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MURPHY'S LAW

ANIMAL IMPOSTERS

2.5D IN VIDEO GAMES

and more...

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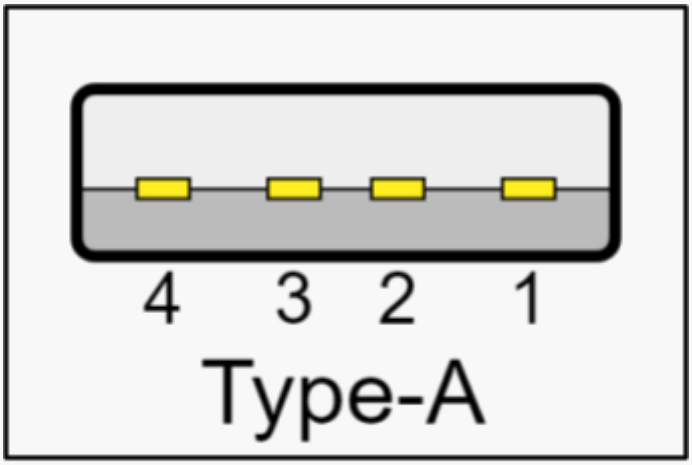
Understanding USB Ports: Transition from USB-A to USB-C

Aidan Hong

Technology has become integral to our lives, with simple tasks revolving around it. Ports help leverage their functionality, offering charging, data transfer, and more. However, different devices use different ports. This begs the question which ports offer which functionality, and where are they present?

One of the most common ports present on most PC devices is USB-A. The port is shaped like a rectangle and offers data transfer. Usually, USB sticks use USB-A to transfer data, and sometimes it is used to help transfer power from a power source or power adapter to a device. However, this port is older and is currently being phased out in favor of USB-C.



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USB-C is a newer port standard that is starting to become commonplace. Most devices use USB-C, including the latest iPhones, MacBooks, and PCs. USB-C offers many advantages USB-A doesn't offer. For example, USB-C can be plugged in any direction, whereas USB-A has to be plugged in a specific direction. Additionally, USB-C offers what USB-A has at faster speeds. Thunderbolt is a variation of USB-C, which not only transfers data faster than USB-C but also supports external displays. This port is common on MacBooks and is present on some PCs. However,

USB-C and Thunderbolt have disadvantages: they aren't as common as USB-A. Since some devices only offer USB-C/Thunderbolt, for example, the MacBook, users are required to buy an adapter to use USB-A.

Different port types are present on all devices, but the two most common are USB-A and USB-C. Both of them offer various functionalities at high speeds, and both have their advantages and disadvantages. It is up to the user to determine which port best suits their needs.

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Animal Imposters: Mimicry

Edward Huang

In the animal kingdom, success is determined by whether one can catch prey and evade predators. Though speed and dexterity are beneficial traits, organisms have evolved to acquire a variety of other skills and tactics to avoid being hunted. One such tactic is mimicry.

Similar to camouflage, mimicry enables organisms to deceive predators, increasing their chance of survival. Unlike camouflage, however, mimicry does not exactly rely on an organism hiding in plain sight. Instead, organisms employing mimicry – the mimic – can look or act like another organism or non-living object – the model. In examples of Batesian mimicry, a harmless mimic may possess the traits of a harmful model to appear more distasteful or dangerous, deterring predators. One example is Passiflora incarnata, a flower whose elongated black spots appear like ants. Herbivores that would otherwise feed on Passiflora incarnata now avoid the flower due to the perceived presence of ants. Another example is the aptly named Mimic poison frog, whose vivid coloring resembles that of other highly venomous dart frogs, despite having a weaker venom. Vivid colorings, or any other kind of visual “warning signal” used to deter predators are known as aposematic traits and are frequently the focus of animals employing mimicry.

Passiflora Incarnata Flower

Batesian mimicry does not only occur with visual aposematic traits, like colorings or spots. In an example of acoustic mimicry, tiger moths that are foul-tasting produce

ultrasonic signals to ward off echolocating bats. Some pyralid moths are then able to mimic this ultrasonic signal to avoid those same bats, despite being more pleasing to eat. An interesting relationship occurs during Emsleyan mimicry, where a deadly prey mimics a less dangerous species. This is more unusual, since the model is typically more dangerous than the mimic, not the other way around. One such explanation for this is that a harmful but nondeadly organism can deter predators without killing them while using its aposematic colorations to condition predators into avoiding the prey in the future. If this organism was instead deadly, the species would not be able to reap the benefits of aposematism (warning signals), since predators would simply die from attack rather than learn to avoid the species as a whole. Thus, deadly prey should therefore avoid having unique aposematism and instead employ Emselayn mimicry by copying the aposematic coloration of the nondeadly prey, as its predators would have already learned to avoid its nondeadly look-alike.

An example of both Emsleyan mimicry and Batesian mimicry is the coral snake system, where there exists harmless milk snakes, deadly coral snakes, and harmful but nondeadly false coral snakes. The nondeadly coral snakes are the model; the harmless milk snakes exhibit Batesian mimicry by mimicking the red and black stripes of the false coral snake, while the deadly coral snakes exhibit Emsleyan mimicry by also mimicking the colorations of its nondeadly (but still venomous) false coral snake.

In addition to defensive mimicry is aggressive mimicry, where the predator mimics a less dangerous organism to lure or avoid suspicion of its prey. One such example is the silver Argiope, a spider whose webs mimic the pattern of various flowers. Bees who are attracted to such patterns are then lured into the web.

There exist countless other forms of mimicry, some defensive, some aggressive, and some not even related to predator-prey relationships at all. In common is the use of deception to aid a species' chances of survival and reproduction. Complex systems of mimicry are common in nature, showing that not only are speed and strength vital to an organism's survival but also its ability to finesse its predators and prey.

Murphy's Law

Angela Chin

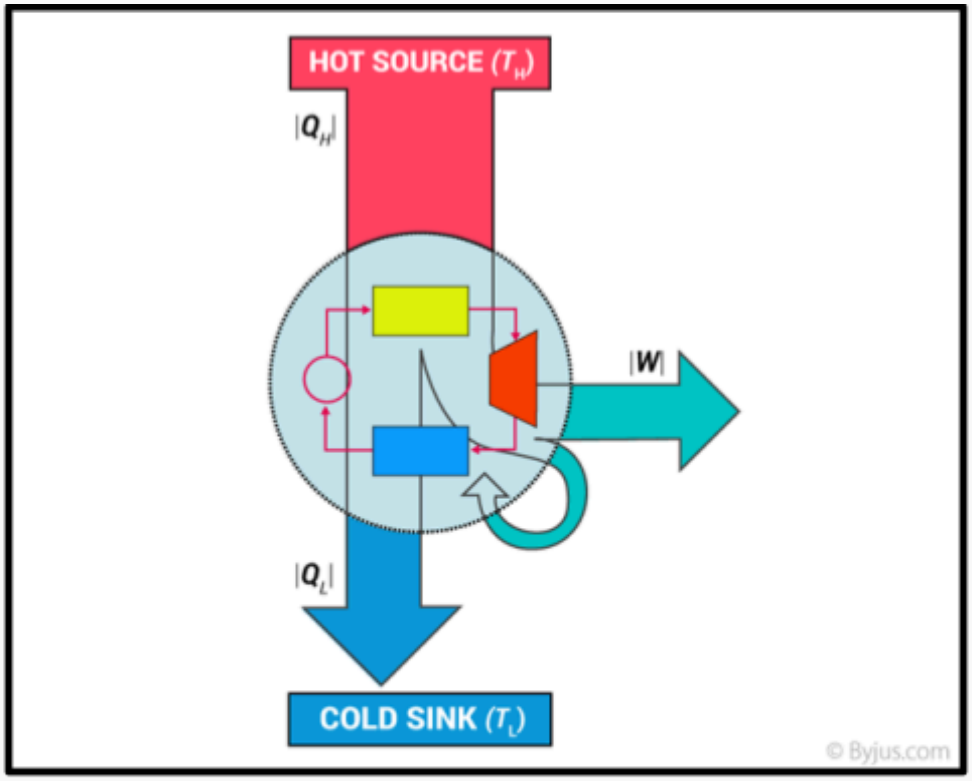
Murphy's most popular law, also known as Sod's Law, is simply declared as "Anything that can go wrong will go wrong." This law is the first of several adages, or proverbs, coined by American engineer Edward Aloysius Murphy Jr. This text will go over the history and corollaries of the phrase, as well as how one may calculate a solution.

