Space News Update

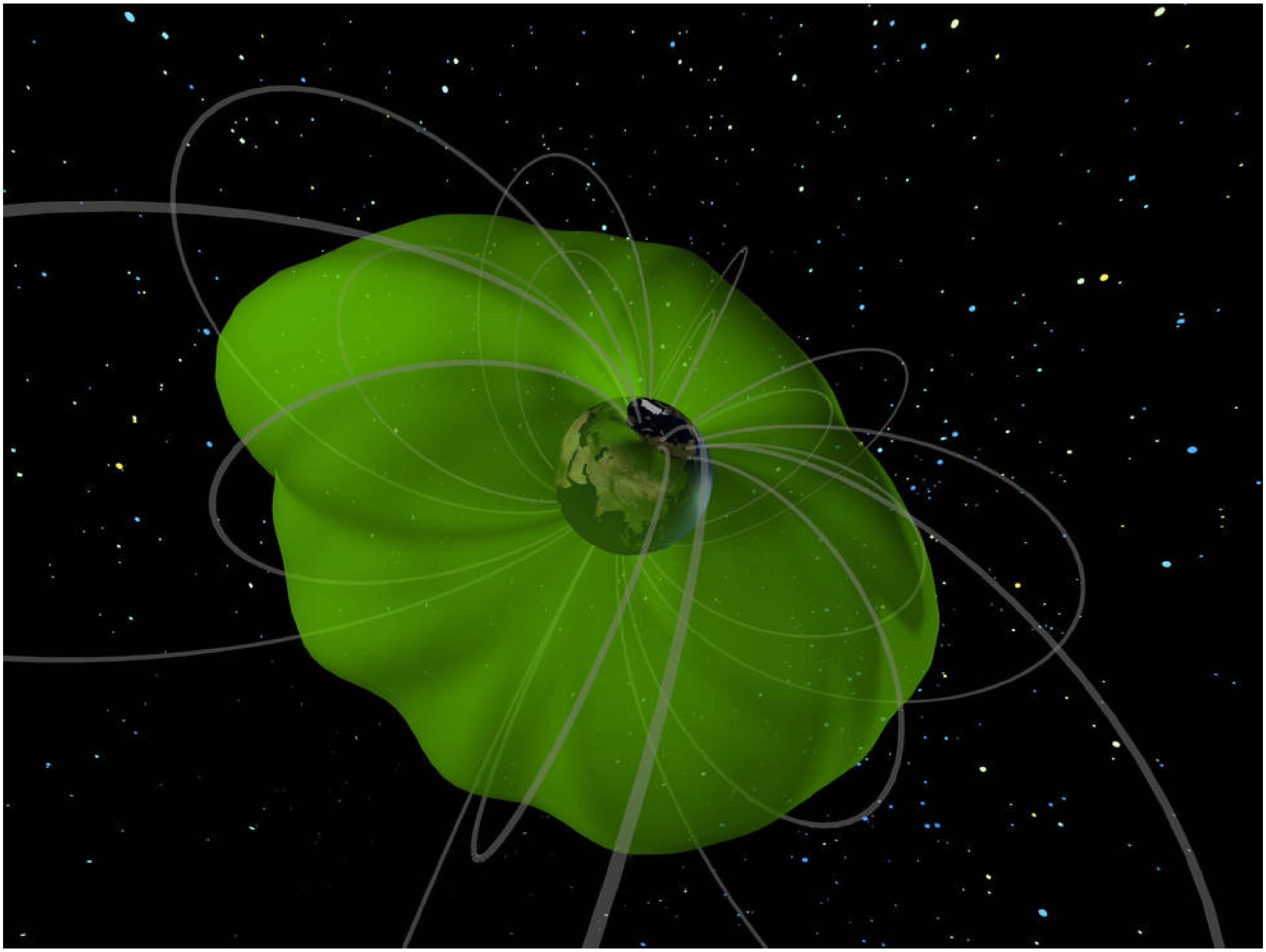
— February 2, 2018 —

Contents

In the News

Departments

1. NASA's Newly Rediscovered IMAGE Mission Provided Key Aurora Research



On Jan. 20, 2018, amateur astronomer Scott Tilley detected an unexpected signal coming from what he later postulated was NASA's long-lost IMAGE satellite, which had not been in contact since 2005. On Jan. 30, NASA — along with help from a community of IMAGE scientists and engineers — confirmed that the signal was indeed from the IMAGE spacecraft. Whatever the next steps for IMAGE may be, the mission's nearly six years in operation provided robust research about the space around Earth that continue to guide science to this day.

Latest Data from IMAGE Indicates Spacecraft's Power Functional (Feb 2, 2018)

New data regarding IMAGE provides some additional — though not yet complete — information on how the spacecraft began to transmit signals again.

On Thanksgiving Day in 2004, the IMAGE spacecraft — at that time still fully functioning — underwent an unexpected power distribution reboot, after which the power returned only on one side — labeled the B side — of the unit. (Satellites are usually built with redundant hardware, often called "A sides" and "B sides." In the event one half fails, operators can switch to the other with minimal effect to the mission.) Scientists involved in the mission concluded that the A side had failed, and proceeded for the rest of the mission exclusively with the B side.

