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SEEKING SCIENCE

by STEM Action Teen Institution

A MONTHLY
STEM NEWSLETTER

TREE TO PAPER

BASICS OF GENETICS

NUCLEAR FUSION

and more...

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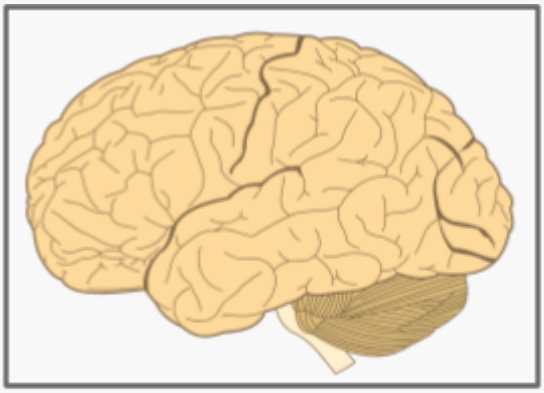
I Swear I Thought I...

Anna Dai

Memory is often thought of as something that stores data or information, in terms of computers and other devices or a recollection of the past. As of now, the current psychological definition of memory is the faculty of encoding, storing, and retrieving information. People often believe that their memory is precise and strong but it is not always perfectly correct, leading to false memory.



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False memory is a distorted recollection of an event from the past that is both completely false and imaginary. A common situation of false memory is experienced as believing something happened a certain way when it is completely fabricated. This could be minor and harmless such as believing that the dishes were washed but they're still sitting in the sink. But, false memory could also be major and possibly fatal. Accusing someone of a crime wrongfully is an example of a major effect of false memory.

How does false memory happen inside the human brain? Memories are very complex due to the amount of detail of a specific event. Storing and forming memories is complicated because of all of the other activities inside the brain. Recollections are moved from temporary storage to permanent storage while you are sleeping. However, some may be lost since the transition from temporary to permanent isn't absolute which leads to false memories.

There are many ways false memory is implanted into the brain. Suggestion is a powerful element that commonly causes false memory. Someone may prompt

information or infer with questions they ask which will lead to creating false memories. Sometimes, you may remember an event but get it jumbled up with another event. This is called misattribution and it is also another major way false memories are produced.

False memories are not unusual since everyone can experience misplacing an object or swearing someone's birthday was another day. Everyone is different so some people may have false memories occur more frequently but luckily, it's usually not extremely harmful.

From Tree to Paper

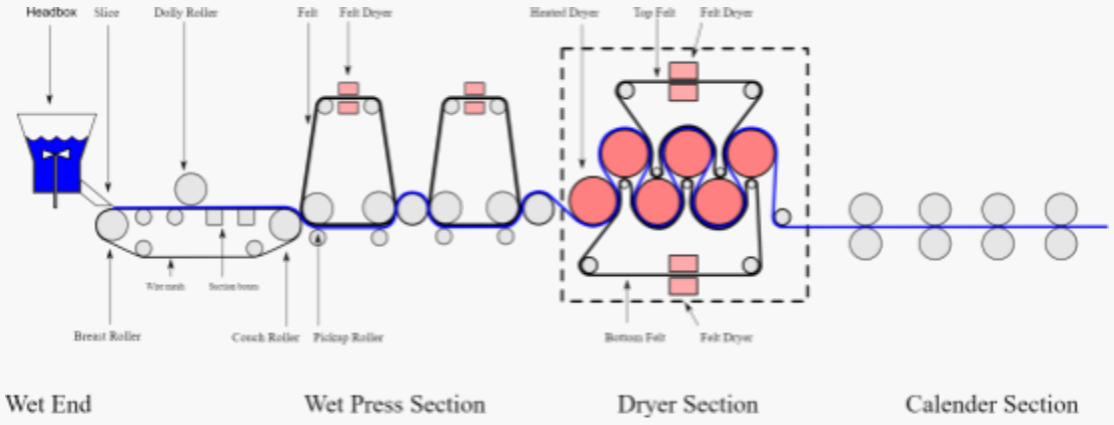
Edward Huang

Since its invention 2000 years ago, paper has become one of the most important and widely used tools in the world! Over time, the papermaking process has evolved, and the modern procedure for producing paper is a technical feat, involving many complex steps. Additionally, there have arisen multiple methods of making paper. While not all paper factories are the same, they all follow the same general process, from extracting the fibers from wood to removing the moisture at the end.

The first step of the papermaking process is to extract the fibers from raw logs, either through mechanical or chemical means. When using mechanical methods, bark is removed from the log, so that the remaining wood can be crushed and pulped. This method produces paper with a light yellowish tint and is also fairly cost effective.

