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Top News

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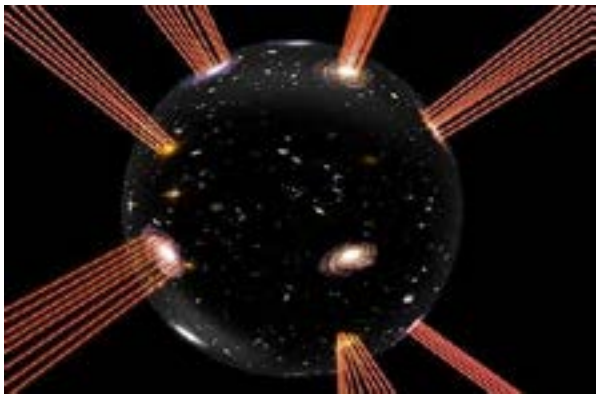
Our universe: An expanding bubble in an extra dimension



In their article, the scientists propose a new model with dark energy and our universe riding on an expanding bubble in an extra dimension. Credit: Suvendu Giri

Uppsala University researchers have devised a new model for the universe – one that may solve the enigma of dark energy. Their new article, published in Physical Review Letters, proposes a new structural concept, including dark energy, for a universe that rides on an expanding bubble in an additional dimension.

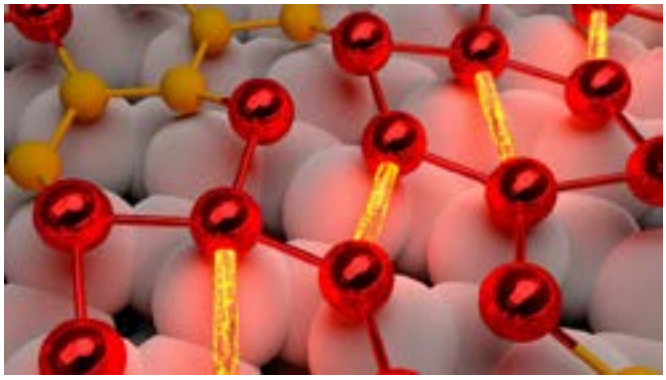
We have known for the past 20 years that the universe is expanding at an ever accelerating rate. The explanation is the "dark energy" that permeates it throughout, pushing it to expand. Understanding the nature of this dark energy is one of the paramount enigmas of fundamental physics.

It has long been hoped that string theory will provide the answer. According to string theory, all matter consists of tiny, vibrating "stringlike" entities. The theory also requires there to be more spatial dimensions than the three that are already part of everyday knowledge. For 15 years, there have been models in string theory that have been thought to give rise to dark energy. However, these have come in for increasingly harsh criticism, and several researchers are now asserting that none of the models proposed to date are workable.

In their article, the scientists propose a new model with dark energy and our universe riding on an expanding bubble in an extra dimension. The whole universe is accommodated on the edge of this expanding bubble. All existing matter in the universe corresponds to the ends of strings that extend out into the extra dimension. The researchers also show that expanding bubbles of this kind can come into existence within the framework of string theory. It is conceivable that there are more bubbles than ours, corresponding to other universes.

The Uppsala scientists' model provides a new, different picture of the creation and future fate of the universe, while it may also pave the way for methods of testing string theory. ...Read More...

Researchers monitor electron behavior during chemical reactions for the first time



A simulation of indium wire atoms (red) on top of a silicon substrate. The glowing regions highlight where indium bonds have been excited and photoholes have formed. Credit: Andreas Lücke

In a recent publication in Science, researchers at the University of Paderborn and the Fritz Haber Institute Berlin demonstrated their ability to observe electrons' movements during a chemical reaction. Researchers have long studied the atomic-scale processes that govern chemical reactions, but were never before able to observe electron motions as they happened.

