Space News Update

— April 6, 2018 —

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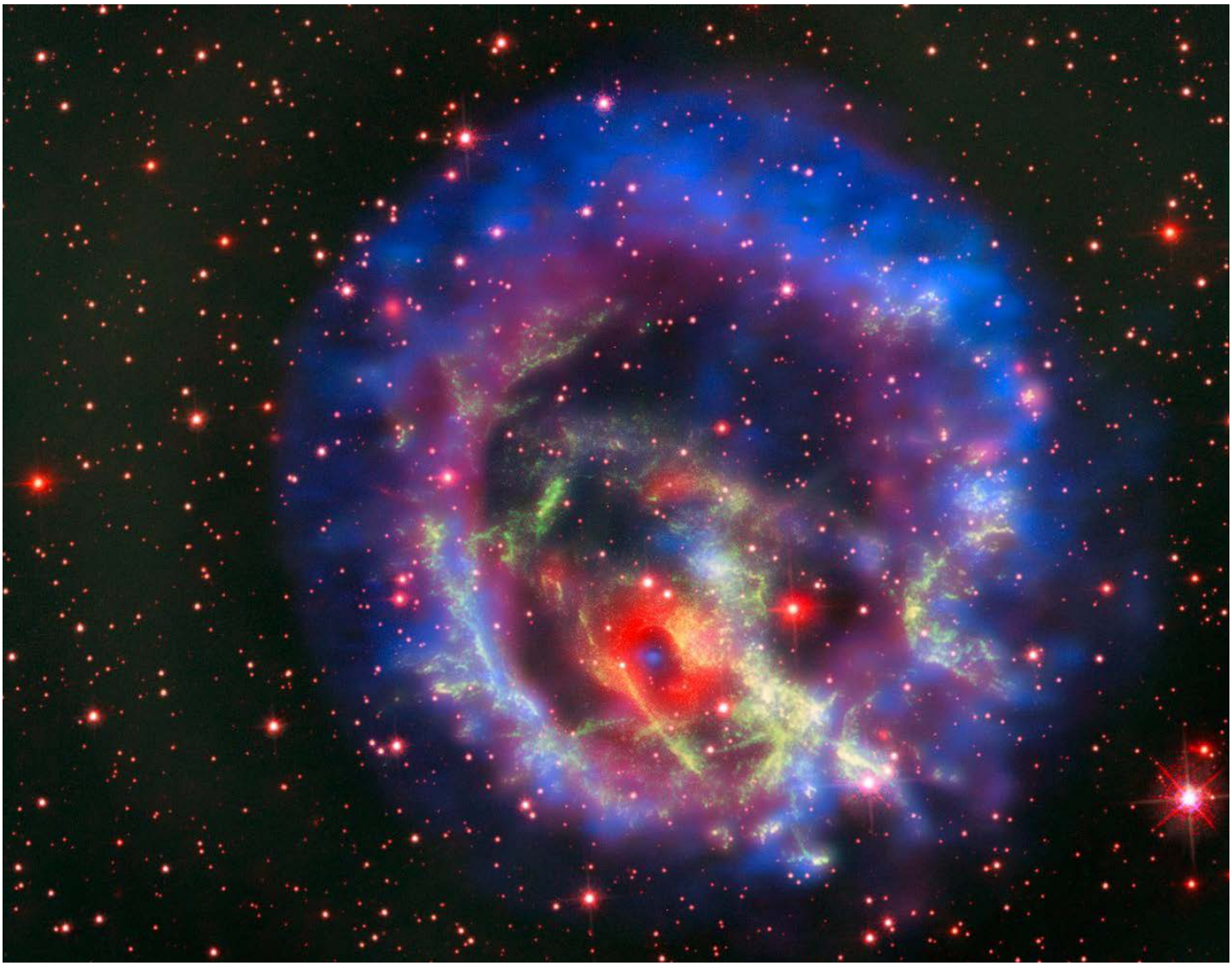
1. Dead star circled by light



New images from ESO's Very Large Telescope and other telescopes reveal a rich landscape of stars and glowing clouds of gas in one of our closest neighboring galaxies, the Small Magellanic Cloud. The pictures have allowed astronomers to identify an elusive stellar corpse left behind by a 2,000-year-old supernova explosion. The MUSE instrument was used to establish where this object is hiding, and Chandra X-ray Observatory data confirmed its identity as an isolated neutron star.

