

ECLIPSE NEWSLETTER



The Eclipse Newsletter is dedicated to increasing the knowledge of Astronomy, Astrophysics, Cosmology and related subjects.

**VOLUMN 2 NUMBER 2
MARCH – APRIL 2018**

**PLEASE SEND ALL PHOTOS, QUESTIONS AND REQUEST FOR
ARTICLES TO
pestrattonmcag@gmail.com**

MCAO PUBLIC NIGHTS AND FAMILY NIGHTS.

The general public and MCAO members are invited to visit the Observatory on select Monday evenings at 8PM for **Public Night** programs. These programs include discussions and illustrated talks on astronomy, planetarium programs and offer the opportunity to view the planets, moon and other objects through the telescope, weather permitting. Due to limited parking and seating at the observatory, **admission is by reservation only.**

Public Night attendance is limited to adults and students 5th grade and above. If you are interested in making reservations for a public night, you can contact us by calling 302-654-6407 between the hours of 9 am and 1 pm Monday through Friday. Or you can email us any time at KimGreenmcao@gmail.com or mtcuba@physics.udel.edu. The public nights will be presented even if the weather does not permit observation through the telescope. The admission fees are \$3 for adults and \$2 for children. There is no admission cost for MCAO members, but reservations are still required. If you are interested in becoming a MCAO member, please see the link for membership. We also offer family memberships.

Family Nights are scheduled from late spring to early fall on Friday nights at 8:30PM. These programs are opportunities for families with younger children to see and learn about astronomy by looking at and enjoying the sky and its wonders. It is meant to teach young children from ages 6-12 about astronomy in simple terms they can really understand.

Reservations are required and admission fees are \$3 for adults and \$2 for children.

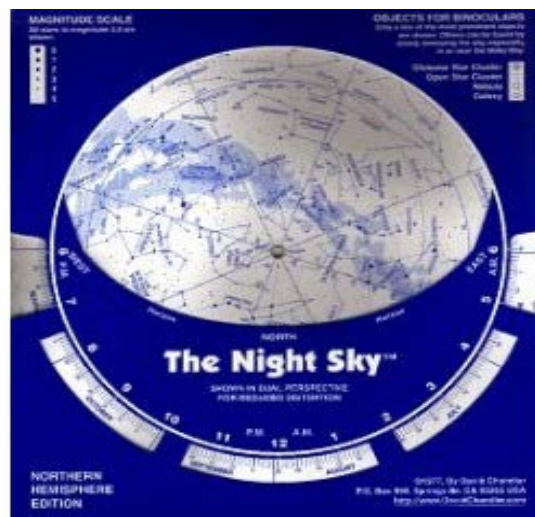
MCAO WEB SITE IS

mountcuba.org

I offer this so those who are new to the subject matter offered will have a better chance of understand certain names as well as terms used in these articles.

HOW TO FIND CONSTELLATIONS

Step 1. Purchase a Star Chart as shown below. Mt. Cuba Astronomical Observatory sells this one for \$4.00.



Step 2. Orient the Star Chart. You will notice there are two sides to the chart. One side is for viewing the sky to the North. The other side is for viewing to the South. Let's start with the side for the North. You will notice that the white part of the chart rotates. At the bottom, you will see months. Above the month is the date and above that the time. The month and date will rotate so now line them up with the time you are ready for viewing. Simply look at the chart to pick out the object then look up at the sky. Compare the stars on the star chart and the stars you see in the night sky. 3. To view South, turn the chart over and turn around to face South.

WHAT ARE THE MESSIER OBJECTS?

The Messier objects are a set of over 100 astronomical objects first listed by French astronomer Charles Messier in 1771.^[1] Messier was a comet hunter, and was frustrated by objects which resembled but were not comets, so he compiled a list of them,^[2] in collaboration with his assistant Pierre Méchain, to avoid wasting time on them. The number of objects in the lists he published reached 103, but a few more thought to have been observed by Messier have been added by other astronomers over the years.

For a list of Messier objects:

https://en.wikipedia.org/wiki/List_of_Messier_objects

UPCOMING STAR PARTIES

For more information on DAS STAR PARTIES, visit the mountcuba.org web site. Select Delaware Astronomical Society DAS.

Select Events at top and then STAR PARTIES.

KEEP AN EYE OUT FOR TWO SPECIAL EVENTS

MARCH 2 AND MARCH 31 BLUE MOON

APRIL 16 TO 25 LYRIDS METEOR SHOWER

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All hyperlinks are in blue.

IN THE NEXT ISSUE, I WILL GET BACK TO COVERING MESSIER OBJECTS AND CONSTELLATIONS. I APOLOGIZE. RAN OUT OF TIME AND ROOM.

ROSS 128b

Scientists have discovered an exoplanet—relatively nearby in cosmic terms—that could be the best candidate for finding life outside Earth.

The new exoplanet, named Ross 128 b, has many of the properties necessary for supporting life: It's a similar size to Earth, it has a rocky surface, and the distance from its star potentially puts it in the “habitable zone”—the area around a star where temperatures allow water to remain liquid on the surface of a planet.

Ross 128 b is 11 lightyears away, the second-closest exoplanet to Earth. (An exoplanet, or extra-solar planet, is one that orbits a star outside of our solar system.)