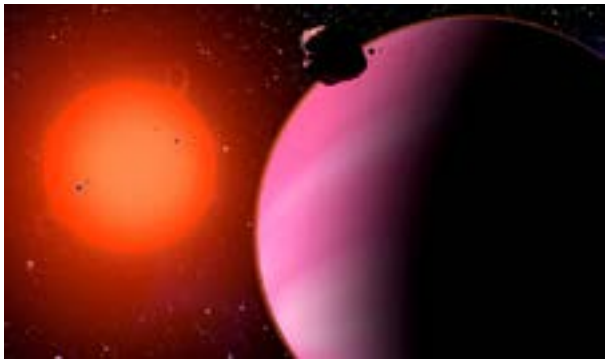
Electrons exist on the smallest scales, being less than one quadrillionth of a meter in diameter and orbiting an atom at femtosecond speeds (one quadrillionth of a second). Experimenters interested in observing electron behaviour use laser pulses to interact with the electrons. They can calculate the energy and momentum of the electrons by analysing the properties of the electrons kicked out of the probe by the laser light.

The challenge for researchers is recording events that are taking place on a femtosecond scale—they must first excite a system with a laser pulse, then watch the next few femtoseconds. Then, they send a second laser pulse with a short time delay of a few femtoseconds. Achieving this level of resolution is difficult, as femtoseconds are extremely short—light can travel 300,000 kilometers in one second, but just 300 nanometers in one femtosecond.

After being excited with the first laser pulse, the atoms' valence electrons—electrons on the outside of an atom that are candidates for helping form chemical bonds—may re-arrange to form new chemical bonds, resulting in new molecules. Because of the speed and scale of these interactions, though, researchers have only hypothesized how this re-arrangement takes place.

In addition to experimental methods, high-performance computing (HPC) has become an increasingly important tool for understanding these atomic-level interactions, verifying experimental observations, and studying electron behaviour during a chemical reaction in more detail. A University of Paderborn group led by Prof. Dr. Wolf Gero Schmidt has been collaborating with physicists and chemists to complement experiments with computational models. ...Read More...

Exploring the Escaping Atmosphere of HAT-P-11b



Artist's impression of the exoplanet HAT-P-11b and its host star. Harvard Center for Astrophysics/D. Aguilar

The atmospheres of planets close to their host stars live a tenuous existence. New observations from the Hubble Space Telescope show signs of a Neptune-like exoplanet's atmosphere being eroded away.

Evaporation at Work
Small planets observed to orbit closely around their host star fall into two main populations:

1. those with radii smaller than 1.5 Earth radii, thought to be primarily rocky cores with little or no remaining atmosphere, and
2. those with radii larger than 2 Earth radii, thought to retain some of their hydrogen and helium atmospheres.

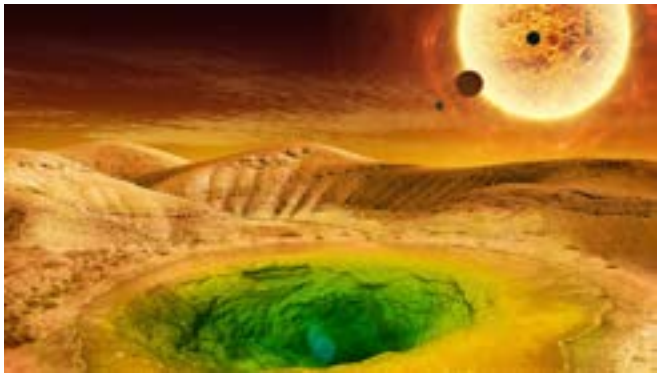
What causes the difference between these two populations? We think that all close-in exoplanets are sculpted by the energetic radiation of their host stars. This radiation can erode away the primordial atmospheres — and for the smallest planets, this will leave only their rocky cores behind.

As we work to understand the detailed physics of this photoevaporation, it would be helpful to be able to directly watch a planet's atmosphere escaping in this way. In a new study, scientist Megan Mansfield (University of Chicago) and collaborators present just the thing: observations of the escaping atmosphere of the exoplanet HAT-P-11b.

Observations of a Hot Neptune
HAT-P-11b is a Neptune-sized exoplanet that orbits very close to its host star in a system that's located approximately 120 light-years from Earth. Using Hubble, Mansfield and collaborators discovered the subtle signature of helium escaping from the atmosphere of HAT-P-11b — making this the second planet for which this signature has been discovered by Hubble (the first was WASP 107-b) and one of only a handful of planets for which we've seen signs of atmospheric escape.

By comparing these observations to models, Mansfield and collaborators estimate that HAT-P-11b is losing mass at a rate of roughly 109-1011 g/s. This rate, while high, is still low enough that the planet has only ...Read More...

