

## *Catskills Astronomy Club News*

*1/1/05*

### ***Club News:***

The December 4<sup>th</sup> and 11<sup>th</sup> observation sessions were canceled due to cloudy skies.

The proposed 2005 observation dates are shown below. Alternate dates will be announced as needed.

1/17, 1/24, 2/21, 2/28, 3/13, 3/20, 4/17, 4/24, 5/15, 5/22, 6/12, 6/19, 7/10, 7/17, 8/7, 8/14, 9/11, 9/18, 10/9, 10/16, 11/6, 11/13, 12/4, 12/11

In the past the club held indoor dinner meetings at local restaurants when the weather looks poor for an observation session during the winter season. When an opportunity arises for a dinner meeting the membership will be contacted via email.

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 if you are interested in borrowing any of these.

### ***Astronomy News:***

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

News Release: 2004-300

December 30, 2004

### **Cassini Caps off 2004 With Flyby of Icy Moon Iapetus**

NASA's Cassini spacecraft is set to cap off 2004 with an encounter of Saturn's ying-yang moon Iapetus (eye-APP-eh-tuss) on New Year's Eve.

This is Cassini's closest pass yet by one of Saturn's smaller icy satellites since its arrival around the ringed giant on June 30 of this year. The next close flyby of Iapetus is not until 2007.

Iapetus is a world of sharp contrasts. The leading hemisphere is as dark as a freshly-tarred street, and the white, trailing hemisphere resembles freshly-fallen snow.

Cassini will fly by the two-toned moon at a distance of approximately 123,400 kilometers (76,700 miles) on Friday, Dec. 31. This flyby brings to an end a year of major accomplishments and rings in what promises to be a year filled with new discoveries about Saturn and its moons.

"I can think of no better way than this to wrap up what has been a whirlwind year," said Robert T. Mitchell, program manager for the Cassini mission at NASA's Jet Propulsion Laboratory, Pasadena, Calif. "The new year offers new opportunities, and 2005 will be the year of the icy satellites."

In 2005 Cassini will have 13 targeted encounters with five of Saturn's moons. "We have 43 close flybys of Titan still ahead of us during the four-year tour. Next year, eight of our 13 close

flybys will be of Titan. We will also have a number of more distant flybys of the icy satellites, and let's not forget Saturn and the rings each time we come around," said Mitchell.

With a diameter of about 1,400 kilometers (890 miles), Iapetus is Saturn's third largest moon. It was discovered by Jean-Dominique Cassini in 1672. It was Cassini, for whom the Cassini-Huygens mission is named, who correctly deduced that one side of Iapetus was dark, while the other was white.

Scientists still do not agree on whether the dark material originated from an outside source or was created from Iapetus' own interior. One scenario for the outside deposit of material would involve dark particles being ejected from Saturn's little moon Phoebe and drifting inward to coat Iapetus. The major problem with this model is that the dark material on Iapetus is redder than Phoebe, although the material could have undergone chemical changes that made it redder after its expulsion from Phoebe. One observation lending credence to the theory of an internal origin is the concentration of material on crater floors, which implies that something is filling in the craters. In one model proposed by scientists, methane could erupt from the interior and then become darkened by ultraviolet radiation.

Iapetus is odd in other respects. It is the only large Saturn moon in a highly inclined orbit, one that takes it far above and below the plane in which the rings and most of the moons orbit. It is less dense than objects of similar brightness, which implies it has a higher fraction of ice or possibly methane or ammonia in its interior.

The last look at Iapetus was by NASA's Voyager 1 and 2 spacecraft in 1980 and 1981. The Cassini images will be the highest resolution images yet of this mysterious moon.

The Iapetus flyby by Cassini follows the successful release of the Huygens probe on December 24.

More information on the Cassini-Huygens mission is available at: <http://saturn.jpl.nasa.gov> and <http://www.nasa.gov/cassini> .

