Space News Update

— June 2, 2017 —

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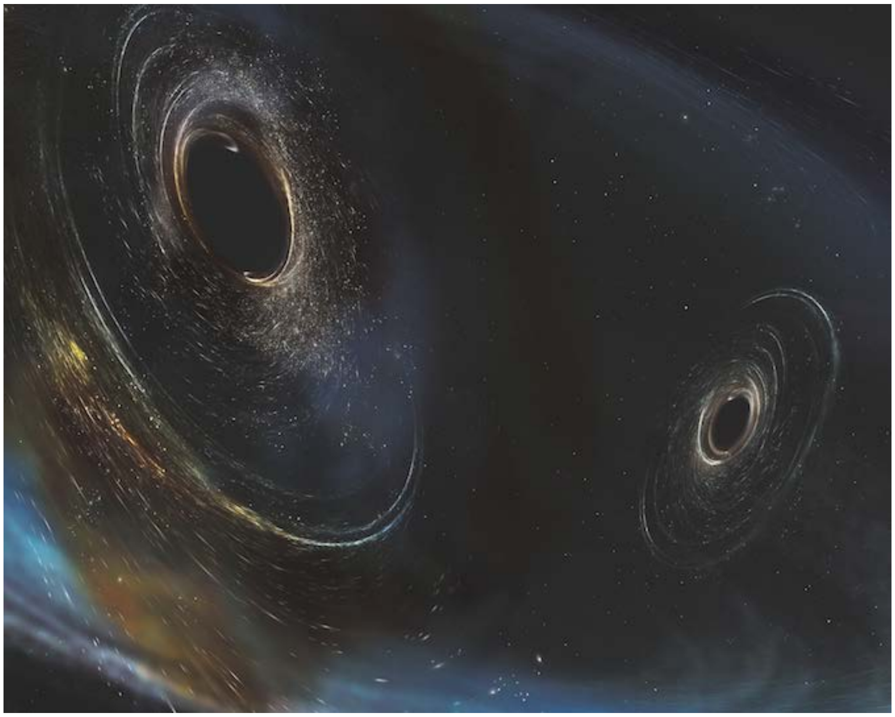
In the News

Departments

1. Black Holes Crash Together and Make Waves



Three billion years ago, in a third of a second, two black holes crashed into each other and merged into a single entity, converting two solar masses into energy that shook the fabric of spacetime, sending gravitational ripples across the universe that were detected on Earth last January, researchers announced Thursday.

It was the third confirmed detection of coalescing black holes detected so far by the U.S.-led Laser Interferometer Gravitational-Wave Observatory, or LIGO, a project made up of two observing stations, one near Hanford, Washington, and the other 1,800 miles away near Livingston, Louisiana.

As the gravitational waves passed by, they caused space to lengthen in one direction and compress in the other, squeezing and stretching the LIGO detectors ever so slightly and causing laser beams to cover slightly different distances as they bounced back and forth between massive mirrors.

Exhaustive tests and analyses confirmed the reality of the signal in another milestone for the growing field of gravitational wave astronomy.

“We have observed, on the fourth of January, 2017, another massive black hole-to-black hole binary coalescence, the merging of black holes roughly 20 and 30 times the mass of our sun,” David Shoemaker, the spokesperson for the LIGO Scientific Collaboration, told reporters.

“The key thing to take away from this third event is we’re really moving from novelty to new observational science, a new astronomy of gravitational waves.”

The discovery was detailed in a paper accepted by the journal Physical Review Letters.

The ripples detected by LIGO indicate the single black hole formed by the merger has a mass of about 49 times that of the sun, midway between the black holes detected by LIGO in September and December 2015. Two times the mass of Earth’s sun was converted directly into energy in a fraction of a second.

Black holes are among the most bizarre objects in the known universe. They are believed to form when massive stars run out of nuclear fuel at the end of their lives. Without the outward pressure generated by nuclear fusion to offset the inward pull of gravity, the core suddenly collapses as the star is blown apart.

For stars similar to the sun, core collapse stops due to quantum mechanical effects and a white dwarf remains, a compact remnant that slowly radiates its residual heat away into space. The cores of more massive stars can collapse even further, crushed to the point where protons merge with electrons. The result is a city-size ball of neutrons with the density of an atomic nucleus.

The cores of even more massive stars can collapse past the neutron star state, disappearing from the observable universe. Their gravity is so strong not even light can escape.

A major question mark is how binary black hole systems like those observed by LIGO form.

One school of thought holds the binary black holes form when two already paired stars explode and collapse to the ultimate state, spiraling into each other in a cataclysmic crash. The spins of each pre-merger black hole likely would be aligned with respect to their orbital motion.

A second theory holds that black holes form separately and later became gravitationally bound. In that case, the spins would be more randomly oriented.

LIGO's latest discovery "likely favors the theory that these two black holes formed separately in a dense stellar cluster, sank to the core of the cluster and then paired up rather than being formed together from the collapse of two already paired stars," said Laura Cadonati, a LIGO researcher at the Georgia Institute of Technology.

"This is an important clue in understanding how black holes form," she said. "We have found a new tile to put in the puzzle of understanding the formation mechanism."

Gravitational waves were predicted in 1916 by Einstein's general theory of relativity. The equations showed that massive bodies under acceleration, like binary black holes or the collapsing cores of huge stars in supernova explosions, would radiate gravitational energy in the form of waves distorting the fabric of space.

The waves would spread out in all directions, traveling at or near the speed of light. But detecting them is a major challenge. By the time a wave from an event many light years away reaches Earth, its effects are vastly reduced, becoming hard-to-detect ripples rather than powerful waves.

