Space News Update

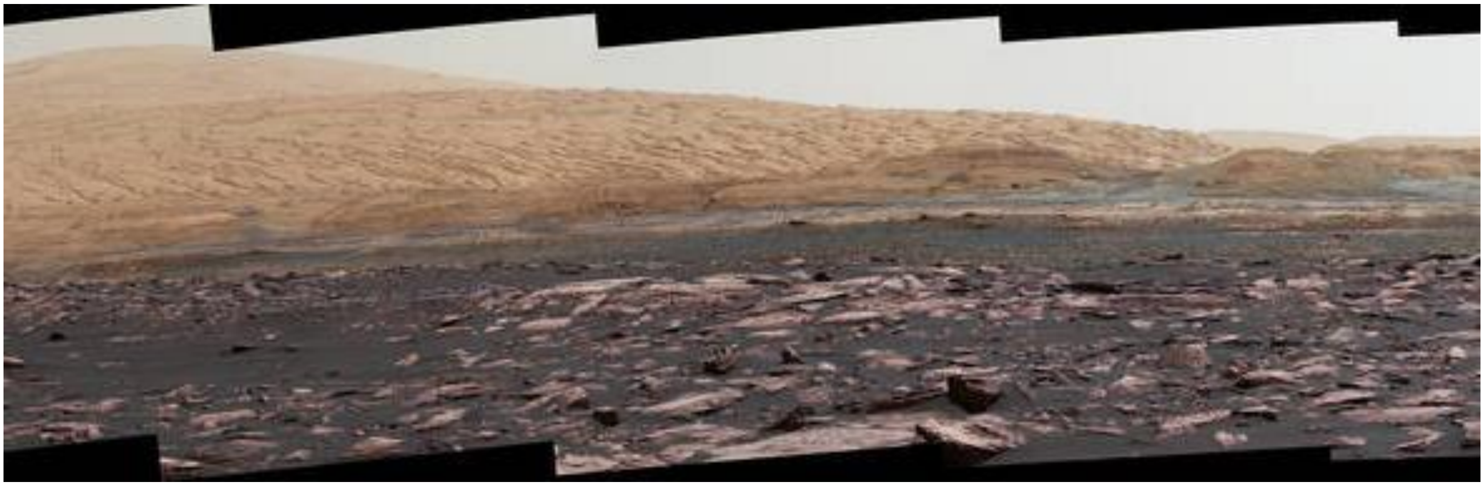
— July 18, 2017 —

Contents

In the News

Departments

1. Curiosity Mars Rover Begins Study of Ridge Destination



This early 2017 look ahead from the Mastcam of NASA's Curiosity Mars rover includes four geological layers to be examined by the mission, and higher reaches of Mount Sharp beyond the planned study area. "Vera Rubin Ridge" sits just above the reddish foreground rocks of the Murray formation. Credits: NASA/JPL-Caltech/MSSS

The car-size NASA rover on a Martian mountain, Curiosity, has begun its long-anticipated study of an iron-bearing ridge forming a distinctive layer on the mountain's slope.

Since before Curiosity's landing five years ago next month, this feature has been recognized as one of four unique terrains on lower Mount Sharp and therefore a key mission destination. Curiosity's science team informally named it "Vera Rubin Ridge" this year, commemorating astronomer Vera Cooper Rubin (1928-2016).

"Our Vera Rubin Ridge campaign has begun," said Curiosity Project Scientist Ashwin Vasavada of NASA's Jet Propulsion Laboratory, Pasadena, California. "Curiosity is driving parallel to the ridge, below it, observing it from different angles as we work our way toward a safe route to the top of the ridge."

A major appeal of the ridge is an iron-oxide mineral, hematite, which can form under wet conditions and reveal information about ancient environments. Hematite-bearing rocks elsewhere on Mars were the scientific basis for choosing the 2004 landing site of an older and still-active rover, Opportunity. Studies of Mount Sharp with the Compact Reconnaissance Imaging Spectrometer for Mars, on NASA's Mars Reconnaissance Orbiter, identified hematite in the ridge and also mapped water-related clay and sulfate minerals in layers just above it.

Vera Rubin Ridge stands about eight stories tall, with a trough behind it where clay minerals await. Curiosity is now near the downhill face, which forms an impressive wall for much of the ridge's length of about 4 miles (6.5 kilometers).

"In this first phase of the campaign, we're studying the sedimentary structures in the wall," said JPL's Abigail Fraeman, a Curiosity science-team member who helped plan these observations.

This summer's investigations also seek information about the boundary zone between the material that makes up the ridge and the geological unit that Curiosity has been studying since late 2014: the Murray formation of lower Mount Sharp, which holds evidence of ancient lakes. The Murray formation has variable levels of hematite, but whether the hematite in it and in the ridge accumulated under similar environmental conditions is unknown. The planned ascent route will provide access to closer inspection of the hematite-bearing rocks.

