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Space Image of the Week
1. Is This Meteorite a Piece of Mercury?

Pieces of the Moon and Mars have been found on Earth before, as well as chunks of Vesta and other asteroids, but what about the innermost planet, Mercury? That’s where some researchers think this greenish meteorite may have originated, based on its curious composition and the most recent data from NASA’s MESSENGER spacecraft. NWA 7325 is the name for a meteorite fall that was spotted in southern Morocco in 2012, comprising 35 fragments totaling about 345 grams. The dark green stones were purchased by meteorite dealer Stefan Ralew (who operates the retail site SR Meteorites) who immediately made note of their deep colors and lustrous, glassy exteriors. Ralew sent samples of NWA 7325 to researcher Anthony Irving of the University of Washington, a specialist in meteorites of planetary origin. Irving found that the fragments contained surprisingly little iron but considerable amounts of magnesium, aluminum, and calcium silicates — in line with what’s been observed by MESSENGER in the surface crust of Mercury. And even though the ratio of calcium silicates is higher than what’s found on Mercury today, Irving speculates that the fragments of NWA 7325 could have come from a deeper part of Mercury’s crust, excavated by a powerful impact event and launched into space, eventually finding their way to Earth.

In addition, exposure to solar radiation for an unknown period of time and shock from its formation could have altered the meteorite’s composition somewhat, making it not exactly match up with measurements from MESSENGER. If this is indeed a piece of our Solar System’s innermost planet, it will be the first Mercury meteorite ever confirmed.

But the only way to know for sure, according to Irving’s team’s paper, is further studies on the fragments and, ultimately, sample returns from Mercury.

Irving’s team’s findings on NWA 7325 will be presented at the 44th Lunar and Planetary Science Conference to be held in Houston, TX, on March 18-22

Source: Universe Today
2. Preparatory Test for First Rock Drilling by Mars Rover Curiosity

The bit in the rotary-percussion drill of NASA’s Mars rover Curiosity left its mark in a target patch of rock called "John Klein" during a test on the rover's 176th Martian day, or sol (Feb. 2, 2013), in preparation for the first drilling of a rock by the rover. The Sol 176 test, called the "drill on rock checkout," used only the hammering or percussive action of the drill, not rotary action.

This image from the Mars Hand Lens Imager (MAHLI) camera on the rover's arm was taken with the camera positioned about 4 inches (10 centimeters) off the ground. It shows an area of John Klein about 3 inches (7.7 centimeters) wide. The length of the gray divot cut by the drill bit is about two-thirds of an inch (1.7 centimeters).

Another preparatory test, called "mini drill," will precede the full drilling. The mini drill test will use both the rotary and percussive actions of the drill to generate a ring of rock powder around a hole. This will allow evaluating the appearance of these drill tailings, to see if they are behaving as dry powder suitable for processing by the rover's sample handling mechanisms.

Malin Space Science Systems, San Diego, developed, built and operates MAHLI and the MAHLI engineering model. NASA's Jet Propulsion Laboratory, Pasadena, Calif., manages the Mars Science Laboratory Project and the mission's Curiosity rover for NASA's Science Mission Directorate in Washington. Curiosity and the mission's Vehicle System Test Bed rover were designed and built at JPL, a division of the California Institute of Technology in Pasadena.
3. NASA to Host Feb. 7 Media Telecon on Asteroid Flyby

PASADENA, Calif. -- NASA will hold a media teleconference at 11 a.m. PST (2 p.m. EST), on Thursday, Feb. 7, to discuss an asteroid, 150 feet (45 meters) in diameter, that will pass close, but safely, by Earth on Feb. 15. The flyby creates a unique opportunity for researchers to observe and learn more about asteroids.


Audio of the teleconference will be streamed live at: http://www.nasa.gov/newsaudio and http://www.ustream.tv/nasajpl2.

Related images will be available at the start of the teleconference at:

For detailed information concerning the Earth flyby of 2012 DA14, visit:
http://www.nasa.gov/topics/solarsystem/features/asteroidflyby.html.

