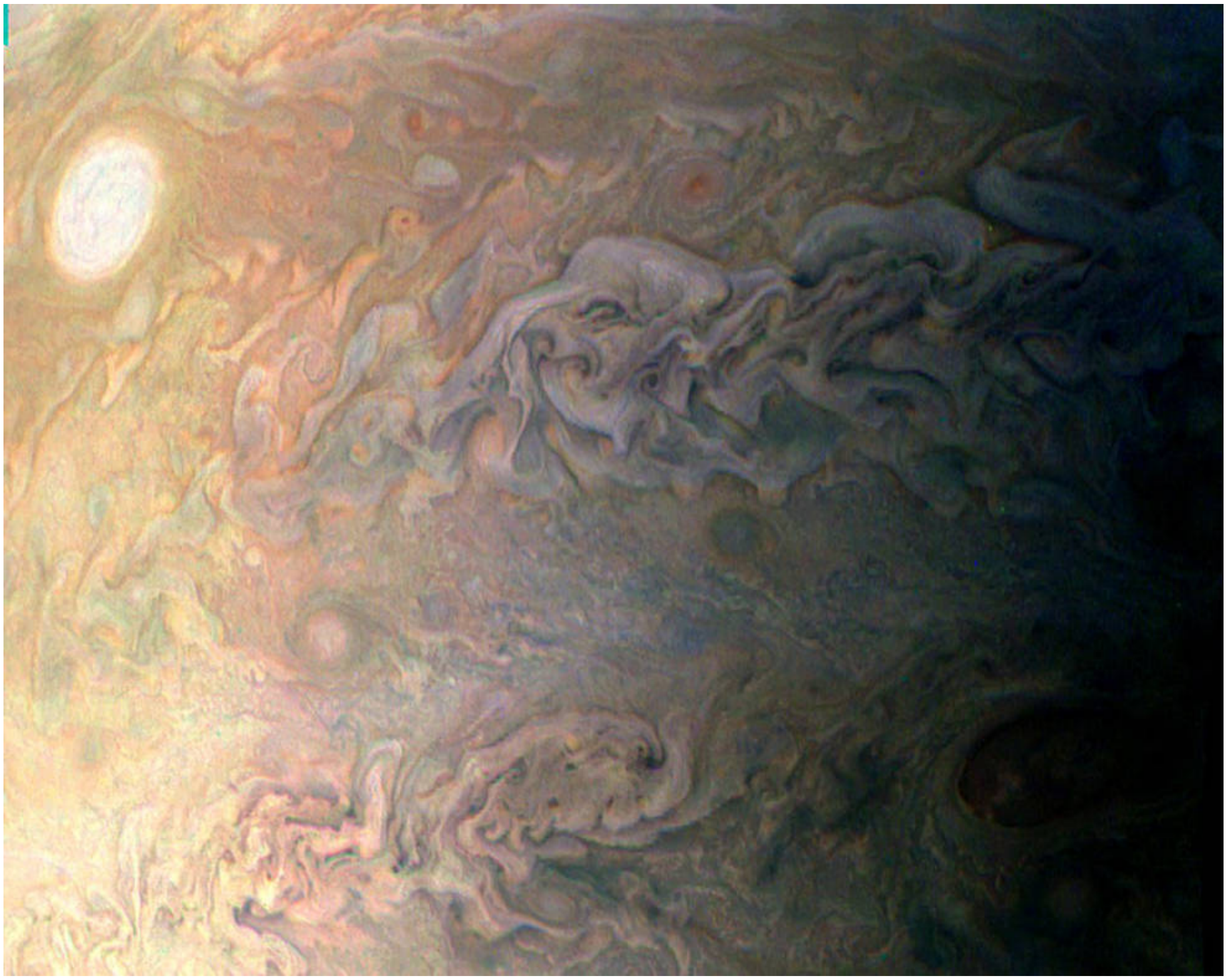
Space News Update

— February 3, 2017 —

Contents

1. Juno Dives over Jupiter's Cloud Tops with Main Engine Still Offline



NASA's Juno spacecraft made a high-speed pass less than 3,000 miles over Jupiter's turbulent clouds Thursday, taking dozens of pictures, measuring radiation and plasma waves, and peering deep inside the planet's atmosphere, but officials still have not cleared the orbiter's main engine for a planned maneuver to position the probe for improved science observations.

As Juno prepared for Thursday's encounter, managers weighed whether to cancel an engine burn originally scheduled for October to reshape the craft's orbit.

The solar-powered spacecraft made its closest approach about 2,670 miles (4,300 kilometers) over Jupiter's cloud tops at 1257 GMT (7:57 a.m. EST) Thursday. NASA said all of Juno's science instruments and its JunoCam color camera were operating during the flyby, and the data is being returned to Earth.

Juno zipped by Jupiter at a relative velocity of about 129,000 mph (57.8 kilometers per second), approaching the planet over its north pole and departing over the south pole, according to NASA.

For the first time, the Juno team solicited votes from the public to select all the pictures the JunoCam camera would take during the flyby.

Participants on the mission's web site will be able to vote on which points of interest on Jupiter they want imaged by JunoCam on each future encounter. Once the raw images are back on Earth, the data will be posted online for interested members of the public to do their own processing.

Thursday's close flyby, called a perijove, was the fourth time Juno has come so close to Jupiter since the probe arrived in orbit July 4. Two of the previous perijove encounters — on Aug. 27 and Dec. 11 — have yielded science data, giving researchers a taste of the harsh environment surrounding the planet.

