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1. First Detection of Sugars in Meteorites Gives Clues to Origin of Life

An international team has found sugars essential to life in meteorites. The new discovery adds to the growing list of biologically important compounds that have been found in meteorites, supporting the hypothesis that chemical reactions in asteroids – the parent bodies of many meteorites – can make some of life’s ingredients. If correct, meteorite bombardment on ancient Earth may have assisted the origin of life with a supply of life’s building blocks.

The team discovered ribose and other bio-essential sugars including arabinose and xylose in two different meteorites that are rich in carbon, NWA 801 (type CR2) and Murchison (type CM2). Ribose is a crucial component of RNA (ribonucleic acid). In much of modern life, RNA serves as a messenger molecule, copying genetic instructions from the DNA molecule (deoxyribonucleic acid) and delivering them to molecular factories within the cell called ribosomes that read the RNA to build specific proteins needed to carry out life processes.

“Other important building blocks of life have been found in meteorites previously, including amino acids (components of proteins) and nucleobases (components of DNA and RNA), but sugars have been a missing piece among the major building blocks of life,” said Yoshihiro Furukawa of Tohoku University, Japan, lead author of the study published in the Proceedings of the National Academy of Sciences November 18. “The research provides the first direct evidence of ribose in space and the delivery of the sugar to Earth. The extraterrestrial sugar might have contributed to the formation of RNA on the prebiotic Earth which possibly led to the origin of life.”

“It is remarkable that a molecule as fragile as ribose could be detected in such ancient material,” said Jason Dworkin, a co-author of the study at NASA’s Goddard Space Flight Center in Greenbelt, Maryland. “These results will help guide our analyses of pristine samples from primitive asteroids Ryugu and Bennu, to be returned by the Japan Aerospace Exploration Agency’s Hayabusa2 and NASA’s OSIRIS-REx spacecraft.”

An enduring mystery regarding the origin of life is how biology could have arisen from non-biological chemical processes. DNA is the template for life, carrying the instructions for how to build and operate a living organism.
However, RNA also carries information, and many researchers think it evolved first and was later replaced by DNA. This is because RNA molecules have capabilities that DNA lacks. RNA can make copies of itself without “help” from other molecules, and it can also initiate or speed up chemical reactions as a catalyst. The new work gives some evidence to support the possibility that RNA coordinated the machinery of life before DNA.

“The sugar in DNA (2-deoxyribose) was not detected in any of the meteorites analyzed in this study,” said Danny Glavin, a co-author of the study at NASA Goddard. “This is important since there could have been a delivery bias of extraterrestrial ribose to the early Earth which is consistent with the hypothesis that RNA evolved first.”

The team discovered the sugars by analyzing powdered samples of the meteorites using gas chromatography mass spectrometry, which sorts and identifies molecules by their mass and electric charge. They found that the abundances of ribose and the other sugars ranged from 2.3 to 11 parts per billion in NWA 801 and from 6.7 to 180 parts per billion in Murchison.

Since Earth is awash with life, the team had to consider the possibility that the sugars in the meteorites simply came from contamination by terrestrial life. Multiple lines of evidence indicate contamination is unlikely, including isotope analysis. Isotopes are versions of an element with different mass due to the number of neutrons in the atomic nucleus. For example, life on Earth prefers to use the lighter variety of carbon ($^{12}$C) over the heavier version ($^{13}$C). However, the carbon in the meteorite sugars was significantly enriched in the heavy $^{13}$C, beyond the amount seen in terrestrial biology, supporting the conclusion that it came from space.

The team plans to analyze more meteorites to get a better idea of the abundance of the extraterrestrial sugars. They also plan to see if the extraterrestrial sugar molecules have a left-handed or right-handed bias. Some molecules come in two varieties that are mirror images of each other, like your hands. On Earth, life uses left-handed amino acids and right-handed sugars. Since it’s possible that the opposite would work fine – right-handed amino acids and left-handed sugars – scientists want to know where this preference came from. If some process in asteroids favors the production of one variety over the other, then maybe the supply from space via meteorite impacts made that variety more abundant on ancient Earth, which made it more likely that life would end up using it.

