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**How Forensic Science
Works** Aidan Hong

3D Bioprinting Denise
Lee

**How Much of Our Ocean
Has Been Discovered?** Audrey
Don

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3D Bioprinting

Denise Lee

3D printing is a manufacturing technique that allows users to showcase their designs as three-dimensional objects. Beyond simply showcasing designs, 3D printing has brought advancements in healthcare by allowing doctors to create personalized prosthetics and replicates of organs that can mimic their functions. These 3D-printed works can also provide a framework for cells and tissue to grow and regenerate.

One of the most notable applications of 3D printing in healthcare is in the creation of personalized prosthetics. Unlike traditional prosthetics, 3-D prosthetics offer superior comfort, functionality, and aesthetics. Moreover, they are cost-efficient since they use materials such as polyethylene, polypropylene, acrylics, carbon fiber, and polyurethane.



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In addition to prosthetics, 3D printing has revolutionized the field of organ and tissue printing. With the latest advancements in 3D bioprinting, scientists can now create replicates of human tissues and organs that mimic their functions. These 3D-printed structures not only serve as models for research and education but also provide scaffolds for cells and tissues to grow and regenerate. The ability to print organs like hearts, kidneys, and livers holds immense promise for regenerative medicine, offering hope to countless patients awaiting transplants and significantly reducing the global organ shortage. 3D printing has transformed implant production, enabling patient-specific device fabrication with precision and accuracy. By customizing implants to fit each patient's unique anatomy, surgeons can ensure a better fit, improved comfort, and reduced risk of complications, ultimately leading to better patient outcomes.

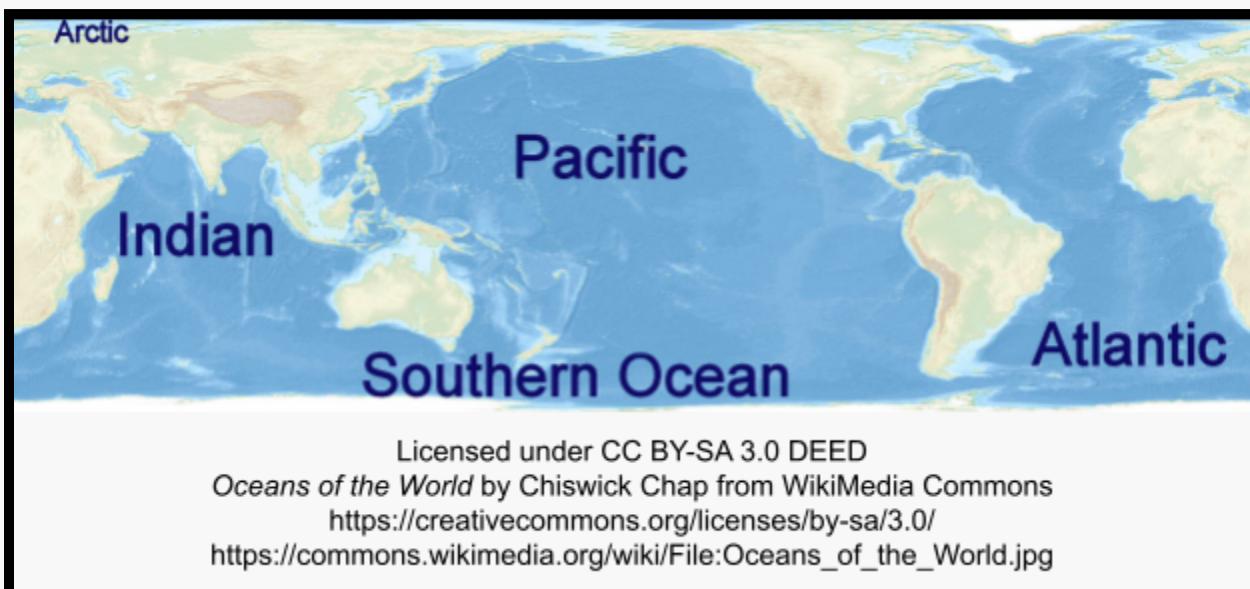


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How Much of Our Ocean Has Been Discovered?

Audrey Don

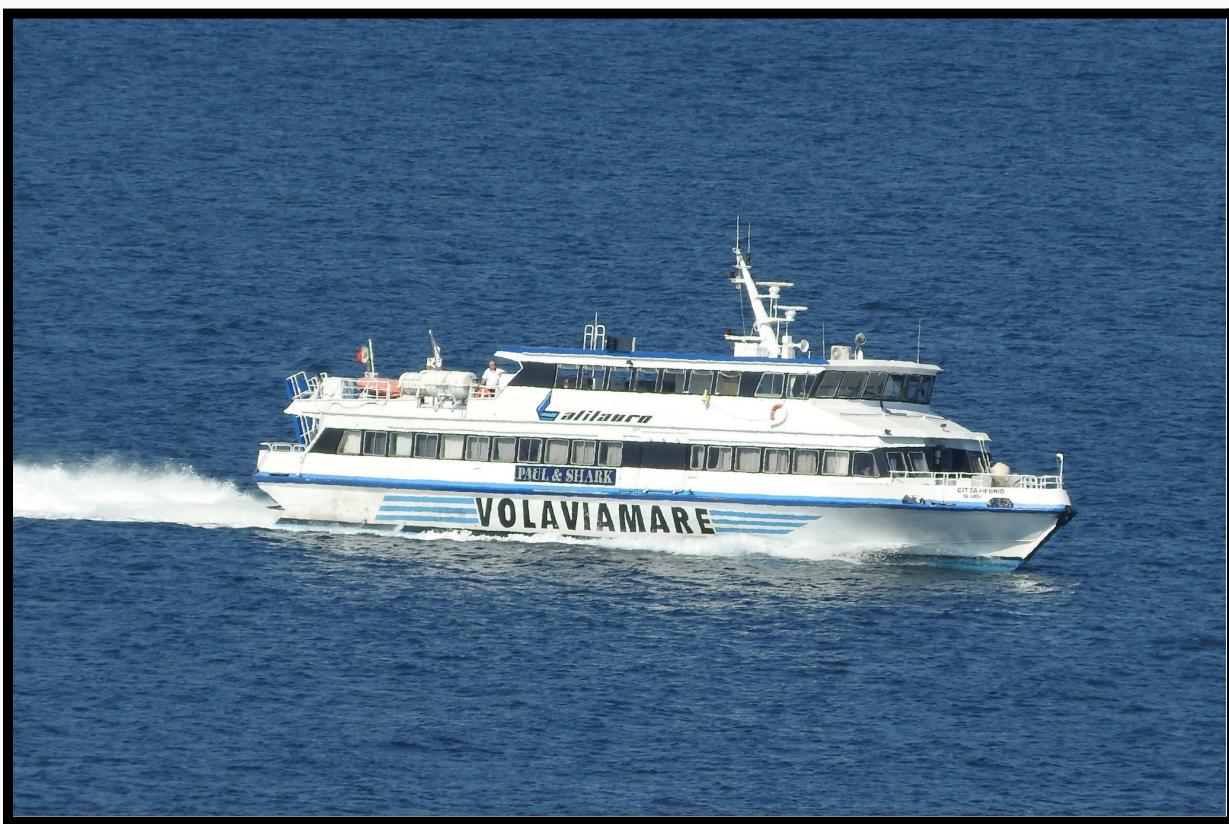
Did you know that currently, we have only discovered about 5% of the oceans? The ocean is the largest living space on our planet which covers nearly 70 percent of Earth's surface. A mere 5 percent of the global ocean has been explored, and less than 10 percent mapped using modern sonar technology. Five main oceans are all technically the same body of water: the Atlantic Ocean, Pacific Ocean, Indian Ocean, Arctic Ocean, and Southern Ocean. So, when we say the "world's ocean" or "the ocean," we are referring to all these ocean basins together. People would ask why 95 percent of the oceans aren't explored, but the conditions in the deep-sea environment include very high pressures, total darkness, extreme temperature, and toxic chemicals.



