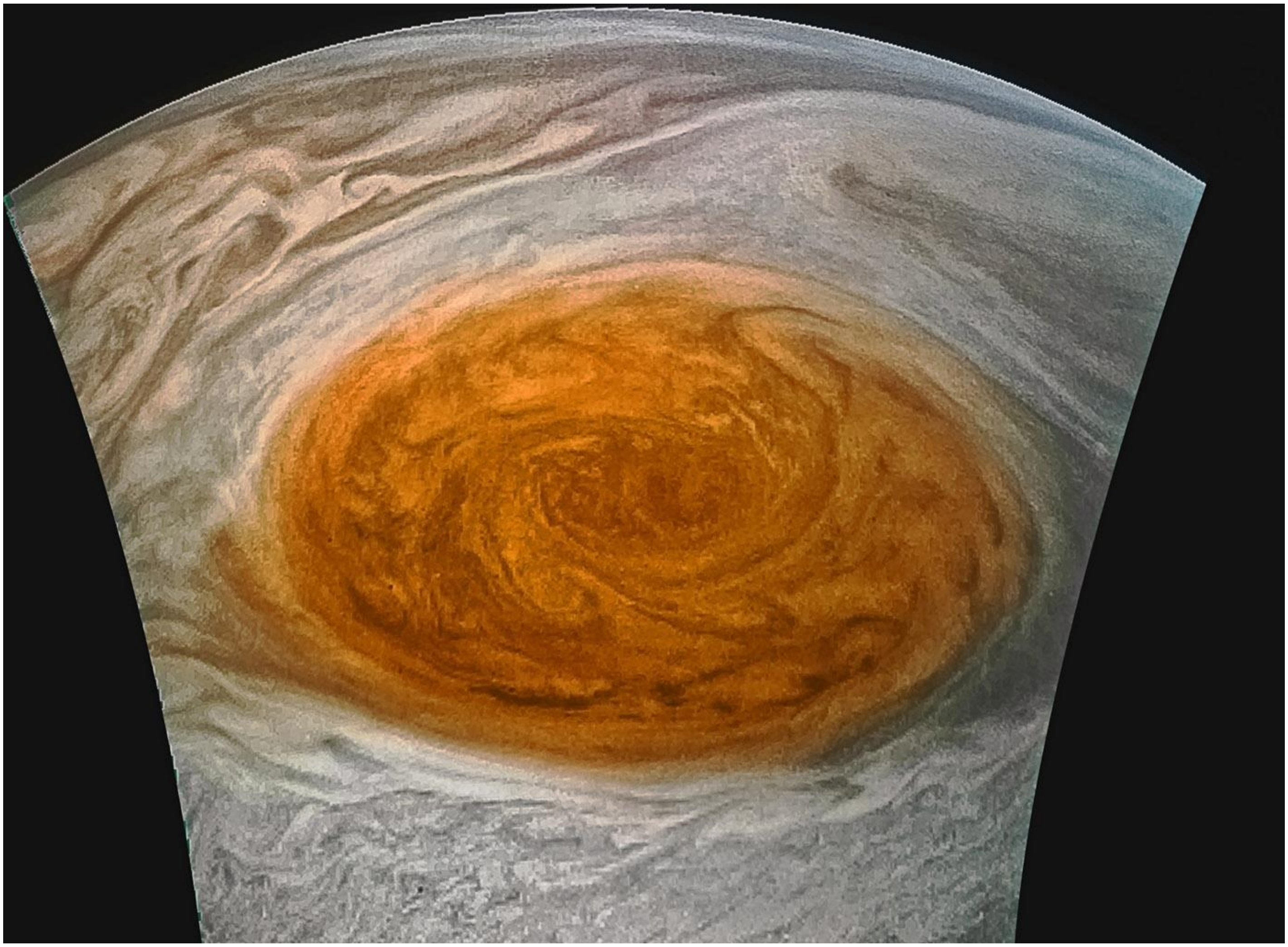
Space News Update

— July 14, 2017 —

Contents

1. Juno Spacecraft Spots Jupiter's Great Red Spot



This enhanced-color image of Jupiter's Great Red Spot was created by citizen scientist Jason Major using data from the JunoCam imager on NASA's Juno spacecraft. Credits: NASA/JPL-Caltech/SwRI/MSSS/Jason Major
› Full image and caption

Images of Jupiter's Great Red Spot reveal a tangle of dark, veinous clouds weaving their way through a massive crimson oval. The JunoCam imager aboard NASA's Juno mission snapped pics of the most iconic feature of the solar system's largest planetary inhabitant during its Monday (July 10) flyby. The images of the Great Red Spot were downlinked from the spacecraft's memory on Tuesday and placed on the mission's JunoCam website Wednesday morning.

"For hundreds of years scientists have been observing, wondering and theorizing about Jupiter's Great Red Spot," said Scott Bolton, Juno principal investigator from the Southwest Research Institute in San Antonio. "Now we have the best pictures ever of this iconic storm. It will take us some time to analyze all the data from not only JunoCam, but Juno's eight science instruments, to shed some new light on the past, present and future of the Great Red Spot."

