

SCISOC UNCHARTED



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Take a mysterious journey into the unknown beyond the planet SCISOC calls home. Get ready to be WOWed as we uncover mysteries and explore theories.

EDITOR'S NOTE

Dear reader,
Humans have explored 65% of Earth's many surfaces, but can you believe that we have only explored 5% of the Earth's oceans???

That's Crazy!!!!

We know everyone's been travelling around the world but have you ever wondered what it would be like to explore intricate hidden caves, subterranean terrain or the cosmos? Follow us as we dive into the wonderful worlds hidden away and chart the uncharted.

We are UNSW SCISOC's Publications portfolio and we would like to thank you for picking up this publication! For a while now we have been working hard to curate this small selection of articles for you and thus are very excited to set sail with you!

Our portfolio has been working diligently these past few months diving into how humans have begun exploring the unknown areas of Earth, in particular cave formations, the deep sea, mysteries of the galaxy in which Earth is situated. We even dug into the inventions that have helped propel our advancement in the aforementioned industries.

We hope you find this voyage enjoyable and are able to learn something new from it!

Get ready to chart the uncharted!

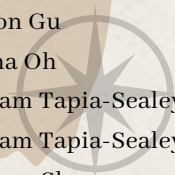
Sincerely,
Publications Portfolio 2023



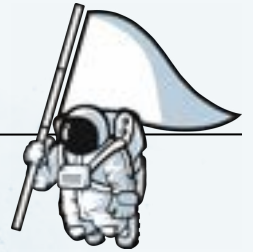
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SPACE INVENTIONS



Telescope

Telescopes were first created in the Netherlands in 1608 and were initially created to view things from afar. A telescope is an optical instrument designed to observe distant objects by collecting and magnifying light. It consists of lenses or mirrors that gather and focus light, enabling us to see celestial objects such as stars, planets, galaxies, and nebulae.

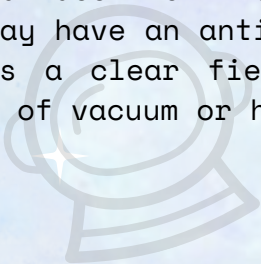
Telescopes have helped us discover new planets, moons, and comets in our solar system, as well as distant galaxies and black holes. Telescopes placed in space, such as the Hubble Space Telescope, have provided exceptionally clear and detailed images of distant objects by avoiding the distorting effects of Earth's atmosphere.



Space Helmet

The space helmet! Originally made in the 1930s, this is a very crucial part of gear that helps humans breathe outside the Earth's atmosphere. To be frank, without it, exploring space would be near impossible outside of a ship. However, the space helmet has much more functions!

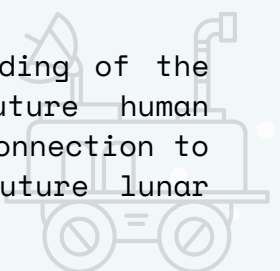
The helmet also features a visor made of a strong and transparent material, usually a polycarbonate or acrylic faceplate, which protects the astronaut's eyes and face from micrometeoroids, space debris, and harmful radiation. The visor may have an anti-glare coating to reduce sun glare and reflections. It provides a clear field of view while maintaining a seal to prevent the ingress of vacuum or harmful gasses.



Lunar Rover

A Lunar rover is a type of robotic vehicle designed for exploration on the Moon. It is specifically built to operate in the lunar environment and is used to conduct scientific experiments, gather data, and explore the lunar surface. The Lunar Roving Vehicle (LRV) was built for NASA in Boeing's Environmental Test Laboratories in Kent, Washington in 1969. It was finally launched on July 26, 1971.

The data gathered by Luna rovers contributes to our understanding of the Moon's geology, its resources, and its potential for future human exploration. It helps scientists study the Moon's history, its connection to Earth's past, and provides valuable insights for planning future lunar missions and potential human settlements.