Alternatively, fibers can be extracted using a chemical method. Whole logs are first cut into small wood chips, before being mixed with hot water and chemicals. Next, the mixture is cooked at extremely high temperatures, breaking down the wood chips into wood fibers. Liquid waste, nicknamed "Black Liquor" must be removed as the fiber undergoes a cleansing process. Paper created from this method is usually of higher

quality, including being smoother and brighter than paper from mechanical pulping. Both methods of pulping result in waste, but this biomass is usually fed back into the system as a source of electricity to power machines.



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Pulp is then pumped into a machine, where wire meshes help remove excess water. In the machine, the pulp travels on a conveyor belt, and fibers are oriented in the same direction. Rollers help guide the direction of the fibers, as well as to compress them into a thin sheet. The next step, called the Wet Press, continues to compress the pulp using rollers while squeezing out water. Finally, the thin sheets of pulp enter the drying stage, where they are pulled along multiple iron rollers, and raised to a temperature of about 100 degrees Celsius. At the same time, felt belts help guide the sheets along and remove even more moisture from the sheets.

The last stage in the papermaking process is called the Calendar Section, where even more rollers thinly squeeze the sheets making them smooth and paper-thin. Chemicals are often added to enhance certain properties of the paper. Coatings are added to the paper, some of which are responsible for gloss. In the end, this paper can be sent off to be made into various products.

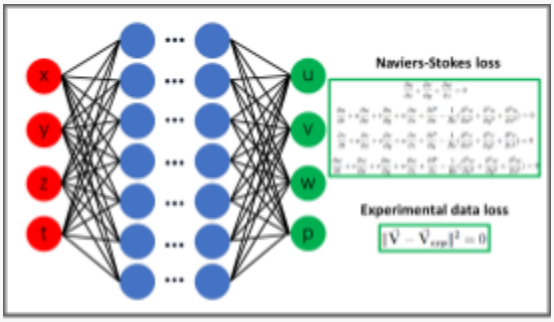
While paper is often a material that we may take for granted for its simplicity and usefulness, the process of making paper is not simple at all. The papermaking process and its numerous stages have been refined and developed for thousands of years, to create the material we know and love today.

The Navier Stokes Equations

Arthur Liang

The motion of fluid flows is described by a set of partial differential equations called the Navier-Stokes equations. The motion of air and water in the atmosphere and oceans, as well as the flow of blood in the human body, are all modeled using these equations.

The conservation of mass, momentum, and energy for fluid forms the foundation of the Navier-Stokes equations. The continuity equation, the momentum equation, and the energy equation are the three main parts of the equations. The momentum equation explains how a fluid's velocity varies over time, while the continuity equation explains how a fluid's mass is conserved. The fluid's internal energy and temperature changes over time are described by the energy equation.



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The Navier-Stokes equations' nonlinearity, which means that the solutions to the equations depend on the values of the variables at all points in space and time, is one of their most important characteristics. Due to this, it is very challenging to solve the equations, and many of the solutions that have been found are approximations. Despite

this challenge, engineers and scientists have created a variety of numerical techniques, such as the finite difference method and the finite element method, to solve the Navier-Stokes equations.

Numerous crucial engineering and scientific applications of the Navier-Stokes equations exist. They are employed in the design and analysis of aircraft and spacecraft in aerospace engineering. They are employed in the design and analysis of bridges, dams, and other structures in civil engineering. They are used to design and analyze pumps, turbines, and other machinery in mechanical engineering. They are employed in the fields of oceanography and meteorology to investigate the motion of air masses and ocean currents, respectively.

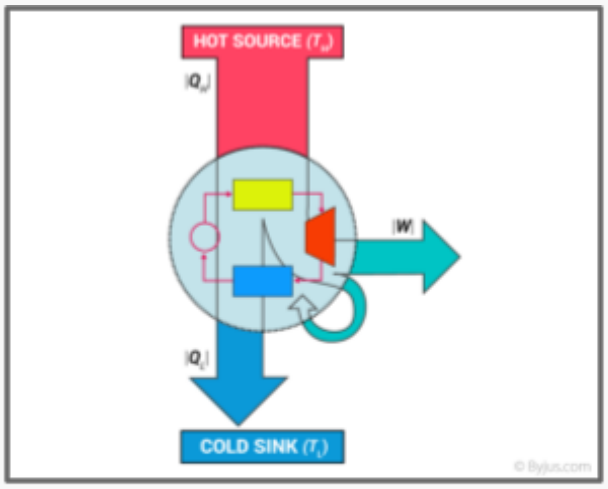
The Navier-Stokes existence and smoothness problem, which investigates whether solutions to the Navier-Stokes equations exist and whether they are smooth for all initial conditions, is one of the most significant open problems in mathematics. The investigation of fluid dynamics and the creation of fluid systems would benefit greatly from the resolution of this issue.