Spectacular new pictures, created from images from both ground- and space-based telescopes, tell the story of the hunt for an elusive missing object hidden amid a complex tangle of gaseous filaments in the Small Magellanic Cloud, about 200 000 light-years from Earth.

New data from the MUSE instrument on ESO's Very Large Telescope in Chile has revealed a remarkable ring of gas in a system called 1E 0102.2-7219, expanding slowly within the depths of numerous other fast-moving filaments of gas and dust left behind after a supernova. This discovery allowed a team led by Frédéric Vogt, an ESO Fellow in Chile, to track down the first ever isolated neutron star with low magnetic field located beyond our own Milky Way galaxy.

The team noticed that the ring was centred on an X-ray source that had been noted years before and designated p1. The nature of this source had remained a mystery. In particular, it was not clear whether p1

actually lies inside the remnant or behind it. It was only when the ring of gas—which includes both neon and oxygen—was observed with MUSE that the science team noticed it perfectly circled p1. The coincidence was too great, and they realised that p1 must lie within the supernova remnant itself. Once p1's location was known, the team used existing X-ray observations of this target from the [Chandra X-ray Observatory] to determine that it must be an isolated neutron star, with a low magnetic field.

In the words of Frédéric Vogt: "If you look for a point source, it doesn't get much better than when the Universe quite literally draws a circle around it to show you where to look."

When massive stars explode as supernovae, they leave behind a curdled web of hot gas and dust, known as a supernova remnant. These turbulent structures are key to the redistribution of the heavier elements—which are cooked up by massive stars as they live and die—into the interstellar medium, where they eventually form new stars and planets.

Typically barely ten kilometres across, yet weighing more than our Sun, isolated neutron stars with low magnetic fields are thought to be abundant across the Universe, but they are very hard to find because they only shine at X-ray wavelengths. The fact that the confirmation of p1 as an isolated neutron star was enabled by optical observations is thus particularly exciting.

Co-author Liz Bartlett, another ESO Fellow in Chile, sums up this discovery: "This is the first object of its kind to be confirmed beyond the Milky Way, made possible using MUSE as a guidance tool. We think that this could open up new channels of discovery and study for these elusive stellar remains."

Source: Phys.org Return to Contents

2. Second SpaceShipTwo performs first powered test flight

Virgin Galactic's second SpaceShipTwo suborbital vehicle successfully performed its first powered flight April 5, the first such test flight since a fatal crash nearly three and a half years ago.

The vehicle, named VSS Unity, was released from its WhiteKnightTwo carrier aircraft in the skies about 14,200 meters above Mojave, California, at approximately 12:00 p.m. Eastern time. The vehicle ignited its hybrid rocket motor on what the company said was a "partial duration burn" lasting 30 seconds. The vehicle reached a top speed of Mach 1.87 and altitude of 25,686 meters.

After the end of its powered flight, SpaceShipTwo deployed its feathering system, raising its twin booms to permit a safe reentry before lowering them again for landing. The vehicle glided to a landing at the Mojave Air and Space Port in California a little more than 10 minutes after release.

The flight was the first powered flight for VSS Unity, which the company rolled out more than two years ago. Virgin started a series of glide flights of VSS Unity in December 2016, with the most recent such flight on Jan. 11. Company officials at the time suggested that January glide flight would be the last before the start of powered test flights.

This flight featured a longer burn, and thus higher speed and altitude, than prior powered test flights by the first SpaceShipTwo, VSS Enterprise. In a January 2014 test flight, VSS Enterprise reached a top speed of Mach 1.4 and altitude of more than 21,000 meters.