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 mission for NASA's Science Mission Directorate, Washington, D.C. JPL designed, developed and assembled the Cassini orbiter. The European Space Agency built and managed the development of the Huygens probe and is in charge of the probe operations. The Italian Space Agency provided the high-gain antenna, much of the radio system and elements of several of Cassini's science instruments.

Cassini spacecraft targeted satellite encounters for 2005:

Titan: January 14, 2005

Titan: February 15, 2005

Enceladus: March 9, 2005

Titan: March 31, 2005

Titan: April 16, 2005

Enceladus: July 14, 2005

Titan: August 22, 2005

Titan: September 7, 2005

Hyperion: September 26, 2005

Dione: October 11, 2005  
Titan: October 28, 2005  
Rhea: November 26, 2005  
Titan: December 26, 2005

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Press Release: 2004-289

December 14, 2004

### ***NASA Set To Launch First Comet Impact Probe***

Launch and flight teams are in final preparations for the planned Jan. 12, 2005, liftoff from Cape Canaveral Air Force Station, Fla., of NASA's Deep Impact spacecraft. The mission is designed for a six-month, one-way, 431 million kilometer (268 million mile) voyage. Deep Impact will deploy a probe that essentially will be "run over" by the nucleus of comet Tempel 1 at approximately 37,000 kilometers per hour (23,000 miles per hour).

"From central Florida to the surface of a comet in six months is almost instant gratification from a deep space mission viewpoint," said Rick Grammier, Deep Impact project manager at NASA's Jet Propulsion Laboratory, Pasadena, Calif. "It is going to be an exciting mission, and we can all witness its culmination together as Deep Impact provides the planet with its first man-made celestial fireworks on our nation's birthday, July 4<sup>th</sup>."

The fireworks will be courtesy of a 1-by-1 meter (39-by-39 inches) copper-fortified probe. It is designed to obliterate itself as it excavates a crater possibly large enough to swallow the Roman Coliseum. Before, during and after the demise of this 372-kilogram (820-pound) impactor, a nearby spacecraft will be watching the 6-kilometer-wide (3.7-mile) comet nucleus, collecting pictures and data of the event.

"We will be capturing the whole thing on the most powerful camera to fly in deep space," said University of Maryland astronomy professor Dr. Michael A'Hearn, Deep Impact's principal investigator. "We know so little about the structure of cometary nuclei that we need exceptional equipment to ensure that we capture the event, whatever the details of the impact turn out to be."

Imagery and other data from the Deep Impact cameras will be sent back to Earth through the antennas of the Deep Space Network. But they will not be the only eyes on the prize. NASA's Chandra, Hubble and Spitzer space telescopes will be observing from near-Earth space. Hundreds of miles below, professional and amateur astronomers on Earth will also be able to observe the material flying from the comet's newly formed crater.

Deep Impact will provide a glimpse beneath the surface of a comet, where material and debris from the solar system's formation remain relatively unchanged. Mission scientists are confident the project will answer basic questions about the formation of the solar system, by offering a better look at the nature and composition of the celestial travelers we call comets.

"Understanding conditions that lead to the formation of planets is a goal of NASA's mission of exploration," said Andy Dantzler, acting director of the Solar System division

at NASA Headquarters, Washington, D.C. "Deep Impact is a bold, innovative and exciting mission which will attempt something never done before to try to uncover clues about our own origins."

With a closing speed of about 37,000 kilometers per hour (23,000 miles per hour), what of the washing machine-sized impactor and its mountain-sized quarry?

"In the world of science, this is the astronomical equivalent of a 767 airliner running into a mosquito," said Don Yeomans, a Deep Impact mission scientist at JPL. "It simply will not appreciably modify the comet's orbital path. Comet Tempel 1 poses no threat to Earth now or in the foreseeable future."

Ball Aerospace & Technologies in Boulder, Colo., built NASA's Deep Impact spacecraft. It was shipped to Florida Oct. 17 to begin final preparations for launch.