As planned by the Juno team, citizen scientists took the raw images of the flyby from the JunoCam site and processed them, providing a higher level of detail than available in their raw form. The citizen-scientist images, as well as the raw images they used for image processing, can be found at:

https://www.missionjuno.swri.edu/junocam/processing

"I have been following the Juno mission since it launched," said Jason Major, a JunoCam citizen scientist and a graphic designer from Warwick, Rhode Island. "It is always exciting to see these new raw images of Jupiter as they arrive. But it is even more thrilling to take the raw images and turn them into something that people can appreciate. That is what I live for."

Measuring in at 10,159 miles (16,350 kilometers) in width (as of April 3, 2017) Jupiter's Great Red Spot is 1.3 times as wide as Earth. The storm has been monitored since 1830 and has possibly existed for more than 350 years. In modern times, the Great Red Spot has appeared to be shrinking.

All of Juno's science instruments and the spacecraft's JunoCam were operating during the flyby, collecting data that are now being returned to Earth. Juno's next close flyby of Jupiter will occur on Sept. 1.

Juno reached perijove (the point at which an orbit comes closest to Jupiter's center) on July 10 at 6:55 p.m. PDT (9:55 p.m. EDT). At the time of perijove, Juno was about 2,200 miles (3,500 kilometers) above the planet's cloud tops. Eleven minutes and 33 seconds later, Juno had covered another 24,713 miles (39,771 kilometers), and was passing directly above the coiling, crimson cloud tops of the Great Red Spot. The spacecraft passed about 5,600 miles (9,000 kilometers) above the clouds of this iconic feature.

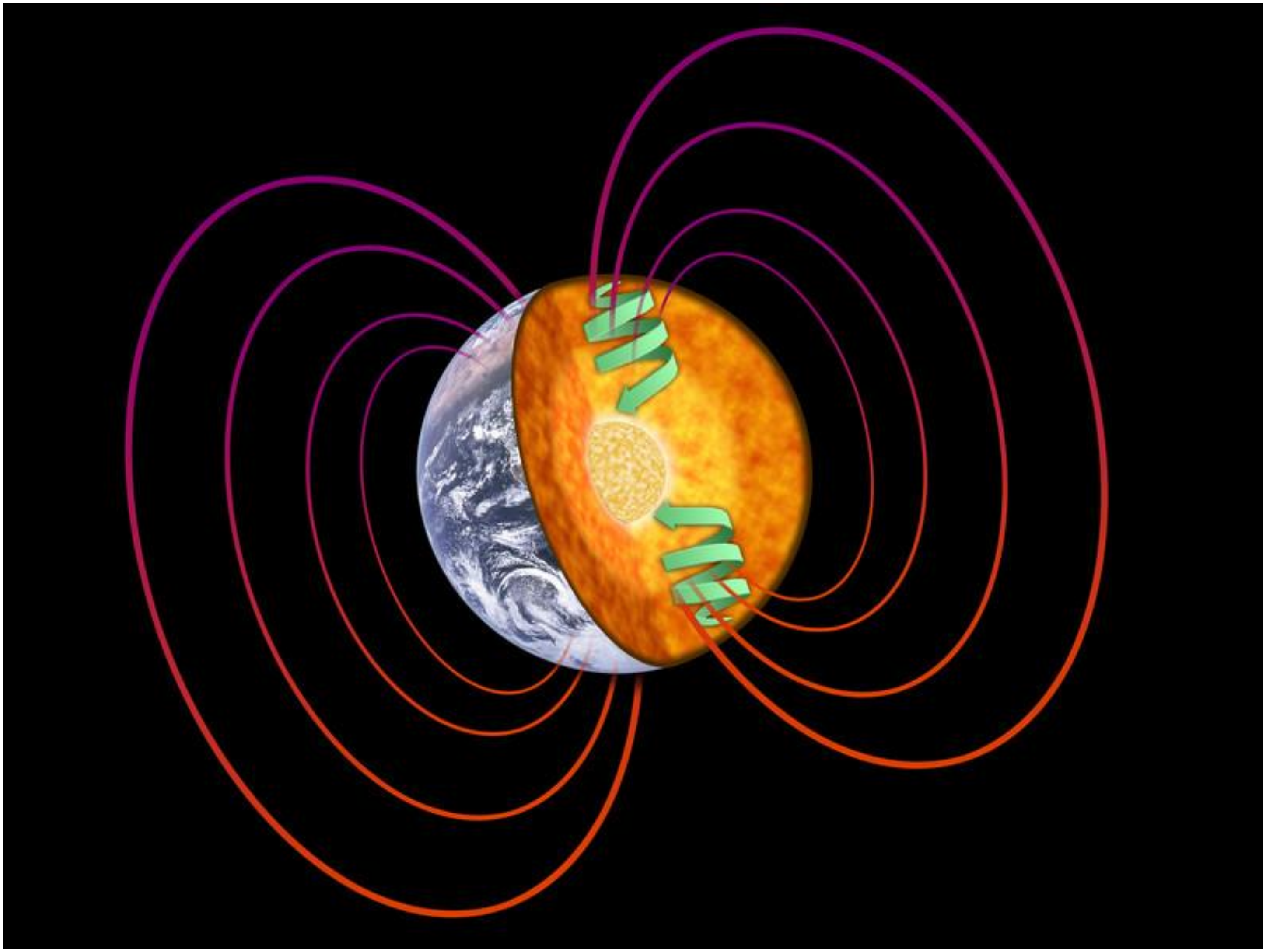
Juno launched on Aug. 5, 2011, from Cape Canaveral, Florida. During its mission of exploration, Juno soars low over the planet's cloud tops -- as close as about 2,100 miles (3,400 kilometers). During these flybys, Juno is probing beneath the obscuring cloud cover of Jupiter and studying its auroras to learn more about the planet's origins, structure, atmosphere and magnetosphere.

