Space News Update

— June 21, 2019 —

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In the News

Departments

1. OSIRIS-REx Sets New Orbital Record

NASA's OSIRIS-REx spacecraft has been at asteroid Bennu since Dec. 3rd, 2018. On that day, it went from travelling to the asteroid to travelling around it. Since then it's been surveying and mapping Bennu.

Now OSIRIS-REx (Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer) has reached a new milestone. On June 12th, the spacecraft executed another maneuver, and in the process broke its own record for the closest orbit of a planetary body by a spacecraft.

This signalled the beginning of a new phase for the OSIRIS-REx mission called Orbital B. In Orbital B, the spacecraft is orbiting asteroid Bennu at an altitude of 680 meters (2,231 feet). (This beats its own previous record of 1.3 kilometers (0.8 miles) above the surface.)

OSIRIS-REx will remain in Orbital B until the second week of August. Following that, it will raise its orbit to 1.3 km (0.8 miles) above the surface. During the first two weeks of Orbital B, the spacecraft will investigate particles being ejected into space. It first spotted those particles when it arrived at Bennu, and scientists want to investigate by taking frequent images of the asteroid's horizon.

or Orbital B's remaining five weeks, the spacecraft will investigate Bennu with its science instruments. These include:

- OSIRIS-REx Laser Altimeter (OLA) which will produce a full map of Bennu's terrain.
- PolyCam, which will create a high-resolution, global image mosaic of the asteroid.
- OSIRIS-REx Thermal Emission Spectrometer (OTES) which will create an infrared global map.
- REgolith X-ray Imaging Specvtrometer (REXIS) which will produce a global X-ray map.

These instruments will work together to help scientists select the best spot to collect a sample from Bennu.

Beyond choosing the sites with the best samples, mission personnel have to assess them for likely success. The team operating the spacecraft will identify four possible sites for sample collection. Following the Orbital B phase is the Reconnaissance Phase of the mission. During that phase, OSIRIS-REx will make a series of low-altitude observations of the final two sample site candidates. At an altitude of only 225 m (738 ft) above the surface, the spacecraft will be able to identify objects as small as 2 cm (0.8 inches.)

One of the obstacles to a successful sample-collection is the unexpected rockiness of Bennu's surface. The sample collection portion of the mission is called Touch-And-Go (TAG) and the rocky surface means that the plans for TAG need to be adjusted.

In order for a successful TAG, the team needs to find a landing site that is clear of large rocks and boulders. The site also needs to be level. If it's too tilted, the sampling arm may not be able to do its job. According to NASA, the unexpected rockiness is adding an additional challenge.

If anyone's up to the challenge, it's probably NASA. Rich Burns is the project manager of OSIRIS-REx at NASA's Goddard Space Flight Center in Greenbelt, Maryland. In a press release he said, "Bennu has issued us a challenge to deal with its rugged terrain, and we are confident that OSIRIS-REx is up to the task."

OSIRIS-REx is a seven year mission to study asteroid Bennu. Asteroids like Bennu are primitive bodies from the early days of the Solar System's formation 4.5 billion years ago. Retrieving a sample from this ancient piece of rock will help scientists piece together the history of our Solar System, including dear old Earth.