Source: NASA

This is a model of the molecular structure of ribose and an image of the Murchison meteorite. Ribose and other sugars were found in this meteorite. Credits: Yoshihiro Furukawa
Astronomers have confirmed the first example of a galaxy cluster where large numbers of stars are being born at its core. Using data from NASA space telescopes and a National Science Foundation radio observatory, researchers have gathered new details about how the most massive black holes in the universe affect their host galaxies.

Galaxy clusters are the largest structures in the cosmos that are held together by gravity, consisting of hundreds or thousands of galaxies embedded in hot gas, as well as invisible dark matter. The largest supermassive black holes known are in galaxies at the centers of these clusters.

For decades, astronomers have looked for galaxy clusters containing rich nurseries of stars in their central galaxies. Instead, they found powerful, giant black holes pumping out energy through jets of high-energy particles and keeping the gas too warm to form many stars.

Now, scientists have compelling evidence for a galaxy cluster where stars are forming at a furious rate, apparently linked to a less effective black hole in its center. In this unique cluster, the jets from the central black hole instead appear to be aiding in the formation of stars. Researchers used new data from NASA’s Chandra X-ray Observatory and Hubble Space Telescope, and the NSF’s Karl G. Jansky Very Large Array (VLA) to build on previous observations of this cluster.

“This is a phenomenon that astronomers had been trying to find for a long time,” said Michael McDonald, astronomer at the Massachusetts Institute of Technology (MIT), who led the study. “This cluster demonstrates that,
in some instances, the energetic output from a black hole can actually enhance cooling, leading to dramatic consequences."

The black hole is in the center of a galaxy cluster called the Phoenix Cluster, located about 5.8 billion light years from Earth in the Phoenix Constellation. The large galaxy hosting the black hole is surrounded by hot gas with temperatures of millions of degrees. The mass of this gas, equivalent to trillions of Suns, is several times greater than the combined mass of the stars in all the galaxies in the cluster.

This hot gas loses energy as it glows in X-rays, which should cause it to cool until it can form large numbers of stars. However, in all other observed galaxy clusters, bursts of energy driven by such a black hole keep most of the hot gas from cooling, preventing widespread star birth.

"Imagine running an air conditioner in your house on a hot day, but then starting a wood fire. Your living room can't properly cool down until you put out the fire," said co-author Brian McNamara of the University of Waterloo in Canada. "Similarly, when a black hole's heating ability is turned off in a galaxy cluster, the gas can then cool."

Evidence for rapid star formation in the Phoenix Cluster was previously reported in 2012 by a team led by McDonald. But deeper observations were required to learn details about the central black hole's role in the rebirth of stars in the central galaxy, and how that might change in the future.

By combining long observations in X-ray, optical, and radio light, the researchers gained a tenfold improvement in the data quality compared to previous observations. The new Chandra data reveal that hot gas is cooling nearly at the rate expected in the absence of energy injected by a black hole. The new Hubble data show that about 10 billion solar masses of cool gas are located along filaments leading towards the black hole, and young stars are forming from this cool gas at a rate of about 500 solar masses per year. By comparison, stars are forming in the Milky Way galaxy at a rate of about one solar mass per year.

The VLA radio data reveal jets blasting out from the vicinity of the central black hole. These jets likely inflated bubbles in the hot gas that are detected in the Chandra data. Both the jets and bubbles are evidence of past rapid growth of the black hole. Early in this growth, the black hole may have been undersized, compared to the mass of its host galaxy, which would allow rapid cooling to go unchecked.

"In the past, outbursts from the undersized black hole may have simply been too weak to heat its surroundings, allowing hot gas to start cooling," said co-author Matthew Bayliss, who was a researcher at MIT during this study, but has recently joined the faculty at the University of Cincinnati. "But as the black hole has grown more massive and more powerful, its influence has been increasing."

The cooling can continue when the gas is carried away from the center of the cluster by the black hole's outbursts. At a greater distance from the heating influence of the black hole, the gas cools faster than it can fall back towards the center of the cluster. This scenario explains the observation that cool gas is located around the borders of the cavities, based on a comparison of the Chandra and Hubble data.

Eventually the outburst will generate enough turbulence, sound waves and shock waves (similar to the sonic booms produced by supersonic aircraft) to provide sources of heat and prevent further cooling. This will continue until the outburst ceases and the build-up of cool gas can recommence. The whole cycle may then repeat.

"These results show that the black hole has temporarily been assisting in the formation of stars, but when it strengthens its effects will start to mimic those of black holes in other clusters, stifling more star birth," said co-author Mark Voit of Michigan State University in East Lansing, Michigan.