How Ross 128 b was found

The discovery was made after over a decade of “intensive monitoring” using the High Accuracy Radial velocity Planet Searcher (HARPS) instrument, a high-contrast imaging and high-dispersion spectrograph, installed on the the ESO 3.6m telescope at La Silla Observatory in Chile. The team has published its findings in the scientific journal **Astronomy & Physics**.

The closest exoplanet to us, Proxima b, orbits the star Proxima Centauri, a very active red-dwarf star that emits powerful radiation. It receives **30 times more** extreme ultraviolet radiation than Earth, so any life there is very unlikely. Ross 128 b also orbits a red dwarf, but its star is much less active, so the surface of the planet is likely more temperate.

An artist’s impression of exoplanet Ross 128 b, with its red-dwarf parent star in the background. (ESO/M. Kornmesser)

Why it could possibly support life

Red-dwarf stars are cool, dim and fairly common in the universe. There are many exoplanets orbiting dwarf stars with the potential to support life, but most of those stars are very active and throw off enough radiation to destroy anything living. Ross 128 is a very “quiet” star, the calmest red dwarf known to have a planet orbiting it, meaning its solar system could be conducive to supporting life.

“Because Proxima Centauri blasts its planet with strong flares and high energy radiation, yes, I think Ross 128 is much more comfortable for the development of life,” Dr. Nicola Astudillo-Defru, one of the researchers on the project, told **BBC News**.

Ross 128 b orbits 20 times closer to its star than the Earth orbits the Sun, yet the exoplanet’s star is a lot smaller and weaker than ours, so Ross 128 b receives a similar amount of solar radiation as Earth.

Astronomers still don't know what the atmosphere of Ross 128 b is like, and therefore don't know if its surface temperature is comfortable enough to support life. Scientists say a planet needs temperatures between -60°C and $+20^{\circ}\text{C}$ to be considered temperate.

What's ahead in examining exoplanets

The next step is for astronomers to study the atmospheric chemistry of exoplanets like Ross 128 b using powerful new telescopes such as the ESO's [Extremely Large Telescope](#) (ELT) and NASA's [James Webb Space Telescope](#), which will begin operations within the next few years. If scientists are able to detect gases like oxygen in the atmosphere of Ross 128 b, that could be a good indicator of biological processes on the planet.

When the ELT comes online, "It shall provide both the collecting power and the angular resolution to observe Ross 128 b directly. We will be able to see if it has an atmosphere and, eventually, to search for O₂, water and CH₄ (methane)," the study's lead author, Dr Xavier Bonfils of the Institute of Planetology and Astrophysics in Grenoble, told the BBC.

If scientists are able to detect atmospheric biomarkers, we might have new next-door neighbors in just a bit—the Ross 128 red dwarf is moving towards Earth and will become the nearest star to us in 79,000 years.

IN FAR AWAY GALAXIES

Using a technique called microlensing, astrophysicists at the University of Oklahoma have [confirmed the existence](#) of exoplanets beyond the [Milky Way galaxy](#). Not just one or two, either — the scientific team has estimated that there are [multitudes of planets](#), ranging in sizes comparable from the Moon to Jupiter, in the galaxy known as RX J1131-1231.

Findings from the research were recently published in the *Astrophysical Journal Letters*. The image above shows the galaxy at the center, surrounded by four quasars. It's estimated there are several trillion planets in that central red dot.

Moreover, these appear to be "rogue" planets not circling a star in a conventional solar system but roaming free around the far-off galaxy.

“We are very excited about this discovery. This is the first time anyone has discovered planets outside our galaxy,” said OU professor Xinyu Dai. “These small planets are the best candidate for the signature we observed in this study using the microlensing technique.”

Einstein theorized that astronomers could use microlensing to observe distant objects using the gravity of stars that are **directly between them and the Earth**, Terry Oswalt of Embry-Riddle Aeronautical University told CNET. “When a star in the foreground passes exactly between us and a background star, gravitational microlensing results in a perfectly circular ring of light — a so-called ‘Einstein ring,’” he said.

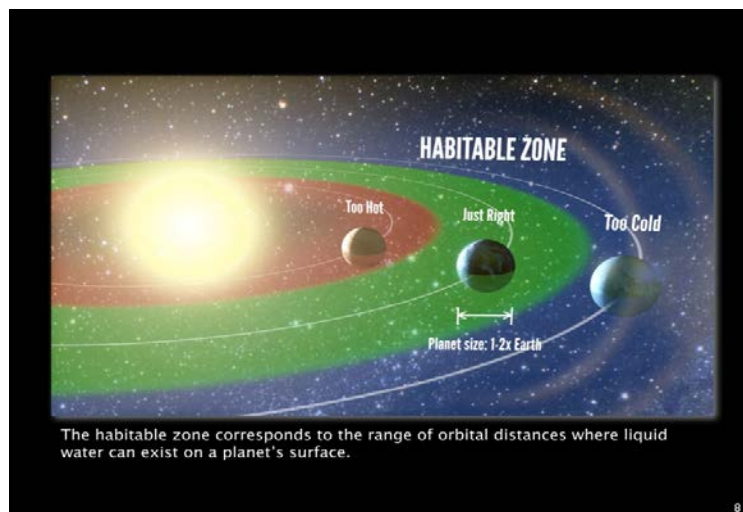
The massive gravitational pull of an object like a star causes space to bend around it, and light from a more distant object would curve around it as well, resulting in a magnifying effect.