However, data from today's telemetry with IMAGE indicate that the spacecraft's power unit is now operating back on its A side. The ultimate cause of the reboot is still not known, but these recent findings suggest that a reboot in some form has, in fact, occurred.

See https://www.nasa.gov/feature/goddard/2018/nasa-image-confirmed for the latest updates on IMAGE

On March 25, 2000, NASA launched the Imager for Magnetopause-to-Aurora Global Exploration, or IMAGE, mission. It was the first mission to use neutral atom, photon and radio imaging techniques to produce large-scale, simultaneous measurements of the charged particles that exist in near-Earth space — namely in our magnetosphere, the magnetic fields that surround our planet, and its inner bubble of cold material called the plasmasphere.

"IMAGE was a discovery machine and a seminal mission that gave us a broader perspective on Earth's environment and its ever-changing magnetosphere," said Jim Green, director of planetary science at NASA Headquarters in Washington, who worked as a co-investigator and deputy project scientist for IMAGE. "Much of my career as a magnetospheric physicist was with IMAGE, and the science was transformative."

Originally designed as a two-year mission, IMAGE was approved twice to continue its operations. But when the spacecraft unexpectedly failed to make contact on a routine pass on Dec.18, 2005, its promising tenure seemed to be cut short.

Investigations into possible causes of failure suggested that the transmitter controller power source was tripped, possibly by an incoming high-energy cosmic ray or radiation belt particle. It was hypothesized that passing through a dramatic change in energy — such as what happens when a spacecraft experiences total darkness during an eclipse — could potentially reset the spacecraft. But after a 2007 eclipse failed to induce a reboot, the mission was declared over.

What was the IMAGE mission?

Before that, however, IMAGE was a powerhouse. The data collected during its nearly five years of operation led to some 40 new discoveries about Earth's magnetosphere and plasmasphere. Many of these discoveries had their basis in energetic neutral atom, or ENA, imaging, a novel technique pioneered by IMAGE to render the invisible visible.

The technique makes use of some fundamental space physics. Particles with an electric charge — like the ions that make up much of the plasma in the magnetosphere — are bound to Earth's magnetic field lines, spinning around them like a yo-yo on a string. But when they crash into neutral particles, the charged particles can steal the neutral's electrons in a process called charge exchange, becoming neutral themselves.

No longer magnetically bound, these energetic neutral atoms barrel off into space in whatever direction they were heading when the collision occurred. ENA instruments capture these neutral atoms and use them to build up large scale images of the surrounding plasma, similar to how ordinary cameras capture light rays to create pictures.

In combination with ENA instruments, IMAGE also used ultraviolet and radio imaging techniques that together led to many of IMAGE's most notable accomplishments. Among them is the confirmation of the plasmaspheric plume, a region of plasma particles that flow backwards toward the Sun on Earth's dayside. Such a backflow had been predicted by models, but never directly observed by spacecraft.

"It's as if you're driving in a convertible," said Thomas Moore, the mission scientist for IMAGE, as well as the lead for the spacecraft's Low Energy Neutral Atom (LENA) Imager at NASA's Goddard Space Flight Center in

Greenbelt, Maryland. “The air is rushing against the car in one direction, but your hair will blow towards the windshield.”

IMAGE produced large-scale images every two minutes. The rapid cadence of imaging allowed scientists to knit the images together to create frame-by-frame movies that could show the vast scale of charged particle interactions in near-Earth space, including those that cause the aurora.

The missions that had flown before IMAGE had only been able to gather measurements at a single point in time and space — catching the particles the spacecraft happened to fly through at the time, rather than capturing a wide panoramic view. But such point measurements are challenging to interpret.

“The trouble with a single point measurement is you’re always moving around and you’re never quite sure if the variation that you see is because you’ve moved to a different place or because something has changed globally in the system,” Moore said. “I used to liken space physics before IMAGE to trying to study severe storms by driving around with a rain gauge out your window.”

IMAGE drastically changed the playing field. “We suddenly had a camera that could see the whole system,” Moore added.

But IMAGE didn’t just make pretty pictures: It was also the first space science mission to formally include an education and public outreach program (POETRY) as part of its proposal to NASA, specifically setting aside a budget for such activities. Partnering with elementary, middle and high school teachers, IMAGE’s science findings were incorporated into lessons and classroom activities.

While IMAGE’s future continues to unfold, its legacy has already proven its worth: The information it gleaned with its wide-range view provides an important complement to missions looking at smaller scales of the magnetosphere, including the highly successful Magnetospheric Multiscale mission, or MMS, launched in March 2015 and currently in orbit.