SEA INVENTIONS

Standard Diving Dress

The old scuba diving equipment served as the predecessor to the modern-day scuba gear that derives its success from its efficiency and convenience. The former gear comprised a wetsuit formed out of a thick sheet of rubber encased within layers of tan twill to form a waterproof canvas that could then be molded to fit the body, providing insulation as well as a safeguard against potential injuries.

The significance of this invention stems from the seemingly counterintuitive head piece statement that was a hefty metallic helmet worn on top of the bearer's head. However, whilst the old scuba gear was essentially a carbon copy of astronaut gear but underwater and demanded considerable physical exertion, it played a crucial role in the progression of diving equipment.

Submarines

The submarine was a vessel created with the intention of allowing land-dwellers to undertake underwater exploration to a greater extent than traditional scuba gear could allow. The machinery enabled us curious humans to spend greater lengths of time underwater exploring not only the sea floor but also propelling our research of marine lifeforms. The evolution of submarines utilise complex biomechanical engineering developed over the course of several centuries with early prototypes dating back to ancient times.

Nowadays, they are equipped with powerful engines, propellers, and ballast tanks that enable them to dive and resurface without a lower risk of mechanical failure. These vessels now play a crucial role in various domains, from scientific research to military operations.

Seafloor Mapping

Seafloor mapping is a sound propagation technique used to create detailed maps of underwater environments. A sonar mapping system typically consists of a transducer that emits sound waves and a receiver that detects the echoes produced by these waves bouncing off underwater objects. By analysing the time it takes for the sound waves to return and their intensity, sonar mapping can accurately measure the depth of the water and create high-resolution images of the seafloor and submerged structures.

Sonar mapping has revolutionised our understanding of the ocean and its ecosystems, allowing us to explore and study these underwater realms to the best of our abilities.



INTO THE DEPTHS

The ocean is a place that inspires both awe and fear. The seemingly unending abundance of the sea supports millions if not billions of people and the call of the oceans is one entwined with the history of humanity; who knows where we would be if people didn't stare out into the horizon and wonder what could be on the other side of the vast open seas. Now however, it seems all exploration is done with the surface of this blue planet being known. The depths, however, are another story.

There is a reason they call earth the blue planet, with **the ocean covering 71% of Earth's surface** there is a phenomenal amount of water. Something which has always gripped people with either excitement or terror at what may lay below the deep blue.

Whether you find it interesting or terrifying, join us as we take you on a tour of our oceans, and uncover some of the secrets of the depths.



The Surface

The surface is somewhere we'd say most people are comfortable or at the very least familiar. In Australia, it is estimated that as a population, we visit the beach more than **300 million times each year**. A staggering number when our population of 25 million is taken into account. The surface and the coast are a hotspot for life, with sun able to reach the seafloor the proliferation of plants, bacteria, and marine creatures is apparent. This is known as the **Euphotic** (or sunlight) zone.



The **Manta Ray** is a behemoth among the rays, and the euphotic zone. With a wing span of up to 9 metres and being able to weigh over 2 tonnes, Manta Rays are massive. Shockingly, with an equally massive brain in comparison to their body weight, Manta Rays are considered to be some of the **most intelligent species not only in the ocean but on the planet**, with recent studies revealing that they show signs of self-awareness. However, these beautiful brainiacs are unfortunately considered a threatened species due to the effects of commercial fishing.



Coral is a vitally important organism. Secreting a hard, calcium-carbonate exoskeleton, the coral polyps, whilst able to protect themselves from predators, are incredibly sensitive to many environmental conditions. **Coral reefs are among some of the most biodiverse ecosystems on the planet** and with the danger coral is facing, many reliant species are subsequently under threat as well.