The astrophysicists used observations from NASA’s Chandray X-ray Observatory, a space telescope controlled by the Smithsonian. They then analyzed the results using the OU Supercomputing Center. Microlensing has been used to discover **thousands of planets** within the Milky Way before, but this is a new frontier.

“This is an example of how powerful the techniques of analysis of extragalactic microlensing can be,” said OU researcher Eduardo Guerras. “This galaxy is located 3.8 billion light years away, and there is not the slightest chance of observing these planets directly, not even with the best telescope one can imagine in a science fiction scenario. However, we are able to study them, unveil their presence and even have an idea of their masses. This is very cool science.”

GOLDIE LOCKS ZONE

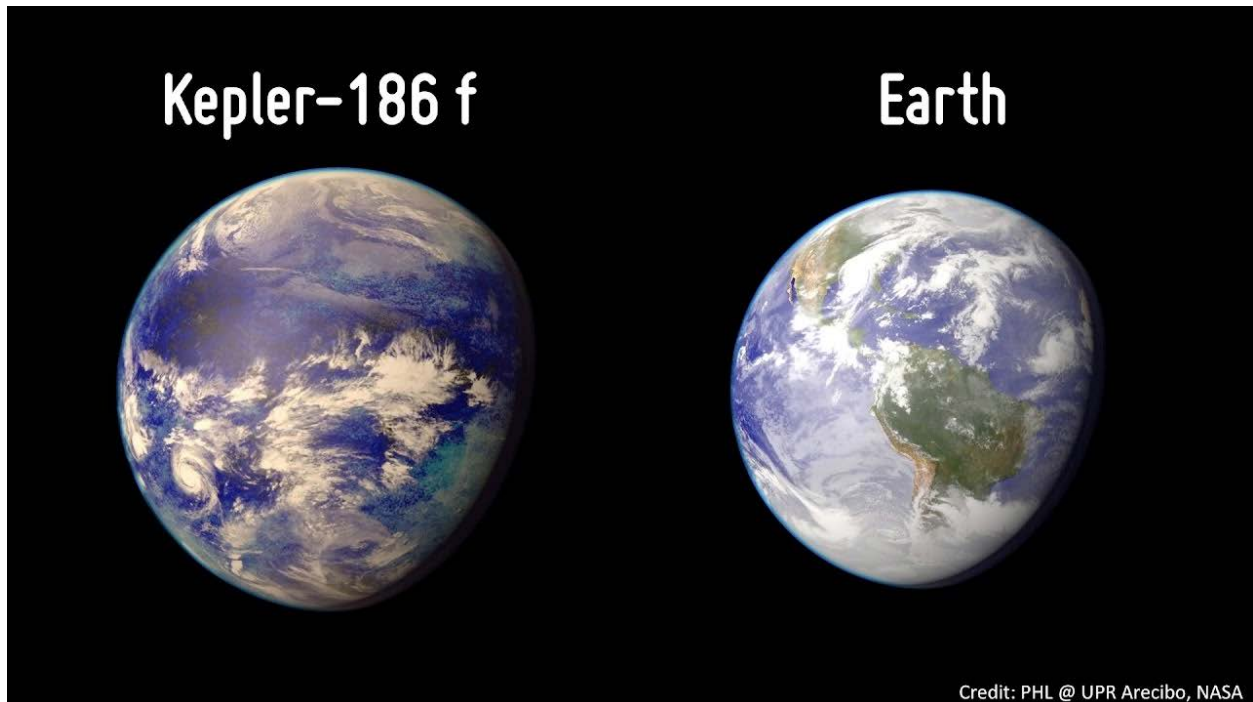
Our planet occupies what scientists sometimes call the **Goldilocks zone or Habitable Zone**. Its distance from our star means it is neither too hot, nor too cold to support liquid water - thought to be a key ingredient for life. Astronomers are searching for rocky planets like ours in the **Goldilocks zones** of other stars.



The Goldilocks Theory. Just as Goldilocks found the porridge that was just right, the Earth seems to be just right for living creatures. The Earth seems to be the perfect distance from the sun for lots of water. Venus is too close to the sun, and too hot for flowing water on its surface.

Mars is too cold but does have ice which leads some to say it could have been in the Goldilocks Zone at one time.

LIFE – WHAT DO WE HAVE HERE?



Kepler 186f and Earth. It is my view that Kepler-186f is the one planet which has the best chance for life as we know it. Google Kepler 186f and make up your own mind.

LIFE AS WE KNOW IT. WHAT IS THAT?

All life is composed mainly of the four macromolecule building blocks: carbohydrates, lipids, proteins, and nucleic acids. The interactions of different polymers of these basic molecule types make up the majority of life's structure and function.