That flight was the third powered test flight by VSS Enterprise. On the fourth, in October 2014, the vehicle broke apart seconds into the powered phase of flight, killing co-pilot Michael Alsbury and injuring pilot Peter Siebold.

An investigation by the National Transportation Safety Board concluded Alsbury had prematurely unlocked SpaceShipTwo's feathering mechanism as it passed through the sound barrier, causing an aerodynamic breakup. The investigation also blamed the vehicle's developer, Scaled Composites, for design elements that contributed to the accident, including its inability to foresee a single-point failure such as a premature unlocking of the feathering mechanism.

The Spaceship Company, originally a joint venture between Virgin and Scaled Composites but now wholly owned by Virgin, had already been building a second SpaceShipTwo at the time of the accident. Virgin leadership, including Sir Richard Branson, decided to continue development of that vehicle, which the company named VSS Unity at its February 2016 rollout. The company also built the rocket motor, using nitrous oxide and HTPB propellants.

This powered test flight is the first in a series of such flights planned by the company to expand the vehicle's performance envelope and to prepare for commercial flights carrying tourists and research payloads. The company has not stated how many such powered tests it expects to fly before the vehicle enters commercial service.

"We're looking forward to having a full 2018 with powered test flights," George Whitesides, chief executive of Virgin Galactic, said at a suborbital research conference in December. "We're going to take our time to do it right."

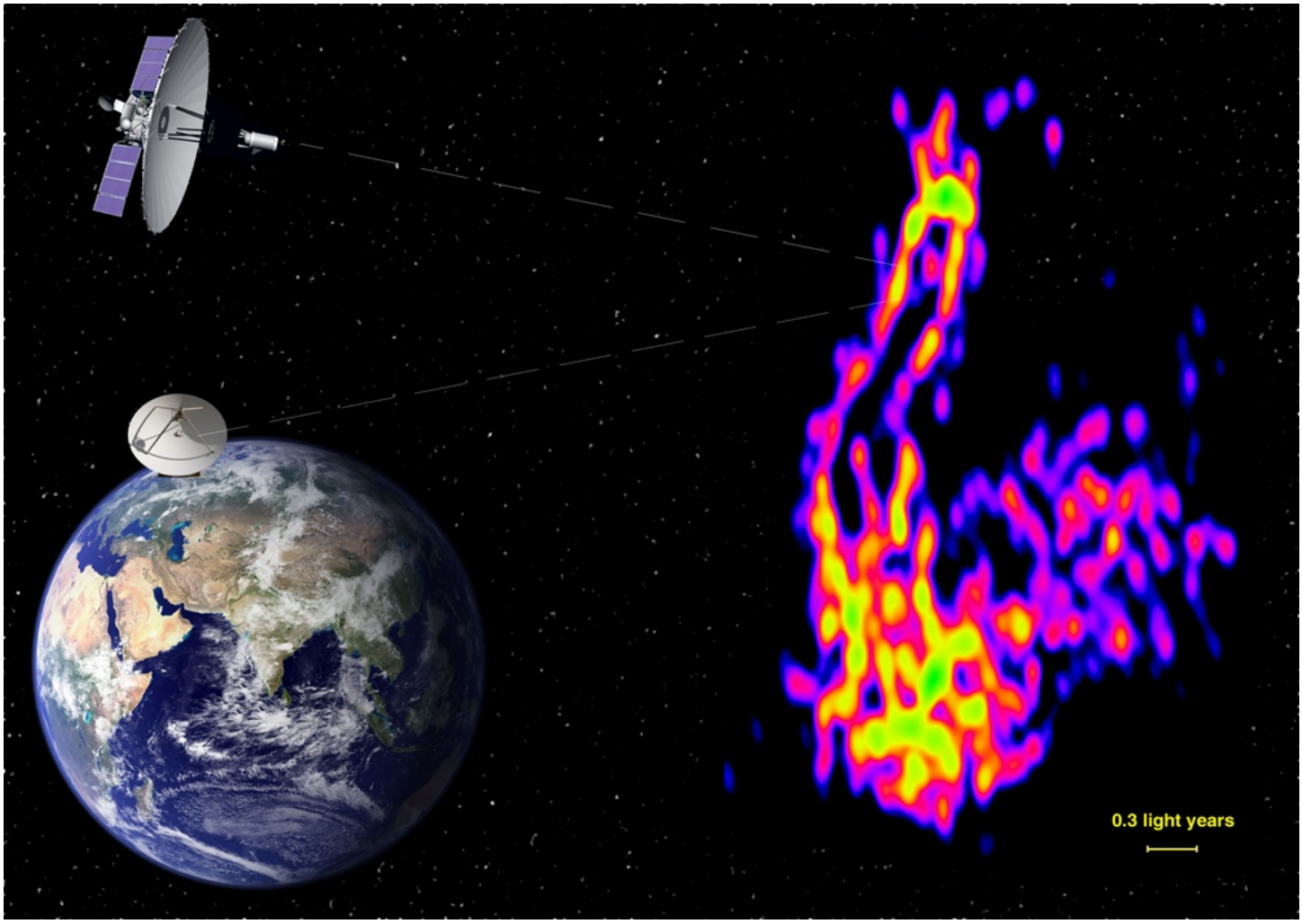
In addition to the test program, Virgin announced a non-binding agreement in October with the Public Investment Fund (PIF) of Saudi Arabia whereby the PIF would invest $1 billion into Virgin's space companies, which also include small launch vehicle developer Virgin Orbit.

