Space News Update

— June 4, 2019 —

Contents

1. NASA to Shut Down Spitzer Space Telescope Early Next Year

Artist's concept of the Spitzer Space Telescope. Credit: NASA/JPL-Caltech

After a search for an outside funding source turned up empty, NASA plans to end observations with the Spitzer Space Telescope in January to conclude a 16-year mission that discovered exoplanets, studied galaxies in the ancient universe, and peered at planets and asteroids in our own solar system.

NASA quietly announced the plan to end Spitzer's observations in a blog post in May. Astronomers hoped to keep Spitzer going until after the launch of the long-delayed James Webb Space Telescope, but the new observatory is now scheduled for launch in early 2021, and continues to dominate the budget for NASA's astrophysics division.

"On January 30, 2020, NASA's Spitzer Space Telescope will transmit the final science and engineering data to mission control and then be commanded off, ending its amazing and surprising mission," wrote Lisa Storrie-Lombardi, Spitzer's project manager at NASA's Jet Propulsion Laboratory in Pasadena, California.

Scientists will archive the final data from Spitzer for use by future scientists.

"But even after Spitzer ceases transmissions, scientists will continue making discoveries from its 16 years of data for decades to come," Storrie-Lombardi wrote. "Spitzer enables groundbreaking advances in our understanding of planetary systems around other stars, the evolution of galaxies in the nearby and distant universe, the structure of our Milky Way galaxy, the infinite variety in the lives of stars, and the constituents of our solar system."

A review of NASA's operating astrophysics missions by an independent panel of scientists in 2016 ranked Spitzer at the bottom of a list of six projects examined by the board. While the independent panel, called a senior review, did not recommend shutting down any of the operating missions, NASA uses the senior review reports to prioritize spending on extended missions, in balance with expenditures to design, develop and build new astrophysics probes and telescopes.

The 2016 senior review recommended NASA continue operating Spitzer until 2019, after the Webb telescope's then-scheduled launch date. Spitzer escape cancellation in 2014 after project managers found ways to reduce the mission's operating costs.

Thomas Zurbuchen, head of NASA's science division, said May 21 that agency followed guidance from the senior review in deciding when to shut down Spitzer.

"Every once in a while, that means that turn off a mission because the science return is no longer warranting keeping it going in the context of the other missions," Zurbuchen said during a meeting of the NASA Advisory Council's science committee. "It's not that there's no science return, but there's less."

Spitzer cost $11 million to operate in fiscal year 2018.

In 2017, NASA sought information from private entities, such as academic institutions, to take over Spitzer operations after NASA's funding for the mission ran out. Two organizations submitted proposals to assume responsibility for Spitzer, but they were unable to secure the required funding, according to Felicia Chou, a NASA spokesperson.

Chou said Spitzer, which is in an Earth-trailing orbit around the sun, can remain in its current orbit through the solar system after NASA turns off the mission. While the spacecraft and its instruments remain functional, the distance between Earth and Spitzer is increasing, which reduces the data flowing from the telescope.

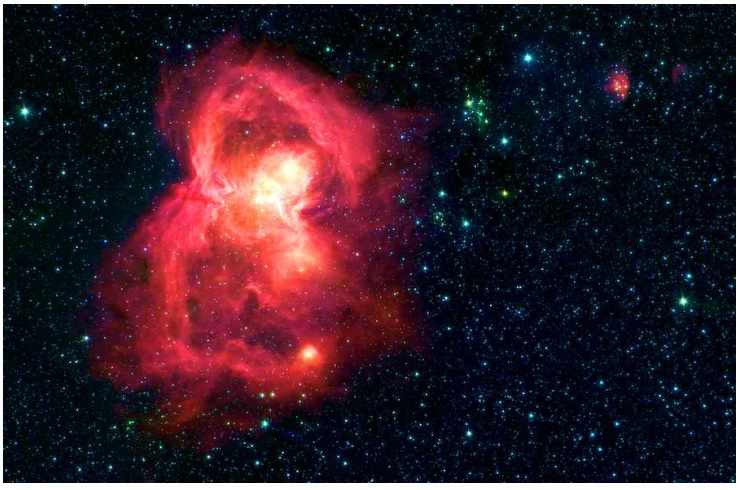
Built by Lockheed Martin, Spitzer was the last of NASA's four original Great Observatories to launch, joining Hubble, the Compton Gamma-Ray Observatory, and the Chandra X-ray Observatory.

Designed for a five-year mission, Spitzer launched on Aug. 25, 2003, aboard a Delta 2 rocket from Cape Canaveral.

Spitzer launched with a supply of super-cold liquid helium to cool its most sensitive infrared detectors, which were designed to image some of the coldest reaches of the universe. Since 2009, Spitzer has only been able to use two of its shorter wavelength imaging bands after running out of cryogenic helium. Detectors in the near-infrared bands do not need to be chilled to do their work.

Zurbuchen said NASA is ending the Spitzer mission with a "sense of celebration for a mission that's exceeding any and all expectations."

"Spitzer's prime mission lasted more than twice the requirement, and I can assert with confidence that no one expected that the observatory would still be operating and doing exciting science in 2019, the tenth year of the extended mission," Storrie-Lombardi wrote.