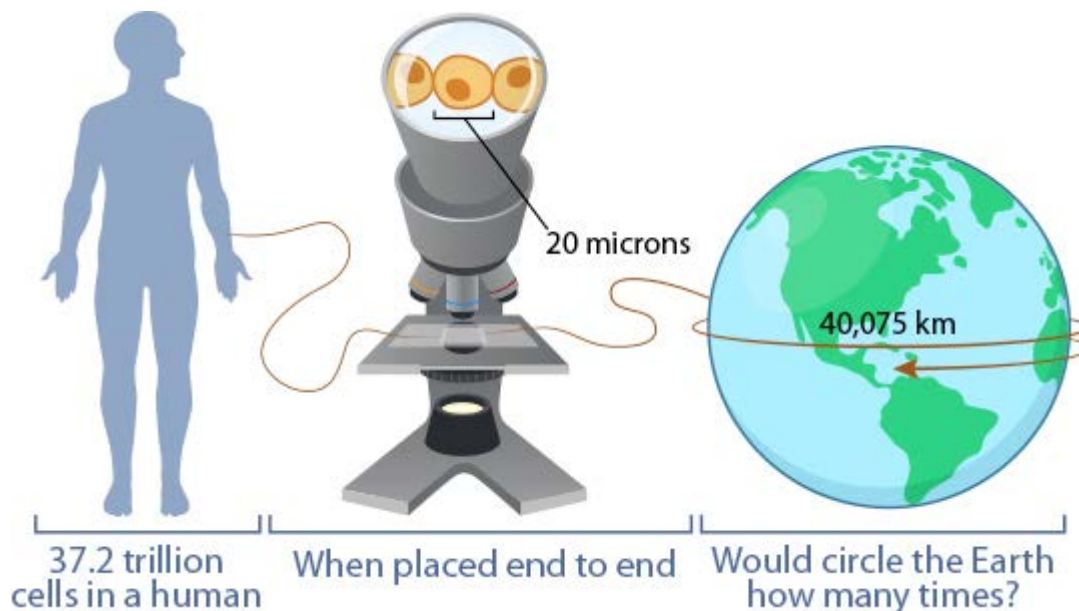
Building Blocks of Life. Nucleic acids: are compounds that make up the DNA strand. Nucleic acids include deoxyribonucleic acids (DNA) and ribonucleic acids(RNA). Proteins: are the business end of the DNA in the cell.

What is called the building blocks of life?

Cells: The Building Blocks of Life! The Cell Theory states that all living things are made of cells, which are the basic units of life, and that cells come from other cells. Prokaryotic cells have no nucleus or organelles enclosed within membranes.

How Many Cells Are in the Human Body?

All living beings are made up of cells. Some of them are made up of only one cell and others have many cells. The average adult human body has around 37.2 trillion cells. **WOW**, that's a lot of cells. So many, in fact, that it's hard to picture. But let's try to imagine it: If we lined up all the cells in a human body end to end, could the line reach around the Earth? If so, how many times?



An adult human body is made up of about 37.2 trillion cells. If we were able to put all of these cells end to end, how many times do you think they would circle the Earth? Click to find the answer.

Cells got their name from an Englishman named [Robert Hooke](#) in the year 1665. He first saw and named "cells" while he was experimenting with a new instrument we now call a "microscope."

For his experiment he cut very thin slices from cork. He looked at these slices under a microscope. He saw tiny box-like shapes. These tiny boxes reminded him of the plain small rooms that monks lived in called "cells"

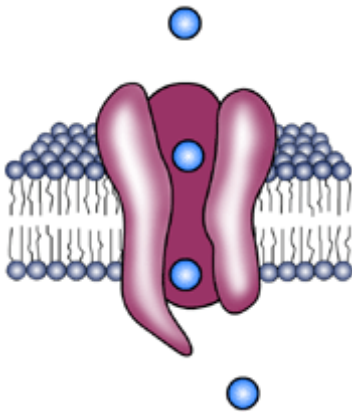
If We Are Made up of Cells, What Are Cells Made From?

Look around at your house and nearby houses. They are made from smaller building materials such as wood, bricks and cement. So are the cars in the street and bike you ride. In fact, everything is made from [building blocks](#) including living things.

What Are the Building Blocks of a Cell Like?

If you take a look at your home you will notice it is enclosed by outer walls. All cells are enclosed within something called a plasma membrane. The plasma membrane is not exactly the same thing as the wall in your house, but it does hold parts of a cell inside. These parts of the cell are what biologists call "[organelles](#)." That is a Latin name for little organs.

Sometimes people think of cells as a balloon filled with fluid. That is not really true because a balloon does not let things move in and out like the membrane of a cell. It is important for cells to be able to move materials in and out of the cell.

