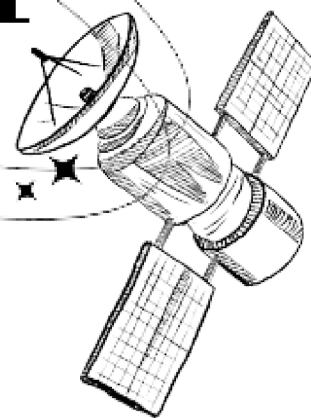
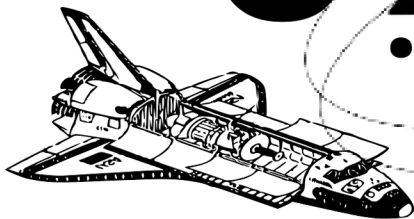


dzlphic



Science in its true glory is ever-encompassing and expanding. From the stars to your heart, it is a part of every form of human existence. It is the connecting thread that when woven together, forms the tapestry of the universe. At the end of the day, after all the commotion and confusion, if there is one thing that we can rely on, it's the logic of science.

On the occasion of Music and Dance, we emphasise the importance of communication. Communication is the voice of the activists, the concern of a mother, the law of the parliament, or the gestures of a lover. It is a connection, an urge for contact and understanding, and as a social being, it is all we can look out for.

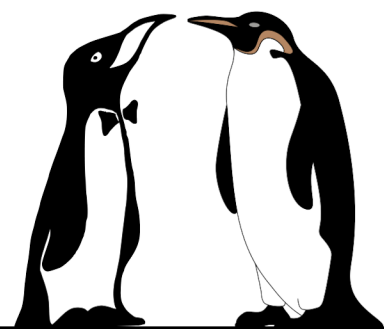
Today we focus not only on the communication between human beings but also highlight its role in all spheres of existence, whether it be between planets or ants, beetles or trees. Planets and galaxies talk through electromagnetic or gravitational waves, little bees through their dance, and turtles sing in their shells to coordinate their hatching. The secrets of the universe are, all around us, ready to be discovered, and all we need to do is *pause* and listen.

Hence, I would like to ask everyone to look beyond the narrow confines of words and keep an ear for the silenced or wordless. From our pedestal of privilege, the onus of responsibility lies upon us to try to listen, empathise, and actuate to change the world.

Happy reading,
Keya Aggarwal
Editor-in-Chief

C O N T E N T S

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Aroma: The Matchmaking Secret

As a species blessed with the boon of a highly developed voice box (maybe more of a bane), one could claim that our main mode of communication lies in the artwork of our voice. Apart from the wonder of words, we may even make a connection through our eyes or even our hands. However, the full stop to our communication does not lie here. Ever heard of communication through smell?

Well, it may seem funny at first, but smell serves as a hidden mode of communication that can even result in involuntary behaviour change!

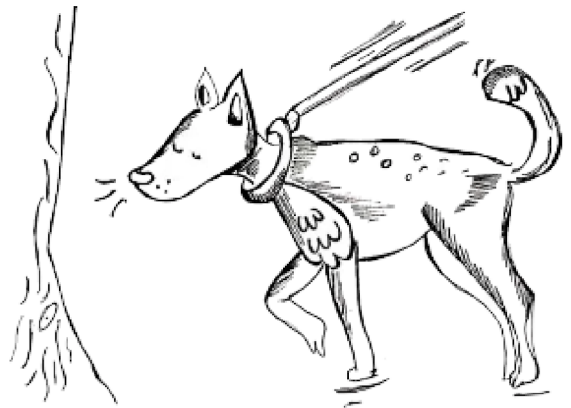
Such a form of communication takes place through chemical messengers: pheromones. Mammals release a cloud of pheromones that make up their chemical profile. This chemical profile helps in the distinction between different individuals. When we talk about dogs recognizing their owners or ants perceiving the members of their colonies, this chemical cloud is the reason. These chemicals may be freely secreted into the environment or particularly deposited on a particular spot, such as antennae. They are used to coordinate complex activities in social organisms like ants and termites, or even in animals living in colonies such as bees. Animals use it to promote several types of behaviour, including sexual arousal, raising an alarm, forming a bond between mother and offspring or defining one's territory.

With the interesting power of pheromones, the beauty industry took a 'nosedive' when it came to creating sexually attractive perfumes. Pheromone perfume can work well to attract people to one's scent. Although they aren't a discovery, the resurgence in pheromone-enhancing perfume is a quick-witted investment.

