Astronomy Club News

July, 2005

John Kocijanski, Editor

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The observation session scheduled for June 4th was held. Ten people attended. Chris Haines brought his 17 inch dobsonian reflector. The scope provided beautiful views of many different objects. It easily showed the spiral structure in the Whirlpool Galaxy as well as the Great Red Spot on Jupiter. The image below shows the telescope. The sky started out a bit poor but cleared nicely as the evening progressed. We observed many galaxies, star clusters, and nebulae.

The observation session scheduled for June 11th was canceled due to poor weather. The observation sessions for July are on the 2nd and 9th.

Anyone interested in submitting an astronomical observation, photograph, or equipment review for the newsletter, please contact John at kocis@verizon.net.

The club has selection of astronomy books, Stardate audio CDs, a Macintosh computer with astronomy software, and a Meade eight 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: 2005-098 June 9, 2005

NASA Announces Spectacular Day of the Comet

After a voyage of 173 days and 431 million kilometers(268 million miles), NASA's Deep Impact spacecraft will get up-close and personal with comet Tempel 1 on July 4 (EDT).

The first of its kind, hyper-speed impact between space-borne iceberg and copper-fortified probe is scheduled for approximately 1:52 a.m. EDT on Independence Day (10:52 p.m. PDT on July 3). The potentially spectacular collision will be observed by the Deep Impact spacecraft, and ground and space-based observatories.

"We are really threading the needle with this one," said Rick Grammier, Deep Impact project manager at NASA's Jet Propulsion Laboratory, Pasadena, Calif. "In our quest of a great scientific payoff, we are attempting something never done before at speeds and distances that are truly out of this world."

During the early morning hours of July 3 (EDT), the Deep Impact spacecraft will deploy a 1-meter-wide(39-inch-wide) impactor into the path of the comet, which is about half the size of Manhattan Island, N.Y. Over the next 22 hours, Deep Impact navigators and mission members located more than 133 million kilometers(83 million miles) away at JPL, will steer both spacecraft and impactor toward the comet. The impactor will head into the comet and the flyby craft will pass approximately 500 kilometers (310 miles) below.

Tempel 1 is hurtling through space at approximately 37,100 kilometers per hour(23,000 miles per hour or 6.3 miles per second). At that speed you could travel from New York to Los Angeles in less than 6.5 minutes. Two hours before impact, when mission events will be happening so fast and so far away, the impactor will kick into autonomous navigation mode. It must perform its own navigational solutions and thruster firings to make contact with the comet.

"The autonav is like having a little astronaut on board," Grammier said. "It has to navigate and fire thrusters three times to steer the wine cask-sized impactor into the mountain-sized comet nucleus closing at 23,000 miles per hour."

The crater produced by the impact could range in size from a large house up to a football stadium, and from two to 14 stories deep. Ice and dust debris will be ejected from the crater, revealing the material beneath. The flyby spacecraft has approximately 13 minutes to take images and spectra of the collision and its result before it must endure a potential blizzard of particles from the nucleus of the comet.

"The last 24 hours of the impactor's life should provide the most spectacular data in the history of cometary science," said Deep Impact Principal Investigator Dr. Michael A'Hearn of the University of Maryland, College Park. "With the information we receive after the impact, it will be a whole new ballgame. We know so little about the structure of cometary nuclei that almost every moment we expect to learn something new."

The Deep Impact spacecraft has four data collectors to observe the effects of the collision. A camera and infrared spectrometer, which comprise the High Resolution Instrument, are carried on the flyby spacecraft, along with a Medium Resolution Instrument. A duplicate of the Medium Resolution Instrument on the impactor will record the vehicle's final moments before it is run over by Tempel 1.

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

Deep Impact will provide a glimpse beneath the surface of a comet, where material from the solar system's formation remains relatively unchanged. Mission scientists expect 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 frozen celestial travelers we call comets.

The University of Maryland is responsible for overall Deep Impact mission management, and project management is handled by JPL. The spacecraft was built for NASA by Ball Aerospace & Technologies Corporation, Boulder, Colo.

For more information about Deep Impact on the Internet, visit: http://www.nasa.gov/deepimpact.

For information about NASA and agency programs on the Internet, visit: http://www.nasa.gov/home/index.html.