Thermodynamics: The Secrets of Heat and Energy

Cody Duan

Thermodynamics is a branch of physics that deals with the relationship between heat, energy, and work. It is a fundamental science that plays a crucial role in many fields, such as engineering, chemistry, and even biology.

There are four primary laws of thermodynamics, each of which describes a different aspect of the relationship between heat, energy, and work. The first law, the law of conservation of energy, states that energy cannot be created or destroyed, only converted from one form to another. The second law, the law of entropy, describes that in any energy transfer or transformation, the total entropy of a closed system will always increase over time. The third law of thermodynamics, also known as the law of absolute zero, states that as the temperature of a system approaches absolute zero, the entropy of the system approaches a minimum value. The fourth law of thermodynamics is Nernst's heat theorem. It entails that the entropy change of a perfect crystal at absolute zero is zero.



"File:Thermodynamics 1.png", by Dizna James
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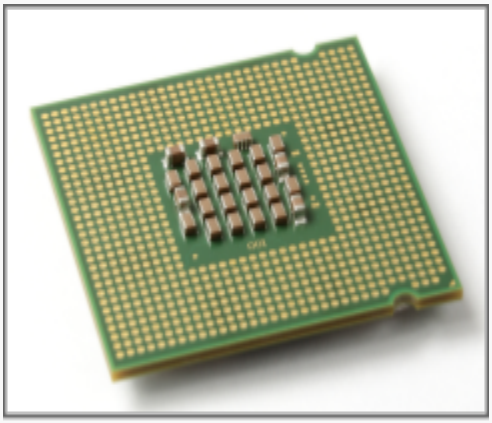
Thermodynamics also has applications in many areas of our daily lives. For example, thermodynamics principles are used to design and improve the efficiency of engines, refrigeration systems, and power plants. It also plays a crucial role in understanding and controlling chemical reactions in the petrochemical field, food, and pharmaceutical industries.

Thermodynamics is a fundamental science that plays a crucial role in many fields. It helps us understand the behavior of heat, energy, and work, and its principles are used to design and improve many of the technologies we use in our daily lives.

How Does a Computer Process Information?

Wilson Zhu

Have you ever wondered how a computer could process information? A computer processes information using a CPU or central processing unit. It is responsible for following instructions, it can complete these instructions by using arithmetic, logic, controlling, and input/output operations that are required from the instructions provided to the CPU. It also informs other computer components like memory and the graphical processing unit. Without the CPU, many programs would be unable to run on the computer itself.



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The CPU works by using its control unit to interpret the instructions given by the program and an Arithmetic Logic Unit that knows how to do basic arithmetic. Using the control unit and Arithmetic Logic Unit can process many complex programs. For hardware, the CPU is an integrated circuit that has millions of tiny electrical parts that are used to create circuits in the CPU. There are many layers in the CPU chip including transistors, the chip, logical circuits, and gates which are all used in the powerful CPU.

All in all, CPUs are one of the most important components of the computer since it can process all the information given to the CPU by programs. Many other components would be useless without a CPU since the CPU is the component that executes the instructions provided.

Major Nuclear Fusion Breakthrough

Eason Fan

On December 13, 2022, the DOE announced a breakthrough in nuclear fusion, having achieved net energy through nuclear fusion. This means we got more power back than we put in.

Nuclear fusion is the process of smaller atoms combining to make a larger one resulting in a huge release of energy. This is the same energy that the sun relies on to burn for billions of years. According to “MIT Climate Portal”, fusion is 20 to 100 million times more efficient than the reaction created by fossil fuel. Director Dr. Arata Prabhakar deemed the breakthrough a “scientific milestone” and an “engineering marvel beyond belief”.

Fusion energy is completely clean and relies on one of the most abundant resources as fuel: deuterium., a resource made from seawater. Unlike nuclear fission, fusion doesn’t create nuclear waste, a big environmental hazard.

In the National Ignition Facility in Livermore, California, during testing about 3 megajoules of energy were used, and about 3 megajoules were returned, said Marvin Adams, NNSA’s Deputy Administrator for Defense Programs.

Nuclear fusion was achieved by shooting 192 lasers at a gold cylinder containing a ball (the size of an eraser) The heat from the lasers will create x-rays imploding the ball and letting out the ingredients for nuclear fusion.