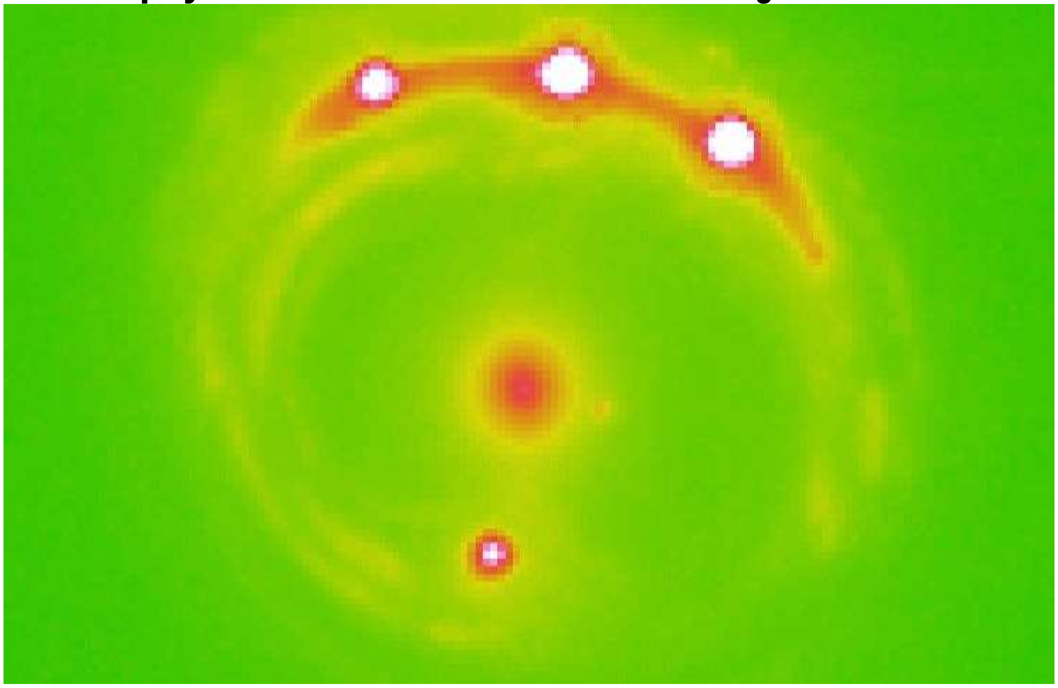
Related:

- IMAGE mission homepage

Source: NASA

Return to Contents

2. Astrophysicists Discover Planets in Extragalactic Galaxies Using Microlensing



A University of Oklahoma astrophysics team has discovered for the first time a population of planets beyond the Milky Way galaxy. Using microlensing—an astronomical phenomenon and the only known method capable of discovering planets at truly great distances from the Earth among other detection techniques—OU researchers were able to detect objects in extragalactic galaxies that range from the mass of the Moon to the mass of Jupiter.

Xinyu Dai, professor in the Homer L. Dodge Department of Physics and Astronomy, OU College of Arts and Sciences, with OU postdoctoral researcher Eduardo Guerras, made the discovery with data from the National Aeronautics and Space Administration's Chandra X-ray Observatory, a telescope in space that is controlled by the Smithsonian Astrophysical Observatory.

"We are very excited about this discovery. This is the first time anyone has discovered planets outside our galaxy," said Dai. "These small planets are the best candidate for the signature we observed in this study using the microlensing technique. We analyzed the high frequency of the signature by modeling the data to determine the mass."

While planets are often discovered within the Milky Way using microlensing, the gravitational effect of even small objects can create high magnification leading to a signature that can be modeled and explained in extragalactic galaxies. Until this study, there has been no evidence of planets in other galaxies. "This is an example of how powerful the techniques of analysis of extragalactic microlensing can be. This galaxy is located 3.8 billion light years away, and there is not the slightest chance of observing these planets directly, not even with the best telescope one can imagine in a science fiction scenario," said Guerras. "However, we are able to study them, unveil their presence and even have an idea of their masses. This is very cool science."

For this study, OU researchers used the NASA Chandra X-ray Observatory at the Smithsonian Astrophysical Observatory. The microlensing models were calculated at the OU Supercomputing Center for Education and Research.