A Ustream feed of the flyby from a telescope at NASA's Marshall Space Flight Center in Huntsville, Ala., will be broadcast from 6 p.m. to 9 p.m. PST (9 p.m. to midnight EST) on Feb. 15. To view the feed and ask researchers questions via Twitter about the flyby, visit: http://www.ustream.tv/channel/nasa-msfc.

Source: NASA JPL
The Night Sky

Monday, February 4
• Jupiter's biggest moon, Ganymede, fades into eclipse by Jupiter's shadow around 7:35 p.m. EST. It reappears around 9:53 p.m. EST. Both events take place just east of the planet. Europa happens to be just south of Ganymede's reappearance point, by a bit less than a Jupiter diameter. When can you detect the first trace of Ganymede coming back?

Tuesday, February 5
• With the Moon gone from the evening sky, this week is a fine time to look for the zodiacal light from the Northern Hemisphere. At a clear, dark site with clean air, look west at the very end of twilight for a vague but huge, tall pyramid of pearly light. It's tilted left to align along the constellations of the zodiac — or more exactly, along the ecliptic line. So it points toward toward Jupiter. What you're seeing is sunlit interplanetary dust — comet and asteroid debris — orbiting the Sun near the plane of the solar system. Mars appears less than 1° upper left of much brighter Mercury low in the west-southwest after sunset on February 7th. Mercury appears less than ½° upper right of much fainter Mars shortly after sunset on February 8th.

Wednesday, February 6
• The cold northern wastes of the February sky may not have drawn your attention. But big, dim Camelopardalis, sprawling between Auriga and the north celestial pole, hosts some interesting wide double stars for binoculars. Take a tour with Gary Seronik's Binocular Highlight column and chart in the February Sky & Telescope, page 45.

Thursday, February 7
• Challenging Mercury-Mars conjunction. Look low in the west-southwest a half hour after sunset. Faint Mars is within ¾° upper left of brighter Mercury (seen from North America), as shown here. Quite an interesting pair in binoculars! See our article Mercury Meets Mars.

Friday, February 8
• Conjunction continues. Mars is now within just ¼° of Mercury low in the west-southwest in bright twilight (for North America) — a fine pair through a telescope, though both will be tiny and blurred. See Mercury Meets Mars.

Source: Sky & Telescope

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## ISS Sighting Opportunities

For Denver:

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Sighting information for other cities can be found at NASA’s [Satellite Sighting Information](#).

## NASA-TV Highlights

(all times Eastern Daylight Time)

**February 4, Monday**

8 p.m. - Science Uncut - Arctic on the Edge? - HQ (All Channels)

**February 5, Tuesday**

8 a.m. - Replay of Science Uncut - Arctic on the Edge? - HQ (All Channels)

10:15 a.m. - ISS Expedition 34 In-Flight Educational Event with the North Carolina Museum of Natural Sciences in Raleigh, N.C. - JSC (All Channels)

1 & 8 p.m. - Replay of Science Uncut - Arctic on the Edge? - HQ (All Channels)

**February 6, Wednesday**

12:05 p.m. - ISS Mission Control Console Interview with the Digital Learning Network - JSC (All Channels)

**February 7, Thursday**

10:40 a.m. - ISS Expedition 34 Canadian Space Agency In-Flight Event with William Shatner and Twitter Followers at CSA Headquarters - JSC (Public and Media Channels)

1:50 p.m. - ISS Expedition 34 In-Flight Event with the Indiana State Legislature - JSC (Public and Media Channels)

**February 8, Friday**

3 p.m. - LDCM Prelaunch News Conference - VAFB (All Channels)

3:45 p.m. - LDCM Mission Science Briefing - VAFB (All Channels)