Early science results from NASA's Juno mission portray the largest planet in our solar system as a turbulent world, with an intriguingly complex interior structure, energetic polar aurora, and huge polar cyclones.

"These highly-anticipated images of Jupiter's Great Red Spot are the 'perfect storm' of art and science. With data from Voyager, Galileo, New Horizons, Hubble and now Juno, we have a better understanding of the composition and evolution of this iconic feature," said Jim Green, NASA's director of planetary science. "We are pleased to share the beauty and excitement of space science with everyone."

Source: JPL Return to Contents

2. Nickel Is Crucial For Earth's Magnetic Field



It only takes a simple compass to demonstrate that the earth has a magnetic field - but it is quite difficult to explain how exactly it is created.

Without any doubt, our planet's hot core, consisting mainly of iron, plays an important part. In combination with the earth's rotation, it builds up a powerful "dynamo effect", which creates a magnetic field.

But with iron alone, this effect cannot be explained. A team of researchers, led by Prof. Alessandro Toschi and Prof. Karsten Held (TU Wien) and Prof. Giorgio Sangiovanni (Würzburg University) has now published calculations in the journal "Nature Communications", which show that the theory of the geodynamo has to be revised. As it turns out, it is crucial for the dynamo effect that the earth's core contains up to 20% nickel - a metal, which under extreme conditions behaves quite differently from iron.

Extreme Heat and Pressure

The earth's core is about as big as the moon and as hot as the surface of the sun. There is a pressure of hundreds of gigapascals - that is comparable to the pressure which several railway locomotives would exert if they could be balanced on one square millimetre. "Under these extreme conditions, materials behave in a way which may be quite different from what we are used to", says Karsten Held. "It is hardly possible to recreate these conditions in a lab, but with sophisticated computer simulations, we are able to calculate the behaviour of metals in the earth's core on a quantum mechanical level."

The heat of the earth's core has to find a way to escape. Hot material rises up to the outer layers of the globe, creating convection currents. At the same time, the earth's rotation leads to strong Coriolis forces. In combination these effects produce a complicated spiralling flow of hot material. "When electrical currents are created in such a system of flows, they can cause a magnetic field which in turn increases the electrical current and so forth - and finally the magnetic field becomes so strong that we can measure it on the surface of the earth", says Alessandro Toschi.

Conducting Heat

Up until now, however, nobody could really explain how these convection currents emerge in the first place: iron is a very good heat conductor and at high pressure its thermal conductivity increases even more. "If the earth's core consisted only of iron, the free electrons in the iron could handle the heat transport by themselves, without the need for any convection currents", says Karsten Held. "Then, earth would not have a magnetic field at all."

However, our planet's core also contains almost 20% nickel. For a long time, this fact was not considered to be particularly important. But as it turns out, nickel plays a crucial role: "Under pressure, nickel behaves differently from iron", says Alessandro Toschi. "At high pressure, the electrons in nickel tend to scatter much more than the electrons in iron. As a consequence, the thermal conductivity of nickel and, thus, the thermal conductivity of the earth's core is much lower than it would be in a core consisting only of iron." Due to the significant proportion of nickel, the heat of the high-temperature earth core cannot flow towards the planet's surface by means of the motion of the electrons alone. As a result, convection currents have to emerge, which eventually build up the earth's magnetic field.

To obtain these results, different metallic structures had to be analysed in large-scale computer simulations, and the behaviour of their electrons had to be calculated. The many-particle-calculations were performed by Andreas Hausoel (University of Würzburg), some of them on the Vienna Scientific Cluster (VSC). "Together with our colleagues from Würzburg, we did not only have a look at iron and nickel, but also at alloys of these two materials. We also had to take imperfections and irregularities into account, which made the computer simulations even more challenging", says Karsten Held.

These advanced simulation methods are not only important to obtain a better understanding of the earth's magnetic field, they also provide new insights into the electronic scattering processes in different materials. Alessandro Toschi is convinced: "Soon, these improvements of computational material algorithms will also lead to exciting forefront applications in chemistry, biology, industry and technology."

Source: SpaceRef Return to Contents

3. Chandra Peers into a Nurturing Cloud

In the context of space, the term 'cloud' can mean something rather different from the fluffy white collections of water in the sky or a way to store data or process information. Giant molecular clouds are vast cosmic objects, composed primarily of hydrogen molecules and helium atoms, where new stars and planets are born. These clouds can contain more mass than a million suns, and stretch across hundreds of light years.

The giant molecular cloud known as W51 is one of the closest to Earth at a distance of about 17,000 light years. Because of its relative proximity, W51 provides astronomers with an excellent opportunity to study how stars are forming in our Milky Way galaxy.