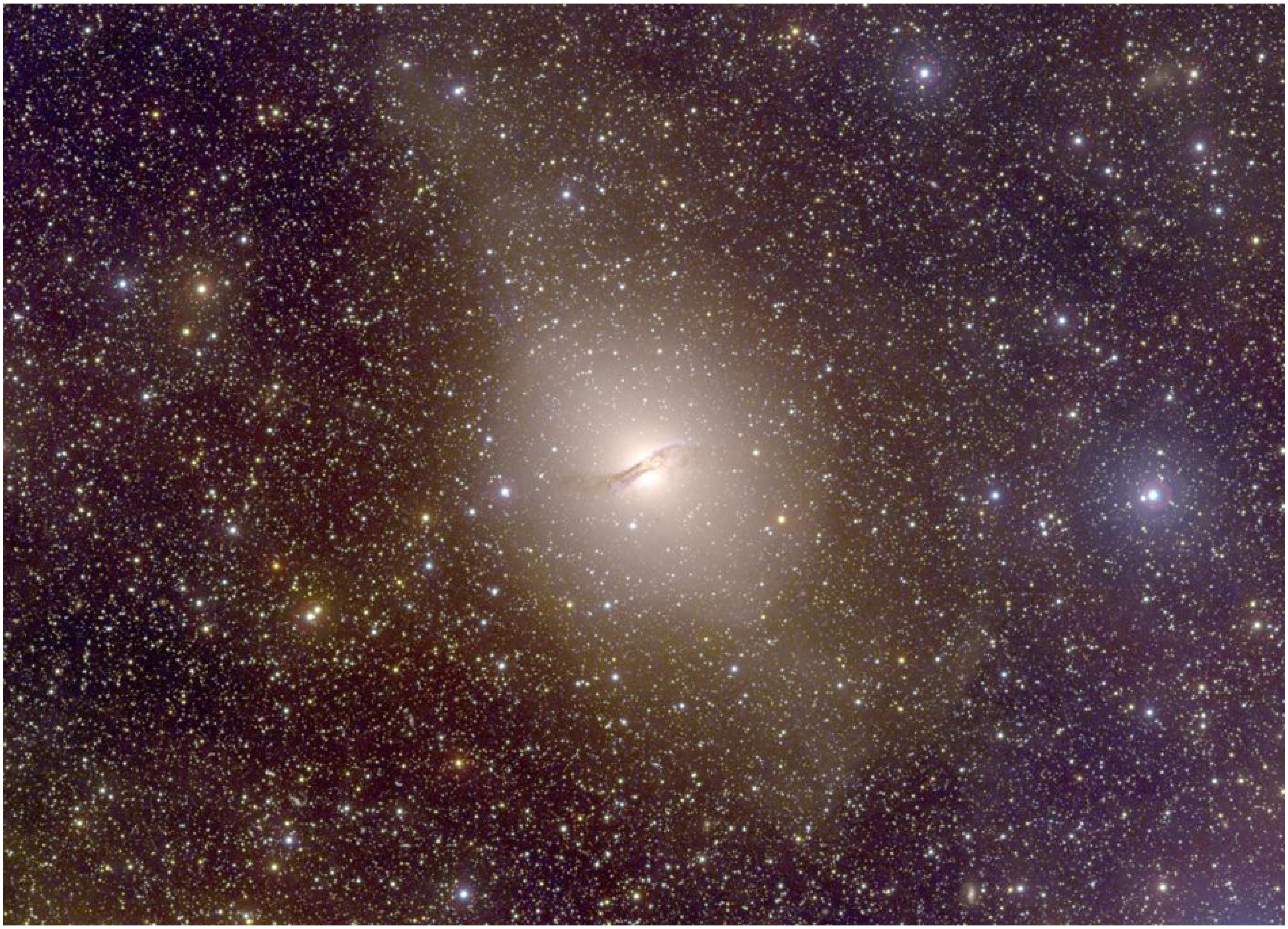
A paper, "Probing Planets in Extragalactic Galaxies Using Quasar Microlensing," by Dai and Guerras on this study has been published in the *Astrophysical Journal Letters*.

Explore further: Extremely massive exoplanet discovered in the Milky Way's bulge

Source: Phys.org

Return to Contents

3. New Study Challenges Popular Theory About Dwarf Galaxies



A new international study involving The Australian National University (ANU) has found a plane of dwarf galaxies orbiting around Centaurus A in a discovery that challenges a popular theory about how dwarf galaxies are spread around the Universe.

Co-researcher Associate Professor Helmut Jerjen from ANU said astronomers had previously observed planes of dwarf galaxies whirling around our galaxy, the Milky Way, and the neighbouring Andromeda.

He said the latest finding challenged a long-held theory among cosmologists and theoreticians that there were thousands of dwarf galaxies in all directions around these large galaxies like bees swarming around a hive.

"Cold dark matter theory made astronomers believe that the best studied galaxies in the Universe - the Milky Way and Andromeda - are the odd ones out," said Dr Jerjen from the ANU Research School of Astronomy and Astrophysics.

"It seems that our Milky Way and Andromeda are normal galaxies after all, and spinning pancake-like systems of satellite galaxies are more common than scientists expected."

Dr Jerjen said dwarf galaxies were distributed in planes that were almost perpendicular to the disks of the Milky Way, Andromeda and Centaurus A.

"Even the best cosmological simulations struggle to explain the phenomenon of these small galaxies revolving in one direction around host galaxies," he said.

Dr Jerjen conducted the study in collaboration with Dr Oliver Müller from the University of Basel in Switzerland, Dr Marcel Pawlowski from the University of California, Irvine, in the United States and Dr Federico Lelli from the European Southern Observatory in Germany.

Dr Müller said it was likely most large galaxies in the Universe have had a close encounter or merged with another galaxy at least once in their life.

"Co-rotating dwarf galaxy systems could have formed during such interactions. In this scenario dwarf galaxies should be devoid of dark matter," he said.

The Milky Way and Andromeda are spiral galaxies, while Centaurus A has both elliptical and spiral features. Centaurus A is about 13 million light years away from Earth.

The most well-known dwarf galaxies around the Milky Way are the Magellanic Clouds, which are visible to the naked eye from the southern hemisphere.

"Scientists have identified close to 50 dwarf galaxy candidates around the Milky Way - most of them are aligned in a plane orbiting the centre of the host galaxy," Dr Jerjen said.