The lack of similar objects shows that clusters and their enormous black holes pass through the rapid star formation phase relatively quickly.

A paper describing these results was published in a recent issue of The Astrophysical Journal, and a preprint is available online.

Source: National Radio Astronomy Observatory
3. The First Global Geologic Map of Titan Completed

The first global geologic map of Titan is based on radar and visible-light images from NASA's Cassini mission, which orbited Saturn from 2004 to 2017. Labels point to several of the named surface features. Credits: NASA/JPL-Caltech/ASU

The first map showing the global geology of Saturn's largest moon, Titan, has been completed and fully reveals a dynamic world of dunes, lakes, plains, craters and other terrains.

Titan is the only planetary body in our solar system other than Earth known to have stable liquid on its surface. But instead of water raining down from clouds and filling lakes and seas as on Earth, on Titan what rains down is methane and ethane — hydrocarbons that we think of as gases but that behave as liquids in Titan's frigid climate.

"Titan has an active methane-based hydrologic cycle that has shaped a complex geologic landscape, making its surface one of most geologically diverse in the solar system," said Rosaly Lopes, a planetary geologist at NASA's Jet Propulsion Laboratory in Pasadena, California, and lead author of new research used to develop the map.

"Despite the different materials, temperatures and gravity fields between Earth and Titan, many surface features are similar between the two worlds and can be interpreted as being products of the same geologic processes. The map shows that the different geologic terrains have a clear distribution with latitude, globally, and that some terrains cover far more area than others."

Lopes and her team, including JPL's Michael Malaska, worked with fellow planetary geologist David Williams of the School of Earth and Space Exploration at Arizona State University in Tempe. Their findings, which include the relative age of Titan's geologic terrains, were recently published in the journal Nature Astronomy.
Lopes' team used data from NASA's Cassini mission, which operated between 2004 and 2017 and did more than 120 flybys of the Mercury-size moon. Specifically, they used data from Cassini's radar imager to penetrate Titan's opaque atmosphere of nitrogen and methane. In addition, the team used data from Cassini's visible and infrared instruments, which were able to capture some of Titan's larger geologic features through the methane haze.

"This study is an example of using combined datasets and instruments," Lopes said. "Although we did not have global coverage with synthetic aperture radar [SAR], we used data from other instruments and other modes from radar to correlate characteristics of the different terrain units so we could infer what the terrains are even in areas where we don't have SAR coverage."

Williams worked with the JPL team to identify what geologic units on Titan could be determined using first the radar images and then to extrapolate those units to the non-radar-covered regions. To do so, he built on his experience working with radar images on NASA's Magellan Venus orbiter and from a previous regional geologic map of Titan that he developed.

"The Cassini mission revealed that Titan is a geologically active world, where hydrocarbons like methane and ethane take the role that water has on Earth," Williams said. "These hydrocarbons rain down on the surface, flow in streams and rivers, accumulate in lakes and seas, and evaporate into the atmosphere. It's quite an astounding world!"

Source: NASA
The Night Sky

**Tuesday, Nov. 26**

- The bowl of the Little Dipper is descending in the evening at this time of year, left or lower left of Polaris. By about 11 p.m. it hangs straight down below Polaris.

- *Two faint fuzzies naked-eye:* The Andromeda Galaxy (M31) and the Perseus Double Cluster are two of the most famous deep-sky objects. They're both cataloged as 4th magnitude, and in a fairly good sky you can see each with the unaided eye. Binoculars make them easier. They're only 22° apart, very high toward the east early these evenings — to the right of Cassiopeia and closer below Cassiopeia, respectively.

But they look rather different, the more so the darker your sky. See for yourself. They're plotted on the all-sky constellation map in the center of the November and December *Sky & Telescopes*.

- New Moon (exact at 10:06 a.m. EST).

**Wednesday, Nov. 27**

- Orion clears the eastern horizon by about 7 or 8 p.m. now, depending on how far east or west you live in your time zone. High above Orion shines orange Aldebaran. Above Aldebaran is the little Pleiades cluster, the size of your fingertip at arm's length.

Far left of Aldebaran and the Pleiades shines bright Capella.

Down below Orion, brilliant Sirius rises around 9 or 10 p.m.