The origins of Murphy's Law aren't precisely known. Most people agree that it was spoken in the 1948-1949 range after Murphy and his team failed a rocket sled test, the words being: "If there are two or more ways to do something and one of those results in a catastrophe, then someone will do it that way." However, there have been accounts of similar proverbs such as the one from mathematician Augustus De Morgan in 1866: "The first experiment already illustrates a truth of the theory...what-ever can happen will happen if we make trials enough." De Morgan's quote is essentially Murphy's without the positive or negative; "whatever can happen will happen" vs. "anything that can go wrong will". Additionally, this law is a way of stating the Second Law of Thermodynamics. This law observes that things tend to disorganize themselves when left alone.

To better understand Murphy's law, scientists have defined it using formulas. Engineer Joel Pel's solution is PM = -KM(e-(I*C*U+F)/FM - 1), where P(m) is the probability that something will go wrong; K(m) is Murphy's constant, how matter will be damaged in direct proportion to its value, and this case is equal to one; F(m) is Murphy's factor, approximately 0.01; I is the importance of the event; C is the complexity of the event; U is urgency; and F frequency of it occurring. To put the equation into action, think of the possibility of something unwelcome happening. Then, replace each variable with a rating of 1-10. For instance, if the situation is urgent, U should be a greater number. The resulting solution would match the probability of something going awry.

$$P(M) = -K(M)\left(e \cdot \frac{-1 \cdot C \cdot U + F}{F(M)} - 1\right)$$

In conclusion, Murphy's Law serves as a reminder that not all things will go according to plan. Not only this law but countless other expressions have been made over the years to express the idea. Scientists and engineers alike have made efforts to prove it, and in return, it became one of the most widely-known laws.



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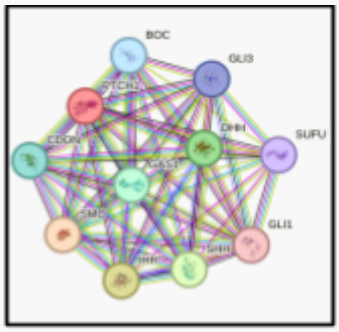
The Sonic Hedgehog Cell Signaling Pathway

Arthur Liang

The Sonic Hedgehog cell signaling pathway is not only notable for its name but also for its pivotal role in regulating cell reproduction during crucial times of bodily development for many organisms, including humans. This complex process of cell signaling is the driver behind embryonic development and tissue and skin repairs.

The main components of the pathway consist firstly of two proteins attached to the outer membrane of animal cells. These proteins are called the Patched protein (Ptch) and the Smoothed protein (Smo), which work in conjunction with many other proteins inside the cell to relay a signal from the outside of the cell to the inner nucleus. Pitch is what is known as a tumor suppressor protein, which inhibits cell division. On the other hand, Smo is a proto-oncogene, which promotes cell division. In the normal state when cell reproduction is not needed, Ptch suppresses Smo from inciting cell division. When cell division is eventually needed, the cell signals for a sonic hedgehog ligand from nearby cells. This ligand binds to Ptch and stops it from inhibiting Smo, which subsequently leads to cell division and mitosis.



PTCH1 Protein (Human) from String-Db
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If this critical pathway malfunctions, it can lead to an array of problems regarding bodily development and tumor growth. Two different outcomes are possible. The first problematic outcome occurs when Smo is inhibited too often and cell reproduction does not occur when it needs to. This can lead to growth deformities such as cyclopia in

certain animals, which is when an animal only has one eye. The other outcome occurs when Smo is not inhibited and cell reproduction occurs too much, leading to the growth of tumors and cancers. For example, if humans are exposed to excessive UV radiation, the Ptch protein can mutate and stop inhibiting Smo, which can lead to skin cancers such as Basal Cell Carcinoma. Luckily, BCC can be treated with chemicals like cyclopamine, which interferes with Smo and interrupts the cell replication signals.

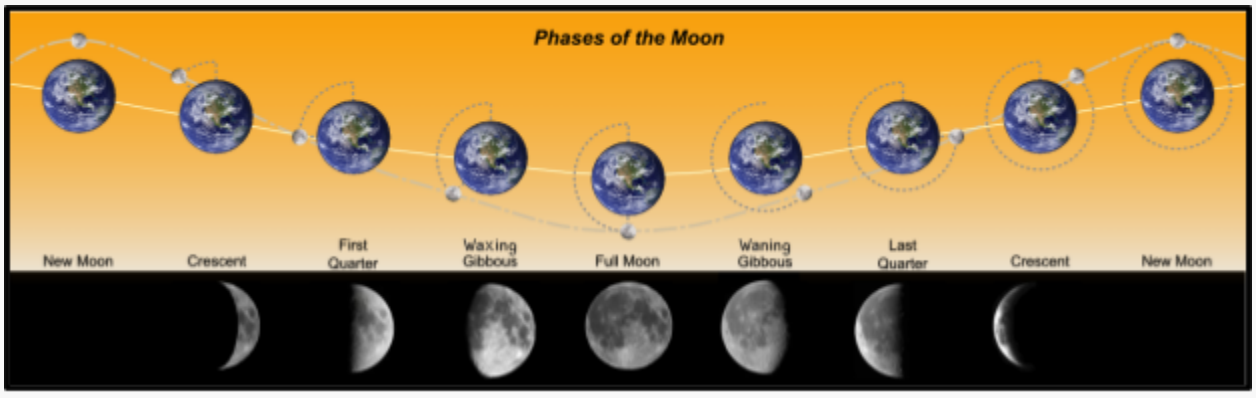
Superficial Basal Cell Carcinoma

What are the Moon Phases?

Audrey Don

I'm sure everyone has seen the moon at least once in their lifetime, no matter how old or young. We have seen the moon in different shapes every day with a bright light shining. But what exactly is it called when the moon changes shape?