Virgin has not provided an update on the status of that investment. However, the company said that Saudi Crown Prince Mohammad bin Salman Al-Saud, whose duties include serving as chairman of PIF, visited the facilities of Virgin Galactic and The Spaceship Company in Mojave last weekend, while the company was preparing for what it only described as an "upcoming" SpaceShipTwo flight test. Photos of the event show the logo for the Saudi Arabian government's "Vision 2030" initiative on the side of WhiteKnightTwo.

Virgin Galactic is "back on track," Branson tweeted shortly after the successful test flight. "Data review to come, then on to the next flight. Space feels tantalizingly close now."

Source: SpaceNews Return to Contents

3. Astronomers zoom in on a supermassive black hole's jets



A telescope bigger than our planet reveals minute details in a nearby galaxy's center.

Supermassive black holes millions to billions of times the mass of our Sun lurk in the centers of most galaxies. In addition to feeding on nearby gas and dust, some of these black holes launch massive jets of plasma that not only dwarf the black hole itself, but the entire galaxy in which they reside. The mechanics of these jets, including exactly where they are launched, are still poorly understood, but observations such as those recently achieved using a combination of Earth- and space-based radio telescopes will help unlock the mysteries surrounding these dramatic structures.

In a paper published April 2 in *Nature Astronomy*, an international collaboration of astronomers released observations of the jets around the black hole in the galaxy NGC 1275, located in the Perseus Cluster of galaxies about 230 million light-years away. Also known as Perseus A or 3C 84, this galaxy is classified as a Seyfert galaxy, meaning it has an “active” black hole currently feeding on surrounding material. That black hole is in the early stages of generating massive jets, which have now been mapped out via radio observations down to a mere 12 light-days from their origin around the black hole. That’s just a few hundred times the radius of the black hole itself (1 light-day is about 16 billion miles [26 billion kilometers]).

What they found surprised them. “It turned out that the observed width of the jet was significantly wider than what was expected in the currently favored models where the jet is launched from the black hole’s ergosphere — an area of space right next to a spinning black hole where space itself is dragged to a circling motion

around the hole," said the paper's lead author, Gabriele Giovannini from the Italian National Institute for Astrophysics, in a press release.