To detect those ripples, the LIGO observatories were designed to measure changes in distance that are vastly smaller than the width of an atomic nucleus.

"Gravitational waves are distortions in the metric of space, in the medium that we live in," said Michael Landry, director of the LIGO observatory near Hanford. "Normally, we don't think of the nothing of space as having any properties at all, so it's quite counter intuitive that it could expand or contract or vibrate.

"But that's what Einstein's relatively tells us. When a gravitational wave passes, the medium that we live in is distorted, and that causes what looks to us like length changes."

By way of analogy, Landry likened spacetime to the canvas of a painting.

"If I stretch the medium of a painting, I can see the painting get distorted," he said. "It's the medium that's vibrating, that's really what a gravitational wave is, and so we register the passage of those gravitational waves by comparing the length of the two long arms of our L-shaped detector."

Each LIGO observatory features a pair of 2.5-mile-long vacuum tubes arranged in an L shape in which precisely tuned laser beams flash back and forth between multiple mirrors that effectively increase the distance each beam travels to nearly 1,000 miles. The laser beams then are recombined and directed into a sensor.

If the laser beam in each vacuum tube travels exactly the same distance before it is recombined, the LIGO detectors do not “see” anything. But if gravitational waves pass through, that distance would change very slightly in a very predictable way, affecting the path of the laser beams.

The resulting interference patterns allow scientists to compute the masses involved and, in some cases, how the initial black holes were spinning with respect to their orbital motion.

The LIGO system features two widely separated observing stations to make sure a local vibration is not misinterpreted. A confirmed gravitational wave must be seen by both stations at roughly the same time.

And that’s precisely what the LIGO researchers found in the three confirmed cases to date. The first two events happened 1.3 and 1.4 billion light years away respectively. The collision that generated the waves detected in January occurred some 3 billion light years away.

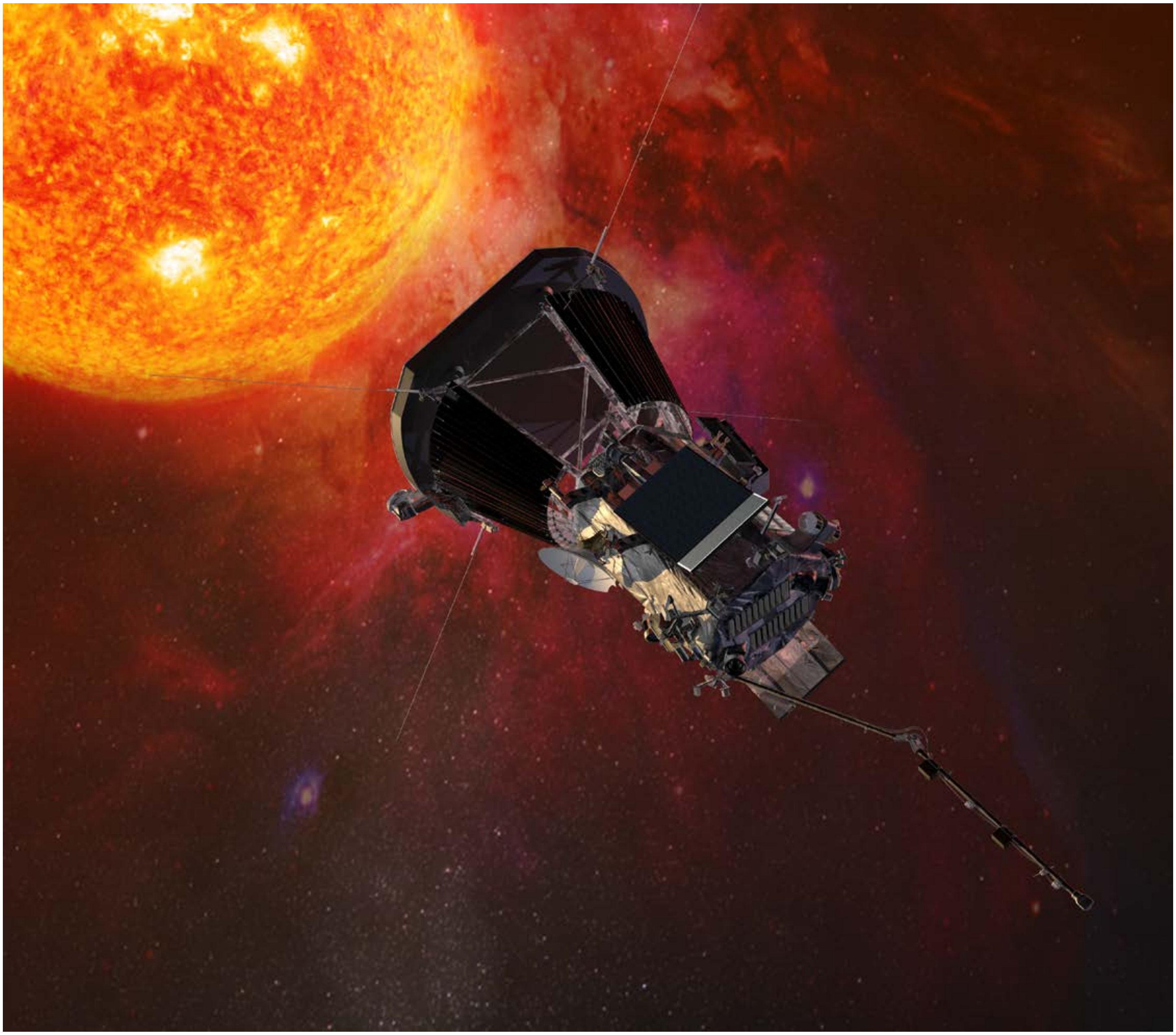
“It is remarkable that humans can put together a story, and test it, for such strange and extreme events that took place billions of years ago and billions of light-years distant from us,” Shoemaker said in a statement.