Source: Universe Today

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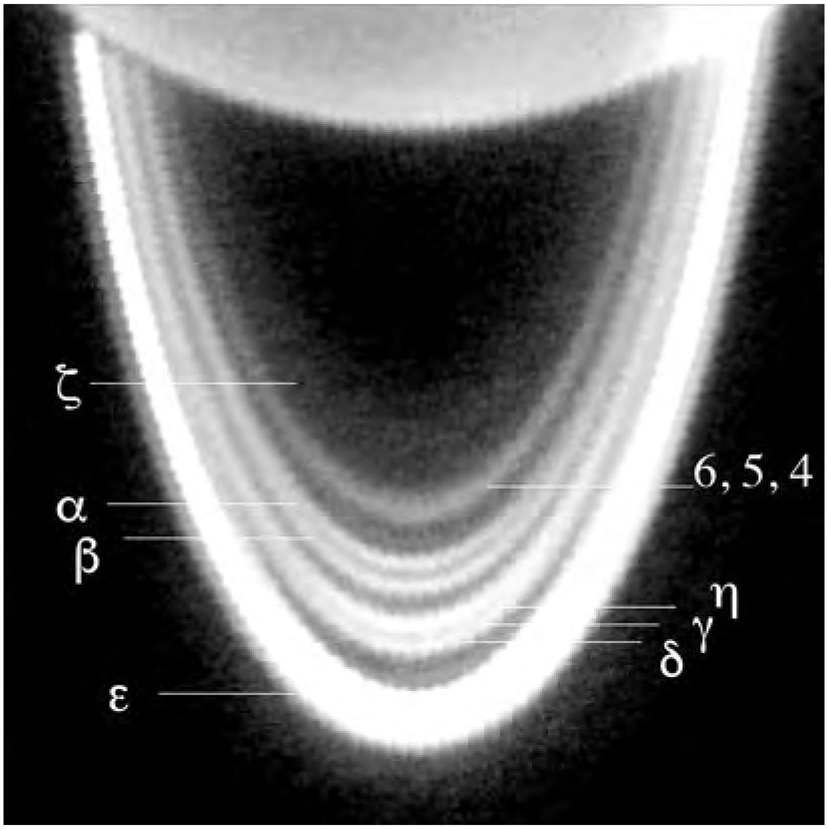
2. Astronomers see 'warm' glow of Uranus's rings



The rings of Uranus are invisible to all but the largest telescopes -- they weren't even discovered until 1977 -- but they're surprisingly bright in new heat images of the planet taken by two large telescopes in the high deserts of Chile.

The thermal glow gives astronomers another window onto the rings, which have been seen only because they reflect a little light in the visible, or optical, range and in the near-infrared. The new images taken by the Atacama Large Millimeter/submillimeter Array (ALMA) and the Very Large Telescope (VLT) allowed the team for the first time to measure the temperature of the rings: a cool 77 Kelvin, or 77 degrees above absolute zero -- the boiling temperature of liquid nitrogen and equivalent to 320 degrees below zero Fahrenheit.

The observations also confirm that Uranus's brightest and densest ring, called the epsilon ring, differs from the other known ring systems within our solar system, in particular the spectacularly beautiful rings of Saturn.

"Saturn's mainly icy rings are broad, bright and have a range of particle sizes, from micron-sized dust in the innermost D ring, to tens of meters in size in the main rings," said Imke de Pater, a UC Berkeley professor of astronomy. "The small end is missing in the main rings of Uranus; the brightest ring, epsilon, is composed of golf ball-sized and larger rocks."

By comparison, Jupiter's rings contain mostly small, micron-sized particles (a micron is a thousandth of a millimeter). Neptune's rings are also mostly dust, and even Uranus has broad sheets of dust between its narrow main rings.

"We already know that the epsilon ring is a bit weird, because we don't see the smaller stuff," said graduate student Edward Molter. "Something has been sweeping the smaller stuff out, or it's all glomming together. We just don't know. This is a step toward understanding their composition and whether all of the rings came from the same source material, or are different for each ring."

Rings could be former asteroids captured by the planet's gravity, remnants of moons that crashed into one another and shattered, the remains of moons torn apart when they got too close to Uranus, or debris remaining from the time of formation 4.5 billion years ago.

The new data were published this week in the *Astronomical Journal*. De Pater and Molter led the ALMA observations, while Michael Roman and Leigh Fletcher from the University of Leicester in the United Kingdom led the VLT observations.

"The rings of Uranus are compositionally different from Saturn's main ring, in the sense that in optical and infrared, the albedo is much lower: they are really dark, like charcoal," Molter said. "They are also extremely narrow compared to the rings of Saturn. The widest, the epsilon ring, varies from 20 to 100 kilometers wide, whereas Saturn's are 100's or tens of thousands of kilometers wide."

The lack of dust-sized particles in Uranus's main rings was first noted when Voyager 2 flew by the planet in 1986 and photographed them. The spacecraft was unable to measure the temperature of the rings, however.

To date, astronomers have counted a total of 13 rings around the planet, with some bands of dust between the rings. The rings differ in other ways from those of Saturn.

"It's cool that we can even do this with the instruments we have," he said. "I was just trying to image the planet as best I could and I saw the rings. It was amazing."