"We want to determine the relationship between the conditions that produced the hematite and the conditions under which the rock layers of the ridge were deposited," Fraeman said. "Were they deposited by wind, or in a lake, or some other setting? Did the hematite form while the sediments accumulated, or later, from fluids moving through the rock?"

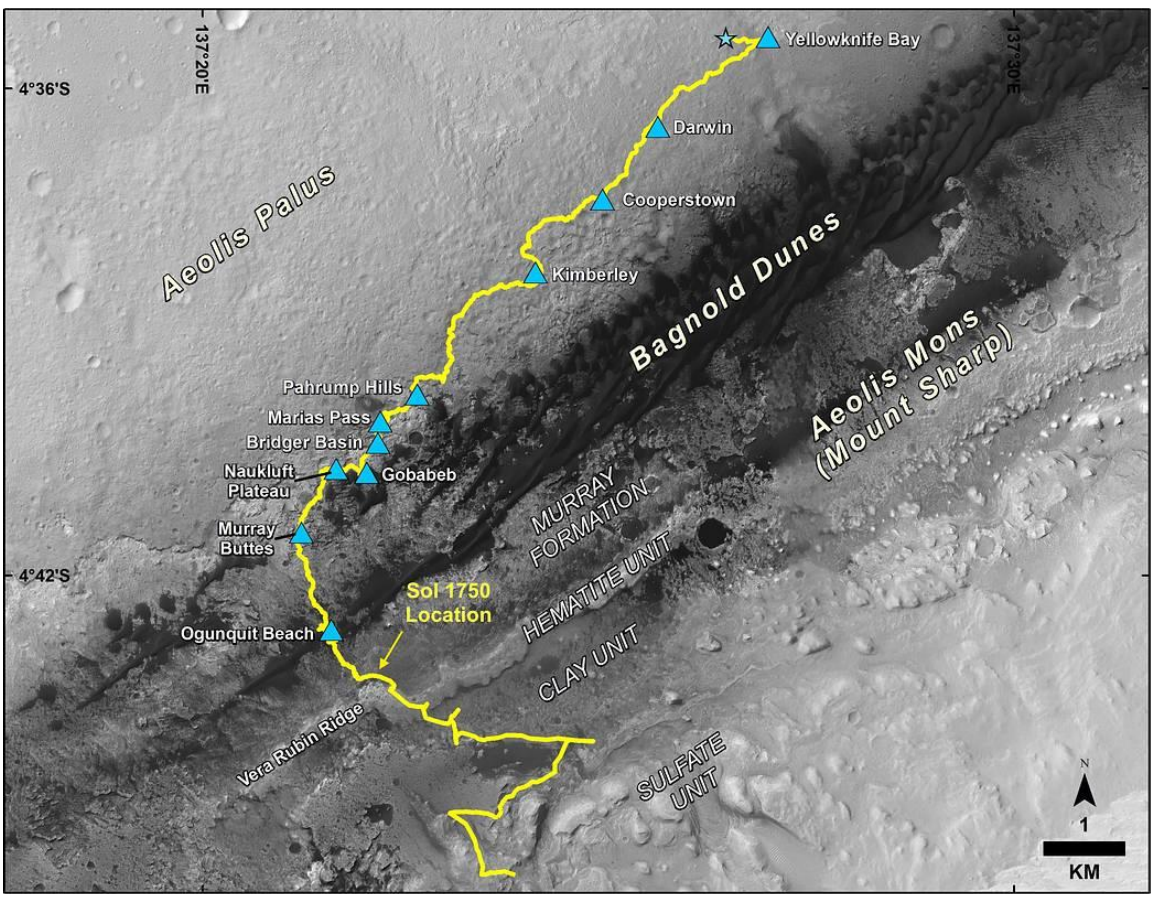
Deciphering the history of the ridge's hematite may shed light on whether the freshwater environments that deposited the layers of the older Murray formation were turning more acidic by the time the layers of the ridge formed. The mission also will be watching for clues about whether a gradient in oxidation levels was present, as that could have provided a potential energy source for microbial life.

Terrain near the base of the ridge is rife with boulders and sand, creating challenging conditions for navigation, as well as opportunities to add to the mission's studies of sand dunes and ripples. The largest sand dunes were at lower elevations, including a linear dune informally named "Nathan Bridges Dune" in memory of Nathan Bridges (1966-2017), a Curiosity team member who helped lead the mission's dune studies.

Status of Curiosity's Drill

The rover team will not have Curiosity's rock sampling drill available in the first phase of studying "Vera Rubin Ridge." The drill feed mechanism, which moves the bit forward or back, faulted on Dec. 1, 2016, and no rocks have been drilled since then. While continuing to test possible ways to move the bit with the drill feed mechanism, rover engineers are also now studying alternative ways to drill. For the 15 rocks that Curiosity has sampled with its drill so far, two stabilizer posts, one to each side of the bit, were placed against the rock before the bit was extended with the feed mechanism.