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Dolores Beasley/Marta Metelko (202/358-1753/1642)
NASA Headquarters, Washington

June 2, 2005

News Release: 2005-091

NASA'S Space Eyes Focus on Deep Impact Target

On July 4, NASA's Deep Impact spacecraft will attempt an extraordinarily daring encounter with the far-flung comet Tempel 1, which is hurtling through space at tens of thousands of miles per hour. As if that is not challenging enough, the comet's size, shape and other characteristics are not entirely known.

Two of NASA's eyes in the sky, the Spitzer and Hubble Space Telescopes, helped scientists prepare for the comet encounter. From their orbits high above Earth, the telescopes watched Tempel 1 in early 2004. Together they came up with the best estimates of the comet's size, shape, reflectivity and rotation rate. The data may help Deep Impact snap pictures of the dramatic rendezvous and increase the probability of making contact with the comet.

"Even tiny adjustments to our model of Tempel 1 are crucial to hitting the target and setting camera exposure times," said Dr. Carey Lisse, Johns Hopkins University Applied Physics Laboratory, Laurel, Md. Lisse is team leader for the Tempel 1 Spitzer studies.

Previous observations of Tempel 1 taken with ground-based telescopes indicated the comet is dark and oblong, with a width of a few miles, or kilometers. Spitzer and Hubble refined these measurements, revealing a matte black comet approximately 14 by 4 kilometers (8.7 by 2.5 miles), or roughly one-half the size of Manhattan.

"Spitzer was crucial in pinning down the comet's size," said Dr. Michael A'Hearn of the University of Maryland, College Park. He is principal investigator for Deep Impact and the Hubble observations. "We'll know exactly what it looks like when we get there."

The Deep Impact spacecraft was launched on Jan. 12, 2005. Its mission is to study the primordial soup of our solar system, which is sealed away inside comets.

On July 3, as it approaches Tempel 1, the spacecraft will separate into two parts. The impactor will attempt the tricky task of placing itself in the path of the speeding snowball, while the second part, the flyby spacecraft, swings around for a ringside view.

After the impactor is released, its specialized software will steer it toward the sunlit portion of Tempel 1's nucleus. To program the software, mission planners at NASA's Jet Propulsion Laboratory, Pasadena, Calif., needed to know the size and reflectivity of Tempel 1's surface. Since its surface can't be observed directly from Earth, scientists turned to Spitzer's infrared eyes to measure its size.

When viewing a comet in visible light from very far away, only reflected sunlight can be seen, so a big, dark comet can look the same as a highly reflective, small comet. In infrared light, a comet's radiated heat is measured, providing a direct look at its size.

Once the size of Tempel 1 was known, scientists could calculate surface reflectivity using a combination of Spitzer and Hubble data. They found Tempel 1 reflects only four percent of the sunlight that falls on it.

"Knowing the reflectivity also tells us how to set up our cameras," Lisse said. "Like photographers, it's important for us to know our subject before the shoot."

Tempel 1's shape and two-day rotation rate were derived from long-term observations made by various telescopes, including Hubble, Spitzer and the University of Hawaii's 2.2-meter telescope at Mauna Kea.

In addition to the flyby spacecraft, at least 30 telescopes around the world, including Spitzer, Hubble and the Chandra X-ray Observatory, will be watching the dramatic impact. By analyzing the material blown out of the interior of the comet, this global network of telescopes will assemble a list of the raw ingredients that went into making the planets in our solar system.

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News Release: 2005-096 June 8, 2005

Scientists Discover Possible Titan Volcano

A recent flyby of Saturn's hazy moon Titan by the Cassini spacecraft has revealed evidence of a possible volcano, which could be a source of methane in Titan's atmosphere.

Images taken in infrared light show a circular feature roughly 30 kilometers (19 miles) in diameter that does not resemble any features seen on Saturn's other icy moons. Scientists interpret the feature as an "ice volcano," a dome formed by upwelling icy plumes that release methane into Titan's atmosphere. The findings appear in the June 9 issue of Nature.

"Before Cassini-Huygens, the most widely accepted explanation for the presence of methane in Titan's atmosphere was the presence of a methane-rich hydrocarbon ocean," said Dr. Christophe Sotin, distinguished visiting scientist at NASA's Jet Propulsion Laboratory, Pasadena, Calif.

"The suite of instruments onboard Cassini and the observations at the Huygens landing site reveal that a global ocean is not present," said Sotin, a team member of the Cassini visual and infrared mapping spectrometer instrument and professor at the Université de Nantes, France.

