

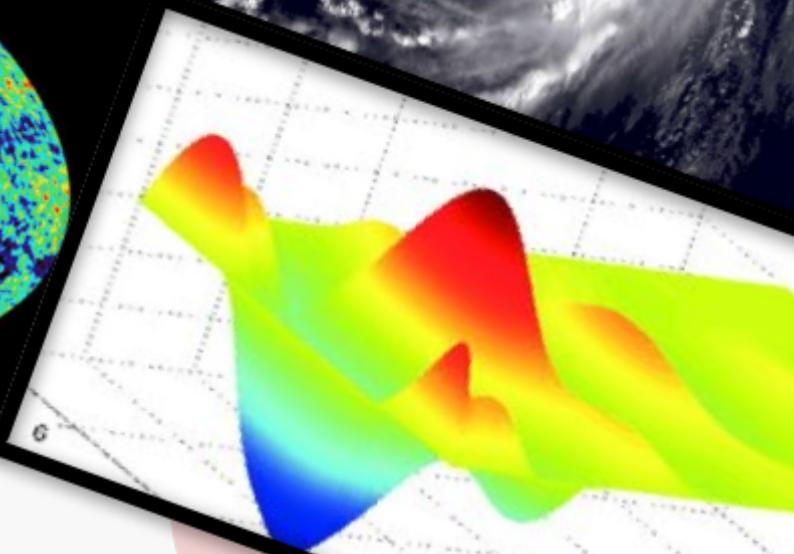
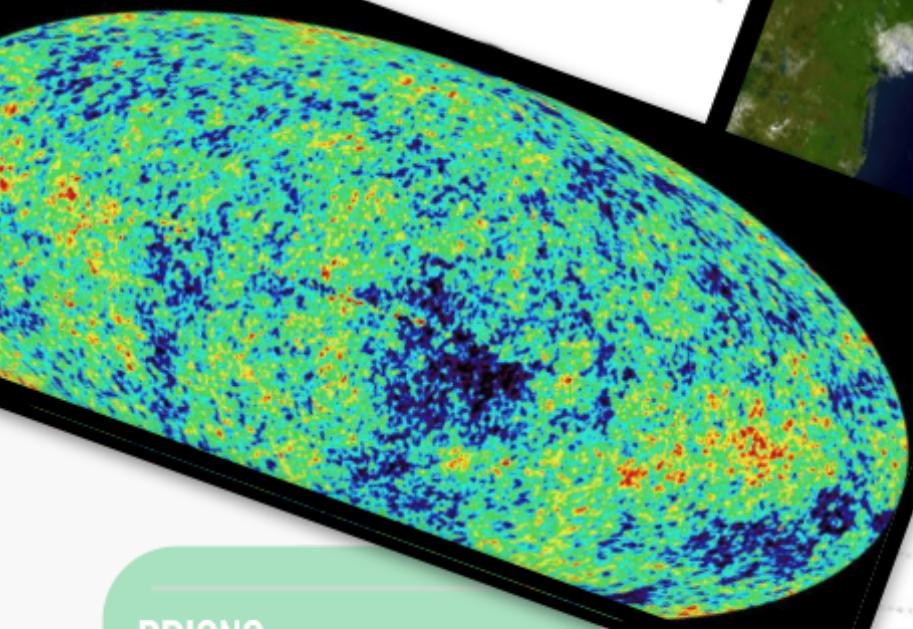
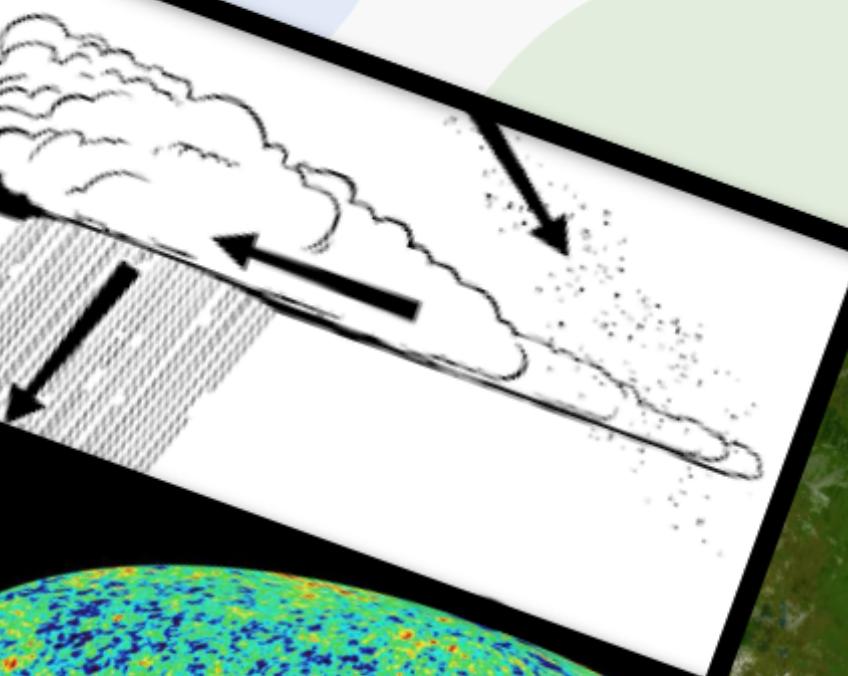
MAY 4TH, 2023

Seeking Science VOL 22

SEEKING SCIENCE

by STEM Action Teen Institution

A MONTHLY
STEM NEWSLETTER



PRIONS

FAST CHARGING

FOOD COLORING

and more...

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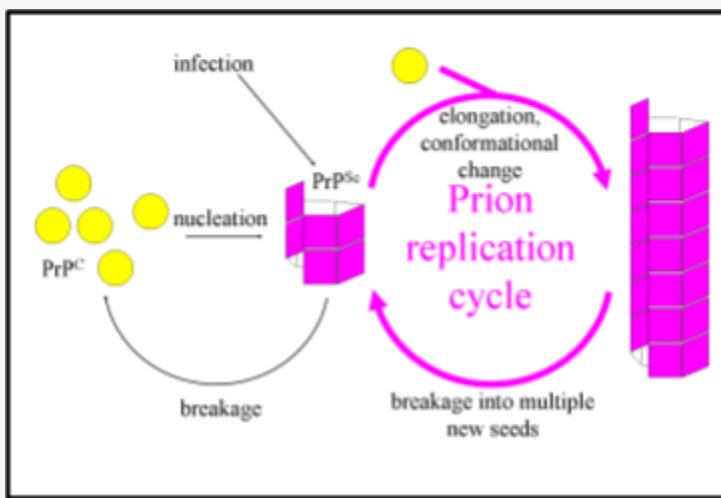
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Prions

Eddie Zhang

Prions are a kind of infectious agent made up of proteins. Unlike viruses and bacteria, they don't have DNA or RNA. Prions cause neurodegenerative diseases, such as Creutzfeldt-Jakob disease in humans, Bovine Spongiform Encephalopathy (BSE) in cows, and Chronic Wasting Disease (CWD) in deer and elk. These diseases happen when abnormal, misfolded proteins collect in the brain, leading to cell death and neurological decline.



