



# ASTRO

NEWSLETTER

Volume 11, Issue 8

March 30, 2018

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### NASA Plans to Send Video of Mars to Earth With Lasers



In 2022, NASA will launch the Psyche mission, carrying sophisticated communication technology. Pictures from space have allowed scientists to examine and search for clues about other planets and let space enthusiasts get a rare view beyond Earth. Now, NASA wants to take that experience to a new level by transmitting high-definition video from places like Mars to Earth using laser beams. Called Deep Space Optical Communications (DSOC), the technology that can beam high-def video to Earth from deep space as it travels aboard the Psyche mission, set to launch in 2022.

Elsewhere, scientists are also working on using laser communication closer to home. Palca reports MIT's Lincoln Laboratory is building a mini optical system to send to low Earth orbit that will transmit data at 200 gigabits per second. [www.smithsonianmag.com](http://www.smithsonianmag.com)



## A star just went out in the cosmos..

Stephen W. Hawking, the Cambridge University physicist and best-selling author who roamed the cosmos from a wheelchair, pondering the nature of gravity and the origin of the universe and becoming an emblem of human determination and curiosity, died early Wednesday at his home in Cambridge, England. He was 76.

Dr. Hawking did that largely through his book “A Brief History of Time: From the Big Bang to Black Holes,” published in 1988. It has sold more than 10 million copies and inspired a documentary film by Errol Morris. His own story was the basis of an award-winning 2014 feature film, “The Theory of Everything.”

Scientifically, Dr. Hawking will be best remembered for a discovery so strange that it might be expressed in the form of a Zen koan: When is a black hole not black? When it explodes. What is equally amazing is that he had a career at all. As a graduate student in 1963, he learned he had amyotrophic lateral sclerosis, a neuromuscular wasting disease also known as Lou Gehrig's

disease. He was given only a few years to live. The disease reduced his bodily control to the flexing of a finger and voluntary eye movements but left his mental faculties untouched.

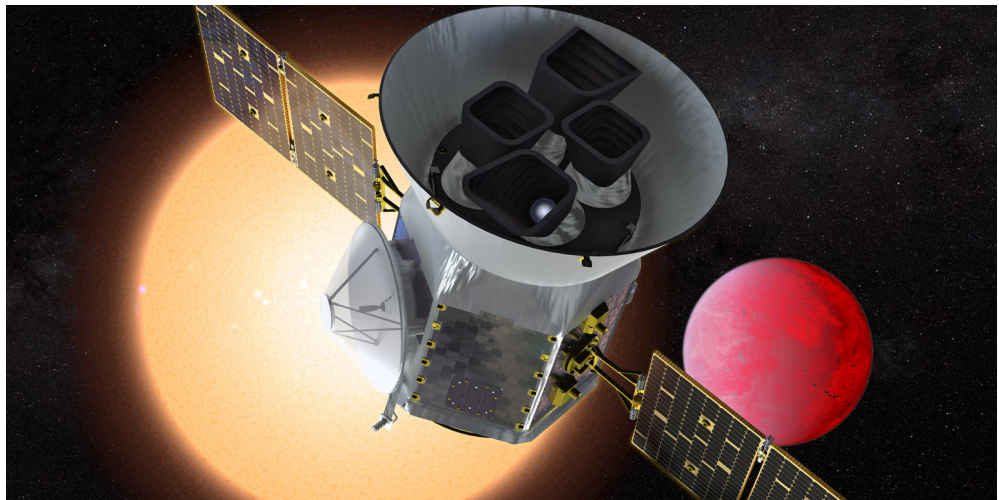
He went on to become his generation's leader in exploring gravity and the properties of black holes, the bottomless gravitational pits so deep and dense that not even light can escape them.

That work led to a turning point in modern physics, playing itself out in the closing months of 1973 on the walls of his brain when Dr. Hawking set out to apply quantum theory, the weird laws that govern subatomic reality, to black holes. In a long and daunting calculation, Dr. Hawking discovered to his befuddlement that black holes — those mythological avatars of cosmic doom — were not really black at all. In fact, he found, they would eventually fizzle, leaking radiation and particles, and finally explode and disappear over the eons.

[www.nytimes.com](http://www.nytimes.com)



## NASA Prepares to Launch Next Mission to Search Sky for New Worlds



NASA's Transiting Exoplanet Survey Satellite (TESS) is undergoing final preparations in Florida for its April 16 launch to find undiscovered worlds around nearby stars, providing targets where future studies will assess their capacity to harbor life.