**Thursday, Nov. 28**

- The Moon pairs with Venus at dusk, as shown here.

- Does the Sun already seem to be setting about as early as it ever will? You're right! We're still three weeks away from the winter solstice — but the Sun sets its earliest around *December 7th* if you're near latitude 40° north, and right now it already sets within only about 1 minute of that time.

A surprising result of this: The Sun actually sets a trace earlier on Thanksgiving than on Christmas — even though Christmas is around solstice time!

This offset from the solstice date is balanced out by the opposite happening at sunrise: the Sun doesn't *come up its latest* until January 4th. Blame the tilt of Earth's axis and the eccentricity of Earth's orbit.

**Friday, Nov. 29**

- Now the Moon pairs with Saturn, as shown above.

- Vega still shines brightly well up in the west-northwest after dark. The brightest star above it is Deneb, the head of the big Northern Cross, which is made of the brightest stars of Cygnus. At nightfall the shaft of the cross extends lower left from Deneb. By about 10 or 11 p.m., it plants itself more or less upright on the northwest horizon.

Source: *Sky and Telescope*  

8 of 14
ISS Sighting Opportunities (from Denver)

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

NASA-TV Highlights  (all times Eastern Time Zone)

**November 27, Wednesday**
- 10:25 a.m. – International Space Station Expedition 61 in-flight event with the Brooke Army Medical Center at Fort Sam Houston, San Antonio, Texas, and NASA astronaut Andrew Morgan (All Channels)

**November 29, Friday**
- 12 a.m - (Premiere) NASA Television Presents “Black Hole Friday”, Select Programming on Black Holes (Public Channel)

**December 1, Sunday**
- 6 a.m. – Coverage of the Launch of the International Space Station Progress 74 cargo craft from the Baikonur Cosmodrome in Kazakhstan; launch is scheduled at 6:30 a.m. EST – Johnson Space Center via Baikonur, Kazakhstan (All Channels)

**December 2, Monday**
- 5:30 a.m. - Coverage of International Space Station Expedition 61 U.S. Spacewalk # 60 to Continue Repairs on the Alpha Magnetic Spectrometer (3rd of 4 spacewalks; spacewalk begins 6:50 a.m. EST; Parmitano and Morgan) (All Channels)

**December 3, Tuesday**
- Noon: Administrator Jim Bridenstine hosts a NASA Town Hall to introduce Douglas Loverro, the agency's new Head of Human Exploration (All Channels)

Watch NASA TV online by going to the NASA website.
Space Calendar

- **Nov 26** - *Cartosat-3* / *NEMO-AM* PSLV-CA Launch
- **Nov 26** - *Inmarsat 5 F5* / *TIBA 1 Ariane 5* Launch
- Nov 26 - Teleconference: Committee on Astronomy and Astrophysics Fall Meeting
- Nov 26 - Astro2020 Teleconference: Panel on Particle Astrophysics and Gravitation - Telecon with NASA/DOE/NSF
- Nov 26 - 20th Anniversary (1999), *Galileo*, Io 25 Flyby
- Nov 27 - *Asteroid 770 Bali* Closest Approach To Earth (0.899 AU)
- Nov 27 - Symposium: Putting Astronauts in Impossible Locations, London, United Kingdom
- Nov 27 - Lecture: DUNE - An International Neutrino Observatory, London, United Kingdom
- **Nov 28** - *ALE 2* / *NOOR 1A & 1B* / *ATL 1* / *FossaSat 1* / *SMOG-P* / *TRSI-Sat* Electron Launch
- Nov 28 - Moon Occults Jupiter
- Nov 28 - *Mercury* At Its Greatest Western Elongation (20 Degrees)
- Nov 28 - 8th UK-QFT Meeting, London, United Kingdom
- Nov 29 - Moon Occults Saturn
- Nov 30 - Moon Occults Dwarf Planet Pluto
- Nov 30 - 410th Anniversary (1609), 1st Telescope Observations of the Moon by Galileo Galilei
- Dec 01 - *Apollo Asteroid 2019 WN1* Near-Earth Flyby (0.011 AU)
- Dec 02 - Lecture: Probing Saturn's Carbon Cycle with Cassini VIMS Stellar Occultations, Ithaca, New York
- Dec 02 - Lecture: Beyond the Known World - New Horizons Mission into the Kuiper Belt, Tucson, Arizona
- Dec 03 - *Apollo Asteroid 2017 AP4* Near-Earth Flyby (0.022 AU)
- Dec 03 - *Apollo Asteroid 37655 Illapa* Closest Approach To Earth (0.640 AU)
- Dec 03 - U.S. Chamber 2nd Annual Space Summit: LAUNCH - The Space Economy, Washington DC
- Dec 03 - Meeting: Cube Sats, Nottingham, United Kingdom
- Dec 03 - Lecture: Red and Brown Dwarfs - Understanding our Smallest and Closest (sub)Stellar Neighbors, Baltimore, Maryland
- Dec 03 - Astro2020 Teleconference: Panel on Cosmology Briefing Development
- Dec 03 - Astro2020 Teleconference: Panel on Particle Astrophysics and Gravitation - Telecon with NASA/DOE/NSF
- Dec 03 - Seminar on Climate Resilient Smart Cities: Human-Technology Integration, Washington DC
- Dec 03-06 - Twenty Years of Chandra Science Symposium, Boston, Massachusetts
- **Dec 04** - *Progress MS-13* Soyuz-2.1a Launch (International Space Station 74P)