A new composite image of W51 shows the high-energy output from this stellar nursery, where X-rays from Chandra are colored blue. In about 20 hours of Chandra exposure time, over 600 young stars were detected as point-like X-ray sources, and diffuse X-ray emission from interstellar gas with a temperature of a million degrees or more was also observed. Infrared light observed with NASA's Spitzer Space Telescope appears orange and yellow-green and shows cool gas and stars surrounded by disks of cool material.

W51 contains multiple clusters of young stars. The Chandra data show that the X-ray sources in the field are found in small clumps, with a clear concentration of more than 100 sources in the central cluster, called G49.5−0.4 (pan over the image to find this source.)

Although the W51 giant molecular cloud fills the entire field-of-view of this image, there are large areas where Chandra does not detect any diffuse, low energy X-rays from hot interstellar gas. Presumably dense regions of cooler material have displaced this hot gas or blocked X-rays from it.

One of the massive stars in W51 is a bright X-ray source that is surrounded by a concentration of much fainter X-ray sources, as shown in a close-up view of the Chandra image. This suggests that massive stars can form nearly in isolation, with just a few lower mass stars rather than the full set of hundreds that are expected in typical star clusters.

Another young, massive cluster located near the center of W51 hosts a star system that produces an extraordinarily large fraction of the highest energy X-rays detected by Chandra from W51. Theories for X-ray emission from massive single stars can't explain this mystery, so it likely requires the close interaction of two very young, massive stars. Such intense, energetic radiation must change the chemistry of the molecules surrounding the star system, presenting a hostile environment for planet formation.

A paper describing these results, led by Leisa Townsley (Penn State), appeared in the July 14th 2014 issue of The Astrophysical Journal Supplement Series and is available online.

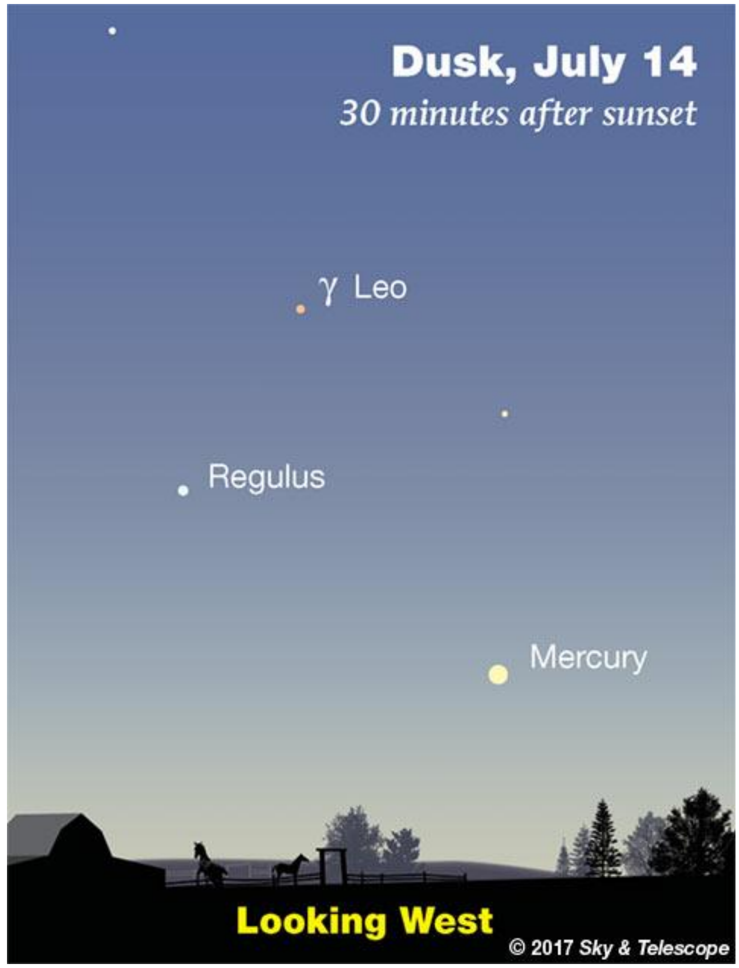
Credit: X-ray: NASA/CXC/PSU/L. Townsley et al; Infrared: NASA/JPL-Caltech

Read More from NASA's Chandra X-ray Observatory.

Source: NASA Return to Contents

The Night Sky

Friday, July 14



• Mercury is having a poor apparition low in evening twilight this month. But it's bright enough (magnitude –0.2 this evening) that you can pick it up anyway if the air is good and clear. Your best chance is probably about a half hour after sunset, as shown at right.

• One hour after sunset, as twilight is fading deeper and the stars are coming out, you'll find the two brightest stars of summer, Vega and Arcturus, high overhead equally far from the zenith: Vega toward the east, and Arcturus toward the southwest (depending on your location).

Saturday, July 15

• The tail of Scorpius is low in the south after darkness is complete. *How* low depends on how far north or south you live: the farther south, the higher. Look for the two stars especially close together in the tail. These are Lambda and fainter Upsilon Scorpii, known as the Cat's Eyes. They're canted at an angle; the cat is tilting his head and winking.

The Cat's Eyes point west (right) by nearly a fist-width toward Mu Scorpii, a much tighter pair known as the Little Cat's Eyes. Can you resolve Mu without using binoculars? It's hard!