Alien Hunters, Stop Using the Drake Equation



Artist's visualization of what a distant, alien planet could look like. What are the chances it develops intelligent life?
Credit: NASA

For the precocious hunter of off-Earth life, the Drake equation is the ever-ready, go-to toolkit for estimating just how (not) lonely humans are in the Milky Way galaxy. The equation was developed by astronomer Frank Drake in 1961 in a slight hurry so that attendees of an upcoming conference would have something to confer about, and it breaks down the daunting question "Are we alone?" into more manageable, bite-size chunks.

The equation starts with some straightforward concepts, such as the rate of star formation and the fraction of stars hosting planets. But it quickly moves into tricky terrain, asking for numbers like what fraction of those planets that could host life actually end up evolving intelligent species and what fraction of those planets blast out friendly signals into the cosmos, inviting us Earthlings to a nice little chat.

The end result is supposed to be a single value (or, at worst, a range of values) that predicts the total number of intelligent and conversation-ready species in the galaxy. And if that seems a little unsettlingly bold, then at the very least, the Drake Equation serves as a philosophical device for instigating conversation. It also frames a proper scientific discussion about the ultimate question of finding and talking to alien species in the galaxy.

Except that it fails on both counts.

Know thine errors
The Drake equation is simple, but deceptively so. Frank's original recipe had only seven ingredients, and further enhancements from other researchers haven't drastically changed that number. So, you might naively think you need only measure or guess a heavy handful of parameters and you're good to go.

But reality isn't that simple. Estimates and measurements always have uncertainties. This concept is absolutely critical for scientific inquiry: What you know is far less important than how well you know it. The real meat of any scientific discussion is digging into the uncertainties and how they're estimated. ..Read More...

The Most Fascinating Exo-planets of 2018

A multitude of magnificent, swirling clouds in Jupiter's dynamic
An artist's illustration of the surface of the "super-Earth" planet candidate detected around Barnard's star, which lies just 6 light-years from the sun. Credit: M. Kornmesser/ESO

In 2018, exoplanet scientists feasted on data from a near-by ice ball, the first exoplanet baby picture, a majority-metal blob the size of Earth and the home planet of a "Star Trek" fan favorite — not to mention the possible first-ever exomoon spotted. And a major exoplanet hunter sent back its first newfound planets. Read on for the strangest and most intriguing exoplanets found in the past year.

1. Frigid neighbor
Researchers spotted a likely super-Earth-size planet orbiting one of our nearest stellar neighbors — the dim, red Barnard's Star. The icy world, named Barnard's Star b, appears to be 3.2 times Earth's mass and orbits its star every 233 Earth days — because of this long orbit and the dimness of the star, it took a massive amount of data from seven different instruments to notice the tiny stellar wobble that indicates an orbiting planet. The planet's surface temperature is probably about minus 275 degrees Fahrenheit (minus 170 degrees Celsius).

This isn't the closest exoplanet to Earth, but it's nearly there — the only known closer planet is Proxima b, orbiting the star Proxima Centauri just 4.2 light-years from Earth. Besides Proxima Centauri and the binary stars of Alpha Centauri, Barnard's Star is the closest star to Earth — and it's coming closer to us every day. In about 10,000 years, Barnard's Star will have moved closer to the solar system than the Alpha Centauri system.

2. Baby picture
Using the European Southern Observatory's Very Large Telescope in Chile, researchers snagged a glimpse of a huge alien world forming from the disk of dust and debris surrounding a dwarf star — the first-ever confirmed direct observation of an exoplanet this young.

The baby planet is growing up around a dwarf star called PDS 70, which is 370 light-years from Earth and is just 5.4 million years old. The planet is shaping up to be a big one — it's a gas giant, and it's already two or three times the size of Jupiter, researchers said. It orbits its star about the distance Uranus orbits from the sun. The planet's a toasty 1,800 degrees F (1,000 degrees C), still ...Read More...

The Greatest Spaceflight Stories of 2018!

SpaceX's Starman mannequin is seen inside Elon Musk's red Tesla Roadster with Earth in the background, shortly after launch on Feb. 6, 2018. As of Nov. 2, the duo were beyond the orbit of Mars. Credit: SpaceX

The year 2018 saw a wide range of milestones in spaceflight, stretching all the way from the sun to the edge of interstellar space.