Instead, "this may imply that at least the outer part of the jet is launched from the [much larger] accretion disk surrounding the black hole," said said Tuomas Savolainen of Aalto University in Finland, and leader of the RadioAstron observing program that created the images.

These images took advantage of a technique called very long baseline interferometry, or VLBI. This technique links several radio telescopes together to essentially observe with a "virtual" dish as large as the distance between the telescopes. In this case, the team linked Earth-based radio telescopes with a Russian 10-meter (33 feet) radio telescope orbiting Earth as part of the RadioAstron project, creating a virtual radio telescope with a diameter of over 200,000 miles (350,000 km), nearly the distance between Earth and the Moon. The larger the radio telescope, the finer the detail it can see, which allowed astronomers to zoom in on the region around NGC 1275's black hole to look for clues about how and where the jet is generated. Their resulting images are 10 times better than anything previously achieved using ground-based radio telescopes alone. This same technique is the one utilized by the Event Horizon Telescope last year in an attempt to image the shadow of a supermassive black hole on its accretion disk; astronomers are eagerly awaiting the results, which should be announced later this year.

But while these observations don't mesh exactly with expectations, "Our result does not yet falsify the current models where the jets are launched from the ergosphere, but it hopefully gives the theorists insight about the jet structure close to the launching site and clues how to develop the models," said Savolainen.

This is only the second observation of jets at such close proximity to the black hole; the only other system that has been observed with this level of detail is M87. But the jets in M87 are much older, which, researchers say, may be why they look different from those in NGC 1275. "The jet in NGC 1275 was re-started just over a decade ago and is currently still forming, which provides a unique opportunity to follow the very early growth of a black hole jet," said Masanori Nakamura from Academia Sinica in Taiwan, a co-author on the paper. "Continuing these observations will be very important."

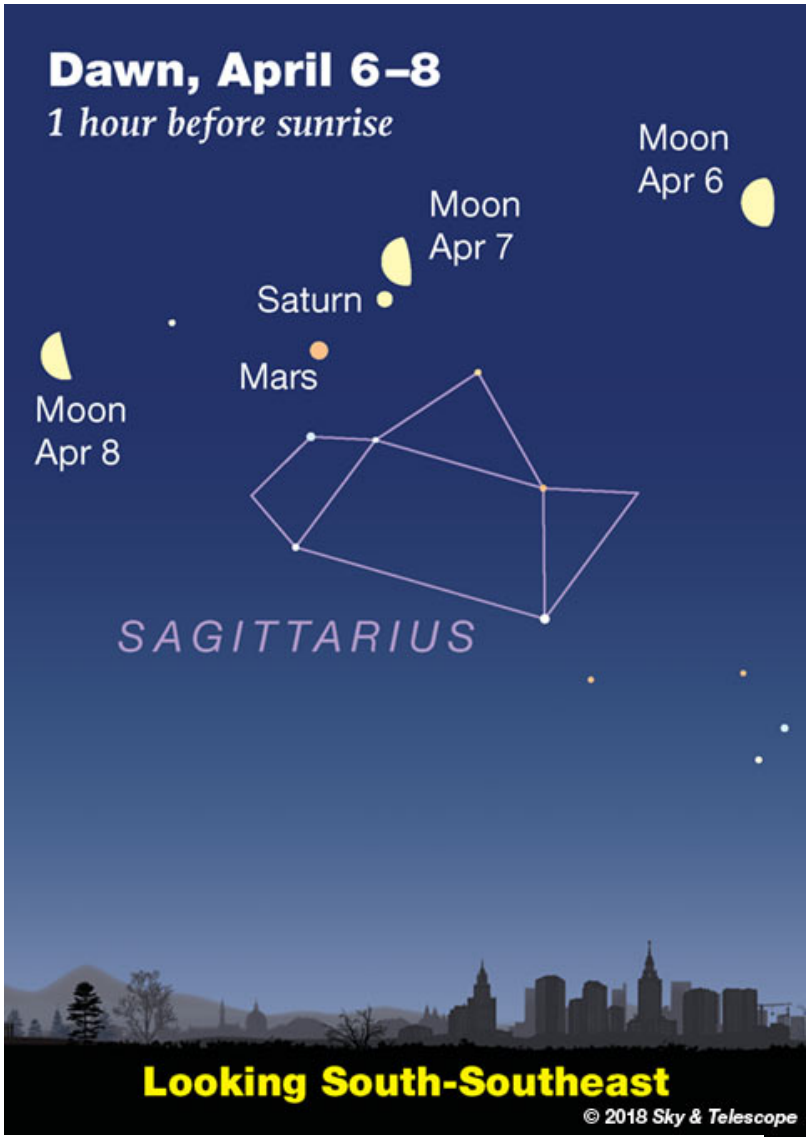
Source: Astronomy.com Return to Contents