The moon phases are the different shapes of the moon that we see each month. In total, there are 8 moon phases, 4 primary and 4 secondary. The primary phases are called the new moon, the first quarter, the full moon, and the last quarter. The secondary phases are waxing crescent, waxing gibbous, waning crescent, and waning gibbous. The Moon's ecliptic longitude is at an angle to the Sun (viewed from Earth) of 0, 90, 180, and 270 degrees respectively. Each of these phases appears at slightly different times at various locations on Earth. The duration from the full moon to the new moon is approximately estimated from 13 days and 22 ½ hours to 15 days and 14 ½ hours.



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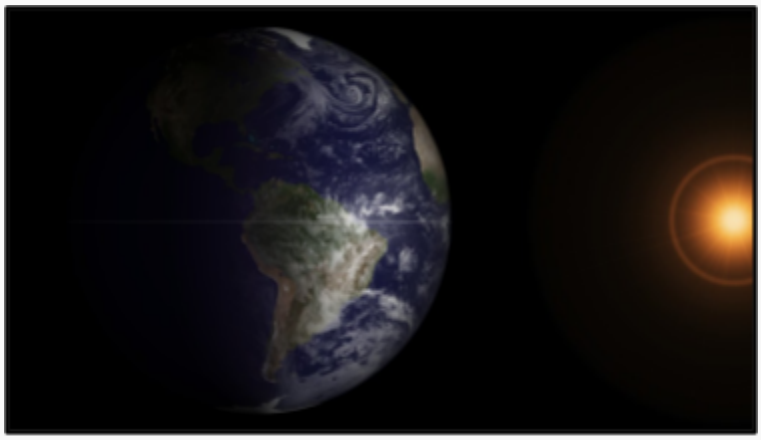
Between the principal phases are the intermediate phases, during which the apparent shape of the Moon is either crescent or gibbous. On Average, the intermediate phases last one-quarter of a synodic month or 7.38 days. The term waxing is used for an intermediate phase when the Moon's apparent shape is thickening, from new to full moon. Waning is when the shape is thinning, the duration from full moon to new moon is 13 days 22 ½ hours to about 15 days 14 ½ Hours.

Due to the lunar motion relative to the meridian and ecliptic, in the Earth's northern hemisphere. A new moon appears highest at the summer solace and lowest during the winter solace. A first-quarter moon appears at its highest at the spring equinox and lowest at the autumn equinox. A full moon appears highest during the winter solace and lowest during the summer solace. A last-quarter moon appears highest at the autumn equinox and lowest during the spring equinox.

From what we could see on Earth, the Moon's eccentric orbit makes it both slightly change its apparent size, and to be seen from a slightly different angle. The effects are rather subtle to the naked eye, from night to night, yet it's still rather obvious in time-lapse photography.



GOES Satellite Captures Spring Equinox by NASA Goddard Space Flight Center from Flickr
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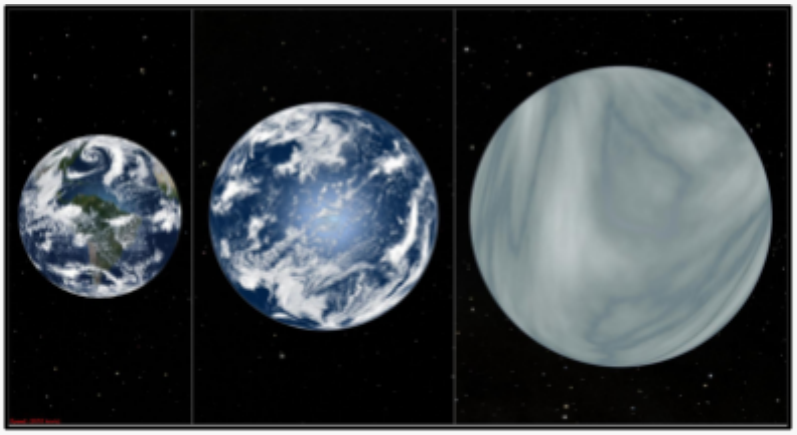
Exoplanets: The Source of Extraterrestrial Life

Brandon Pian

Exoplanets are planets that orbit stars outside of our solar system. Astronomers didn't observe exoplanets until the 1990s, in the 30 years of observations astronomers have 5,500 confirmed exoplanets and 10,000 additional candidate exoplanets.

Life can survive on exoplanets if they are in the habitable zone of a star. Astronomers are also learning more about Hycean Worlds, which are planets that are mainly liquid oceans. The closest exoplanet to Earth is Proxima Centauri B which orbits the star Proxima Centauri 4 light years away. To put this in perspective, if you were on the Orion with a top speed of 24,000 miles per hour, it would take a billion hours or 114,000 years to reach Proxima Centauri B.



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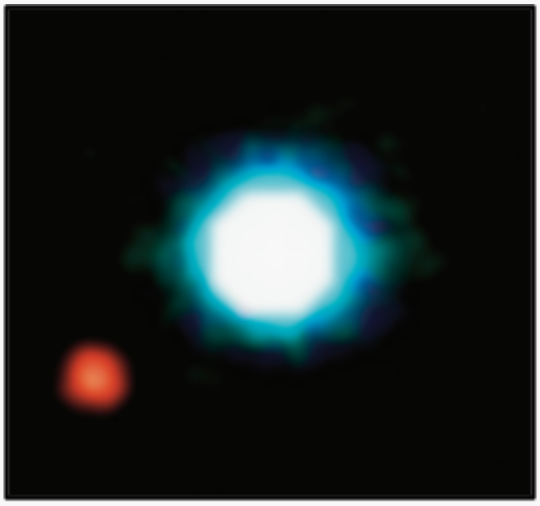
There are different types of exoplanets; one such type is called a Hot Jupiter. Hot Jupiters are gas giant exoplanets that orbit close to their stars and complete an orbit in a couple of Earth days. Due to Hot Jupiter's closeness to its star, they are easily seen using radial velocity and transit methods, leading Hot Jupiter to be a more easy planet to find and discover.

Another type of exoplanet are Terrestrial exoplanet. Terrestrial exoplanets are Earth-sized planets outside of our solar system that are made of rock, silicate, water, and carbon. These exoplanets usually are mostly composed of rock or iron, with either a solid or liquid surface.

Super-Earths or mini-Neptunes are exoplanets twice the size of Earth with up to 10 times Earth's mass. This means they are bigger than terrestrial planets but smaller than ice and gas giants. Neptunian exoplanets are exoplanets similar to Uranus and Neptune with 4 times Earth's size and 17 times Earth's mass. Neptunian exoplanets are thought to have mixed interiors but heavy metals at its core.

Rouge Exoplanets are free-floating planets that are not orbiting a star. This means that these planets just float in their galaxy alone and without a star. A cause for these planets is they are flung away by gravitational interactions with other planets.

Though astronomers have discovered many potential exoplanets to habit life, none have yet been confirmed to have life, continuing their search for life on another planet.



Harmony in the Hives: Insights into Colony Behavior

Brandon Wang

The specks you see on the ground outside are usually viewed as unnoticeable dots. When zooming in, they are seen as a more complex and remarkable species and possess an exceptional ability to communicate with their colonies. Combining chemical signals, physical touch, and sound cues coordinates elaborate tasks efficiently that are essential for survival.