Space agencies launched missions to explore several planets in the solar system, as well as the sun. A long-running space-tourism company performed its first spaceflight (at least by one definition). And who can forget that rocket launch that carried a dummy astronaut and car toward a Martian orbit? Here are some of the highlights of this year's spaceflight activities.

1) NASA's InSight lands on Mars
NASA's newest Red Planet spacecraft made a safe touchdown on Elysium Planitia on Nov. 26, ushering in a new era of Martian science. As a stationary lander, InSight is a departure from NASA's roving trend; NASA's last surface mission to Mars was the Curiosity rover, which touched down in 2012 (and is still healthy and active as it climbs Mount Sharp or Aeolis Mons); the space agency also plans to send another rover in 2020. But staying still is necessary for the science InSight will perform. It will listen for marsquakes and volcanic activity, track the wobble of the Red Planet's axis and probe the structure of the Red Planet's interior. (Also accompanying InSight on the flight to Mars were two cubesats, which are discussed later in this article.)

The arrival of InSight was all the sweeter because a leak in the spacecraft's seismometer forced a two-year delay from its original launch date in 2016. At the time, NASA wasn't even sure if the mission could go forward due to the increased cost that fixing the problem would entail. A science review determined that InSight's mission is fundamental to understanding the interior of all rocky planets, including Earth, and that letting it fly would be the best decision on scientific grounds. InSight is now setting up its instruments and should be ready to start gathering science data soon.

2) Soyuz crew launch abort
NASA astronaut Nick Hague and Russian cosmonaut Alexey Ovchinin were just minutes into their Expedition 57 flight to space on Oct. 11 when a deformed sensor on their Soyuz rocket forced a launch abort. ...Read More...

Did a nearby supernova cause one of Earth's mass extinctions?

This composite image shows supernova remnant 1E 0102.2-7219, which lies 190,000 light-years away. The supernova that may have caused a mass extinction on Earth was much closer, only about 150 light-years distant. X-ray (NASA/CXC/MIT/D.Dewey et al. & NASA/CXC/SAO/J.DePasquale); Optical (NASA/STScI)

Astronomers say radiation arriving from a powerful stellar explosion may be the event that wiped coastal ocean animals off the planet 2.6 million years ago.

Supernovae are the explosive end stages of massive stars. About 2.6 million years ago, one such supernova lit up Earth's sky from about 150 light-years away. A few hundred years later, after the new star had long since faded from the sky, cosmic rays from the event finally reached Earth, slamming into our planet. Now, a group of researchers led by Adrian Melott at the University of Kansas believes this cosmic onslaught is linked to a mass extinction of ocean animals roaming Earth's waters at the time — including the Megalodon. Their work was published November 27 in Astrobiology.

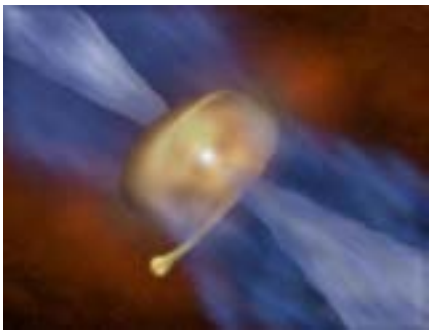
"Supernovae should have affected Earth at some time or another," Melott said in a press release. However, in the past, it's been hard to determine exactly how or when such events would have had an effect. But, according to the group's paper, "a newly documented marine megafaunal extinction" lines up with the arrival of a potentially lethal influx of radiation, indicating they might be able to pin a particular supernova on a particular event.

That event, which occurred at the Pliocene-Pleistocene boundary, caused about 36 percent of the genera in coastal waters — where the penetration of radiation would have been greater in the shallower water — to go extinct. "We have evidence of nearby [supernova] events at a specific time. We know about how far away they were, so we can actually compute how that would have affected Earth and compare it to what we know about what happened at that time," Melott said.

Incoming!

The killer radiation came in the form of cosmic rays made up of fast-moving muons, which are a few hundred times the mass of an electron, according to Melott. "They're very penetrating. Even normally, there are lots of them passing through us. Nearly all of them pass ....Read More...