Hundred thousands if not millions of dead bodies are in the oceans. There have been thousands of ships, if not more have sunk over the years, from the days of a simple wooden boat to the large navy warships we have now. As our technologies advance

every day, such as remote-controlled cars or remote-controlled submarines created by engineers and scientists, our ability to discover the oceans is still rather small but it's also discovering oceans depth improving, but there is still much to discover. The oceans do more than just fill the gaps between continents. They regulate our climate, supply food, and harbor a myriad of marine life that remains undiscovered.

Their influence extends to weather patterns and even planetary health, underscoring the urgency to understand and protect these briny depths. Which is exactly why scientists and geologists want to continue and discover what other creatures and monuments they'll discover if they continue to map and discover the ocean.



How Forensic Science Works

Arick Hong

Most people have watched a murder mystery on TV before. The killer tries his best to leave behind no evidence, yet he slips up in the least suspected way possible, leading to his arrest. However, how do they manage to do this? How does the forensic team manage to put all the clues together? Let's find out.

The Atlanta Child Murders were a string of connected killings of young and adolescent children from 1979 to 1981. Parents kept their kids locked indoors in fear of their child being next. It was on June 21, 1981, when the killer, Wayne Williams, was finally captured. But how did they finally catch a killer who was evading the FBI for 2 years? First, the FBI mapped out the killings. They all seemed to be connected to a street called Memorial Drive and 11 other streets. Since some of the bodies were found in rivers, the FBI decided to stake out nearly a dozen bridges in the area that ran right over rivers. They got their break when a splash was heard near the area, and they saw a white Chevrolet drive away. They caught up to it and asked the driver Wayne Williams a few questions.

Wayne was said to be with victim Nathaniel Carter the night he died, and he had an alibi that was already incorrect. He claimed to be on his way to interview a singer named Cheryl Johnson, but the police found no record of her. Furthermore, fibers on a carpet in Williams's residence were found to patch fibers found on several victims. Not only that, but the FBI managed to match fibers from his dog to the victims. The police also remembered seeing gloves and a rope that seemed to match marks on the victim's necks. They put all the evidence together and successfully convicted Wayne Williams of murder.

Some of the information above may have seemed a little confusing, so let's break down some of the common methods/people used to catch culprits. AFIS (Automated

Fingerprint Identification System) is commonly used in crimes to identify fingerprints. Investigators will gather all the fingerprints from a crime scene and see if they can match them with AFIS. The system gets a match in a matter of seconds, but the problem with this is that it can only be used to catch people who have committed a crime before. Convicts who have committed a crime get their fingerprints entered into AFIS, where they stay there for a long time. Next, we have the ballistic specialists. These specialists are called whenever they suspect that a gun is used in the crime. They use something called a ballistic water tank to see how the gun is fired. They are also skilled in matching the ammunition from a crime scene to what gun it might have been fired from. They can later use this evidence to catch a culprit if he/she has that same model gun on them.

Next time you watch shows like CSI on TV, try to remember these things and see if you can crack the case before the show reveals who the killer is. Forensic science is a fun skill to have, as cracking cases can be quite interesting. Maybe you can become a forensic scientist one day!



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Axolotls

Mary Liang

Axolotls are amphibians that can grow up to 18 inches in length with a color variety from pink to green. They can regrow multiple organs, such as their limbs, tail, brain, gills, and heart. Weighing from 2-8 oz, they live in freshwater and are only found in 2 areas on Earth, Lake Xochimilco, and Lake Chalco. Although they have few predators in the wilderness like storks, herons, and large fish, their biggest predator is the pollution of the freshwater lakes and ponds they live in, human development, and loss of habitat from droughts.

An Axolotl's diet includes crustaceans, insect larvae, worms, mollusks, and small fish. They use a suction method to hunt their prey, but may also use it to suck gravel to help grind their food to aid in digestion. Unlike other amphibians that live in water in their earlier life, lose their gills which requires them to live on land, gills are vital to axolotls so they live underwater for their whole life, but for brief amounts of time, they can live outside of the water.



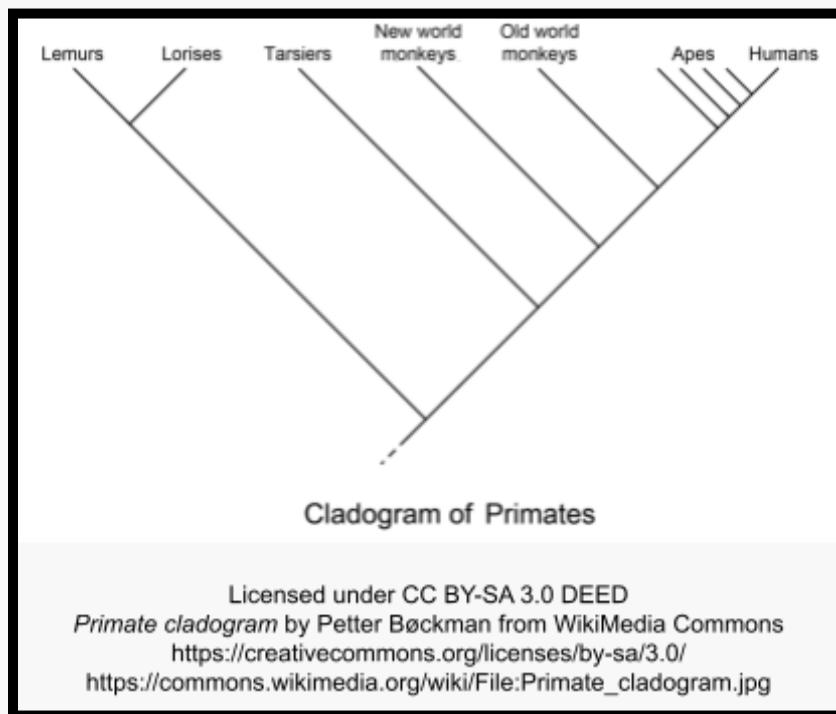
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The “Mexican walking fish” descended from the tiger salamander and is indigenous to the lake along the southern edge of the Basin of Mexico, but is no longer suitable for axolotl life. Found in the 13th century by the Aztecs who settled in the Valley of Mexico (now known as Mexico City). From recent research, the population of axolotls is decreasing from the former 6,000 per kilometer squared to - 1000 left in the wild.