The primary modes of communication ants use are pheromones, special glands that leave scent trails to recruit and alert other ants if there is trouble. For instance, when ants discover a food source, they usually return to the nest, leaving pheromones trails that guide other colony members to it. This indirect form of communication allows ants to communicate effectively and to quickly adapt during environmental changes. Additionally, ants use physical touch with their antennas with one another, trading chemical signals and evaluating how other ants feel. Their antennas can distinguish the differences between their friends and foes, identifying potential threats. Furthermore, recently, research displayed that ants utilized

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their abdomens that produce chirping sounds called stridulation by rubbing them together. This informs other ants about the location and what the environment is like and also alerts danger. Deciphering the language of ants proved to be incredibly useful such as controlling ant populations and has also inspired designs of autonomous systems. All in all, ants have an intricate system of communication that allows them to survive and flourish despite their size.

Their many ways of communication allow them to systematically defend their nests and exploit resources. The mysteries of the way ants interact add to our unlimited knowledge of how insect societies and the natural world work. The next time you see an ant hill, you may think it's just a mound of dirt, but inside is a complicated network of communication systems that keep the colony alive.

Communication in bulldog ants (Myrmecia nigriscapa) Sydney, Australia by BMC Ecology Image from WikiMedia Commons
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Abstract Dimensions: 2.5D Video Games

Brian Wang

In a video game industry that is full of competition, unique developers stand out among others. Within the mist of game properties, dimensions harbor a significant aspect of a player's experience. Traditional video game developers tend to create games that are in 2D or 3D. 2D dimensions display the x and y axis, while 3D dimensions display the x, y, and z axis. However, a new dimension has taken hold of the market: 2.5D dimensions.

On a simple basis, 2.D means a video game that presents itself in a 3D environment, while retaining 2D qualities. What does this mean? Imagine a video game that utilizes the same 3D graphics such as Genshin Impact (Legend of Zelda, Valorant, etc.), but the character models are 2D. 2.5D video games date back to 1975 when a video game called Interceptor was released by the Taito Corporation - a Japanese Company that still stands today. Interceptor presents a first-person shooter experience as an arcade game, where you can shoot planes down in a 2D/3D environment. Another popular example is the original DOOM from 1993 (released by id Software), which is yet another first-person shooter that follows a main character fighting through hordes of undead creatures. Again, a player traverses a spaceship in a 3D environment - three axial movements - while displaying all the graphics with 2D sprites.

How does 2.5D work? Video games that utilize this feature depend on two key factors. First, the video game should be a normal 3D game project. This means that initially, the project should look like any other 3D video game. After that, all 3D objects will then harbor 2D graphics that look directly towards the player's camera. Since 2D only has an x and y axis, it can only be displayed by facing the camera. From a perspective

that is away from the camera, the video game will look as if billboards were turning towards the player's camera, while displaying user input actions (WASD movement, for example).

In the present day, 2.5D video games are still on the rise. One of the most popular 2.5D games is the Octopath Traveller series, developed by Square Enix. They have versions of the video game on the Nintendo Switch, PC, Xbox, and mobile phone. In this video game, players traverse a map on three axes, while the camera is always maintained in one direction. Essentially, Octopath has billboards that don't need to constantly follow the player's camera, because the camera is set in one axis only. Square Enix's technique shows consideration of universal gameplay, as constantly making 2D sprites within the range of the player's camera look at it will take an abundance of resources from the device. Their technique reduces the usage of too many resources, while also keeping their 2.D stylizations.

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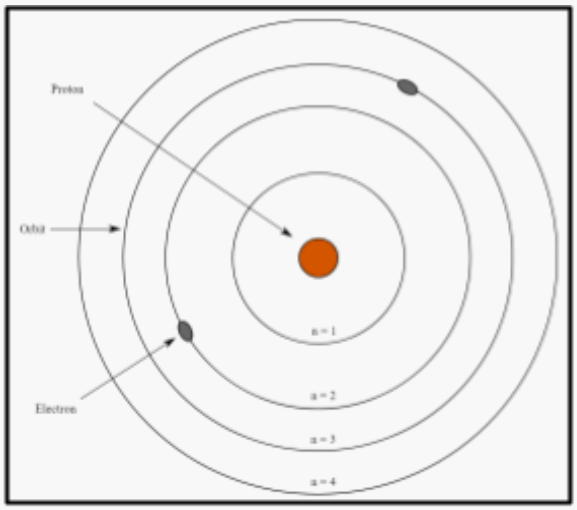
In summary, 2.5D video games are games that harbor 2D elements in a 3D environment. They have existed in the past, and are still on the rise today. Therefore, if any video game developers aspire to follow a similar path to discover new unique aspects of video game design, then it should be done. Many have already explored this path, thus, making this an easier process for every video game developer.

Bohr's Model: Structure of an Atom

Cody Duan

Starting with Rutherford's picture of an atom, a Danish scientist, Niels Bohr, introduced his idea of an atom's structure in 1913. In doing so, Bohr connected the ideas of classical and modern physics.

Inside an atom, electrons orbit the nucleus, made of protons and neutrons. Bohr theorized that only certain values of total energy existed, consisting of kinetic energy and electric potential energy, and these electrons orbit in different radii dependent on these energy levels, where the larger the orbit, the higher the energy. He labeled the radii as "shells" or "energy levels." To connect the ideas of Planck and Einstein, Bohr had to assume many ideas. One of them was that the electrons were in a radiationless orbit, which defies the laws of physics because it was thought that electrons radiated electromagnetic waves as they orbited the nucleus. The energy would slowly decrease until the orbit collapsed.



Bohr's model by Sharon Bewick (raster); Adrignola (vector) from WikiMedia Commons
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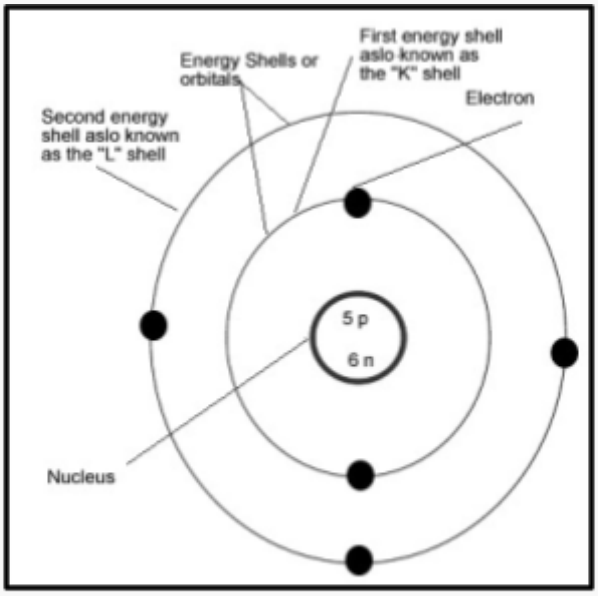
Using Eintein's photon theory, where a photon will transfer all of its energy to an electron upon contact, Bohr developed a theory stating that photons are only emitted when the electron changes from a higher potential orbit to a lower potential orbit. The electrons move orbits whenever they emit or absorb a photon, emitting a photon when it changes to a lower potential orbit and absorbing a photon as it moves to a higher potential orbit by clashing atoms. He then found that the lowest energy orbit, or the ground state, is the most stable, emitting no radiation, and as the orbit gets larger, the atom gets unstable as it emits or absorbs photons.