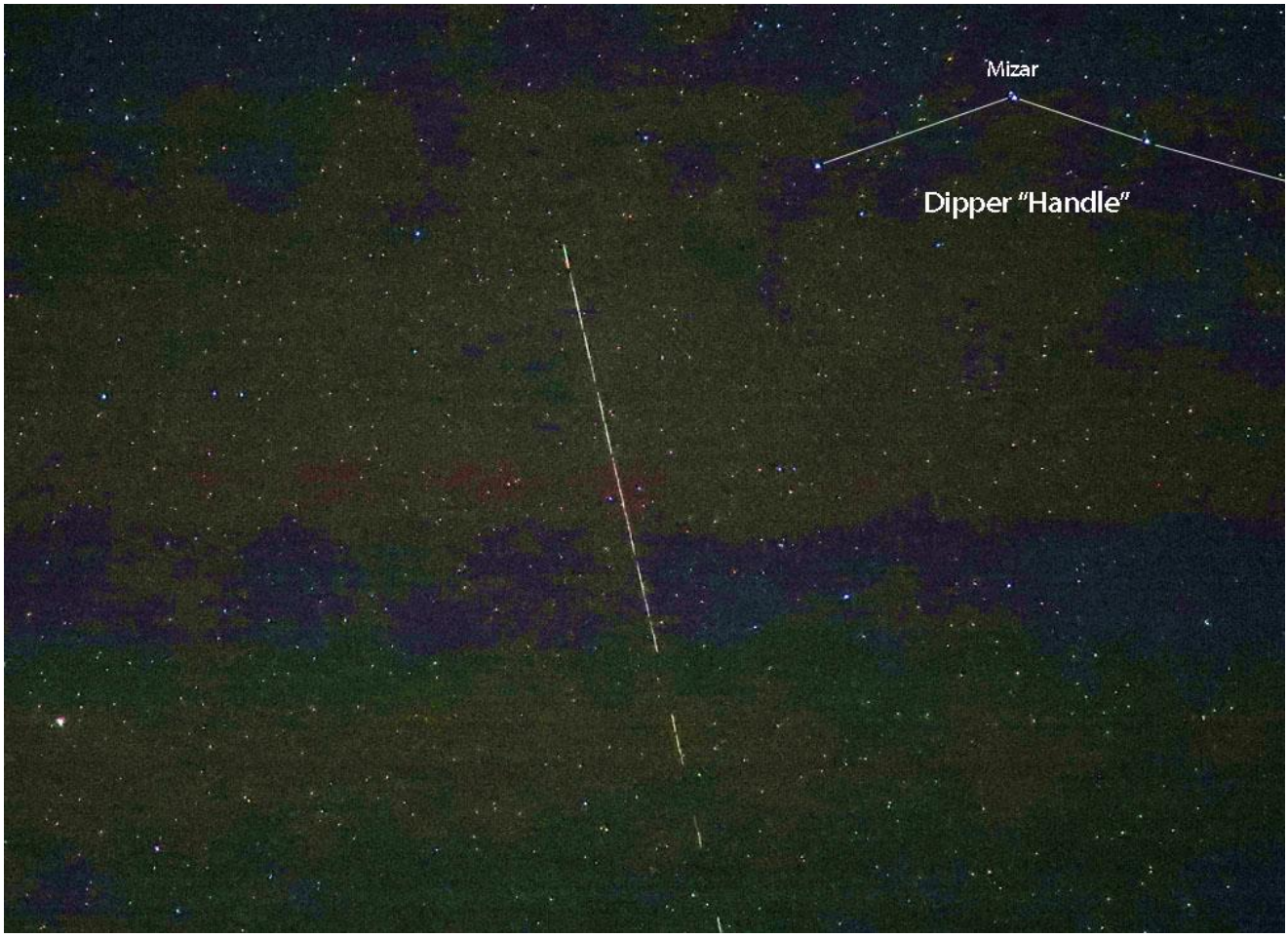


This infrared view of the butterfly-shaped W40 nebula, a star-forming cloud of gas and dust 1,400 light-years from Earth, was captured by the Spitzer Space Telescope. Credit: NASA/JPL-Caltech

Source: Spaceflight Now

Return to Contents

2. SpaceX Launches First Volley of Starlink Satellites



The Starlink satellite pack crosses the zenith near the handle of the Big Dipper during the May 25th pass. Exposure: 1 second at ISO 32,000. Bob King

The 60 Starlink satellites parading across the sky make an incredible sight, but some skywatchers wonder at what cost to the night.

It's a safe bet to say no one had ever seen anything like it — 60 satellites chugging across the sky in a straight line like some outer space choo-choo. We're grateful that Dutch satellite sleuth Marco_Langbroek captured video. If nothing else, it will calm those who were convinced they were seeing a UFO. But as is nearly always the case, there was a more prosaic explanation: Elon Musk, SpaceX founder, sent the first volley of what will become a megaconstellation of 12,000 *Starlink* satellites to provide broadband internet service for under-served areas of the globe.

That's right. 12,000. If all goes according to plan, SpaceX will send up fusillades of the satellites on its Falcon 9 rocket multiple times a year over until the entire constellation is complete, which will take about 9 years. Fortunately or not, depending on how you feel about sending this many machines into orbit, the incredible sight will be repeated 4–5 times again in 2019 alone. That means lots of opportunities to see the heavenly procession in case you were clouded out this time around.

During the initial orbit, the Starlink train passed over northwestern Europe at an altitude of just 440 km) and formed a neat line about 7° long that resembled a ticker tape (if anyone still remembers those) or the crawl under the talking heads on the nightly news. At the time, the satellites ranged in brightness from 1st to 3rd magnitude and were easily visible with the naked eye.

Since then, the satellites have been firing their thrusters to climb to an operational altitude of 550 kilometers with an orbital inclination of 53° — steep enough for most of the world to connect to the internet as well as see its orbiting providers.

I got my first look during a beautiful high pass on May 25th and couldn't believe my eyes. I first spotted the 60 satellites as a freaky thread of light rising straight up through Leo's tail. As it drew closer I could faintly make out dozens of tiny lights between 4th and 5th magnitude lined up like geese in flight. When low in the west, the group sight spanned some 10° (two fists) but closer to 20° when overhead. Incredibly, individual or clusters of the objects would briefly flare and fade — some as bright as magnitude 2 — which made the train sparkle like a frost-covered twig in sunlight.