Cladograms - Nature's Family Tree

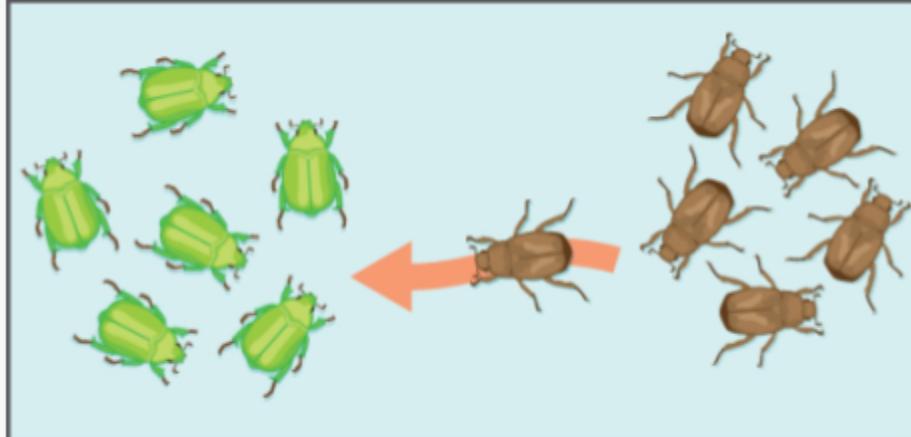
Arthur Liang

In the world of biology, one of the key concepts that you need to know is the theory of evolution and natural selection, pioneered by scientists like Charles Darwin in the 19th century. These concepts essentially cover how species and their gene pools can change based on their environment, leading to new traits being introduced and the physiology of the species being altered over time.



There are 5 main catalysts for evolution and this change in the gene pool. First is the selection of a small population, which can be caused by a natural disaster killing off most of a species in an area or by a small group being isolated in a certain location. These situations are called the bottleneck effect and founder's effect, respectively. The selection of a smaller population to survive will not represent the entire gene pool of the old larger group, which causes a change in the gene pool. The second catalyst is

non-random mating, where certain traits are selected based on how attractive they are to a potential mate. The third is mutations, which are simply random changes in DNA as it replicates. The fourth is gene flow, which constitutes immigration and emigration leading to genes being introduced and removed from a population. The last catalyst is natural selection, basically how advantageous a trait is to survival in an environment.



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Gene flow Figure 19 02 04 by OpenStax, Rice University from WikiMedia Commons

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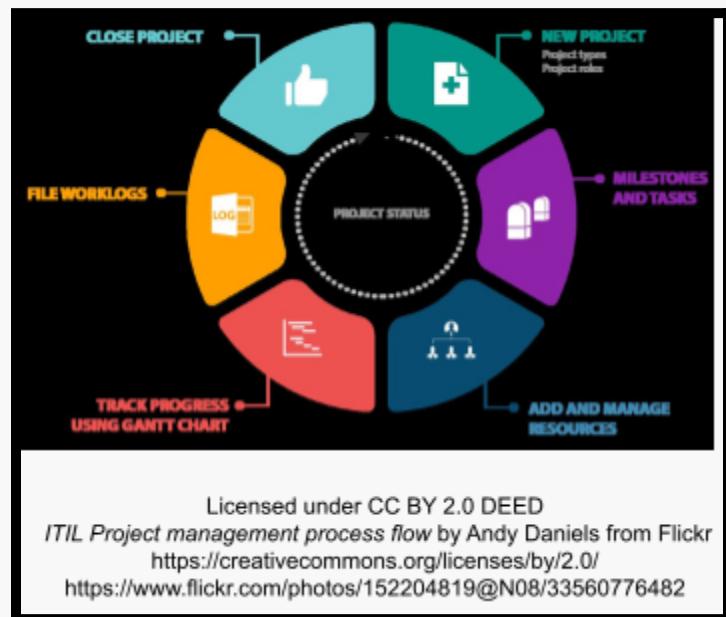
All of these causes for evolution lead to organisms branching off and evolving differently from common ancestors. One can track the evolution and branches of these organisms through the use of a cladogram. A cladogram is essentially a branching tree diagram that shows ancestral relationships among organisms. Organisms more closely related will be closer to each other and have a more recent common ancestor. Common ancestors can be identified by intersections of the branches of these organisms. Cladograms prove extremely important to scientists by giving them a framework to understand how organisms evolved from each other and what traits they may share based on their evolutionary relationships.

Traversal of a Solo Developer: Project Management

Brian Wang

With professional companies ruling over the video game industry, how can a small indie developer work towards finishing a video game? Along this sea of desire, thousands of ships sink, the storms of giving up thunder on the pirates we know as game developers, with only a select few making it to the next island. However, the process of reaching the other destination isn't as difficult as many make it out to be. The indie developers who complete a video game simply use project management tools, which is a developer role that many companies even hire people for.

What does the project management role entail? At the most foundational level, these project managers have to document all the changes made in the past to ensure that the video game can be reverted to its original state at many points in time. The purpose of documentation is to provide a process of how a game is developed in an organized fashion and provide an explanation of what the game is about at that specific point in time. If any other lead developers are lost in their retrieval of an old save, then they can easily read the documentation. For indie developers, documentation can represent great project management skills for their resume, and



better yet, allows them to visualize the game better - as the more you write, the more ideas will pop into your head.

That being said, what tools should project managers use? Project managers from AAA game companies - companies that hire hundreds or thousands of workers to work on a game - utilize their proprietary organizational tools or programs such as Jira. Jira is a project management tool that streamlines the development process of any application for software engineering companies (with the video game industry being only one of them). It allows for 2 GB storage for free users, which can increase as the user pays more money monthly. Indie game developers find Notion and Trello to be more popular. Notion is another board-organization tool that developers can use to create boards and list down anything they need to work on. Notion lies in a similar situation in that it comes with a free version, and increases as users pay more money monthly, with a longer page history, more member invites, and more security. Trello is a website-based organization program that gives up to 10 MB per file with the free version. Again, if users pay more money monthly, they get more size per file, more administrative permissions, and the utilization of AI in their boards.