"Most of the dwarf galaxy candidates that my colleagues and I observed around Centaurus A are arranged this way, and it's a similar case with at least half of them around Andromeda."

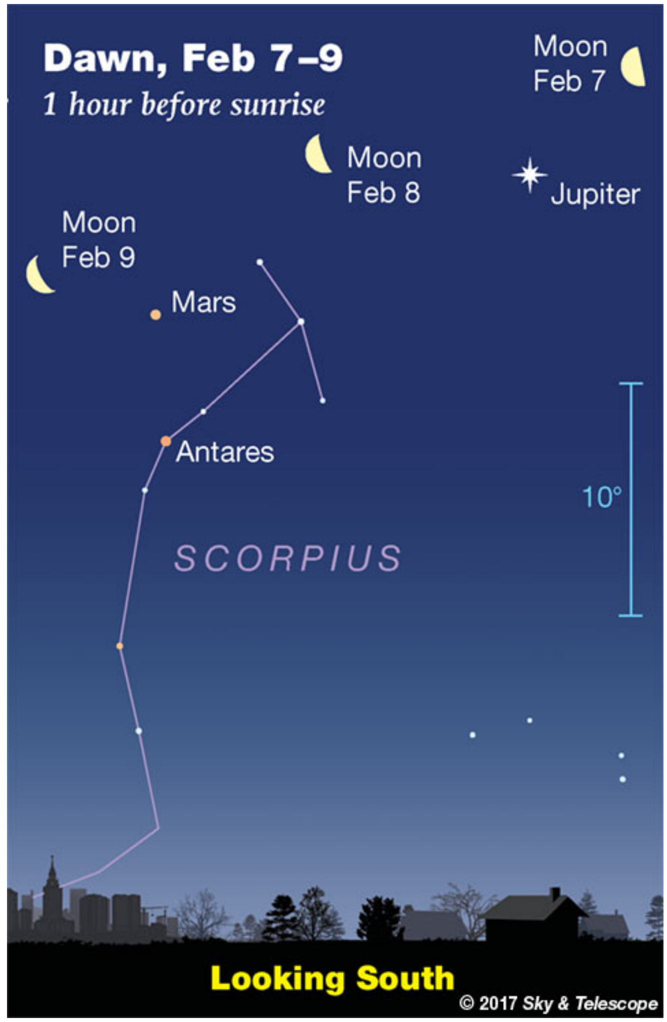
Dr Jerjen said the latest research will have major implications for future cosmological work.

Source: Spaceref.com Return to Contents

The Night Sky

Friday, February 2

• The sky's biggest asterism (informal star pattern) — at least the biggest that's widely recognized — is the Winter Hexagon. It fills the sky toward the east and south these evenings. Start with brilliant Sirius at its bottom. Going clockwise from there, march up through Procyon, Pollux and Castor, Menkalinan and Capella on high, down to Aldebaran, then to Rigel in Orion's foot, and back to Sirius.



Betelgeuse shines inside the Hexagon, off center.

Saturday, February 3

• After it's good and dark, look due east, not very high, for twinkly Regulus. Extending upper left from it is the Sickle of Leo, a backward question mark. "Leo announces spring," goes an old saying. Actually, Leo showing up in the evening announces the cold, messy back half of winter. Come spring, Leo will already be high.

Sunday, February 4

• As soon as it's fully dark, Orion and the Winter Triangle shine high in the southeast. Sirius is the Triangle's brightest and lowest star. Betelgeuse in Orion' shoulder stands above Sirius by about two fists at arm's length. Left of them is the Triangle's third star, Procyon.

And standing above Procyon now (depending on your latitude) is 3rd-magnitude Gomeisa, or Beta Canis Minoris, the only other easy naked-eye star of Canis Minor.

Monday, February 5

• Betelgeuse, Orion's armpit, and Aldebaran, the bright eye of Taurus, are high in the south these evenings. Have you ever closely compared their colors? Can you detect any difference in their colors at all? I can't, really. Yet Aldebaran, spectral type *K* III, is often called an "orange" giant, while Betelgeuse, spectral type *M*1-*M*2 Ia, is usually called a "red" supergiant. Their temperatures are indeed a bit different: 3,910 Kelvin and 3,590 Kelvin, respectively.

A complication: Betelgeuse is brighter, and to the human eye, the colors of brighter objects appear, falsely, to be *desaturated:* tending paler (whiter) than they really are.