"File:Prion Replication.jpg" by Joannamasel at English Wikipedia,
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<https://pixabay.com/illustrations/dna-helix-string-biology-3d-1811955/>

A unique fact about prions is that they can spread the disease without needing nucleic acids (DNA or RNA). They do this by making normal proteins misfold and collect into solid structures, which then convert even more normal proteins into the misfolded state, creating a positive feedback loop. This creates prion collections that spread through the brain, resulting in potentially lethal diseases. Researchers don't completely

understand how prions spread, but they know that it's important for the development and transmission of prion diseases.

There's currently no known cure for prion diseases, and treatment options are limited. The best way to control these diseases is to prevent prion transmission. This can be done by following strict regulations on animal-derived products in the food chain and taking safety measures in labs where prions may be present.

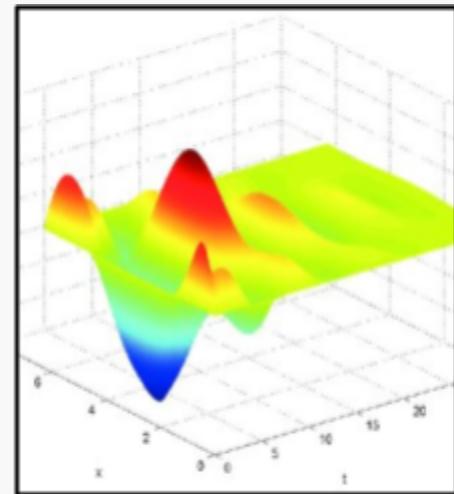
Overall, prions are an interesting kind of infectious agent that present unique challenges when it comes to understanding and controlling neurodegenerative diseases. Although researchers have made progress in prion research, there's still much to learn about how these pathogens work and how to develop effective treatments and prevention strategies.

Optimizer Functions in Artificial Intelligence

Stephen Hung

As the field of artificial intelligence (AI) continues to evolve and become more sophisticated, the need to optimize machine learning models has become increasingly crucial. One of the most crucial aspects of creating high-performing models is choosing the appropriate optimizer function.

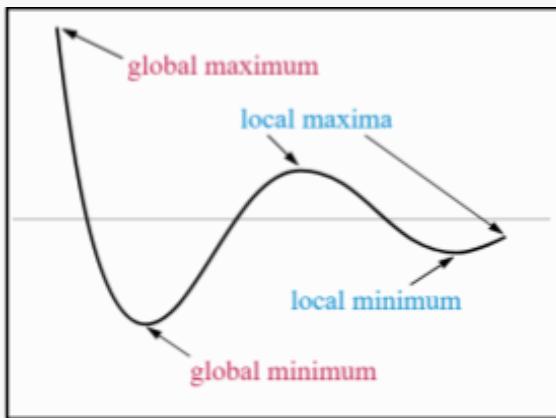
Gradient Descent, the most commonly used optimization algorithm in machine learning, functions by iteratively adjusting model parameters to minimize the difference between predicted and actual values, by moving in the direction of steepest descent. This algorithm has several variations, such as Stochastic Gradient Descent (SGD) and Mini-Batch Gradient Descent. Although Gradient Descent is computationally efficient and widely applicable to many problems, it is sensitive to the initial learning rate and dataset size. Additionally, it may get stuck in local minima, necessitating a large number of iterations to converge.



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https://www.researchgate.net/figure/Surface-plots-of-approximate-solutions-w_fig1_361249473

RMSprop is an optimization algorithm that adapts the learning rate of each parameter based on the moving average of the squared gradient for that parameter. This helps to stabilize the learning process, particularly in cases where the gradients can be noisy or sparse. RMSprop is known for its ability to handle non-stationary objectives and

adapt to dynamic changes in the training data. However, it can be sensitive to the choice of initial learning rate and may get stuck in local minima.



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The Adam optimizer is another popular optimization algorithm that improves upon RMSprop. This adaptive optimization algorithm computes learning rates for each parameter and stores an exponentially decaying average of past gradients. Adam optimizer is known for its fast convergence and robustness to noisy gradients, making it particularly useful in deep learning models. However, its adaptive learning rates may result in poor generalization if the training data is not representative of the test data.

In conclusion, optimization is a critical component of machine learning, and the choice of optimizer function can have a significant impact on model performance. While there are many optimizer functions available, each with its unique strengths and limitations, it is essential to choose the right one for a particular use case. By understanding the differences between optimizer functions, one can make informed decisions when designing machine learning models.

Tornadoes vs Hurricanes

Riley Lee

Tornadoes and hurricanes are two of the most powerful and destructive weather phenomena on our planet. While they share some similarities, such as their ability to cause widespread damage and loss of life, they also have distinct differences in how they form and develop.

Tornadoes are typically formed from large thunderstorms. When warm, moist air rises rapidly into the atmosphere, it can create a rotating column or group of air called a mesocyclone. If this column or group of air reaches the ground, it becomes a tornado. Tornadoes can form at any time of the year, but they are most common in the spring and early summer when warm, moist air from the Gulf of Mexico meets cooler air from the north. The most destructive tornadoes are typically produced by supercell thunderstorms, which are large, rotating thunderstorms that can be active for several hours.



"Oakfield Tornado 71896" by Cailyn Lloyd, licensed by Wikimedia Commons, under CC BY-SA 4.0.
https://commons.wikimedia.org/wiki/File:Oakfield_Tornado_71896.jpg

Hurricanes, on the other hand, are large, organized storms that form over warm ocean waters. They are characterized by their circular shape and their low-pressure center that draws in warm, moist air from the surrounding ocean. As this warm, moist air rises, it cools and condenses, forming clouds and releasing heat energy. This heat energy is what powers the hurricane, causing it to become more powerful and bigger. Hurricanes typically form in the late summer and early fall, when ocean waters are at their warmest.