Planets? Who needs 'em! A massive star is forming a companion instead



This artist's impression shows small companion star MM 1b forming in the outskirts of star MM 1a's massive disk.
J. D. Ilee / University of Leeds

The universe is full of surprises, and a colossal young star has been hiding a stellar one.

While observing infant star MM 1a, astronomers found that its massive disk was actually forming another star instead of planets. The much smaller companion, dubbed MM 1b, was detected just outside the behemoth star's dusty disk, and could actually house a planet-forming disk of its own. The discovery of the new star, published on December 14 in the Astrophysical Journal Letters, marks one of the first times astronomers saw a star forming in the fragmented disk of another.

Stellar Siblings

Binary stars are pretty common in the universe, and it's thought that they form the same way single stars do: from a massive cloud of dust and gas that collapses under its own gravity. If the molecular cloud is large enough, it can birth two similar-sized stars instead of one.

And since binary pairs are easily detectable, astronomers from the University of Leeds were rather surprised when they observed MM 1a. Homing in on the seemingly single star, they found an unexpected, much smaller companion star lurking in the outskirts of its dense disk — the region of dust and gas where planets typically form.

"In this case, the star and disk we have observed is so massive that, rather than witnessing a planet forming in the disk, we are seeing another star being born," said John Ilee, a researcher at the University of Leeds and head of the study, in a news release.

To shed light on the peculiar pair, the researchers used the Atacama Large Millimetre/submillimetre Array (ALMA) to probe the star system — observing the light frequencies that emit from the disk's gas and measuring the radiation that emits from the disk's dust. They used this information to calculate the mass of the stars, and found that MM 1a is about 40 times the mass of our Sun, and that MM 1b weighs just half our Sun's mass. ...Read More...

NASA spaceship closes in on distant world

This artist's illustration obtained from NASA shows the New Horizons spacecraft encountering 2014 MU69 - nicknamed "Ultima Thule" -- a Kuiper Belt object that orbits one billion miles beyond Pluto

NASA's unmanned New Horizons spacecraft is closing in on its historic New Year's flyby target, the most distant world ever studied, a frozen relic of the solar system some four billion miles (6.4 billion kilometers) away.

The cosmic object, known as Ultima Thule, is about the size of the US capital, Washington, and orbits in the dark and frigid Kuiper Belt about a billion miles beyond the dwarf planet, Pluto.

The spacecraft's closest approach to this primitive space rock comes January 1 at 12:33 am ET (0533 GMT).

Until then, what it looks like, and what it is made of, remain a mystery.

"This is a time capsule that is going to take us back four and a half billion years to the birth of the solar system," said Alan Stern, the principal investigator on the project at the Southwest Research Institute, during a press briefing Friday.

A camera on board the New Horizons spacecraft is currently zooming in on Ultima Thule, so scientists can get a better sense of its shape and configuration—whether it is one object or several.

"We've never been to a type of object like this before," said Kelsi Singer, New Horizons co-investigator at the Southwest Research Institute.

About a day prior, "we will start to see what the actual shape of the object is," she said.

The spacecraft entered "encounter mode" on December 26, and is "very healthy," added Stern.

Communicating with a spacecraft that is so far away takes six hours and eight minutes each way—or about 12 hours and 15 minutes round trip.

New Horizons' eagerly awaited "phone home" command, indicating if it survived the close pass—at a distance of just 2,200 miles (3,500 kilometers)—is expected January 1 at 10:29 am (1529 GMT). ...Read more...

A big space crash likely made Uranus lopsided

This image made from video provided by Durham University astronomy researcher Jacob Kegerreis shows a computer simulation generated by the open-source code SWIFT that depicts an object crashing into the planet Uranus. Kegerreis says the detailed simulations show that the collision and reshaping of Uranus 3 billion to 4 billion years ago likely caused the massive planet to tilt about 90 degrees on its side. (Jacob A. Kegerreis/Durham University via AP)

Uranus is a lopsided oddity, the only planet to spin on its side. Scientists now think they know how it got that way: It was pushed over by a rock at least twice as big as Earth.