"One of the biggest questions in exoplanet exploration is: If an astronomer finds a planet in a star's habitable zone, will it be interesting from a biologist's point of view?" said George Ricker, TESS principal investigator at the Massachusetts Institute of Technology (MIT) Kavli Institute for Astrophysics and Space Research in Cambridge, which is leading the mission. "We expect TESS will discover a number of planets whose atmospheric compositions, which hold potential clues to the presence of life, could be precisely measured by future observers."

On March 15, the spacecraft passed a review that confirmed it was ready for launch. For final launch preparations, the spacecraft will be fueled and encapsulated within the payload fairing of its SpaceX Falcon 9 rocket.

TESS will launch from Space Launch Complex 40 at Cape Canaveral Air Force Station in Florida. With the help of a gravitational assist from the Moon, the spacecraft will settle into a 13.7-day orbit around Earth. Sixty days after launch, and following tests of its instruments, the satellite will begin its initial two-year mission.

Four wide-field cameras will give TESS a field-of-view that covers 85 percent of our entire sky. Within this vast visual

perspective, the sky has been divided into 26 sectors that TESS will observe one by one. The first year of observations will map the 13 sectors encompassing the southern sky, and the second year will map the 13 sectors of the northern sky.

The spacecraft will be looking for a phenomenon known as a transit, where a planet passes in front of its star, causing a periodic and regular dip in the star's brightness. NASA's Kepler spacecraft used the same method to spot more than 2,600 confirmed exoplanets, most of them orbiting faint stars 300 to 3,000 light-years away

"We learned from Kepler that there are more planets than stars in our sky, and now TESS will open our eyes to the variety of planets around some of the closest stars," said Paul Hertz, Astrophysics Division director at NASA Headquarters. "TESS will cast a wider net than ever before for enigmatic worlds whose properties can be probed by NASA's upcoming James Webb Space Telescope and other missions."

TESS will concentrate on stars less than 300 light-years away and 30 to 100 times brighter than Kepler's targets. The brightness of these target stars will allow researchers to use spectroscopy, the study of the absorption and emission of light, to determine a planet's mass, density and atmospheric composition. Water, and other key molecules, in its atmosphere can give us hints about a planet's capacity to harbor life.

[www.nasa.gov](http://www.nasa.gov)

## TRAPPIST-1 system may have too much water to support life

The planets around TRAPPIST-1 are estimated to be between 15 and 50 percent water by mass — Earth is only 0.02 percent.

Hope was ignited in the science community when researchers discovered that three of the seven Earth-size planets orbiting TRAPPIST-1, a cool red dwarf about 40 light-years from Earth, are within the star's habitable zone and could have flowing water on their surfaces. But while the presence of water undoubtedly increases the likelihood of habitability for these planets, it doesn't automatically make them safe havens for life. In fact, an overabundance of water suggests just the opposite, and new research conducted by scientists at Arizona State and Vanderbilt Universities indicates that the TRAPPIST-1 system actually has too much water to support life.

Each of TRAPPIST-1's planets are roughly the size of Earth and are tightly packed together, with all of their orbits keeping them closer to their host star than Mercury is to the Sun. While the exoplanets are similar in size to Earth, measurements of their masses and volumes show that they're much less dense. They're too light to be rocky and, unlike other low-density planets of similar size, too compact to be primarily composed of atmospheric gas.

"The TRAPPIST-1 planets are too small in mass to hold onto enough gas to make up the density deficit," said Arizona State University geoscientist, Cayman Unterborn, in a press release. "Even if they were able to hold onto the gas, the amount needed to make up the density deficit would make the planet much puffer than we see." <http://www.astronomy.com>

# NASA's Next Mars Lander Will Look Deep to Understand the Red Planet

NASA's next Mars lander InSight, set to launch May 5 at earliest from Vandenberg Air Force Base in California, will bring a trio of powerful instruments to measure the wobbles, quakes and heat that reveal what's going on deep inside the Red Planet — and perhaps offer insight into how Earth formed, as well.

"The goal of InSight is nothing less than to better understand the birth of the Earth, the birth of the planet that we live on," Bruce Banerdt, InSight's principal investigator at JPL. "And we're going to do that by going to Mars, which seems a little bit counter-intuitive."