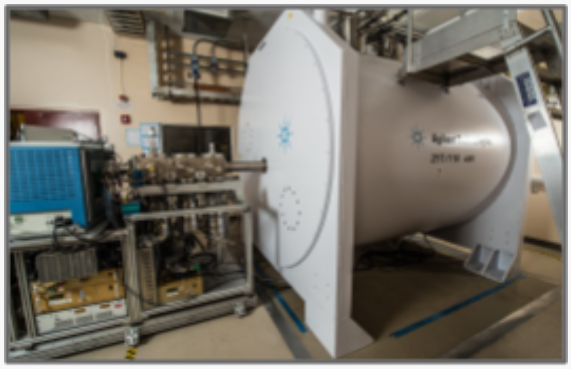
Fusion energy will enable many discoveries limited by energy consumption such as converting seawater to drinkable water or flying cars. This discovery will make humans one step closer to a 0-carbon society and enable more fields of research. Let's be hopeful for the future!

Early Diagnosis of Alzheimer's Disease: The Role of Mass Spectrometry

Stephen Hung

Alzheimer's disease is a progressive neurological illness that affects millions of individuals worldwide. However, present diagnostic tests are usually invasive and not always exact, making early diagnosis critical for optimal treatment and therapy. A powerful analytical method known as mass spectrometry is now being used to develop innovative strategies for the early diagnosis of Alzheimer's disease.

The accumulation of beta-amyloid plaques and tau tangles in the brain is one of the hallmarks of Alzheimer's disease. These abnormal protein deposits have been found in the patient's cerebrospinal fluid (CSF) and blood. With high sensitivity and specificity, mass spectrometry can be used to identify and quantify these proteins, providing a reliable early diagnostic marker for Alzheimer's disease.



"21T FTICR Mass Spectrometer", by EMSL, licensed under CC BY-NC-SA 2.0, https://www.flickr.com/photos/emsl/18170479829

The use of "metabolomics" which is the study of the metabolic changes that occur in Alzheimer's disease, is one of the most promising applications of mass spectrometry in early diagnosis. Metabolomics can identify the disease's specific metabolic signature,

which can then be used as a diagnostic marker. For example, a study used a combination of liquid chromatography-MS and multivariate statistical analysis to identify a metabolic signature of AD in blood plasma, with a sensitivity of 89.3% and a specificity of 90.9%.

MS can also be used to identify specific forms of these proteins, such as phosphorylated tau, which are known to be associated with the development of AD. A study by Peng et al. (2018) used a combination of liquid chromatography-MS and immunoprecipitation to identify phosphorylated tau in the CSF of AD patients.

To summarize, mass spectrometry is a powerful analytical technique used to develop new methods for early Alzheimer's disease detection. Further research and development are needed to validate these methods and bring them into clinical practice.

(Image credit: "Atomic Structure and Symbolism: Figure 5" by OpenStax Chemistry, CC BY 4.0.)

Combatting Doxxing with Machine Learning

Brian Wang

As more and more users on the internet get digitally attacked, phished, or baited, cybercriminals learn and multiply all across the web, causing real identities to be in danger. On the opposing side are researchers using machine learning to protect our community from Penn State's College of Information Sciences and Technology. Using a system of filters with a language model, detection of doxxing is now over 96% using their processes.

Kai Stachowiak
https://www.publicdomainpictures.net/en/view-image.php?image=189529&picture=background-wallpaper
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To start, a database of tweets that potentially contain personal information about IP addresses, social security numbers, locations, and anything related to private and sensitive data is collected. The data is then categorized into its sections, where unintended and intentional leaking of this information is classified. To filter this even further, they look for motivations to either further the look into the data or throw it off due to benign behavior.

From here, the real meat of the process begins. They use nine different approaches in existing language models to detect instances of doxing or unintended leaking of information, especially of social security numbers and IP addresses. Finally, they compare the results with the highest accuracy rate information and present these tweets in their essence.

To conclude, the use of machine learning and language models in tracking down malicious doxxing on the internet is a promising development in the realm of cybersecurity. With the ability to swiftly identify doxxing with high accuracy from the internet, protection for individuals from online harassment and abuse can increase. Research like this will further protect the integrity of online identities.

iOS vs Android App Development

Aidan Hong

Developing apps is already very hard. However, developing for both iOS and Android is even harder. The differences in structure between iOS and Android and a lack of interoperability make it difficult for developers to develop both operating systems.

The coding languages involved in developing both are already different. While Android utilizes Kotlin and Java, iOS uses Swift and Objective-C, both vastly different coding languages. The IDEs involved are also different, with iOS providing xCode for developers while Android uses Android App Studio to develop. Both IDEs cannot program for the other operating system.