Sunday, July 16

• The Big Dipper, still high in the northwest after dark, is turning around to "scoop up water" through the evenings of summer and early fall.

• Last-quarter Moon (exact at 3:26 p.m. EDT). The Moon rises tonight around 2 a.m. daylight-saving time and is high in the southeast by Monday's dawn.

Monday, July 17

• If you have a dark enough sky, the Milky Way forms a magnificent arch very high across the whole eastern sky after nightfall is complete. It runs all the way from below Cassiopeia in the north-northeast, up and across Cygnus and the Summer Triangle high in the east below bright Vega, and down past the spout of the Sagittarius Teapot in the south.

Tuesday, July 18

• The first "star" you're likely to see coming out after sunset this month is bright Jupiter, in the southwest. Once you find it, examine the sky 30° above it (three fists at arm's length) for Arcturus, two magnitudes fainter.

Once the night is completely dark, look for the kite-shaped pattern of Bootes extending upper right from Arcturus. It's two fists long.

Source: Sky & Telescope Return to Contents

ISS Sighting Opportunities

For Denver:

Date	Visible	Max Height	Appears	Disappears
Sat Jul 15, 2:11 AM	< 1 min	19°	19° above NNE	19° above NNE
Sat Jul 15, 3:46 AM	2 min	11°	10° above NNW	11° above N
Sun Jul 16, 1:20 AM	< 1 min	10°	10° above NE	10° above NE
Sun Jul 16, 2:53 AM	2 min	14°	12° above NW	13° above N
Sun Jul 16, 4:31 AM	< 1 min	10°	10° above N	10° above N
Mon Jul 17, 2:02 AM	< 1 min	18°	18° above N	16° above N
Mon Jul 17, 3:39 AM	< 1 min	10°	10° above N	10° above N
Mon Jul 17, 5:15 AM	2 min	15°	10° above NNW	15° above NNE
Tue Jul 18, 1:12 AM	< 1 min	12°	12° above NNE	10° above NNE
Tue Jul 18, 2:46 AM	1 min	11°	10° above NNW	11° above N
Tue Jul 18, 4:23 AM	1 min	12°	10° above N	12° above N

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

NASA-TV Highlights
(all times Eastern Daylight Time)

- **2 p.m., 6 p.m., 9 p.m., Friday, July 14 -** Replay of SpaceCast (all channels)
- **4 p.m., 8 p.m., 10 p.m., Friday, July 14 -** Replay of the Video B-Roll Feed of Training and Previous Mission of ISS Expedition 52-53 Flight Engineer Randy Bresnik of NASA (all channels)
- **1 a.m., 2 a.m., 3 .m., 7 a.m., 11 a.m., 3 p.m., 7 p.m., 11 p.m., Saturday, July 15 -** Replay of ISS Expedition 52 In-Flight Media Interviews with the CBS Radio Network and WBZ Radio, Boston and NASA Flight Engineer Jack Fischer (NTV-1 (Public))
- **9 a.m., 5 p.m., 9 pm.m, Saturday, July 15 -** Replay of SpaceCast Weekly (all channels)
- **10 a.m., 4 p.m., 8 p.m., Saturday, July 15 -** Replay of the ISS Expedition 52-53 Crew (Ryazanskiy, Bresnik, Nespoli) News Conference at the Gagarin Cosmonaut Training Center in Star City, Russia (all channels)
- **10:45 a.m., 4:45 p.m., 8:45 p.m., Saturday, July 15 -** Replay of the Video File of the ISS Expedition 52-53 Crew's (Ryazanskiy, Bresnik, Nespoli) Ceremonial Visit to the Gagarin Museum at the Gagarin Cosmonaut Training Center and Visit to Red Square and the Kremlin in Moscow (all channels)
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- **12 p.m., Monday, July 17 -** Video File of the ISS Expedition 52-53 Crew's (Ryazanskiy, Bresnik, Nespoli) Departure from the Gagarin Cosmonaut Training Center in Star City, Russia for the Baikonur Cosmodrome in Kazakhstan (Recorded on July 16) (all channels)
- **8 a.m., Tuesday, July 18 -** ISS Research & Development Conference 2017 - Welcome and Opening (NTV-1 (Public))
- **8:30 a.m., Tuesday, July 18 -** ISS Research & Development Conference 2017 - Morning Keynote (NTV-1 (Public))
- **9:45 a.m., Tuesday, July 18 -** ISS Research & Development Conference 2017 - Benefits for Humanity—Innovations on the ISS (NTV-1 (Public))
- **11 a.m., Tuesday, July 18 -** ISS Research & Development Conference 2017 - Revolutionizing Science from Ground to Orbit Featuring NASA Astronaut Kate Rubins (NTV-1 (Public))
- **12:15 p.m., Tuesday, July 18 - I**SS Research & Development Conference 2017 - Luncheon Keynote: Senator Peters (NTV-1 (Public))
- **4:30 p.m., Tuesday, July 18 -** ISS Research & Development Conference 2017 - ISS Exploration Technologies (NTV-1 (Public))

