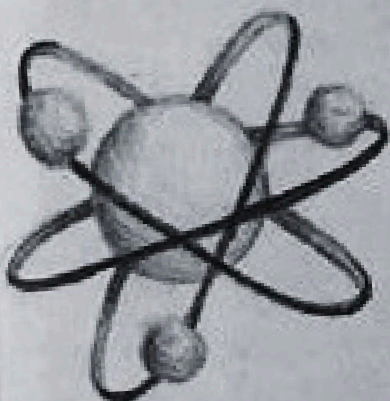
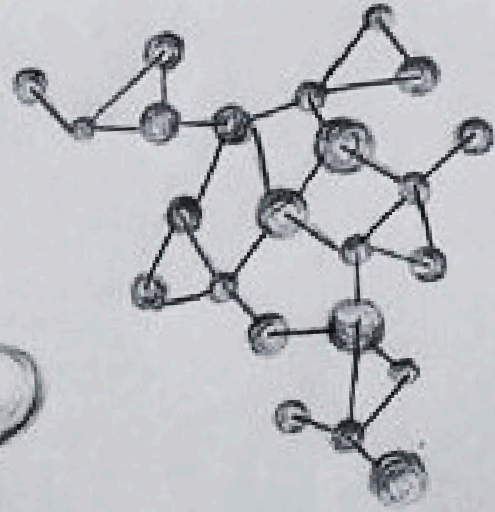


DELTA KAPPA

SAS Issue 26'



Editor's Note

"The mind is not a vessel to be filled but a fire to be kindled." — Plutarch

We often live our lives assuming that what we see is a sum of what exists. However, if we look at it through a scientific lens, we see how utterly untrue that is. We tend to derive meaning from what cannot be seen not because it is inherently there, but because our mind thrives when meaning is found. It thrives on finding poetry in the noise and beauty in the broken. We are, in a sense, architects of our own reality. This issue is a journey into the noise and an attempt to shrug off the flowery obvious and reveal the raw universal machinery underneath.

At a fundamental level, we find a world that completely disregards our knowledge. We are built from heavy and reliable baryon particles, yet we exist merely as ghosts to the thousands of neutrinos that pass through us. We are solid enough to touch, yet we are composed of particles that barely exist by our own definitions. Are we to embrace reductionalism and conclude that the same forces governing the stars are mirrored in the biological composition of our cells or not?

This issue pushes and questions the uncomfortable corners of discovery. We examine neuroaesthetics to ask if "beauty" is just a dopamine hit and look at neuroplasticity to see how much of "us" are truly permanent. We look at the contrasting isolation of "Punch the monkey" with the social liberation of the Rat Park experiment, questioning the root of addiction and proving that environment is just as important as chemistry.

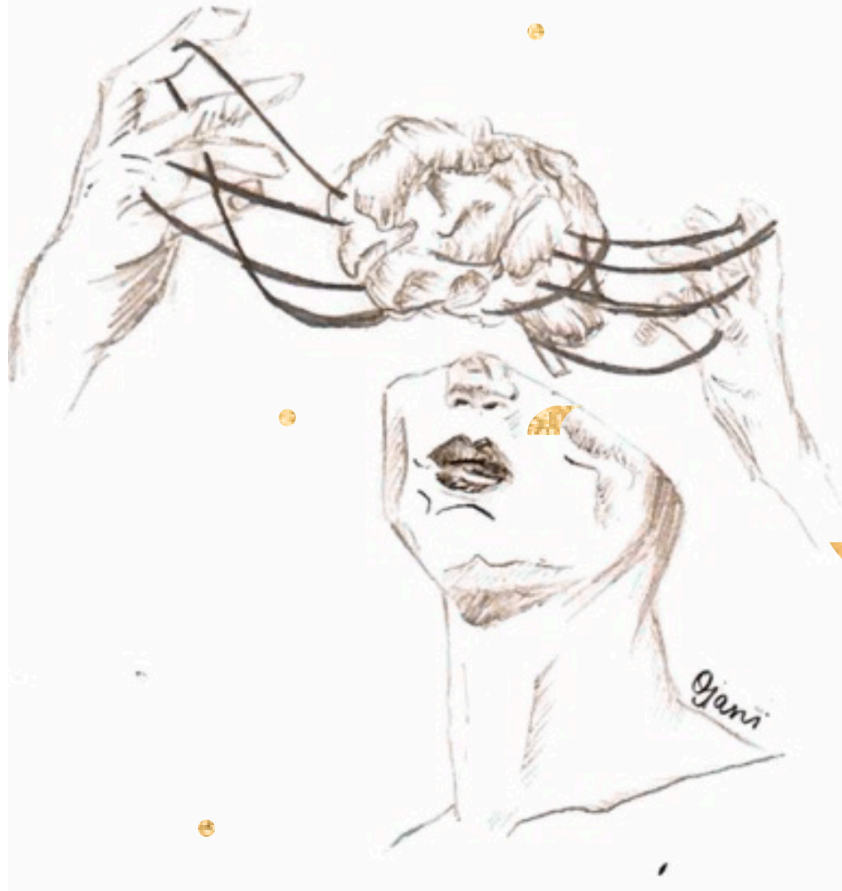
Signing off,
Meher D'Souza
Editor-In-Chief