Watch NASA TV online by going to the [NASA website](#).
Space Calendar

- Feb 04 - Mars Passes 0.5 Degrees From Neptune
- Feb 04 - Comet C/2012 C1 (McNaught) Perihelion (4.838 AU)
- Feb 04 - Asteroid 2003 BN4 Near-Earth Flyby (0.071 AU)
- Feb 04 - Asteroid 7816 Hanoi Closest Approach To Earth (1.382 AU)
- Feb 04 - Asteroid 18132 Spector Closest Approach To Earth (1.422 AU)
- Feb 04 - Asteroid 472 Roma Closest Approach To Earth (1.477 AU)
- Feb 04 - Asteroid 6042 Chesirecat Closest Approach To Earth (2.547 AU)
- Feb 04 - Asteroid 15417 Babylon Closest Approach To Earth (3.083 AU)
- Feb 04 - Asteroid 5254 Ulysses Closest Approach To Earth (4.157 AU)
- Feb 05 - Globalstar 2 Closest Approach To Earth (3.083 AU)
- Feb 05 - Comet C/2012 F6 (Lemmon) Closest Approach To Earth (0.985 AU)
- Feb 05 - Asteroid 2013 BU15 Near-Earth Flyby (0.031 AU)
- Feb 05 - Asteroid 7010 Locke Closest Approach To Earth (1.340 AU)
- Feb 06 - Mercury Passes 0.5 Degrees From Neptune
- Feb 06 - Comet 26P/Grigg-Skjellerup Closest Approach To Earth (1.346 AU)
- Feb 06 - Asteroid 2013 BA74 Near-Earth Flyby (0.011 AU)
- Feb 06 - Asteroid 9620 Ericidle Closest Approach To Earth (1.086 AU)
- Feb 06 - Asteroid 3656 Hemingway Closest Approach To Earth (1.352 AU)
- Feb 06 - Asteroid 4370 Dickens Closest Approach To Earth (1.441 AU)
- Feb 06 - Asteroid 2554 Skiff Closest Approach To Earth (1.494 AU)
- Feb 06 - Asteroid 2013 AQ27 Closest Approach To Earth (0.067 AU)
- Feb 06 - Asteroid 1566 Icarus Closest Approach To Earth (0.806 AU)
- Feb 06 - Asteroid 7818 Muirhead Closest Approach To Earth (1.119 AU)
- Feb 06 - Asteroid 2160 Spitzer Closest Approach To Earth (2.171 AU)
- Feb 08 - Mercury Passes 0.3 Degrees From Mars
- Feb 08 - Comet P/2013 US27 (Siding Spring) Perihelion (1.821 AU)
- Feb 08 - Asteroid 2002 LY1 Near-Earth Flyby (0.074 AU)
- Feb 08 - Asteroid 151259 333 Hain Closest Approach To Earth (0.724 AU)
- Feb 08 - Asteroid 118401 LINEAR Closest Approach To Earth (2.446 AU)
- Feb 08 - Jules Verne's 185th Birthday (1853)
Food for Thought

Carnival of Space

1. **Meridiani Journal** - Astronomers redefine the habitable zone for exoplanets. Astronomers, from Penn State and also collaborators with the Planetary Habitability Laboratory, have concluded that, overall, the habitable zones are a bit farther out from their stars than previously thought. “This has implications for finding other planets with life on them,” according to Ravi Kumar Kopparapu, a lead investigator with the new study.

2. **The Planetary Society** - Just like on Earth, clouds and storms often ripple through the Martian atmosphere. You can even check the daily weather report.

3. **Urban Astronomer** - Water ice found on Mercury, and how this can even be possible. Mercury is pockmarked with large craters, just like the Moon, and it's axis of rotation is aligned almost perfectly with it's orbit around the Sun. Together, these two factors mean that the craters near the North and South poles of Mercury are in permanent shadow and are never exposed to the fierce heat of the nearby Sun. Throw in several million years worth of space-dust to make a nice insulating blanket, and it turns out that the accumulated water from all those ancient comets manages to freeze into quite a thick crust of ice.

4. **At Here. There. Everywhere.** Quarterback Throws and a Pulsar goes. Superbowl Sunday is a good excuse to mull over the science behind the game. The same physics is in play on a much bigger scale elsewhere in the Universe.

5. **Astroblogger** - Initial orbit values for comet C/2013 A1 suggests it may come very close to Mars, with a slight chance it could actually hit.

6. **Nextbigfuture** - NASA has developed a water and ice mining robot for the moon and it is called RASSOR. RASSOR, for Regolith Advanced Surface Systems Operations Robot and pronounced "razor," the autonomous machine is far from space-ready, but the earliest design has shown engineers the broad strokes of what their lunar soil excavator needs in order to operate reliably. A concept mission for RASSOR would have a 2000 pound payload in addition to the lander, which would be about the size of the Phoenix lander NASA sent to Mars. The RASSOR is expected to weigh about 100 pounds. The remaining payload would be used to process the lunar soil delivered by RASSOR.