"We are investigating methods to drill without using the stabilizers," said Curiosity Deputy Project Manager Steve Lee, of JPL. "Instead of using the feed mechanism to drive the bit into the rock, we may be able to use motion of the arm to drive the bit into the rock." Adaptation in delivering the resulting rock powder to laboratory instruments is also under study, such as use of the arm's soil scoop.



This map shows the route driven by NASA's Curiosity Mars rover, from the location where it landed in August 2012 to its location in July 2017 (Sol 1750), and its planned path to additional geological layers of lower Mount Sharp.

Credits: NASA/JPL-Caltech/Univ. of Arizona

Source: NASA Return to Contents

2. Eight Planetary Systems Found Hosting 20 Super-Earth & Neptune-Mass Companions

The ESO 3.6-metre telescope (rear) at ESO's La Silla observatory. La Silla, in the southern part of the Atacama Desert of Chile, was used for this exoplanet research. Image: ESO.

A new treasure trove of planets, ranging from worlds with small masses and short orbital periods of less than 15 days to super-Earth-sized planets that can take up to a year to orbit their star, has been discovered by astronomers using the world's most successful ground-based planet-finding instrument.

The 20 new worlds have been found around eight bright, Sun-like stars by the HARPS (High Accuracy Radial velocity Planet Searcher) Echelle Spectograph instrument, mounted on the 3.6m telescope at the European Southern Observatory in Chile. HARPS, which has discovered around 200 planets since 2003, is are able to measure the velocity of a star's wobble incurred by the gravity of orbiting planets with the extreme precision of 1 m/s.

Xavier Dumusque, from the University of Geneva, is part of the consortium that built the HARPS instrument back in 2003 and is a member of the research team who discovered the 20 new planets.

"It's important that we examine the data carefully and make sure we do all the tests we can to make sure we announce bonafide planets and not spurious signals. Because both the planets and the star induce signals, there has been quite a few planets announced which have turned out to be to be false-positives." says Dumusque.

One of the systems observed was a binary system containing the stars HD 20781 and HD 20782. Although planets have been found in binary systems before, it is still uncertain how disruptive the gravitational tides from two stars can be to planet formation, or whether there could be long-term interactions between the two stars and their planets which make them unstable.

This system, however, is packed with planets. Orbiting around the star HD 201781 are two super-Earths with orbits of 5.3 and 13.9 days and two Neptune-mass planets with orbits of 29 and 86 days. The brighter star of the two, HD 20782, also has a Jupiter-sized world in an eccentric 595-day orbit.

Jason Dittman an astronomer at Harvard University was excited by the planets in the study and, in particular, this binary system. "These planets are really interesting because they have these longer orbital periods, and they complement the planets from transit surveys like Kepler. If we want a complete picture of what sort of planets exist in the universe, then discoveries like these are vital to the story," he says.

At this moment there's not much known about the eccentric Jupiter-like planet orbiting HD201782, except its minimum mass, its orbital period, and its eccentricity.

However, it is these highly eccentric planets that are interesting because we don't see any like them in our own Solar System, and their existence implies that something strange has happened in their history.

It's believed that the disks these highly eccentric planets form in are circular; meaning a star or another planet is responsible for getting them into such a highly eccentric orbit.

Dittman said, "I'd be curious to see if someone does some modelling to see if it's possible that HD 20781 or its planets could have perturbed HD 20782's planet to higher eccentricities."

Another star studied was HD 20003, which was found to harbor two Neptune-mass planets with eccentric orbits of 11.9 and 33.9 days, close enough that they gravitationally interact with each other. It is possible that in the past, the two planets were in resonance, which might have increased the eccentricity of the innermost planet until a specific event, such as the presence of additional planet, made the two planets go slightly out of resonance on their current orbit.

"We saw 20 more planets orbiting bright and therefore close by stars. Thus the probability of having at least one planet around each star increases. Today, the statistics show at least 50% of stars similar to the Sun have planets." Dumusque said.