Source: JPL Space Calendar
Food for Thought

The Large Synoptic Survey Telescope Could Find More of Earth’s Transient Moons

![Artist’s impression of the NEO double asteroid 1999 KW4. Credit: ESO](image)

It is a well-known astronomical convention that Earth has only one natural satellite, which is known (somewhat uncreatively) as “the Moon”. However, astronomers have known for a little over a decade that Earth also has a population of what are known as “transient Moons”. These are a subset of Near-Earth Objects (NEOs) that are temporarily scooped up by Earth’s gravity and assume orbits around our planet.

According to a new study by a team of Finish and American astronomers, these temporarily-captured orbiters (TCOs) could be studied with the Large Synoptic Survey Telescope (LSST) in Chile – which is expected to become operational by 2020. By examining these objects with the next-generation telescope, the study’s authors argue that we stand to learn a great deal about NEOs and even begin conducting missions to them.

The study, which recently appeared in the journal *Icarus*, was led by Grigori Fedorets – a doctoral student from the University of Helsinki’s department of physics. He was joined by physicists from the Luleå University of Technology, the University of Washington’s Data Intensive Research in Astrophysics and Cosmology (DIRAC) Institute, and the University of Hawaii.

The concept of TCOs was first postulated in 2006 following the discovery and characterization of RH120, an object measuring 2 to 3 meters (6.5 to 10 ft.) in diameter that normally orbits the Sun. Every twenty or so years, it makes close approaches to the Earth-Moon system and is temporarily captured by Earth’s gravity.
Subsequent observations of NEOs – such as asteroid 1991 VG and meteor EN130114 – added further weight to this theory and allowed astronomers to place constraints on TCO populations. This led to the conclusion that temporarily-captured satellites come in two populations. On the one hand, there are TCOs, which make the equivalent of at least one revolution around the Earth while being captured.

Second, there are temporarily-captured flybys (TCFs), which make the equivalent of less than one revolution while being captured. According to Fedorets and his colleagues, these objects are an appealing target for research and rendezvous with spacecraft – either in the form of CubeSat-sized missions or larger spacecraft that could conduct sample-return missions.

For starters, the study of these objects would allow astronomers to constrain the size and frequency of NEOs that range in size from 1/10th of a meter to 10 meters in diameter, which are not well-understood. Typically, these objects are too small and too faint for most telescopes and techniques to observe effectively.

Monitoring and studying this special class of NEOs is where the LSST comes into play. Because of its high-resolution and sensitivity, the LSST is expected to become one of the primary facilities for the discovery of NEOs and potentially hazardous objects that are otherwise very difficult to detect. As Fedorets told Universe Today via email:

"[E]ven for LSST, the vast majority of the transient moons will be too faint to discover. However, it will be the only survey capable of discovering any transient moons on a regular basis... The features of LSST that are particularly suitable for TCO detection include: a large field of view; limiting magnitude $V=24.7$, allowing detections of faint objects; operational mode with back-to-back observations and rapid follow-up of the same field initially on the same night, helping to identify fast-moving trailed objects."

