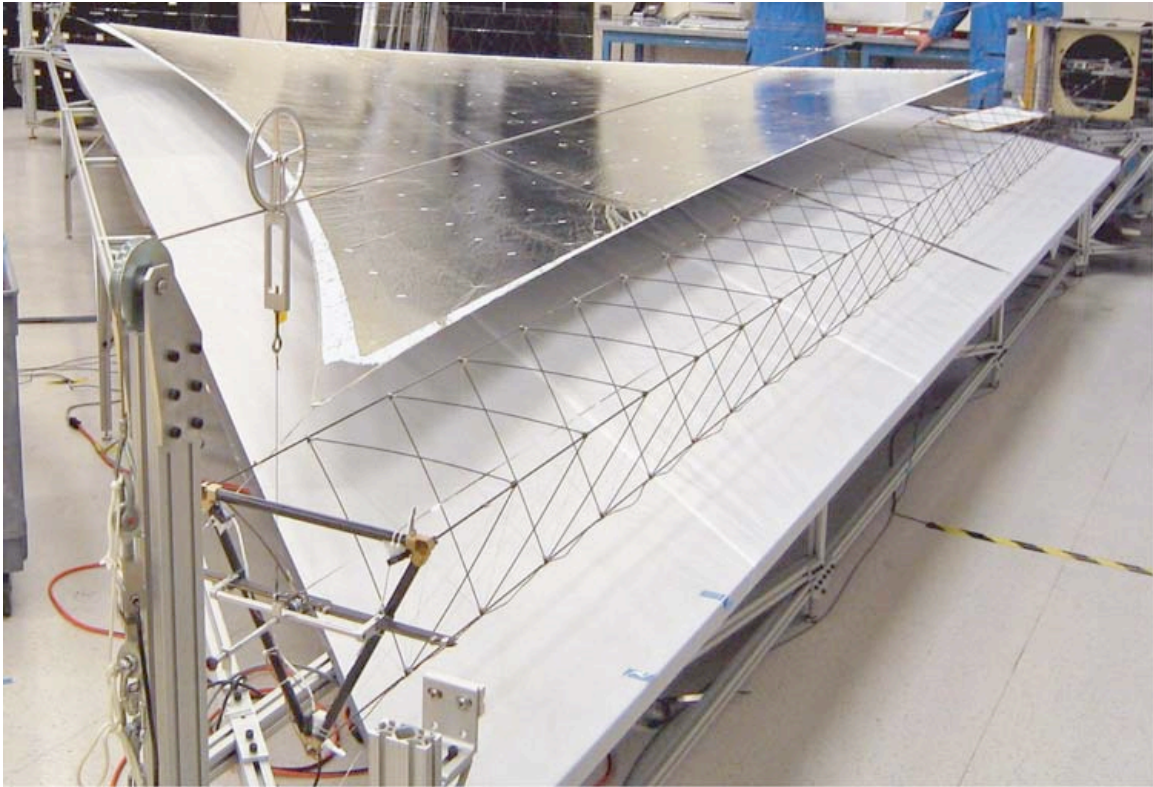
Once in space, ST8 will slowly deploy SAILMAST by uncoiling it. The truss consists of three very thin, 40-meter-long rods connected by short cross-members. The engineers used high-strength graphite for these structural members so that they could make them very thin and light.

The key question is how straight SAILMAST will be after it deploys in space. The smaller the curve of the mast the more load it can support. "That's really why we need to fly it in space, to see how straight it is when it's floating weightlessly," McEachen says.

It's an important step toward building a sail for the space-mariners of the future.

Find out more about SAILMAST at [nmp.nasa.gov/st8](http://nmp.nasa.gov/st8). Kids can visit [spaceplace.nasa.gov/en/kids/st8/sailmast](http://spaceplace.nasa.gov/en/kids/st8/sailmast) to see how SAILMAST is like a Slinky® toy in space.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.



**Caption:**

SAILMAST is the thin triangular truss in front of the picture. It is attached to a section of a silver foil solar sail section shown here in a laboratory test. The mast in the picture is 2m (6 ft) long. The Space Technology 8 mission will test the SAILMAST, which is 20 times longer.