Space News Update
— October 23, 2015 —

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1. OSIRIS-REx spacecraft completes assembly stage, begins environmental testing

NASA's Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer (OSIRIS-REx) spacecraft has begun environmental testing at Lockheed Martin Space Systems facilities, near Denver, Colorado. OSIRIS-REx, led by the University of Arizona, will be the first U.S. mission to return samples from an asteroid to Earth for further study.

"This milestone marks the end of the design and assembly stage," said Dante Lauretta, principal investigator for OSIRIS-REx at the University of Arizona, Tucson. "We now move on to test the entire flight system over the range of environmental conditions that will be experienced on the journey to Bennu and back. This phase is critical to mission success, and I am confident that we have built the right system for the job."

Over the next five months, the spacecraft will be subjected to a range of rigorous tests that simulate the vacuum, vibration and extreme temperatures it will experience throughout the life of its mission.

"This is an exciting time for the program as we now have a completed spacecraft and the team gets to test drive it, in a sense, before we actually fly it to asteroid Bennu," said Rich Kuhns, OSIRIS-REx program manager at Lockheed Martin Space Systems. "The environmental test phase is an important time in the mission as it will reveal any issues with the spacecraft and instruments, while here on Earth, before we send it into deep space."

Specifically, the OSIRIS-REx spacecraft will undergo tests to simulate the harsh environment of space, including acoustical, separation and deployment shock, vibration, and electromagnetic interference. The simulation concludes with a test in which the spacecraft and its instruments are placed in a vacuum chamber and cycled through the extreme hot and cold temperatures it will face during its journey to Bennu.

"OSIRIS-REx is entering environmental testing on schedule, on budget and with schedule reserves," said Mike Donnelly, OSIRIS-REx project manager at NASA's Goddard Space Flight Center in Greenbelt, Maryland. "This allows us to have flexibility if any concerns arise during final launch preparations."

OSIRIS-REx is scheduled to ship from Lockheed Martin's facility to NASA's Kennedy Space Center next May, where it will undergo final preparations for launch.

After launch in September 2016, the spacecraft will travel to the near-Earth asteroid Bennu and bring at least a 60-gram (2.1-ounce) sample back to Earth for study.

Scientists expect that the Bennu may hold clues to the origin of the solar system and the source of water and organic molecules that may have made their way to Earth. OSIRIS-REx's investigation will inform future efforts to develop a mission to mitigate an impact, should one be required.

Source: Eureka Alert
SpaceX plans an ambitious ‘Return to Flight’ agenda with their Falcon 9 rocket comprising dual launches this coming December, nearly six months after their failed launch in June 2015 that culminated in the total mid-air loss of the rocket and NASA cargo bound for the crew aboard the International Space Station (ISS).

The double barreled salvo of Falcon 9 blastoffs both involve launches of commercial communications satellites – first for Orbcomm followed by SES – and are specifically devised to allow a gradually ramp up in complexity, as SpaceX introduces fixes for the launch failure and multiple improvements to the boosters overall design.

The order of launches for the inaugural Return to Flight slot has been switched from SES to Orbcomm by mutual agreement since it involves using a simpler launch profile, according to announcements by both Orbcomm and SpaceX.

“As we prepare for return to flight, SpaceX together with its customers SES and Orbcomm have evaluated opportunities to optimize the readiness of the upcoming Falcon 9 return-to-flight mission,” SpaceX officials said in a statement.

“All parties have mutually agreed that SpaceX will now fly the Orbcomm-2 mission on the return-to-flight Falcon 9 vehicle.”

As currently foreseen, the Falcon 9's targeted liftoff timeframe is expected to take place in approximately six to eight weeks – roughly corresponding to early December 2015.

“This change does not affect the timeline for SpaceX's return-to-flight mission which is still targeted to take place in the next 6-8 weeks,” noted SpaceX.