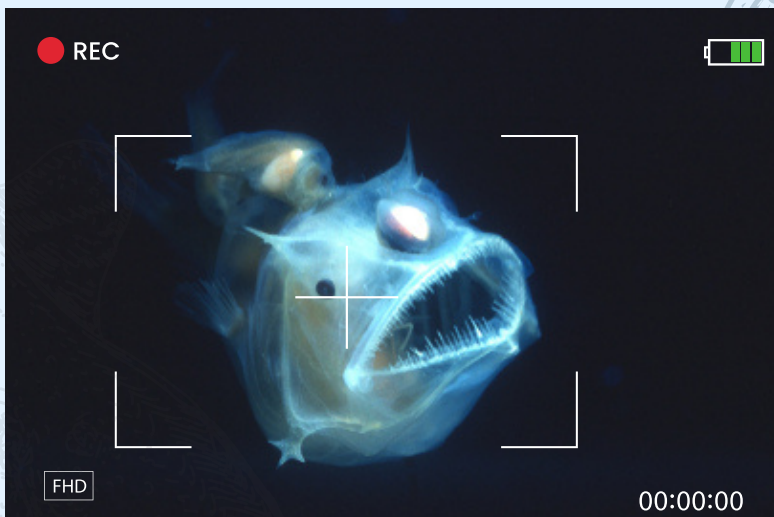


The Twilight Zone

Delving further below, where the sunlight begins to dwindle, we are now entering the **Disphotic zone**. Also known as the **Twilight zone**, this is a fitting name where the first traces of the abyss start to become apparent. **The disphotic zone truly embodies an intermediary zone**, with enough light for visual predators to hunt, yet plentiful darkness for alternative organisms to thrive. Enough sunlight for photosynthesis to occur, but so little that the rate of respiration is greater than the rate of photosynthesis. Few organisms venture here, let alone survive and thrive in these conditions, so those who do truly look like creatures that can survive the near unlivable environment.



The Giant Squid is a creature that has earned a place in legend and rightfully so. Despite growing up to 43 feet in length, they are shockingly elusive organisms. The first ever images of a Giant Squid were recorded in 2004 by a team of Japanese researchers. To this day, sightings and video footage remain rare with few people ever seeing a living specimen in the flesh. **Estimates place the population size at vastly different figures**, with some suggesting there could be around a few million, with other estimates suggesting there could be over 100 million dwelling in the depths.



The **Gulper Eel**, also known as The **Pelican Eel**, is a deep sea organism, which like a Pelican, is able to open its mouth incredibly wide, allowing it to swallow prey much larger than itself. The Jaw of the Gulper Eel is so large that it is estimated to be about a quarter of the eels entire body length. Interestingly, unlike other deep sea organisms, **the Gulper Eel has very small eyes, with it being believed they evolved to detect traces of light** rather than enable sight in the traditional sense. The gulper eel also has a long tail, with a complex organ that enables bioluminescence through photophores. It is theorised that this could be used for movement, communication, and luring in prey.



The Abyss



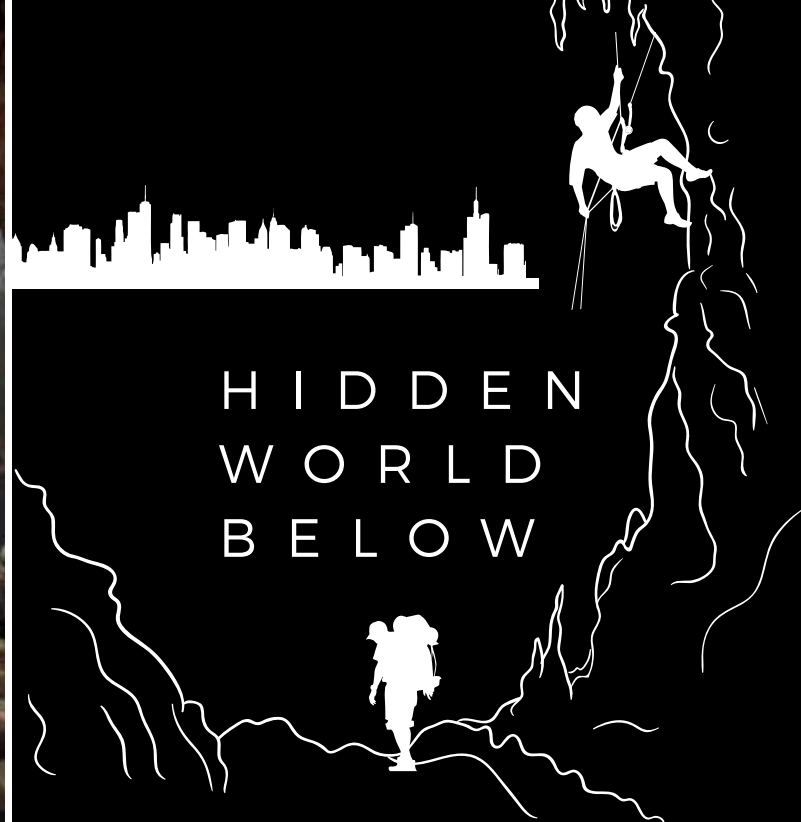
The **Vampire Squid** is at home in extreme deep sea conditions. With its latin name translating to “**Vampire Squid From Hell**” this organism uses its **distinctive oxygen metabolism to survive in areas of the ocean with the lowest oxygen concentration**. Despite its name, the vampire squid is distinguished from both squids, and octopuses, being placed in its own order “**Vampyromorphida**”. They are covered in light producing photophores which allow it to produce distracting flashes of light, much like a light show at a performance.