Both tornadoes and hurricanes can cause significant amounts of damage and loss of life. Tornadoes are typically smaller and more localized than hurricanes, but they can still pack a powerful punch. The most destructive tornadoes can have winds of 300 miles per hour and can leave a trail of destruction several miles long. Hurricanes can be hundreds of miles wide and can produce winds above 150 miles per hour. They can also cause storm surges that make a rise in sea level and can flood coastal areas and cause significant damage.

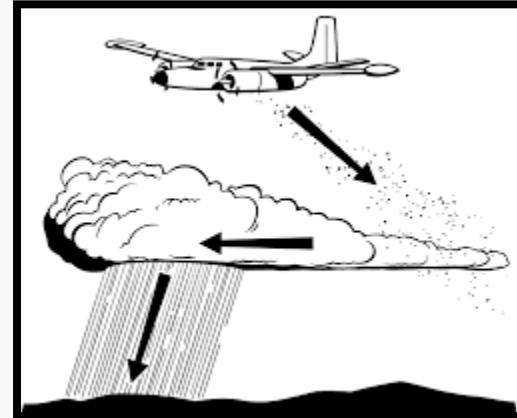
In conclusion, tornadoes and hurricanes are two of the most powerful and destructive weather phenomena on our planet. While they have distinct differences in how they form and develop, they share some common safety measures. By being informed about the risks and taking appropriate safety measures, we can minimize the impact of these storms and protect ourselves and our communities from their effects.

Cloud Seeding: Good or Bad?

Denise Lee

Have you ever heard of cloud seeding? Cloud seeding is a way we can produce rain or snow by introducing tiny ice nuclei that provide clouds with a base for snowflakes to form. Cloud seeding may seem like a great way to water the planet and fix drought problems, but it could lead to other environmental problems. Here are some pros and cons of cloud seeding.

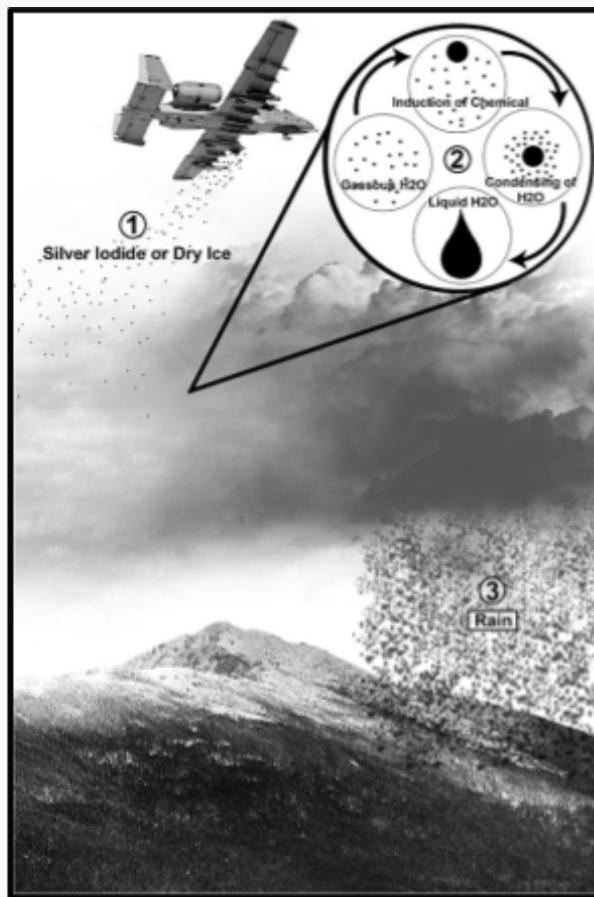
Some advantages of using cloud seeding are that cloud seeding enhances winter snowfall, elevates the natural water supply available to communities of the surrounding area, and boosts the economy. According to the Desert Research Institute (DRI), they say, “long-term cloud seeding projects over the mountains of Nevada and other parts of the world have been shown to increase the overall snowpack in the targeted areas by 10% or more per year.” Cloud seeding has been increasing snowpack which also waters the environment when the snow melts. The increase in snowpack can also benefit ski resorts and other businesses that rely on snow, by providing them with more snow and business. All in all, cloud seeding increases snowfall, enhances the natural water supply, and boosts the economy.



Although there are many great advantages of cloud seeding, there are also disadvantages of cloud seeding, such as the use of harmful chemicals, the health issues that cloud seeding may give animals and other living organisms, and the expenses. As reported by Janet Pelley, from Chemical & Engineering News (C&EN), “Silver iodide is the seeding agent of choice for cold clouds... ‘Nevertheless, if the practice of cloud seeding intensifies at a larger scale, silver toxicity and other environmental issues could

become a concern,' Jackson says."Silver iodide is a harmful chemical that is poisonous to fish. Since we eat fish, we may be consuming silver iodide, which may permanently affect internal orgasms and the body. WIRED shows that the cost for 1,000 hours of seeding is worth 1.25 million. In conclusion, cloud seeding involves harmful chemicals like silver iodide, which leads to health issues, and it is very expensive.

In conclusion, cloud seeding is a method using silver iodide to produce rain or snow. It may save the planet by enhancing rainfall which will increase the growth of living organisms, or it may harm the planet from its silver iodide and other toxic chemicals.



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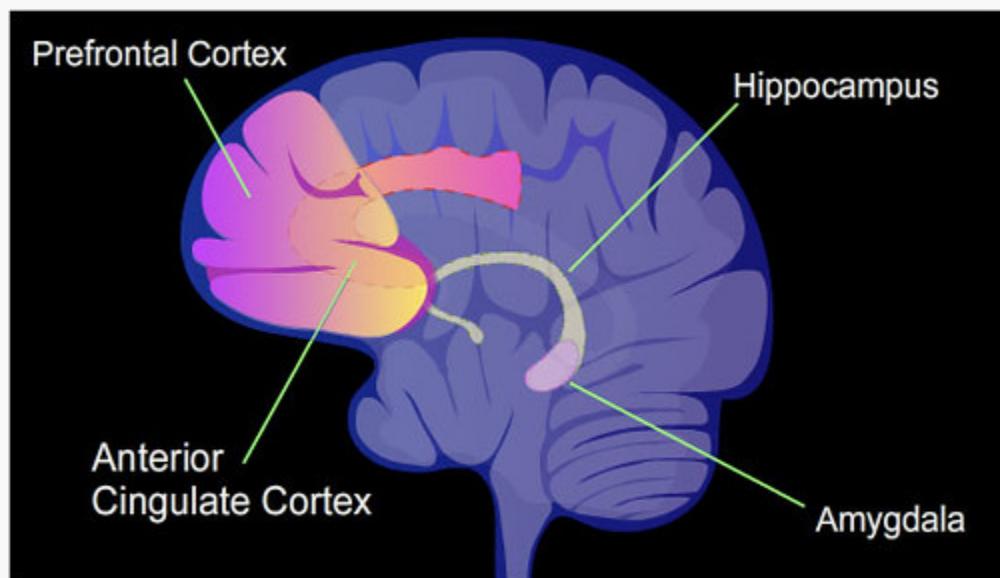
The Stages of Fear

Eason Fan

Fear is a complex and crucial process for human survival. While modern society may provide a sense of safety, understanding the stages of fear can help individuals navigate potential dangers.