“ORBCOMM and SpaceX plan to launch eleven OG2 satellites from Cape Canaveral Air Force Station in Florida on the next launch of the SpaceX Falcon 9 rocket targeted to take place in the next six to eight weeks,’ said Orbcomm in a statement.

All SpaceX launches ground to an immediate halt this past summer when the commercial two stage Falcon 9 booster carrying a SpaceX Dragon spacecraft heading to the ISS on a critical resupply mission for NASA were unexpectedly destroyed by an overpressure event 139 seconds after a picture perfect blastoff from Space Launch Complex 40 at Cape Canaveral Air Force Station in Florida on June 28 at 10:21 a.m. EDT.

The cause of the in-flight breakup was traced to the failure of a critical support strut inside the second stage liquid oxygen tank holding a high pressure helium tank in the Falcon 9 rocket, as the likely cause, revealed SpaceX CEO and chief designer Elon Musk during a briefing for reporters on July 20.

At recent public forums, SpaceX managers have confirmed that a failure of the second stage strut is still the leading candidate for the launch mishap in June.
December is shaping up to be a very busy month for crucial ‘Return to Flight’ rocket launches on the Florida Space Coast.

SpaceX competitor Orbital ATK has set Dec. 3 for the ‘Return to Flight’ launch of their Cygnus supply ship on a cargo mission to the ISS.

Cygnus will fly on a ULA Atlas V while Orbital ATK continues work to fly a new version of their commercial Antares rocket which exploded seconds after blastoff to the ISS on Oct. 28, 2014.

SpaceX executives are eager to resume launches as rapidly as possible, and at a swift cadence, since they have a huge backlog of customer bookings involving over 50 launches.

SpaceX is also vying for lucrative new contracts from the US Air Force to launch the nation’s most capable, high value and expensive national security satellites critical to US national defense.

So SpaceX has a lot riding on a successful ‘Return to Flight.’

The launch of the SES-9 satellite for SES would quickly follow OG2 and could come as soon as late December 2015.

“The SES-9 launch is currently targeted for late December 2015,” SpaceX stated.

SpaceX engineers apparently decided that it was best to fly the Orbcomm payload first because the launch profile was less demanding since it did not require a reignition of the Falcon 9 second stage Merlin engine.

Instead SpaceX will use the Orbcomm-2 flight to demonstrate an in flight test of the second stage relight system after first deploying the payload as a confidence building measure for subsequent missions.

“The Orbcomm-2 mission does not require a relight of the second stage engine following orbital insertion. Flying the Orbcomm-2 mission first will therefore allow SpaceX to conduct an on-orbit test of the second stage relight system after the Orbcomm-2 satellites have been safely deployed.”

Orbcomm executives are apparently delighted to get first crack at the opportunity to launch their payload of eleven Orbcomm OG2 satellites on the ‘Return to Flight’ Falcon 9 launch which also features the first actual test flight test of the second stage strut modifications as well as several upgrades to the Merlin engines and rocket.

“We are excited to launch our eleven OG2 satellites aboard SpaceX’s newly upgraded Falcon 9 rocket and have full confidence in SpaceX and their dedication to this launch,” said Marc Eisenberg, ORBCOMM’s Chief Executive Officer.

“We look forward to completing the deployment of our next generation constellation and delivering a higher level of performance, coverage and reliability through our modernized and upgraded OG2 network to our customers around the world.”

Source: Universe Today
Scientists using NASA's repurposed Kepler space telescope, known as the K2 mission, have uncovered strong evidence of a tiny, rocky object being torn apart as it spirals around a white dwarf star. This discovery validates a long-held theory that white dwarfs are capable of cannibalizing possible remnant planets that have survived within its solar system.

"We are for the first time witnessing a miniature "planet" ripped apart by intense gravity, being vaporized by starlight and raining rocky material onto its star," said Andrew Vanderburg, graduate student at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, and lead author of the paper published in Nature.