Androsterone is the most common pheromone found in perfumes and oils. It is said to exude youthfulness, create an aura of comfort, promote physical and emotional bonding, and even divert women's attention.

Moreover, pheromones from plants may even be used as a form of aromatherapy. For example, chamomile and lavender might help ease your stress or anxiety, allowing you to relax.

We are familiar with the words from the poem 'The Spider and the Fly'- *"To idle, silly flattering words, I pray you ne'er give heed"*. Well, in today's world, as science gives way to a future of implausible solutions, we must get familiar with a norm-free society, and smell the wary world of pheromone communication!



Bhavya Sangal



JUST IN

Astronomers using the James Webb Space Telescope have discovered the four most distant galaxies ever seen, that are located more than 13 billion light-years from Earth. This means astronomers are seeing what galaxies looked like only 300 to 500 million years after the Big Bang.

The Curious Incident of the Buried Ant

Have you ever wondered if there are other species in the animal kingdom which have mourning rituals for their dead? Well, as intriguing as it sounds, ants do mourn their dead and even bury them in graveyards. However, their reason to bury their dead is quite contrasting to our religious reasons. It all comes down to chemicals, smells, and pheromones. When an ant dies, its body releases a chemical called oleic acid. On sensing this certain acid, the other ants carry the dead off to bury them. This process is known as Necrophoresis. A Harvard assistant named Ed Wilson further conducted an experiment regarding this phenomenon. He dabbed an ant crossing by with oleic acid and he noticed that almost immediately some of the other ants grabbed that ant and took it over to the ant Graveyard. Moreover, the ant that had the oleic acid on it was conveniently willing and accepting of its fate. It stayed in the graveyard until eventually it cleaned itself off and joined the colony again.

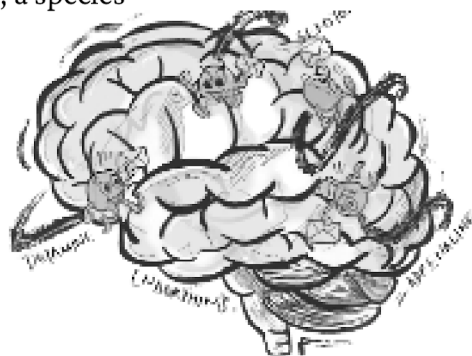
Delishah Mirza & Arushree Kashyap

CRACKING THE CODE: THE TINY MESSENGERS THAT RULE YOUR MIND AND BODY“

Remember 'Serotonin' by Girl in Red? It does not just stand for “happiness”. It is one of the various neurotransmitters- masters of communication within your body!

Neurotransmitters are chemical messengers that are transported across synapses, the tiny gaps between neurons, and bind to specific receptors on the postsynaptic neurons. Take dopamine, for example. This neurotransmitter is associated with pleasure and reward, and it is what makes you feel happy when you indulge in your favourite food or experience something positive. Neurons activate certain areas of the brain, including the substantia nigra and ventral tegmental area, to synthesize and release dopamine. But did you know that dopamine also plays a role in that pleasurable shiver you get when listening to music? A ground-breaking study by the University of Sussex found that frisson, that oh-so-satisfying sensation, is triggered by the release of dopamine in the brain. Talk about an ear-gasm! This release of dopamine in response to pleasurable experiences is thought to be a key driver of addictive behaviours, such as drug use or gambling.

But that is not all. The interplay of neurotransmitters can have surprising effects on our behaviour, too. Oxytocin, for instance, is associated with bonding and social behaviour. This neurotransmitter is released in response to a variety of stimuli, including touch, eye contact, and positive social interactions. One fascinating study by Emory University found that prairie voles, a species of rodent, release oxytocin during mating, promoting bonding and social behaviour between the two voles, ultimately leading to lifelong monogamous relationships. Talk about the power of love! And when the release of oxytocin was blocked, their bond was not formed, proving the crucial role neurotransmitters play in social behaviour.



From dopamine and serotonin to acetylcholine and norepinephrine, neurotransmitters rule your world. They regulate your physical and emotional well-being, keeping you happy, stressed, and even in love. So the next time you think that “chemical imbalance got me twisting things”, realise it’s not you, it’s a neurotransmitter.