"Interpreting this feature as a cryovolcano provides an alternative explanation for the presence of methane in Titan's atmosphere. Such an interpretation is supported by models of Titan's evolution," Sotin said.

Titan, Saturn's largest moon, is the only known moon to have a significant atmosphere, composed primarily of nitrogen, with 2 to 3 percent methane. One goal of the Cassini mission is to find an explanation for what is replenishing and maintaining this atmosphere. This dense atmosphere makes the surface very difficult to study with visible-light cameras, but infrared instruments like the visual and infrared mapping spectrometer can peer through the haze. Infrared images provide information about both the composition and the shape of the area studied.

The highest resolution image obtained by the visual and infrared mapping spectrometer instrument covers an area 150 kilometers square (90 miles) that includes a bright circular feature about 30 kilometers (19 miles) in diameter, with two elongated wings extending westward. This structure resembles volcanoes on Earth and Venus, with overlapping layers of material from a series of flows.

“We all thought volcanoes had to exist on Titan, and now we’ve found the most convincing evidence to date. This is exactly what we've been looking for," said Dr. Bonnie Buratti, team member of the Cassini visual and infrared mapping spectrometer at JPL.

In the center of the area, scientists clearly see a dark feature that resembles a caldera, a bowl-shaped structure formed above chambers of molten material. The material erupting from the volcano might be a methane-water ice mixture combined with other ices and hydrocarbons. Energy from an internal heat source may cause these materials to upwell and vaporize as they reach the surface. Future Titan flybys will help determine whether tidal forces can generate enough heat to drive the volcano, or whether some other energy source must be present. Black channels seen by the European Space Agency's Huygens probe, which piggybacked on Cassini and landed on Titan's surface in January 2005, could have been formed by erosion from liquid methane rains following the eruptions.

Scientists have considered other explanations. They say the feature cannot be a cloud because it does not appear to move and it is the wrong composition. Another alternative is that an accumulation of solid particles was transported by gas or liquid, similar to sand dunes on Earth. But the shape and wind patterns don't match those normally seen in sand dunes.

The data for these findings are from Cassini's first targeted flyby of Titan on Oct. 26, 2004, at a distance of 1,200 kilometers (750 miles) from the moon's surface.

The visual and infrared mapping spectrometer instrument can detect 352 wavelengths of light from 0.35 to 5.1 micrometers. It measures the intensities of individual wavelengths and uses the data to infer the composition

and other properties of the object that emitted the light; each chemical has a unique spectral signature that can be identified.

Forty-five flybys of Titan are planned during Cassini's four-year prime mission. The next one is Aug. 22, 2005. Radar data of the same sites observed by the visual and infrared mapping spectrometer may provide additional information.

For more information about the Cassini-Huygens mission visit http://saturn.jpl.nasa.gov and http://www.nasa.gov/cassini . The visual and infrared mapping spectrometer page is at http://wwwvims.lpl.arizona.edu .

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 mission for NASA's Science Mission Directorate, Washington, D.C. The Cassini orbiter was designed, developed and assembled at JPL. The visual and infrared mapping spectrometer team is based at the University of Arizona.

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News Release: 2005-095 June 6, 2005

NASA’s Opportunity Rover Rolls Free on Mars

Engineers and mission managers for NASA's Mars Exploration Rover mission cheered when images from the Martian surface confirmed Opportunity had successfully escaped from a sand trap.

From about 174 million kilometers away (about 108 million miles), the rover team at NASA's Jet Propulsion Laboratory, Pasadena, Calif., had worked diligently for nearly five weeks to extricate the rover. The long-distance roadside assistance was a painstaking operation to free all six wheels of the rover, which were mired up to their rims in the soft sand of a small martian dune.

"After a nerve-wracking month of hard work, the rover team is both elated and relieved to finally see our wheels sitting on top of the sand instead of half buried in it," said Jeffrey Biesiadecki, a JPL rover mobility engineer.

Traction was difficult in the ripple-shaped dune of windblown dust and sand that Opportunity drove into on April 26. In the weeks following, the rover churned 192 meters (629 feet) worth of wheel rotations before gaining enough traction to actually move one meter (about three feet). The rover team directed the drives in cautious increments from May 13 through June 4.