LIGO’s current observing campaign runs through the summer. After that, upgrades are planned to increase the sensitivity of the detectors, possibly bringing less powerful events like neutron star mergers into view. And there’s always a chance a nearby supernova or merger might occur, one that would give space a major shake.

“If one of this size were to actually coalesce in the Milky Way, it would make a marvelous signal for us, it would be enormously strong,” said Shoemaker. “But the likelihood there’s one in our Milky Way that’s about to coalesce is very, very low, so that’s not something that we’re betting on.”

Source: Spaceflight Now Return to Contents

2. NASA Solar Probe to “Touch” Sun’s Atmosphere



A NASA spacecraft being readied for launch in 2018 will make repeated trips through the sun's outer atmosphere, passing within 4 million miles of the star's blazing surface at more than 430,000 mph to shed light on what powers the sun's high-temperature corona, the origins of the solar wind and the causes of potentially catastrophic solar storms.

The Parker Solar Probe was officially renamed Wednesday in honor of Eugene Parker, the University of Chicago astrophysicist whose landmark 1958 paper predicted the existence of the million-mile-per-hour solar wind and its widespread influence across the solar system. It is the first NASA spacecraft to be named after a living individual.

"NASA has never named a spacecraft after a researcher during their lifetime," Thomas Zurbuchen, chief of science operations at NASA, said during a ceremony at the University of Chicago. "Well, ladies and gentlemen, we're about to make history. It is my great honor, a few days before your 90th birthday, Gene, to announce we're renaming the Solar Probe Plus spacecraft to be known from now on as the Parker Solar Probe."

Parker said he was "greatly honored to be associated with such a heroic scientific space mission."

"By heroic, of course, I'm referring to the temperature, the thermal radiation from the sun," he said. "The extreme measures developed to survive that radiation and collect scientific data should be fully appreciated."

Nicola Fox, the Parker Solar Probe project scientist at the Johns Hopkins University Applied Physics Laboratory, agreed, saying the first spacecraft named after a living scientist will "the hottest, fastest mission -- I like to call it the coolest hottest mission -- under the sun. ... We are going to go right up into the corona."

The visible surface of the sun, the photosphere, has a temperature of about 6,000 degrees Fahrenheit. But just a few hundred miles above the photosphere, in the star's corona, the temperature suddenly jumps to several million degrees. No one knows why.

"Why is the corona hotter than the surface of the sun?" Fox asked. "That defies the laws of nature. It's like water flowing uphill, it shouldn't happen. Why in this region does the solar atmosphere suddenly get so energized that it escapes from the hold of the sun and bathes all of the planets? We have not been able to answer these questions."

The Parker Solar Probe, equipped with a suite of sensitive instruments, is designed to directly probe those basic questions.

"We're going to be seven times closer than any other mission has ever been, and we will repeatedly swoop through the corona making these measurements," Fox said.

Perched atop a heavy-lift United Launch Alliance Delta 4 rocket, the 1,500-pound solar probe is scheduled for launch from the Cape Canaveral Air Force Station between July 31 and Aug. 19, 2018.

The heavy-lift booster, one of the most powerful in the U.S. inventory, is required to counteract Earth's 18-mile-per-second orbital velocity, allowing the spacecraft to drop into the inner solar system.

Even so, the spacecraft will need seven years to reach its target, making seven flybys of Venus along the way and using the planet's gravity to bend the trajectory into the desired elliptical trajectory around the sun.

The low point of the science orbit will be well inside the orbit of Mercury, taking the Parker Solar Probe as close as 3.7 million miles of the sun. The star's gravity will accelerate the spacecraft to a mind-boggling 450,000 mph at closest approach, fast enough to fly from New York to Tokyo in less than two minutes.

"Now, four million miles might not sound that close to you, but if the Earth and the sun were separated by one meter, we would be at four centimeters from the sun," Fox said. "So it's actually very, very close."

Protected by a 4.5-inch-thick carbon-composite heat shield, the Parker Solar Probe will endure temperatures up to 2,500 degrees Fahrenheit while keeping its science instruments at room temperature. It's technology that wasn't available when scientists first started dreaming of a solar spacecraft decades ago.

"As a theoretician, I greatly admire the scientists and engineers whose patient efforts together converted the solar probe concept into a functioning reality," Parker said, "ready to do battle with the solar elements as it divulges the secrets of the expanding corona. So hooray for for solar probe!"

Source: CBS News

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3. Lunar Orbiter Takes a Meteorite Strike Right in the Camera

On October 13th, 2014, the Lunar Reconnaissance Orbiter (LRO) experienced something rare and unexpected. While monitoring the surface of the Moon, the LRO's main instrument – the Lunar Reconnaissance Orbiter Camera (LROC) – produced an image that was rather unusual. Whereas most of the images it has produced were detailed and exact, this one was subject to all kinds of distortion.

From the way this image was disturbed, the LRO science team theorized that the camera must have experienced a sudden and violent movement. In short, they concluded that it had been struck by a tiny meteoroid, which proved to a significant find in itself. Luckily, the LRO and its camera appear to have survived the impact unharmed and will continue to survey the surface of the Moon for years to come.

The LROC is a system of three cameras that are mounted aboard the LRO spacecraft. This include two Narrow Angle Cameras (NACs) – which capture high-resolution black and white images – and a third Wide Angle Camera (WAC), which captures moderate resolution images that provide information about the properties and color of the lunar surface.