Sukhmeet Kaur

WORLD WOOD WEB

For most of us, forests exist as a setting, a supporting actor in an ongoing story. It is where Harry Potter first learns about the magical Sorcerer's Stone, Puck plays matchmaker for the 4 Athenians, and Mowgli feels at home. But forests are so much more than that. Underneath the dense cover of trees exists an underground network, where they communicate with each other and have conversations on topics ranging from environmental changes to excessive production cycles. This underground communication is facilitated through the Mycorrhizal network or more commonly known as the World Wood Web.

Trees of the same or different varieties communicate with each other through extensive networks of fungi that act like cell phone providers. The mutualistic association is done through multiple webs of fungal hyphae that extend beyond the root systems of individual plants, linking them together. Communication takes place by using elements like Carbon and Nitrogen as languages.

These portals act as communication highways for sharing resources between plants, enabling them to support each other in times of biotic or abiotic stressors or nutrient deficiency (or plain gossip sessions). The fungi can facilitate the uptake of nutrients and water by the plants and provide them with protective compounds. The trees can also differentiate between different species, and even tell whether a tree is a close relative of theirs, in this case, a mother or sibling.

What was once considered simple getaways from the hustle and bustle of the city, forests are complex biosystems that communicate with each other and facilitate collective growth and survival, thus behaving as single-functioning organisms. They are beautiful examples of symbiotic relations, bringing together hundreds of distinct species and supporting one another.

However, industrial practices that cause deforestation are resulting in the loss of this great heritage most of which still remains unknown to man!

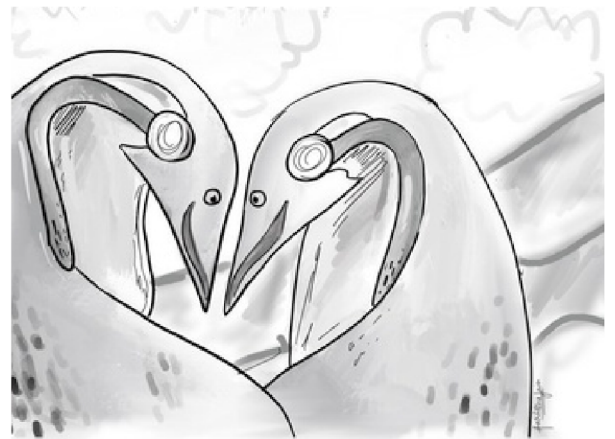
Tvisha Mahajan

Homosexuality in the Animal World

Homosexuality is widely believed to be a man-made construct and many look towards its existence in nature to definitively prove that it is indeed a natural phenomenon. Thus, the question of whether animals can really be gay has plagued many scientists and fascinated a large portion of the human population for a long time, partly due to the desire to find parallels to human sexual orientations in the natural world.

Homosexual relationships including coitus, romantic affection and even parenting, among animals are often viewed and portrayed as something eccentric and as somewhat of an oddity, but you will find that homosexual behaviour among animals is actually a rather common occurrence. Same-sex affinity has been recorded in over 1500 species of the animal kingdom, including penguins, dolphins, flamingos, giraffes, many varieties of birds and even dragonflies. To give a rather famous example of homosexuality in nature, we must not look any further than Roy and Silo, two male chinstrap penguins at New York's Central Park Zoo, who had been a couple for more than six years.

The study and evolution of same-sex relationships among different species is truly a fascinating one. It should be noted that although proof of homosexuality among animals should not be required to justify its existence among humans, the definitive evidence of homosexual behaviour among animals confirms for the world at large that homosexuality is indeed a natural construct and proves that sexual orientation, whether it be in any species, is natural and is not a binary but rather part of a much larger and fluid spectrum.



Aarisha Jain & Kriti Malani

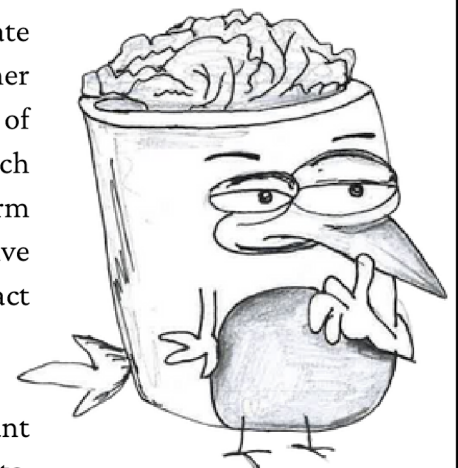
BirdBrain?