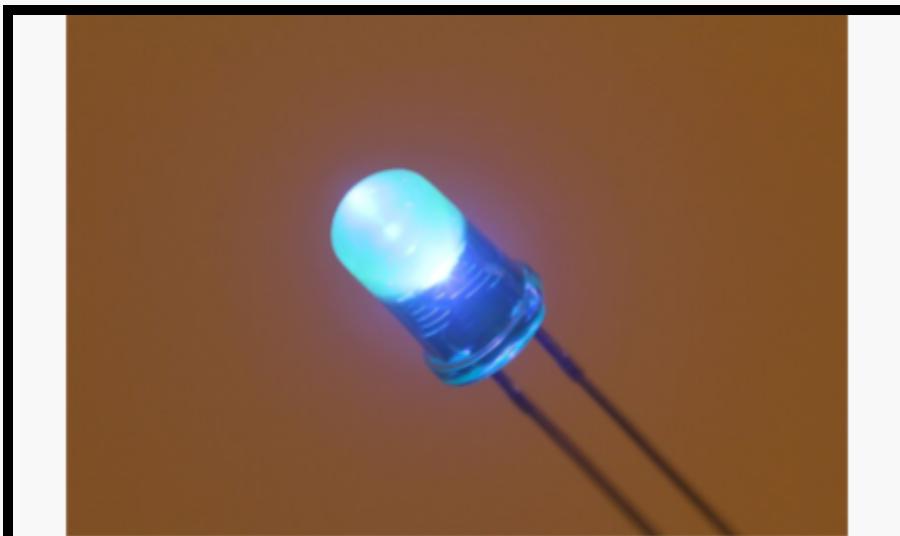
What best fits your organization? If there are hundreds of workers in your organization, Jira would be the best fit, as it is a program that is specifically made for AAA companies that have thousands of workers online daily. Indie developers with 1-3 people can consider Notion or Trello, with Notion taking precedence as a program that provides more features, such as the Calendar, template stylizations, and Google Calendar reminder features.

Therefore, indie developers, whether they are by themselves or with a group of people, should consider working with organizational tools to streamline their development and ensure their safe travel to the next island of completing their application project. Organization tools are an important product that developers of all wavelengths use and something that you should too.

The Struggle for Blue LEDs

Angela Chin

When you come across a streetlight, traffic light, or even your device, chances are you're looking at a blue LED light. However, the assembly of these small, practical diodes earned three scientists the Nobel Prize in Physics, required immense skill, and has been integrated into people's everyday lives. So, who were the three researchers credited with inventing the blue LEDs?



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Around 60 years ago, the first LEDs had just been invented. Companies all over the world rushed to design a variety of colors. Nonetheless, nobody succeeded in coloring them blue—that is to say, until a researcher named Shuji Nakamura working at Nichia made the breakthrough. He, along with the assistance of physicists Hiroshi Amano

and Isamu Akasaki, developed the world's first pure-blue LED light within 30 years. This brings us to the next question: What made this color so difficult to formulate?

To succeed in his invention, Nakamura had to make several scientific breakthroughs, such as finding the correct materials and having the brightness surpass 1,000 microwatts. One of the larger challenges was the scarcity of semiconductors that could provide blue light. Unlike red and green LEDs, blue LEDs are higher up in the electromagnetic spectrum and require semiconductors with a wider bandgap and thus more energy. Nakamura's first success was in 1994 when he discovered how to utilize gallium nitride (GaN) as a semiconductor metal. However, most scientists abandoned the material due to its 16% lattice mismatch with sapphire, the gemstone primarily used for growing GaN. This meant that there would be faults in the finished product. Additional nozzles were added to his MOCVD reactor, the machine he used to grow high-quality GaN crystals. The movement of electrons in the LED was also modified to produce a brighter, bluer hue.

After Nakamura's invention, Nichia's revenue quadrupled into the billions. This was also due to the addition of yellow yttrium aluminum garnet (YAG) phosphor over blue LEDs, turning the light white. Since then, LEDs have been useful for device screens, light bulbs, and a great deal of other everyday objects. Additionally, they contribute to significant reductions in CO₂ emissions compared to other light sources.

In conclusion, the pioneering work of analyzing blue light was done by three physicists. Still, with several years of research, they prevailed with solutions for every drawback. Because of this, they've grown to be one of the most popular sources of light. Though they may seem insignificant compared to today's machinery, dozens of years of effort were put into the blue LED.

Intel vs AMD

Aidan Hong

When it comes to computer chips, most people choose between the two most popular brands of computer chips: Intel and AMD. However, many don't know the difference between the two chips. Intel and AMD are vastly different chips, with some offering better performance and some with better efficiency.

To start, Intel and AMD are both popular computer chips for Windows. Although Apple used to sell Macs with Intel chips, today both are exclusive to Windows. Both of them run on the x86 architecture, which is most common. However, the innovations for both are different. AMD excels in power consumption. This means that AMD is more power efficient and is better for those aiming to save money on energy. AMD chips use a 5nm process, meaning that more nodes can be packed into a single area, requiring less energy.

On the other hand, Intel is better when it comes to performance. Although Intel uses more energy, its chips are more powerful and are a better fit for those looking for power, no matter the cost. Another important factor is cost. When it comes to cheaper chips, Intel easily wins, with its low price range chips lower than AMD's. However, when it comes to higher-range chips, AMD is cheaper.

Intel and AMD both offer their respective advantages over the other. Both have innovated a lot and have created two, quality choices when it comes to buying a computer.



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Exploring the Promise of Nanotechnology and Nanomaterials

Eddie Zhang

Nanotechnology, the science of manipulating matter at the nanoscale, has emerged as a revolutionary field with vast potential to transform various aspects of human life. At the heart of nanotechnology lie nanomaterials, which exhibit unique properties due to their small size and high surface area-to-volume ratio. In this essay, we delve into the fascinating world of nanotechnology and nanomaterials, exploring their applications, benefits, challenges, and ethical considerations.

Nanotechnology involves the manipulation of matter at the nanometer scale, typically ranging from 1 to 100 nanometers. At this scale, materials exhibit novel properties that differ from their bulk counterparts. Nanomaterials can be classified into nanoparticles, nanotubes, nanowires, quantum dots, and more, each with distinct properties and applications. These materials can be engineered to possess desired characteristics such as strength, conductivity, catalytic activity, and biocompatibility.