"We did careful testing for how to get Opportunity out of the sand. Then we patiently followed the strategy developed from the testing, monitoring every step of the way," Biesiadecki said. "We hope to have Opportunity busy with a full schedule of scientific exploration again shortly.”

Opportunity's next task is to examine the site to provide a better understanding of what makes that ripple different from the dozens of similar ones the rover easily crossed. "After we analyze this area, we'll be able to plan safer driving in the terrain ahead," said JPL's Jim Erickson, rover project manager.

Both Spirit and Opportunity have worked in harsh martian conditions much longer than anticipated. They have been studying geology on opposite sides of Mars for more than a year of extended missions since successfully completing their three-month primary missions in April 2004.

"The first thing we're going to do is simply take a hard look at the stuff we were stuck in," said Dr. Steve Squyres of Cornell University, Ithaca, N.Y. He is the principal investigator for the Mars rovers' science instruments. "After that, we will begin a cautious set of moves to get us on our way southward again. South is where we think the best science is, so that's still where we want to go."

Shortly after landing in January 2004, Opportunity found layered bedrock that bore geological evidence for a shallow ancient sea. Spirit did not find extensive layered bedrock until more than a year later, after driving more than two miles and climbing into a range of hills known as "Columbia Hills."

Images and information about the rovers and their discoveries are available on the Web at: http://www.nasa.gov/vision/universe/solarsystem/mer_main.html and http://www.jpl.nasa.gov/missions/mer/ .

For information about NASA and agency programs on the Web, visit: http://www.nasa.gov/home/index.html .

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News Release: 2005-099 June 9, 2005

NASA's Spitzer Captures Echo of Dead Star's Rumblings

An enormous light echo etched in the sky by a fitful dead star was spotted by the infrared eyes of NASA's Spitzer Space Telescope.

The surprising finding indicates Cassiopeia A, the remnant of a star that died in a supernova explosion 325 years ago, is not resting peacefully. Instead, this dead star likely shot out at least one burst of energy as recently as 50 years ago.

"We had thought the stellar remains inside Cassiopeia A were just fading away," said Dr. Oliver Krause, University of Arizona, Tucson. "Spitzer came along and showed us this exploded star, one of the most intensively studied objects in the sky, is still undergoing death throes before heading to its final grave."

Infrared echoes trace the dusty journeys of light waves blasted away from supernova or erupting stars. As the light waves move outward, they heat up clumps of surrounding dust, causing them to glow in infrared light. The echo from Cassiopeia A is the first witnessed around a long-dead star and the largest ever seen. It was discovered by accident during a Spitzer instrument test.

"We had no idea that Spitzer would ever see light echoes," said Dr. George Rieke of the University of Arizona. "Sometimes you just trip over the biggest discoveries."

To view the echoes dancing through clouds of dust surrounding Cassiopeia A, visit: http://www.spitzer.caltech.edu/Media/releases/ssc2005-14/visuals.shtml.

A supernova remnant like Cassiopeia A typically consists of an outer, shimmering shell of expelled material and a core skeleton of a once-massive star, called a neutron star. Neutron stars come in several varieties, ranging from intensely active to silent. Typically, a star that has recently died will continue to act up. Consequently, astronomers were puzzled that the star responsible for Cassiopeia A appeared to be silent so soon after its death.

The new infrared echo indicates the Cassiopeia A neutron star is active and may even be an exotic, spastic type of object called a magnetar. Magnetars are like screaming dead stars, with eruptive surfaces that rupture and quake, pouring out tremendous amounts of high-energy gamma rays. Spitzer may have captured the "shriek" of such a star in the form of light zipping away through space and heating up its surroundings.

"Magnetars are very rare and hard to study, especially if they are no longer associated with their place of origin. If we have indeed uncovered one, then it will be just about the only one for which we know what kind of star it came from and when," Rieke said.

Astronomers first saw hints of the infrared echo in strange, tangled dust features that showed up in the Spitzer test image. When they looked at the same dust features again a few months later using ground-based telescopes, the dust appeared to be moving outward at the speed of light. Follow-up Spitzer observations taken one year later revealed the dust was not moving, but was being lit up by passing light.

A close inspection of the Spitzer pictures revealed a blend of at least two light echoes around Cassiopeia A, one from its supernova explosion, and one from the hiccup of activity that occurred around 1953. Additional Spitzer observations of these light echoes may help pin down their enigmatic source.