Somewhere in the quest for political correctness, the Delphic editorial board would like to warn the masses against forgetting their scientific bases. In our attempt to highlight the foolishness of our fellows, we have made a folly with our titles and unknowingly complimented them with what we believed was an insult. The term 'BirdBrain' has often been used as an insult as we had categorised the avian(bird) species as stupid, forgetful or foolish. Yet, this is indeed far from the truth.

Hear us out-

A bird brain has a higher neuron packing density than any human or primate brain. Some specific species, such as corvid or parrots, have a much higher proportion of brain neurons located in the pallial telencephalon (the part of the brain that controls emotions, hearing, vision and personality). Such features allow these creatures with garlic clove-sized brains to perform complicated cognitive tasks. Many birds use tools, recognise faces, solve puzzles, plan for the future, show empathy, and even recognize abstract concepts.

In fact, trained pigeons (yes, you read right, pigeons) can detect malignant tumours in mammograms with the accuracy of human radiologists. Moreover, some corvids in Sweden have also been trained to pick up trash in exchange for treats. (Something we haven't even trained humans to do!)



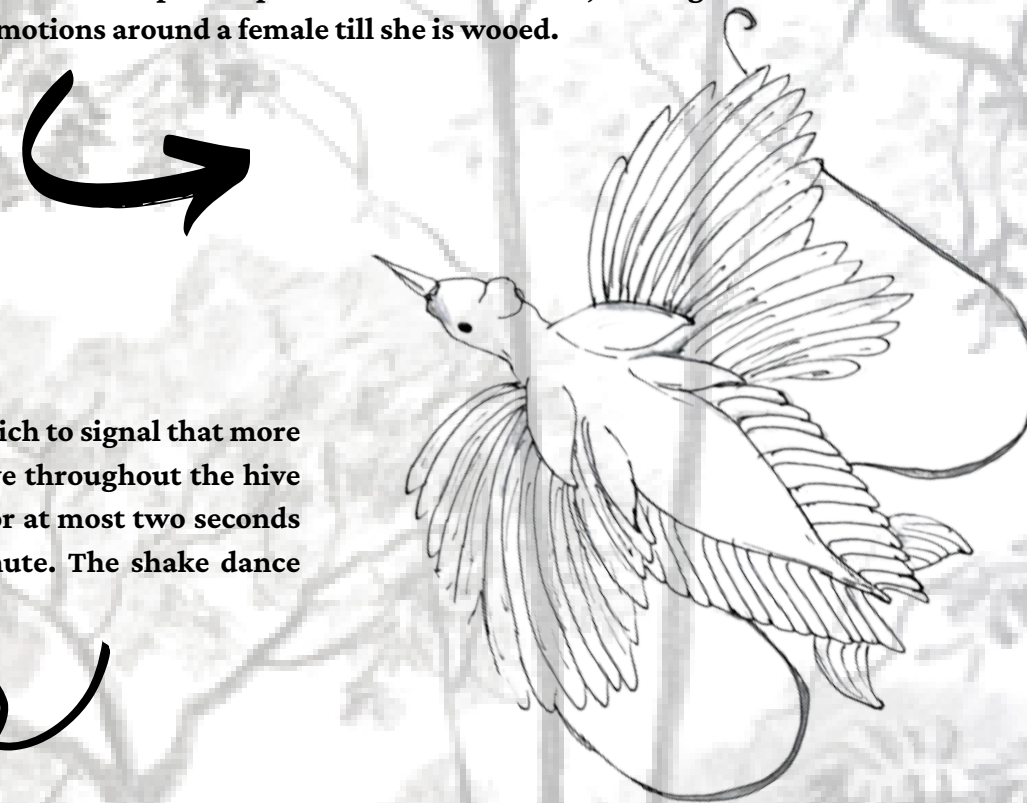
Keya Aggarwal



Researchers recorded sea turtles using suitable microphones and determined that they communicate through their breath. They discovered that their babies sing from within their eggs to ensure that they all hatch at the same time! When they hatch, this can help them avoid being devoured by predators. The organisms also interact in order to find a mate and thereby continue their species.



To attract a female, the male paradise bird undertakes an elaborate wooing ritual in which he spreads out their black capes until only a bright blue breastplate and blue eyes are visible in the all-encompassing blackness. He puffs out his chest and shimmies his small feet as he flicks up his cape. Then he does a dance, moving in semi-circle motions around a female till she is wooed.