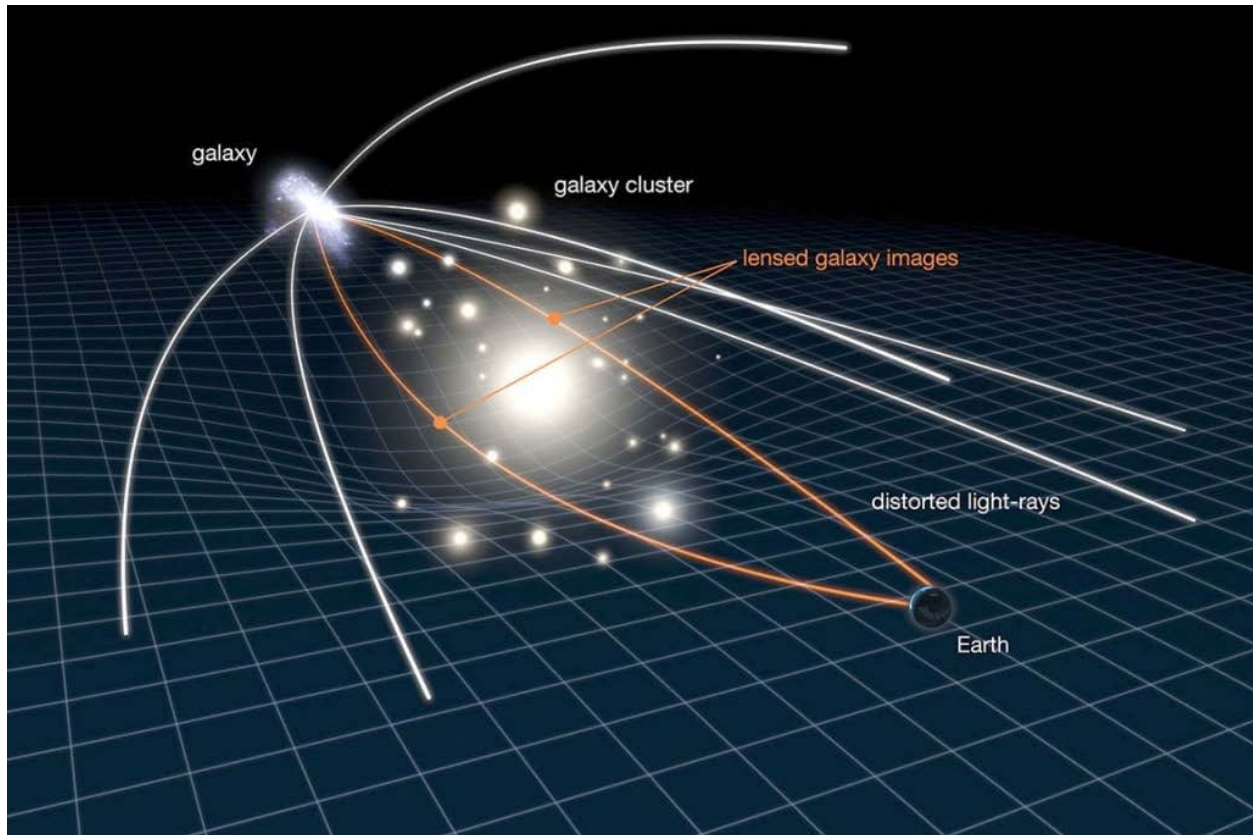


The plasma membrane in cells have special structures that allow water and other food materials to pass in and out of the cell. At thousands of places across its surface, the plasma membrane holds gatekeeper structures- called channels and pores. These channels allow things to move in and out of the cell. Not everything can freely pass in and out of the cell. The cells allow only those things which are necessary for them to function.

Cells are amazing. They are all made of similar building blocks, but they do many different things depending on how they are programmed. Some cells carry oxygen to parts of our body. Other cells defend against invading bacteria and viruses. There are cells that transmit signals through out the body like the signals from your eyes to your brain while reading this article. Some cells can even convert the sun's energy into food. This is called photosynthesis. There are hundreds of jobs that cells can do. Cells also make other cells in a process called [cell division](#). That is something other building blocks cannot do.

CUTTING-EDGE ASTRONOMY

Cutting-Edge Astronomy Confirms Most Ancient Galaxy to Date



This illustration shows how gravitational lensing works. The gravity of a large galaxy cluster is so strong, it bends, brightens and distorts the light of distant galaxies behind it. The scale has been greatly exaggerated; in reality, the distant galaxy is much further away and much smaller.