The view in binoculars was even more striking and looked exactly like the video, with satellites streaming by so quickly I could hardly count them. Over time, as they've reached altitude, the Starlink birds have faded considerably . . . and spread out. What used to take a few minutes for a pass now takes close to half an hour! During a 10:55 p.m. pass on May 28th, none were visible with the naked eye from my home (limiting magnitude 5 at the time), though I did see one or two flare to 4th magnitude in binoculars. Most glimmered between 6th and 8th magnitude and either appeared singly or in small bunches of two to four. I looked for nearly 20 minutes at a train more than 100° long.

If you like satellite watching, Starlink is a boon. But if you worry about humans polluting the sky with space junk, you've probably already slammed your fist on the table while reading this. Either way, the design life for the birds is around 5 years followed by a tidy and safe burn-up in the atmosphere. All are equipped with a satellite-avoidance technology to prevent crashes that might lead to the release of orbital debris.

Starlink satellites have a folding design that allows 60 at a time to be packed as tight as sardines in a Falcon 9. Once in orbit, each deploys a single solar panel to generate the electricity to power a krypton ion engine similar to the xenon ion engine used by NASA's Dawn spacecraft to travel to Vesta and Ceres. Although krypton is less efficient than xenon, it's also cheaper — a consideration if you plan to launch thousands of satellites.

Six more launches of 60 will be needed to initially activate the system. Because the satellites will communicate by lasers, the network is expected to provide higher internet speeds than what can be achieved on the ground with fiber optic cable. Light travels considerably faster across the vacuum of space than it does through glass fibers.

After 12 launches, the constellation will begin to provide significant coverage. The long-term plan will roll out in three phases with satellites launched into 53° orbits in three major orbital planes:

- ~1,600 satellites in a constellation at an altitude of 550 km
- ~2,800 objects at 1,150 km
- ~7,500 satellites at the lowest altitude of 340 km

How to See Starlink

The easiest way is to go to Heavens Above and select your location. Return to the main page and click on the *Starlink leader* and *Starlink trailer* links. These are the first and last satellites in what has now become a long procession. The leader is a several minutes ahead of the main group, so if you see just one or two at first, stick around. The others will follow along the same path.

Starlink Satellite Tracker is super-easy to use. Select your city from the drop-down list or input your latitude and longitude if your city's not on the list. You'll get a list of passes and where to look. The site also provides a live map showing Starlink's location. If you don't know your latitude and longitude, click here.

N2YO.com also shows passes and information for the Starlink Group. Just type Starlink in the *Find a Satellite* box. This will show the next pass. For a list of passes, click the *10-day predictions* link.

CalSky is another excellent site. Like the Heavens Above website, CalSky offers printable sky maps showing the satellite track. Sign in and select your city under the *Setup* link, then click the *Satellites* link. In the more detailed menu, click on *Sat-Library*. In the box at left, type **Starlink** for satellite name. Go back to the links under the heading and click *Selected Satellite*. In the yellow *Satellite Menu* box to the right, click *Sighting Opportunities*. Scroll down to see a list of local times, directions, and altitudes. Click *Star Map* to get a map of the path for a particular pass. The next time you come back you'll only have to click the S*ighting Opportunities* link — the site remembers the rest.

Be sure to go out a few 5–10 minutes beforehand to dark-adapt your eyes. Until the next launch, binoculars are essential for seeing these. Few if any are visible with the naked eye unless they flare. If you live near a big city it will be an even greater challenge, so try this: Check the Starlink path on a map and note when a pass takes it close to a bright star. Put that star in your binoculars then wait and watch for them to zip by. On May 28th I was lucky enough to have Polaris as my guide.

A Million Points of Unwanted Light?

Although the sight of five dozen satellites in a row will take your breath away, not a few of us are concerned about the volume of traffic over our heads. Yes, there's a lot of space up there. We get it. But in 9 years, when 12,000 of them will be crawling the skies like so many ants, will it detract from the sight of the stars at night? Some will say that most of the units will be too high to see with the naked eye, and my May 28th observation seems to be proving the point, but that lowest and most populated belt — the 7,500 at 340 kilometers altitude — will almost certainly be visible. Not just in bright twilight either. My May 25th sighting was made at 11:25 p.m.

If you're an astrophotographer, trails from Starlink may be unavoidable and require frequent and deft use of your photo program's cloning tool. For professional astronomers, imaging headaches undoubtedly lie ahead. For the visual observer, will it mean a constant reminder of machines on parade while seeking the solace of a dark sky?

In response to online concerns from amateur and professional astronomers, planetary astronomer Alex Parker tweeted his concerns that "If SpaceX launches all 12,000, they will outnumber stars visible to the naked eye," and estimates that "at midsummer midnight in Seattle about 500 of them will both be above the horizon and directly illuminated by the Sun."

Musk has already talked to his staff about making Starlink satellites less shiny. The team can also tweak the satellites' orientations to further reduce reflectivity if astronomers need to make sensitive observations. Musk has also addressed any potential conflicts with radio astronomers, tweeting that Starlink will "avoid use of certain lower Ku frequencies specifically for radio astronomy."

There are still many unknowns and a few troubling "knowns" as well. Starlink is only the first wave. Other companies plan to compete with SpaceX for your internet dollar by launching their own satellite networks. Amazon recently announced plans to launch a broadband internet constellation of 3,236 satellites called Project Kuiper in the near future. More are in the works including OneWeb and Telesat.

Despite the thrill of seeing a unique human-made wonder like Starlink and the understandable need for internet service in remote locations, some of us are worried just where this road is taking us. A statement from the International Dark-Sky Association (IDA) sums up many skywatchers' concerns in a nutshell.