The first stage of fear is sensing danger. The ears and eyes detect something unexpected, and this information is sent to the thalamus, which then signals the amygdala. The hippocampus plays a significant role in determining whether the threat is real and assessing its level of danger.

The second stage of fear involves sending signals to the nervous system. The amygdala releases neurotransmitters that alert the surrounding area of the brain. The signal is then passed to the hypothalamus, the control center of the brain, and the periaqueductal gray, which controls physical movement.



The third stage of fear is the physical response of the body. The amygdala sends a signal to the autonomic nervous system, releasing neurotransmitters like glutamate. The brainstem, particularly the Pons and Medulla, controls the autonomic nervous system functions like heart rate, breathing, and blood pressure.

The fourth stage of fear involves preparing the body for fight or flight. The amygdala signals the adrenal gland to release two chemicals: cortisol and adrenaline. Adrenaline provides the body with energy to take action, such as a faster heart rate, higher blood pressure, and respiratory rate.

After the fight or flight response, the body may experience sensations like freezing or sweating, which depend on the level of fear. The amount of sweat is categorized as upper or lower, depending on whether the threat is up close or far away.

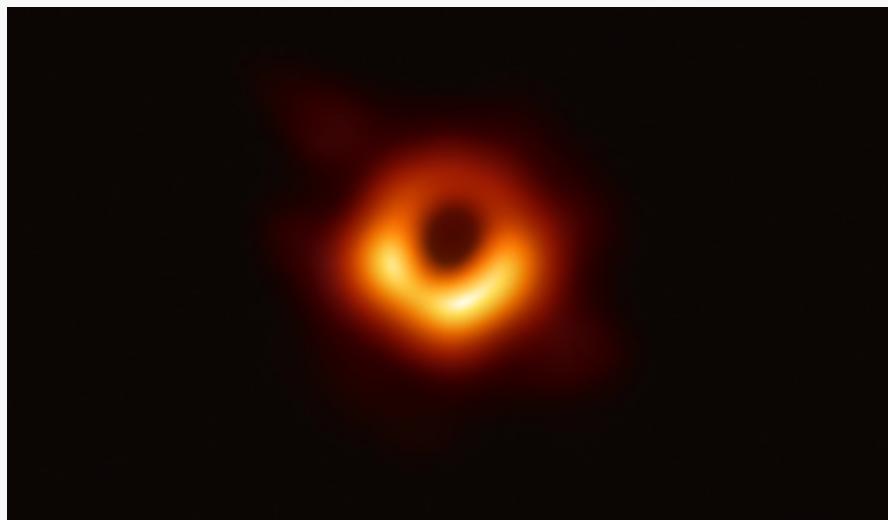
The final stage of fear is the body returning to a normal state. The parasympathetic nervous system lowers the flow of adrenaline and turns the heart rate back to normal, helping the body to calm down.

Understanding the stages of fear can help individuals recognize and manage their response to potential threats, ultimately contributing to their survival.

The Rogue Black Hole

Arthur Liang

Recently, astronomers have discovered a supermassive black hole that seemed to have been ejected from its home galaxy. Even more amazingly, it seems to have a trail of stars forming in its wake.



"First Image of a Black Hole", by European Southern Observatory, licensed under CC BY 4.0
<https://www.eso.org/public/images/eso1907a/>

The black hole was first observed as a bright streak of light on the Hubble Space Telescope, and initially it was just thought to be an imaging error by the telescope while it was observing a dwarf galaxy called RCP-28. However, in looking deeper at the phenomenon, scientists announced on April 6th that it was actually a supermassive black hole that pulled in compressed gas that followed in its wake, which formed a large string of stars.

Further observation showed that the trail is over 200,000 light years long, almost double the width of the whole Milky Way Galaxy. The compressed gas that forms the stars is estimated to have a mass 20 million times the mass of the sun and is moving at around 3.5 million miles per hour. The bright streak of stars seems to originate from the center of the dwarf galaxy, which could imply that this black hole was originally the core of the galaxy before it somehow was ejected. But how was this massive object kicked out of its galaxy?

One possible theory is a three-body interaction, where three similarly large celestial bodies interact gravitationally, leading to the ejection of one of the three objects. In other words, the black hole used to be a part of a pair with another black hole, but a third one came in and kicked this unlucky black hole out.

Big Data And Its Impact

Wilson Zhu

Big Data, as its name evidently says, relates to a big amount of data. More specifically, big data is a term, which has been used since the 1990s, that refers to extremely large data sets that have greater variety, arriving in increasing volumes and with more velocity. Variety, volume, and velocity are known as the three Vs that refer to the qualities of big data. Volume refers to the size of the data, velocity is the rate of flow, and variety is the types of data and sources. Secondly, there are also two additional Vs which are sometimes added and are described as veracity and value. Veracity refers to the quality and reliability of the big data and value refers to the usefulness of the big data.

The source of big data could be generated from sensors, satellites, audio, etc., and could have an enormous velocity of generation, this data has quantities of variety. Some of this data can have lots of veracity, or quality, and could have lots of value. Lots of this data are continuously generated from these sources which create the large volume that big data has. This big data is generated and processed by a variety of industries to better understand customers.