Finally, we have reached **The Abyss**. An environment completely devoid of sunlight, here the organisms are unlike those found anywhere else. Between the darkness, the absence of plants, and the immense pressure of 1,000 metres of water above you, the creatures of the aphotic zone make you realise that the myths and legends of sea monsters aren't so far from reality.



An organism which has become synonymous with the life of the deep sea abyss, the **Angler Fish** is a creature that needs no introduction. One of the best examples of bioluminescence, the angler fish is covered in strange spines, has a **gaping maw full of needle-like teeth**, and a **long bioluminescent lure** that hangs from their forehead. This lure is used to attract prey, thus inspiring its name “Angler”. A phylogenetic study suggests that anglerfish diversified from other species around the mid-Cretaceous, roughly 130 to 100 million years ago.



DEEP IN THE DEPTHS OF THE EARTH, BENEATH OUR FEET, LIE CAVERNS;

DEEP, CRAMPED, YAWNING. UNTOUCHED.

The sense of mystery and mystique that drives forward the desire to explore uncharted territory, pioneers of worlds old and new are drawn to crawl and clamper down further into the unknown.

To the uninspired, caves are little more than rock formations in the ground - who would want to go there?

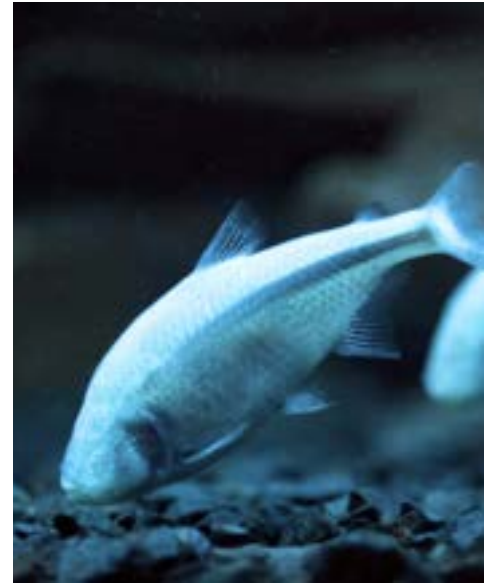
However, to those who are fascinated by the natural world and the unknown, caves are a source of wonder and intrigue. Caves provide a glimpse into a hidden realm, where unique biological adaptations have led to the evolution of a wide range of specialized species. These underground ecosystems have been studied by scientists for decades, revealing a world that is just as complex and diverse as any above ground.



Alien adaptations...



Secluded and hidden away from the sways of weather, the ecosystems in caves are alien and boast conditions unsuitable for typical species.