Detailed computer simulations show that an enormous rock crashed into the seventh planet from the sun, said Durham University astronomy researcher Jacob Kegerreis, who presented his analysis at a large earth and space science conference this month.

Uranus is unique in the solar system. The massive planet tilts about 90 degrees on its side, as do its five largest moons. Its magnetic field is also lopsided and doesn't go out the poles like ours does, said NASA chief scientist Jim Green. It also is the only planet that doesn't have its interior heat escape from the core. It has rings like Saturn, albeit faint ones.

"It's very strange," said Carnegie Institution planetary scientist Scott Sheppard, who wasn't part of the research.

The computer simulations show that the collision and reshaping of Uranus—maybe enveloping some or all of the rock that hit it—happened in a matter of hours, Kegerreis said. He produced an animation showing the violent crash and its aftermath.

It's also possible that the big object that knocked over Uranus is still lurking in the solar system too far for us to see, said Green. It would explain some of the orbits of the planet and fit with a theory that a missing planet X is circling the sun well beyond Pluto, he said.

Green said it's possible that a lot of smaller space rocks—the size of Pluto—pushed Uranus over, but Kegerreis' research and Sheppard point to a single huge unknown suspect. Green said a single impact "is the right thinking."

The collision happened 3 billion to 4 billion years ago, likely before the larger moons of Uranus formed. Instead there was a disk of stuff that would eventually come together to form moons. And when that happened, ...Read More...

Faint glow within galaxy clusters illuminates dark matter

Two massive galaxy clusters — Abell S1063 (left) and MACS J0416.1-2403 (right) — display a soft blue haze, called intracluster light, embedded among innumerable galaxies. The intracluster light is produced by orphan stars that no longer belong to any single galaxy, having been thrown loose during a violent galaxy interaction, and now drift freely throughout the cluster of galaxies. Astronomers have found that intracluster light closely matches with a map of mass distribution in the cluster's overall gravitational field. This makes the blue "ghost light" a good indicator of how invisible dark matter is distributed in the cluster. Dark matter is a key missing link in our understanding of the structure and evolution of the universe. Abell S1063 and MACS J0416.1-2403 were the strongest examples of intracluster light providing a much better match to the cluster's mass map than X-ray light, which has been used in the past to trace dark matter. Credit: NASA, ESA, and M. Montes (University of New South Wales)

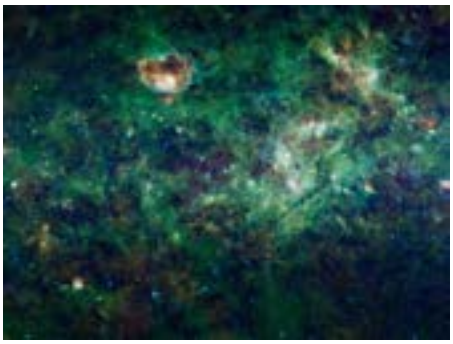
A new look at Hubble images of galaxies could be a step toward illuminating the elusive nature of dark matter, the unobservable material that makes up the majority of the universe, according to a study published online today in the Monthly Notices of the Royal Astronomical Society.

Utilizing Hubble's past observations of six massive galaxy clusters in the Frontier Fields program, astronomers demonstrated that intracluster light—the diffuse glow between galaxies in a cluster—traces the path of dark matter, illuminating its distribution more accurately than existing methods that observe X-ray light.

Intracluster light is the byproduct of interactions between galaxies that disrupt their structures; in the chaos, individual stars are thrown free of their gravitational moorings in their home galaxy to realign themselves with the gravity map of the overall cluster. This is also where the vast majority of dark matter resides. X-ray light indicates where groups of galaxies are colliding, but not the underlying structure of the cluster. This makes it a less precise tracer of dark matter.

"The reason that intracluster light is such an excellent tracer of dark matter in a galaxy cluster is that both the dark matter and these stars forming the intracluster light are free-floating on the gravitational potential of the cluster itself—so they are following exactly the same gravity," said Mireia Montes of the University of New South Wales in Sydney, Australia, who is co-author of the study. "We have found a new way to see the location where the dark matter should be, because you are tracing ...Read More...