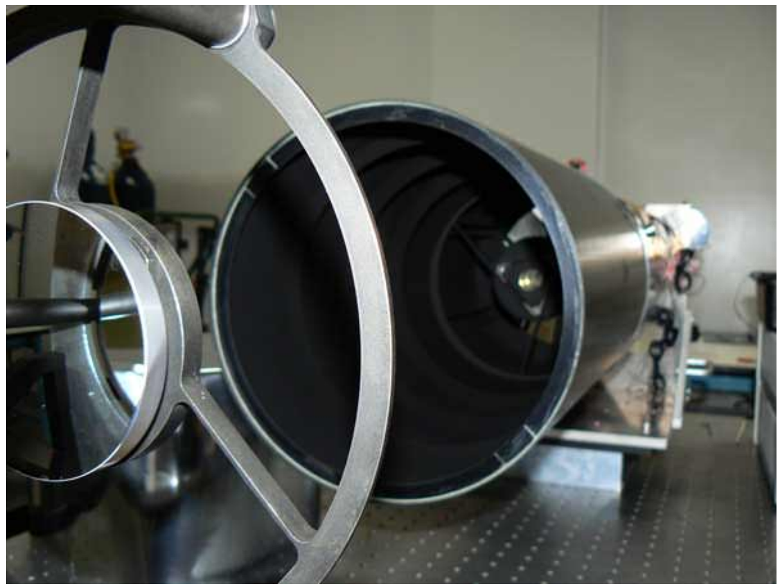
The NACs works by building an image one line at a time, with thousands of lines being used to compile a full image. In between the capture process, the spacecraft moves the camera relative to the surface. On October 13th, 2014, at precisely 21:18:48 UTC, the camera added a line that was visibly distorted. This sent the LRO team on a mission to investigate what could have caused it.

Led by Mark Robinson – a professor and the principal investigator of the LROC at Arizona State University's School of Earth and Space Exploration – the LROC researchers concluded that the left Narrow Angle Camera must have experienced a brief and violent movement. As there were no spacecraft events – like a solar panel movement or antenna tracking – that might have caused this, the only possibility appeared to be a collision.

As Robinson explained in a recent post on the LROC's website:

"There were no spacecraft events (such as slews, solar panel movements, antenna tracking, etc.) that might have caused spacecraft jitter during this period, and even if there had been, the resulting jitter should have affected both cameras identically… Clearly there was a brief violent movement of the left NAC. The only logical explanation is that the NAC was hit by a meteoroid! How big was the meteoroid, and where did it hit?"

To test this, the team used a detailed computer model that was developed specifically for the LROC to ensure that the NAC would not fail during the launch of the spacecraft, when severe vibrations would occur. With this model, the LROC team ran simulations to see if they could reproduce the distortions that would have caused the image. Not only did they conclude it was the result of a collision, but they were also able to determine the size of the meteoroid that hit it.



The results indicated that the impacting meteoroid would have measured about 0.8 mm in diameter and had a density of a regular chondrite meteorite (2.7 g/cm^3). What's more, they were able to estimate that it was traveling at a velocity of about 7 km/s (4.3 miles per second) when it collided with the NAC. This was rather surprising, given the odds of collisions and how much time the LRO spends gathering data.

Typically, the LROC only captures images during daylight hours, and for about 10% of the day. So for it to have been hit while it was also capturing images is statistically unlikely – only about 5% by Robinson's own estimate. Luckily, the impact has not caused any technical problems for the LROC, which is also something of a minor miracle. As Robinson explained:

"For comparison, the muzzle velocity of a bullet fired from a rifle is typically 0.5 to 1.0 kilometers per second. The meteoroid was traveling much faster than a speeding bullet. In this case, LROC did not dodge a speeding bullet, but rather survived a speeding bullet! LROC was struck and survived to keep exploring the Moon, thanks to Malin Space Science Systems' robust camera design."

It was only after the team deduced that no damage had been caused that prompted the announcement. According to John Keller, the LRO project scientist from NASA's Goddard Space Flight Center, the real story here was how the imagery that was being acquired at the time was used to deduce how and when the LRO had been struck by a meteoroid.

Artist's rendering of Lunar Reconnaissance Orbiter (LRO) in orbit. Credit: ASU/LROC

"Since the impact presented no technical problems for the health and safety of the instrument," he said, "the team is only now announcing this event as a fascinating example of how engineering data can be used, in ways not previously anticipated, to understand what is happening to the spacecraft over 236,000 miles (380,000 kilometers) from the Earth."

In addition, the impact of a meteoroid on the LRO demonstrates just how precious the information that missions like the LRO provides truly is. Beyond mapping the lunar surface, the orbiter was also able to let its science team know exactly and when its images were comprised, all because of the high-quality data it collects.

Since it launched in June of 2008, the LRO has collected an immense amount of data on the lunar surface. The mission has been extended several times, from its original duration of two years to the just under nine. Its ongoing performance is also a testament to the durability of the craft and its components.