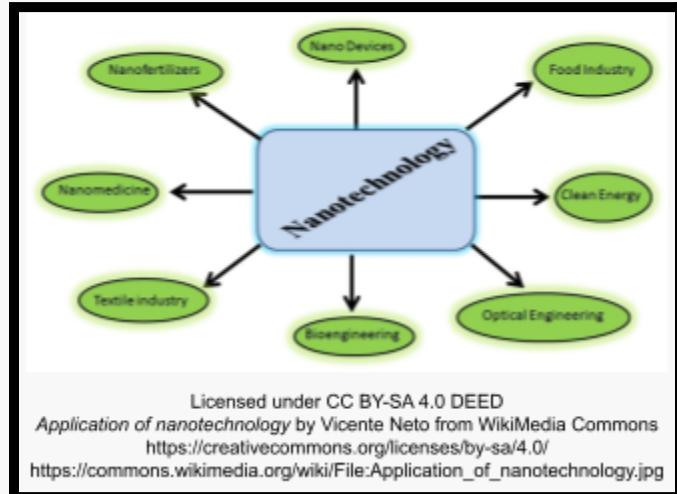
Nanotechnology finds applications across diverse fields, including medicine, electronics, energy, environmental remediation, and materials science. In medicine, nanomaterials are used for targeted drug delivery, imaging, and tissue engineering. In electronics, nanotechnology enables the development of faster, smaller, and more efficient devices. Nanomaterials also play a crucial role in renewable energy technologies, catalysis, and pollution control.

The utilization of nanotechnology and nanomaterials offers numerous benefits. In healthcare, targeted drug delivery systems reduce side effects and improve treatment efficacy. Nanomaterials enhance the performance and lifespan of electronic devices while reducing energy consumption. In environmental applications, nanotechnology

enables the efficient removal of pollutants from air and water, contributing to sustainable development.

Despite their promise, nanotechnology and nanomaterials pose certain challenges and ethical considerations. Concerns regarding the environmental impact of nanomaterials, their potential toxicity, and long-term effects on human health need to be addressed through rigorous research and regulation. Additionally, there are ethical concerns surrounding privacy, security, and equitable access to nanotechnology-driven innovations.

As nanotechnology continues to advance, its potential for innovation remains vast. Future research efforts should focus on enhancing the safety and sustainability of nanomaterials, expanding their applications in emerging fields such as quantum computing and personalized medicine, and addressing ethical considerations to ensure responsible development and deployment of nanotechnology-based solutions.

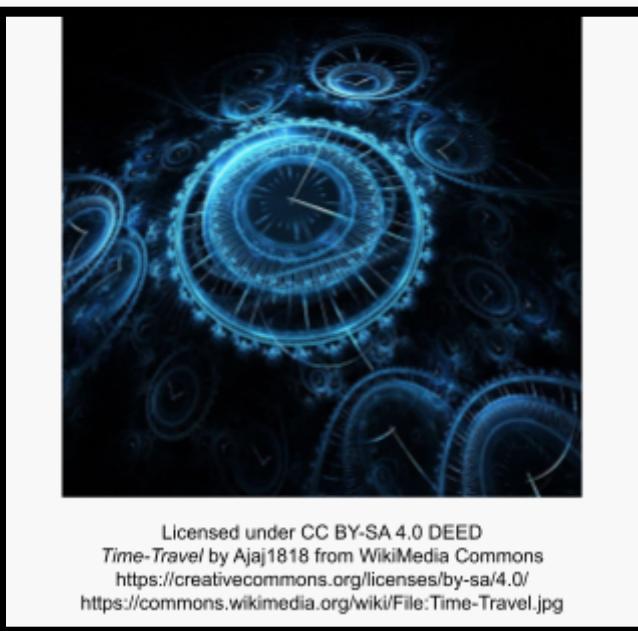


Nanotechnology and nanomaterials hold immense promise for addressing pressing global challenges and driving technological innovation across various domains. By harnessing the unique properties of nanomaterials and addressing associated challenges and ethical considerations, we can unlock the full potential of nanotechnology to improve lives, enhance sustainability, and propel humanity toward a brighter future.

Time Travel: A Contradicting Concept

Richard Wang

A temporal, time, or time travel paradox is a logical contradiction related to the notion of time travel. Time travel does follow today's understanding of physics through time dilation but temporal paradoxes are an emergent question. These contrasting ideas bring about discussion of the ability to time travel and make interesting topics in sci-fi literature and movies. Two types of temporal paradoxes are a bootstrap paradox and a grandfather paradox.



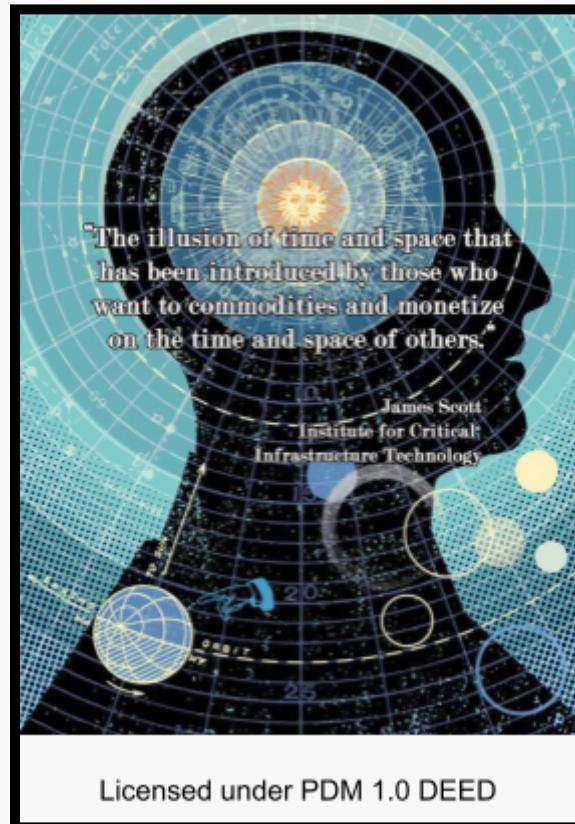
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The intriguing bootstrap paradox involves an object or information being sent back in time to become its origin. Origin and existence are brought into question when a specific scenario is brought up: an object exists without ever being created, leading to a loop with an unclear beginning. An example would be if a composer received a song from the future and then published it in the past where it is discovered by the composer.

This raises questions about the concept of originality. The questionability of originality brings the resolution of already self-existence which is a contradictory concept.

The grandfather paradox is the paradox that occurs as a result of changing the past. The most common example is traveling back in time and preventing oneself from being conceived which is impossible. In this scenario, if the person was never born, they would have never existed to go back in time. A probable resolution to this inconsistent idea is that a person can only do something that has happened but can't do anything that has never happened.

A proposed resolution is the consideration of backward time travel by thinking of time as an illusion. Kurt Gödel suggests something similar to the block time view where time is just a dimension in space with all events being fixed. Overall, whether exploring the grandfather paradox or bootstrap paradox, these paradoxes challenge scientists about the idea of past, present, and future.



The Cold Truth About Fast Food Industries

Kenny Wu

Fast food is one of the most popular and successful genres of food restaurants. The convenience and low cost make fast foods a tempting choice for people who don't have the time to prepare homemade meals. However, for something that is widely appreciated. Fast food brings many unhealthy impacts on the human body that goes unchecked.