Principal Investigator A'Hearn leads the mission from the University of Maryland, College Park. JPL manages the Deep Impact project for the Science Mission Directorate at NASA Headquarters. Deep Impact is a mission in NASA's Discovery Program of moderately priced solar system exploration missions.

For more information about Deep Impact on the Internet, visit:

<http://www.nasa.gov/deepimpact> .

For more information about NASA and agency programs on the Internet, visit:

<http://www.nasa.gov> .

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*News Release: 2004-294*

*December 21, 2004*

### ***Ageing Universe may Still be Spawning Massive Galaxies***

NASA's Galaxy Evolution Explorer has spotted what appear to be massive "baby" galaxies in our corner of the universe. Previously, astronomers thought the universe's birth rate had dramatically declined and only small galaxies were forming.

"We knew there were really massive young galaxies eons ago, but we thought they had all matured into older ones more like our Milky Way. If these galaxies are indeed newly formed, then this implies parts of the universe are still hotbeds of galaxy birth," said Dr. Chris Martin. He is principal investigator for the Galaxy Evolution Explorer at the California Institute of Technology, Pasadena, Calif., and co-author of the study.

Martin and colleagues, led by Dr. Tim Heckman of Johns Hopkins University, Baltimore, Md., unearthed three-dozen bright, compact galaxies that greatly resemble the youthful galaxies of more than 10 billions years ago. These new galaxies are relatively close to us, ranging from two to four billion light-years away. They may be as young as 100 million to one billion years old. The Milky Way is approximately 10 billion years old.

The recent discovery suggests our aging universe is still alive with youth. It also offers astronomers their first, close-up glimpse at what our galaxy probably looked like when it was in its infancy.

"Now we can study the ancestors to galaxies much like our Milky Way in much more detail than ever before," Heckman said. "It's like finding a living fossil in your own backyard. We thought this type of galaxy had gone extinct, but in fact newborn galaxies are alive and well in the universe," he added.

The new discoveries are of a type called ultraviolet luminous galaxies. They were discovered after the Galaxy Evolution Explorer scanned a large portion of the sky with its highly sensitive ultraviolet light detectors. Since young stars pack most of their light into ultraviolet wavelengths, young galaxies appear to the spacecraft like diamonds in a field of stones. Astronomers mined for these rare gems before, but missed them because they weren't able to examine a large enough slice of the sky.

"The Galaxy Evolution Explorer surveyed thousands of galaxies before finding these few dozen ultraviolet-bright ones," said Dr. Michael Rich, a co-author of the study from the University of California, Los Angeles.

The newfound galaxies are about 10 times as bright in ultraviolet wavelengths as the Milky Way. This indicates they are teeming with violent star-forming regions and exploding supernova, which are characteristics of youth.

When our universe was young, massive galaxies were regularly bursting into existence. Over time, the universe bore fewer and fewer galactic progeny, and its newborn galaxies grew up into ones that look like our own. Until now, astronomers thought they had seen the last of these giant babies.

The results will be published in an upcoming special issue of *Astrophysical Journal Letters*, along with several other papers describing new results from the Galaxy Evolution Explorer.

The Galaxy Evolution Explorer was launched on April 28, 2003. Its mission is to study the shape, brightness, size and distance of galaxies across 10 billion years of cosmic history. The Explorer's 50-centimeter-diameter (19.7-inch) telescope sweeps the skies in search of ultraviolet-light sources.

Caltech leads the Galaxy Evolution Explorer mission and is responsible for science operations and data analysis. NASA's Jet Propulsion Laboratory, Pasadena, Calif., manages the mission and built the science instrument. The mission was developed under NASA's Explorers Program managed by the Goddard Space Flight Center, Greenbelt, Md. South Korea and France are the international partners in the mission.

For images and information about the Galaxy Evolution Explorer on the Internet, visit <http://www.nasa.gov/centers/jpl/missions/galex.html> . For information about NASA and agency programs on the Internet, visit <http://www.nasa.gov> .