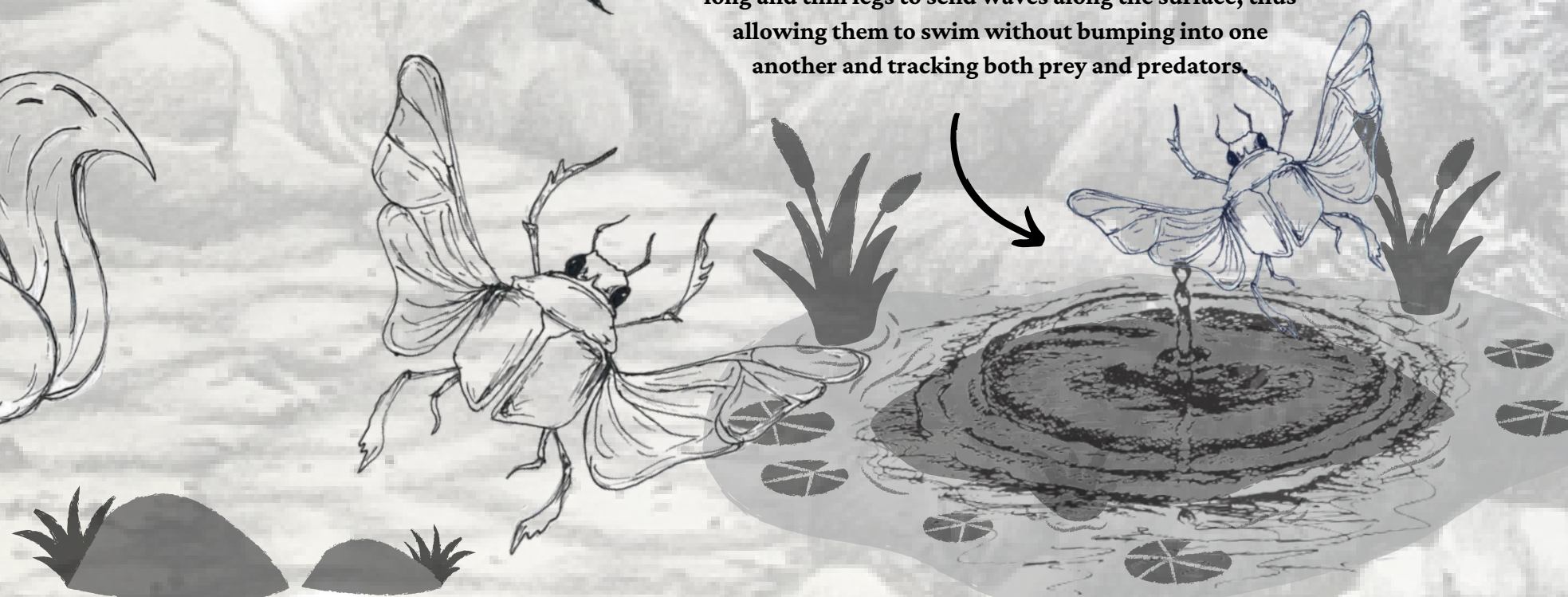
Honeybee workers perform the "shake" dance when nectar sources are too rich to signal that more foragers are required. A worker arriving back from a foraging run will move throughout the hive and shake her abdomen back and forth in front of a non-foraging worker for at most two seconds before moving onto others, at the rate of a maximum of 20 bees per minute. The shake dance encourages them to make their way to the waggle dance floor.



Grey squirrels eavesdrop on the chatter between nearby songbirds as a sign of safety, who chatter when they feel safe to communicate the absence of danger or share their location. This "chatter" from multiple bird species is a useful cue to other creatures that there is no imminent threat.



The beetles of the Gyrinidae family produce ripples on water surfaces to communicate and monitor their brothers. The nerve sensors in each of their legs enable them to detect slight waves. The beetles stand up on their long and thin legs to send waves along the surface, thus allowing them to swim without bumping into one another and tracking both prey and predators.



SOUND OF UNIVERSE

"There's not the smallest orb which thou behold'st
But in his motion like an angel sings,"

- Lorenzo in Merchant of Venice.

These lines bring about a variety of emotions: annoyance at the idea of learning the scene, cringe at the overexpressed sense of love and perhaps curious about the truth of such a prospect. Is there any way of knowing whether these actually huge balls of matter are capable of making sounds despite the absence of a medium for propagation in the boundless outer space?