Another difference is the hardware. While iOS has less device fragmentation, the variations between Android hardware are huge. This leads to complications for the developers as they have to accommodate for all the different Android devices. Apple, on the other hand, only produces around 4 phones a year, so it is easier for developers to cater to these needs. As a result, Android apps may seem buggy sometimes, while iOS apps almost always work the way it is intended to work.

One final difference is the way developers can distribute their apps. While iOS developers are currently forced to publish their apps via the App Store, Android apps can publish their apps in any way they wish to do so. Android developers can publish their app via the Google Play Store, or off the internet. By doing so, Android developers do not need to worry about the rules Google makes, they can easily bypass these restrictions.

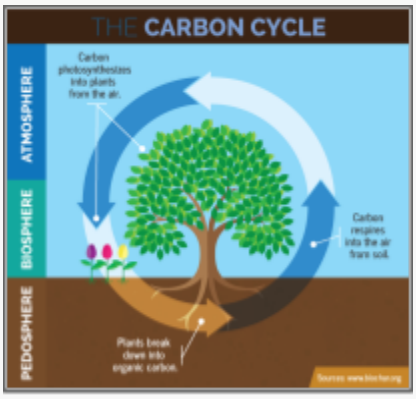
The development process for iOS and Android makes it hard for developers to develop apps for both platforms. The IDE and language involved are already not cross-compatible, and the hardware varies a lot. The process to publish the app is different, too. Although 3rd party software is present to solve these issues, Apple and Google still do not provide a way to develop the other operating system.

The Carbon Cycle

Kenny Wu

The carbon cycle is a major need of our mother Earth, it occurs daily and plays a great role in helping out the entire biosphere. It is essentially how nature recycles carbon, which is an element that forms the basis of most organisms. Carbon is also discovered in forms of both abiotic and biotic factors, such as rocks, foil, CO2, and carbohydrates. The carbon cycle is performed by the 4 carbon reservoirs, geosphere, hydrosphere, atmosphere, and biosphere.

First and foremost, the carbon cycle begins with photosynthesis. Plants absorb the energy from the sun along with other abiotic factors and then proceed to release oxygen, made use of by humans and resulting CO2s as waste products. Subsequently, CO2 flows from the biosphere to the atmosphere and is later absorbed back into the plants repeating itself. The carbons in the atmosphere can also diffuse into oceans which temporarily gets rid of the issue of global warming, but also leads to an increase in the acidity of oceans. Diffusions occur as long as the concentration of CO2 in the atmosphere is higher than in the hydrosphere.



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Furthermore, there is a concern for the entire biosphere, because there is a capacity for how much carbon the atmosphere and hydrosphere can hold. It is important to understand that humans are the reason behind these issues, we invented the idea of deforestation and combustion which inhibited parts of the carbon cycle. The last carbon reservoir is the geosphere, carbons are stored as fossils and fuels beneath the surface of the Earth. Living organisms are

decayed by decomposers, linking the biosphere and geosphere. Eventually, humans step in and do combustion which is the process of burning fossil fuels, directing the carbons from the geosphere to the atmosphere.

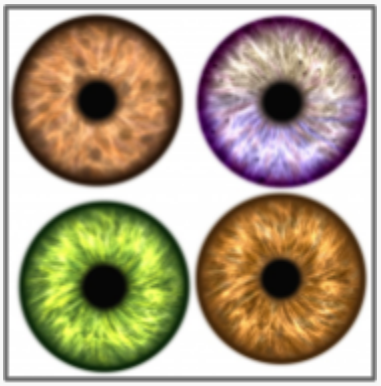
All in all, the carbon cycle has satisfied our daily needs, prevented global warming, and held back the acidity of oceans. Humanity must realize that our mother Earth needs us to terminate our ways of abusing nature. And if you are not one of the corrupted souls, do know that you are not alone. The #teamtrees project is a splendid example that successfully lends nature a helping hand. Play your role as a resident on Earth, and care for nature starting now.

The Basics of Mendelian Genetics

Eddie Zhang

When we look at the people around us, we see many different faces. Everyone has their own set of unique features and traits. But how does this variation arise? It rests on the principles of genetics.

But before we delve into the world of genes, we must understand some basic terminology. For starters, a "character" is an observable feature present in the species. Human examples include height, eye color, skin color, hair color, hair type, etc. A "trait" is a variation of a character. Examples are blue eyes, dark skin, and wavy hair.



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With this established, we can look into what causes variations of these traits. Every trait is determined by the genes of the said trait. These genes have the chance to undergo mutations, turning into what we call alleles -

variations or alternate forms of a gene. This new gene could then override the original gene, giving rise to a new visible trait.