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## **Mars Rovers Spot Water-Clue Mineral, Frost, Clouds**

Scientists have identified a water-signature mineral called goethite in bedrock that the NASA's Mars rover Spirit examined in the "Columbia Hills," one of the mission's surest indicators yet for a wet history on Spirit's side of Mars.

"Goethite, like the jarosite that Opportunity found on the other side of Mars, is strong evidence for water activity," said Dr. Goestar Klingelhofer of the University of Mainz, Germany, lead scientist for the iron-mineral analyzer on each rover, the Moessbauer spectrometer. Goethite forms only in the presence of water, whether in liquid, ice or gaseous form. Hematite, a mineral that had previously been identified in Columbia Hills bedrock, usually, but not always, forms in the presence of water.

The rovers' main purpose is to look for geological evidence of whether their landing regions were ever wet and possibly hospitable to life. The successful results so far -- with extended missions still underway -- advance a NASA goal of continuing Mars exploration by robots and, eventually, by humans, said Doug McCuiston, Mars Exploration Program Director at NASA Headquarters.

Klingelhofer presented the new results from a rock in the "West Spur" of Mars' "Husband Hill" at a meeting of the American Geophysical Union in San Francisco this week.

Spirit has now driven past the West Spur to ascend Husband Hill itself. One remaining question is whether water was only underground or ever pooled above the surface, as it did at Opportunity's site. "As we climb Husband Hill and characterize the rock record, we'll be looking for additional evidence that the materials were modified by ground water and searching for textural, mineralogical and chemical evidence that the rocks were formed in or modified by surface water," said Dr. Ray Arvidson of Washington University in St. Louis, deputy principal investigator for the rover instruments.

The amount of worrisome friction in Spirit's right front wheel has been decreasing. Meanwhile, rover wranglers at NASA's Jet Propulsion Laboratory in Pasadena, Calif., continue to minimize use of that wheel by often letting it drag while the other five wheels drive. "Babying that wheel seems to be helping," said JPL's Jim Erickson, rover project manager. Both rovers continue working in good health about eight months after their primary three-month missions. "Looks as though Spirit and Opportunity will still be with us when we celebrate the landing anniversaries in January," Erickson said.

Opportunity has completed six months of inspecting the inside of "Endurance Crater" and is ready to resume exploration of the broad plains of the Meridiani region. It has recently seen frost and clouds marking the seasonal changes on Mars. At this week's conference, rover science-team member Dr. Michael Wolff of the Brookfield, Wisconsin branch of the Boulder, Colorado-based Space Science Institute is reporting those and other atmospheric observations. "We're seeing some spectacular clouds," Wolff said. "They are a dramatic reminder that you have weather on Mars. Some days are cloudy. Some are clear."

A portion of Mars' water vapor is moving from the north pole toward the south pole during the current northern-summer and southern-winter period. The transient increase in atmospheric water at Meridiani, just south of the equator, plus low temperatures near the surface, contribute

to appearance of the clouds and frost, Wolff said. Frost shows up some mornings on the rover itself. The possibility that it has a clumping effect on the accumulated dust on solar panels is under consideration as a factor in unexpected boosts of electric output from the panels.

As its last major endeavor inside Endurance Crater, Opportunity made a close inspection of rock layers exposed in a part of the crater wall called "Burns Cliff." Dr. Steve Squyres of Cornell University, Ithaca, N.Y., principal investigator for the rover instruments, said, "In the lower portion of the cliff, the layers show very strong indications that they were last transported by wind, not by water like some layers higher up. The combination suggests that this was not a deep-water environment but more of a salt flat, alternately wet and dry."

JPL has managed the Mars Exploration Rover project since it began in 2000. Images and additional information about the rovers and their discoveries are available on the Internet at [http://www.nasa.gov/vision/universe/solarsystem/mer\\_main.html](http://www.nasa.gov/vision/universe/solarsystem/mer_main.html) and at <http://marsrovers.jpl.nasa.gov>. Information about NASA and agency programs is available on the Web at <http://www.nasa.gov>.