Both the VLT and ALMA observations were designed to explore the temperature structure of Uranus' atmosphere, with VLT probing shorter wavelengths than ALMA.

"We were astonished to see the rings jump out clearly when we reduced the data for the first time," Fletcher said.

This presents an exciting opportunity for the upcoming James Webb Space Telescope, which will be able provide vastly improved spectroscopic constraints on the Uranian rings in the coming decade.

Source: EurekAlert Return to Contents

3. 10 years since its launch, NASA lunar orbiter remains crucial for moon landings

Scientists marked the 10th anniversary of the launch of NASA's Lunar Reconnaissance Orbiter on Tuesday, celebrating a mission that has greatly outlived its original one-year design life and continues taking high-resolution pictures to help U.S. companies and international space agencies select destinations for moon landers.

LRO launched June 18, 2009, from Cape Canaveral aboard a United Launch Alliance Atlas 5 rocket and arrived in lunar orbit four-and-a-half days later. By mid-July of that year, the orbiter's sharp-eyed camera captured the first detailed views of the Apollo landing sites in time for the 40th anniversary of the Apollo 11 mission.

In its 10-year mission, LRO has contributed to new discoveries of water and other volatile molecules on the moon, located fresh lunar impact craters, and found that the moon was contracting in its recent history, and may still be shrinking today, due to the cooling of lunar interior.

"The great strides that we've made in understanding the volatile inventory on the moon, beginning to understand the volatile cycle on the moon, and beginning to understand the volcanic history of the moon is something that we've made incredible contributions to," said Noah Petro, LRO's project scientist at NASA's Goddard Space Flight Center in Maryland.

"The moon is an extension of the Earth," Petro said. "I like to think of the moon as the eighth continent of the Earth, and when we study the moon, we learn about the ancient history of the solar system, as well as the current history of the solr system."

LRO is still operating, and all seven of its instruments are still collecting data, Petro said. There's enough propellant left on LRO to continue the mission for at least seven more years, based on the current rate of fuel consumption, he said.

NASA officials expect LRO to live up to its “reconnaissance” function into the 2020s, providing maps for robotic lunar landers and helping identify sites where humans could safely return to the moon’s surface.

“The spacecraft is remarkably healthy,” Petro said. “Ever since about 2011, we’ve been in a very … fuel-efficient orbit, so we’ve basically been able to save our fuel for the last seven or eight years now. That has really given us the ability to continue operating.

“Some systems are showing signs of age, but that is what engineers love to try to solve … and they’ve been able to figure out a way to keep it going.”

The transmitter on LRO’s radar instrument failed in 2011, but ground teams devised a way to use ground-based radars coupled with the still-functioning receiver on LRO to image the moon in search of water ice deposits. Last year, engineers determined LRO’s inertial measurement unit was nearing the end of its life.

The unit measures the spacecraft’s rotation rates, and ground teams are using LRO’s star tracker cameras to derive an estimate of the orbiter’s rotation, reserving the rest of the inertial measurement unit’s lifetime for critical events such as emergencies and eclipses.

“I hesitate to talk about the legacy of a mission that’s still ongoing,” Petro said in an interview Tuesday with Spaceflight Now.

LRO is currently circling the moon in an elliptical orbit, ranging from a low point about 30 miles (50 kilometers) over the moon’s south pole and a high point around 110 miles (180 kilometers) over the lunar north pole, Petro said.

Over the next few years, the spacecraft’s orbit will naturally change, due to gravitational perturbations, to a circular orbit at an altitude of about 60 miles (100 kilometers), according to Petro.

LRO was developed during NASA’s Constellation program, which started during the George W. Bush administration with a goal of returning humans to the moon by 2020. The program fell years behind schedule and its costs rose by billions of dollars, prompting President Barack Obama to cancel the program in 2010, a year after LRO’s launch.

The Obama administration, with the urging of lawmakers in Congress, directed NASA to focus on a human mission to Mars. The Orion crew capsule, a holdover from the Constellation program, and the new heavy-lift Space Launch System rocket became the centerpieces of NASA’s deep space exploration program.