	A	B	C	D
1	Date	Income	Expenses	Profit
2	2005-12-17	235 €	128 €	107 €
3	2005-12-18	311 €	124 €	187 €
4	2005-12-19	457 €	466 €	-9 €
5	2005-12-20	232 €	132 €	100 €
6	2005-12-21	122 €	134 €	-12 €
7	2005-12-22	128 €	223 €	-95 €
8	2005-12-23	432 €	218 €	214 €
9	2005-12-24	256 €	121 €	135 €
10		2.173 €	1.546 €	627 €
11				
12	Avg. Profit	=AVERAGE(D2:D9)		

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Big data can have a significant impact on many businesses, and society. It has substantial value in things like understanding what customers would like in a product and this could help with business marketing since it can allow them to specifically choose an advertisement that would create a considerable amount of sales for the product. But

overuse of big data can create ethical challenges like how it can be used to bypass the privacy of many users and thus it is essential to use big data legally and ethically.

In summary, big data is referring to large data sets that are difficult to fully process. The three Vs or five Vs are used to describe the qualities of big data. This big data can be generated from various sources like sensors, satellites, and text. There are many uses that this big data can provide to diverse industries to better understand the needs of people. There are also legal and ethical problems relating to big data. All in all, big data is important since it is able to provide detailed insights.

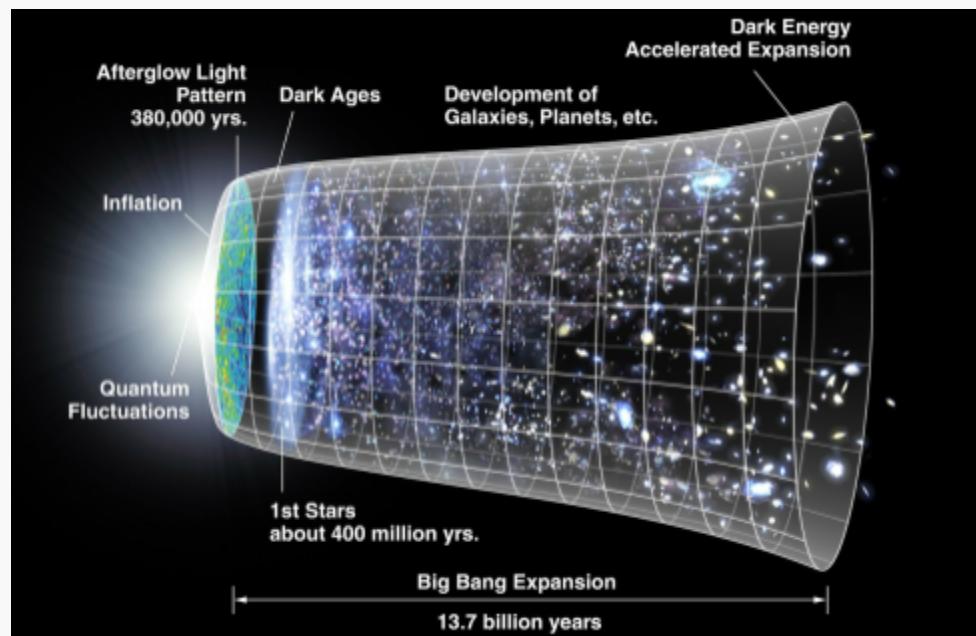


Birth of the Universe: The Big Bang

Cody Duan

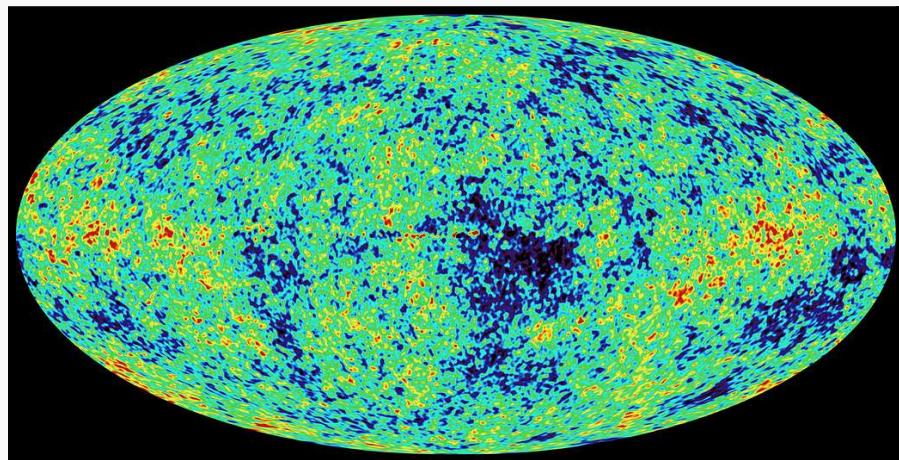
The Big Bang theory is a momentous part in the formation of the universe. Starting as a single infinitely dense and hot point, or singularity, the universe rapidly expanded into what we see today.

Around 13.8 billion years ago, a sudden spike in energy and radiation caused the expansion of the singularity. As a result of the cooling, the first atoms were created, followed by matter. Over time, celestial objects formed by the clumping of these atoms.



The redshift of galaxies is one important piece of evidence for the expansion of the universe. When light from other galaxies hits Earth, it becomes stretched and looks redder than it should be. The red is caused because the galaxies are moving away from us, which shows that the universe is constantly expanding.

Another piece of evidence for the Big Bang theory is the cosmic microwave background radiation (CMB). CMB is thought to be the leftover radiation from the rapid heating and cooling of the Big Bang. It represents leftover heat and is just above absolute zero. CMB is the afterglow of the Big Bang.



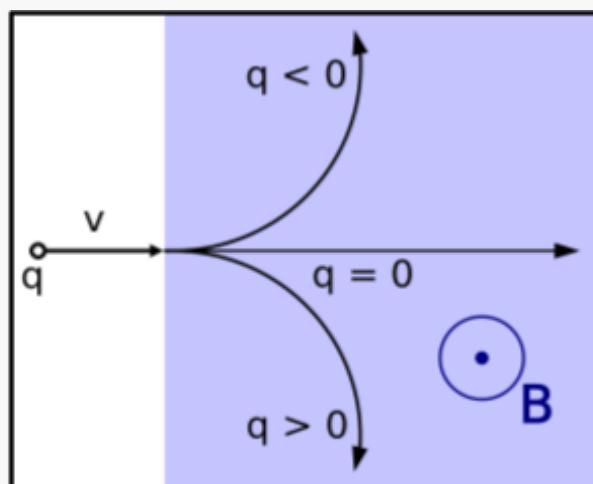
Although the Big Bang explains the beginning of the universe, it only provides an outer shell, as it does not explain why the singularity started expanding. It also does not explain dark matter and dark energy which makes up most of deep space. On the other hand, the Big Bang provides a sturdy pedestal for today's understanding of the universe, and it revolutionized our understanding of the cosmos. Even now it continues to play an active role in research.