The Night Sky

Friday, April 6

• Right after dark, Orion remains well up in the southwest in his spring orientation: striding down to the right, with his belt roughly horizontal. The belt points left toward Sirius, and to the right toward Aldebaran and, farther on, the Pleiades.

• As dawn approaches on Saturday the 7th, you'll find the waning Moon bunching up with Mars and Saturn, as shown here.



Saturday, April 7

• At this time of year, the two Dog Stars stand vertically aligned around the end of twilight. Look southwest. Brilliant Sirius in Canis Major is below; Procyon in Canis Minor is high above.

• Last-quarter Moon tonight (exactly so at 3:18 a.m. April 8th EDT). The Moon rises around 2 or 3 a.m. your local daylight saving time, some 8° or 10° to the lower left of Mars and Saturn. By dawn on the 8th they're all well up in the south-southeast, as shown here.

Sunday, April 8

• Jupiter's moon Europa disappears into eclipse by Jupiter's shadow around 2:52 a.m. Monday morning EDT (11:52 p.m. Sunday evening PDT). A 2-inch telescope will show it gradually fading away just west of the planet.

Monday, April 9

• Vega, the bright "Summer Star," rises in the northeast around 9 or 10 p.m. these evenings. Exactly where should you watch for it? Spot the Big Dipper very high in the northeast. Look at Mizar at the bend of its handle. If you can see Mizar's tiny, close companion Alcor (binoculars make it easy), follow a line from Mizar through Alcor all the way down to the horizon. That's where Vega will make its appearance.

Tuesday, April 10

• Capella is the bright star high in the west-northwest during and after dusk. Its pale-yellow color matches that of the Sun, meaning they're both about the same temperature. But otherwise Capella is very different. It consists of two yellow giant stars orbiting each other rather closely every 104 days.

Moreover, for telescope users, Capella is distantly accompanied by a tight pair of red dwarfs: Capella H and L, magnitudes 10 and 13. Article and finder charts.

Source: Sky & Telescope

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ISS Sighting Opportunities

For Denver:

Date	Visible	Max Height	Appears	Disappears
Fri Apr 6, 8:25 PM	4 min	17°	10° above NNW	12° above ENE
Fri Apr 6, 10:02 PM	< 1 min	19°	19° above NW	19° above NW
Sat Apr 7, 9:10 PM	2 min	45°	18° above NW	45° above NNE
Sun Apr 8, 8:17 PM	5 min	27°	12° above NNW	14° above E
Sun Apr 8, 9:54 PM	< 1 min	20°	17° above WNW	20° above W
Mon Apr 9, 9:02 PM	2 min	73°	28° above WNW	58° above SSE
Tue Apr 10, 8:10 PM	5 min	56°	22° above NW	12° above ESE
Tue Apr 10, 9:46 PM	1 min	13°	10° above W	13° above WSW

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

NASA-TV Highlights

(all times Eastern Daylight Time)

4 p.m., 6 p.m., 10 p.m., Friday, April 6 - Replay of SpaceCast Weekly (all channels)