Despite Bohr's wonderful ideas of an atom, his model is flawed, for it does not fully explain the aspects of atoms with more than one electron. However, Bohr's model led to the development of quantum mechanics and laid the foundation of our understanding of quantum theory, significantly contributing to our understanding of atomic physics.



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The Basic Unit of Life

Denise Lee

The journey of understanding life at its most fundamental level began with the pioneering work of scientists like Robert Hooke and Anton van Leeuwenhoek in the 1800s. A cell is the smallest unit that can carry out all life processes. The word “cell” was first used in late 1665 by Robert Hooke.

The discovery of cells first began when Robert Hooke looked at thin slices of cork under the microscope. Robert Hooke discovered that the thin slices of cork were made of thousands of tiny, empty chambers. Hooke called these chambers “cells” because they reminded him of the tiny rooms in which he lived in the monastery. Today we know that cells are not empty chambers but contain much living matter. In the late 1600s, Leeuwenhoek made many simple microscopes to observe things in nature that interested him. These microscopes had magnifications 10 times greater than the microscopes used by Hooke. Leeuwenhoek discovered the hidden world of microorganisms in a drop of water. He called them “little beasties.” He was the first to see and describe microorganisms under the microscope. On the road to the cell theory, Matthias Schleiden, a German botanist, concluded that all plant tissues were composed of cells. In 1839, a year after Schlediden’s conclusion, Theodore Schwann, a German Zoologist,

Leeuwenhoek simple microscope (copy), Leyden, 1901-1930 Wellcome L0057739 by Wellcome Images from WikiMedia Commons
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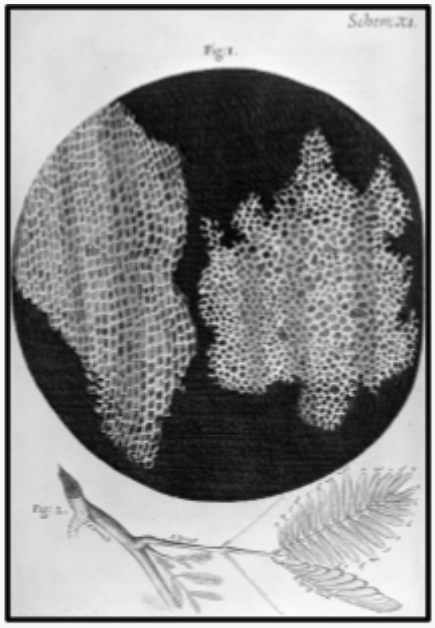
concluded that all animals were composed of cells. In 1858, Rudolph Virchow noted that cells could only arise from preexisting cells. The Cell Theory states all living things are composed of cells, cells are the basic units of structure and function in living things, and new cells are produced from existing cells. With the development of the cell theory, scientists began to clarify the characteristics of living organisms.

In conclusion, the journey from Hooke's discovery of cells to the formulation of the Cell Theory by Schleiden, Schwann, and Virchow has defined our understanding of life's basic units. The principles of the Cell Theory, emphasizing cells' fundamental structures and the origin of new cells from preexisting ones allow us a better understanding of life.



Robert Hooke, Micrographia, cork. Wellcome M0010579 by Wellcome Images from WikiMedia Commons
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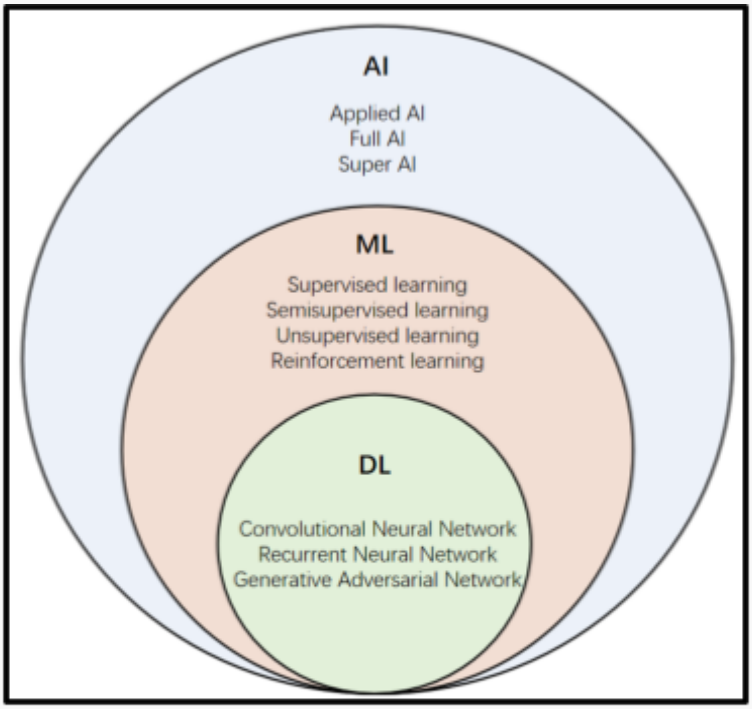
Deepfakes: A Mirage in the Digital Realm

Eddie Zhang

Deepfake technology has become a powerful tool that alters our digital world. The employment of sophisticated algorithms such as autoencoders and generative adversarial networks (GANs) in deepfakes has brought in a new era of artificial intelligence (AI) media production. This research looks at the ethics of using deepfakes as well as their mechanics and production process.

An intricate interaction of neural networks is the basis of deepfake technology. Two neural networks, the generator, and the discriminator, are put up against one another in a competitive dance by generative adversarial networks (GANs). The generator continuously generates deepfakes and compares them with the discriminator. This process continues until the fake is extremely realistic. By compressing and rebuilding input data, autoencoders, on the other hand, let users



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manipulate encoded characteristics to produce original material and support unsupervised learning.

To begin, a large amount of training data is gathered. This data is used by the AI model to comprehend the user. It looks at different parameters such as appearance gestures, speech, etc. After training, the model then be used to generate extremely realistic videos, some of which may fool the everyday internet user.

Deepfakes are a concern for ethics due to deception. They create realistic media, shaking trust. This adds uncertainty to an already chaotic media scene. Deepfakes can be used for harm, like political manipulation or identity theft. Reliable detection systems are vital.

In summary, deepfakes are a double-edged sword in synthetic media. They showcase AI and digital manipulation's immense potential but also pose significant threats to truth and authenticity.

This person doesn't exist Imagined by a GAN (generative adversarial network) StyleGAN2 (Dec 2019) by Datasciencearabic1 from WikiMedia Commons
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Animal Cognition and Behaviors

Emily Wang

The study of animal intelligence stems from the desire to learn more about how animals perceive the world, allowing scientists to better understand their actions and cognitive behaviors. The exploration of these behaviors reveals a complex landscape of animals' abilities to understand the world around them and their varying social-emotional interactions.