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Image Advisory: 2004-282

December 3, 2004

### ***Cassini Captures Saturn Moon Red-Handed***

Stealing is a crime on Earth, but at Saturn, apparently it is routine. The Cassini spacecraft has witnessed Saturn's moon Prometheus snatching particles from one of Saturn's rings.

This potato-shaped moon is also believed to be responsible for kinks within Saturn's thin F ring, a contorted, narrow ring flanked by two small moons, Prometheus and Pandora. The thievery and the detailed behavior of kinks were observed for the first time ever in images taken by the Cassini spacecraft.

In an image taken on Oct. 29, Prometheus is seen stealing particles from the F ring while connected to the ringlets by a faint streak of material. A movie sequence of the ring, taken on Oct. 28, captures in freeze-frame motion the zigzagging kinks and knots, some of which are almost certainly caused by Prometheus.

The new still and movie are available at <http://saturn.jpl.nasa.gov>, <http://www.nasa.gov/cassini> and <http://ciclops.org>.

The kinks look like "hiccups" traveling around the ring. Consisting of 44 frames taken three minutes apart, the sequence represents almost two hours, or about one-eighth of the orbital period of F ring particles around the planet.

Cassini was on a flight path that took the spacecraft away from the planet and farther south, so that the rings appear to tilt upward. The top portion of the F ring is closer to the spacecraft, while the bottom portion is farther away and curves around the far side of Saturn.

Scientists are not sure exactly how Prometheus is interacting with the F ring here, but they have speculated that the moon might be gravitationally pulling material away from the ring. Scientists speculate that the ring particles may end up in a slightly different orbit from the one

they were in prior to getting a 'kick' from the moon. These kicks occur at specific locations in the rings and can actually cause large waves or knots to form. In the still image, gaps in the diffuse inner strands are seen. All these features appear to be due to the influence of Prometheus in ways that are not fully understood.

Saturn's moon Prometheus is following in the footsteps of the legendary Titan for which it is named. In Greek mythology, Prometheus stole fire from the gods and gave it to the mortals.

Scientists will use what they learn about Prometheus' interaction with the F ring to understand the gravitational exchanges between moons and rings, which give rise to so much of the structure that is observed in Saturn's rings.

The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. The Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, manages the Cassini-Huygens mission for NASA's Science Mission Directorate, Washington, D.C. The Cassini orbiter and its two onboard cameras were designed, developed and assembled at JPL. The imaging team is based at the Space Science Institute, Boulder, Colo.