Even though interplanetary (and interstellar) space is not entirely empty, the gas molecules and dust particles do not form a continuous medium that would allow sound waves to be transferred directly because of their sparse distribution. Yet, we would be mistaken to believe that the universe is silent. Instead, it is abuzz with charged particles.

Radio emissions, which are the result of particle vibrations in the magnetosphere and ionosphere, are what give planets their sounds. Similar to how each individual has their own authentic voice, each planet produces vibrations that are unique in quality, pitch, and intensity due to the varied compositions of its ionosphere and magnetosphere.

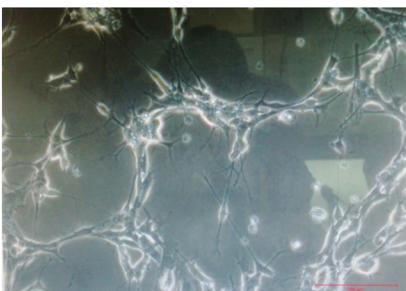
The Waves instrument, part of the Electric and Magnetic Field Instrument Suite and Integrated Science Instrument Suite (EMFISIS) --yes, it is a mouthful-- on the Van Allen Probes was created by NASA scientists with the sole purpose of detecting these frequencies. Both magnetic and electric waves can be detected by this gadget. It investigates them by spotting variations in the magnetic and electric fields using three electric sensors and three search coil magnetometers, respectively, making it power-efficient yet overly sensitive.

Did you really think your matrons were the best listeners? With the EMFISIS, scientists can literally eavesdrop on space. Waves detected around Saturn and Earth have been the most prominent ones.

The radio emissions, called Saturn kilometric radiation, are generated along with Saturn's auroras, or northern and southern lights. These signals can be slowed and brought down to an audible frequency to allow us to hear them. These sounds are eerie enough to be mistaken for a Halloween track. These creepy and strange-sounding whistlers, crackles, pops, and hums are only a few of the planet's various "songs," or more precisely, their magnetic field. Remember that time when that 'Sadhu Baba' claimed that the universe had a message for you? Maybe, just maybe, it actually does. ;)



Pakhi Pragya Sinha



A MOMENT OF PRIDE

From the pocket of knowledge of our very own Shirin Mirza, Batch of 2018, we have received fresh pictures of undifferentiated stem cells. Shirin is doing an internship at IITR Lucknow to understand the effects of lead on neurons. We wish you all the best Shirin!

Gravity: A language for planets

Gravity is universal, with its inescapable grasp acting on everything and everyone we know, even linking celestial bodies with one another. Without gravity, planets cannot exist. In the vast expanse of the universe, planets orbit around their respective stars in a dance of gravity. This dance is not just a mechanical movement of celestial bodies; it is a language, a communication between planets.