Banerdt spoke during a NASA news conference Thursday (March 29) at the agency's Jet Propulsion Laboratory (JPL) in California to discuss the upcoming mission, which is scheduled to launch between May 5 to June 8, and arrive on Mars Nov. 26. The mission, whose name is short for Interior Exploration using Seismic Investigations, Geodesy and Heat Transport, is currently slated launch at 4 a.m. PDT on United Launch Alliance's Atlas V rocket on May 5. That means skywatchers along California's coast, from Santa Maria to San Diego, should be able to see the launch if skies are clear, NASA officials said — and it may be visible further down the coast as well.

When InSight arrives at Mars, the spacecraft will spend a dramatic 7 minutes decelerating from 12,500 mph (20,000 km/h) to just 5 mph (8 km/h) before dropping down on the surface, Banerdt

said. Then, over a matter of months, it will lower its instruments to the surface to begin its investigation.

"How we get from a ball of featureless rock into a planet that may or may not support life is a key question in planetary science, and these processes that do this all happen in the first tens of millions of years, which is just a few seconds at the beginning of the life of a planet that lasts 4.5 billion years," Banerdt said. "We'd like to be able to understand what happened, and the clues to that are in the structure of the planet that gets set up in these early years."

### What's inside Mars?

To learn about the early days of the solar system's rocky planets, InSight will need to go deep. Its first key instrument, a seismometer, will measure minuscule "marsquakes" rippling through the planet. Marsquakes generated on the other side of the planet will be distorted by the planet's interior, so scientists can measure them to learn about the composition deep inside. While previous missions, such as the Viking lander, have carried seismometers, none were sensitive enough to pick up these marsquakes, Banerdt said — InSight should be able to precisely measure vibrations with amplitudes as small as the size of an atom. Apollo astronauts measured moonquakes during their exploration of the lunar surface, and researchers measure earthquakes every day; Banerdt anticipates marsquakes' size and frequency will be somewhere in between.

[www.space.com](http://www.space.com)



## Roscosmos, NASA to set common standards for first lunar orbit station

The Russian and US space agencies will meet next month to set out plans for mankind's first outpost in the moon's orbit, which will include a Russia-built module, a source told Sputnik on Thursday.

"A bilateral working meeting will kick off in Houston on April 9, where Russia will present a report on the work it has done on the lunar station to coordinate the integration of a Russian-built sluice module and a US-built super-heavy SLS booster and the Orion spaceship," the space industry source said.

The meet-up will follow last September's cooperation agreement between Russia's Roscosmos and United States' NASA to build a gateway to future deep space missions in lunar orbit. The segment that Russia intends to build will serve as an exit for astronauts going on spacewalks.

The module will be designed by RKK Energia, Russia's main rocket and space corporation. The segment is expected to be built by 2021 and sent to the United States the following year. It will be lifted into the moon's orbit atop the SLS rocket in 2025, the source said. [www.moondaily.com](http://www.moondaily.com)



# SCHOOLS IN ACTION

Students had exams and holidays on their schedule this month. But despite that, they grabbed the chance to use their imagination for their projects. Hopefully in the future, their dreams will come true. Maybe we will see their space station models, rocketships or Mars colony ideas come to life sometime during the future space explorations.



1- TAKEV Schools, IZMIR 2- Rota Collage, IZMIR 3- UKEB Schools, IZMIR  
4- Turk Collage, IZMIR 5- Turk Collage, İZMİR 6- Fen Bilimleri School, KIRKLARELI

## Astronomy Picture of the Day

### Blue Moon Tree

Does an alignment like this occur only once in a blue moon? No, although it was during a blue moon that this single-shot image was taken. During a full moon that happened to be the second of the month -- the situation that defines a blue moon -- the photographer created the juxtaposition in late January by quickly moving around to find just the right spot to get the background Moon superposed behind the arc of a foreground tree. Unfortunately, in this case, there seemed no other way than getting bogged down in mud and resting the camera on a barbed-wire fence. The arc in the oak tree was previously created by hungry cows in Knight's Ferry, California, USA. Quirky Moon-tree juxtapositions like this can be created during any full moon though, given enough planning and time. Another opportunity will arise this weekend, coincidentally during another blue moon. Then, the second blue moon in 2018 will occur, meaning that for the second month this year, two full moons will appear during a single month (moon-th). Double blue-moon years are relatively rare, with the last occurring in 1999, and the next in 2037.

[apod.nasa.gov](http://apod.nasa.gov)



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