Lab study adds credence to life arriving on Earth from asteroids theory



This enormous mosaic of the Milky Way galaxy from NASA's Wide-field Infrared Survey Explorer, or WISE, shows areas of interstellar space where dozens of dense clouds, called nebulas, are forming into new stars. Credit: NASA

A team of researchers at NASA's Ames Research Center has found some evidence that adds credence to the theory that the basic ingredients for life came to Earth from asteroids. In their paper published in the journal Nature Communications, the group describes the experiments they carried out, what they found, and why they believe their work offers evidence of life arriving from elsewhere.

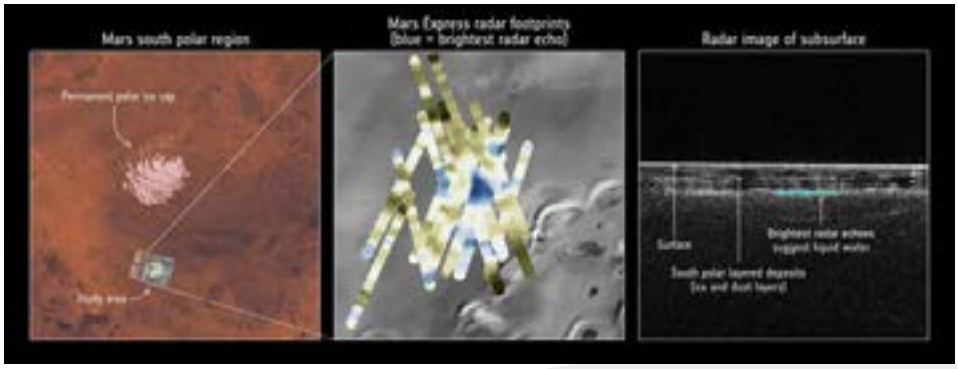
Despite a lot of effort, scientists still do not know how life started on planet Earth. They also do not know if it sprang out of existing ingredients or if those ingredients came from somewhere else, via asteroid or comet. There are two current leading theories. The first suggests that life began in a hot spring on land or in a deep-sea thermal vent, because the right mix of ingredients were there to allow it to happen. The other main theory suggests that the basic ingredients for life arrived on a comet or asteroid and things took off from there. In this new effort, the researchers have found some evidence that supports the latter theory.

One of the main ingredients of life is sugar—it provides energy. One kind of sugar, 2-deoxyribose, is the sugar component in DNA. In their lab, the researchers created space-like conditions and found they were sufficient for spontaneously creating 2-deoxyribose. More specifically, they put a sample of an aluminum substrate in a freezer, cooling it down to near absolute zero. They then placed it in a vacuum chamber. That allowed for simulating conditions in deep space. Next, the team piped in a water and methanol gas mixture, similar to that found in the interstellar medium. To simulate radiation from stars, they bathed the sample in UV light.

The researchers report that initially, ice built up on the sample, but it was melted by the UV light. The team found that a small amount of 2-deoxyribose had formed along with some other sugars. Intrigued by their findings, the researchers examined samples from several carbonaceous meteorites that have been found over the years and found evidence of alcohols and deoxysugar acids—not exactly 2-deoxyribose, but the ...Read More...

Special Read:

The Top 10 Astronomy News Stories of 2018



The Mars Express orbiter used radar signals bounced through underground layers of ice to find evidence of a pond of water buried below the south polar cap. Context map: NASA / Viking; THEMIS background: NASA / JPL-Caltech / Arizona State Univ.; MARSIS data: ESA / NASA / JPL / ASI / Univ. Rome; R. Orosei et al 2018

Astronomers have made great strides this year in their quest to observe the universe. Here's a recap of astronomy news in 2018.

It has been an exciting year for space missions. As one launched toward the inner solar system in an epic quest to touch the Sun, another left the solar system entirely to touch interstellar space — a whopping 18 billion kilometers from home. Both will shed light on extreme and distant environments. Meanwhile, other missions are focused on environments more like home — working toward better understanding Earth and the planets like it.

In April, for example, the TESS mission launched to study nearby exoplanets, increasing the chances that astronomers might soon find more habitable abodes. And in late November, NASA's Insight lander reached Mars in the first mission to study the planet's interior. That's particularly exciting given that two findings this year have increased the odds that the Red Planet might have once hosted life: The first found organic molecules within ancient rocks and the second discovered a sub-surface briny lake.