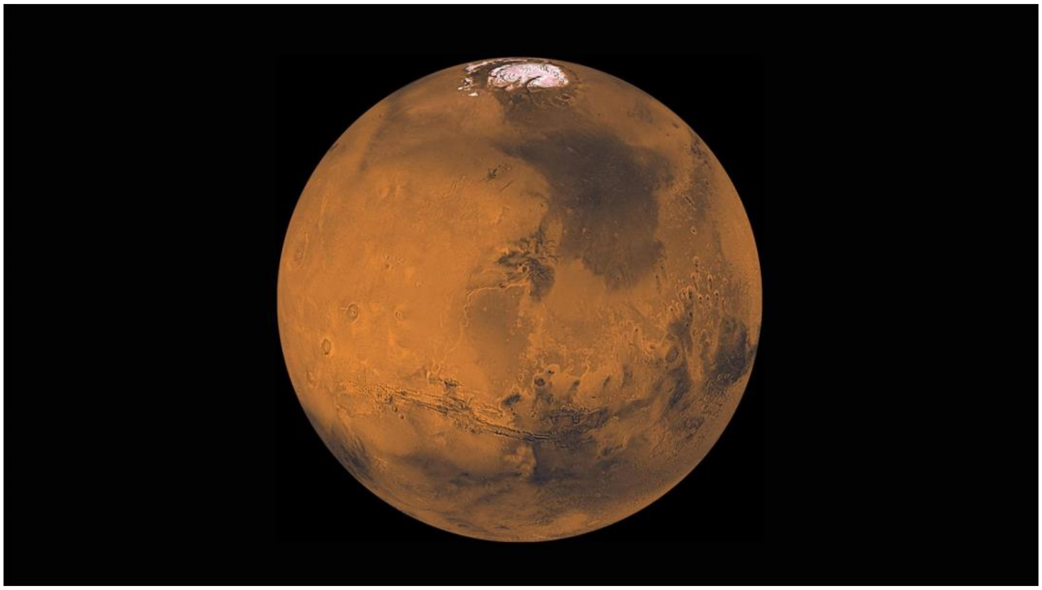
Dittman believes that HARPS and other radial velocity surveys in general don't get enough credit for the amount of time and dedication that goes into their observations. "Detecting planets with periods that are several years long takes a long time to do because you want to see the planet go around the star a couple of times."

He continued, "The dedication and forward-thinking to get data on a star for many years is amazing. It's great to see these long-running radial velocity programs continue to hit pay-dirt and find some longer period, eccentric systems with which to test our theories."

The other systems observed were: HD 21693, a system with two Neptune-mass planets close to a 5:2 resonance; HD 31527, a three-Neptune system lying in the habitable zone; HD 45184, a system with two close-in Neptunes; HD 51608 harboring two Neptune-mass planets; HD 134060, a system with a short-period Neptune on an eccentric orbit with a more massive long-period companion; and HD 136352, a system which has three planets in orbit.

Source: Astronomy Now.com Return to Contents

3. Ancient, Massive Asteroid Impact Could Explain Martian Geological Mysteries



The origin and nature of Mars are mysterious. The planet has geologically distinct hemispheres with smooth lowlands in the north and cratered, high-elevation terrain in the south. The red planet also has two small oddly-shaped oblong moons and a composition that sets it apart from that of the Earth.

New research by CU Boulder professor Stephen Mojzsis outlines a likely cause for these mysterious features of Mars: a colossal impact with a large asteroid early in the planet's history. This asteroid—about the size of Ceres, one of the largest asteroids in the solar system—smashed into Mars, ripped off a chunk of the northern hemisphere and left behind a legacy of metallic elements in the planet's interior. The crash also created a ring of rocky debris around Mars that may have later clumped together to form its moons, Phobos and Deimos.

The study appeared online in the journal *Geophysical Research Letters*, a publication of the American Geophysical Union, in June.

"We showed in this paper—that from dynamics and from geochemistry—that we could explain these three unique features of Mars," said Mojzsis, a professor in CU Boulder's Department of Geological Sciences. "This solution is elegant, in the sense that it solves three interesting and outstanding problems about how Mars came to be."

Astronomers have long wondered about these features. Over 30 years ago, scientists proposed a large asteroid impact to explain the disparate elevations of Mars' northern and southern hemispheres; the theory became known as the "single impact hypothesis." Other scientists have suggested that erosion, plate tectonics or ancient oceans could have sculpted the distinct landscapes. Support for the single impact hypothesis has grown in recent years, supported by computer simulations of giant impacts.

Mojzsis thought that by studying Mars' metallic element inventory, he might be able to better understand its mysteries. He teamed up with Ramon Brasser, an astronomer at the Earth-Life Science Institute at the Tokyo Institute of Technology in Japan, to dig in.

The team studied samples from Martian meteorites and realized that an overabundance of rare metals—such as platinum, osmium and iridium—in the planet's mantle required an explanation. Such elements are normally captured in the metallic cores of rocky worlds, and their existence hinted that Mars had been pelted by asteroids throughout its early history. By modeling how a large object such as an asteroid would have left behind such elements, Mojzsis and Brasser explored the likelihood that a colossal impact could account for this metal inventory.

The two scientists first estimated the amount of these elements from Martian meteorites, and deduced that the metals account for about 0.8 percent of Mars' mass. Then, they used impact simulations with different-sized asteroids striking Mars to see which size asteroid accumulated the metals at the rate they expected in the early solar system.

Based on their analysis, Mars' metals are best explained by a massive meteorite collision about 4.43 billion years ago, followed by a long history of smaller impacts. In their computer simulations, an impact by an asteroid at least 1,200 kilometers (745 miles) across was needed to deposit enough of the elements. An impact of this size also could have wildly changed the crust of Mars, creating its distinctive hemispheres.