Animal cognition refers to the ability and mental processes of animals, including perception, learning, memory, and communication skills. Cognition processes play an important role in mating choices, finding food, navigating, and many other behaviors. While studying animal cognition does not inherently define whether they have awareness or self-feeling, the focus of the study is to understand their mental processes and capabilities.

Through many studies, rats and octopuses have displayed remarkable problem-solving abilities and high intelligence levels, such as navigating through mazes to reach a reward or escaping from enclosures. Other cognition examples in animals include ants, who have high social intelligence, and honeybees, who exhibit good communication skills. Problem-solving abilities help animals find food and overcome obstacles, and communication and social intelligence contribute to good collaboration skills, helping them obtain information faster and defend against

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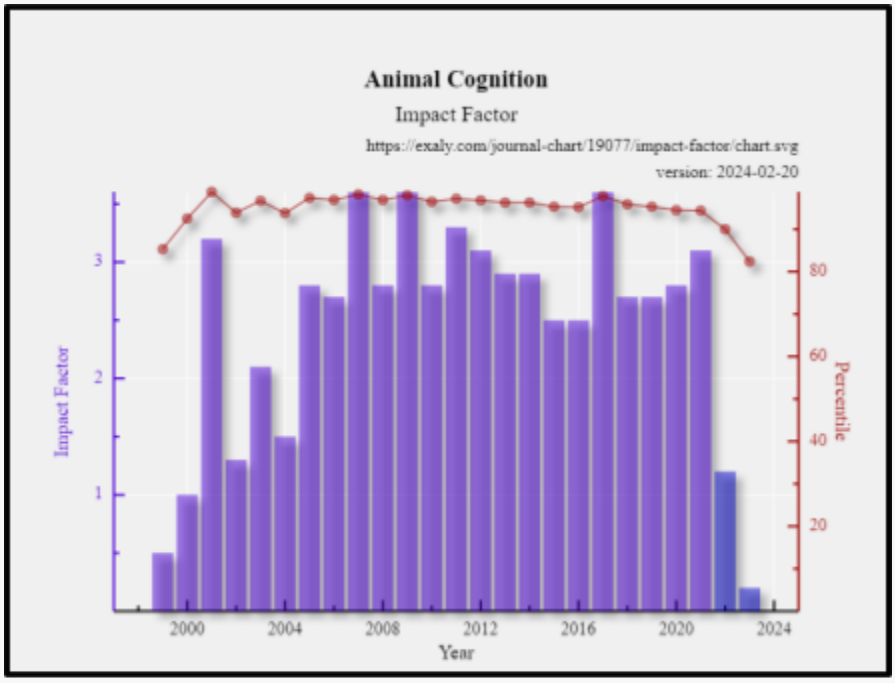
predators. In essence, animal cognition varies between species and has developed to their environments to help them survive and thrive in the animal kingdom.

Animal behaviors show a fascinating variety of actions displayed by creatures across the natural world. The study of animal behavior reveals how species adapt and thrive in their environments. Animals display a remarkable range of behaviors, including foraging, communication, territorial defense, parental care, and migration. These behaviors are affected by a combination of genetic influences, environmental cues, and learning experiences.

Studying animal behaviors not only sheds light on the evolutionary processes that have developed these traits over time but also highlights the importance of conservation movements aimed toward preserving the beautiful life and behaviors of animals.



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Discovery of Translucent Red Cross Jellyfish in Volcanic Caldera

Natalie Dai

A newly discovered jellyfish species has been found off the coast of Japan. This peculiar creature was discovered at a depth of 2,664 feet in the Pacific Ocean, near Japan's Ogasawara Islands, specifically within the Sumisu caldera. The caldera is situated in a hydrothermally active area, part of a volcanic arc known as the Ring of Fire.

Named George's Cross Medusa (Santjordia pagesi) by researchers, it stands out for its unique appearance. It features a translucent body with a stomach that resembles a bright red cross, which can only be depicted when viewed from above. This unusual creature has a diameter of 4 meters and resembles the shape of an umbrella with draping tentacles covered in stinging cells. The reason for its red stomach is to protect the jellyfish from predators due to its diet. Santjordia pagesi's diet mainly consists of bioluminescent organisms, creatures that glow in the dark. However, their red stomach aids in reducing the light emitted from these creatures, protecting the jellyfish.

A few years ago, divers spotted Santjordia pagesi during a swim in the Sumisu caldera. At that time, researchers were unable to identify the jellyfish. However, upon rediscovery, researchers were able to analyze its DNA. The analysis revealed that Santjordia pagesi was so distantly related to other jellyfish species that scientists needed to designate a new species name, genus, and subfamily. Due to these significant differences, scientists have suggested that Santjordia pagesi may contain a unique and unexplored type of venom.

Moon Jelly 1 (Genus Species) by Julia Sumangil from WikiMedia Commons
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Water Cycle

Owen Chen

From the law of conservation of energy, matter cannot be recreated nor destroyed meaning that all resources on Earth are finite. This concept applies to water too. They may seem new in your daily usage, but Earth is constantly recycling water through a process called the water cycle. The water cycle process contains three stages; evaporation, condensation, and precipitation.

Evaporation is one of the major processes during the water cycle. By changing the state of water from liquid to gaseous state, the water converts into water vapor that ascends to the atmosphere. This transformation can only occur if there's a suitable amount of kinetic energy in the water, which is often received by natural occurrences such as temperature, humidity, and solar radiation. Water can also become water vapor through other processes such as from transpiration. The process of transpiration comes from cellular respiration organisms use to make their energy. which contains water vapor as one of its byproducts.

The transition process from the vapor state to the liquid state is called condensation. Condensation often occurs due to an abundance of water vapor confined in the atmosphere. The mix in the temperature difference of different water vapor causes the entire molecule to bond with each other, creating a cloud. Once the clouds develop solid hydrogen bonds, the

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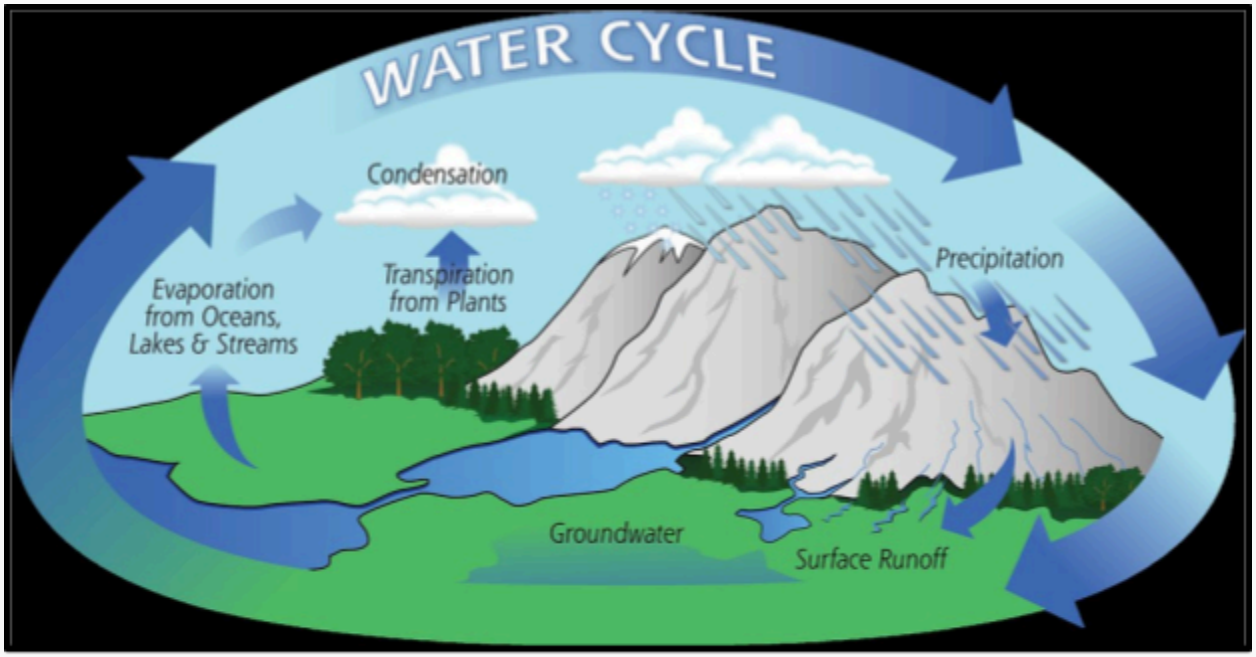
water will be released to the Earth through precipitation.