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

Space Calendar

- Jul 14 - [Jul 13] Kanopus-V-IK 1/ AISSat 3/ CICERO 1/ Corvus-BC 1 & 2/ Perseus-O 1-4/ MKA-N 1 & 2/ Mayak/ TechnoSat Soyuz-2-1a Fregat-M Launch
- Jul 14 - Comet C/2017 D2 (Barros) Perihelion (2.485 AU)
- Jul 14 - [Jul 14] Apollo Asteroid 2017 NT5 Near-Earth Flyby (0.003 AU)
- Jul 14 - Apollo Asteroid 2014 UV115 Near-Earth Flyby (0.096 AU)
- Jul 14 - Asteroid 7392 Kowalski Closest Approach To Earth (1.782 AU)
- Jul 14 - 70th Anniversary (1847), Braunau Meteorite Fall (Hit House in Czechoslovakia)
- Jul 15 - International Observe The Moon Night
- Jul 15 - BeiDou-3 (M1 & M2) CZ-3C/YZ-1 Launch
- Jul 15 - Comet P/2016 WM48 (Lemmon) Closest Approach To Earth (2.058 AU)
- Jul 15 - Apollo Asteroid 2017 MR8 Near-Earth Flyby (0.008 AU)
- Jul 15 - Apollo Asteroid 2017 BS6 Near-Earth Flyby (0.055 AU)
- Jul 15 - Apollo Asteroid 2015 XZ378 Near-Earth Flyby (0.080 AU)
- Jul 15 - Amor Asteroid 153591 (2001 SN263) (2 Moons) Closest Approach To Earth (1.768 AU)
- Jul 15 - 45th Anniversary (1972), Pioneer 10 Becomes 1st Spacecraft to Enter Main Asteroid Belt
- Jul 16 - Comet 332P-F/Ikeya-Murakami At Opposition (2.734 AU)
- Jul 16 - Comet P/2004 FY140 (LINEAR) At Opposition (3.662 AU)
- Jul 16 - Apollo Asteroid 2007 MB4 Near-Earth Flyby (0.037 AU)
- Jul 16 - Asteroid 91287 Simon-Garfunkel Closest Approach To Earth (1.345 AU)
- Jul 16 - Asteroid 132904 Notkin Closest Approach To Earth (2.441 AU)
- Jul 16 - Apollo Asteroid 5731 Zeus Closest Approach To Earth (2.453 AU)
- Jul 17 - Comet 189P/NEAT Closest Approach To Earth (0.360 AU)
- Jul 17 - Comet 217P/LINEAR Perihelion (1.235 AU)
- Jul 17 - Comet 217P/LINEAR Closest Approach To Earth (1.430 AU)
- Jul 17 - Comet 251P/LINEAR Perihelion (1.733 AU)
- Jul 17 - Comet 180P/NEAT At Opposition (2.999 AU)
- Jul 17 - Asteroid 2701 Cherson Occults HIP 98351 (6.3 Magnitude Star)
- Jul 17 - [Jul 14] Aten Asteroid 2017 NS5 Near-Earth Flyby (0.034 AU)
- Jul 17 - Asteroid 2247 Hiroshima Closest Approach To Earth (1.489 AU)
- Jul 17 - Asteroid 5277 Brisbane Closest Approach To Earth (1.605 AU)
- Jul 17 - Asteroid 7016 Conandoyle Closest Approach To Earth (1.617 AU)
- Jul 17 - Asteroid 7934 Sinatra Closest Approach To Earth (1.908 AU)
- Jul 17 - Amor Asteroid 1915 Quetzalcoatl Closest Approach To Earth (1.984 AU)
- Jul 17 - 50th Anniversary (1967), Denver Meteorite Fall (Hit Warehouse in Colorado)
- Jul 18 - Comet 213P/Van Ness Closest Approach To Earth (1.052 AU)
- Jul 18 - Comet 213P-B/Van Ness 3Closest Approach To Earth (1.055 AU)
- Jul 18 - Comet 332P-I/Ikeya-Murakami At Opposition (2.705 AU)
- Jul 18 - Comet 332P-B/Ikeya-Murakami At Opposition (2.706 AU)
- Jul 18 - Comet 332P-D/Ikeya-Murakami At Opposition (2.706 AU)

- Jul 18 - Comet 332P-H/Ikeya-Murakami At Opposition (2.707 AU)
- Jul 18 - Comet 332P-A/Ikeya-Murakami At Opposition (2.708 AU)
- Jul 18 - Comet 332P-E/Ikeya-Murakami At Opposition (2.709 AU)
- Jul 18 - Comet 332P-C/Ikeya-Murakami At Opposition (2.711 AU)
- Jul 18 - Comet 332P/Ikeya-Murakami At Opposition (2.717 AU)
- Jul 18 - Atira Asteroid 2015 DR215 Closest Approach To Earth (0.580 AU)
- Jul 18 - Asteroid 7273 Garyhuss Closest Approach To Earth (1.652 AU)