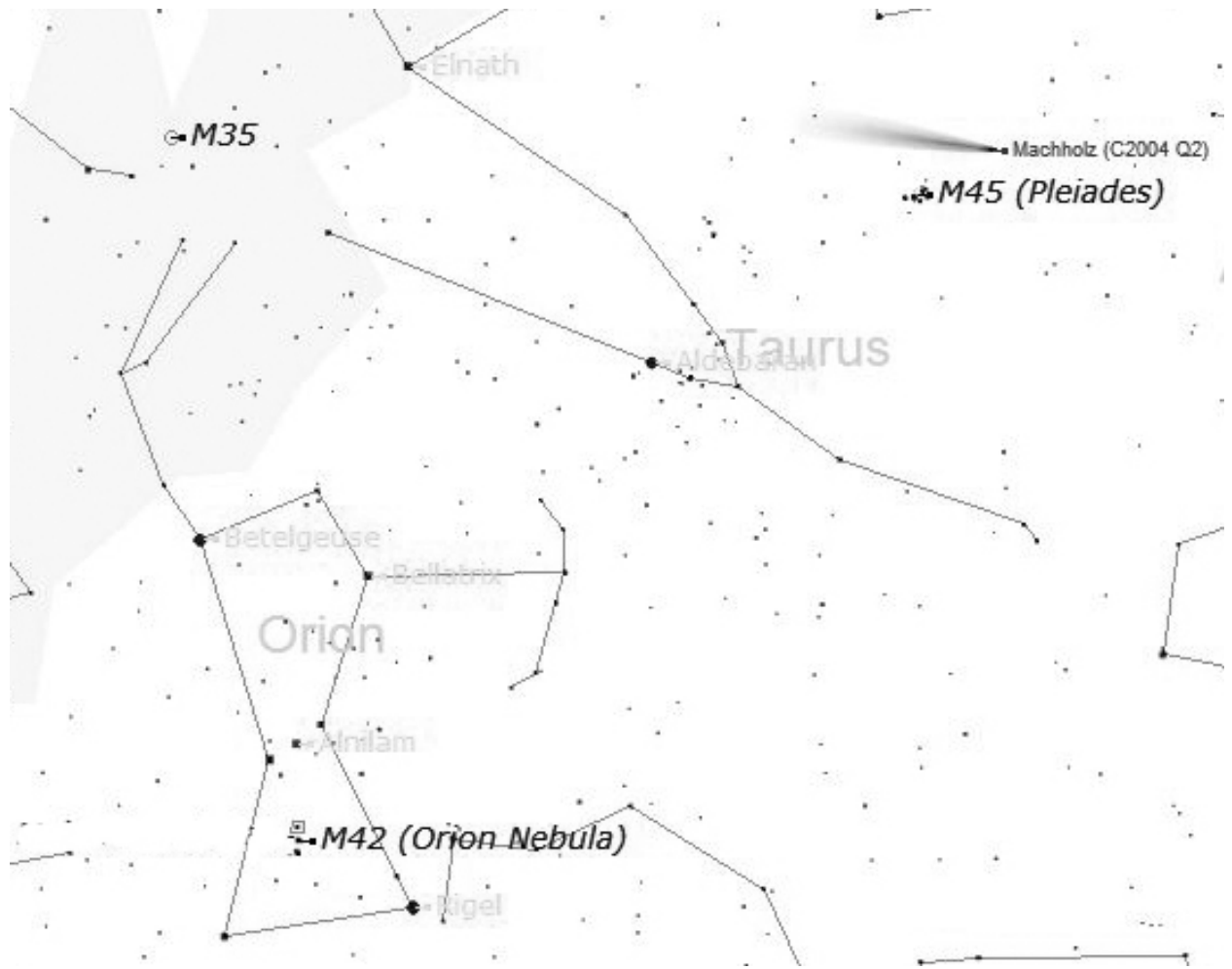
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### ***Mid Evening Observing Highlights for January***

Saturn can be found in the eastern sky in Gemini. Orion is prominent in the eastern sky. Below the three stars in Orion's belt the Orion Nebula (M42) can be seen. Auriga and Taurus are high in the sky. The bright star Aldebaran can be found in Taurus in the eastern part of the sky next to Saturn. The Andromeda Galaxy (M31) is in the western sky. The Great Square is setting in the western sky. The Double Cluster in Perseus can be found close to the zenith. The Milky Way stretches from the southeast to northwest. Full moon is on January 25th and new moon is on January 10th. Comet Machholz can be found earlier in January at its brightest in Taurus. Its maximum brightness will be on January 9<sup>th</sup> at magnitude 4.1. On January 8<sup>th</sup> it will be just to the west of the Pleiades. Check out the following link for more details.

[http://skyandtelescope.com/observing/objects/comets/article\\_1396\\_1.asp](http://skyandtelescope.com/observing/objects/comets/article_1396_1.asp)