President Donald Trump in 2017 signed a directive tasking NASA with returning humans to the lunar surface. In a speech in March, Vice President Mike Pence set a 2024 deadline for a human landing on the moon, an accelerated schedule that NASA Administrator Jim Bridenstine told CNN last week would require an extra $20 billion to $30 billion to the agency’s budget over the next five years.

NASA announced contracts last month with three U.S. companies — Astrobotic, Intuitive Machines and Orbit Beyond — to fly experiments to the moon in 2020 and 2021. The commercial robotic probes are precursors before an eventual landing with astronauts.

LRO will provide maps for the companies in charge of the commercial landing probes.

“We’ve been scouting landing sites for all 10 years,” Petro said. “Initially, that was one of LRO’s primary objectives, was to find safe landing sites, and as missions were conceived and developed, requests would be made to (NASA) Headquarters, and to us, to make observations to find safe and interesting landing sites.”

LRO has also aided international lunar missions. Chinese scientists planning the Chang'e 3 and Chang'e 4 lunar landing missions used LRO's maps, and the NASA orbiter imaged the Chang'e 4 spacecraft on the far side of the moon after its arrival there earlier this year.

India's Chandrayaan 2 mission is set to become the next spacecraft to land on the moon. Its launch is scheduled for July 14, followed by a landing near the moon's south pole in September.

"We've been collecting data for a number of international missions, including Chandrayaan 2, and when that data is collected it's processed and made available to everyone," Petro said.

"Once they land, we'll be able to image the location of the lander and provide context for their measurements," Petro said of Chandrayaan 2.

"My personal goal is to have LRO operate long enough to see not just one, but many, U.S. missions to the lunar surface, so getting these commercial landers there is going to be the first part of that dream of mine," Petro said.

Source: Spaceflight Now Return to Contents

The Night Sky

Friday, June 21

• The solstice arrives today at 11:54 a.m. EDT. This is when the Sun is farthest north for the year as seen in Earth's sky and begins its six-month return southward. Summer officially begins in the Northern Hemisphere, winter in the Southern Hemisphere. For us northerners, this is the year's longest day and shortest night.

It's also the day when (in the north temperate latitudes) the midday Sun passes the closest it ever can to being straight overhead, and thus when your shadow becomes the shortest it can ever be at your location. This happens at *local apparent noon* (solar noon), which is probably rather far removed from noon in your civil (clock) time.

• Jupiter's Great Red Spot should transit the planet's central meridian (the line down the center of the planet's disk from pole to pole) around 1:21 a.m. EDT tonight; 12:21 a.m. CDT.

Meanwhile Europa, the smallest of Jupiter's Galilean moons, crosses the planet's disk tonight from 11:32 p.m. to 1:57 a.m. EDT, followed closely by its tiny black shadow from 12:04 to 2:32 a.m. EDT.

Saturday, June 22

• Leo the Lion is mostly a constellation of late winter and spring. But he's not gone yet. As twilight ends look due west, somewhat low, for Regulus, his brightest and now lowest star: the forefoot of the Lion stick figure.

The Sickle of Leo extends upper right from Regulus. The rest of the Lion's constellation figure extends for almost three fist-widths to the upper left, to his tail star Denebola, the highest.

Sunday, June 23

• Can you spot the Coma Berenices star cluster with your unaided eye? It's big but sparse and dim, high in the west after dark. You can locate the right spot as follows: Find brilliant Arcturus high in the southwest, and to the right of that, the end star of the Big Dipper's handle. The Coma Star Cluster is down below the midpoint between them, forming a nearly equilateral triangle with those two stars.

You'll need a dark sky. The cluster is about 4° wide, about the size of a ping-pong ball held at arm's length. Its brightest stars form a tilted, upside-down letter Y.

Monday, June 24

• This is the time of year when, right after dark, the dim Little Dipper floats straight upward from Polaris (the end of its handle) — like a helium balloon on a string, escaped from a summer-evening party. Through heavy light pollution, however, all you may see of the Little Dipper are Polaris at its bottom and Kochab, the lip of the Little Dipper's bowl, at the top.

Tuesday, June 25

• The two brightest stars of summer, Arcturus and Vega, are about equally high overhead shortly after dark: Arcturus toward the southwest, Vega toward the east.