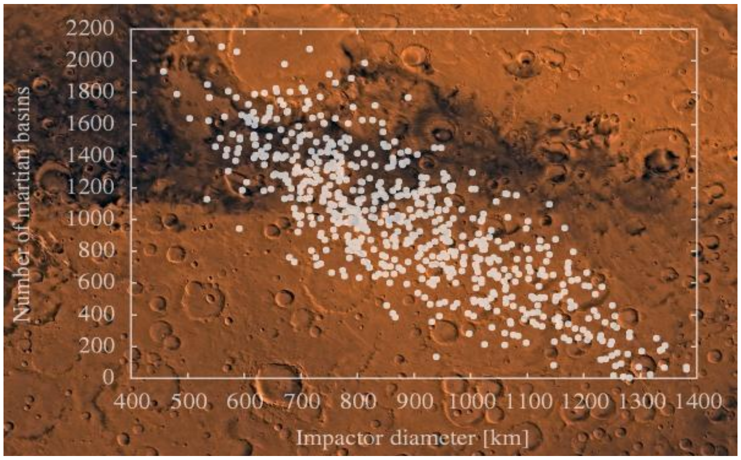
In fact, Mojzsis said, the crust of the northern hemisphere appears to be somewhat younger than the ancient southern highlands, which would agree with their findings.

"The surprising part is how well it fit into our understanding of the dynamics of planet formation," said Mojzsis, referring to the theoretical impact. "Such a large impact event elegantly fits in to what we understand from that formative time."

Such an impact would also be expected to have generated a ring of material around Mars that later coalesced into Phobos and Deimos; this explains in part why those moons are made of a mix of native and non-Martian material.

In the future, Mojzsis will use CU Boulder's collection of Martian meteorites to further understand Mars' mineralogy and what it can tell us about a possible asteroid impact. Such an impact should have initially created patchy clumps of asteroid material and native Martian rock. Over time, the two material reservoirs became mixed. By looking at meteorites of different ages, Mojzsis can see if there's further evidence for this mixing pattern and, therefore, potentially provide further support for a primordial collision.

"Good theories make predictions," said Mojzsis, referring to how the impact theory may predict how Mars' makeup. By studying meteorites from Mars and linking them with planet-formation models, he hopes to better our understanding of how massive, ancient asteroids radically changed the red planet in its earliest days.



A global false-color topographic view of Mars from the Mars Orbiter Laser Altimeter (MOLA) experiment. The spatial resolution is about 15 kilometers at the equator and less at higher latitudes, with a vertical accuracy of less than 5 meters. The figure illustrates topographic features associated with resurfacing of the northern hemisphere lowlands in the vicinity of the Utopia impact basin (at the near-center of the image in blue).
Credit: MOLA Science Team

Source: University of Colorado Boulder

Return to Contents

The Night Sky

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.

Wednesday, July 19

- Early in Thursday's dawn, and even a bit earlier, Venus and the waning crescent moon shine together in the east, as shown here. Upper right of them is Aldebaran, and above Aldebaran are the Pleiades. Left of the Moon and Venus is 2nd-magnitude El Nath, Beta Tauri.

Thursday, July 20

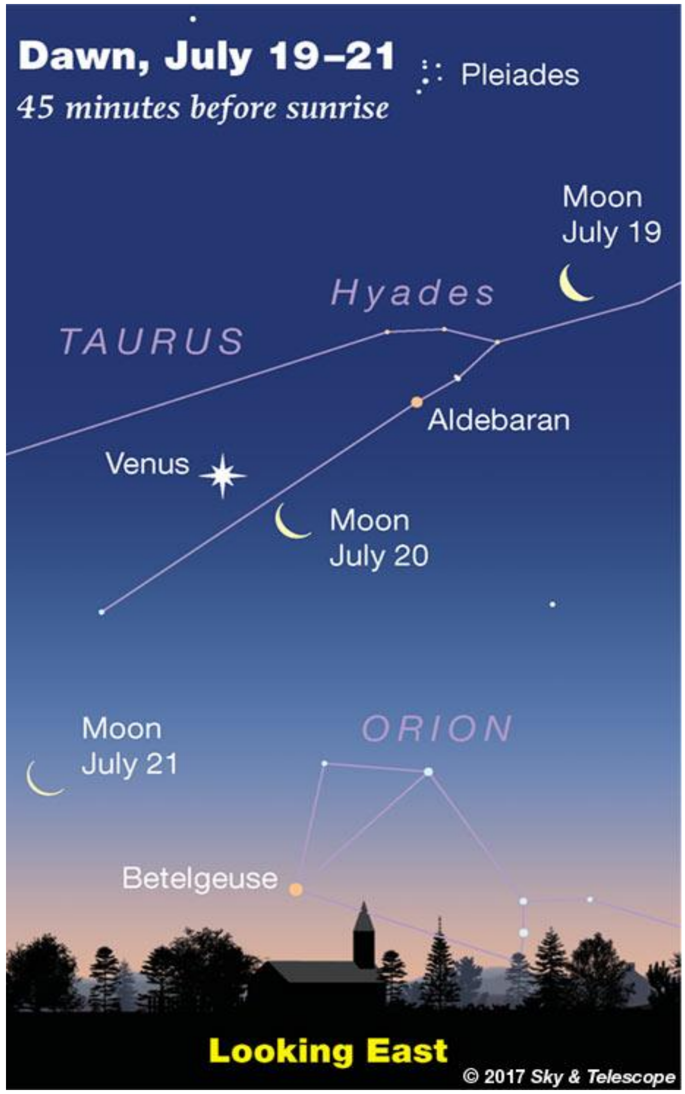
- With the advance of summer, the Sagittarius Teapot, in the south after dark now, is starting to tilt and pour from its spout to the right. The Teapot will tilt farther and farther for the rest of the summer — or for much of the night, if you stay out very late.