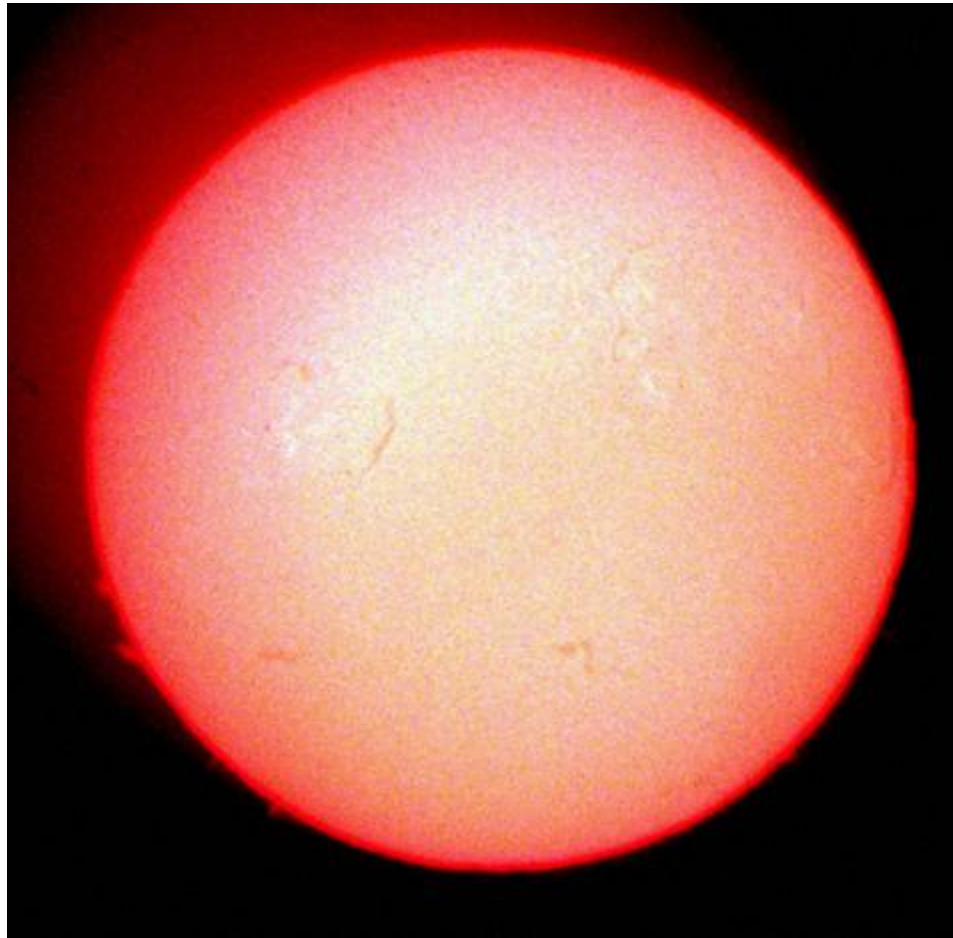
The chart below shows the location of Comet Machholz on January 8<sup>th</sup>.



### ***Observations and Photographs***

If you are interested in submitting an observation or photograph please contact John at [kocis@verizon.net](mailto:kocis@verizon.net).

John Kocijanski took the picture below that shows a hydrogen alpha view of the sun on Christmas day taken afocally through a Coronado PST using a 13mm Televue Nagler eyepiece and an Olympus D-550 digital zoom camera.



***BARLOW BOB'S CORNER***

Barlow Bob is a member of the Rockland Astronomy Club.

***2005 EVENTS***

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|----------------------|--|
| <b>APRIL 8 - 10</b>  | <b>DELMARVA STAR PARTY<br/>TUCKAHOE STATE PARK, MARYLAND<br/><a href="http://www.delmarvastargazers.org">http://www.delmarvastargazers.org</a></b> |
| <b>APRIL 16 - 17</b> | <b>NEAF<br/>SUFFERN, NEW YORK<br/><a href="http://www.rocklandastronomy.com/neaf/">http://www.rocklandastronomy.com/neaf/</a></b>                  |
| <b>JUNE 3 – 5</b>    | <b>JERSEY STARQUEST STAR PARTY<br/>HOPE, NEW JERSY<br/><a href="http://www.princetonastronomy.org">http://www.princetonastronomy.org</a></b>       |
| <b>JUNE 2 – 6</b>    | <b>CHERRY SPRINGS STAR PARTY<br/>CHERRY SPRINGS PARK, PA</b>   |