Arcturus and Vega are 37 and 25 light-years away, respectively. They represent the two commonest types of naked-eye stars: a yellow-orange *K* giant and a white type-*A* main-sequence star. They're 150 and 50 times brighter than the Sun, respectively — which, combined with their nearness, is why they dominate the evening sky.

• Last-quarter Moon (exact at 5:46 a.m. on this date). Late tonight, the Moon rises around 1 a.m. lower right of the Great Square of Pegasus.

Source: Sky & Telescope Return to Contents

ISS Sighting Opportunities

For Denver:

There are no sightings in your area for the period of **Wednesday Jun 12, 2019 through Friday Jun 28, 2019**

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

NASA-TV Highlights

(all times Eastern Daylight Time)

June 21, Friday
11 a.m. – SpaceCast Weekly (All Channels)

June 23, Sunday
12 p.m. – SpaceX Falcon Heavy Space Test Program-2 (STP-2) Technical Briefing (All Channels)
3:35 p.m. - International Space Station Expedition 59-60 Change of Command Ceremony; Kononenko hands over command of the Space Station to Ovchinin (All Channels)

June 24, Monday
3:30 p.m. - International Space Station Expedition 59 farewells and Soyuz MS-11 hatch closure coverage (Kononenko, Saint-Jacques, McClain); hatch closure scheduled at 4:10 p.m. EDT (All Channels)
7 p.m. - International Space Station Expedition 59/Soyuz MS-11 undocking coverage (Kononenko, Saint-Jacques, McClain); undocking scheduled at 7:25 p.m. EDT (All Channels)
9:30 p.m. - International Space Station Expedition 59/Soyuz MS-11 deorbit burn and landing coverage (Kononenko, Saint-Jacques, McClain); deorbit burn scheduled at 9:55 p.m. EDT; landing near Dzhezkazgan, Kazakhstan scheduled at 10:47 p.m. EDT) – Johnson Space Center via Korolev, Russia and Kazakhstan (Public Channel)
11 p.m. - Coverage of the SpaceX Falcon 9 Heavy STP-2 Launch, a multi-manifest mission of the U.S. Air Force's Space Test Program 2 (Media Channel)

June 25, Tuesday
1:30 a.m. - Video File of the International Space Station Expedition 59/Soyuz MS-11 hatch closure, undocking, landing and post-landing activities (Kononenko, Saint-Jacques, McClain) (Media Channel)
1 p.m. – Video File of the International Space Station Expedition 59/Soyuz MS-11 post-landing crew activities in Karaganda, Kazakhstan (may include post-landing interviews with astronauts David Saint-Jacques of the Canadian Space Agency and Anne McClain of NASA) (Media Channel)