Krause was lead author with Rieke of a study about the discovery appearing this week in the journal Science.

JPL manages the Spitzer Space Telescope mission for NASA's Science Mission Directorate. Science operations are conducted at the Spitzer Science Center, California Institute of Technology, Pasadena, Calif. JPL is a division of Caltech. Spitzer's multiband imaging photometer, which made the new observations, was built by Ball Aerospace Corporation, Boulder, Colo.; the University of Arizona; and Boeing North America, Canoga Park, Calif. Its development was led by Rieke.

For additional images and information about Spitzer on the Web, visit: http://www.spitzer.caltech.edu/Media . For information about NASA and agency programs on the Web, visit: http://www.nasa.gov/home/index.html .

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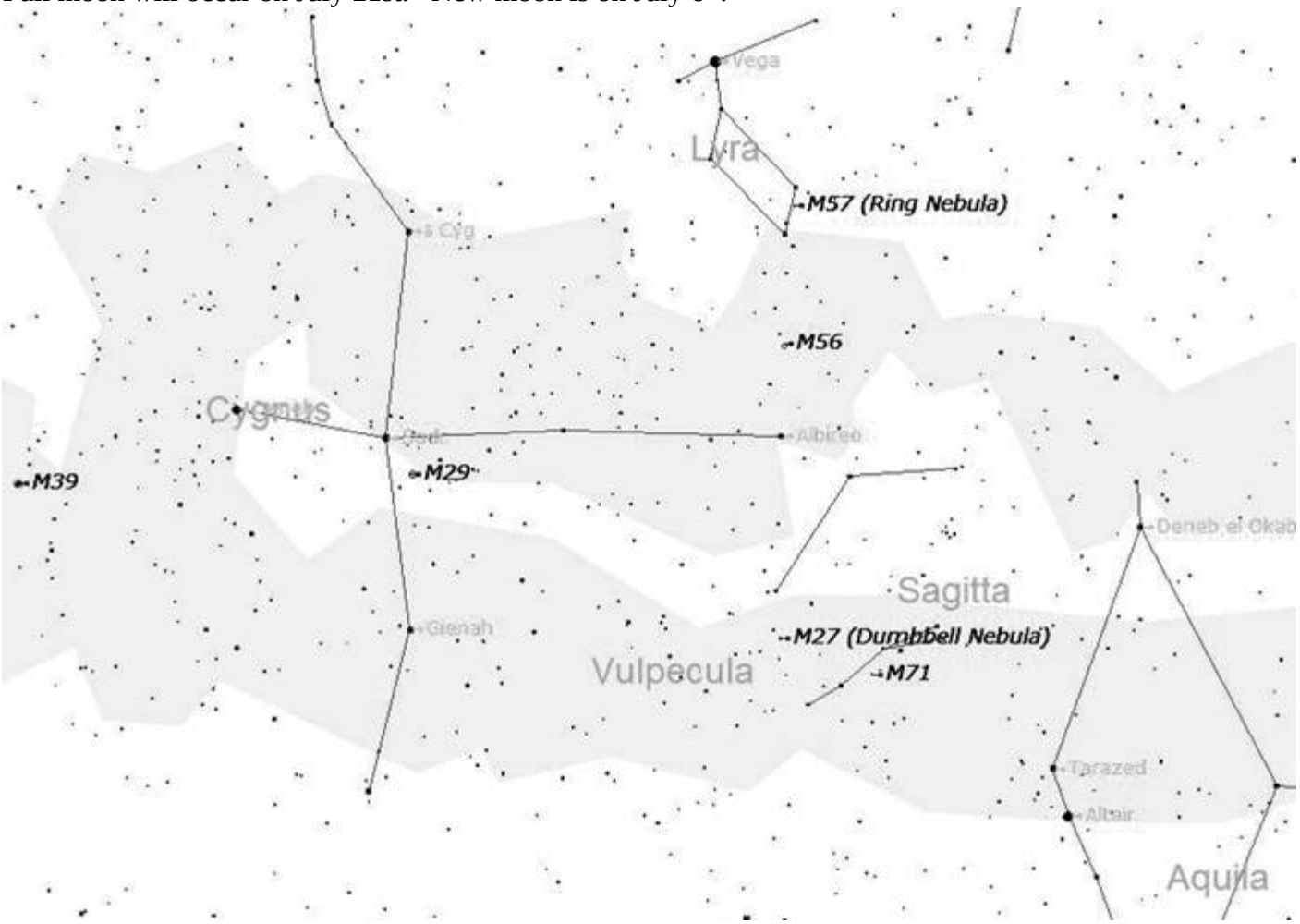
Middle Evening Observing Highlights for July