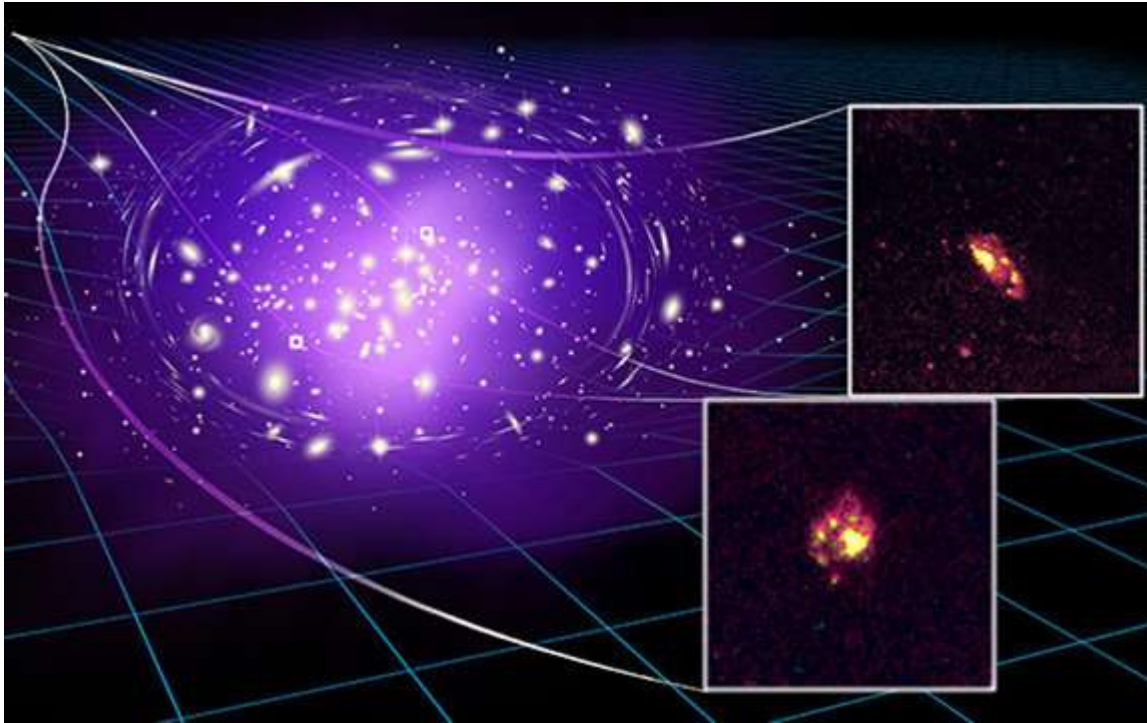
Credit: NASA, ESA, L. Calcada

Since the deployment of the [Hubble Space Telescope](#), astronomers have been able to look deeper into the cosmic web than ever before. The farther they've looked, the deeper back in time they are able to see, and thus learn what the Universe looked like billions of years ago. With the deployment of other cutting-edge telescopes and observatories, scientists have been able to learn a great deal more about the history and evolution of the cosmos.

Most recently, an international team of astronomers using the [Gemini North Telescope](#) in Hawaii were able to spot a spiral galaxy located 11 billion light years away. Thanks to a new technique that combined gravitational lensing and spectrography, they were able to see an object that existed just 2.6 billion years after the Big Bang. This makes this spiral galaxy, known as A1689B11, the oldest and most distant spiral galaxy spotted to date.

The study which details the team's findings, titled "The most ancient spiral galaxy: a 2.6-Gyr-old disk with a tranquil velocity field", recently appeared in *The Astrophysical Journal*. The team consisted of members from the Swinburne University of Technology, the Australian Research

Council Center of Excellence in All Sky Astrophysics in 3D (ASTRO 3D), the University of Lyon, Princeton University, and the Racah Institute of Physics at The Hebrew University in Jerusalem.



Spiral galaxy A1689B11 sits behind a massive cluster of galaxies that acts as a lens, producing two magnified images of the spiral galaxy in different positions in the sky. Credit: James Josephides

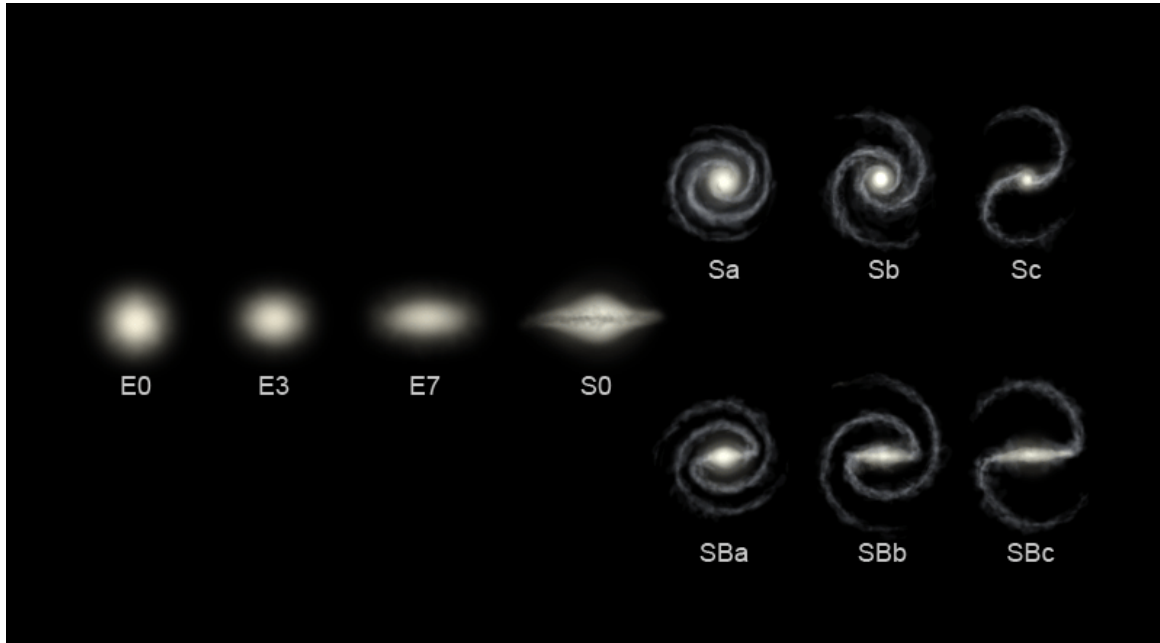
Together, the team relied on the gravitational lensing technique to spot A1689B11. This technique has become a mainstay for astronomers, and involves using a large object (like a galaxy cluster) to bend and magnify the light of a galaxy located behind it.

This technique allows us to study ancient galaxies in high resolution with unprecedented detail. They are able to look 11 billion years back in time and directly witness the formation of the first, primitive spiral arms of a galaxy.

They then used the [Near-infrared Integral Field Spectrograph \(NIFS\)](#) on the Gemini North telescope to verify the structure and nature of this spiral galaxy. This instrument was built Peter McGregor of The Australian National University (ANU), which now is responsible for maintaining it. Thanks to this latest discovery, astronomers now have some additional clues as to how galaxies took on the forms that we are familiar with today.

Based on the classification scheme developed by famed astronomer Edwin Hubble (the “Hubble Sequence“), galaxies are divided into 3 broad classes based on their shapes – ellipticals, lenticulars and spirals – with a fourth category reserved for “irregularly-shaped” galaxies. In accordance with this scheme, galaxies start out as elliptical structures before branching off to become spiraled, lenticular, or irregular.