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

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Space Calendar

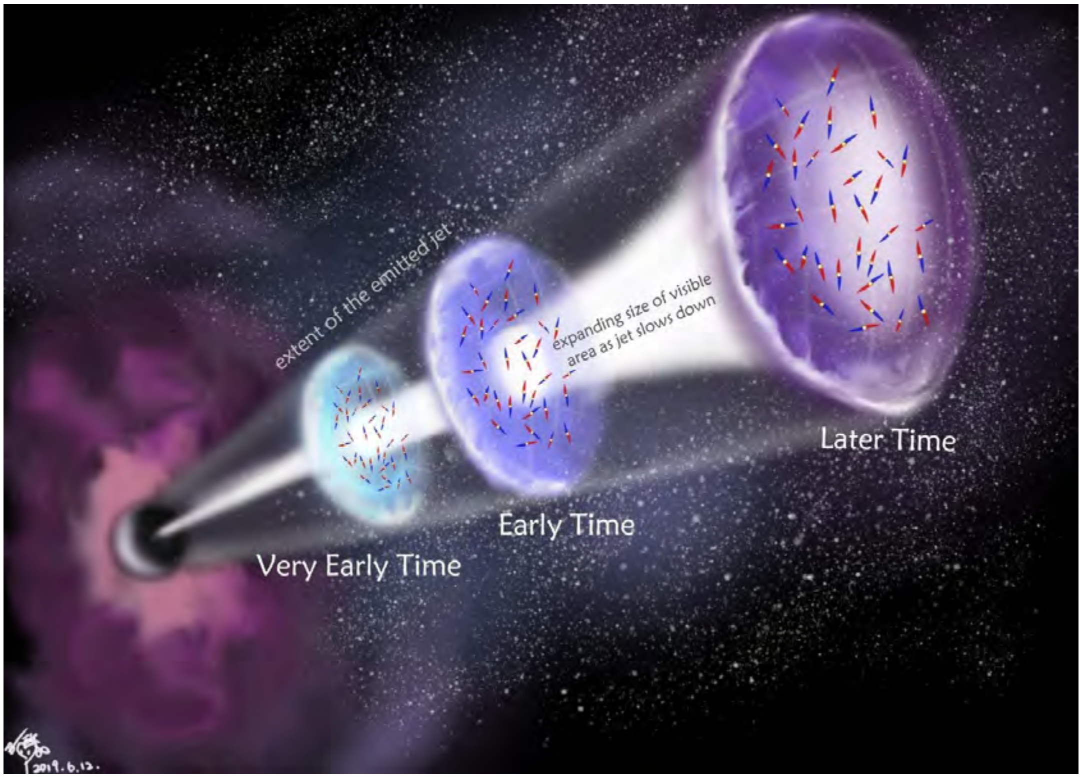
- Jun 21 - [Jun 14] Summer Solstice, 15:54 UT
- Jun 21 - [Jun 15] Spektr-RG (SXG) Proton-M/DM-03 Launch
- Jun 21 - Comet C/2018 V1 (Machholz-Fujikawa-Iwamoto) At Opposition (2.548 AU)
- Jun 21 - Comet 120P/Mueller At Opposition (3.383 AU)
- Jun 21 - Comet 118P/Shoemaker-Levy At Opposition (3.942 AU)
- Jun 21 - Comet P/2017 B4 (PANSTARRS) At Opposition (4.037 AU)
- Jun 21 - Aten Asteroid 2010 RX30 Near-Earth Flyby (0.094 AU)
- Jun 21 - Apollo Asteroid 11500 Tomaiyowit Closest Approach To Earth (0.187 AU)
- Jun 21 - Asteroid 274300 UNESCO Closest Approach To Earth (1.110 AU)
- Jun 21 - Amor Asteroid 3553 Mera Closest Approach To Earth (1.227 AU)
- Jun 21 - Asteroid 5053 Chladni Closest Approach To Earth (1.495 AU)
- Jun 21 - Asteroid 26858 Misterrogers Closest Approach To Earth (2.223 AU)
- Jun 21 - 15th Anniversary (2004), SpaceShipOne Launch (1st Private Manned Space Launch)
- Jun 21 - Oleg Kononenko's 55th Birthtday (1964)
- Jun 21-23 - AlienCon, Los Angeles, California
- Jun 21-23 - 6th KAGRA International Workshop, Wuhan, China
- Jun 21-23 - Ensisheim Meteorite Show 2019, Ensisheim, Alsace, France
- Jun 22 - Ziyuan 2D (ZY 2D)/ BNU 1/Tianyi 1 MV-1 CZ-4B Launch
- Jun 22 - Comet C/2019 J3 (ATLAS) At Opposition (1.388 AU)
- Jun 22 - Comet 255P/Levy At Opposition (3.920 AU)
- Jun 22 - Apollo Asteroid 2016 WQ3 Near-Earth Flyby (0.079 AU)
- Jun 22 - Atira Asteroid 418265 (2008 EA32) Closest Approach To Earth (0.589 AU)
- Jun 22 - Apollo Asteroid 11066 Sigurd Closest Approach To Earth (1.161 AU)
- Jun 22 - Asteroid 2906 Caltech Closest Approach To Earth (2.253 AU)
- Jun 22-29 - 2019 Grand Canyon Star Party, Grand Canyon, Arizona
- Jun 23 - Tiangi 2 JL-1 F1 Launch
- Jun 23 - Mercury At Its Greatest Eastern Elongation (25 Degrees)
- Jun 23 - Comet P/2006 H1 (McNaught) Closest Approach To Earth (1.842 AU)
- Jun 23 - Comet 235P/LINEAR At Opposition (2.657 AU)
- Jun 23 - Comet P/2011 U2 (Bressi) At Opposition (4.403 AU)
- Jun 23 - [Jun 18] Apollo Asteroid 2019 LC5 Near-Earth Flyby (0.035 AU)
- Jun 23 - Asteroid 44597 Thoreau Closest Approach To Earth (1.085 AU)
- Jun 23 - Apollo Asteroid 2019 LM1 Near-Earth Flyby (0.025 AU)
- Jun 23 - Apollo Asteroid 2063 Bacchus Closest Approach To Earth (1.574 AU)
- Jun 23 - Asteroid 65675 Mohr-Gruber Closest Approach To Earth (2.179 AU)
- Jun 23 - Centaur Object 5145 Pholus At Opposition (27.282 AU)
- Jun 23 - 10th Anniversary (2009), Lunar Reconnaissance Orbiter (LRO), Lunar Orbit Insertion
- Jun 24 - [Jun 17] Soyuz MS-11 Return to Earth (International Space Station)
- Jun 24 - [Jun 19] STP-2/ DSX/ FORMOSAT 7A-77F/ GPIM/ OTB/ FalconSat 6/ NPSat 1/ Oculus-ASR/ Prox 1/ LightSail-B/ Nanosat 7/ SSTE 4/SET 1/ ARMADILLO/ Falconsat 7 (Peregrinne)/ TBEx A & B/ Prometheus 2-1 - 2-8/ TEPCE 1 & 2/ CP 9/ StangSat/ DOTS-XFalcon Heavy Launch
- Jun 24 - Comet C/2019 J3 (ATLAS) Closest Approach To Earth (1.386 AU)
- Jun 24 - Aten Asteroid 441987 (2010 NY65) Near-Earth Flyby (0.020 AU)
- Jun 24 - Asteroid 7470 Jabberwock Closest Approach To Earth (1.187 AU)
- Jun 24 - Asteroid 3714 Kenrussell Closest Approach To Earth (1.913 AU)
- Jun 24 - Asteroid 12432 Usuda Closest Approach To Earth (2.128 AU)
- Jun 24 - Kuiper Belt Object 50000 Quaoar At Opposition (41.849 AU)
- Jun 24 - 20th Anniversary (1999), Cassini, 2nd Venus Flyby