All About Magnetic Fields

Owen Chen

A magnetic field is an invisible yet powerful force that has a significant impact on charged particles. It can alter the paths that these particles take, generate electricity, and even influence the behavior of atoms and molecules.

One of the most significant effects of magnetic fields is the Lorentz force, which causes charged particles to move in circular or spiral paths. This force is dependent on factors such as the particle's velocity, charge, and the strength and direction of the magnetic field. The Lorentz force is crucial in controlling the movement of charged particles in devices such as particle accelerators.



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Another crucial effect of magnetic fields is their ability to generate electric fields, as described by Faraday's law. The changing magnetic field around a closed circuit wire can produce an electric current. This concept forms the basis for generating electricity using magnets in devices such as generators.

Magnetic fields also play a crucial role in the behavior of atoms and molecules. For instance, strong magnetic fields in magnetic resonance imaging (MRI) machines align the spins of hydrogen atoms in the body to create signals used to produce detailed images of organs and tissues. Magnetic fields also affect electron behavior in materials, making them essential to technologies such as magnetic tape and computer hard drives.



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Understanding the effects of magnetic fields is critical for scientific and technological advancements in fields ranging from particle physics to medical imaging. As such, researchers in various scientific and engineering fields continue to study magnetic fields to unlock new applications and possibilities.

What is “Fast Charging”?

Aidan Hong

Many phones, like Samsung and Apple, often feature “fast charging.” Some may wonder what’s so special about this, and what’s the difference from their trusty, old 5V charger that came with their phone ten years ago. The difference is enormous, and new advances in phone ports are the culprit.

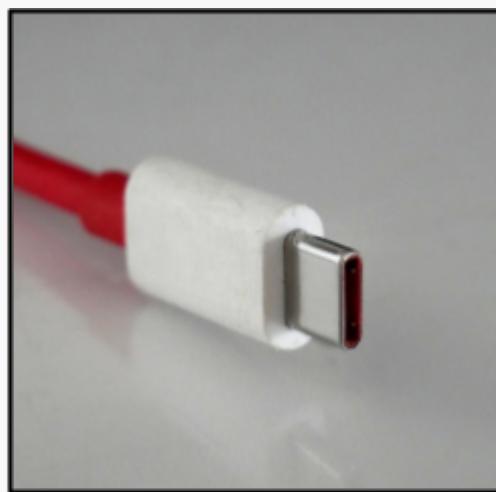


Back then, most phones often came bundled with the following – a 5V power brick and a USB-A charging cable. The 5V power brick was slow, and often took a whole night to fully charge the phone. This was the case for many years until USB-C started becoming more widespread. USB-C touted many features, like increased file transfer speeds and support for external monitors. However, one underrated feature is USB power delivery. This is why most phones, tablets, and even laptops utilize USB-C for charging. However, how does this work? Most USB-A power brick output at 5V/1A. However, USB-C can go beyond this, either by raising the voltage or raising the amperes. Also, modern technology devices are capable of handling newer charging speeds. A fast

charger would be useless if the phone is incapable of receiving such high speeds. Together, with a modern device and fast charging, a device can go from 0-50% in as little as 30 minutes!

The new feature of fast charging seems amazing, so what are the drawbacks? For starters, fast charging generates more heat compared to 5V chargers. This additional heat can cause some unprecedented problems, such as batteries swelling and the battery's lifespan diminishing at a faster rate. However, most phones often have a feature that will slow down charging after it reaches a certain threshold to prevent this from happening.

Fast charging is a new feature that allows devices to charge faster. This is accomplished with modern port technologies and advanced hardware and software built into phones. Despite having some drawbacks, such as more heat being generated, the advantages often outweigh the drawbacks of this feature.



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Risks of Red 40: Food Dye Linked To Health issues

Anna Dai

Red 40, or Allura Red AC, is an artificial food dye used in a variety of products such as snacks, candies, and other colorful foods. It is synthetic and used for coloring products to make them more appealing and eye-catching. Despite its attractive nature, it is the source of many health-threatening risks.

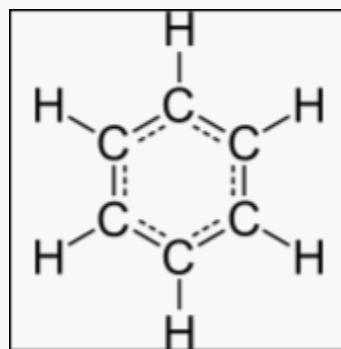
In the United States, 40 was first introduced in the 1970s and became the most often used food dye in many other countries. The bright red dye is derived from petroleum and classified as an azo dye, meaning it has a chemical structure. Studies have shown that Red 40 causes cancer and increased hyperactivity in young children.



"Food Coloring Bottles" by Larry Jacobsen, licensed by Flickr, under CC BY 2.0, <https://www.flickr.com/photos/ljguitar/1042903373>

Benzene is a chemical found in the controversial food coloring as it is known as a carcinogen, meaning the substance can potentially cause cancer. When Red 40 is processed, stored, and transported, benzene is formed by high temperatures and light

exposure. When ingested, benzene can disrupt DNA and normal cellular functions, leading to cancer. Although the amount of benzene in products containing Red 40 may be low, the risks have led to some regulations against it. The U.S. Environmental Protection Agency set a constraint for the usage of a maximum of 5 parts per billion (ppb) in drinking water. This shows that benzene is recognized as a harmful chemical that can cause cancer in humans even in small quantities. Consumers are highly recommended to limit their intake of processed foods and other foods containing artificial coloring.



Chemical structure of Benzene

An increase in hyperactivity and impulsivity in children is found to be a consequence of Red 40. Azo dyes contain p-Cresidine, a compound known to have effects on dopamine signaling. Dopamine is a neurotransmitter that regulates mood, pleasure, and movement which explains why disturbance causes hyperactivity and impulsivity. In an experiment, a group of children who consumed high doses of Red 40 showed high levels of hyperactivity and impulsivity compared to another group of children that consumed a placebo.

While Red 40 is what makes most foods appetizing and vibrant, there are many concerns related to the consumption of the red food coloring. Some effects include cancer and behavioral changes caused by the compounds and chemicals within Red 40. All of this can be avoided by turning towards foods that are not processed or foods that contain natural coloring instead of artificial coloring.