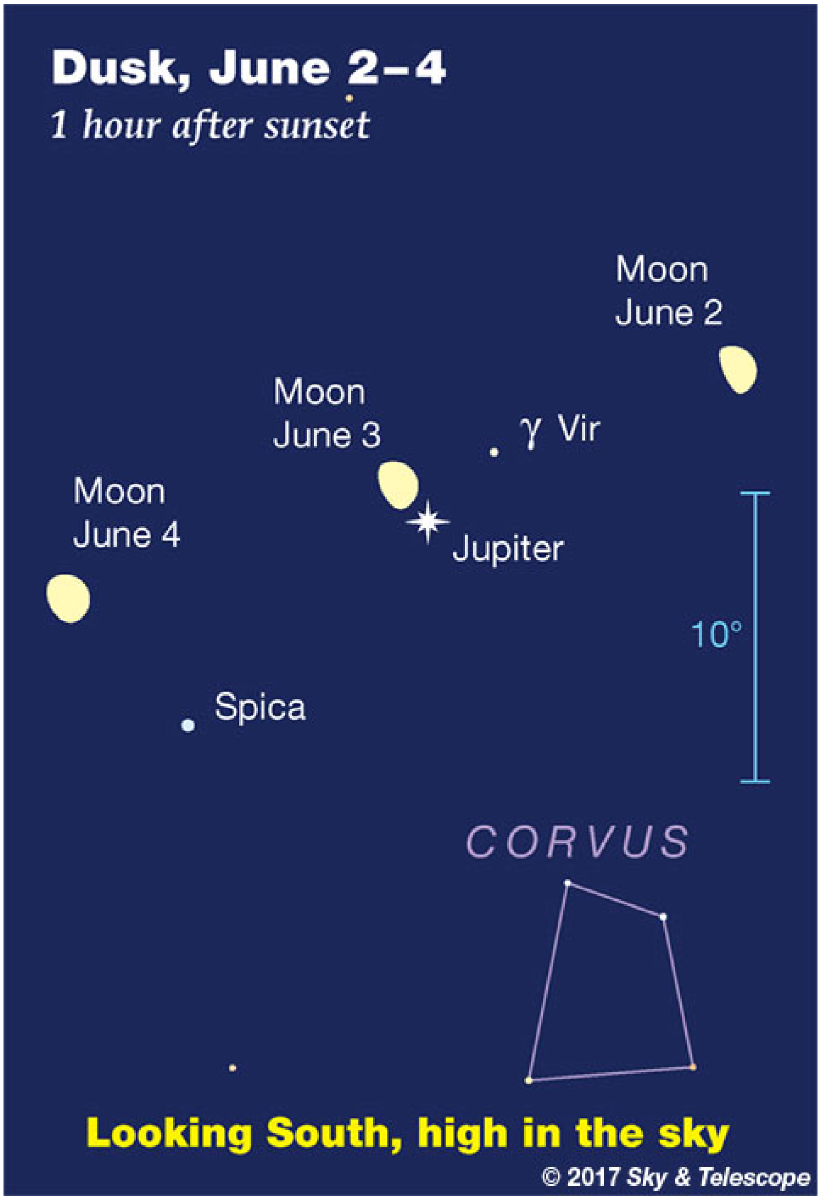
Be sure to enjoy this video of the images obtained by the LRO, courtesy of the LROC team.

Source: Universe Today Return to Contents

The Night Sky

Friday, June 2
• The Moon, Jupiter, and Spica form a gently curving arc in the southwest this evening.

• You may know the naked-eye Head of Serpens asterism, but what about the binocular Serpent's Fang jutting to its west? It's rich in optical double stars for binoculars — as Matt Wedel describes in his Binocular Highlight column and chart in the June *Sky & Telescope*, page 43.



Saturday, June 3
• Jupiter is the bright "star" with the Moon, as seen at right. They're only a couple degrees apart as viewed at dusk from North America. But Jupiter this evening is 1,860 times farther away.

• Lower left of them is Spica. Much closer to them in the opposite direction is fainter Gamma (γ) Virginis, a close double star for telescopes (separation 2.6 arcseconds this year).

• And, a double shadow-transit occurs on Jupiter tonight. From 10:22 p.m. to 12:22 a.m. EDT, both Io and larger Ganymede are casting their tiny black shadows onto Jupiter's face.

• And then, Jupiter's Great Red Spot transits the planet's central meridian around 12:55 a.m. EDT (9:55 p.m. PDT). Quite a telescopic night for this little group of objects.

Sunday, June 4
• Now the Moon stands closer to Spica than to Jupiter.

• Arcturus shines 30° to the upper left of Jupiter after dark. The brightest star in the northeast, very far lower left from Arcturus, is Vega. Look a third of the way from Arcturus to Vega for the delicate semicircle of Corona Borealis, the Northern Crown, with its brighter gem star Alphecca.

Two thirds of the way from Arcturus to Vega is the dim Keystone of Hercules.

Monday, June 5
• Do you sometimes like to watch the stars come out, one by one and then in great numbers? After sunset this evening, how soon you can spot Jupiter, the brightest point of all? It's about 25° (2½ fist-widths at arm's length) upper right of the Moon, as seen in twilight for North America.

Next, watch for Arcturus to appear 30° above the Moon.

And then comes Spica. Find the midpoint between the Moon and Jupiter, and watch just below or lower right of there for Spica to appear.

Tuesday, June 6

• After dark, Vega is the brightest star very high in the east. Just a little lower left of it is 4th-magnitude Epsilon Lyrae, the Double-Double. Epsilon forms one corner of a roughly equilateral triangle with Vega and Zeta Lyrae. The triangle is less than 2° on a side, hardly the width of your thumb at arm's length.

Binoculars easily resolve Epsilon. And a 4-inch telescope at 100× or more should resolve each of Epsilon's wide components into a tight pair.

Zeta Lyrae is also a double star for binoculars; much tougher, but plainly resolved in any telescope.

Delta Lyrae, below Zeta, is a much wider and easier pair.