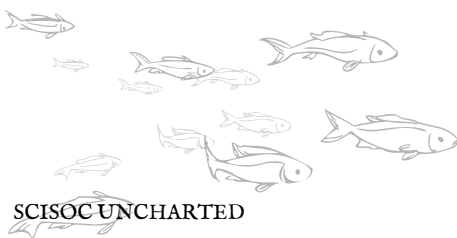
Secluded and hidden away from the sways of weather, the ecosystems in caves are alien and boast conditions unsuitable for typical species. Cave ecosystems are unique and challenging environments, characterized by complete darkness, limited resources, and extreme conditions such as low oxygen and high humidity.

To survive in these harsh conditions, many species have evolved specialized adaptations that allow them to thrive in the cave ecosystem.



Similar to biological adaptations to marine life in the lightless aphotic zone of the ocean, many species have adapted to cave ecosystems through loss of eyesight and pigmentation, as these aren't necessary and can even be disadvantageous adaptations for survival.

Take for example, the *Astyanax mexicanus*. The blind cavefish, also known as the blind cave tetra, or the mexican tetra, has lost its eyesight in exchange for an highly sensitive lateral lines, sensory organs which detect changes in water pressure.



A closer look...

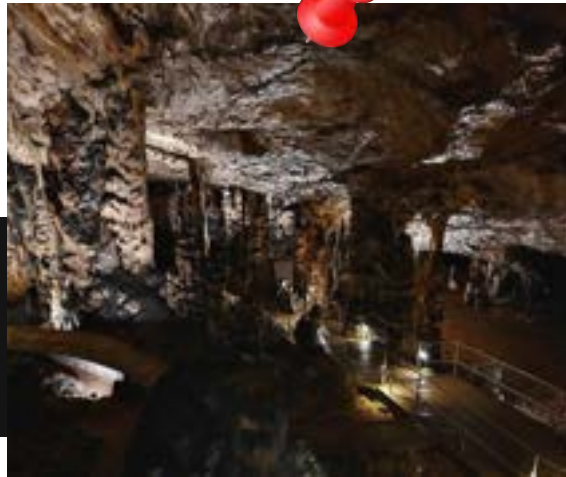
the world's most beautiful cave formations

Cave exploration has progressively heightened in correspondence with technological advancements over the past centuries. Through the exploration of these hidden gems, many stunning and unique cave formations have been discovered.



Waitomo Glow Caves

Bioluminescent glowworms light up the ceiling, creating a vivid picture reminiscent of the stars.



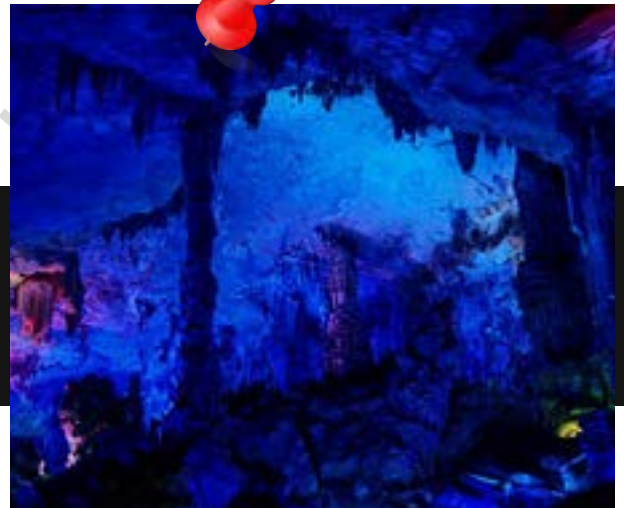
Hungary's Baradla Caves

The first written mention of the cave being in 1549, Baradla cave is now a world heritage site, and also the deepest cave in Hungary.



Slovenia's Skocjan Caves

Boasts one of the world's largest underground chambers. A real-life Minecraft ravine...



Guilin's Reed Flute Cave

Named after the reeds used to make flutes grown outside the cave, the Reed Flute Cave is deeply engrained into Chinese culture.