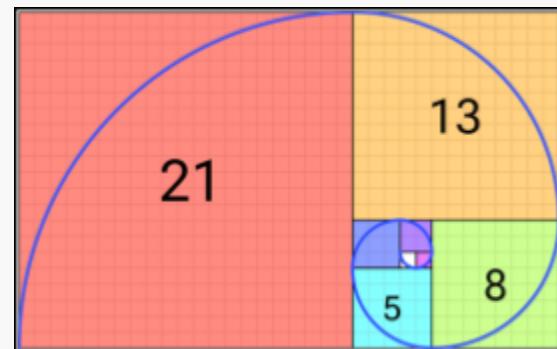
The Beauty of Math

Richard Wang

In math class, students have to do many seemingly useless calculations and it creates the interpretation of math being tedious. Math, it's a topic a lot of us think is boring. However, what if I told you that by the end of this article, you may switch your perspective of math. Taking a break from the negatives of math, let's shift our mind to the fascinating things of math. Looking at math from a broader perspective, we can come to understand the beauty of it.

It is strange how we are surrounded by nature but fail to even notice how commonly math appears in it. When the topic of nature is brought up, people likely will think of plants while others may think of outer space. A common example of nature would be the fibonacci sequence. The basic idea of it is that the next number in the sequence is the sum of the two previous numbers. It would start with $0 + 1 = 1$, $1 + 1 = 2$, $2 + 1 = 3$, $2 + 3 = 5$, and it continues forever. The first few terms of the sequence are 0, 1, 1, 2, 3, 5. If we were to plot it, we would form a beautiful spiral. This shape finds itself in many things in nature. Look at a rose for example.

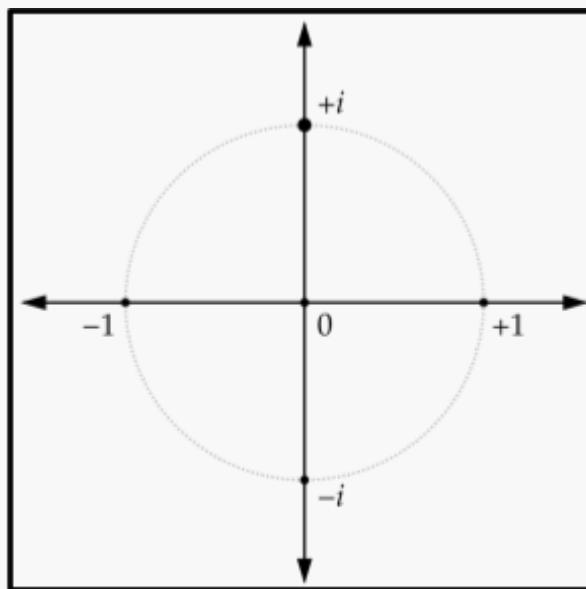
From above, we can see this satisfying spiral-like pattern. Imagine the picture of our galaxy, the Milky Way, it itself is a spiral shape. Spirals even exist within life as DNA has a spiral shape. What makes a spiral interesting however is the pattern-like shape it takes on.



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https://commons.wikimedia.org/wiki/File:Fibonacci_Spiral.svg

Symmetry and patterns are very satisfying elements that come from math. The brain feels rewarded at the sight of being able to recognize a pattern, especially a symmetrical image. Symmetry also creates a feeling of order and peace. Imagine a snowflake with all its branches. On both sides the number of branches and the size of them are all the same and it creates a satisfying image. It is also very fascinating because it is a natural occurrence. In contrast, things can be asymmetrical which creates the idea of something abstract.

Famous mathematician René Descartes once dismissed the idea that a number could have a negative square. When mathematicians were confronted with an equation like x squared equals negative 1, many scoffed at the idea of it. How could this be possible? Yet, some would assume the impossible was possible and with imagination it would lead to the imaginary number being created. The beauty in this, is that we can assume this concept to exist. It is hard to imagine how a number like this would look like on a graph. It is hard to imagine a number multiplied by itself results in a negative number. All this is not possible because it is something that is imaginary.



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Math can be seen in nature and can be imagined but what makes it captivating is how mysterious it can be. Pi fits this category very well. You have probably encountered people that have tried memorizing the digits of Pi. However, you will never meet somebody that can memorize every digit because Pi is ongoing. Already trillions of digits have been calculated which means we should know a lot about it, right? No, we truly don't know it because it goes on forever without a pattern. This singular number connecting all the circles of the world remains a mystery. The infinite number of digits and the attention it has received is what makes it beautiful

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The Social Hierarchy of Bees

Cathie Zhu

The highly sociable insect known as the honey bee performs a range of intricate functions that other solitary insects do not. A queen, drones, and workers make up a honey bee colony. Several thousand worker bees work together to construct nests, gather food, and raise young, with each individual having a specific role to complete that is proportional to its adult age.

An efficient communication system is essential to the colony's social structure, and worker bees' labor requirements change depending on their age and the needs of the colony. The only sexually mature female, the queen, reproduces primarily by laying both fertilized and unfertilized eggs. Up to 250,000 eggs may be laid by a queen in a single year, and maybe over a million in her lifetime.

Her second primary job is to produce pheromones, which act as a social "glue" for a bee colony and aid in giving each bee a unique identity. The queen's ability to lay eggs and produce chemicals has a significant impact on the colony's characteristics. Either fertilized eggs or immature worker larvae that are no older than three days old are used to create new (virgin) queens. In three separate situations—an emergency, a supersEDURE, or a swarm—new queens are raised.



By Pollinator at English Wikipedia, licensed by Wikimedia Commons, under CC BY-SA 3.0, https://commons.wikimedia.org/wiki/File:Adult_queen_bee.jpg

Is Genetic Editing Humans Playing God?

Kenny Wu

Genetically editing humans has been quite the controversial topic that has raised ethical and moral concerns. It refers to the deliberate manipulation of an individual's genetic makeup using biotechnology, with the aim of correcting genetic disorders or enhancing desirable traits. While genetic editing has the potential to revolutionize medicine, it also raises significant ethical concerns.



Starting off, the prominent benefit of genetic editing is its ability to manually correct or remove mutated genes. This technology is the last hope of individuals who suffer from debilitating genetic conditions, such as cystic fibrosis or Huntington's disease. Additionally, genetic editing has the potential to prevent genetic diseases, such as breast cancer or Alzheimer's.

However, genetic editing also poses serious ethical concerns. One concern is the potential for creating a new form of social inequality. The technology to manipulate genes will likely be expensive, meaning that only the wealthy will be able to afford it. This could overwhelm the already existing social inequalities by creating advantages for the genetically edited individuals and disadvantages for those who cannot afford it. Furthermore, the "designer babies" is another great concern. By selecting specific traits and characteristics for their children, parents could create a society in which people are valued not for their merit but rather for their genetic makeup. This could lead to a situation where some individuals are seen as superior to others based on their genetic profile, rather than their individual quality.