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To begin, Fast food consists of a large sum of fat, sugar, and cholesterol which by consuming an excessive amount of them would have harmful impacts on the human body. Any processed food would be considered unhealthy due to the high amount of chemical taste enhancers and, therefore unsafe to eat. These seemingly mild chemicals

can lead to a series of health issues, including obesity, heart disease, and high blood pressure. It should be also made known that consuming an overwhelming amount of fast food can also facilitate the development of Type 2 diabetes. It is suggested by most doctors that the only safe way to keep yourself healthy is to never eat fast food and only reach for it if you must.

Furthermore, Fast food is often highly processed, containing preservatives, additives, and other chemicals that can be harmful to the body. These chemicals can lead to digestive issues, such as bloating, gas, and indigestion. In addition, the high levels of sodium in fast food can cause water retention, leading to swelling and discomfort.

(Selenium): 0.05 mg - Technological additives. Climopatone or Selementary
origin: 10 g - **Preservatives** - Antioxidants. **ANALYTICAL CONSTITUENTS:**
Protein: 36% - Fat content: 18% - Crude ash: 8.3% - Crude fibres: 2.5% -
Calcium: 1.2%. **FEEDING INSTRUCTIONS:** see table. Batch number, factory
Best before date: see information on packaging. To be

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In addition, there are also psychological consequences of consuming fast food daily. Studies have shown that regularly eating fast food can lead to feelings of shame, addiction, tiredness, and loss of control. This can contribute to lower self-esteem and depression which makes life go downhill.

All in all, the damage of fast food to the human body needs to be brought to the attention of the public. Individuals must be mindful of their diet and decision-making. By doing so, they can greatly reduce the risk of serious health issues and improve their overall quality of life.

Revolutionizing Transportation: The Future of Electric and Self-Driving Cars

Brandon Wang

In the last several years, transportation has drastically improved undergoing rapid advancements in electric and self-driving technologies. Electric cars have been an innovation in the past, but now they are becoming increasingly common on the road—the need to reduce greenhouse gas emissions and combat climate change.

Unlike traditional internal combustion engine vehicles, electric cars run on rechargeable batteries protecting the environment from fossil fuels, and have more long-term viability. The advancements in battery technology have increased the range and performance of electric vehicles by a significant amount, addressing one of the major concerns of consumers. Electric cars have become more affordable due to the declining costs of lithium-ion batteries, allowing them to spread globally more easily.

Correspondingly, self-driving or autonomous vehicles represent another groundbreaking development in the automotive industry. These cars, armed with an array of sensors, cameras, and advanced artificial intelligence



algorithms, have the potential to revolutionize transportation, remarkably reducing accidents and fatalities, usually caused by human error. Additionally, companies such as Tesla and Uber are developing and testing self-driving technology to refine traffic flow

and enable conveyance to those unable to drive. Although notable progress has been made, there are still many challenges to overcome, such as the reliability and safety of autonomous vehicles in all driving conditions.

However, before electric and self-driving cars become the first pick for everyone, there are still several obstacles, such as infrastructure, regulatory framework, and societal acceptance. Some improvements still need to be made such as global charging stations and long-lasting communication networks for self-driving cars. Furthermore, safety, liability, and privacy concerns must be established with the concerns of autonomous vehicles. These new technologies must be socially accepted and trusted to gain worldwide adoption.

To conclude, electric cars and self-driving cars are the future of transportation and have the potential to make our roads safe, our environment cleaner, and overall more efficient. Nonetheless, there are still many refinements to be made paired with safety and reliability concerns. With continued innovation and cooperation, we can build a dependable transportation system that ensures the well-being and easy accessibility for everyone.



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Fiberglass history, usage, and how it works

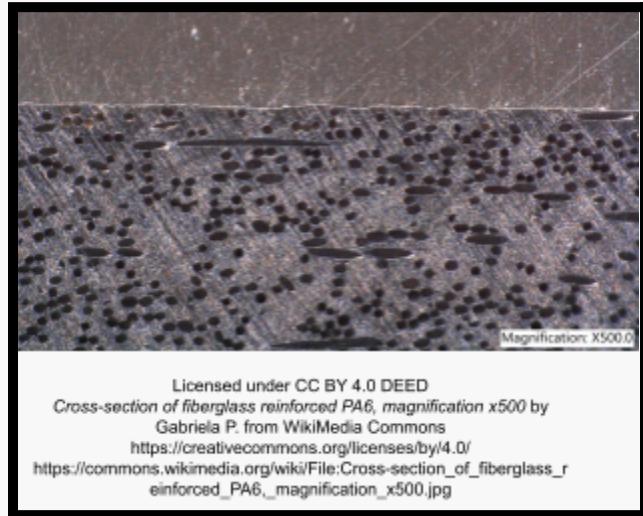
Ben Liang

Fiberglass is used in a lot of applications. It is the stuff that makes our homes warm. Fiberglass is used in so many different locations and knowing how it works, the history of fiberglass, and its applications is important.

Fiberglass was made way back by the ancient Greeks and Egyptians. The first guy to make fiberglass in the US was Hermann Hammesfahr. He made it with glass fibers and silk. Games Slayter was the first guy to make it commercially. Dupont made it better by adding resin and plastic to the fiberglass. It got into the market in 1932.

Fiberglass is an insulator that traps air in between to keep things inside warm. That is why fiberglass is not supposed to get wet. It works by using plastic-infused glass fibers(grp). It also uses resin to harden it. Fiberglass has the flexibility of plastic but also retains the durability of glass. It also works as a soundproof barrier. It acts like wool and absorbs sound.

Fiberglass has a lot of uses. They chose fiberglass because it is unable to degrade from mold or bacteria, is easy to use in homes or cars, is nonflammable to fire, can be used for a long time, and is sustainable. It is also lightweight, making it able to be used in more applications than heavier options. Some of its uses are for cars or houses. Houses are constantly susceptible to heat waves and winter storms.

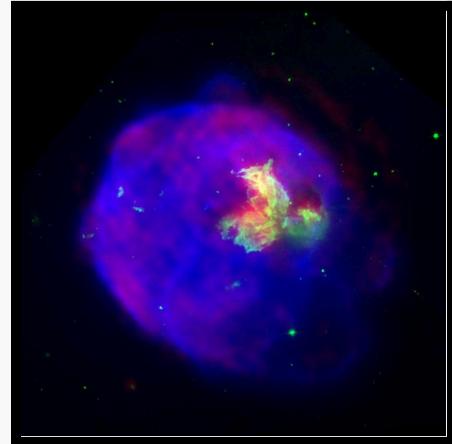


Exploding Stars: Unveiling the Spectacular Phenomenon of Supernovas

Brandon Pian

Like humans, stars also one day die. The day stars die a massive explosion as strong as 10²⁸ megaton bombs. Those massive explosions are called supernovas. When supernovas explode they can be briefly brighter than galaxies and exert more energy than our sun will do in its entire lifetime. When supernovas explode they release heavy elements like silver, gold, and uranium.