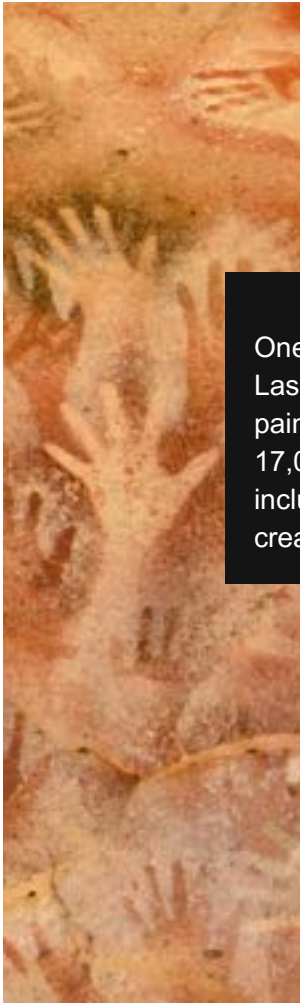


From a time long past...

echoes of a people lost to time

While we appreciate the beauty of cave formations in the present, caves themselves carry echoes of the prehistoric past; cave paintings and fossils dating back millions of years.

These imprints from our ancestors give insight into an ancient world, culture and history.



The Lauscaux Caves

One of the most famous examples of cave art can be found in Lascaux Cave in France. The cave is home to over 600 paintings, which were created by prehistoric people around 17,000 years ago. The paintings depict a range of animals, including horses, bulls, and deer, and are thought to have been created for religious or ceremonial purposes.



The Altamira Caves

In 1868, a chance incident led to the discovery of Altamira Cave by Marcelino de Sautuola. The paintings in Altamira Cave are thought to have been created around 15,000-20,000 years ago, during the Upper Paleolithic period. They are considered to be some of the finest examples of prehistoric art in the world, due to their fine level of detail and realism - some appearing to be in motion.

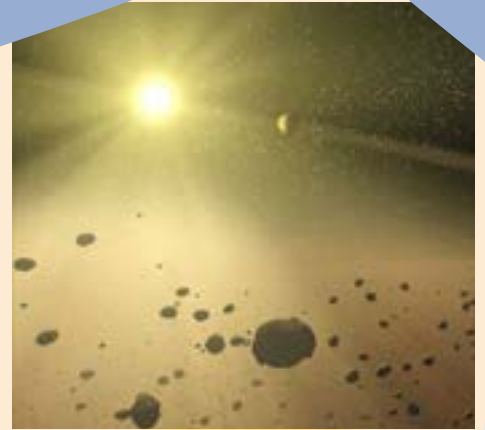


Mysteries in Space

Tabby's Star KIC 8462852

Mystery of Tabby's star

The mystery surrounding Tabby's star stems from observations of dimming of up to **20%** over a matter of days and returning as if nothing happened, additionally, to this **unusual dimming** the star has a much subtler but longer-term dimming trend. Although these behaviours are not expected for normal stars of similar mass to the Sun, astronomers have come up with theories ranging from a **giant cloud of dust** surrounding the star to an **alien megastructure** such as **Dyson Spheres** mining the star.