Source: JPL Space Calendar

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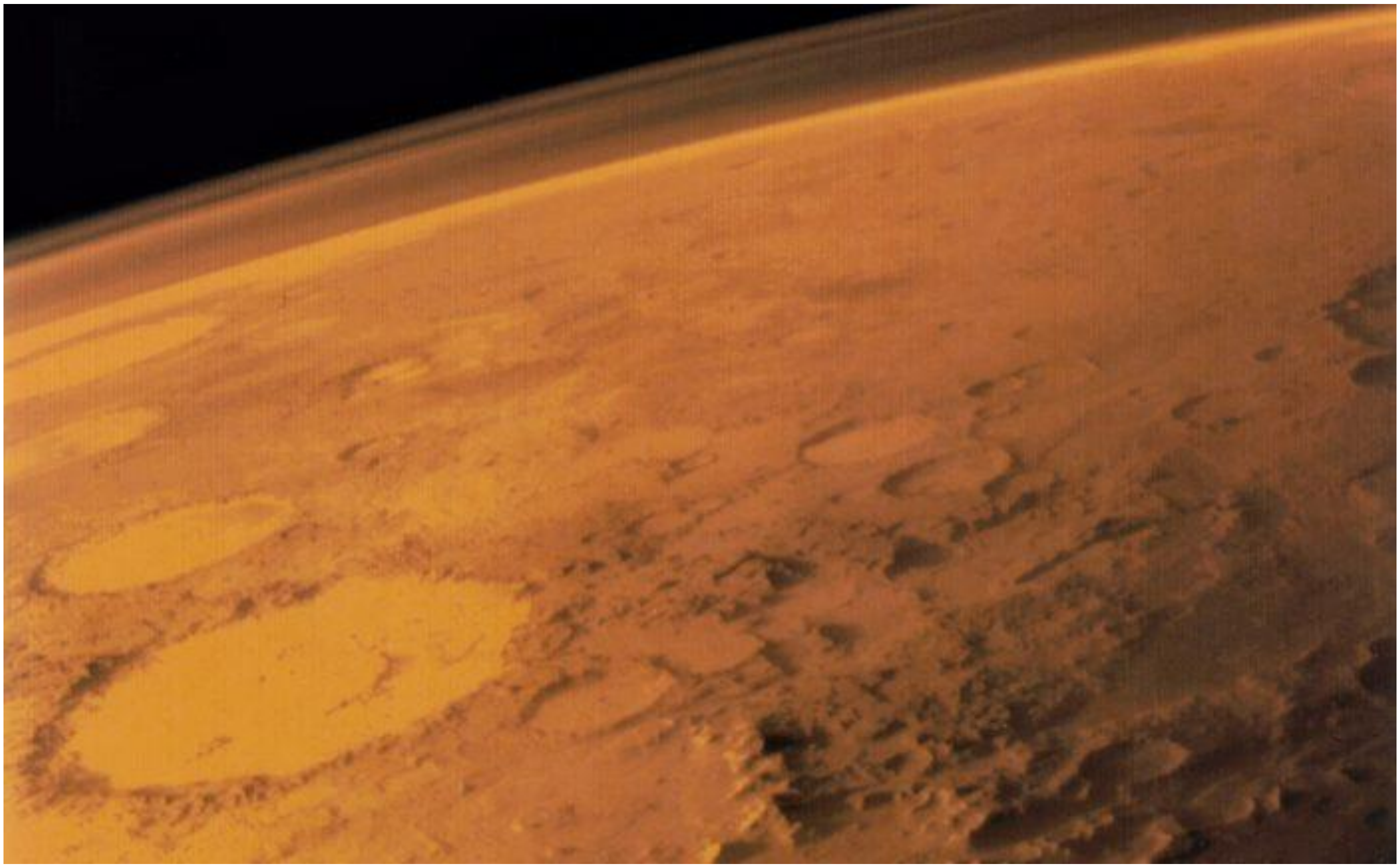
Food for Thought

Turns Out, Mars Sucks Even Worse Than We Knew



One of the most significant finds to come from our ongoing exploration and research efforts of Mars is the fact that the planet once had a warmer, wetter environment. Between 4.2 and 3.7 billion years ago, the planet had a thicker atmosphere and was able to maintain liquid water on its surface. As such, it has been ventured that life could have once existed there, and might still exist there in some form.

However, according to some recent lab tests by a pair of researchers from the UK Center for Astrobiology at the University of Edinburgh, Mars may be more hostile to life than previously thought. Not only does this not bode well for those currently engaged in the hunt for life on Mars (sorry *Curiosity!*), it could also be bad news for anyone hoping to one day grow things on the surface (sorry Mark Watney!).

Their study, titled "Perchlorates on Mars Enhance the Bacteriocidal Effects of UV Light", was recently published in the journal *Science Reports.* Performed by Jennifer Wadsworth and Charles Cockell – a postgraduate student and a professor of astrobiology at the UK Center for Astrobiology, respectively – the purpose of this study was to see how perchlorates (a chemical compound that is common to Mars) behaved under Mars-like conditions.

Basically, perchlorates are a negative ion of chlorine and oxygen that are found on Earth. When the Pheonix lander touched down on Mars in 2008, it found that this chemical was also found on the Red Planet. While stable at room temperature, perchlorates become active when exposed to high levels of heat energy. And under the kinds of conditions associated with Mars, they become rather toxic.

Interestingly enough, the presence of perchlorates on the surface of Mars was presented in 2015 as evidence of there being liquid water there in the past. This was due to the fact that these compounds were found both in-situ and as part of what are known as "brine sweeps". In other words, some of the discovered perchlorates took the form of streaky lines that were thought to have been the result of water evaporating.