Friday, July 21

- Starry Scorpius is sometimes called "the Orion of Summer" for its brightness and its prominent red supergiant (Antares in the case of Scorpius, Betelgeuse for Orion). But Scorpius is a lot lower in the south than Orion for those of us at mid-northern latitudes. That means Scorpius has only one really good evening month: July. Catch Scorpius due south just after dark now, before it starts to tilt lower toward the southwest. It's full of deep-sky objects for binoculars or a telescope — if you have a detailed star atlas to find them with.

Saturday, July 22

- We're only a third of the way through summer, but already W-shaped Cassiopeia, a constellation better known for fall and winter evenings, is climbing up in the north-northeast as evening grows late. And the Great Square of Pegasus, emblem of fall, comes up to balance on one corner just over the eastern horizon.



Set your alarm to catch the crescent Moon with Venus early in the dawn of Thursday the 20th.

Source: Sky and Telescope

Return to Contents

ISS Sighting Opportunities (from Denver)

Date	Visible	Max Height	Appears	Disappears
Wed Jul 19, 1:54 AM	< 1 min	13°	13° above NNW	13° above N
Wed Jul 19, 3:31 AM	< 1 min	10°	10° above N	10° above N
Wed Jul 19, 5:06 AM	2 min	24°	11° above NNW	24° above NNE
Thu Jul 20, 1:03 AM	< 1 min	12°	12° above NNE	10° above NNE
Thu Jul 20, 2:38 AM	< 1 min	10°	10° above N	10° above N
Thu Jul 20, 4:14 AM	2 min	16°	10° above NNW	16° above N
Fri Jul 21, 1:45 AM	< 1 min	10°	10° above NNW	10° above NNW
Fri Jul 21, 3:22 AM	1 min	13°	10° above NNW	13° above N
Fri Jul 21, 4:58 AM	6 min	48°	10° above NW	11° above ESE

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

NASA-TV Highlights (all times Eastern Time Zone)

Tuesday, July 18

- 12:15 p.m. - ISS Research & Development Conference 2017 - Luncheon Keynote: Senator Peters (NTV-1 (Public))
- 4:30 p.m. - ISS Research & Development Conference 2017 - ISS Exploration Technologies (NTV-1 (Public))

Wednesday, July 19

- TBD, - ISS Expedition 52 In-Flight Interview with WFXT-TV, Boston (Fox 25 Boston) and the Weather Channel with NASA Flight Engineer Jack Fischer (all channels)
- 8:30 a.m. - ISS Research & Development Conference 2017 - Morning Keynote: Robert Lightfoot, NASA Acting Administrator (NTV-1 (Public))
- 10:30 a.m. - ISS Research & Development Conference 2017 - Keynote: Robert T. Bigelow, Founder and President, Bigelow Aerospace (NTV-1 (Public))
- 11:30 a.m. - ISS Expedition 52 In-Flight Media Interviews with the Weather Channel and NASA Flight Engineer Jack Fischer (starts at 11:40 a.m.) (all channels)
- 12:30 p.m. - ISS Research & Development Conference 2017 - An Innovation Discussion with Elon Musk (NTV-1 (Public))

Thursday, July 20

- 9:30 a.m. - ISS Research & Development Conference 2017 - Commercial Space – It Is More Than Just Transportation (NTV-1 (Public))
- 11:15 a.m. - ISS Research & Development Conference 2017 - STEM on Station: How the ISS National Lab is Influencing Students and Educators in STEM Education (NTV-1 (Public))