The data haul from the $1.1 billion mission so far shows that Jupiter's magnetic field and auroras are bigger than expected, and the belts and zones seen at the top of the planet's clouds extend deep into the atmosphere, according to NASA.

A pair of problems thwarted manager's plans during Juno's Oct. 19 close approach.

The original flight plan called for Juno to fire its main engine Oct. 19 to send the spacecraft into a tighter 14-day orbit around Jupiter. Juno currently takes about 53 days to complete one orbit.

But ground controllers discovered a potential problem with two check valves in the spacecraft's propulsion system less than a week before the scheduled engine burn. The valves are part of the spacecraft's helium pressurization system, and they took several minutes to open after receiving commands, when they should have taken only a few seconds.

The behavior of the valves led managers to postpone the Oct. 19 engine burn to study the problem, and researchers hoped to use the flyby to collect science data from Juno's nine instruments, comprising 29 individual sensors.

An unexpected computer reboot just before the perijove shut down Juno's science instruments. The spacecraft safely made the passage by Jupiter, but it gathered no data.

Scott Bolton, Juno's principal investigator, said in October that the mission can still obtain its intended measurements from the 53-day orbit. The prime time for Juno's observations of Jupiter come when the spacecraft is closest to the planet, and the probe will still pass through that region on each orbit.

But the science opportunities will come less frequently, just once every 53 days instead of once every two weeks.

"We can obtain all of the science goals of Juno even if we stay in a 53-day orbit," said Bolton, a scientist based at the Southwest Research Institute in San Antonio. "Each pass has the same value that a 14-day orbit would have had. We were changing to 14 days primarily because we wanted the science faster, but there was no requirement to do that."

One factor limiting Juno's lifetime around Jupiter is the spacecraft's radiation exposure. The spacecraft only flies through Jupiter's intense radiation belts just before and after each perijove, and Bolton said in October that keeping Juno in its current orbit will not affect the radiation dose on each flyby, but it will spread out the overall exposure over a longer period of time.

Juno's original flight plan called for the mission to complete 32 of the 14-day science orbits before the spacecraft was to be intentionally crashed in Jupiter's thick atmosphere in February 2018. That outline is now being re-evaluated with the delay in Juno's orbital adjustment.

Juno's next low-altitude flyby of Jupiter will come March 27.

Source: Spaceflight Now Return to Contents

2. First Look at Finding of NASA Twin Study

Preliminary research results for the NASA Twins Study debuted at NASA's Human Research Program's annual Investigators' Workshop in Galveston, Texas the week of January 23. NASA astronaut Scott Kelly returned home last March after nearly one year in space living on the International Space Station. His identical twin brother, Mark, remained on Earth.

Researchers found this to be a great opportunity for a nature versus nurture study, thus the Twins Study was formed. Using Mark, a retired NASA astronaut, as a ground-based control subject, ten researchers are sharing biological samples taken from each twin before, during and after Scott's mission. From these samples, knowledge is gained as to how the body is affected by extended time in space. These studies are far from complete. Additional research analysis is in process.

Mike Snyder, the Integrated Omics investigator, reported altered levels of a panel of lipids in Scott (the flight twin) that indicate inflammation. Additionally, there was an increased presence of 3-indolepropionic (IPA) in Mark (the ground-based twin). This metabolite is known to be produced only by bacteria in the gut and is being investigated as a potential brain antioxidant therapeutic. IPA is also known to help maintain normal insulin activity to regulate blood sugar after meals.

Susan Bailey's investigation focuses on Telomeres and Telomerase. It is understood that when looked at over many years, telomeres decrease in length as a person ages. Interestingly, on a time scale of just one year, Bailey found Scott's telomeres on the ends of chromosomes in his white blood cells increased in length while in space. This could be linked to increased exercise and reduced caloric intake during the mission. However, upon his return to Earth they began to shorten again. Interestingly, telomerase activity (the enzyme that repairs the telomeres and lengthens them) increased in both twins in November, which may be related to a significant, stressful family event happening around that time.

Mathias Basner's study, Cognitive Performance in Spaceflight, is looking at cognition, especially the difference found during a 12-month mission as compared to six-month missions. Following the one-year mission, he found a slight decrease in speed and accuracy post mission. Overall, however, the data does not support a relevant change in cognitive performance inflight by increasing the mission duration from six to 12 months.

In the Biochemical Profile investigation, headed by Scott Smith, there appeared to be a decline in bone formation during the second half of Scott's mission. Also, by looking at C Reactive Protein levels (a widely accepted biochemical marker for inflammation), there appeared to be a spike in inflammation soon after landing, likely related to the stresses of reentry and landing. The stress hormone Cortisol was low normal throughout the one-year mission, but IGF-1 hormone levels increased over the course of the year. This hormone is implicated with bone and muscle health and was likely impacted by heavy exercise countermeasures during flight.

Fred Turek's focus is on the Microbiome in the GI Tract – or "bugs" naturally found in the gut to aid in digestion. Differences in the viral, bacterial, and fungal microbiome between the twins were pronounced at all time points; however, this was expected due to their differing diet and environment. Of interest were the differences in microbial species observed in Scott on the ground versus his time in space. One shift was a change in ratio of two dominant bacterial groups (i.e., Firmicutes and Bacteroidetes) present in his GI tract. The ratio of one group to the other increased during flight and returned to pre-flight levels upon return to Earth.