Table of Contents

"WHY NEW YEAR, NEW ME" NEVER WORKS BIOLUMINESCENCE IN CANCER CELLS	SPONTANEOUS RECOVERY OF CANCER CELLS
ADDICTION WHY WE CAN'T FEEL WATER	THE DECEPTION OF REDUCTIONISM WHY SNAKES DON'T FEEL HUNGRY
PUNCH THE MONKEY PINHOLE CAMERA	WHY GOLD SHOULDN'T BE GOLD
NEUTRINOS AND BARYONS	NERUROASTHETHICS
YAMANAKA FACTOR	CREDITS PAGE

WHY “NEW YEAR, NEW ME” ALMOST ALWAYS NEVER WORKS.

Till the late 90's, scientists assumed that our brains stay the same from the day we turn 21 till the day we die. The truth is, our brain structure changes constantly. It physically rewires itself to help the body adapt to its surroundings. Its ability to change structure, in scientific terms, is called neuroplasticity. 'Neuro' because it is related to neurons and 'plasticity' because the brain changes structure the same way plastic changes structure when we apply force to it. Hence, it is termed as neuroplasticity.



The brain transmits different signals through neurons. The neurons have a protective covering that helps in the transmission of these signals. This covering is called the myelin sheath. When we do something every day, we usually do it unconsciously or without much thought. This happens because the myelin sheath surrounding the neuron pathway that is transmitting this signal is very thick. The thicker the myelin sheath, the faster the signal is transmitted. However, when we change the task or try to build new habits, the brain quite literally fights against this change. This happens because the brain itself is metabolically expensive and requires a lot of oxygen supply.

When your brain starts forming new neural pathways, the amount of oxygen intake and energy required increases. Essentially, your brain doesn't understand why so much energy needs to be spent on changing something when there is already a perfectly curated, low-energy myelinated highway which it can follow to accomplish this same task.

Remember how we all struggled when morning sports first began? Our bodies were wired to wake up at seven, suddenly because of the new requirement, the brain structure needed to change as well. It was comparatively easier because there was already an existing myelinated pathway. However, when you try to pick up a new habit, your brain structure physically changes and builds new pathways which then gets myelinated. This is also why just will power every New Year's Eve doesn't work. Of course, motivation is imperative, but time for your brain to adapt is equally important.

Some of us adapt faster and some slower. Some of us give up on our “New Year, New Me” resolutions after just a month, some after three, while some manage to accomplish their two-year pending resolutions. It all depends on an individual's ability.

ADDICTION

“The opposite of addiction is not sobriety, it’s connection.”-Johann Hari.

What is it in the complex network of chemical signals intertwined with neurons that makes us addicted? Addiction doesn’t happen from having a lack of will power or because of making bad decisions. Your brain chemistry changes with addiction.