Water, as we all know, is also an essential ingredient to life as we know it, and it's discovery of Mars was seen as evidence that life could have once existed there. Hence, as Jennifer Wadsworth (the study's lead author) told Universe Today via email, she and Dr. Cockell were interested to see how such compounds would behave under conditions that are particular to Mars:

"There is a relatively large amount of perchlorate on Mars (0.6 weight percent) and it was confirmed to be a component of a Martian brine by NASA in 2015. It has been speculated that these brines may be habitable. There has been previous work done showing that perchlorates can be 'activated' by ionizing radiation which leads them to chlorinate amino acids and degrade organics. We wanted to test whether perchlorate could be activated by UV under Martian environmental conditions to directly kill bacteria. We thought it would be interesting to investigate in light of the discussions of brine habitability."

After recreating the temperature conditions that are common to the Martian surface, Wadsworth and Cockell began exposing the samples to ultra-violet light – which the surface of Mars gets plenty of exposure to. What they found was that under cold conditions, the samples became activated when exposed to UV radiation. And As Wadsworth explained, the results were less than encouraging:

"The main results were that perchlorate, that is usually only activated at high temperatures, can be activated by only using UV light. This is interesting because this compound is abundant on Mars (where it's very cold), so we might have previously thought it wouldn't be possible to activate it under Martian conditions. We also found the bactericidal effect increased when bacteria were irradiated with perchlorate and other Martian compounds (iron oxide and hydrogen peroxide). This is important because it is lethal to bacteria when activated. So, if we want to find life on Mars, we have to take this into consideration."

Iron oxide – aka. rust – and hydrogen peroxide are two compounds that are also found in abundance on the surface of Mars. In fact, it is the prevalence of iron oxide in the soil that gives Mars its distinct, reddish appearance. When Wadsworth and Cockell added these compounds to the perchlorates, the result was nothing less than a 10.8-fold increase in the death of bacterial cells, when compared to perchlorates alone.

While the surface of Mars has long been suspected of having toxic effects, this study shows that it could actually be very hostile to living cells. Thanks to the toxic combination that is created when these three chemical compounds come together and are activated by UV light, the most basic of life forms may be unable to survive there. For those researchers attempting to determine if Mars could in fact be habitable, this is not good news!

It is also bad news as far as the existence of liquid water is concerned. While the presence of liquid water in Mars' past was seen as compelling evidence for past habitability, this water would not have been particularly supportive for life as we know it. Not if these compounds were present in Mars' surface water, which this study would seem to suggest. Luckily, this research does present a few silver linings.

On the one hand, the fact that perchlorates became hostile to B. subtilis in the presence of UV does not necessarily mean that the Martian surface is hostile to *all* life. Second, the presence of these bacteria-killing compounds means that contaminants left behind by robotic explorers are not likely to survive long. So the risk of contaminating Mars' environment (always a going concern for any mission) is very low.

As Wadsworth explained, there are unanswered questions, and more research is necessary:

"We don't know exactly how far reaching the effect of UV and perchlorate would penetrate the surface layers, as the precise mechanism isn't understood. If it's the case of altered forms of perchlorate (such as chlorite or hypochlorite) diffusing through the environment, that might extend the uninhabitable zone. If you're looking for life you have to additionally keep the ionizing radiation in mind that can penetrate the top layers of soil, so I'd suggest digging at least a few meters into the ground to ensure the levels of radiation would be relatively low. At those depths, it's possible Martian life may survive."

As for all the potential Mark Watney's out there (the protoganist from *The Martian*), there might be some good news as well. "Perchlorate can be dangerous to humans so we'd just have to make sure we keep it out of the austronauts' living quarters," said Wadsworth. "We could potentially use it in sterilization processes. I think the more immediate threat to Martian colonies would be the amount of radiation reaching the surface."

So maybe we don't need to cancel our tickets to Mars just yet! However, as the day draws nearer to where people like Elon Musk and Bas Lansdorp are able to make commercial trips to the Red Planet a reality, we will need to know precisely how terrestrial organisms will fare on the planet – and that includes us! And if the prospects don't look good, we better make certain we have some decent counter-measures in place.

Further Reading: Nature, University of Edinburgh

Source: Universe Today Return to Contents

Space Image of the Week

NGC 4449: Close-up of a Small Galaxy
Image Credit & Copyright: *Data* - Hubble Legacy Archive, ESA, NASA;
***Processing* - Domingo Pestana Galvan, Raul Villaverde Fraile**

Explanation: Grand spiral galaxies often seem to get all the glory. Their young, blue star clusters and pink star forming regions along sweeping spiral arms are guaranteed to attract attention. But small irregular galaxies form stars too, like NGC 4449, about 12 million light-years distant. Less than 20,000 light-years across, the small island universe is similar in size, and often compared to our Milky Way's satellite galaxy, the Large Magellanic Cloud (LMC). This remarkable Hubble Space Telescope close-up of the well-studied galaxy was reprocessed to highlight the telltale reddish glow of hydrogen gas. The glow traces NGC 4449's widespread star forming regions, some even larger than those in the LMC, with enormous interstellar arcs and bubbles blown by short-lived, massive stars. NGC 4449 is a member of a group of galaxies found in the constellation Canes Venatici. It also holds the distinction of being the first dwarf galaxy with an identified tidal star stream.

Source: APOD

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