Addendum, May 30: I just received this statement from the National Science Foundation's spokesperson Amanda Greenwell regarding radio astronomy and Starlink. It reads in part:

"NSF is committed to ensuring the scientific community's access to vital portions of the radio spectrum required for research purposes. We have been working with SpaceX to finalize an agreement related to management of the affected portion of the radio spectrum and can provide more information after that agreement is finalized."

Source: Sky and Telescope Return to Contents

3. Double Asteroid Tracked By VLT In Planetary Defense Test

The left frame shows asteroid 1999 KW4 as imaged by the European Southern Observatory's Very Large Telescope and the SPHERE planet-hunting instrument. The image on the right is an artist's impression of the double asteroid. Image: ESO

The European Southern Observatory's Very Large Telescope participated in test coordinated by the International Asteroid Warning Network (IAWN), successfully targeting, tracking and imaging a double asteroid as it flew within 5.2 million kilometres (3.2 million miles) of Earth on 25 May.

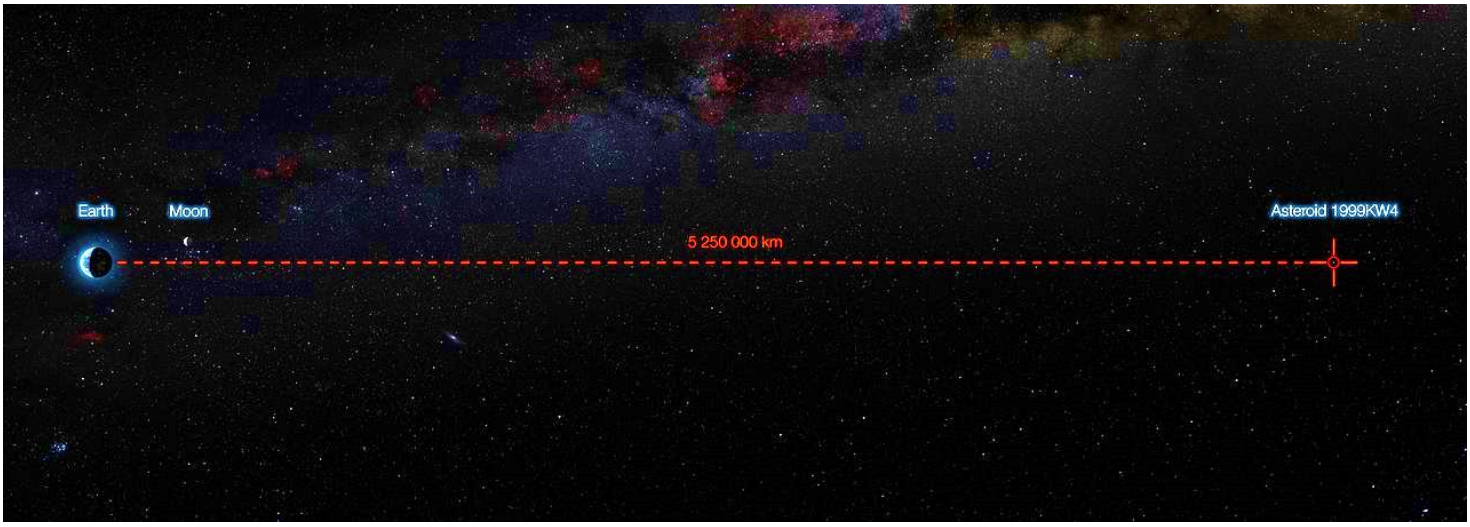
Using the sensitive Spectro-Polarimetric High-contrast Exoplanet Research (SPHERE) planet-finding instrument attached to VLT's Unit 3 telescope, along with state-of-the-art adaptive optics, asteroid 1999 KW4's two components, separated by just 2.6 kilometres (1.6 miles), were clearly seen despite their rapid track across the sky and somewhat unstable air above the observatory.

The double asteroid was moving through space at some 77,000 kilometres per hour (48,000 mph). While the larger member of the pair has a diameter of about 1.3 kilometres (0.8 mile), the duo's orbit is well known and there is no risk of impact with Earth.

But by studying the passing asteroids with a variety of instruments, the IAWN campaign aims to learn more about detecting, tracking and studying threatening asteroids to give engineers and scientists time to develop possible countermeasures.

"These data, combined with all those that are obtained on other telescopes through the IAWN campaign, will be essential for evaluating effective deflection strategies in the event that an asteroid was found to be on a collision course with Earth," said ESO astronomer Olivier Hainaut.

"In the worst possible case, this knowledge is also essential to predict how an asteroid could interact with the atmosphere and Earth's surface, allowing us to mitigate damage in the event of a collision."



Imaging asteroid 1999 KW4 was a challenge for the VLT given its distance and rapid movement across the sky. Image: ESO

Observing the fast-moving double asteroid was a major challenge for operators of ESO's VLT.

"During the observations the atmospheric conditions were a bit unstable," said Mathias Jones, a VLT astronomer. "In addition, the asteroid was relatively faint and moving very fast in the sky, making these observations particularly challenging, and causing the AO system to crash several times. It was great to see our hard work pay off despite the difficulties."

1999 KW4 is similar in appearance to Didymos, a double asteroid made up of a 780-metre-wide (2,560-foot-wide) component – Didymos A – and a smaller sibling measuring 160 metres (525 feet) across.

Assuming funding questions are resolved, NASA's Double Asteroid Redirection Test, or DART, spacecraft will deliberately crash into Didymos B in 2022 in an attempt to slightly change its orbital velocity and in so doing, demonstrate the feasibility of deflecting a threatening asteroid. Observations like those of 1999 KW4 will be carried out to document the mission's results.

The success of such missions depends on collaborations between organizations, and tracking Near-Earth Objects is a major focus for the collaboration between ESO and ESA. This cooperative effort has been ongoing since their first successful tracking of a potentially hazardous NEO in early 2014.