The process of precipitation consists of the water falling back to the Earth. The water is mainly distributed in ways: some are returned to the atmosphere by evaporation, some may be intercepted by vegetation and then evaporated from the surface of leaves, some percolates into the soil by infiltration, and the remainder flows directly as surface runoff into the sea. Some of the infiltrated precipitation may later percolate into streams as groundwater runoff. Direct measurement of runoff is made by stream gauges and plotted against time on hydrographs.

The water cycle is continuous, and from that society's finite amount of water supply can be replenished from time to time. However, special occasions may reduce some of the water resupplied yearly, meaning humans must always consider being conserved about the amount of water source they use daily.



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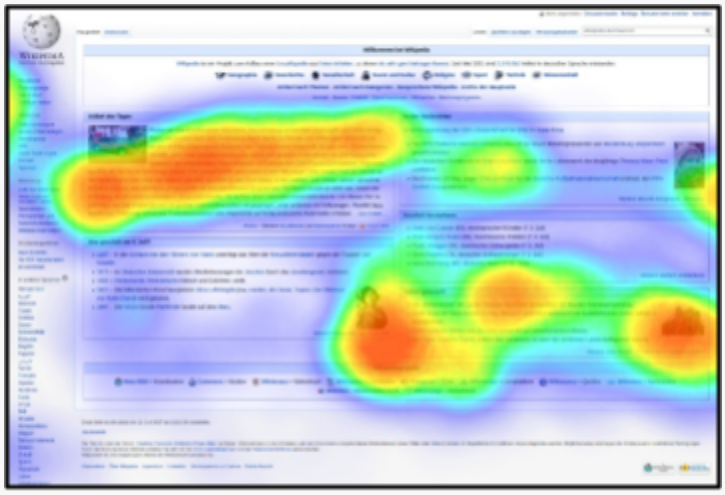
Blending Reality: The Apple Vision Pro

Richard Wang

Released on February 2, 2024, the Apple Vision Pro is a mixed-reality headset that blends the physical and digital worlds seamlessly. It is a project made from a decade of accumulated knowledge. The system can interact with motion gestures, eye tracking, and speech recognition. The spatial computer's OS is vision, and it allows multitasking on a big screen displayed in the headset. With all these features, the Apple Vision Pro has a whopping retail price of $3499 but it can be seen being sold for as much as $5000 on 3rd party sellers. To understand Vision Pro in more detail, people should learn about its special features and the public perception.



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The headset boasts a curved laminated glass display that goes over the eyes. The user sees a 4k micro OLED display that combines up to 23 million pixels. In the frame are five sensors, six microphones, and twelve cameras. Eye tracking is done by LEDs and infrared cameras. The user can insert custom optical inserts if they purchase prescription

glasses. Any surround sound becomes virtualized into the headset, and it is run by an external battery with two hours of battery life. It is not a see-through headset, so it instead uses its cameras to make a map of the surroundings which gets translated into a digital image. People who may not always want to see the real world can switch to an immersive world where the person is isolated.

In the pre-release, people were shocked at seeing something they truly had never seen before. People were also deterred from comparing it to the formerly Oculus product line as Apple advertised it to be a spatial computer instead of virtual reality. When the idea was introduced, the general public wasn't only shocked by its price, but also by its outrageous price. The battery life especially does not justify its price as people say its battery life is too short. The headset has so much technology, so much so that people become frustrated when they struggle to navigate through all the headset's complex systems.

The Apple Vision Pro isn't in its final form as there is still room for improvement. Its bulkiness also introduces the concept of future lightweight AR glasses. It is only the start of the future of great technology to come.

Wearing AR Glasses by Maxibu from WikiMedia Commons
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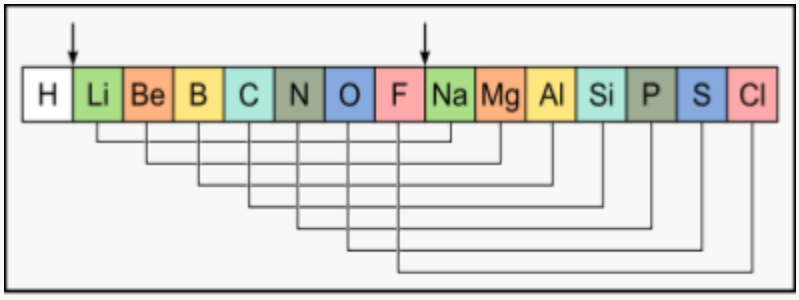
The Origin of the Periodic Table

Riley Lee

The periodic table is more than just a chart hanging in science classrooms. The periodic table is a map that helps guide chemists through elements and their properties. Before Dmitri Mendeleev's work in the 19th century, early scientists were already trying to find out what the elements were and what the elements do.

They noticed patterns in how substances behaved and attempted to classify them based on their similarities. Mendeleev's periodic table wasn't just a list of elements Mendeleev's periodic table was a framework that organized the elements from their atomic weight and their properties. Mendeleev's periodic table left gaps for elements that have not been discovered yet and the periodic table was very accurate in predicting the element properties based on their place in the table.

Mendeleev wasn't the only one contributing to the periodic table, others such as John Newlands, Julius Lothar Meyer, and Henry Moseley also made big contributions to the periodic table. John Newlands created the "Law of Octaves" which helped group elements with similar properties in sets of seven. While John Newlands created the "Law of Octaves," Julius Lothar Meyer arranged elements by their atomic volume. The periodic table received a really big upgrade with Henry Moseley's discovery of the atomic number in 1913. The atomic number is the number of protons in an atom's nucleus. Henry Moseley's discovery made a much more precise way to organize elements.