Once it is up and running, the LSST telescope will conduct a 10-year survey that will address some of the most pressing questions about the structure and evolution of the Universe. These include the mysteries of dark matter and dark energy and the formation and structure of the Milky Way. It will also dedicate observation time to the Solar System in the hopes of learning more about minor planet populations and NEOs.

To determine how many TCOs the LSST will detect, the team ran a series of simulations. Their work builds on a previous study conducted in 2014 by Dr. Bryce Bolin of Caltech and colleagues, where they assessed the current and next-generation astronomical facilities. It was this study that indicated how the LSST would be extremely effective at detecting transient moons.

For their study, Fedorets reconsidered the work of Bolin and conducted their own analysis. As he described it:

"[A] synthetic population of transient moons was ran through the LSST pointing simulation. The initial analysis showed that the Moving Object Processing System of LSST could recognize only three objects in four years (cadence of three detections over a period of 15 days). This seemed [like] a small number, so we performed additional analysis. We selected all observations with at least two observations, and performed orbit determination and orbital linking with methods alternative to MOPS. This special treatment increased the number of observable transient moon candidates by an order of magnitude."

In the end, Fedorets and his team concluded that using the LSST and modern automatic asteroid identifications software – aka. a moving-object processing system (MOPS) – a TCO could be discovered once every year. That rate could be increased to one TCO every two months if additional software tools are developed specifically for the identification of TCOs that could complement a baseline MOPS.

Ultimately, the study of TCOs will be beneficial to astronomers for a number of reasons. For starters, there exists a gap between the study of larger asteroids and smaller bolides – small meteors that regularly burn up in Earth’s atmosphere. Those that fall in between, which typically measure between 1 and 40 meters (~3 to 130 ft.) in diameter, are currently not well-constrained.
“Transient moons are a good population to constrain that size range, as at those size ranges they should appear regularly and be detected with LSST,” says Fedorets. “Moreover, TCOs are outstanding targets for [in-situ] missions. They have been delivered “for free” to the vicinity of the Earth. Therefore, a relatively small amount of fuel is required to reach them. Potential missions could be designed as in situ flyby missions (e.g. of CubeSat class), or as first steps in asteroid resource utilization.”

An artist’s overview of the mission concept for the Comet Interceptor spacecraft, which will fly from the vicinity of Earth to rendezvous with a long-period comet or interstellar object inbound from the outer solar system. Credit: ESA

Another benefit of the study of these objects is how they will help astronomers gain a better understanding of potentially-hazardous objects (PHOs). This term is used to describe asteroids that periodically cross Earth’s orbit and pose a risk of collision. While they have similar observational characteristics to TCOs, they can be discerned based on their orbits alone.

Of course, Fedorets emphasized that while TCOs spend months in geocentric orbits, a possible mission to study one of them would have to be rapid-response in nature. Luckily, the ESA is developing such a mission in the form of their “Comet Interceptor”, which will be launched to a stable hibernating orbit and activated once a comet or asteroid enters Earth’s orbit.

A greater understanding of Earth’s temporary satellites, potentially-hazardous objects, and Near-Earth Asteroids is merely one of many benefits that are expected to come from next-generation telescopes like the LSST. These instruments will not only allow us to see farther and with greater clarity (thus expanding our knowledge of our Solar System and the cosmos) they could also help us to ensure our long-term survival as a species.

Source: Universe Today  

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**Space Image of the Week**

Arp 273: Battling Galaxies from Hubble  
Image Credit: NASA, ESA, Hubble; Processing & Copyright: Rudy Pohl

**Explanation:** What's happening to these spiral galaxies? Although details remain uncertain, there sure seems to be a titanic battle going on. The upper galaxy is labelled UGC 1810 by itself, but together with its collisional partners is known as Arp 273. The overall shape of the UGC 1810 -- in particular its blue outer ring -- is likely a result of wild and violent gravitational interactions. The blue color of the outer ring at the top is caused by massive stars that are blue hot and have formed only in the past few million years. The inner part of the upper galaxy -- itself an older spiral galaxy -- appears redder and threaded with cool filamentary dust.

A few bright stars appear well in the foreground, unrelated to colliding galaxies, while several far-distant galaxies are visible in the background. Arp 273 lies about 300 million light years away toward the constellation of Andromeda. Quite likely, UGC 1810 will devour its galactic sidekicks over the next billion years and settle into a classic spiral form.

Source: [NASA APOD](https://apod.nasa.gov/apod/ap190515.html)