- Jun 24 - 45th Anniversary (1974), Salyut 3 Launch (USSR Space Station)
- Jun 24 - Carolyn Shoemaker's 90th Birthday (1929)
- Jun 25 - NEW [Jun 20] Beidou 3 CZ-3B Launch
- Jun 25 - Comet C/2019 JU6 (ATLAS) Closest Approach To Earth (1.294 AU)
- Jun 25 - Comet C/2018 W1 (Catalina) Closest Approach To Earth (1.674 AU)
- Jun 25 - Amor Asteroid 2011 HT Near-Earth Flyby (0.080 AU)
- Jun 25 - Asteroid 3473 Sapporo Closest Approach To Earth (1.292 AU)
- Jun 25 - Hermann Oberth's 125th Birthday (1894)

Source: JPL Space Calendar Return to Contents

Food for Thought

Astronomers make first detection of polarised radio waves in Gamma Ray Burst jets



Good fortune and cutting-edge scientific equipment have allowed scientists to observe a Gamma Ray Burst jet with a radio telescope and detect the polarisation of radio waves within it for the first time—moving us closer to an understanding of what causes the universe's most powerful explosions.

Gamma Ray Bursts (GRBs) are the most energetic explosions in the universe, beaming out mighty jets which travel through space at over 99.9% the speed of light, as a star much more massive than our sun collapses at the end of its life to produce a black hole.

Studying the light from Gamma Ray Burst jets as we detect it travelling across space is our best hope of understanding how these powerful jets are formed, but scientists need to be quick to get their telescopes into position and get the best data. The detection of polarised radio waves from a burst's jet, made possible by a new generation of advanced radio telescopes, offers new clues to this mystery.

The light from this particular event, known as GRB 190114C, which exploded with the force of millions of suns' worth of TNT about 4.5 billion years ago, reached NASA's Neil Gehrels Swift Observatory on Jan 14, 2019.

A rapid alert from Swift allowed the research team to direct the Atacama Large Millimeter/Sub-millimeter Array (ALMA) telescope in Chile to observe the burst just two hours after Swift discovered it. Two hours later the team was able to observe the GRB from the Karl G. Jansky Very Large Array (VLA) telescope when it became visible in New Mexico, USA.