Source: Sky & Telescope

Return to Contents

ISS Sighting Opportunities

For Denver:

Date	Visible	Max Height	Appears	Disappears
Fri Feb 2, 7:00 PM	< 1 min	10°	10° above N	10° above N
Sat Feb 3, 6:07 PM	1 min	10°	10° above NNW	10° above N
Sun Feb 4, 6:52 PM	1 min	11°	10° above N	11° above N
Mon Feb 5, 6:00 PM	1 min	10°	10° above N	10° above NNE
Tue Feb 6, 6:44 PM	2 min	15°	11° above NNW	15° above NNE

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

NASA-TV Highlights

(all times Eastern Daylight Time)

Friday, February 2

5 p.m., "NASA in Silicon Valley Live: Let's Play Space Video Games! (NTV-1 (Public))

6 p.m., Replay of SpaceCast Weekly (all channels)

9 p.m., Replay of SpaceCast Weekly (all channels)

Monday, February 5

11:30 a.m., IISS Expedition 54 In-Flight Interviews with WHDH-TV, Boston and Bloomberg Bay State Radio with NASA Flight Engineers Mark Vande Hei and Scott Tingle (starts at 11:40 a.m.) (all channels)

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

Return to Contents

Space Calendar

- Feb 02 - Comet C/2017 G3 (PANSTARRS) At Opposition (2.991 AU)
- Feb 02 - Comet 250P/Larson Perihelion (2.213 AU)
- Feb 02 - Dwarf Planet Ceres Occults TYC 2492-00824-1 (10.5 Magnitude Star)
- Feb 02 - Apollo Asteroid 2002 CB19 Near-Earth Flyby (0.027 AU)
- Feb 02 - Apollo Asteroid 2018 AQ2 Near-Earth Flyby (0.035 AU)
- Feb 02 - [Jan 26] Apollo Asteroid 2018 BH5 Near-Earth Flyby (0.055 AU)
- Feb 02 - Apollo Asteroid 2008 OC9 Near-Earth Flyby (0.083 AU)
- Feb 02 - Dwarf Planet Ceres Closest Approach To Earth (1.602 AU)
- Feb 03 - Comet P/2005 J1 (McNaught) At Opposition (1.938 AU)
- Feb 03 - Comet 323P/SOHO At Opposition (3.544 AU)
- Feb 03 - Apollo Asteroid 2018 BG3 Near-Earth Flyby (0.030 AU)
- Feb 03 - [Jan 26] Apollo Asteroid 2018 BN5 Near-Earth Flyby (0.041 AU)
- Feb 03 - Asteroid 3255 Tholen Closest Approach To Earth (1.060 AU)
- Feb 03 - Asteroid 12818 Tomhanks Closest Approach To Earth (1.920 AU)
- Feb 03 - Asteroid 1000 Piazzia Closest Approach To Earth (2.409 AU)
- Feb 03 - Apollo Asteroid 6489 Golevka Closest Approach To Earth (2.510 AU)
- Feb 03 - Alan Rubin's 65th Birthday (1953)
- Feb 04 - Apollo Asteroid 2018 AH12 Near-Earth Flyby (0.014 AU)
- Feb 04 - Apollo Asteroid 276033 (2002 AJ129) Near-Earth Flyby (0.028 AU)
- Feb 04 - Asteroid 3264 Bounty Closest Approach To Earth (1.779 AU)
- Feb 04 - Asteroid 9341 Gracekelly Closest Approach To Earth (1.789 AU)
- Feb 04 - Asteroid 1940 Whipple Closest Approach To Earth (1.954 AU)
- Feb 05 - [Jan 31] Apollo Asteroid 2018 BP6 Near-Earth Flyby (0.009 AU)
- Feb 05 - 55th Anniversary (1963), 1st Quasar Redshift Measurement (Maarten Schmidt)
- Feb 05 - 175th Anniversary (1843), Great Comet of 1843 Discovered
- Feb 06 - [Jan 30] Tesla Roadster Falcon 9 Heavy (Maiden Launch)
- Feb 06 - Comet 311P/PANSTARRS Closest Approach To Earth (1.122 AU)
- Feb 06 - Asteroid 4 Vesta Occults 2UCAC 25787320 (11.0 Magnitude Star)
- Feb 06 - Asteroid 4 Vesta Occults 6216-00783-1 (10.2 Magnitude Star)
- Feb 06 - Aten Asteroid 2017 YS8 Near-Earth Flyby (0.077 AU)
- Feb 06 - [Jan 26] Aten Asteroid 2018 BB5 Near-Earth Flyby (0.090 AU)
- Feb 06 - Asteroid 7359 Messier Closest Approach To Earth (2.148 AU)
- Feb 06 - Colloquium: Reading Between the Lines - Using Fractures to Understand Icy Satellite Evolution, Tucson, Arizona
- Feb 06 - 130th Anniversary (1888), Williamina Fleming's Discovery of the Horsehead Nebula
- Feb 06 - Thomas David Anderson's 165th Birthday (1853)