Source: Sky & Telescope Return to Contents

ISS Sighting Opportunities

For Denver:

Date	Visible	Max Height	Appears	Disappears
Fri Jun 2, 00:20 AM	1 min	17°	10° above NW	17° above NNW
Fri Jun 2, 9:53 PM	1 min	10°	10° above N	10° above NNE
Fri Jun 2, 11:30 PM	1 min	24°	20° above N	24° above NNE
Sat Jun 3, 9:01 PM	1 min	10°	10° above N	10° above N
Sat Jun 3, 10:38 PM	3 min	17°	15° above N	12° above ENE
Sun Jun 4, 00:12 AM	< 1 min	15°	10° above NW	15° above NW
Sun Jun 4, 9:45 PM	3 min	13°	12° above N	10° above NE
Sun Jun 4, 11:22 PM	1 min	37°	22° above NNW	37° above N
Mon Jun 5, 8:53 PM	2 min	11°	10° above N	10° above NNE
Mon Jun 5, 10:30 PM	2 min	28°	21° above N	22° above ENE
Tue Jun 6, 9:38 PM	4 min	19°	15° above N	10° above ENE
Tue Jun 6, 11:13 PM	2 min	34°	12° above WNW	34° above WNW

Sighting information for other cities can be found at NASA's Satellite Sighting Information

NASA-TV Highlights
(all times Eastern Daylight Time)

3 p.m., 7 p.m., 11 p.m., Friday, June 2 - Replay of the ISS Expedition 51/Soyuz MS-03 Landing Video File (all channels)

4 p.m., 8 p.m., 10 p.m., Friday, June 2 - Replay of SpaceCast (all channels)

1 a.m., 2 a.m., 7 a.m., 11 a.m., Saturday, June 3 - Replay of the ISS Expedition 51 In-Flight Interview for KMGH-TV, Denver with Flight Engineer Jack Fischer of NASA (NTV-1 (Public))

8 a.m., 11 p.m., Saturday, June 3 - Replay of SpaceCast (all channels)

1:30 p.m., Saturday, June 3 - Replay of the "What's On Board" CRS-11 Science Briefing (all channels)

3:30 p.m., Saturday, June 3 - Replay of the CRS-11 Prelaunch News Conference (all channels)

4:30 p.m., Saturday, June 3 - Coverage of the SpaceX/Dragon CRS-11 Launch (Launch scheduled at 5:07 p.m. EDT) (all channels)

6:30 p.m., Saturday, June 3 - SpaceX/Dragon CRS-11 Post-Launch News Conference (all channels)

9 p.m., Saturday, June 3 - Replay of the CRS-11 Post launch News Conference (all channels)

1 a.m., 2 a.m., 3 a.m., 7 a.m., 3 p.m., 7 p.m., 11 p.m., Sunday, June 4 - Replay of the ISS Expedition 51 In-Flight Interview for KMGH-TV, Denver with Flight Engineer Jack Fischer of NASA (NTV-1 (Public))

6 a.m., 4 p.m., Sunday, June 4 - Replay of SpaceCast (all channels)

8:30 a.m., Sunday, June 4 - Coverage of the Departure of the Orbital ATK Cygnus CRS-7 Cargo Craft from the ISS (Release scheduled at 9:10 a.m. EDT) (all channels)

2 p.m., 6 p.m., Sunday, June 4 - Replay of the CRS-11 Post launch News Conference (all channels)

8:30 a.m., Monday, June 5 - Coverage of the Rendezvous and Capture of the SpaceX/Dragon CRS-11 Cargo Craft at the ISS (Capture scheduled at 10 a.m. ET) (all channels)

12 p.m., Monday, June 5 - Video File Feed of ISS Expedition 51 Post-Landing Activities in Karaganda, Kazakhstan and Star City, Russia (recorded on June 2) (all channels)