"We are delighted to be playing a role in keeping Earth safe from asteroids," said Xavier Barcons, ESO's Director General. "As well as employing the sophisticated capabilities of the VLT, we are working with ESA to create prototypes for a large network to take asteroid detection, tracking and characterization to the next level."

This recent close encounter with 1999 KW4 comes just a month before Asteroid Day, an official United Nations day of education and awareness about asteroids, to be celebrated on 30 June.

Source: Astronomy Now / European Southern Observatory Return to Contents

The Night Sky

Tuesday, June 4

• About 30 or 40 minutes after sunset, scan very low in the west-northwest for the hair-thin Moon. About 6° to the right of it is Mercury.

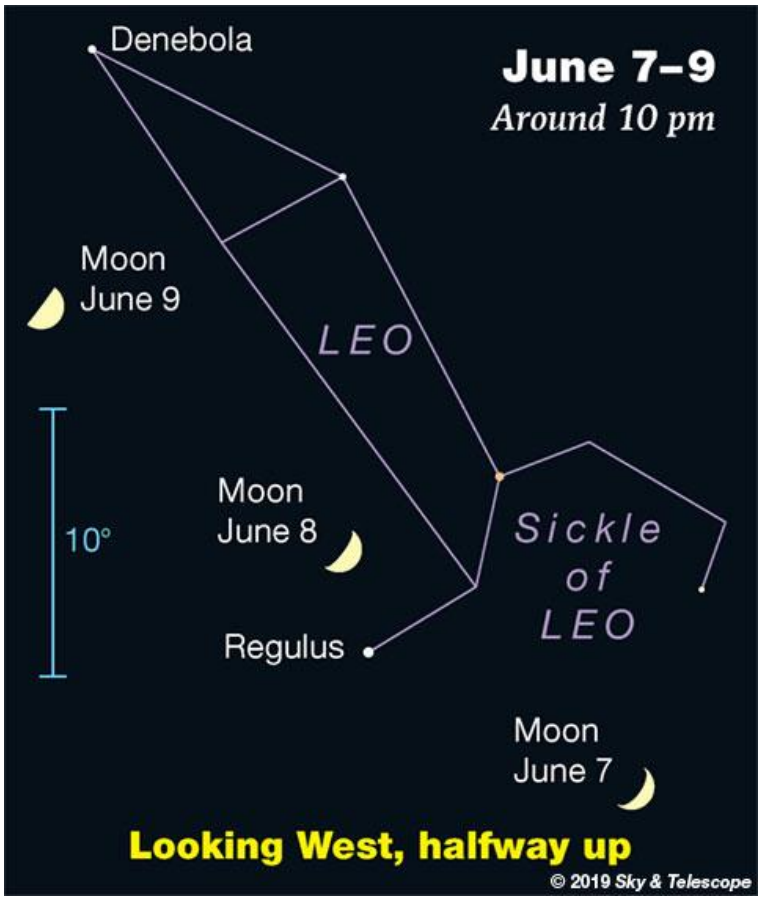
• Ceres, the largest asteroid, is just past opposition and magnitude 7.1 this week. It's high in the south by 11 or midnight, in Ophiuchus 9° north of Antares. See the article and finder chart in the May *Sky & Telescope*, page 48.

Wednesday, June 5

• Bright Arcturus, magnitude 0 and pale yellow-orange, shines high overhead toward the south these evenings. The kite shape of Bootes, its constellation, extends upper left from it. The kite is narrow, slightly bent, and 23° long: about two fists at arm's length.

Just east (left) of the Bootes kite is the semicircle of Corona Borealis, the pretty but mostly dim Northern Crown. Its brightest star, Alphecca, is a gem mounted on its front.

• Before the Moon starts to light the evening sky in a few days, work through the heart of the Virgo Galaxy Cluster with your telescope using the article and chart in the June *Sky & Telescope*, page 48.



The Moon passes below departing Leo as it waxes toward first quarter. (The blue 10° scale is about the width of your fist at arm's length.)

Thursday, June 6

• A third of the way from Arcturus to Vega, look for Corona Borealis with 2nd-magnitude Alphecca as its one moderately bright star.

Two thirds of the way from Arcturus to Vega is the dim Keystone of Hercules, lying almost level. Use binoculars or a telescope to examine its top edge. A third of the way from the edge's left end to right end is 6th-magnitude M13, one of Hercules's two great globular star clusters. (The other is M92, almost M13's twin.)

Friday, June 7

• Just after dark look for Regulus upper left of the Moon, as shown here. From there trace out the rest of Leo.

Saturday, June 8

• Now the Moon shines closer above Regulus at nightfall.

• The middle star of the Big Dipper's bent handle is Mizar, with tiny little Alcor right next to it. On which side of Mizar should you look for Alcor? As always, on the side toward Vega! Which is now the brightest star in the east. If your eyes aren't quite sharp enough, binoculars show Alcor easily.

Source: Sky and Telescope

Return to Contents

ISS Sighting Opportunities (from Denver)

Date	Visible	Max Height	Appears	Disappears
Tue Jun 4, 9:26 PM	4 min	89°	35° above NW	17° above SE
Wed Jun 5, 10:12 PM	3 min	16°	10° above W	15° above SSW
Thu Jun 6, 9:23 PM	4 min	30°	19° above W	11° above SSE
Sat Jun 8, 9:21 PM	2 min	10°	10° above WSW	10° above SW

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

NASA-TV Highlights (all times Eastern Time Zone)

June 6, Thursday

- 1:45 p.m. – International Space Station In-Flight Event for the Canadian Space Agency with Canadian Media and CSA astronaut David Saint-Jacques (Public Channel with interpretation; Media Channel in native language)
-

June 7, Friday

- 10 a.m. – NASA Announces Plans to Open the International Space Station to Expanded Commercial Activities (Public Channel)
- 10:35 p.m. – International Space Station In-Flight Interviews with the Westwood One Radio Network and astronauts Nick Hague and Christina Koch of NASA and David Saint-Jacques of the Canadian Space Agency (All Channels)
- 11:30 a.m. – SpaceCast Weekly (All Channels)

Watch NASA TV online by going to the NASA website.