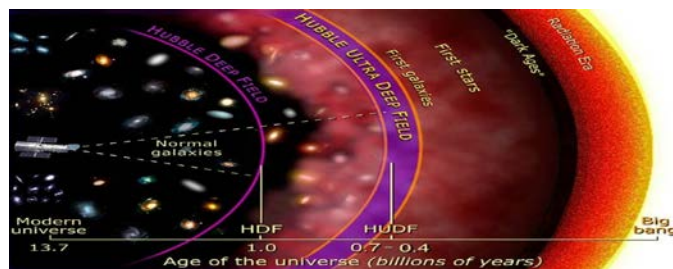
The following figure illustrates the Hubble sequence, showing elliptical galaxies (left) and evolving to fit the three broad categories (right) of ellipticals, lenticulars and spirals.



As such, the discovery of such an ancient spiral galaxy is crucial to determining when and how the earliest galaxies began changing from being elliptical to taking on their modern forms. As Dr Renyue Cen, an astronomer from Princeton University and a co-author on the study, says:

“Studying ancient spirals like A1689B11 is a key to unlocking the mystery of how and when the Hubble sequence emerges. Spiral galaxies are exceptionally rare in the early Universe, and this discovery opens the door to investigating how galaxies transition from highly chaotic, turbulent discs to tranquil, thin discs like those of our own Milky Way galaxy.”

“This galaxy is forming stars 20 times faster than galaxies today – as fast as other young galaxies of similar masses in the early Universe,” said Dr. Yuan. “However, unlike other galaxies of the same epoch, A1689B11 has a very cool and thin disc, rotating calmly with surprisingly little turbulence. This type of spiral galaxy has never been seen before at this early epoch of the Universe!”



The illustration above shows the depth by which Hubble imaged galaxies in prior Deep Field initiatives, in units of the Age of the Universe.

In the future, the team hopes to conduct further studies of this galaxy to further resolve its structure and nature, and to compare it to other spiral galaxies from this epoch. Of particular interest to them is when the onset of spiral arms takes place, which should serve as a sort of boundary marker between ancient elliptical galaxies and modern spiral, lenticular and irregular shapes.

They will continue to rely on the NIFS to conduct these studies, but the team also hopes to rely on data collected by the James Webb Space Telescope (which will be launched in 2019). These and other surveys in the coming years are expected to reveal vital information about the earliest galaxies in the Universe, and reveal further clues as to how it changed over time.

Article written:
by Matt Williams

A Giant Galaxy Orbiting Our Own Just Appeared Out of Nowhere?

Researchers scanning the skies just got a big surprise. They spotted a humongous galaxy orbiting our own, where none had been seen before. It appeared, seemingly, out of nowhere.

So, just how did the newly-discovered Crater 2 manage to pull off this feat, like a deer leaping from the interstellar bushes to stare us down through our collective headlights? Although the appearance may seem sudden, the fact is that Crater 2 has been there all along. We just missed it.

Now that we know it's there, though, there are a few other humiliating details that astronomers discovered. First of all, we can't blame the galaxy's size for its relative obscurity. Crater 2 is so enormous that researchers have already pegged it as the fourth largest galaxy orbiting our own. We can't blame its distance, either. Crater 2's orbit around the Milky Way puts it right in our neighborhood.

That said, how did we still not know it was there? A new paper out in *Monthly Notices of the Royal Astronomical Society* (you may want to save this site. Always has good stuff.) from researchers at the University of Cambridge has an answer for us. It turns out that, despite being large and close, Crater 2 is also a pretty dark galaxy. In fact, it's one of the dimmest galaxies ever spotted in the universe. That, along with some much brighter neighbors, let the galaxy that researchers have nicknamed "the feeble giant" escape detection until now.