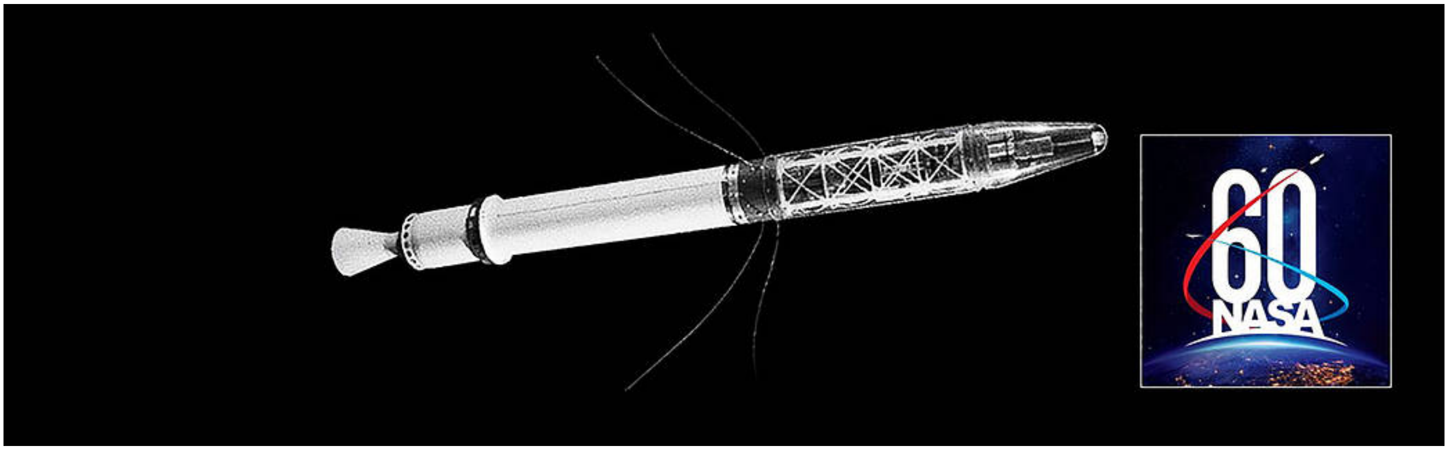
Williamina Paton Stevens Fleming

Source: JPL Space Calendar

Return to Contents

Food for Thought

America's First Satellite Established 'Foothold in Space'



On the evening of Jan. 31, 1958, the United States orbited its first satellite -- Explorer 1. The effort was part of the nation's participation in the International Geophysical Year (IGY), a peaceful scientific endeavor. It also marked America's first step in the Space Race of the Cold War.

Dr. Wernher von Braun led the Army Ballistic Missile Agency (ABMA) team at Redstone Arsenal in Huntsville, Alabama, that designed the rocket that launched Explorer 1. After the satellite was confirmed to be in orbit, he characterized the event as a crucial beginning for the nation's space program.

“We have firmly established our foothold in space," von Braun said. "We will never give it up."

“We have firmly established our foothold in space. We will never give it up."

-- Dr. Wernher von Braun

Plans to orbit a satellite were part of IGY, a scientific collaboration of 67 nations taking place from July 1, 1957, to Dec. 31, 1958. Both the U.S. and Soviet Union announced that their participation would include launching satellites to orbit the Earth.

Even with the advance declaration, many Americans were stunned when the Soviets launched the world's first satellite, Sputnik, on Oct. 4, 1957. A month later, Sputnik 2 orbited with a dog as a passenger.

Plans to launch an American satellite began in 1954 and despite strong advocacy from the ABMA, the Eisenhower Administration chose the U.S. Navy’s Vanguard project to lead the nation's efforts for the IGY. However, the first attempt to orbit a Vanguard satellite ended in a launch pad explosion on Dec. 6, 1957.

The job of launching America's first satellite then was given to ABMA, which had been waiting for just such an opportunity. Taking on the task of designing and building the Explorer 1 satellite was the Jet Propulsion Laboratory (JPL) of the California Institute of Technology in Pasadena, California, directed by Dr. William Pickering.

The Explorer 1 effort included the work of the satellite's principal investigator, Dr. James Van Allen, professor of physics and astronomy at the University of Iowa. He had been studying cosmic rays around the Earth. Van Allen developed instrumentation to measure the concentration of ions and electrons in space and to detect cosmic rays. By Jan. 11, 1958, the work of assembling and testing the 30.8-pound, 6-foot, 9-inch Explorer 1 satellite was complete.

The Jupiter C’s first stage was positioned at Launch Complex 26 at the Cape Canaveral Missile Annex (now Cape Canaveral Air Force Station), on Jan. 16. The rocket’s upper stages arrived at the pad on Jan. 24, and were attached to the top the rocket.

On the evening of Jan. 31, a group of 57 engineers, technicians and managers monitored the countdown from the pad 26 blockhouse. Pickering, von Braun and Van Allen waited at the Pentagon. Plans called for the trio to travel to the National Academy of Sciences, where they would announce either success or failure.

At 10:48 p.m. EST, the rocket roared to life and blazed a trail into the night sky. Soon it was out of sight and contact was lost as there was not yet a far-flung network of tracking stations.

Pickering stayed on the telephone with his team at JPL waiting for confirmation that Explorer 1 was successfully in orbit. If so, it would pass over a California tracking station no later than 12:30 a.m. EST early on Feb. 1.

That time passed with no signal.

But at 12:45 p.m. came the report, "California has the bird."

At the news conference, Pickering, von Braun and Van Allen reported that America's first satellite was in an elliptical orbit slightly higher than planned accounting for the 15-minute delay in receiving a signal from Explorer 1. The spacecraft was circling the Earth every 114 minutes, 1,594 miles high, with a low point of 225 miles.

During operation, the satellite's cosmic ray detector discovered radiation belts around Earth which were named for Van Allen.