10 a.m., 3 p.m., 10 p.m., Saturday, April 7 - Replay of SpaceCast Weekly (all channels)

11 a.m., 2 p.m., 8 p.m., Saturday, April 7 - Replay of Low Boom Flight Demonstrator (LBFD) X- Plane Build News Conference (all channels)

8 a.m., 4 p.m., 9 p.m., Sunday, April 8 - Replay of Low Boom Flight Demonstrator (LBFD) X- Plane Build News Conference (all channels)

9 a.m., 2 p.m., 7 p.m., Sunday, April 8 - Replay of SpaceCast Weekly (all channels)

6:30 a.m., Monday, April 9 - ISS Expedition 55 In-Flight Event with Czech TV and Flight Engineer Drew Feustel of NASA (starts at 6:30 a.m.) (all channels)

9:30 a.m., Monday, April 9 - ISS Expedition 55 Educational In-Flight Event with Frostburg State University in Frostburg, Maryland and Flight Engineers Ricky Arnold and Drew Feustel of NASA (starts at 9:55 a.m.) (all channels)

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

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Space Calendar

- Apr 06 - Comet 316P/LONEOS-Christensen At Opposition (3.535 AU)
- Apr 06 - Comet P/2006 H1 (McNaught) At Opposition (3.943 AU)
- Apr 06 - Asteroid 35352 Texas Closest Approach To Earth (1.490 AU)
- Apr 06 - 10th Anniversary (2008), Berduc Meteorite Fall (Hit Building in Argentina)
- Apr 06 - Franck Marchis' 45th Birthday (1973)
- Apr 07 - 

[Mar 31] 50th Anniversary (1968), Luna 14 Launch (Soviet Moon Orbiter Mission)
- Apr 07 - 

[Apr 06] Comet 366P/Spacewatch Closest Approach To Earth (1.410 AU)
- Apr 07 - Comet P/2006 S1 (Christensen) At Opposition (3.437 AU)
- Apr 07 - Asteroid 2511 Patterson Closest Approach To Earth (1.264 AU)
- Apr 07 - Asteroid 163693 Atira Closest Approach To Earth (1.363 AU)
- Apr 07 - Asteroid 12561 Howard Closest Approach To Earth (1.671 AU)
- Apr 07 - Asteroid 11945 Amsterdam Closest Approach To Earth (2.280 AU)
- Apr 07 - 35th Anniversary (1983), 1st Spacewalk from Space Shuttle (Story Musgrave, Don Peterson, STS-6)
- Apr 08 - Comet 143P/Kowal-Mrkos At Opposition (1.542 AU)
- Apr 08 - Comet P/2012 O2 (McNaught) Closest Approach To Earth (2.652 AU)
- Apr 08 - Comet C/2015 O1 (PANSTARRS) At Opposition (3.234 AU)
- Apr 08 - Comet C/2016 T1 (Matheny) At Opposition (4.192 AU)
- Apr 08 - Comet 196P/Tichy At Opposition (4.204 AU)
- Apr 08 - Amor Asteroid 2018 CZ13 Near-Earth Flyby (0.072 AU)
- Apr 08 - AmorAsteroid 2018 FV3 Near-Earth Flyby (0.086 AU)
- Apr 08 - Asteroid 1198 Atlantis Closest Approach To Earth (1.845 AU)
- Apr 08 - Kuiper Belt Object 2014 FT71 At Opposition (46.680 AU)
- Apr 08 - 25th Anniversary (1993), STS-56 Launch (Space Shuttle Discovery, ATLAS-2)
- Apr 08 - Karl Hencke's 225th Birthday (1793)
- Apr 09 - Asteroid 75564 Audubon Closest Approach To Earth (1.062 AU)
- Apr 09 - Apollo Asteroid 4179 Toutatis Closest Approach To Earth (2.818 AU)
- Apr 09 - Kuiper Belt Object 2013 FS28 At Opposition (83.802 AU)
- Apr 10 - Comet 222P/LINEAR At Opposition (2.922 AU)
- Apr 10 - Comet 68P/Klemola At Opposition (3.857 AU)
- Apr 10 - Amor Asteroid 3757 Anagolay Closest Approach To Earth (0.950 AU)

Source: JPL Space Calendar

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Food for Thought

An Experimental Space Junk Collector Is On Its Way to the ISS

A group of European engineers are about to go fishing in space. Their target: space junk.