Combining the measurements from these observatories allowed the research team to determine the structure of magnetic fields within the jet itself, which affects how the radio light is polarised. Theories predict different arrangements of magnetic fields within the jet depending on the fields' origin, so capturing radio data enabled the researchers to test these theories with observations from telescopes for the first time.

The research team, from the University of Bath, Northwestern University, the Open University of Israel, Harvard University, California State University in Sacramento, the Max Planck Institute in Garching, and Liverpool John Moores University discovered that only 0.8% of the jet light was polarised, meaning that jet's magnetic field was only ordered over relatively small patches—each less than about 1% of the diameter of the jet. Larger patches would have produced more polarised light.

These measurements suggest that magnetic fields may play a less significant structural role in GRB jets than previously thought.

This helps us narrow down the possible explanations for what causes and powers these extraordinary explosions. The study is published in *Astrophysical Journal Letters*.

First author Dr. Tanmoy Laskar, from the University of Bath's Astrophysics group, said: "We want to understand why some stars produce these extraordinary jets when they die, and the mechanism by which these jets are fuelled—the fastest known outflows in the universe, moving at speeds close to that of light and shining with the incredible luminosity of over a billion suns combined.

"I was in a cab on my way to O'Hare airport in Chicago, following a visit with collaborators when the burst went off. The extreme brightness of this event and the fact that it was visible in Chile right away made it a prime target for our study, and so I immediately contacted ALMA to say we were going to observe this one, in the hope of detecting the first radio polarisation signal.

"It was fortuitous that the target was well placed in the sky for observations with both ALMA in Chile and the VLA in New Mexico. Both facilities responded quickly and the weather was excellent. We then spent two months in a painstaking process to make sure our measurement was genuine and free from instrumental effects. Everything checked out, and that was exciting.

Dr. Kate Alexander, who led the VLA observations, said: "The lower frequency data from the VLA helped confirm that we were seeing the light from the jet itself, rather than from the interaction of the jet with its environment."

Dr. Laskar added: "This measurement opens a new window into GRB science and the studies of energetic astrophysical jets. We would like to understand whether the low level of polarisation measured in this event is characteristic of all GRBs, and if so, what this could tell us about the magnetic structures in GRB jets and the role of magnetic fields in powering jets throughout the universe."

Professor Carole Mundell, Head of Astrophysics at the University of Bath, added: "The exquisite sensitivity of ALMA and rapid response of the telescopes has, for the first time, allowed us to swiftly and accurately measure the degree of polarisation of microwaves from a GRB afterglow just two hours after the blast and probe the magnetic fields that are thought to drive these powerful, ultrafast outflows."

The research team plans to hunt for more GRBs to continue to unravel the mysteries of the biggest explosions in the universe.

The study "ALMA detection of a linearly polarized reverse shock in GRB 190114C" is published in *Astrophysical Journal Letters*.

Source: Phys.org Return to Contents

Space Image of the Week

Hubble Captures Elusive, Irregular Galaxy

This image shows an irregular galaxy named IC 10, a member of the Local Group — a collection of over 50 galaxies in our cosmic neighborhood that includes the Milky Way.

IC 10 is a remarkable object. It is the closest-known starburst galaxy, meaning that it is undergoing a furious bout of star formation fueled by ample supplies of cool hydrogen gas. This gas condenses into vast molecular clouds, which then form into dense knots where pressures and temperatures reach a point sufficient to ignite nuclear fusion, thus giving rise to new generations of stars.

As an irregular galaxy, IC 10 lacks the majestic shape of spiral galaxies such as the Milky Way, or the rounded, ethereal appearance of elliptical galaxies. It is a faint object, despite its relative proximity to us of 2.2 million light-years. In fact, IC 10 only became known to humankind in 1887, when American astronomer Lewis Swift spotted it during an observing campaign. The small galaxy remains difficult to study even today, because it is located along a line-of-sight which is chock-full of cosmic dust and stars.

A version of this image was entered into the Hubble's Hidden Treasures image processing competition by contestant Nikolaus Sulzenauer, and went on to win 10th prize.

Text credit: ESA (European Space Agency), Image credit: NASA, ESA and F. Bauer

Source: NASA

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