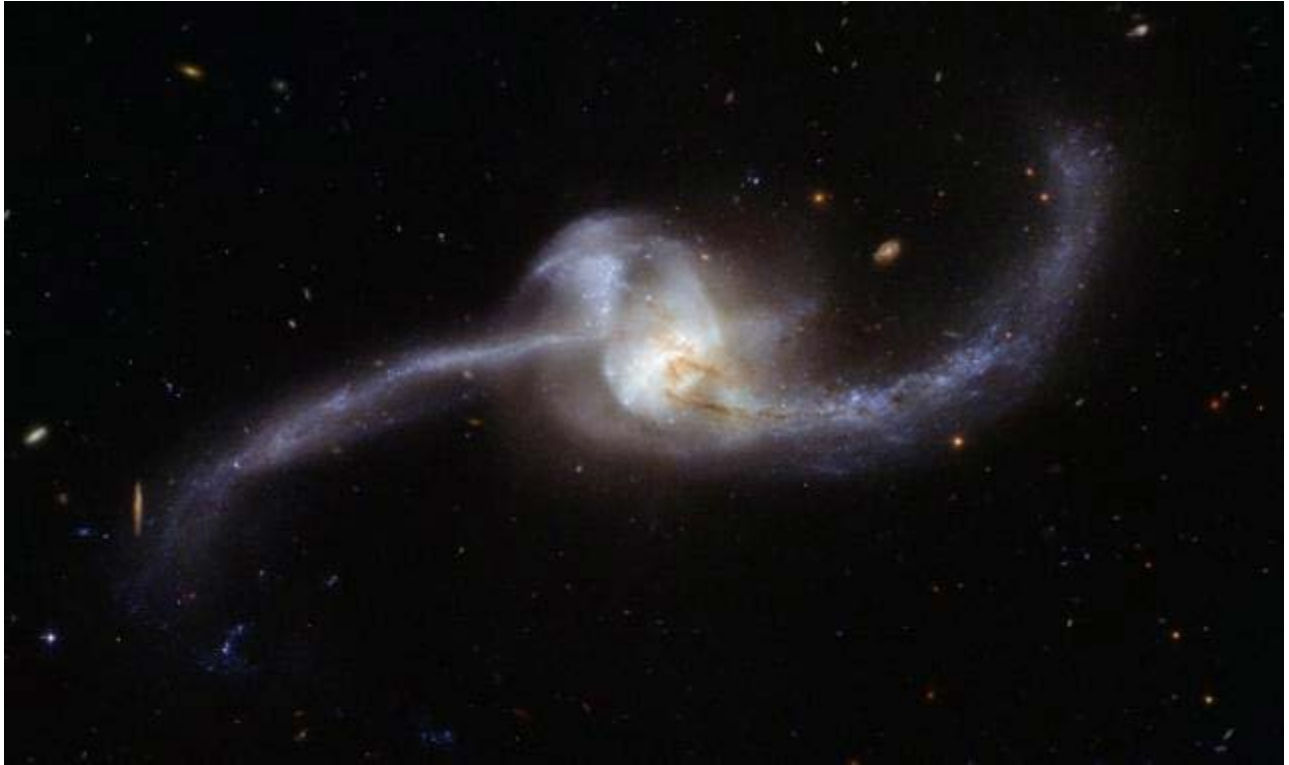
Now that we have seen Crater 2, however, the discovery raises questions about what else is out there. Researchers are already talking about mounting a search for similarly large, dark galaxies around us. It's a good reminder that there's still so much about space that we don't know.

NASA CAPTURES

https://www.youtube.com/watch?v=Xd8KPzJPO_U

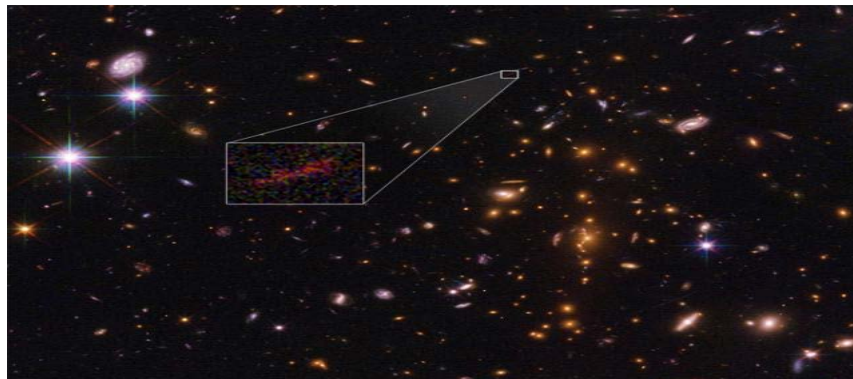
NASA captures rare image of a distant galaxy nearly as old as the Universe itself.

Zach Epstein, BGR News Tue, Jan 16



When astronomers at NASA capture images of far-off galaxies, they typically appear only as tiny red dots. These distant celestial bodies are so far away that even the strongest telescopes are usually incapable of distinguishing between the many stars contained within a galaxy. In an exciting turn of events, however, NASA's Hubble Space Telescope managed to capture a rare up-close view of the farthest and oldest galaxy known to man. In fact, this particular galaxy is so old that it's nearly as old as the Universe itself.

In a remarkable case of being in the right place at the right time, NASA scientists managed to capture a remarkably detailed shot of a galaxy called SPT0615-JD. The name might not be very catchy, but the significance of this image is huge. The image below shows the oldest galaxy known to man with an amount of detail that should be impossible.



“This Hubble Space Telescope image shows the farthest galaxy yet seen in an image that has been stretched and amplified by a phenomenon called gravitational lensing,” NASA explained in a post on its website.

NASA explains that several early galaxies in this age range have been photographed in the past, they have always appeared merely as small red dots because of their small size and the tremendous distance between these galaxies and Earth. In this case, however, a happy accident allowed NASA’s Hubble Space Telescope to capture a surprising amount of detail. The gravitational field created by a cluster of galaxies called SPT-CL J0615-5746 that sits between us and SPT0615-JD distorted light in such a way that the image above could be captured.

“The gravitational field of a massive foreground galaxy cluster, called SPT-CL J0615-5746, not only amplified the light from the background galaxy but also smeared the image of it into an arc (about 2 arcseconds long),” NASA explained. “Image analysis shows that the galaxy weighs in at no more than 3 billion solar masses (roughly 1/100th the mass of our fully grown Milky Way galaxy). It is less than 2,500 light-years across, half the size of the Small Magellanic Cloud, a satellite galaxy of our Milky Way. The object is considered prototypical of young galaxies that emerged during the epoch shortly after the big bang.”

According to astronomers, the SPT0615-JD galaxy has existed for more than 13 billion years. The Universe itself is believed to be between 13 billion and 14 billion years old, which means SPT0615-JD could be among the first galaxies created by the Big Bang.