Watch NASA TV online by going to the NASA website. Return to Contents

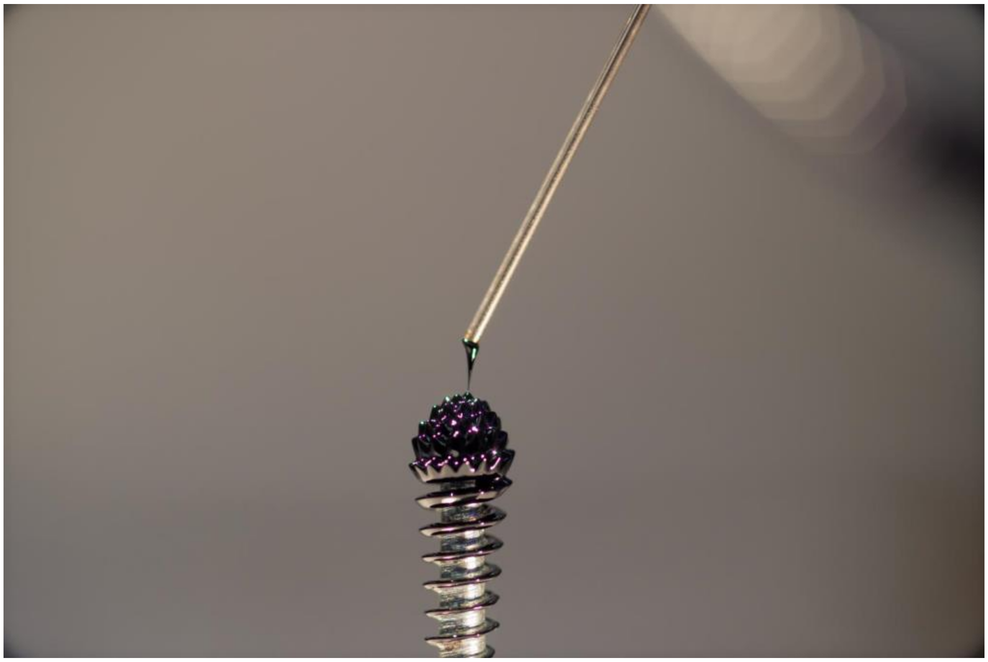
Space Calendar

- **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 3 Closest 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 - Apollo Asteroid 2017 NX5 Near-Earth Flyby (0.026 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)
- Jul 18-20 - 4th Annual NASA Exploration Science Forum (NESF), Moffett Field, California
- Jul 18-28 - CTEQ Summer School on QCD and Electroweak Phenomenology (CTEQ 2017), Pittsburgh, Pennsylvania
- Jul 19 - Cassini, Distant Flyby of Atlas & Janus
- Jul 19 - Asteroid 10183 Ampere Closest Approach To Earth (1.415 AU)
- Jul 19 - Asteroid 365756 ISON Closest Approach To Earth (7.659 AU)
- Jul 19 - 50th Anniversary (1967), Explorer 35 Launch (Moon Orbiter)
- Jul 19 - 105th Anniversary (1912), Holbrook Meteorite Shower (Hit Train Station in Arizona)
- Jul 20 - Moon Occults Aldebaran
- Jul 20 - Atira Asteroid 2010 XB11 Closest Approach To Earth (0.735 AU)
- Jul 20 - Asteroid 3688 Navajo Closest Approach To Earth (3.179 AU)
- Jul 20 - Lecture: Red-hot Real Estate - Living on Mars, Pasadena, California
- Jul 21 - Comet 185P/Petriew Closest Approach To Earth (1.606 AU)
- Jul 21 - Comet 81P/Wild At Opposition (2.338 AU)
- Jul 21 - Comet 332P-G/Ikeya-Murakami At Opposition (2.709 AU)
- Jul 21 - Asteroid 17640 Mount Stromlo Closest Approach To Earth (1.177 AU)
- Jul 21 - Asteroid 5649 Donnashirley Closest Approach To Earth (1.795 AU)
- Jul 21 - Asteroid 6318 Cronkite Closest Approach To Earth (2.339 AU)
- Jul 21 - 15th Anniversary (2002), Thuathe Meteorite Fall (Hit Houses in Lesotho)
- Jul 21 - Workshop: The Autonomy on Future SMD Missions, Moffett Field, California
- Jul 21-23 - 2017 Alberta Star-B-Q, Caroline, Alberta, Canada

Source: JPL Space Calendar Return to Contents

Food for Thought

Spiky Ferrofluid Thrusters Can Move Satellites



A ferrofluid is a magnetic liquid that turns spiky in a magnetic field. Add an electric field and each needle-like spike emits a jet of ions, which could solve micro-propulsion for nanosatellites in space. Credit: Sarah Bird/Michigan Tech

Once launched into low-Earth orbit, a small satellite needs propulsion. Electrospray uses spiky, needle-like jets of fluid to push spacecraft.

Brandon Jackson, a doctoral candidate in mechanical engineering at Michigan Technological University, has created a new computational model of an electrospray thruster using ionic liquid ferrofluid—a promising technology for propelling small satellites through space. Specifically, Jackson looks at simulating the electrospray startup dynamics; in other words, what gives the ferrofluid its characteristic spikes.