Emmanuel Mignot's investigation, Immunome Studies, looks at changes in the body before and after a flu vaccine was administered to each twin. Following flu vaccines, "personalized" T cell receptors were created. These unique T cell receptors increased in both twins which was the expected immune response that protects from catching the flu.

Chris Mason is performing Genome Sequencing on the DNA and RNA contained within the twins' white blood cells with his investigation. Whole genome sequencing was completed and showed each twin has hundreds of unique mutations in their genome, which are normal variants. RNA (transcriptome) sequencing showed more than 200,000 RNA molecules that were expressed differently between the twins. They will look closer to see if a "space gene" could have been activated while Scott was in space.

Andy Feinberg studies Epigenomics, or how the environment regulates our gene expression. In the DNA within Scott's white blood cells, he found that the level of methylation, or chemical modifications to DNA, decreased while inflight – including a gene regulating telomeres, but returned to normal upon return. On the ground, Mark's level of methylation in the DNA derived from his white blood cells increased at the midpoint of the study but returned to normal in the end. Variability was observed in the methylation patterns from both twins; however, this epigenetic noise was slightly higher in Scott during spaceflight and then returned to baseline levels after return to Earth. These results could indicate genes that are more sensitive to a changing environment whether on Earth or in space.

Through further research integrating these preliminary findings, in coordination with other physiological, psychological, and technological investigations, NASA and its partners will continue to ensure that astronauts undertake future space exploration missions safely, efficiently and effectively. A joint summary publication is planned for later in 2017, to be followed by investigator research articles.

Source: NASA

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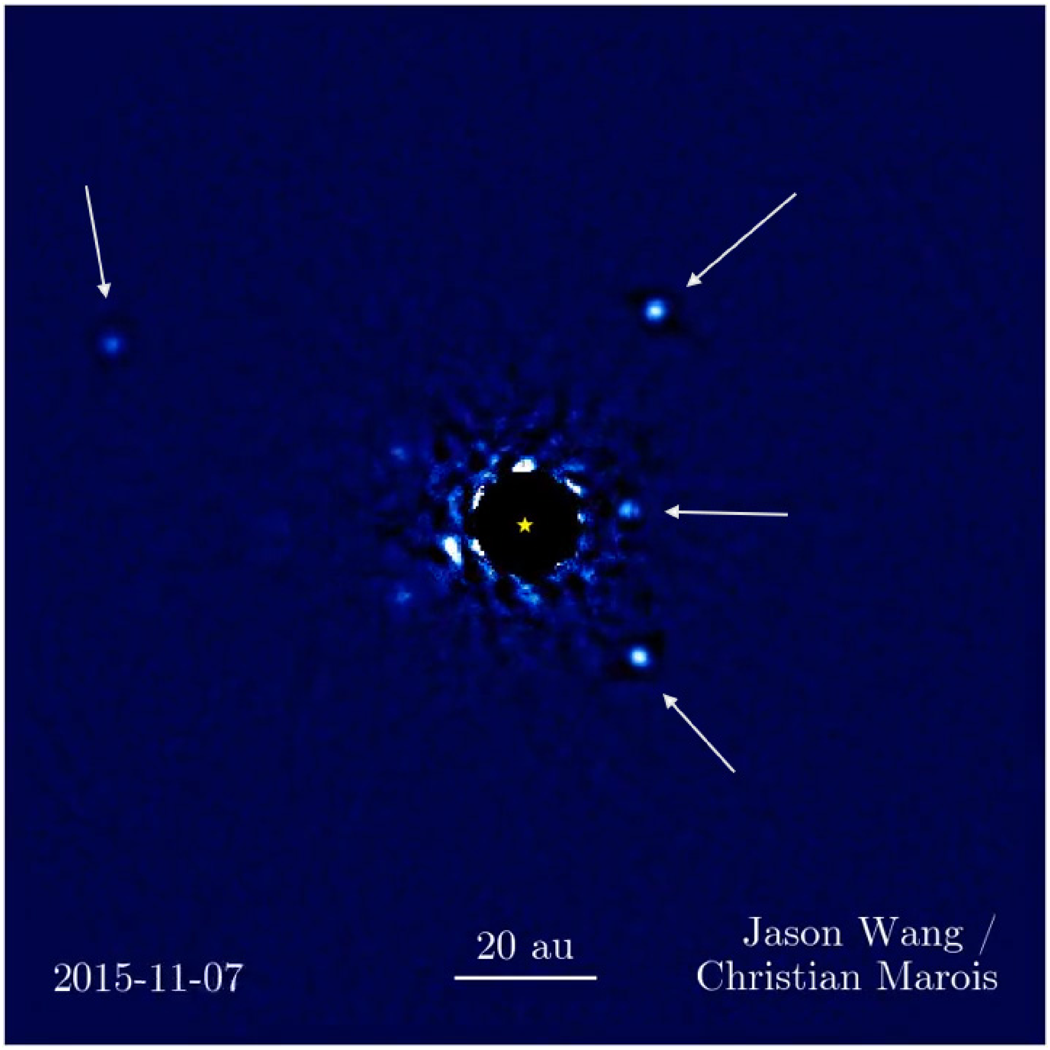
3. Four Planet System Directly Imaged in Motion



Click image to view animation on YouTube

Located about 129 light years from Earth in the direction of the Pegasus constellation is the relatively young star system of HR 8799. Beginning in 2008, four orbiting exoplanets were discovered in this system which – alongside the exoplanet Formalhaut b – were the very first to be confirmed using the direct imaging technique. And over time, astronomer have come to believe that these four planets are in resonance with each other.