Return to Contents

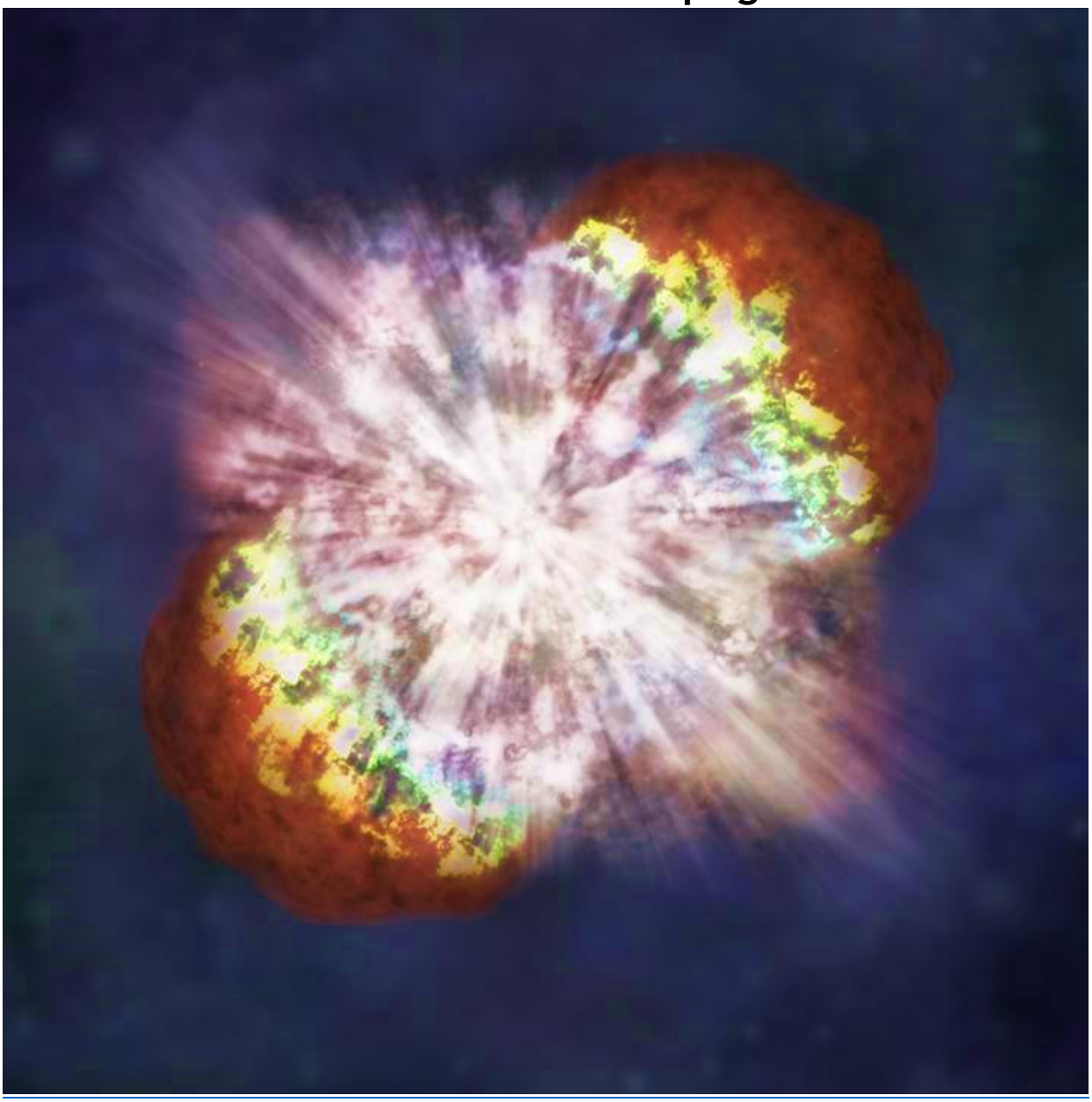
Space Calendar

- Jun 04 - Apollo Asteroid 2019 KY Near-Earth Flyby (0.014 AU)
- Jun 04 - Apollo Asteroid 2019 KS Near-Earth Flyby (0.031 AU)
- Jun 04 - Aten Asteroid 2014 JU15 Near-Earth Flyby (0.100 AU)
- Jun 04 - Event: Collaboration for the Impactful Earth System Science - European Environmental Research Infrastructures, Brussels, Belgium
- Jun 04 - Lecture: Recycle Your Used Pulsars - Explaining the Extra Gamma-Radiation from the Central Milky Way, Baltimore, Maryland
- Jun 04-06 - 2nd Large Synoptic Survey Telescope (LSST) Solar System Readiness Sprint, Chicago, Illinois
- Jun 04-06 - 4th ESA CubeSat Industry Days, Noordwijk, The Netherlands
- Jun 04-06 - Beidou Satellite Navigation Expo and Summit, Nanjing, China
- Jun 04-07 - 46th Space Congress, Cape Canaveral, Florida
- Jun 04-07 - Workshop: The Main Belt - A Gateway to the Formation and Early Evolution of the Solar System, Villasimius, Italy
- **Jun 04-07 - 1st National Solar Observatory Community Science Plan (NCSP) Data Training Workshop: An Introduction to DKIST Data, Boulder, Colorado**
- Jun 04-08 - Joint Conference of the Sub-Regional European Astronomical Committee (SPEAC) and the Bulgarian Astronomical Society (BgAS), Sofia, Bulgaria
- **Jun 05 - Jilin 1 CZ-11 Launch**
- Jun 05 - Amor Asteroid 2019 KA4 Near-Earth Flyby (0.022 AU)
- Jun 05 - Colloquia: The Origin of Supermassive Black Holes at the Dawn of Galaxy Formation, Trieste, Italy
- Jun 05 - Seminar: Project Life-Cycle and Implementation for a Class of Small Satellites, Houston, Texas
- Jun 05 - Colloquium: Is There a Path Forward for Solar Climate Engineering?, Greenbelt, Maryland
- Jun 05-06 - Workshop: Societal Impacts of Research on Extraterrestrial Life and Studies on the Origin of Life, Grenoble, France
- Jun 05-06 - ESA ScyLight Workshop on Optical Communication, Bucharest, Romania
- Jun 05-07 - 24th Itzykson Meeting: Effective Field Theorie in Cosmology, Gravitation and Particle Physics, Gif-sur-Yvette, France
- Jun 06 - Apollo Asteroid 2019 KA3 Near-Earth Flyby (0.010 AU)
- Jun 06 - Aten Asteroid 2014 MF18 Near-Earth Flyby (0.022 AU)
- Jun 06 - Amor Asteroid 2019 JX2 Near-Earth Flyby (0.035 AU)
- Jun 06 - 5th Virtual Mars Exploration Program Analysis Group (MEPAG) Meeting
- Jun 06 - Lecture: Finding Aliens - An Update on the Search for Life in the Universe, Oxford, United Kingdom
- Jun 06 - Seminar: Red Giants, Chemical Clocks of the Milky Way, Barcelona, Spain
- Jun 06 - Seminar: Time-Crystal Ground State and Production of Gravitational Waves from QCD Phase Transition, Barcelona, Spain
- Jun 07 - Amor Asteroid 2019 KZ3 Near-Earth Flyby (0.015 AU)
- Jun 07 - Apollo Asteroid 2019 LA Near-Earth Flyby (0.036 AU)
- Jun 07 - Apollo Asteroid 2017 BM93 Near-Earth Flyby (0.086 AU)
- Jun 07 - 24th JSPS "Science in Japan" Forum, Washington DC
- Jun 07 - Meeting: Jim Hartle - A Man With No Boundaries, Santa Barbara, California
- Jun 07 - Lecture: We Were the Discoverers - Witnessing the Exoplanet Revolution, Pasadena, California
- Jun 07-08 - Kouchibouguac Spring Star Fest, Kouchibouguac National Park, Canada

Source: JPL Space Calendar Return to Contents

Food for Thought

Researchers Wonder If Ancient Supernovae Prompted Human Ancestors to Walk Upright



A new paper from a University of Kansas researcher suggests bipedalism arose when ancient supernovae caused lightning that burned Earth's forests and prompted human ancestors to walk upright._Credit: NASA