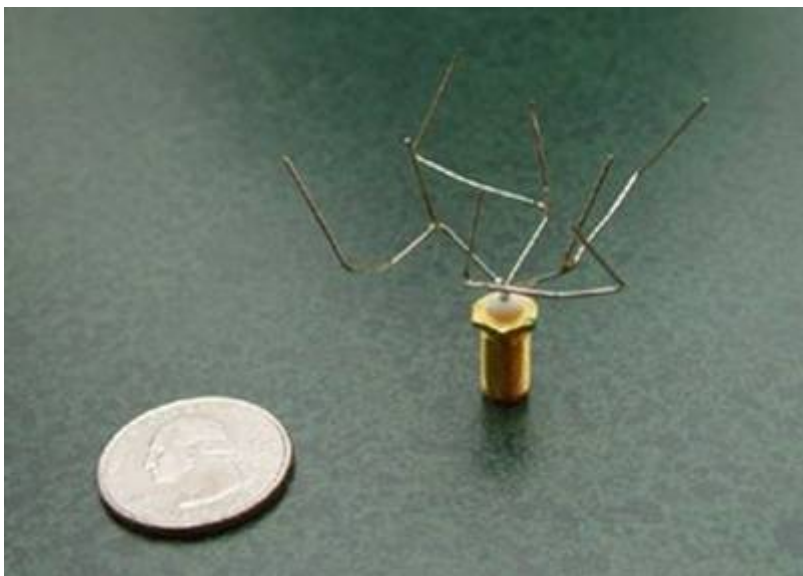


## **Antennas, Designed by Darwin**

by Patrick L. Barry

Who in their right mind would design this bizarre-looking antenna? Actually, nobody did. It *evolved*.

Taking a cue from nature, NASA engineers used a kind of "artificial evolution" to find this design. The result may look odd, but it works very well.



"The evolutionary process improves the design of antennas, just as evolution in nature leads to fitter plants and animals," says Jason Lohn, leader of the Evolvable Systems Group at NASA's Ames Research Center.

The improvement comes from Darwin's idea of natural selection: only the fittest members of a generation survive to produce offspring. Over many generations, traits that hinder survival are weeded out, while beneficial traits become more common. "In the end," he says, "you have the design equivalent of a shark, honed over countless generations to be well adapted to its environment and tasks."

Evolutionary computation, as it's called, applies this principle to hardware design. It's particularly useful for tackling problems that are difficult to solve by hand--like the design of new antennas.

Designing a new antenna for NASA's Space Technology 5 (ST-5) mission was the challenge facing Lohn's group. ST-5 will explore how TV-sized "nano-satellites" can perform the tasks of much larger, conventional satellites at a cheaper cost. Antennas on these satellites must be smaller than usual, yet capable of doing everything that a bigger antenna can do.

The evolution of this bizarre-looking antenna happened inside a computer. Many random designs were tested in a computer simulation. The computer judged their performance against certain goals for the design: efficiency, a narrow or wide broadcast angle, frequency range, and so on.

As in nature, only the best performers were kept, and these served as parents of a new generation. To make the new generation, the traits of the best designs were randomly mixed by the computer to produce fresh, new designs—just as a father and mother's genes are mixed to make unique children. This new generation was again tested in the computer simulation, and the best designs became the parents of yet another generation.

This process was repeated thousands, millions of times, until it settled onto an optimal, shark-like design that wouldn't improve any further. With today's fast computers, millions of generations can be simulated in only a day or so.

The result: an excellent antenna with an odd shape no human would, or could, design.

For more about artificial evolution, see [ic.arc.nasa.gov/story.php?sid=86&sec](http://ic.arc.nasa.gov/story.php?sid=86&sec). For more about Space Technology 5, see [nmp.nasa.gov/st5](http://nmp.nasa.gov/st5). For an animation that helps explain to kids how ST5's antenna sends pictures through space, go to [spaceplace.nasa.gov/en/kids/st5xband/st5xband.shtml](http://spaceplace.nasa.gov/en/kids/st5xband/st5xband.shtml).

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