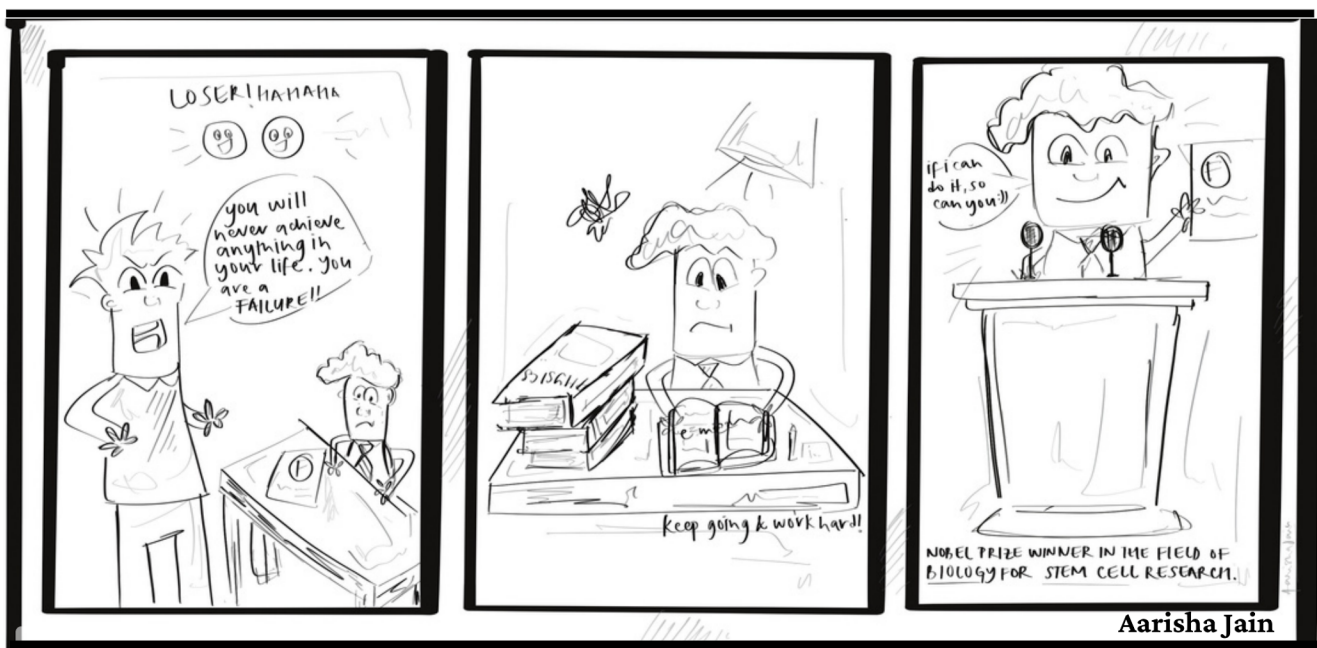
Simply put, gravity is the force that attracts two objects towards each other. This is why planets orbit around stars - the gravitational pull of the star keeps the planet in its orbit. Gravity is not just a one-way force. Every object in the universe exerts a gravitational force on every other object, no matter how distant they are.

When planets exert a gravitational force on each other, they cause tiny wobbles in each other's orbits. These wobbles are known as perturbations. By observing these perturbations, astronomers can infer the existence of other planets in the solar system and a lot of information about the planets themselves. For example, the mass, size, and composition of a planet can be determined by observing its gravitational effects on other planets. Gravitational perturbations can also be used to study the habitability of planets. Understanding the gravity of one planet can also help in understanding the working of other planets.

The universe is a boundless and convoluted fabric of gravitational forces. Planets communicate with each other through these forces, revealing their characteristics, their presence, and their potential for life. The discovery of this form of communication just goes to show how vital the smallest of details can be to understand the essence of the universe, if only you know where to look.

Varija Manglik

ROOTS TO STEM



Aarisha Jain

Disclaimer - This art is based on the real experience of Nobel Prize Laureate Sir John Gurdon whose teacher had written in his report - "I believe Gurdon has ideas about becoming a scientist; on his present showing this is quite ridiculous."

We want to remind everyone that your current aptitude in science will not define your success. You are the author of your own story!

MYTH BUSTERS

MYTH- Science students are nerds.

REALITY- Being a nerd is a privilege, we don't have time to be a nerd.

REASONS- The prioritisation of everything else over academics.

Science books are used as dumbbells for fitness rather than for studies.

(Does this actually make us a stud??)

NASA'S TWIN VOYAGER SPACECRAFT

Despite Stephen Hawking's warning that said, "If aliens visit us, the outcome would be much as when Columbus landed in America, which didn't turn out well for the Native Americans", the human quest for interaction with other sentient species continues for the sakes of both: curiosity and connection. The myth of human exceptionalism has cut us off from other species on our planet and has left us searching for more than just an existence; we look for contact.

Humankind has been considering the possibility of the existence of extra-terrestrial existence since the Greek era. It was with the twin Voyager probes that NASA made its first and only attempt to communicate with 'aliens.' They have attained many feats - it is the only spacecraft that has taken the "The solar system family portrait" and was the first man-made object to venture into interstellar space.

The Voyager 1 carries the Golden Record which contains greetings in 55 languages and 35 lifelike sounds such as those of laughter, whale songs, thunder, etc. It also contains - Mozart, Beethoven, and Chuck Berry. There are amiable recordings of ex-US president Jimmy Carter. It is what can be considered the essence of humanity. As friendly and frankly amusing as that sounds, the 115 lifelike images of Earth are no jokes. Therefore, it is an accurate navigator that provides the receptor with an effective idea of our location and mode of lifestyle which we are giving away to an unknown realm without any prior knowledge.