Up in Space

More than 1,300 active satellites orbit the Earth. Some are the size of a school bus, and others are far smaller, the size of a shoebox or a smart phone.

Small satellites can now perform the missions of much larger and more expensive spacecraft, due to advances in satellite computational and communications systems. However, the tiny vehicles still need a more efficient way to maneuver in space.

Scaled-down plasma thrusters, like those deployed on larger-class satellites, do not work well. A more promising method of micropropulsion is electrospray.

Electrospray involves microscopic, hollow needles that use electricity to spray thin jets of fluid, pushing the spacecraft in the opposite direction. But the needles have drawbacks. They are intricate, expensive and easily destroyed.

Flying with Ferrofluids

To solve this problem, L. Brad King, Ron & Elaine Starr Professor in Space Systems at Michigan Tech, is creating a new kind of micro-thruster that assembles itself out of its own propellant when excited by a magnetic field. The tiny thruster requires no fragile needles and is essentially indestructible.

“We’re working with a unique material called an ionic liquid ferrofluid,” King says, explaining that it's both magnetic and ionic, a liquid salt. “When we put a magnet underneath a small pool of the ferrofluid, it turns into a beautiful hedgehog structure of aligned peaks. When we apply a strong electric field to that array of peaks, each one emits an individual micro-jet of ions.”

The phenomenon is known as a Rosensweig instability. The peaks also heal themselves and re-grow if they are somehow damaged.

Without a magnetic field, ferrofluids look like a tarry, oil-based fuel. With a magnetic field, the propellant self-assembles, raising into a spiky ball.

King came up with the idea of using ferrofluids for thrusters in 2012. He was trying to make an ionic liquid that behaved like a ferrofluid when he learned about a research team at the University of Sydney led by Brian Hawkett and Nirmesh Jain. They had developed a ferrofluid from magnetic nanoparticles made by the life sciences company Sirtex.

King’s early work with the ferrofluid sample was pure trial and error; the results were good, but the physics were poorly understood. That’s when the Air Force Office of Scientific Research (AFOSR) gave King a contract to research the fluid physics of ferrofluid.

Electrospray Thrusters

Enter Jackson, whose doctoral work is advised by King.

“Typically among engineers, there are experimentalists who build and measure things, or there are modelers who simulate things,” King says. “Brandon excels at both.”

Working in King’s Ion Space Propulsion Laboratory, Jackson conducted an experimental and computational study on the interfacial dynamics of the ferrofluid, and created a computational model of ionic liquid ferrofluid electrosprays.

“We wanted to learn what led up to emission instability in one single peak of the ferrofluid micro-thruster,” Jackson says, who developed a model for a single peak and conducted rigorous testing to ensure the model was correct.

The team gained a much better understanding of the relationships between magnetic, electric and surface tension stresses. Some of the data gathered through the model surprised them.

“We learned that the magnetic field has a large effect in preconditioning the fluid electric stress,” Jackson says, explaining this discovery might lead to a better understanding of the unique behaviors of ferrofluid electrosprays.

To Infinity and Beyond

The AFOSR recently awarded King a second contract to continue researching the physics of ferrofluids, and he says, “Now we can take what we’ve learned, and instead of modeling a single peak, we’ll scale it up and model multiple peaks."

Their next set of experiments will be more like a thruster, though a working thruster is still several years away. Although making 100 peaks or more, all thrusting identically, will be much more challenging.

"Often in the lab we’ll have one peak working and 99 others loafing. Brandon’s model will be a vital tool for the team going forward,” King says. “If we are successful, our thruster will enable small inexpensive satellites with their own propulsion to be mass produced. That could improve remote sensing for better climate modeling, or provide better internet connectivity, which three billion people in the world still do not have.”

In addition to spacecraft propulsion, ferrofluid electrospray technology could be useful in spectrometry, pharmaceutical production, and nanofabrication. Michigan Tech has a pending patent for the technology.

Source: Michigan Technological University Return to Contents

Space Image of the Week

Earth at Night

Image Credit: NASA, NOAA NGDC, Suomi-NPP, Earth Observatory,
Data and Processing: Chris Elvidge and Robert Simmon

Explanation: Can you find your favorite country or city?

Surprisingly, on this world-wide nightscape, city lights make this task quite possible. Human-made lights highlight particularly developed or populated areas of the Earth's surface, including the seaboards of Europe, the eastern United States, and Japan. Many large cities are located near rivers or oceans so that they can exchange goods cheaply by boat. Particularly dark areas include the central parts of South America, Africa, Asia, and Australia. The featured composite was created from images that were collected during cloud-free periods in April and October 2012 by the Suomi-NPP satellite, from a polar orbit about 824 kilometers above the surface, using its Visible Infrared Imaging Radiometer Suite (VIIRS).

Source: NASA APOD

Return to Contents