While these missions highlight the potential for future discoveries, the year has also hosted an array of sad endings. We said goodbye to the beloved scientist Stephen Hawking — who helped uncover many of the secrets within black holes — and the Kepler Space Telescope — which revealed thousands of alien worlds. Yes, it has been quite a year. Below are the top 10 stories from 2018.

LIGO: The Gift That Keeps on Giving
In December, scientists identified four more ghostly signals from distant pairs of black holes that swirled in toward each other and collided — raising the total number of gravitational-wave detections to 11. Not only was the announcement the largest batch of detections released at once, but one event was the most distant and most powerful black-hole merger yet discovered. It occurred 5 billion years ago when two huge black holes merged into an 80-solar-mass behemoth, unleashing the energy equivalent to 5 solar masses in the form of powerful gravitational waves.

Voyager 2 Leaves the Solar System
On December 5th Voyager 2 entered interstellar space — making it the second probe in history to travel so far beyond home, after Voyager 1. Astronomers noted the event not by the probe's distance (a whopping 18 billion kilometers from home) but by a drop in the solar wind. The Sun sends a steady breeze of charged particles far past Neptune, but eventually that wind gives way to the interstellar plasma that fills the galaxy. So, when the plasma detector onboard Voyager 2 recorded a significant drop in the speed of the solar wind, mission scientists knew that the probe had officially entered interstellar space. At their current rate, the Voyagers will encounter the inner edge of the Oort Cloud — the icy shell of debris surrounding our solar system — in roughly 300 years.

Insight Lander Reaches Mars
In late November NASA's Mars Insight (Interior Exploration using Seismic Investigations, Geodesy and Heat Transport) lander touched down on the Red Planet. It's NASA's eighth successful landing on Mars and the first dedicated geophysical mission. ..Read More...

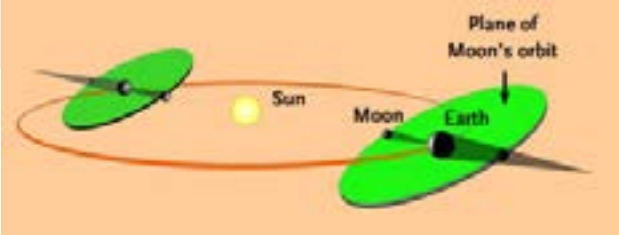
This Week's Sky at a Glance - Dec. 29, 2018 - Jan. 04, 2019

Dec 29	Sa	13:34	Last Quarter
Jan. 02	We	01:50	Moon-Venus: 1.4° S
		08:53	Saturn Conjunction
Jan. 03	Th	08:59	Perihelion: 0.9833 AU
		11:37	Moon-Jupiter: 3.4° S
Jan. 04	Fr	06:28	Quadrantid Shower: ZHR = 120

Solar and Lunar Eclipses in 2019

There'll be something for everybody in 2019, with total, annular, and partial solar eclipses — and total and partial lunar eclipses to look forward to.

Up to seven eclipses of the Sun and Moon can take place in one year, though the last time that happened was 1982, and the fewest possible is four. The mix of five events occurring in 2019 is especially interesting, because no two will be alike! There'll be three different types of solar eclipse — one each of partial, annular, and total — along with a total and a partial lunar eclipse. ...Read More....



Eclipses of the Sun or Moon can only occur when the Moon crosses the plane of Earth's orbit (orange circle) very close to the time of new or full Moon. Eclipse "windows" occur six months apart. Jay Anderson

The Best Meteor Showers in 2019

The two best meteor showers in 2019 will be the Quadrantids in early January and the Eta Aquariids in early May. Unfortunately, the popular Perseid and Geminid showers will be spoiled by bright moonlight.

If you look up into a dark, Moonless night sky from a location far from city lights, you'll see brief streaks from meteors a few times every hour. These "shooting stars" can range in brightness from tiny blips just at the limit of visibility to dramatically bright fireballs that outshine Venus and light up the nightscape around you. The rarest of these, called a bolide, shatters into pieces during its rapid descent. ...Read More...

A Geminid heads for the horizon above "First Canyon", east of Gallup, New Mexico, on December 13, 2017. John Van't Land / www.southwestgreetingcards.com