As stars like our sun age, they puff up into red giants and then gradually lose about half their mass, shrinking down to 1/100th of their original size to roughly the size of Earth. This dead, dense star remnant is called a white dwarf.

The devastated planetesimal, or cosmic object formed from dust, rock, and other materials, is estimated to be the size of a large asteroid, and is the first planetary object to be confirmed transiting a white dwarf. It orbits its white dwarf, WD 1145+017, once every 4.5 hours. This orbital period places it extremely close to the white dwarf and its searing heat and shearing gravitational force.

During its first observing campaign from May 30 to Aug. 21, 2014, K2 trained its gaze on a patch of sky in the constellation Virgo, measuring the minuscule change in brightness of the distant white dwarf. When an object transits, or passes in front of a star from the vantage point of the space telescope, a dip in starlight is recorded. The periodic dimming of starlight indicates the presence of an object in orbit about the star.

A research team led by Vanderburg found an unusual, but vaguely familiar pattern in the data. While there was a prominent dip in brightness occurring every 4.5 hours, blocking up to 40 percent of the white dwarf's
light, the transit signal of the tiny planet did not exhibit the typical symmetric U-shaped pattern. It showed an asymmetric elongated slope pattern that would indicate the presence of a comet-like tail. Together these features indicated a ring of dusty debris circling the white dwarf, and what could be the signature of a small planet being vaporized.

"The eureka moment of discovery came on the last night of observation with a sudden realization of what was going around the white dwarf. The shape and changing depth of the transit were undeniable signatures," said Vanderburg.

In addition to the strangely shaped transits, Vanderburg and his team found signs of heavier elements polluting the atmosphere of WD 1145+017, as predicted by theory.

Due to intense gravity, white dwarfs are expected to have chemically pure surfaces, covered only with light elements of helium and hydrogen. For years, researchers have found evidence that some white dwarf atmospheres are polluted with traces of heavier elements such as calcium, silicon, magnesium and iron. Scientists have long suspected that the source of this pollution was an asteroid or a small planet being torn apart by the white dwarf's intense gravity.

Analysis of the star's atmospheric composition was conducted using observations made by the University of Arizona's MMT Observatory near Tucson.

"For the last decade we've suspected that white dwarf stars were feeding on the remains of rocky objects, and this result may be the smoking gun we're looking for," said Fergal Mullally, staff scientist of K2 at SETI and NASA's Ames Research Center in Moffett Field, California. "However, there's still a lot more work to be done figuring out the history of this system."

"This discovery highlights the power and serendipitous nature of K2. The science community has full access to K2 observations and is using these data to make a wide range of unique discoveries across the full range of astrophysics phenomena," said Steve Howell, K2 project scientist at Ames.

For more information about the Kepler and K2 missions, visit: http://www.nasa.gov/kepler

Source: JPL
Friday, October 23

The Venus-Jupiter-Mars assemblage at dawn finally reaches its peak on Saturday through Monday mornings, as shown above. The best views should be about an hour before your local sunrise time. Mercury, very far below them, shows best a little later in the dawn as it edges higher. See our story [Venus-Jupiter Conjunction This Weekend](#), and pass it on to your family and friends!

Saturday, October 24

Look upper left of the waxing gibbous Moon this evening for the Great Square of Pegasus balancing on one corner.

Venus and Jupiter are in conjunction in the dawns of Sunday and Monday, 1.1° apart as seen from the time zones of the Americas.

Sunday, October 25

The Venus-Jupiter conjunction continues at dawn Monday morning. And Venus happens to be at its greatest elongation, 46° west of the Sun.

Monday, October 26

The brightest asteroid, 4 Vesta, is visible in binoculars at magnitude 6.8 this week. It's in the tail (western) end of Cetus, well up in the southeast to south after dinnertime.

Tuesday, October 27
Full Moon (exact at 8:05 a.m. Eastern Daylight Time). The Moon rises shortly after sunset for North America. After dark look above it, by about a fist and a half at arm's length, for the two or three brightest stars of Aries lined up horizontally. The brightest, Alpha Arietis or Hamal (on the left), is an orange giant.