In this case, the four planets orbit their star with a 1:2:4:8 resonance, meaning that each planet's orbital period is in a nearly precise ratio with the others in the system. This is a relatively unique phenomena, one which inspired a Jason Wang – a graduate student from the Berkeley arm of the NASA-sponsored Nexus for Exoplanet System Science (NExSS) – to produce a video that illustrates their orbital dance.

Using images obtained by the W.M. Keck Observatory over a seven year period, Wang's video provides a glimpse of these four exoplanets in motion. As you can see below, the central star is blacked out so that the light reflecting off of its planets can be seen. And while it does not show the planets completing a full orbital period (which would take decades and even centuries) it beautifully illustrates the resonance that exists between the star's four planets.

As Jason Wang told Universe Today via email:

"The data was obtained over 7 years from one of the 10 meter Keck telescopes by a team of astronomers (Christian Marois, Quinn Konopacky, Bruce Macintosh, Travis Barman, and Ben Zuckerman). Christian reduced each of the 7 epochs of data, to make 7 frames of data. I then made a movie by using a motion interpolation to interpolate those

7 frames into 100 frames to get a smooth video so that it's not choppy (as if we could observe them every month from Earth)."

The images of the four exoplanets were originally captured by Dr. Christian Marois of the National Research Council of Canada's Herzberg Institute of Astrophysics. It was in 2008 that Marois and his colleagues discovered the first three of HR 8799's planets – HR 8799 b, c and d – using direct imaging technique. At around the same time, a team from UC Berkeley announced the discovery of Fomalhaut b, also using direct imaging.

These planets were all determined to be gas giants of similar size and mass, with between 1.2 and 1.3 times the size of Jupiter, and 7 to 10 times its mass. At the time of their discovery, HR 8799 d was believed to be the closest planet to its star, at a distance of about 27 Astronomical Units (AUs) – while the other two orbit at distances of about 42 and 68 AUs, respectively.

It was only afterwards that the team realized the planets had already been observed in 1998. Back then, the Hubble Space Telescope's Near Infrared Camera and Multi-Object Spectrometer (NICMOS) had obtained light from the system that indicated the presence of planets. However, this was not made clear until after a newly-developed image-processing technique had been installed. Hence, the "pre-discovery" went unnoticed.

Further observations in 2009 and 2010 revealed the existence of fourth planet – HR 8799 e – which had an orbit placing it inside the other three. Even so, this planet is fifteen times farther from its star than the Earth is from the Sun, which results in an orbital period of about 18,000 days (49 years). The others take around 112, 225, and 450 years (respectively) to complete an orbit of HR 8799.

Ultimately, Wang decided to produce the video (which was not his first), to illustrate how exciting the search for exoplanets can be. As he put it:

"I had written this motion interpolation algorithm for another exoplanet system, Beta Pictoris b, where we see one planet on an edge-on orbit looking like it's diving into its star (it's actually just circling in front of it). We wanted to do the same thing for HR 8799 to bring this system to life and share our excitement in directly imaging exoplanets. I think it's quite amazing that we have the technology to watch other worlds orbit other stars."

In addition, the video draws attention to a star system that presents some unique opportunities for exoplanet research. Since HR 8799 was the first multi-planetary system to be directly-imaged means that astronomers can directly observe the orbits of the four planets, observe their dynamical interactions, and determine how they came to their present-day configuration.

Astronomers will also be able to take spectra of these planet's atmospheres to study their composition, and compare this to our own Solar System's gas giants. And since the system is really quite young (just 40 million years old), it can tell us much about the planet-formation process. Last, but not least, their wide orbits (a necessity given their size) could mean the system is less than stable.

In the future, according to Wang, astronomers will be watching to see if any planets get ejected from the system. I don't know about you, but I would consider a video that illustrates one of HR 8799's gas giants getting booted out of its system would be pretty inspiring too!

Further Reading: NASA

Source: Universe Today

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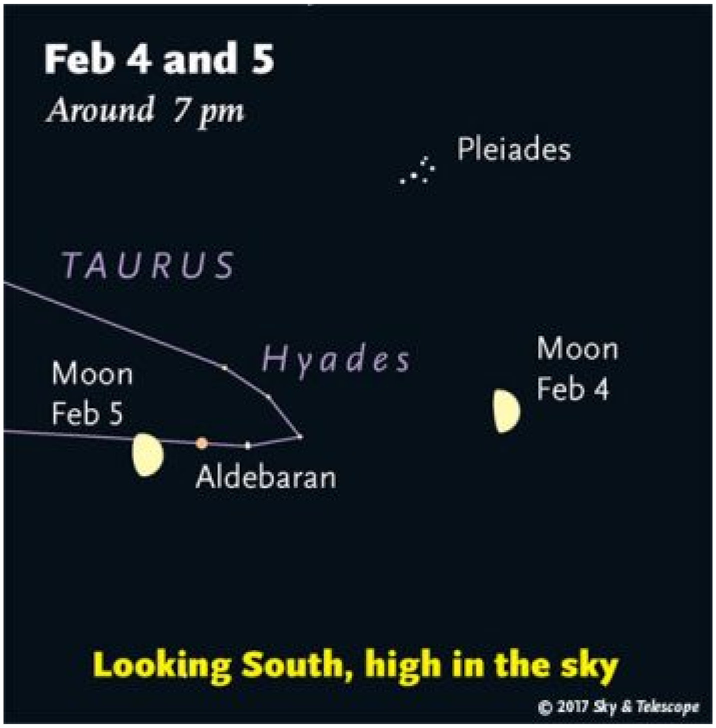
The Night Sky

Friday, February 3

• First-quarter Moon (exact at 11:19 p.m. EST). At sunset the half-lit Moon is high in the south. After dark it balances on the dim head of Cetus. Spot the stars of Aries to its upper right, and the Pleiades a little farther to its upper left.