In conclusion, genetic editing raises serious moral and ethical questions even though the technology has the potential to revolutionize medicine and improve people's lives. It is essential to proceed with caution and consider the disadvantages of this technology before pursuing widespread implementation. All in all, any decision to genetically edit humans must be made with great care and consideration for the broader societal implications.

What are Tsunamis?

Aimee Fan

The world is changing all the time. From the movement of the clouds to the changes in weather, it is affecting our environment every day. Natural disasters are also happening very often in the world, for example, tsunamis.

Tsunamis are giant waves that are caused by earthquakes or volcanic eruptions that happen under the sea. Normally out in the ocean, tsunami waves do not increase in height very dramatically. But as the waves travel further and further towards the beach, the waves start to build up higher and higher as the depth of the ocean decreases. The speed of tsunami waves usually depends on the ocean's depth rather than the distance from the starting place of the wave. Tsunami waves are very fast in terms of speed. They can sometimes reach up to the speed of jet planes over deep waters, which will only slow down when reaching shallow waters like the beaches. Tsunamis are also often referred to as tidal waves, but this name is not favored by oceanographers because tides have nothing to do with the giant waves that the tsunami creates.



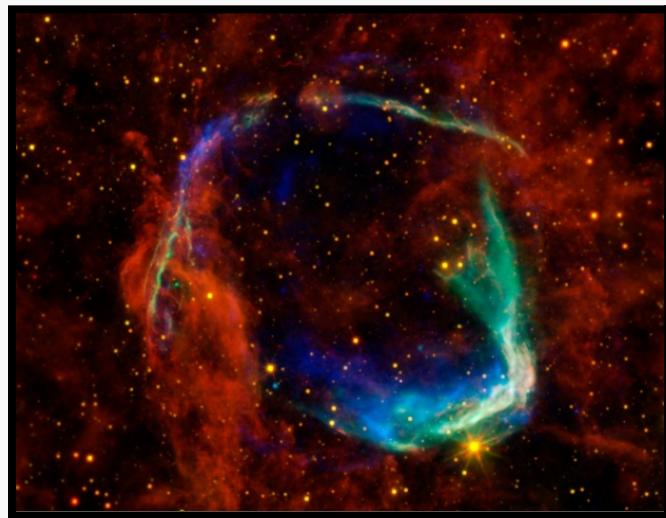
Most tsunamis can be very life-threatening, those with runups over one meter are particularly dangerous to people and property. But smaller tsunamis can also be dangerous. Strong currents that were caused by tsunamis can injure and drown swimmers and damage boats and infrastructure in harbors. Big tsunamis can hit with a tremendous force and can be a significant threat to human health, coastal property, coastal resources, and more. Most of the tsunami's damage and destruction is caused by giant wave impacts, strong currents, and floating debris. The water that comes from the tsunami can be just as dangerous, as it makes its way back to the sea, it takes debris and people with it.

In conclusion, a tsunami can be a very dangerous natural disaster that can cause important injuries.

Supernovas

Donia Cao

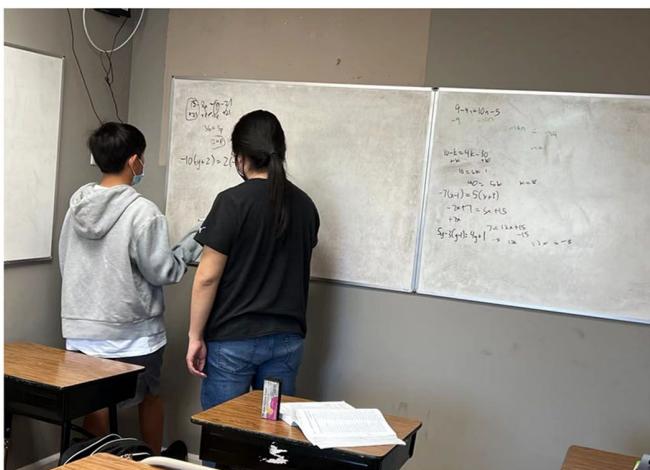
Supernovas are powerful phenomena that result from the combustion of a star's nuclear fuel. These stellar explosions create temperatures that surpass 100 billion kelvin, making them the hottest objects we have ever discovered in the cosmos. Scientists theorize that Supernovas have a role in the evolution of stars, which provides us with key insights into our understanding of star formation and death. As a massive star rapidly collapses, it forms a shockwave that triggers fusion reactions in its outer shell, known as nucleosynthesis.



Astrophysical phenomena like supernovae are notable for their intense brightness, making them easily visible in the night sky even at great distances. This luminosity is caused by a certain type of supernova, type Ia: its spectrum indicates the presence of higher amounts of hydrogen near the explosion site than any other galaxy-originated event – thus explaining its prodigious shine, which can last for extended durations of time.

According to astronomers, the universe is hypothesized to experience hundreds of supernovas each year. In particular, the Milky Way galaxy is estimated to have around two to three supernovas per century. Nonetheless, due to dust and interstellar medium blocking our view of our cosmos, we are unable to accurately calculate the precise number made per year.

Astrophysicists can use supernovas as a 'ruler' to calculate distances in space, increasing our understanding of the universe. Supernovas also facilitate the study of star formation and help us discover new elements. Stars are capable of converting simple elements such as hydrogen into more complex substances including gold, silver, and uranium. When a supernova is triggered, vast amounts of stored and newly created elements get dispersed throughout galaxies due to the immense amounts of energy released.



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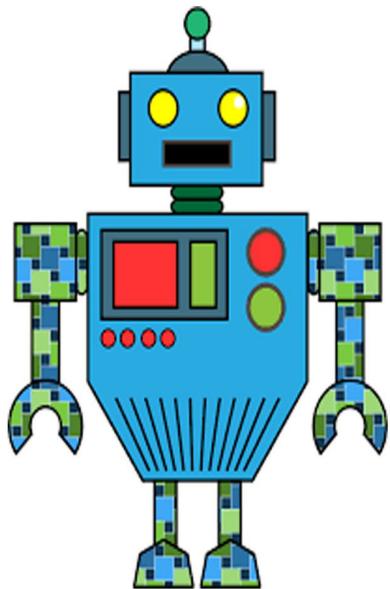
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