Yesterday (04/02), SpaceX launched the Dragon spacecraft, which, if all goes according to plan, will reach the International Space Station on Wednesday, April 4. Among the many different experiments it has in tow, one didn't receive much attention: a new "proof of concept" space junk collector called RemoveDEBRIS.

Created by scientists at the University of Surrey Space Center in the U.K., this spacecraft will run a series of experiments over the coming months aimed at capturing and destroying some of the debris floating around our planet.

NASA currently estimates there are more than 500,000 pieces of debris currently orbiting the Earth, all traveling fast enough to seriously damage any unlucky spacecraft that happens to cross their path. And while scientists have proposed many creative solutions for removing some of these dangerous bits, none have been ever been tested out in space.

Enter: RemoveDEBRIS. When the 100-kilogram (220-pound) space junk collector arrives at the ISS, the station's six-person crew will unpack it in the next few weeks (makes sense that they would want to first get to the fresh food in the same shipment). At the end of May or in early June, *Spaceflight Now* reports, the crew will then transfer the craft to the Japanese Kibo lab's airlock, and transfer it out into space via a robotic arm. When released, RemoveDEBRIS will be the largest satellite ever launched from the ISS.

Once out in space, REMOVEDebris will run three tests. It will:

- Attempt to snag a dummy piece of debris (mimicked by an inflatable miniature satellite called a CubeSat) using a net
- Track another CubeSat using close-up ranging lasers and navigation technology, as a space junk collector would need to pursue a target piece of junk
- Fire a harpoon at a test target attached to the RemoveDEBRIS arm

If successful, these tests could show that the simple technology once applied to sea creatures could be useful in snagging some of the junk threatening orbiting spacecraft.

Guglielmo Aglietti, RemoveDEBRIS principal investigator, told *Spaceflight Now* that the primary aim of the mission is to show that cleaning up space debris can be relatively affordable.

“At the end of the day, everything boils down to funding,” Aglietti said. “We all agree, in the space sector, that it is a good idea to start to remove larger pieces of debris… if the cost to do it is exorbitant, then people will prefer to take the risk that their new satellite is going to be hit by a piece of debris. If we manage to lower the cost of the missions, then this is much more likely to happen.”

At the end of its mission, RemoveDEBRIS will run one final test: opening an expandable sail to generate drag (remember, it will be in the upper atmosphere still has some air, unlike the vacuum of space), pulling itself down into the atmosphere and burning up there. That will happen up to 1.5 years after the experiment begins.

It’s a fitting end for RemoveDEBRIS. After all, it would be pretty ironic for a space junk cleaner become space junk itself.

Source: Futurism

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Space Image of the Week

Gullies of Matara Crater

Gullies on Martian sand dunes, like these in Matara Crater, have been very active, with many flows in the last ten years. The flows typically occur when seasonal frost is present.

In this image from NASA's Mars Reconnaissance Orbiter we see frost in and around two gullies, which have both been active before. (View this observation to see what these gullies looked like in 2010.) There are no fresh flows so far this year, but HiRISE will keep watching.

The map is projected here at a scale of 50 centimeters (19.7 inches) per pixel. [The original image scale is 50.3 centimeters (19.8 inches) per pixel (with 2 x 2 binning); objects on the order of 151 centimeters (59.4 inches) across are resolved.] North is up.

The University of Arizona, Tucson, operates HiRISE, which was built by Ball Aerospace & Technologies Corp., Boulder, Colorado. 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.

Image credit: NASA/JPL-Caltech/Univ. of Arizona Image download options

Source: NASA

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