Moon near Pleiades and Aldebaran, Feb. 4-5, 2017

The waxing Moon crosses Taurus these nights.

Saturday, February 4

• In early evening the Pleiades stand above the Moon, and Aldebaran shines left of it, as shown here.

Sunday, February 5

• The waxing gibbous Moon shines left of Aldebaran in twilight for North America, then pulls farther away from it through the night. The Moon occults Aldebaran for southern Europe and northern Africa; map and timetables.

Monday, February 6

• The sky's biggest asterism (informal star pattern) is the Winter Hexagon, and the Moon shines inside it tonight and tomorrow night. Start with brilliant Sirius at the Hexagon's bottom. Going clockwise from there, march through Procyon, Pollux and Castor, Menkalinan and Capella high up, Aldebaran down to Capella's lower right, down to Rigel in Orion's foot, and back to Sirius. Betelgeuse sparkles inside the Hexagon, south of the Moon this evening.

Tuesday, February 7

• After 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.

Source: Sky & Telescope Return to Contents

ISS Sighting Opportunities

For Denver:

Date	Visible	Max Height	Appears	Disappears
Fri Feb 3, 6:44 PM	2 min	12°	10° above NW	11° above N
Sat Feb 4, 5:51 PM	4 min	16°	11° above WNW	10° above NNE
Sun Feb 5, 6:37 PM	1 min	10°	10° above NNW	10° above N
Tue Feb 7, 6:29 PM	1 min	10°	10° above N	10° above NNE

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

NASA-TV Highlights

(all times Eastern Daylight Time)

1 p.m., Tuesday, February 7 - ISS Expedition 50 Interviews with the CBS Evening News and WFTV-TV, Orlando, Fla. and Flight Engineer Peggy Whitson of NASA (starts at 1:20 p.m.) (all channels)

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

Space Calendar

- Feb 03 - Moon Occults Dwarf Planet Ceres
- Feb 03 - Comet 336P/McNaught Perihelion (2.782 AU)
- Feb 03 - UPDATED [Jan 28] Aten Asteroid 2005 VL1 Near-Earth Flyby (0.029 AU)
- Feb 03 - NEW [Feb 01] Amor Asteroid 2017 BP32 Near-Earth Flyby (0.067 AU)
- Feb 03 - Asteroid 2991 Bilbo Closest Approach To Earth (1.834 AU)
- Feb 03 - Asteroid 4535 Adamcarolla Closest Approach To Earth (1.869 AU)
- Feb 03 - Asteroid 12397 Peterbrown Closest Approach To Earth (1.918 AU)
- Feb 03 - 15th Anniversary (2002), Alby sur Cheran Meteorite Fall (Hit Building in France)
- Feb 03 - 135th Anniversary (1882), Mocs Meteorite Shower in Romania
- Feb 04 - HOT [Feb 02] 50th Anniverary (1967), Lunar Orbiter 3 Launch
- Feb 04 - Comet 73P-BN/Schwassmann-Wachmann Closest Approach To Earth (1.690 AU)
- Feb 04 - Comet 327P/Van Ness At Opposition (2.839 AU)
- Feb 04 - Comet 314P/Montani Closest Approach To Earth (3.299 AU)
- Feb 04 - Apollo Asteroid 2015 CE1 Near-Earth Flyby (0.061 AU)
- Feb 04 - Asteroid 4099 Wiggins Closest Approach To Earth (1.481 AU)
- Feb 04 - Asteroid 128523 Johnmuir Closest Approach To Earth (1.655 AU)
- Feb 04 - Asteroid 4017 Disneya Closest Approach To Earth (1.823 AU)
- Feb 04 - Asteroid 9134 Encke Closest Approach To Earth (2.016 AU)
- Feb 04 - Asteroid 5471 Tunguska Closest Approach To Earth (2.204 AU)
- Feb 04 - Charles Lindbergh's 115th Birthday (1902)
- Feb 05 - HOT [Jan 28] HTV Reenters Earth's Atmosphere
- Feb 05 - Moon Occults Aldebaran
- Feb 05 - Comet 73P-BO/Schwassmann-Wachmann Closest Approach To Earth (1.679 AU)
- Feb 05 - UPDATED [Feb 01] Apollo Asteroid 2017 BG30 Near-Earth Flyby (0.006 AU)
- Feb 05 - Apollo Asteroid 2013 FK Near-Earth Flyby (0.018 AU)
- Feb 05 - NEW [Jan 30] Apollo Asteroid 2017 BK30 Near-Earth Flyby (0.022 AU)
- Feb 05 - Aten Asteroid 2011 EP51 Near-Earth Flyby (0.090 AU)
- Feb 05 - August Kopff's 135th Birthday (1882)
- Feb 06 - Comet 73P-BJ/Schwassmann-Wachmann Perihelion (0.970.9777 AU)
- Feb 06 - Comet 314P/Montani At Opposition (3.299 AU)
- Feb 06 - Apollo Asteroid 459872 (2014 EK24) Near-Earth Flyby (0.060 AU)
- Feb 06 - Asteroid 61342 Lovejoy Closest Approach To Earth (1.892 AU)
- Feb 06 - Asteroid 1958 Chandra Closest Approach To Earth (2.627 AU)
- Feb 06 - Binary Asteroid 617 Patroclus Closest Approach To Earth (4.879 AU)
- Feb 07 - Cassini, Distant Flyby of Pan, Janus & Methone
- Feb 07 - Comet 50P/Arend Closest Approach To Earth (2.498 AU)
- Feb 07 - NEW [Jan 29] Apollo Asteroid 2017 BQ6 Near-Earth Flyby (0.017 AU)
- Feb 07 - Apollo Asteroid 2017 BU Near-Earth Flyby (0.039 AU)
- Feb 07 - Apollo Asteroid 2015 BN509 Near-Earth Flyby (0.042 AU)
- Feb 07 - NEW [Jan 30] Amor Asteroid 2017 BF29 Near-Earth Flyby (0.055 AU)
- Feb 07 - Apollo Asteroid 2016 YN1 Near-Earth Flyby (0.078 AU)
- Feb 07 - Apollo Asteroid 38086 Beowolf Closest Approach To Earth (1.096 AU)
- Feb 07 - Asteroid 4798 Mercator Closest Approach To Earth (1.315 AU)
- Feb 07 - Asteroid 1001 Gaussia Closest Approach To Earth (2.258 AU)
- Feb 07 - Asteroid 13330 Dondavis Closest Approach To Earth (2.653 AU)
- Feb 07 - 40th Anniversary (1977), Soyuz 24 Launch (Final launch to Salyut 5 Space Station)
- Feb 07 - Al Worden's 85th Birthday (1932)