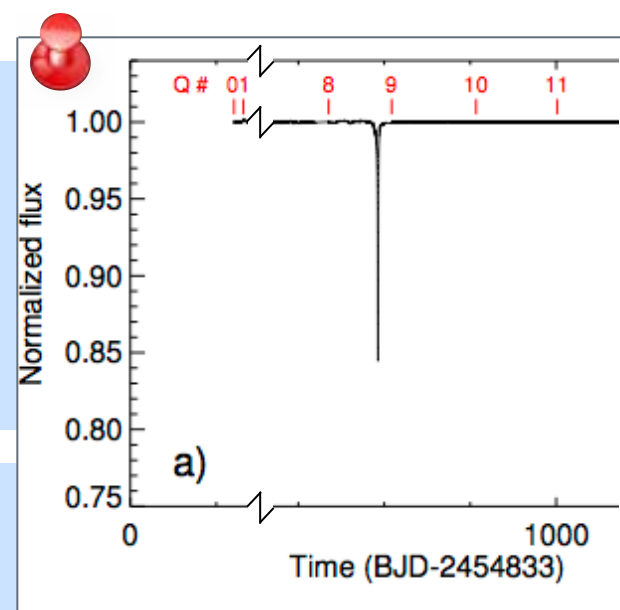


Tabby's star, officially known as Boyajian's star or KIC 8462852, is a F-type main sequence star located in the constellation Cygnus approximately **1500 light years** from Earth. The widespread fascination with Tabby's star in the astronomy community stems from its **unusual fluctuations** in brightness of the star. The star's unusual dimming behaviour was first detected between **2009 and 2013** by NASA's Kepler spacecraft but was only later confirmed in 2015 by a team of astronomers led by **Tabetha Boyajian**.

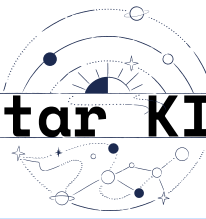
History and Patterns

In 2011 Kepler's Spacecraft observed a **15% dip** in the star's brightness and another massive **20% dip** followed by a series of smaller dips in **2013**, astronomers were shocked by this data as these dips are **not symmetrical** and even planets as massive as **Jupiter only cause a 1% dip** in brightness. This means the object passing in front of Tabby's star is over **1000 times as large as Earth** and is **not spherical**.

Although the Kepler spacecraft had moved onto a different mission, professional and **amateur astronomers** have continued observation in hopes of solving the mystery surrounding Tabby's star but unfortunately, **the star went quiet**.



Tabby's Star KIC 8462852

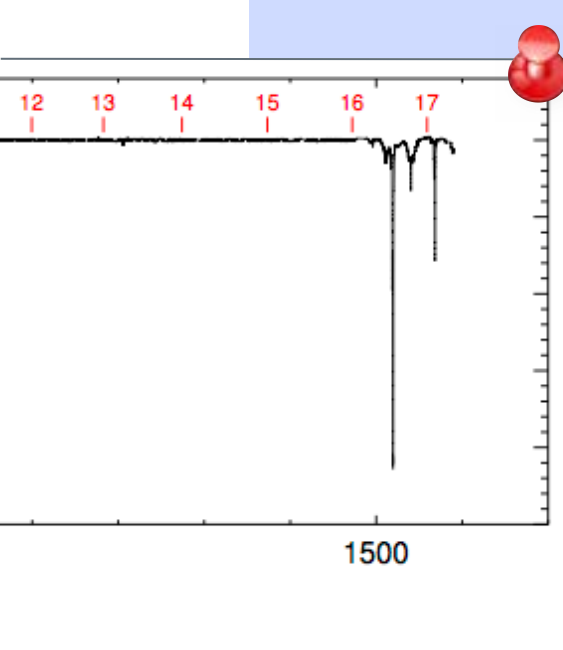


It was not until **May 2017** when a series of 4 distinct dips finally broke the silence, the signatures of the first 2 dips in the series **perfectly matched** up with the dips observed in the last few months of **Keplers mission in 2013**. From this information astronomers calculated the orbit of these objects to be approximately **1574 days**, this calculation was then supported as the next series of **dips appeared in 2021 just as expected**.

Theories

Popular theories surrounding Tabby's star's included theories of a **collision event** similar to the forming of Earth and the moon, or theories that the star was in its **early stages of development**. Although these theories could explain part of the data, there were **no signs of the star being young** nor was there any glow from any of the material surrounding the star which would be found if either of these theories were true.

In Boyajian's 2015 report "Where's The Flux?", she concluded that these dips were caused by a **massive swarm of comets** orbiting the star in an elliptical orbit. Although this would take **tens of thousands** of comets to produce such results as we observe, this theory consistently aligns with the data.