Source:  Sky & Telescope
ISS Sighting Opportunities

For Denver:

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Sighting information for other cities can be found at NASA’s [Satellite Sighting Information](https://www.nasa.gov/)

**NASA-TV Highlights**

(all times Eastern Daylight Time)

10 p.m., Friday, October 23 - Replay of NASA Television Presents “Hunting Planets: Celebrating 20 Years of Exoplanets” – a Carnegie Institution for Science Program (all channels)

12 p.m., Saturday, October 24 - Replay of NASA Television Presents “Hunting Planets: Celebrating 20 Years of Exoplanets” – a Carnegie Institution for Science Program (all channels)

9 p.m., Saturday, October 24 - Replay of NASA Television Presents “Hunting Planets: Celebrating 20 Years of Exoplanets” – a Carnegie Institution for Science Program (all channels)

Watch NASA TV on the Net by going to the [NASA website](https://www.nasa.gov/)

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Space Calendar

- Oct 23 - Comet 7P/Pons-Winnecke At Opposition (2.030 AU)
- Oct 23 - Comet 326P/Hill Perihelion (2.780 AU)
- Oct 23 - Asteroid 203 Pompeja Closest Approach To Earth (1.588 AU)
- Oct 23 - Asteroid 2700 Baikonur Closest Approach To Earth (1.843 AU)
- Oct 23 - Neptune Trojan 2001 QR322 At Opposition (29.035 AU)
- Oct 23 - Kuiper Belt Object 55636 (2002 TX300) At Opposition (41.326 AU)
- Oct 23 - 40th Anniversary (1975), Venera 10, Venus Orbit Insertion (USSR Venus Orbiter/Lander)
- Oct 24 - Cassini, Orbital Trim Maneuver #427 (OTM-427)
- Oct 24 - Comet 61P/Shajn-Schaldach Closest Approach To Earth (1.135 AU)
- Oct 24 - Asteroid 2991 Bilbo Closest Approach To Earth (1.363 AU)
- Oct 24 - Asteroid 12561 Howard Closest Approach To Earth (2.522 AU)
- Oct 24 - Workshop: Toys in Space and Mass vs. Weight, Pasadena, California
- Oct 24 - 55th Anniversary (1960), Nedelin Disaster - Launch Pad Explosion, Over 100 People Killed
- Oct 25 - European Summer Time Ends - Set Clock Back 1 Hour (European Union)
- Oct 25 - Venus Passes 1.0 Degrees From Jupiter
- Oct 25 - Asteroid 9000 Hal Closest Approach To Earth (1.166 AU)
- Oct 25 - Asteroid 10346 Triathlon Closest Approach To Earth (1.845 AU)
- Oct 25 - Asteroid 16626 Thumper Closest Approach To Earth (1.881 AU)
- Oct 25 - 40th Anniversary (1975), Venera 10, Venus Landing (USSR Venus Orbiter/Lander)
- Oct 25 - David Schramm's 70th Birthday (1945)
- Oct 25 - Rusty Schweikart's 80th Birthday (1935)
- Oct 26 - Venus At Its Greatest Western Elongation (46 Degrees)
- Oct 26 - Moon Occults Uranus
- Oct 26 - Comet C/2014 S2 (PANSTARRS) Closest Approach To Earth (1.870 AU)
- Oct 26 - Comet P/2005 L1 (McNaught) Closest Approach To Earth (3.133 AU)
- Oct 26 - Comet 91P/Russell At Opposition (3.856 AU)
- Oct 26 - Asteroid 1541 Estonia Closest Approach To Earth (1.956 AU)
- Oct 26 - Phobos and Deimos Webcast: Origin of Phobos - Capture
- Oct 26 - Gennadi Strekalov's 75th Birthday (1940)
- Oct 27 - Comet 51P/Harrington At Opposition (0.859 AU)
- Oct 27 - Apollo Asteroid 2015 TL20 Near-Earth Flyby (0.063 AU)
- Oct 27 - Apollo Asteroid 2015 TF Near-Earth Flyby (0.077 AU)
- Oct 27 - Kuiper Belt Object 15760 (1992 OB1) At Opposition (40.252 AU)
- Oct 27 - Oleg Kotov's 50th Birthday (1965)
- Oct 27 - Gustave Solomon's 85th Birthday (1930)
Food for Thought