Watch NASA TV on the Net by going to the NASA website. Return to Contents

Space Calendar

- Jun 02 - [May 28] Soyuz MS-3 Return to Earth (International Space Station)
- Jun 02 - Venus Passes 1.8 Degrees From Uranus
- Jun 02 - Comet C/2016 S1 (PANSTARRS) Closest Approach To Earth (2.218 AU)
- Jun 02 - [Jun 02] Comet P/2017 K3 (Gasparovic) Perihelion (2.312 AU)
- Jun 02 - Comet 234P/LINEAR Perihelion (2.848 AU)
- Jun 02 - Asteroid 13188 Okinawa Closest Approach To Earth (1.060 AU)
- Jun 02 - Asteroid 3709 Polypoites Closest Approach To Earth (4.601 AU)
- Jun 02 - Kuiper Belt Object 278361 (2007 JJ43) At Opposition (40.061 AU)
- Jun 02 - Clair Patterson's 95th Birthday (1922)
- Jun 03 - Venus At Its Greatest Western Elongation (46 Degrees)
- Jun 03 - Comet 73P-W/Schwassmann-Wachmann Perihelion (0.965 AU)
- Jun 03 - Comet C/2015 T4 (PANSTARRS) At Opposition (3.277 AU)
- Jun 03 - Asteroid 8844 (1990 QR2) Occults HIP 95408 (6.0 Magnitude Star)
- Jun 03 - Apollo Asteroid 2017 KJ3 Near-Earth Flyby (0.028 AU)
- Jun 03 - Amor Asteroid 2017 JL3 Near-Earth Flyby (0.081 AU)
- Jun 03 - Asteroid 293934 MPIA Closest Approach To Earth (1.760 AU)
- Jun 04 - Cassini, Distant Flyby of Pan & Epimetheus
- Jun 04 - Comet 172P/Yeung Closest Approach To Earth (2.355 AU)
- Jun 04 - [May 26] Amor Asteroid 2017 KJ5 Near-Earth Flyby (0.030 AU)
- Jun 04 - [May 29] Apollo Asteroid 2017 KK27 Near-Earth Flyby (0.040 AU)
- Jun 04 - Apollo Asteroid 1685 Toro Closest Approach To Earth (1.355 AU)
- Jun 04 - Asteroid 231307 Peterfalk Closest Approach To Earth (1.981 AU)
- Jun 04 - Asteroid 4559 Strauss Closest Approach To Earth (2.127 AU)
- Jun 04 - 15th Anniversary (2002), Mike Brown, Chad Trujillo's Discovery of 50000 Quaoar
- Jun 05 - GSAT-19E LVM3 Launch
- Jun 05 - Comet C/2015 V2 (Johnson) Closest Approach To Earth (0.811 AU)
- Jun 05 - Comet 172P/Yeung At Opposition (2.355 AU)
- Jun 05 - Comet 169P/NEAT Closest Approach To Earth (2.552 AU)
- Jun 05 - Asteroid 4150 Starr Closest Approach To Earth (1.057 AU)
- Jun 05 - Asteroid 1941 Wild Closest Approach To Earth (3.134 AU)
- Jun 05 - Jupiter Trojan Asteroid 5254 Ulysses Closest Approach To Earth (4.829 AU)
- Jun 05 - 10th Anniversary (2007), MESSENGER, 2nd Venus Flyby
- Jun 05 - 15th Anniversary (2002), STS-111 Launch (Space Shuttle Endeavour, International Space Station)
- Jun 05 - John Bolton's 95th Birthday (1922)
- Jun 06 - Comet C/2016 A8 (LINEAR) At Opposition (2.718 AU)
- Jun 06 - Comet P/1996 R2 (Lagerkvist) At Opposition (2.973 AU)
- Jun 06 - [May 29] Apollo Asteroid 2017 KQ27 Near-Earth Flyby (0.003 AU)
- Jun 06 - [May 29] Apollo Asteroid 2017 KR27 Near-Earth Flyby (0.018 AU)
- Jun 06 - Apollo Asteroid 2012 HN13 Near-Earth Flyby (0.073 AU)
- Jun 06 - Asteroid 13070 Seanconnery Closest Approach To Earth (1.254 AU)
- Jun 06 - Asteroid 1886 Lowell Closest Approach To Earth (1.315 AU)
- Jun 06 - Asteroid 1756 Giacobini Closest Approach To Earth (1.938 AU)
- Jun 06 - Asteroid 2046 Leningrad Closest Approach To Earth (2.217 AU)
- Jun 06 - David Scott's 85th Birthday (1932)
- Jun 06 - Ralph Baldwin's 105th Birthday (1912)

Source: JPL Space Calendar

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Food for Thought

Inspiration Links The Beatles, a Fossil and a NASA Mission

Fifty years ago today (June 1), The Beatles released their album 'Sgt. Pepper's Lonely Hearts Club Band,' which included the iconic song "Lucy In The Sky With Diamonds." The popular song was critically acclaimed for evoking a surreal dreamscape, along the lines of Lewis Carroll’s classic "Alice's Adventures in Wonderland" fantasy. John Lennon said it was inspired by a drawing his son Julian — then age 3 — had made of a nursery school classmate named Lucy.

Fast forward to Nov. 24, 1974, when, during a fossil-hunting expedition in Hadar, Ethiopia, anthropologist Donald Johanson and a student decided to take an alternate route back to their Land Rover through a nearby gully. There, Johanson discovered a fossil forearm bone and quickly identified it as a species of hominin, a human ancestor originating after the evolutionary split from the ancestors of apes. Shortly thereafter, he saw an occipital (skull) bone, then a femur, some ribs, a pelvis and the lower jaw. Two weeks later, after many hours of excavation, screening and sorting, several hundred fragments of bone had been recovered, representing 40 percent of a single hominin skeleton.

Later that night, there was much celebration and excitement over the discovery of what looked like a fairly complete hominin skeleton. There was dancing and singing; The Beatles’ song "Lucy In The Sky With Diamonds" was playing. At some point during that night, expedition member Pamela Alderman named the skeleton "Lucy," and the name stuck.

Jump ahead to 2013, when a proposed NASA mission to explore Jupiter's Trojan asteroids was in search of a name. While most NASA missions are acronyms, this particular mission took a different path.

Planets were built from solid materials orbiting the sun that came together under their mutual gravitational attraction. Primitive, volatile-rich bodies like the Trojans — in swarms ahead of and behind Jupiter in its orbit around the sun — are fossils of these first planetary building blocks and hold valuable clues to how the planets formed. Earth's oceans and atmosphere may have been supplemented by impacts from primitive bodies similar to the Trojans, so these fossils may help reveal our most distant origins.

That link to our beginnings inspired the mission's principal investigator, Harold Levison of the Southwest Research Institute (SwRI), Boulder, Colorado, to name the spacecraft after the Lucy fossil. The connection to The Beatles' song was the icing on the cake. "These asteroids really are like diamonds in the sky in terms of their scientific value for understanding how the giant planets formed and the solar system evolved," said Levison.

News of the Lucy mission name was welcomed by the team that discovered the famous fossil.

"When I first learned of the Lucy mission, during a visit to Bhutan, I was thrilled and overwhelmed with pride," said anthropologist Johanson. "As a teenager, I was very involved in astronomy with a 10-inch Clark refractor telescope at my high school. It is deeply rewarding that more than 40 years after my discovery of Lucy, she continues to play an important role in scientific exploration."