Did ancient supernovae induce proto-humans to walk on two legs, eventually resulting in Homo sapiens with hands free to build cathedrals, design rockets and snap iPhone selfies?

A paper published today in the *Journal of Geology* makes the case: Supernovae bombarded Earth with cosmic energy starting as many as 8 million years ago, with a peak some 2.6 million years ago, initiating an avalanche of electrons in the lower atmosphere and setting off a chain of events that feasibly ended with bipedal hominins such as Homo habilis, dubbed "handy man."

The authors believe atmospheric ionization probably triggered an enormous upsurge in cloud-to-ground lightning strikes that ignited forest fires around the globe. These infernos could be one reason ancestors of Homo sapiens developed bipedalism -- to adapt in savannas that replaced torched forests in northeast Africa.

"It is thought there was already some tendency for hominins to walk on two legs, even before this event," said lead author Adrian Melott, professor emeritus of physics & astronomy at the University of Kansas. "But they were mainly adapted for climbing around in trees. After this conversion to savanna, they would much more often have to walk from one tree to another across the grassland, and so they become better at walking upright. They could see over the tops of grass and watch for predators. It's thought this conversion to savanna contributed to bipedalism as it became more and more dominant in human ancestors."

Based on a "telltale" layer of iron-60 deposits lining the world's sea beds, astronomers have high confidence supernovae exploded in Earth's immediate cosmic neighborhood -- between 100 and only 50 parsecs (163 light years) away -- during the transition from the Pliocene Epoch to the Ice Age.

"We calculated the ionization of the atmosphere from cosmic rays which would come from a supernova about as far away as the iron-60 deposits indicate," Melott said. "It appears that this was the closest one in a much longer series. We contend it would increase the ionization of the lower atmosphere by 50-fold. Usually, you don't get lower-atmosphere ionization because cosmic rays don't penetrate that far, but the more energetic ones from supernovae come right down to the surface -- so there would be a lot of electrons being knocked out of the atmosphere."

According to Melott and co-author Brian Thomas of Washburn University, ionization in the lower atmosphere meant an abundance of electrons would form more pathways for lightning strikes.

"The bottom mile or so of atmosphere gets affected in ways it normally never does," Melott said. "When high-energy cosmic rays hit atoms and molecules in the atmosphere, they knock electrons out of them -- so these electrons are running around loose instead of bound to atoms. Ordinarily, in the lightning process, there's a buildup of voltage between clouds or the clouds and the ground -- but current can't flow because not enough electrons are around to carry it. So, it has to build up high voltage before electrons start moving. Once they're moving, electrons knock more electrons out of more atoms, and it builds to a lightning bolt. But with this ionization, that process can get started a lot more easily, so there would be a lot more lightning bolts."

The KU researcher said the probability that this lightning spike touched off a worldwide upsurge in wildfires is supported by the discovery of carbon deposits found in soils that correspond with the timing of the cosmic-ray bombardment.