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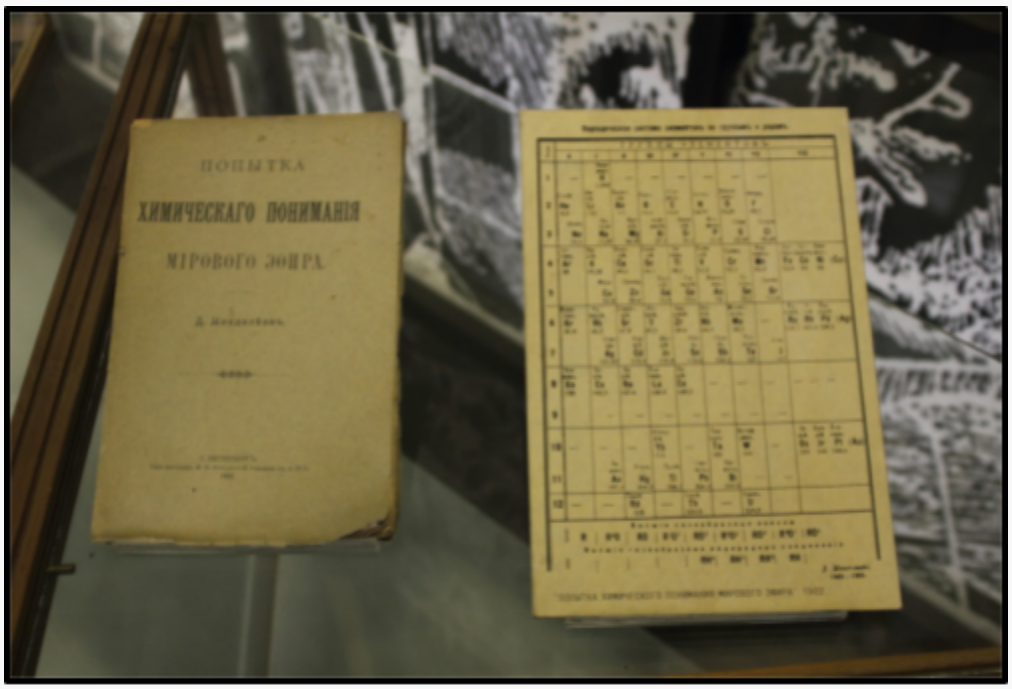
In conclusion, the periodic table is not just a static chart, it's a dynamic tool that continues to evolve and improve with our understanding of chemistry.

The periodic table's creation represents a triumph of scientific collaborations and innovations while showing the countless discoveries and advancements in the field of chemistry. If there were no people such as Mendeleev, John Newlands, Julius Lothar Meyer, and Henry Moseley, the periodic table would not look like how it is today.



D. Mendeleev's Periodic table from his book

What Makes Peppers Spicy?

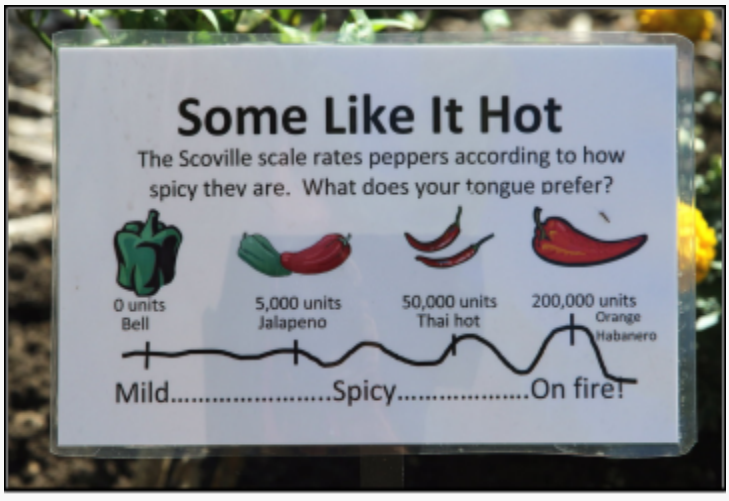
Wilson Zhu

Peppers boasts the characteristic of spiciness, eating one causes your mouth, tongue, and throat to feel on fire. The main cause for this spice in peppers is primarily attributed to a compound named capsaicin. Capsaicin is a chemical compound naturally found in some peppers and causes a burning sensation when it comes into contact with human tissue. Thus, capsaicin is the compound that makes peppers spicy in the first Place.

Scientists would study the reason for capsaicin to exist in the peppers, concluding that capsaicin was in peppers to deter animals from eating them. However, recent studies, show that it is likely to prevent damage and fungal growth within the peppers. Peppers do not increase the temperature in your mouth since they trigger pain receptors in your mouth, tongue, and the back of your throat and send signals to the brain to register the pain. This triggers a sensation of burning or heat, fooling the brain into perceiving a temperature rise.

Wilbur Scoville created the Scoville Scale to measure the heat of peppers. The scale is measured in Scoville Heat Units (SHU), which represent the number of times the concentration of capsaicinoids needs to be diluted before it's no longer detectable.

Higher SHU ratings contain a higher concentration of the chemical compound capsaicin. Bell peppers are the lowest on the list



Some Like It Hot Pepper Rating by Jim, the Photographer from Flickr
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as they contain the least amount of capsaicin.

Secondly, Jalapeno peppers have around 5,000 SHUs and are one of the most common spicy peppers. Next, the Habanero pepper ranks around 200,000 SHUs and is much hotter than Jalapeno peppers. Finally, one of the hottest peppers is the Carolina Reaper, which ranks around 2.2 million SHUs.

Jalapeño Peppers - levels of ripening by Conrads.wikipedia.account from WikiMedia Commons
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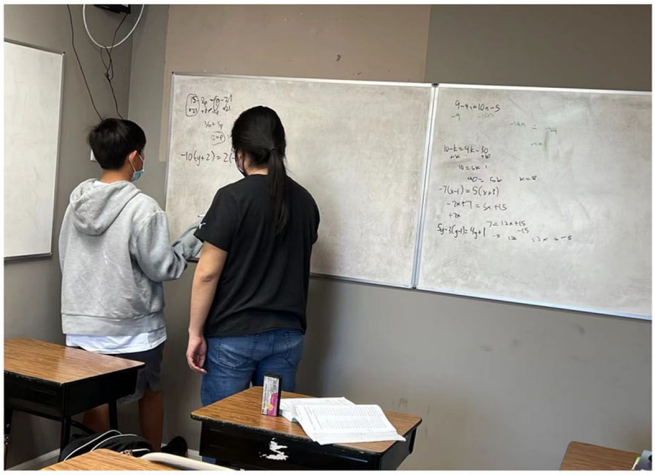

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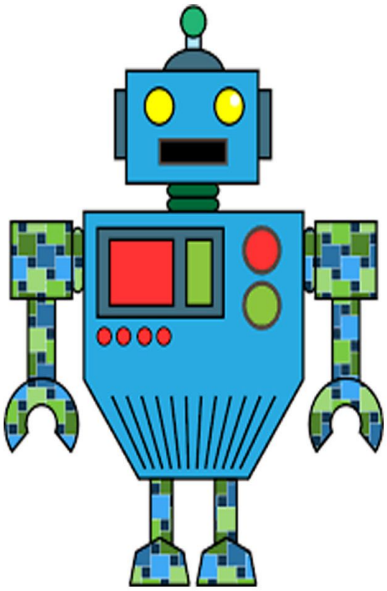

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