The first supernova was observed in 185 A.D. by Chinese astronomers calling it the mysterious “Guest Star” and it remained in the sky for 8 months. One of the most well-known supernovas, Crab Nebula was discovered in 1054 by both Chinese and Korean astronomers and may also be seen by Native Americans. The supernova was so bright astronomers could even see it in the day. Other supernovas also occurred in the years 393, 1006, 1181, 1572, 1604, and 2023 all studied by famed astronomer Tycho Brahe. Brahe wrote about his observations of this “new star” in his book *De Nova Stella* leading to the name Nova.



The term “supernova” was first used by Walter Baade and Fritz Zwicky at Mount Wilson Observatory, which was used about an explosive event they observed called S Andromedae, found in the Andromeda galaxy.

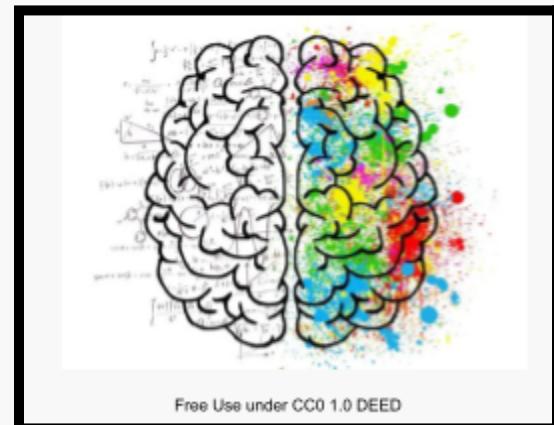
Why do humans have an ear for music? What is the science behind catchy tunes?

Emily Ma

The human fascination with music has been a topic of interest for researchers and music enthusiasts alike for centuries. We all have our favorite songs that we can't help but hum along to, tap our feet to, or even dance along with. But what is it about music that makes it so enjoyable and memorable to us?

One possible explanation can be found in our evolutionary history. Music has played a significant role in human societies for thousands of years, serving as a means of communication, entertainment, and even religious worship. As a result, humans have evolved to recognize patterns and rhythms, which are fundamental building blocks of music. Studies have shown that even infants can distinguish between different musical tones and rhythms, suggesting that our ability to appreciate music is innate.

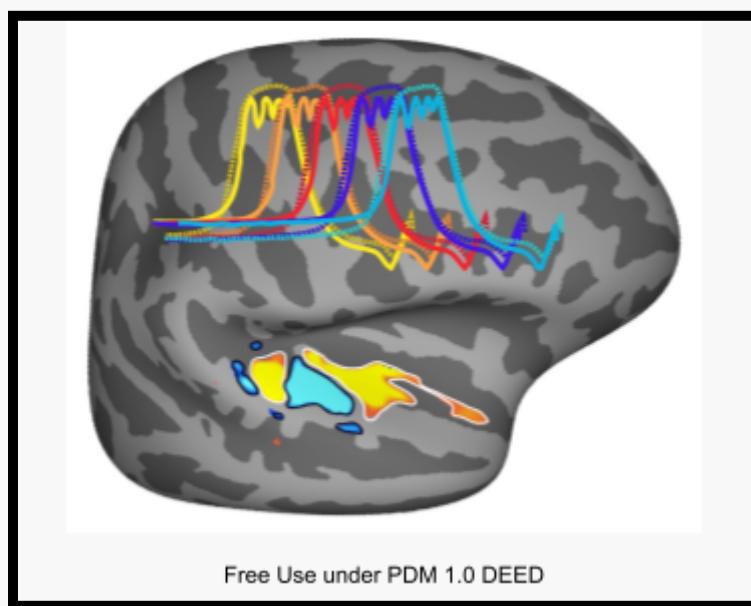
Moreover, research has revealed that certain areas of the brain are specifically dedicated to processing music. For example, the auditory cortex is responsible for recognizing and interpreting musical notes and rhythms, while the prefrontal cortex is involved in the emotional and cognitive aspects of music. This suggests that music is an integral part of human cognition, and can affect our emotions and behavior in profound ways.



When it comes to catchy tunes, several musical elements work together to create a memorable listening experience. Simple melodies, repetitive rhythms, and memorable lyrics or hooks are common components of catchy tunes. These elements activate pleasure centers in the brain, releasing dopamine and causing a sense of enjoyment that makes the tune stick in our minds.

Additionally, music theory and composition principles can contribute to the catchiness of a tune. For example, syncopation involves accentuating off-beat rhythms, which can create a sense of tension and release within a song. Unexpected chord progressions can also create emotional engagement and make the song more memorable.

In conclusion, the love for music is a complex and multifaceted phenomenon that involves biological and cultural factors. However, it is clear that music has a profound effect on our brains and emotions, and that certain musical elements and principles contribute to the catchiness and memorability of a tune. As such, we can appreciate music as a unique and powerful form of human expression that has been an integral part of our evolutionary and cultural history.



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What is the science behind reflectivity?

Owen Chen

The concept of reflectivity is often denoted by a light ray striking an object, generating an incidental ray that rebounds back at an angle relative to the original ray with the same magnitude. The typical reflection can only occur for specular surfaces such as mirrors, forming reversed images from left to right. Specular reflection magnification can vary, depending on whether the mirror is shaped as parabolic or spherical.

Further exploration into the realm of reflectivity unveils its diverse manifestations, each offering a unique perspective on the interaction between waves and their surroundings. Consider the phenomenon of diffuse reflections, where waves encounter non-shiny surfaces and scatter in multiple directions due to microscopic irregularities, resulting in the absence of a clear image formation.

Moreover, the intriguing phenomenon of infinite reflections emerges when mirrors are arranged in parallel, giving rise to an endless series of images along a straight line. However, imperfections in the mirror surface eventually propagate and extinguish the infinite images, highlighting the delicate balance between reflection and imperfection.

In the domain of retroreflection, waves exhibit a fascinating behavior as they return in the direction of the originating source, echoing their path with a sense of nostalgia. This effect can be observed through the use of corner reflectors or the



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natural adaptations found within certain animal eyes, such as the tapetum lucidum, which enhances night vision in creatures like cats.

Lastly, within the realm of nonlinear optics, the phenomenon of complex conjugate reflection adds a surreal dimension to the study of reflectivity. Here, waves reflect exactly in the original direction but with reversed wavefronts and directions, offering a tantalizing glimpse into the untamed wilderness of wave dynamics.

In essence, reflectivity serves as a gateway to unraveling the mysteries of wave behavior, offering insights into the intricate interplay between waves and their environment. From the shimmering dance of light upon a mirror's surface to the haunting echoes that reverberate through the corridors of time, reflectivity invites us to embark on a journey of discovery, where the silent symphony of waves echoes across the cosmos, binding us together in the eternal dance of reflection.