So this is how a hit song, inspired by a drawing from a rock star's young son, inspired the name of a fossil human ancestor, which inspired the name of a NASA mission to understand our origins.

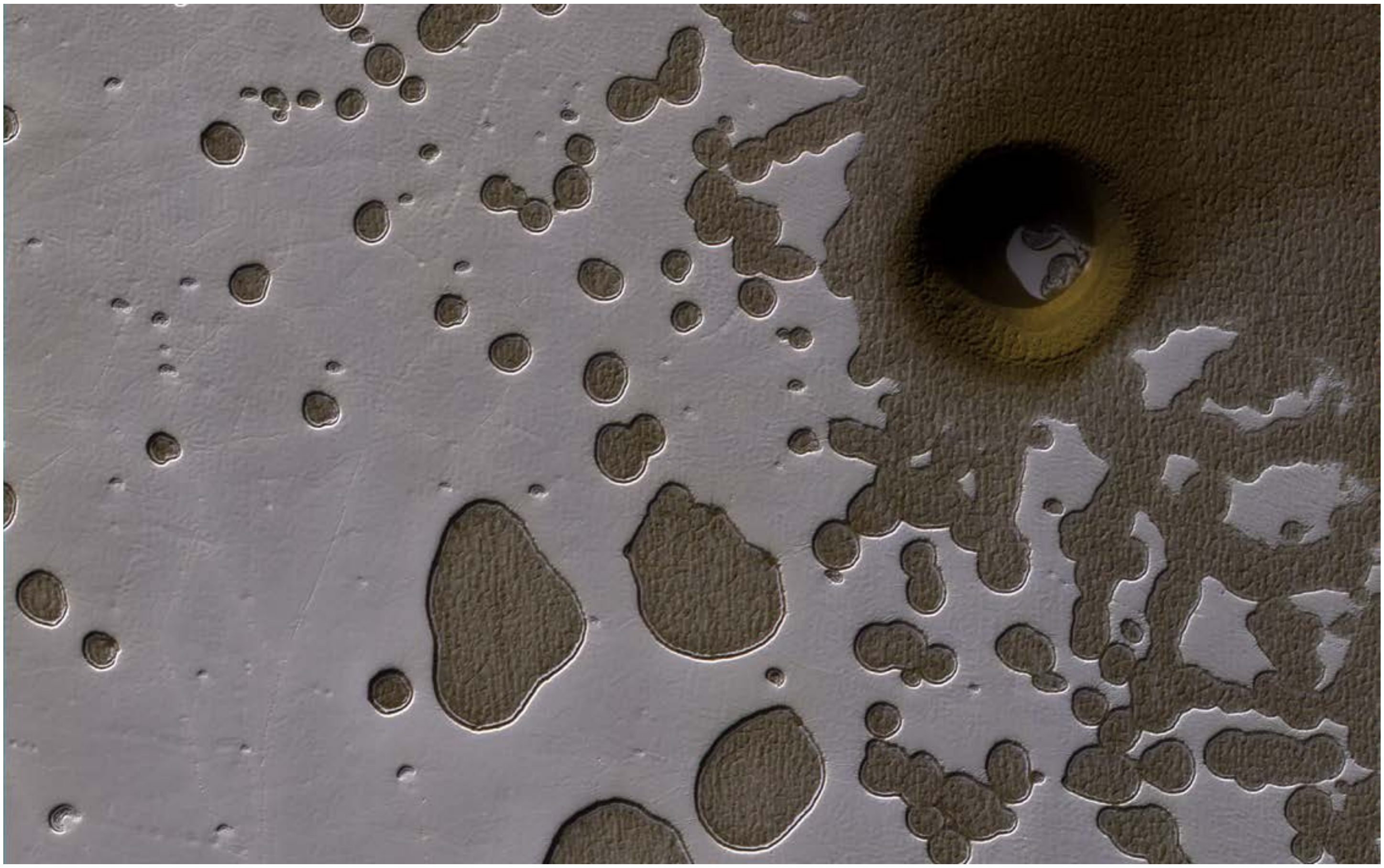
"We are conscious of all the ways the name we chose for this mission has different cultural meanings," said Keith Noll, project scientist for Lucy at NASA's Goddard Space Flight Center in Greenbelt, Maryland. "If Lucy resonates with someone, brings them in and gets them asking questions, that's just great."

Lucy will launch in October 2021 and fly by its targets between 2025 and 2033. In all, Lucy will study six Trojans and one Main Belt asteroid.

For more information about NASA's Lucy mission: www.nasa.gov/lucy

Source: NASA Return to Contents

Space Image of the Week



A South Polar Pit or an Impact Crater?

This observation from NASA's Mars Reconnaissance Orbiter show it is late summer in the Southern hemisphere, so the Sun is low in the sky and subtle topography is accentuated in orbital images. We see many shallow pits in the bright residual cap of carbon dioxide ice (also called "Swiss cheese terrain"). There is also a deeper, circular formation that penetrates through the ice and dust. This might be an impact crater or it could be a collapse pit.

This is a stereo pair with ESP_049945_0930.

The map is projected here at a scale of 50 centimeters (19.7 inches) per pixel. [The original image scale is 49.7 centimeters (19.6 inches) per pixel (with 2 x 2 binning); objects on the order of 149 centimeters (67.3 inches) across are resolved.] North is up.

The University of Arizona, Tucson, operates HiRISE, which was built by Ball Aerospace & Technologies Corp., Boulder, Colo. NASA's Jet Propulsion Laboratory, a division of Caltech in Pasadena, California, manages the Mars Reconnaissance Orbiter Project for NASA's Science Mission Directorate, Washington.

Source: NASA

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