Source: JPL Space Calendar

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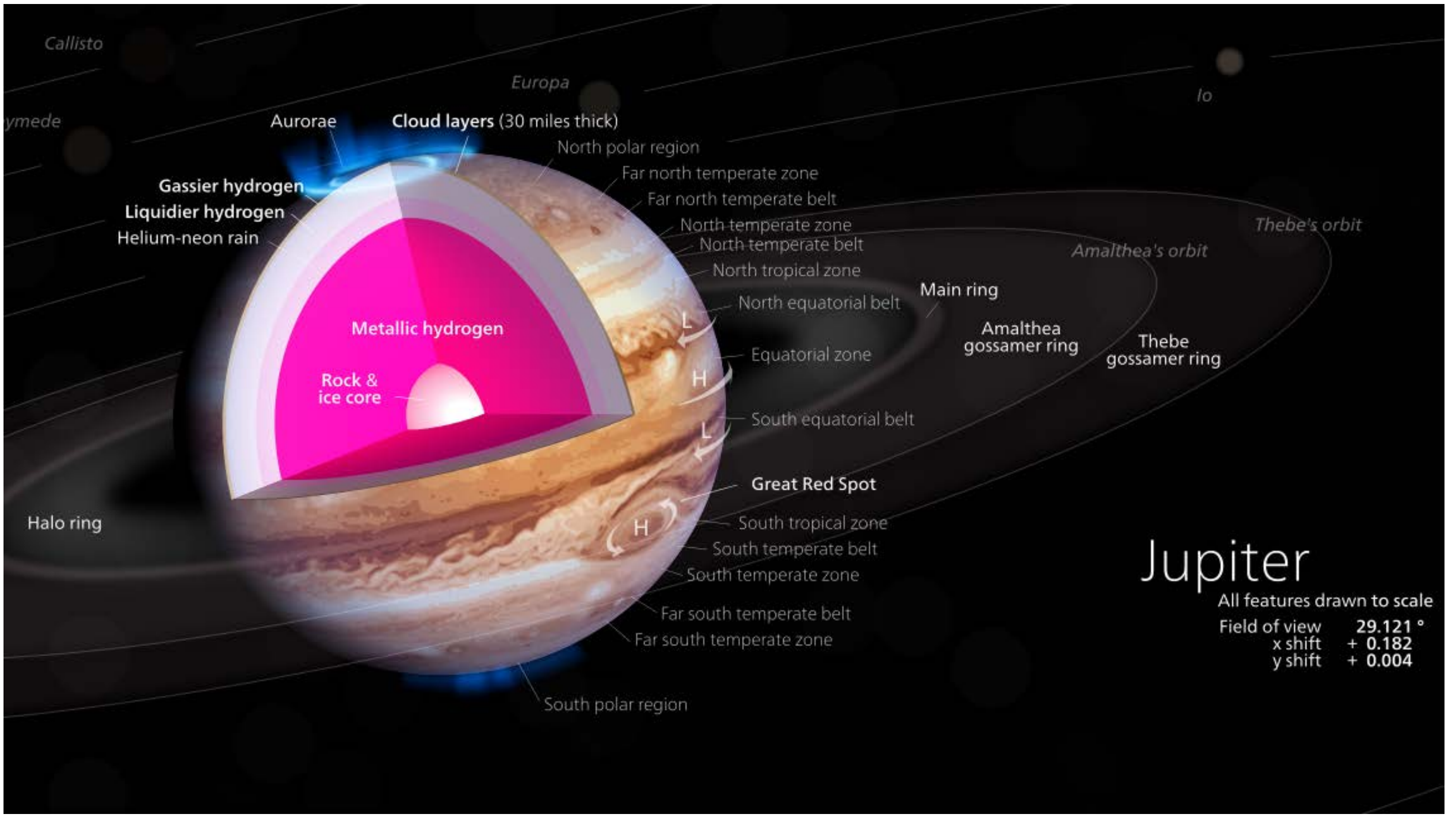
Food for Thought