However, these genes are not alone–they pair up. But, if genes are paired, then what decides which allele trait is shown? This is where the concept of “dominance” comes into play. If an allele is “dominant”, it will express its trait as long as one allele is present in a pair. Conversely, if an allele is “recessive”, it will only express its trait when two alleles are present in the pair.

These alleles are expressed using letters–capitalized for dominant and lower case for recessive. An example of this phenomenon is blue eyes in humans (alleles will be represented by “B” and “b”). Since blue eyes are a recessive trait, it means that a person would need both recessive genes (“bb”) to express this trait. If a dominant allele is present (“Bb”, “bB”, “BB”), then the person will not have blue eyes.

This dynamic is what causes variation among species and is a key principle in evolution.

What Is An Annual Solar Eclipse?

Owen Chen

Everytime you see the sun it looks like a colorless round sphere. However, once in a while, you might see the sun forming a ring shape with the middle pitch black. Some may call it the “Ring of Fire” or its official term the annular eclipse.

“2017 Total Solar Eclipse”, by NASA Goddard Space Flight Center”, licensed under CC BY 2.0, https://www.flickr.com/photos/gsfc/35909952653

The word annular is derived from annulus, which is used to describe a ring shaped object or the maximum point of an annular eclipses.

Like any other solar eclipse, annular solar eclipse forms when the moon is covering up the sun at a position where the sun isn't visible anymore for the people on Earth. Unlike the total solar eclipse, the annular solar eclipse only covers up the majority of the sun, leaving the edges still visible forming a ring shape that everyone can still see. Annular solar eclipse can only occur when it's a new moon and when it's close to lunar mode, so that the moon can align with the Earth and the sun. Furthermore, in order to see an annular eclipse the moon has to be at its farthest point in the orbit, so that the umbra shadow doesn't cover up all the sunlight.

Although not all places can see an annular solar eclipse at the same time, there will still be many opportunities throughout your life. If you ever get to see an annular eclipse, make sure to wear eclipse glasses when facing the sun, since the radioactive waves can cause harm to your eyes that could lead to blindness. The event only lasts for a few seconds, but it's still a great experience to encounter.

Plastic Waste in the Deep Sea

Cathie Zhu

Plastics are strong and elastic, making them ideal for use in household and industrial products. However, these properties also make it difficult for plastics to break down. About 15 million metric tons of plastic, or the weight of two million elephants, enter the oceans each year! The deep oceans receive approximately three-quarters of this debris. The potential impact of these deep-sea plastics on marine ecosystems has scientists concerned. Deep-sea plastics, however, are expensive to sample and challenging to study.

To take on the challenge, two Chinese geochemists recently took the manned submersible Shenhaiyongshi to the bottom of the South China Sea. In order to

investigate how quickly and how they were degrading, they conducted 20 dives several kilometers below the seafloor to retrieve approximately 100 pieces of plastic.

Photo-oxidation is the process by which the majority of plastics decompose in the presence of oxygen and light. They are also damaged by heat and physical force. While these processes are relatively quick on beaches, it is unlikely that they will be active in the deep ocean because it is dark, cold, and calm. Microbiologists have found bacteria in shallow, cold marine habitats that can break down plastic. As a result, the Chinese team hypothesized that plastic might also break down in the deep sea.

Using a technique known as Raman spectroscopy, the researchers were able to ascertain the varieties of plastic that they had collected. Raman works by shining photons—light particles—at the surface of a sample. Depending on the elements that are bonded, as well as whether they are single- or double-bonds, some of the photons come into contact with molecular bonds, which vibrate like springs. The photons return in patterns known as spectra, which are similar to the "fingerprints" of certain kinds of bonds. This information is utilized by researchers to ascertain the molecule's composition.

The deep-sea plastics' Raman spectra revealed that polypropylene (PP) made up 14% and polyethylene (PE) made up 80% of the samples. Everything from milk cartons to plastic bags is made of PE, which is the most widely used plastic in the world. Because of its resistance to heat and its inability to melt in the microwave, PP is frequently used in food containers. Polyvinyl chloride (PVC) and other less common plastics made up the remainder.

Using a scanning electron microscope (SEM), the team looked at the samples' surfaces for evidence of decomposition. On a variety of plastics, the SEM images revealed a variety of degradation features. While other types of plastic only had scratches, PP occasionally had cracks. The most degraded PE samples had corrosion pits and rough surfaces. The corrosion pits appeared to be made of bacteria-like-sized small rods, worms, and filaments. Additionally, the researchers discovered microbial cells in

some of the pits, corroborating their hypothesis that microbes assisted in the plastic's degradation.