The Golden Disk

Are we ready to be baited into a net unknown to us? With no knowledge of what we stand against, how must we be prepared for such an encounter and its outcome? We must be cautious, or we may regret it. Instead of trying to search and communicate with life in the cosmos, we should protect what we have and know who we coexist with before we reveal our location, resources and risk absolutely everything that we have built so far. Everything comes with a price and this one may cost us something we cannot afford.

Akshita Goyal

RECOMMENDATIONS

Books:

1. Artificial Condition
2. The Soul of an Octopus: A Surprising Exploration into the Wonder of Consciousness
3. Hitchhikers Guide to the Galaxy
4. Project Hail Mary

Movies:

1. Jung_e
2. Vesper
3. Wrinkle in Time
4. Everything Everywhere All at Once

Series:

1. Arcane
2. Alice in Borderland

Upcoming:

1. Dune: Part two
2. Guardians of the Galaxy

QUANTUMANIA

Listening to passionate people about their interests is sometimes the hardest task to do. Especially when that passion is one of the hardest types of physics.

As someone who has never yet managed to hold a full conversation about quantum physics, this is my attempt to simplify it for you-

Quantum - Particles or Waves?

Quantum is the study of the smallest particles in our universe. Imagine particles that constitute atoms as small bouncy balls. These bouncy balls behave as waves and particles all at the same time. Now imagine one of these bouncy balls being dropped in water. It will pierce through the water creating wave like ripples. This is the principle of particle wave duality which is the building blocks to understanding quantum particles.

Quantum Entanglement- the Truest Form of Friendship

One of the things that quantum helped us with is our understanding of silicon which further helped us develop the silicon chip which is in every single computer in the world. So, the entire computer infrastructure of the world exists because of quantum physics. Quantum entanglement is a phenomenon in quantum mechanics where two or more particles can become connected in such a way that their states are linked and dependent on each other, regardless of the distance between them. Entanglement occurs when two or more particles are created or interact in a way that their properties become intertwined like when two particles are created at the same time and place, or when become entangled during collisions or emission of photons. These particles do not actually exchange any physical form of information but are still interconnected.

The case of the Un-alive Cat.

Here is a simplified version of a thought experiment by Erwin Schrodinger. Think of a cat in a box with a bomb that has a 50% chance of exploding. If this box was sent out into space with no form of signal transmission, until the box was somehow opened, we would have no way of knowing whether its dead or alive. Hence, its state would be of both - dead AND alive. This is the basic principle of quantum superposition. This fancy term basically means that something that can do opposite things at the same time.



Syna Gupta

Super dense coding is a quantum communication protocol that allows two parties to communicate two classical bits of information by exchanging only a single qubit. The super dense coding protocol works as follows: Alice has a qubit in a particular state, which she wants to use to transmit two bits of classical information to Jake. Alice applies a specific quantum gate to the qubit, depending on the two classical bits she wants to send. She then sends the qubit to Jake, who performs a measurement on the qubit. By comparing their results, Alice and Jake can extract the two bits of classical information.

Aashi Tiwari

Development of speech



In a world divided by different cultures and traditions, speech is what links one community to another. Although we grow up to learn different languages, as babies we all almost babbled the same way. To explore the mystery behind this complicated yet overlooked concept of speech development, there have been quite a few digs at formulating the theories behind it.

One of them was The Bow-Wow theory, presented by German philosopher Max Müller. As funny as it sounds, it suggested that the development of language started when our ancestors began to imitate sounds from their environment like 'moo', 'bow wow' or 'a-choo' for a sneeze.

Stephen Krashen, an American Linguist, proposed a model called the Krahsen's Monitor Model of Second Language Acquisition (SLA) that includes five hypotheses which investigates how individuals learn a new language. The K-drama fans among us would agree that although they have never had a proper Korean language class, they find the language familiar having picked up several phrases from the shows they watch. This proves that one does not need to follow strict grammar rules for learning a language. Instead, meaningful interactions and repeated listening are enough to build a steady learning base.

Another theory, by B. F. Skinner, called the Behaviourism theory, suggests that children tend to pick up words by imitating adults. This learning is consolidated by reinforcement by the parents as well. For example, a child is praised for using a new word which reinforces their behaviour.

Despite the tremendous amount of research and experimentation, the development of speech remains of unclear origin. A single spoken word has the power to wage a war, or to stop it, yet we often take it for granted. The concept of communication revolves around speech which in itself is humanity's most powerful weapon.

Vaanya Bhandari

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