A possible - not likely - alien megastructure

Did you see the stories late last week about the Kepler space telescope’s discovery of an oddly dimming star – some 1,500 light-years from Earth – hypothesized to harbor a potential, but far from definitely proven, alien megastructure? This week, according to Space.com, astronomers began using a radio telescope northeast of San Francisco – called the Allen Telescope Array (ATA) – to try to detect possible signals coming from the vicinity of this bizarre and now-controversial star, which is known to astronomers as KIC 8462852. Here’s a Q & A about this story, which has captured so much attention and is still unfolding.

What is an alien megastructure? If we, as a civilization, could collect all of our sun’s energy, we’d do it with some sort of megastructure, otherwise known as a Dyson sphere or a Dyson shell. See the infographic at the bottom of this post to learn more about them. It was only a month ago that a Dutch astronomer released a statement saying in no uncertain terms that – since sensitive new telescopes now permit astronomers to detect waste heat expected from an advanced alien civilization known as a Kardashev Type III civilization, which would collect all the energy of an entire galaxy, and since no such waste heat has been detected – advanced civilizations using megastructures are very rare or entirely absent from the local universe. Taken together, the current story about a possible alien megastructure around a single star, and September’s story about the absence of megastructures on a galactic scale, don’t really add up to anything ... but do help illustrate the fact that no definite sign of alien life has been detected here.

When and how did the story break about KIC 8462852? Professional astronomers analyzing data from NASA's Kepler space telescope (a famed planet-finding telescope), and citizen scientists from the Planet Hunters crowdsourcing program, have been studying this star. They noticed it from among the 150,000 stars stars examined by Kepler, and noted that it is “strange” and “bizarre.” Tabetha Boyajian, a postdoc at Yale who oversees Planet Hunters, submitted a paper about KIC 8462852 on September 11 to the journal Monthly Notices of the Royal Astronomical Society. The paper passed mostly unnoticed until Ross Andersen published a story about it on October 13 at TheAtlantic.com. The story – titled The Most Mysterious Star in Our Galaxy – started a scramble among science media outlets to publicize the strange case of KIC 8462852.


What has been found, exactly? The Kepler telescope looks for planets by seeking tiny dips in the light of stars. Such dips are often caused by distant, unknown planets transiting – or passing in front of – their stars. But the signal from KIC 8462852 is strange. The dimming events observed from this star were very strong. It appears that anywhere from a fraction-of-a-percent to around 20 percent of the star’s light is sometimes
blocked. The astronomers thus rule out a planet – even a huge planet – crossing in front of the star as the cause. The scale is just too large for that. Ross Andersen wrote at TheAtlantic.com:

*The light pattern suggests there is a big mess of matter circling the star, in tight formation. That would be expected if the star were young ... But this unusual star isn't young. If it were young, it would be surrounded by dust that would give off extra infrared light. There doesn't seem to be an excess of infrared light around this star.*

*It appears to be mature.*

So the uproar over a possible megastructure surrounding KIC 8462852 stems from just a dip in the star's light, observed by the Kepler telescope. It is a very intriguing dip.

Could it be instrument error? The astronomers now say no, it could not. *Something strange* is going on here.

**Why would astronomers link KIC 8462852 with alien civilizations?** Astronomers don't like to assign exotic explanations for processes that nearly always turn out to be natural and ordinary. In the September 11 paper about the star, Boyajian and her colleagues explored some scenarios that might explain the pattern naturally, for example, an impact on a planetary scale, like the one that created our moon. They did not say “megastructure.”