The duo then used a different technique known as photo-induced force microscopy (PiFM) to create detailed three-dimensional images of the PE pits. Using the 3D images, the researchers estimated that up to 14% of the PE in the samples had been lost. Based on the South China Sea's history of pollution, they assumed that the plastic had been there for 40 years. Without some additional assistance, the PE would take nearly 300 years to completely degrade at this rate.

These findings show that PE plastic is broken down by microbes in the deep ocean, but only slowly. The degradation time could have been reduced if the plastics had spent less time on the seafloor because they did not know how old the plastics in their samples were. Regardless, the absence of corrosion pits in PP, PVC, and other plastics suggests that they are biodegradable. According to the researchers, future studies on pollution should focus on these plastics.

The James Webb Telescope

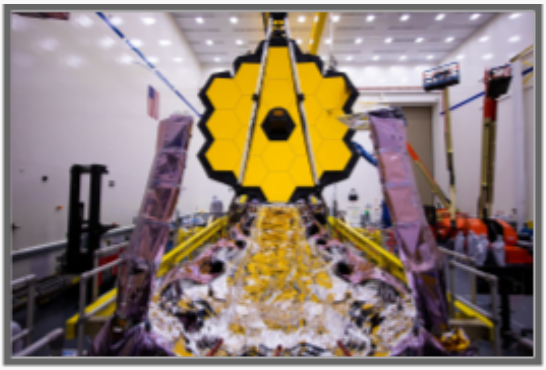
Richard Wang

This telescope, more refined than the Hubble, can see objects as old as glows after the big bang. First launched on December 25, 2021, the James Webb Space Telescope (JWST) has already delivered the sharpest infrared image of the distant universe and is capable of tracing galaxies to the beginning of their time.

The telescope utilizes infrared light, unable to be perceived by the human eye. Objects around us give off radiation, and those varieties of radiation are found in the em (electromagnetic) spectrum. However, we can only see a small part of radiation which is

called visible light. Infrared light when compared to visible light is longer, which allows it to slip more easily in between particles. Stars and planetary systems covered in clouds of gas are opaque to visible light but with infrared vision gives us the ability to now see through them.

Some main components of the JWST include its sunshield with a size equivalent to a tennis court. There is also a cooling system in order to keep extremely cold temperatures as heat from the sun will interfere with observations. The telescope also sends transmitter signals that are received by countless, large antennas dispersed around the world. There is a gold mirror made up of 18 hexagonal gold segments. It reflects high percentages of infrared light and is used because gold is relatively unreactive which means it won't tarnish easily.



"Legacy Image: The James Webb Space Telescope" by NASA's James Webb Space Telescope, licensed under CC BY 2.0", https://www.flickr.com/photos/nasawebbtelescope/50222410512

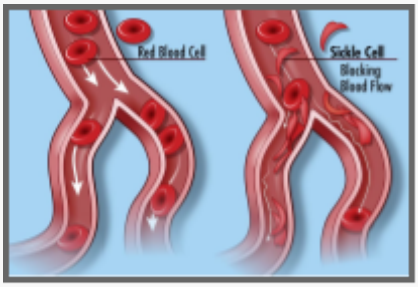
A mission that is being aimed to be achieved by the JWST is observing deeper into the universe than ever before. It also aims to discover the first stars after the big bang. It hopes to better understand the birthhood of stars and galaxies and how they develop. Most importantly, it focuses on determining potential life on other planetary objects. There is more to be discovered by the JWST and the possibilities are endless.

What Is Sickle Cell Disease?

Ryan Zhu

According to the Centers for Disease Control and Prevention, sickle-cell disease is a very common disease with which one in 365 African Americans are diagnosed with. Sickle-cell disease affects the red blood cells and their ability to transport oxygen, changing their shape into a sickle or a C shape. Furthermore, sickle-cell disease stops blood flow and oxygen to the organs, hence why patients require blood donors.

Interestingly, this disease has the ability to prevent malaria. As many know, malaria is a very dangerous disease with a high mortality rate. Upon infection, malaria parasites infect red blood cells and absorbs their oxygen. However, since the sickle cell is short of oxygen, the parasite lacks the necessary amount of oxygen to reproduce, destroying the parasite.