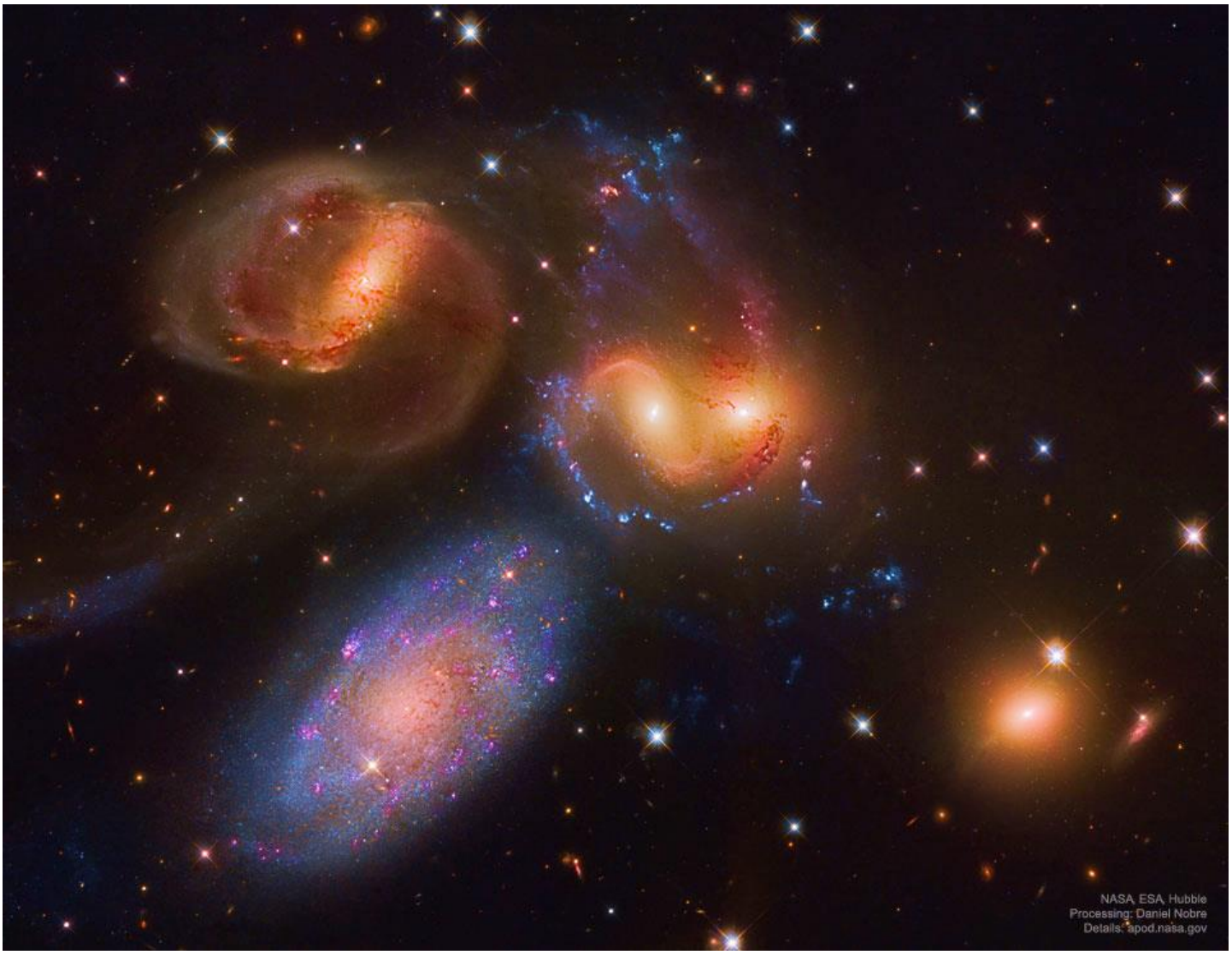
"The observation is that there's a lot more charcoal and soot in the world starting a few million years ago," Melott said. "It's all over the place, and nobody has any explanation for why it would have happened all over the world in different climate zones. This could be an explanation. That increase in fires is thought to have stimulated the transition from woodland to savanna in a lot of places -- where you had forests, now you had mostly open grassland with shrubby things here and there. That's thought to be related to human evolution in northeast Africa. Specifically, in the Great Rift Valley where you get all these hominin fossils."

Melott said no such event is likely to occur again anytime soon. The nearest star capable of exploding into a supernova in the next million years is Betelgeuse, some 200 parsecs (652 light years) from Earth.

"Betelgeuse is too far away to have effects anywhere near this strong," Melott said. "So, don't worry about this. Worry about solar proton events. That's the danger for us with our technology -- a solar flare that knocks out electrical power. Just imagine months without electricity."

Source: EurekAlert /University of Kansas Return to Contents

Space Image of the Week



Stephan's Quintet from Hubble

Image Credit: NASA, ESA, Hubble; Processing: Daniel Nobre

Explanation: When did these big galaxies first begin to dance? Really only four of the five of Stephan's Quintet are locked in a cosmic tango of repeated close encounters taking place some 300 million light-years away. The odd galaxy out is easy to spot in this recently reprocessed image by the Hubble Space Telescope -- the interacting galaxies, NGC 7319, 7318B, 7318A, and 7317 (left to right), have a more dominant yellowish cast. They also tend to have distorted loops and tails, grown under the influence of disruptive gravitational tides.

The mostly bluish galaxy, large NGC 7320 on the lower left, is in the foreground at about 40 million light-years distant, and so is not part of the interacting group. Data and modeling indicate that NGC 7318B is a relatively new intruder. A recently-discovered halo of old red stars surrounding Stephan's Quintet indicate that at least some of these galaxies started tangling over a billion years. Stephan's Quintet is visible with a moderate sized-telescope toward the constellation of Winged Horse (Pegasus).

Source: NASA APOD

Return to Contents