But, later, another astronomer did say it. That astronomer was Jason Wright of Penn State University, who was quoted in the article at TheAtlantic.com as saying:

*When [Boyajian] showed me the data, I was fascinated by how crazy it looked. Aliens should always be the very last hypothesis you consider, but this looked like something you would expect an alien civilization to build.*

Wright said he will be publishing an alternative interpretation of the light pattern, suggesting that it is consistent with a “swarm of megastructures,” perhaps light collectors aimed at the star itself, designed to capture the energy of KIC 8462852. This is clearly something our own civilization can't do yet, although I've heard people say we are only a few hundred years from taking the first steps toward it.

![Keck AO H-band Image](image_url)

What other explanations might there be? Let me emphasize again that astronomers, as a rule, do not like to go out on a limb and rarely prefer exotic explanations over simple ones. And indeed there are explanations unconnected with alien civilizations that could work to explain KIC 8462852’s weird light pattern. The best story I saw about this was from Ethan Siegel, writing in Forbes on October 16. He wrote:

On the one hand, it could, of course, simply be aliens. But there are plenty of astrophysical explanations that could explain these light curves:

This could be a young star with a protoplanetary disk still around it, full of dust and debris, that blocks the light at intermittent levels depending on the orientation of the disk and the star relative to our line-of-sight.

There could be a series of giant planets with tremendous ‘ring’ structures that prevent a significant portion of the light from reaching our eyes when they pass across their star’s disk.

This could be a star that’s undergone a significant mass-ejection event, and when a dense portion of that gas passes between our eyes and the star, a significant fraction of the light gets blocked.

This could be an older, but violent solar system, where planets crash together and leave large amounts of debris around their star.

Or it could be a result of a large number of comet-like objects swarming around the star, blocking large amounts of light at regular and/or irregular intervals.

He went on to say that the last two explanations are the most likely, in part because the star does appear to have a wide, binary companion. Other stories about KIC 8462852 agree that the leading hypothesis at the moment involves a swarm of comets sent hurtling toward the star by another star. In any case, so far, KIC 8462852 lacks the characteristic infrared signatures you’d expect to see if these truly were signs of alien intelligence.

What will astronomers do next? They’ll do what they always do … think, talk to each other, perhaps re-analyze some of the existing data, and try to collect and analyze more data. As mentioned at the top of this post, they began this week to peer at KIC 8462852 with a small radio telescope, the Allen Telescope Array near San Francisco. If they find something interesting, they hope to follow up with the Very Large Array (VLA) near Socorro, New Mexico.

Will they get the answer then? Will they be able to say for sure that KIC 8462852 is emitting radio waves from an alien civilization’s network of radio stations, much like those found on Earth? Or perhaps even find an intentional signal?

Only time will tell. Stay tuned.

Source: EarthSky
Daily Views of Earth Available on New NASA Website

NASA launched a new website Monday so the world can see images of the full, sunlit side of the Earth every day. The images are taken by a NASA camera one million miles away on the Deep Space Climate Observatory (DSCOVR), a partnership between NASA, the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Air Force.

Once a day NASA will post at least a dozen new color images of Earth acquired from 12 to 36 hours earlier by NASA’s Earth Polychromatic Imaging Camera (EPIC). Each daily sequence of images will show the Earth as it rotates, thus revealing the whole globe over the course of a day. The new website also features an archive of EPIC images searchable by date and continent.

The primary objective of NOAA’s DSCOVR mission is to maintain the nation’s real-time solar wind monitoring capabilities, which are critical to the accuracy and lead time of space weather alerts and forecasts from NOAA. NASA has two Earth-observing instruments on the spacecraft. EPIC’s images of Earth allow scientists to study daily variations over the entire globe in such features as vegetation, ozone, aerosols, and cloud height and reflectivity.

Source: NASA