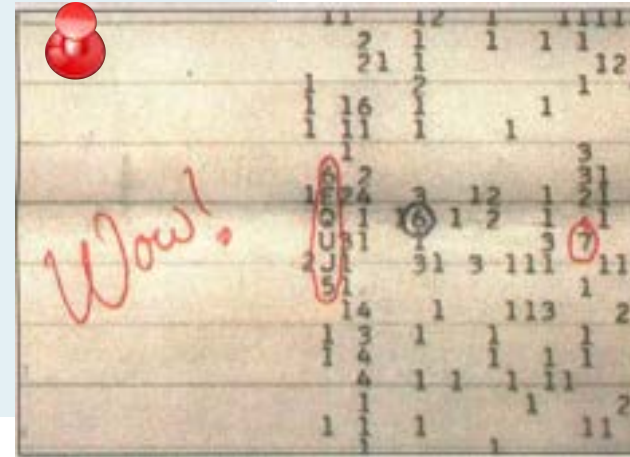
As the natural explanations for the unnatural dimming, citizen astronomers began resorting to **aliens** to explain this phenomenon. Many have theorised that aliens have built **megastructures over 40 million Km** in diameter surrounding this star in order to **mine for minerals or energy**. Although these megastructures orbiting the star at high speeds may explain the unnatural dips, we would expect heat radiation or dips on the infrared spectrum, but we don't observe this.

Astronomers **around the world**, professional and amateur, continue to observe and report findings on Tabby's star in hopes of finding an answer to this mysterious behaviour to help with the understanding of our universe or to potentially discover **new forms of life**.

The **WOW** Signal



In the infinite vastness of a universe full of secrets waiting to be explored, we often encounter captivating and puzzling phenomena that leave us in awe. One such enigma is the famous "**Wow Signal**," an **anomalous radio signal** detected in 1977 that has since remained one of the most intriguing and debated mysteries in the realm of astronomy. Captivating the imagination of scientists and enthusiasts alike, the Wow Signal continues to spark curiosity as we explore the possibility of **extraterrestrial intelligence** and the mysteries of the cosmos.



"The **Wow! Signal** is highly suggestive of extraterrestrial intelligent origin"
- Dr Kraus



On August 15, 1977, at the Ohio State University's Big Ear radio telescope, **Jerry R. Ehman** detected an unusual and powerful radio signal originating from a seemingly empty patch of space in the constellation **Sagittarius**. As Ehman reviewed the data, he circled the signal on the computer printout and wrote "**Wow!**" beside it, giving rise to the name that would forever be associated with this enigmatic event.

The Wow Signal's most intriguing aspect is its uniqueness. The signal was a **narrowband radio transmission** at a frequency of **1420.4556 MHz**, which coincidentally falls within the frequency range of **hydrogen**, the most abundant element in the universe. It exhibited a remarkable signal-to-noise ratio, appearing as a strong, continuous 72-second burst, nearly **30 times** above the background noise level.

Theories

Numerous theories have emerged over the years to explain the origin of the Wow Signal. Some suggest it was a natural **celestial phenomenon**, such as a comet or a burst of radio emissions from a previously unknown astrophysical source. However, extensive searches and observations have failed to reproduce the signal, casting doubt on these explanations.



The most attractive theory is that the signal was of artificial origin, emitted by an advanced **extraterrestrial civilisations**. This hypothesis ignited the imagination of many, envisioning the Wow Signal as our first contact with intelligent life beyond Earth. However, despite diligent efforts to detect similar signals and follow-up observations, **no conclusive evidence** has been found to support the extraterrestrial hypothesis.

The Wow Signal stands as an enduring enigma in the field of astronomy, captivating our imagination and pushing the boundaries of our understanding. While the true nature of the signal remains unknown, it has left an indelible mark on the scientific community's pursuit of answers to the age-old question: **Are we alone in the universe?** As we continue our explorations of the cosmos, the quest to unravel the mystery of the Wow Signal remains a testament to the enduring human curiosity and the allure of the unknown.