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Cancer

Riley Lee

Cancer is a big word that means something's wrong with how cells grow in your body. Cancer starts when some cells in your body don't follow the rules anymore. Normally, cells grow, divide, and make new cells in an orderly way, but with cancer, the cells start growing too much and don't stop. There are lots of different types of cancer, and they can happen in different parts of your body. Some common ones are breast cancer, lung cancer, and skin cancer. Each type of cancer is a different kind of troublemaker and doctors have to treat them in different ways.

Cancer can happen because of different reasons. Cancer can be from genetics, not being healthy, and smoking. Things like too much sun or getting certain infections can also make cancer more likely. Finding cancer early is really important because it's easier to treat when it's small. Doctors have special tests they can do to check for cancer, like scans and blood tests. Treating cancer is like fighting a tough enemy. Doctors use different tools to help such as surgery, chemotherapy, radiation therapy, immunotherapy, targeted therapy, hormone therapy, and stem cell transplantation.

Cancer is a serious problem, but there are lots of people working together to fight it. By learning more about it, taking care of ourselves, and supporting each other, we can make a big difference in keeping cancer away and helping those who have it get better.

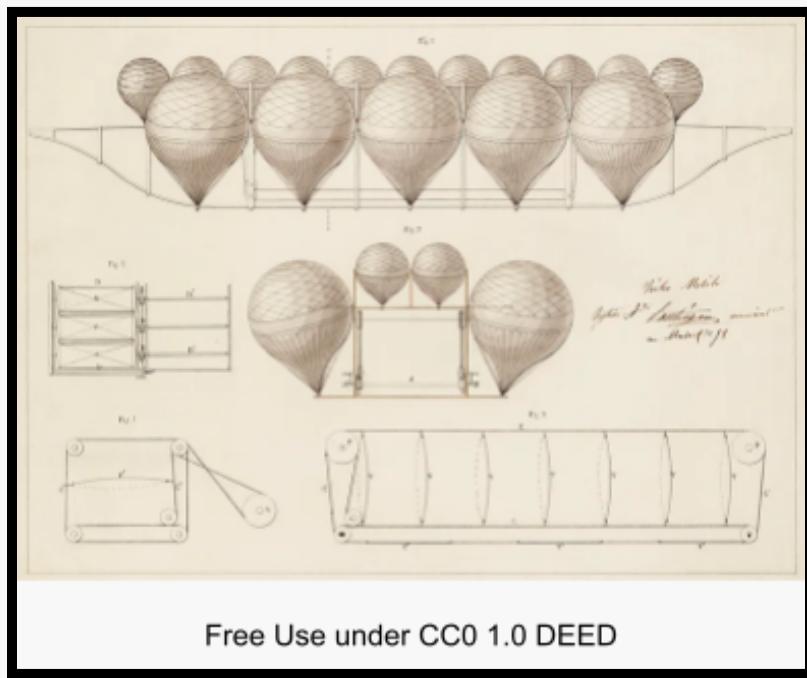


The Science Behind Hot Air Balloons

Wilson Zhu

The hot air balloon is a lighter-than-air aircraft that demonstrates the elegant scientific principles to properly sustain flight. The core of the hot air balloon operation relies on the basic physical law that warm air ascends. Warm air ascends due to lower density which makes it rise over the cold air which has a higher density. Additionally, the increase in temperature makes the gas particles move faster as they gain more kinetic energy. The hot air balloon consists of a bag, known as an envelope, a burner, and a basket. The heated air inside of the hot air balloon's envelope is buoyant since it has a lower density compared to the colder air in the atmosphere.

First, the envelope of the hot air balloon is usually made of flame-resistant materials such as ripstop nylon and polyester. The material is cut into panels and sewn together to carry the weight of the basket. There are cables at the bottom of the envelope connected to the basket. The top of the envelope often has a vent that the operator of the hot air balloon can use to release hot air to slow the ascent, start a descent, or increase the rate of the balloon's descent. The shape of the envelope is usually a flipped water drop and there are some other sophisticated shapes used to

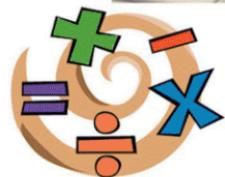
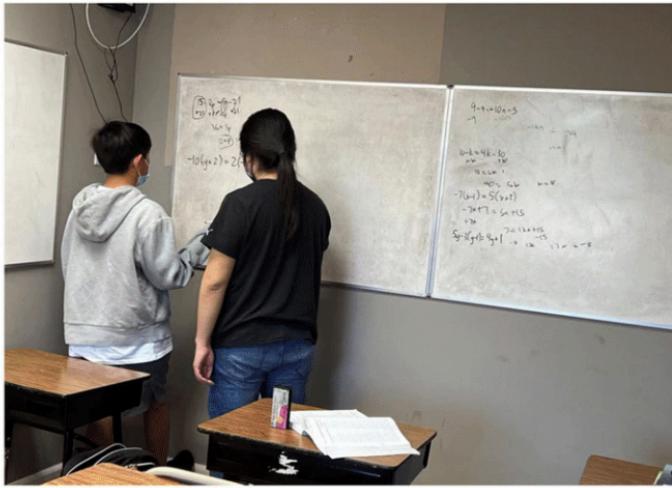


outdo traditional designs. The basket of the hot air balloon is commonly made of woven wicker or rattan. The shape of the basket is often rectangular and varies in size to fit people. The burner of the hot air balloon uses liquid propane and converts it into gas which is ignited to create warm air in the envelope. The pilot controls the amount of gas created in the hot air balloon for more control over the aircraft.

In summary, the hot air balloon harnesses the fundamental principle that warm air rises due to its lower density compared to cooler air. Consisting of an envelope crafted from flame-resistant materials like ripstop nylon, a basket woven from wicker or rattan, and a burner fueled by liquid propane, this aircraft exemplifies the fusion of physics and engineering. By heating the air within the envelope, pilots manipulate buoyancy to control altitude, while steering relies on navigating wind currents at varying altitudes. Through careful modulation of the burner, pilots can initiate ascent or descent, showcasing the intricate use of temperature, density, and aerodynamics.



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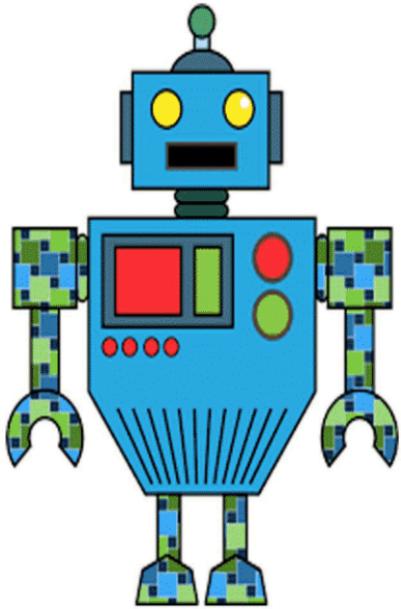
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