"Sickle Cell Disease", by NIH Image Gallery, licensed under CC BY-NC 2.0, https://www.flickr.com/photos/nihgov/27669979993

While malaria may be common in Africa, the sickle-cell disease is also happens to be common among people of African descent. Upon examination of the distribution of the two diseases, it can be found that the locations where sickle-cell disease and malaria are most common overlap. Furthermore, the death rate of malaria is lower where the sickle-cell trait is higher. Because of this, more people live on to pass on the sickle-cell traits to their children. Consequently, sickle-cell disease continues to increase in Africa. Currently, there is no cure for this mutation, so it is important for African-Americans to provide blood donations to sickle cell patients.

Aurora: Night Sky Wonders

Donia Cao

Every now and then a pleasing light appears in the sky. This beautiful light is called an aurora, also known as polar light. They display lively designs of amazing lights that appear as veils, beams, coils, or spirited glimmers casing the entire sky. Although people may be more familiar with the name Aurora Borealis, these lights actually have two names, Aurora Borealis at the North Pole, and Aurora Australis at the South Pole.

The aurora borealis is a gorgeous ripple of light. However, this peculiar show of light is actually quite a dangerous event. The lights appear when particles from the Sun, traveling at extremely high velocities, impact the Earth's outer atmosphere. Though Earth's magnetic field protects us, it diverts the particles back toward the poles.

"VISIONS: Seeing the Aurora in a New Light", by NASA Goddard Space Flight Center, licensed under CC BY 2.0 https://www.flickr.com/photos/gsfc/8448618812

An aurora australis appears in the form of a veil of light. It is often green and takes on forms in other colors every now and then. It's powerful when it's in an egg-shaped focal

point on the south magnetic pole. This phenomenal display is the result of collisions between electrons, atoms and molecules in the upper atmosphere.

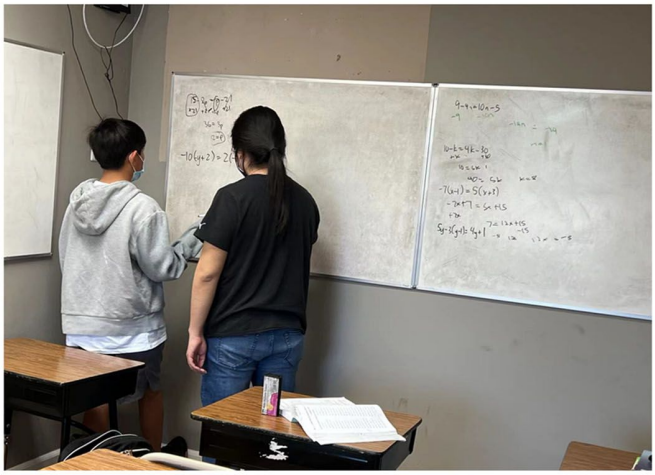
The Second Brain

Denise Lee

As a child, people have been taught that there's only one brain, but what if a second brain existed in our stomach? Medical experts have discovered a "second brain" in the gastrointestinal system, otherwise known as the stomach. The enteric nervous system (ENS), nicknamed the second brain, is the largest autonomous part of the nervous system. In fact, it has five times the amount of neurons in the human spinal cord. It controls motor functions, local blood flow, mucus secretions, immune, and endocrine functions, independently controlling all gastrointestinal functions without the central nervous system (CNS) input.

A common postulation medical professionals theorize is that many diseases can be caused by both gastrointestinal and neurological consequences. On one hand, Parkinson's disease, which causes shakiness, and other diseases such as Alzheimer's, which causes memory loss, or even Lou Gehrig's disease, which weakens the muscles, have been speculated to be caused by ENS problems.

Autistic spectrum disorders, which affect how people behave, learn, and interact, is a disorder scientists suspect to be caused by gastrointestinal malfunctions. According to neurobiologist, Lu Chen, Ph.D., "We know very little about the brain. We know about connections, but we don't know how information is processed." Only the surface of the original brain has been uncovered, so the iceberg of the second brain is a ways away from being flipped. The second brain is one of the mysteries in the world that neurologists yearn to explore.



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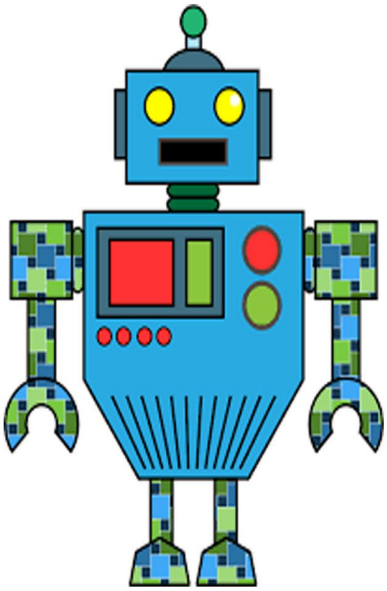

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