7. **Nextbigfuture** - The Wang Bullet is a single pulse nuclear external pulse propulsion system. Freeman Dyson and Ted Taylor and others worked on the project Orion nuclear pulse propulsion system. The designs involved
about 200 pulses to get out of the earth's gravity and 600 more pulses to go to Mars or Saturn's moon Titan. The single pulse propulsion system is to dig a large hole and use one pulse which is a nuclear cannon that could launch thousands of tons in one shot. In this article, the reports from past nuclear tests is used to consider if the blast size and the projectile could not be configured for a successful launch. They also consider nuclear blasts for excavation.

8. **Nextbigfuture** has a follow up examination of the Friedlander Cold Crown and managing large scale lunar industry. The purpose of the Friedlander Cold Crown is to capture runaway gas escapes that otherwise would ruin the wonderful Lunar ambient vacuum during a period of massive industrial bootup. For current lunar atmosphere, Landis gives ten million molecules/cubic centimeter (half nanotorr) during the lunar day 100,000 molecules/cubic centimeter during the lunar night. This corresponds to pressures from 0.001 nanotorr This is good enough to use vacuum tubes without the tube, a vacuum technician’s paradise easily spoiled by large scale outgassing.

9. **Nextbigfuture** - Culham Science Centre’s Reaction Engines Ltd has carried out successful tests on a revolutionary rocket engine for its Skylon vehicle. The space plane will be able to reach speeds of more than 19,000 miles an hour – which would cut the journey time from London to Australia to just four hours. Reaction Engines hopes to run cargo flights to space stations by 2022 and says the craft – which will take off and land from conventional runways – could later be adapted to take tourists towards the stars. They are targeting the first test flights in 2019.

10. **Nextbigfuture** argues that have to rewrite the economics of space as we go. Build things so that which follows is cheaper. Food, water, fuel, accommodations, etc... It should all be ready and waiting. We have spent about $3 trillion (in todays dollars on space, (50 years of NASA and Defense space budgets). Yet we do not have the interstate highway system for space after all of that money because we did not try to build things or put things up there to make what followed cheaper. Everything was one off. It is not just the economics of one asteroid. It is about leveraging for hundreds and tens of thousands of asteroids. A proper plan for $3 trillion of space development would have been to make fuel depots in low earth orbit and higher orbits and on the moon and to develop power generation and material processing systems. There should be oxygen, water, fuel, food and other materials available so that space missions that follow can be cheap and light weight. There should be solar system wide positioning system and communications network. Tether (skyhook) systems can be used to reduce the speed and cost needed to get to orbit. By halving the speed to get to orbit (intercept with a skyhook and get boosted to orbit instead of just going to orbit) you would lower fuel requirements by four times. Internet companies and venture capitalists talk about scaling a business model. Space industrialization is about truly scaling. The biggest economic bootstrap ever. A smaller comparison is the investment to develop the missions and colonies in North and South America in the 1600s and 1700s.

Source: [Universe Today](http://www.universetoday.com)
LL Ori and the Orion Nebula

Image Credit: NASA, ESA, and The Hubble Heritage Team

Explanation: This esthetic close-up of cosmic clouds and stellar winds features LL Orionis, interacting with the Orion Nebula flow. Adrift in Orion's stellar nursery and still in its formative years, variable star LL Orionis produces a wind more energetic than the wind from our own middle-aged Sun. As the fast stellar wind runs into slow moving gas a shock front is formed, analogous to the bow wave of a boat moving through water or a plane traveling at supersonic speed. The small, arcing, graceful structure just above and left of center is LL Ori's cosmic bow shock, measuring about half a light-year across. The slower gas is flowing away from the Orion Nebula's hot central star cluster, the Trapezium, located off the upper left corner of the picture. In three dimensions, LL Ori's wrap-around shock front is shaped like a bowl that appears brightest when viewed along the "bottom" edge. The beautiful picture is part of a large mosaic view of the complex stellar nursery in Orion, filled with a myriad of fluid shapes associated with star formation.

Source: NASA