Harvard Physicist Creates Metallic Hydrogen Using Diamond Vise



For some time, scientists have been fascinated by the concept of metallic hydrogen. Such an element is believed to exist naturally when hydrogen is placed under extreme pressures (like in the interior of gas giants like Jupiter). But as a synthetic material, it would have endless applications, since it is believed to have superconducting properties at room temperature and the ability to retain its solidity once it has been brought back to normal pressure.

For this reason, condensed matter physicists have been attempting to create metallic hydrogen for decades. And according to a recent study published in *Science Magazine*, a pair of physicists from the Lyman Laboratory of Physics at Harvard University claim to have done this very thing. If true, this accomplishment could usher in a new age of super materials and high-pressure physics.

The existence of metallic hydrogen was first predicted in 1935 Princeton physicists Eugene Wigner and Hillard Bell Huntington. For years, Isaac Silvera (the Thomas D. Cabot Professor at Harvard University) and Ranga Dias, a postdoctorate fellow, have sought to create it. They claim to have succeeded, using a process which they described in their recently-published study, "Observation of the Wigner-Huntington transition to metallic hydrogen".

Such a feat, which is tantamount to creating the heart of Jupiter between two diamonds, is unparalleled in the history of science. As Silvera described the accomplishment in a recent Harvard press release:

"This is the Holy Grail of high-pressure physics. It's the first-ever sample of metallic hydrogen on Earth, so when you're looking at it, you're looking at something that's never existed before."

In the past, scientists have succeeded in creating liquid hydrogen at high temperature conditions by ramping up the pressures it was exposed to (as opposed to cryogenically cooling it). But metallic hydrogen has continued to elude experimental scientists, despite repeated (and unproven) claims in the past to have achieved synthesis. The reason for this is because such experiments are extremely temperamental.

For instance, the diamond anvil method (which Silvera and Dias used a variation of) consists of holding a sample of hydrogen in place with a thin metal gasket, then compressing it between two diamond-tipped vices. This puts the sample under extreme pressure, and a laser sensor is used to monitor for any changes. In the past, this has proved problematic since the pressure can cause the hydrogen to fill imperfections in the diamonds and crack them.

While protective coatings can ensure the diamonds don't crack, the additional materials makes it harder to get accurate readings from laser measurements. What's more, scientists attempting to experiment with hydrogen have found that pressures of ~400 gigapascals (GPa) or more need to be involved – which turns the hydrogen samples black, thus preventing the laser light from being able to penetrate it.

For the sake of their experiment, Professors Ranga Dias and Isaac Silvera took a different approach. For starters, they used two small pieces of polished synthetic diamond rather than natural ones. They then used a reactive ion etching process to shave their surfaces, then coated them with a thin layer of alumina to prevent hydrogen from diffusing into the crystal structure.

They also simplified the experiment by removing the need for high-intensity laser monitoring, relying on Raman spectroscopy instead. When they reached a pressure of 495 GPa (greater than that at the center of the Earth), their sample reportedly became metallic and changed from black to shiny red. This was revealed by measuring the spectrum of the sample, which showed that it had become highly reflective (which is expected for a sample of metal).

As Silvera explained, these experimental results (if verified) could lead to all kinds of possibilities:

"One prediction that's very important is metallic hydrogen is predicted to be meta-stable. That means if you take the pressure off, it will stay metallic, similar to the way diamonds form from graphite under intense heat and pressure, but remain diamonds when that pressure and heat are removed. As much as 15 percent of energy is lost to dissipation during transmission, so if you could make wires from this material and use them in the electrical grid, it could change that story."

In short, metallic hydrogen could speed the revolution in electronics already underway, thanks to the discovery of materials like graphene. Since metallic hydrogen is also believed to be a superconductor at room temperature, its synthetic production would have immense implications for high-energy research and physics – such as that being conducted by CERN.

Beyond that, it would also enable research into the interior's of gas giants. For some time, scientists have suspected that a layer of metallic hydrogen may surround the cores of gas giants like Jupiter and Saturn. Naturally, the temperature and pressure conditions in the interiors of these planets make direct study impossible. But by being able to produce metallic hydrogen synthetically, scientists could conduct experiment to see how it behaves.

Naturally, the news of this experiment and its results is being met with skepticism. For instance, critics wonder if the pressure reading of 495 GPa was in fact accurate, since Silvera and Dias only obtained that as a final measurement and were forced to rely on estimates prior to that. Second, there are those who question if the reddish speck that resulted is in fact hydrogen, and some material that came from the gasket or diamond coating during the process.