The brighter stars in the sky are Antares, Arcturus, Spica, Vega, Deneb, and Altair. Antares is in the southern sky in the constellation Scorpius. It has an orange. The globular cluster M4 can be found just to the west of it. Spica is in the western part of the sky in the constellation Virgo. Arcturus is in the western sky in the constellation Bootes but it is higher in the sky than Spica. Arcturus has a “ginger ale” tint. Vega, Deneb, and Altair are in the eastern sky. They form the asterism known as the Summer Triangle. Vega is in the constellation Lyra. Deneb is in the constellation Cygnus (the Northern Cross). Altair is in the constellation Aquilla. There are several deep sky objects that can be found within it such as the planetary nebula M57 and the open star cluster M39. The Keystone of the constellation Hercules is almost directly overhead (in the zenith). In the middle of the western side of the Keystone the globular cluster M13 can be seen. In the southeastern sky the constellation Sagittarius can be seen. It has a “teapot” shape. The Lagoon Nebula (M8) can be found to the northwest of the “teapot”. The globular cluster M22 can be found just to the east of the top

of the teapot. The center of our galaxy is located near Sagittarius. The plane of our galaxy (the Milky Way) stretches from the south to the north across the sky. The image below shows the area of the summer triangle and the location of some of the deep sky objects within it.

Full moon will occur on July 21st. New moon is on July 6th.



BARLOW BOB'S CORNER

Barlow Bob is a member of the Rockland Astronomy Club.

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Barlow Bob

NASA Space Place

Moving a Mountain of a Dish

by Patrick L. Barry

Your first reaction: "That's impossible!"

How on earth could someone simply *pick up* one of NASA's giant Deep Space Network (DSN) antennas—a colossal steel dish 12 stories high and 112 feet across that weighs more than 800,000 pounds—move it about 80 yards, and delicately set it down again?

Yet that's exactly what NASA engineers recently did.

One of the DSN dishes near Madrid, Spain, needed to be moved to a new pad. And it had to be done gingerly; the dish is a sensitive scientific instrument full of delicate electronics. Banging it around would not do.

"It was a heck of a challenge," says Benjamin Saldua, the structural engineer at JPL who was in charge of the move. "But thanks to some very careful planning, we pulled it off without a problem!"

The Deep Space Network enables NASA to communicate with probes exploring the solar system. Because Earth is constantly rotating, a single antenna on the ground can communicate with a probe for only part of the day, when the probe is overhead. By placing large dishes at three locations around the planet—Madrid, California, and Australia—NASA can maintain contact with spacecraft around the clock.

To move the Madrid dish, NASA called in a company from the Netherlands named Mammoet, which specializes in moving massive objects. (Mammoet is the Dutch word for "mammoth.")

On a clear day (bad weather might blow the dish over!), they began to slowly lift the dish. Hydraulic jacks at all four corners gradually raised the entire dish to a height of about 4.5 feet. Then Mammoet engineers positioned specialized crawlers under each corner. Each crawler looks like a mix between a flatbed trailer and a centipede: a flat, load-bearing surface supported by 24 wheels on 12 independently rotating axes, giving each crawler a maximum load of 194 tons!

One engineer took the master joystick and steered the whole package in its slow crawl to the new pad, never exceeding the glacial speed of 3 feet per minute. The four crawlers automatically stayed aligned with each other, and their independently suspended wheels compensated for unevenness in the ground.

Placement on the new pad had to be perfect, and the alignment was tested with a laser. To position the dish, believe it or not, Mammoet engineers simply followed a length of string tied to the pad's center pivot where the dish was gently lowered.

It worked. So much for "impossible."

Find out more about the DSN at http://deepspace.jpl.nasa.gov/dsn/ . Kids can learn about the amazing DSN antennas and make their own "Super Sound Cone" at The Space Place, http://spaceplace.nasa.gov/en/kids/tmodact.shtml.

Caption: *Giant Deep Space Network antenna in Madrid is moved using four 12-axle, 24-wheel crawlers.*