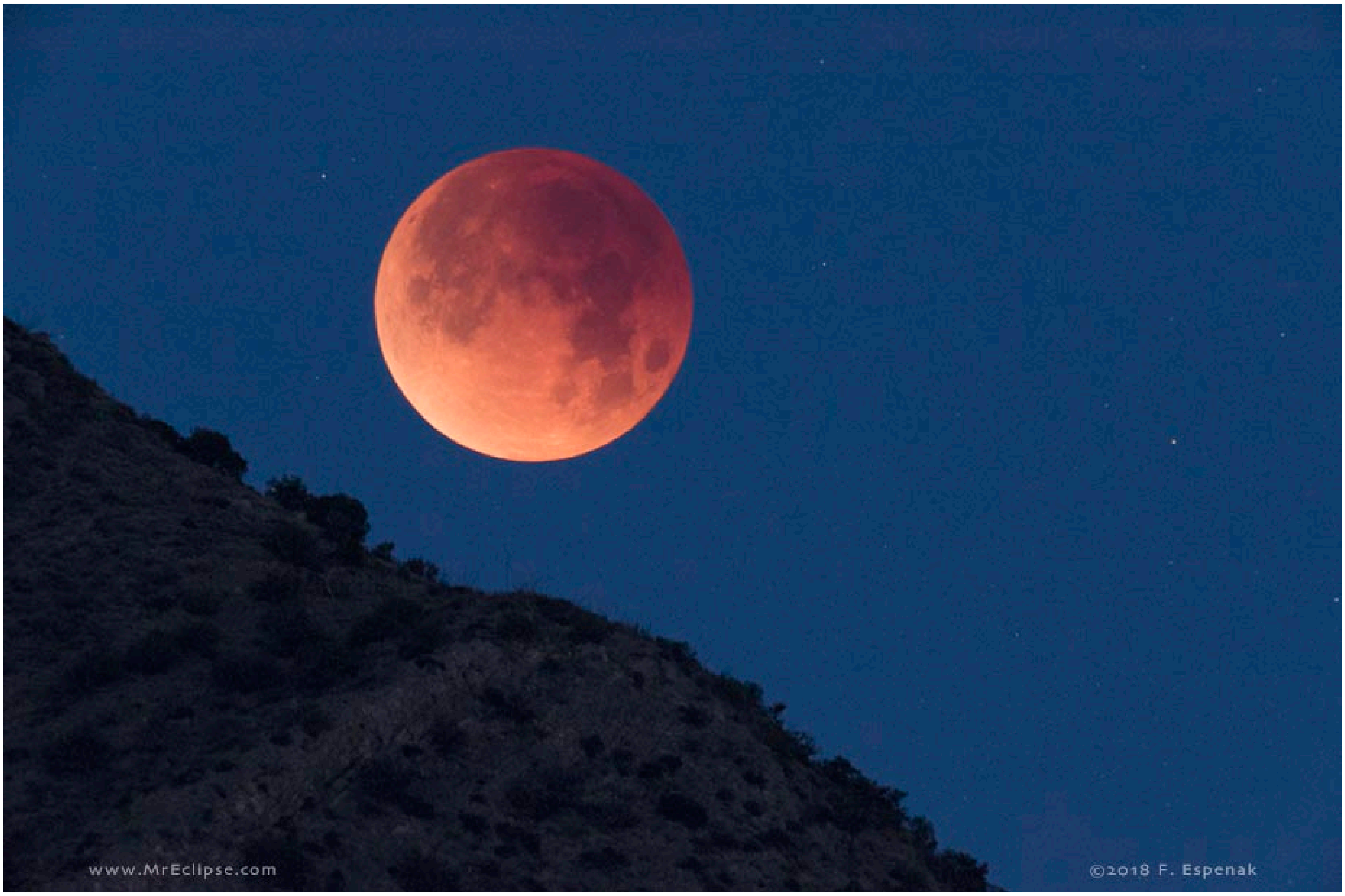
In the 60 years since liftoff of Explorer 1, the eyes of the world often focuses on The Cape as additional spacecraft are launched to Earth orbit, the Moon and planets. In 1961, Alan Shepard became the first American in space lifting off only a few hundred yards from where the nation's first satellite began its mission.

With construction of the Kennedy Space Center on adjacent Merritt Island, astronauts traveled to the lunar surface. For 30 years, space shuttles took crews to Earth orbit, culminating in construction of the International Space Station.

Today, Kennedy is a premier, multi-user spaceport where NASA and its partners continue to launch spacecraft, and soon will send crews on missions well beyond low-Earth orbit.

Source: NASA Return to Contents

Space Image of the Week



Moonset Eclipse

Explanation Near the closest point in its orbit, the second Full Moon of the month occurred on January 31. So did the first Total Lunar Eclipse of 2018, as the Moon slid through planet Earth's shadow. In a postcard from planet Earth, this telescopic snapshot captures the totally eclipsed Moon as it set above the western horizon and the Chiricahua Mountains of southern Arizona. The Moon's evocative reddened hue is due to sunlight scattered into the shadow. Still, the planet's shadow visibly grows darker near the center, toward the top of the lunar disk.

Source: APOD

Return to Contents