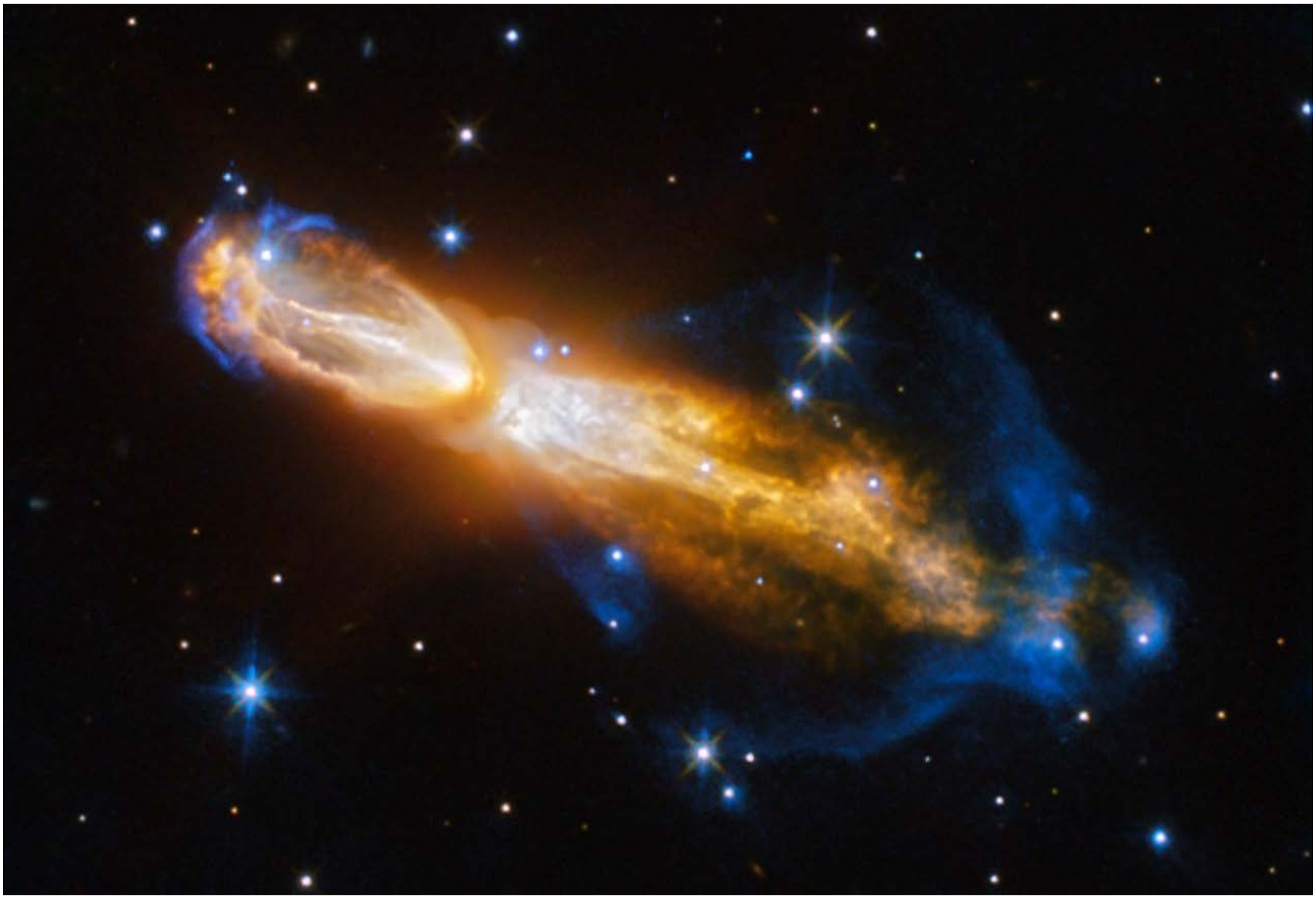
However, Silvera and Dias are confident in their results and believe they can be replicated (which would go far to silence doubts about their results). For one, they emphasize that a comparative measurement of the reflective properties of the hydrogen dot and the surrounding gasket suggest that the hydrogen is pure. They also claim their pressure measurements were properly calibrated and verified.

In the future, they intend to obtain additional spectrographic readings from the sample to confirm that it is in fact metallic. Once that is done, they plan to test the sample to see if it is truly metastable, which will consist of them opening the vise and seeing if it remains in a solid state. Given the implications of success, there are many who would like to see their experiment borne out!

Be sure to check out this video produced by Harvard University that talks about the experiment: https://youtu.be/1qitm5fteL0

Source: Universe Today Return to Contents

Space Image of the Week



Hubble Captures Brilliant Star Death in “Rotten Egg” Nebula

The Calabash Nebula, pictured here — which has the technical name OH 231.8+04.2 — is a spectacular example of the death of a low-mass star like the sun. This image taken by the NASA/ESA Hubble Space Telescope shows the star going through a rapid transformation from a red giant to a planetary nebula, during which it blows its outer layers of gas and dust out into the surrounding space. The recently ejected material is spat out in opposite directions with immense speed — the gas shown in yellow is moving close to one million kilometers per hour (621,371 miles per hour).

Astronomers rarely capture a star in this phase of its evolution because it occurs within the blink of an eye — in astronomical terms. Over the next thousand years the nebula is expected to evolve into a fully-fledged planetary nebula.

The nebula is also known as the Rotten Egg Nebula because it contains a lot of sulphur, an element that, when combined with other elements, smells like a rotten egg — but luckily, it resides over 5,000 light-years away in the constellation of Puppis.

Image credit: ESA/Hubble & NASA, Acknowledgement: Judy Schmidt
Text credit: European Space Agency

Source: NASA Return to Contents