An experiment called the “rat park” was conducted by the famous Dr. Bruce K. Alexander in the 1970’s. It consisted mainly of two groups of rats. One group was isolated in a cage and the other cage had 5-6 rats in a social setup. The common factor was that there were two dispensers of water. One dispenser contained a sweetened morphine solution and the other plain tap water. The isolated rats were often over-drugged but, in the other, stimulating environment with toys, tunnels, food and other rats, the rats rarely chose the drugged water and none overdosed.

So, just think about it. What if addiction isn't about your chemical hooks but it's about your cage? Humans have a particular trait called bonding. If humans cannot bond with other humans, they tend to bond with anything that gives them a sense of relief. A major part of addiction is not being able to bear to be present in your life. On the other hand, someone who is socially active, wants to be present and show up for events, for people, and to bond with them.

Many Vietnam War soldiers used heroin, but when they returned home to supportive environments, most stopped without rehab . In Portugal, in the 2000’s, the population faced severe addiction issues. The government, instead of punishing the addicts, spent money on reconnecting them with society.

That small step decreased the number of addicts by more than 60%. So maybe the problem was never the drugs alone.

Maybe the problem was the cage.

If cages create addiction, then connection can destroy it.

At the end of the day, the opposite of addiction isn’t sobriety. It is belonging. It is purpose. It is connection.

Miraya Puri
AII B

EARLY AGE PIXELS

Imagine if photography was not confined to just bulky DSLRs but was just a matter of physics, cardboard boxes, holes and light. That is exactly what a pinhole camera does. Except, instead of a bright circle of light that you may be imagining, we see a shadow. How?

It consists of a small hole on one side of a dark box with a screen on the other. Light passing through forms an image of the object that we are using. In nature, pinhole cameras play a major role. Take a walk on the bajri on a hot May Day. The sun shines through the tiny gaps of the tree leaves. This is our natural camera. Hundreds of small circular suns are projected onto the ground. Since the Sun is round, the spots of light we see are also round. It has nothing to do with the shape of the hole but only the size. The rays of light that line up exactly with the sun are allowed to pass while the others are stopped. But because the sun is well... the sun, so its multiple light rays pass through all the holes and form tiny images much like what we see during a solar eclipse. This phenomenon was witnessed in North America on 27 March 2024. Thousands of crescent shaped images were seen floating about on the ground. This is because a solar eclipse causes the moon to be partially covered. Even in window curtains, a small gap projects inverted images of the outside scene onto the wall, only it is upside down. The light rays from the top reach the cardboard box at the bottom and vice versa.

Modern cameras are all the rage for pixels, but pinhole cameras give you everything raw and unadulterated. Sometimes the simplest ideas create the cleverest picture.

Araina Dang and Shanaya Gupta
AI

THE ADORABLE CASE OF PUNCH THE MONKEY

On February 5, 2026, the Ichikawa City Zoo shared the story of Punch, a seven-month-old Japanese monkey abandoned at birth. Suffering from social anxiety and stress, Punch became a global sensation after footage showed him being rejected by older monkeys and finding solace in a Djungelskog orangutan plushie.

This attachment is not merely a product of grief but can be linked to a series of experiments conducted by Harry Harlow. Harlow's research with infant Rhesus monkeys demonstrated that when given a choice between a wire surrogate providing food and a plushie that could only provide comfort, the infants consistently chose the soft figure. This can be explained with the help of the attachment theory which was developed by John Bowlby.



Drawing on the ethological theory (dealing with ethics and morals), he stated that attachment behaviour (crying, screaming, searching etc.) were adaptive responses to separation from a primary attachment figure. Through this he worked out that humans who were in contact with attachment figures who provided them with love, emotional security etc., for a long time were more likely to survive to reproductive age. Bowlby stated that the brain "designed its own system known as an "attachment behaviour system" to regulate proximity to an attachment figure. According to Bowlby, the attachment system asks the following questions. "Is the attachment figure nearby, accessible, and attentive?" If the child perceives the answer to be "yes", then the child feels loved and is secure in his or her relationship with the primary attachment figure. But if the answer is "no", the child is insecure in his or her relationship with the attachment figure and is likely to have anxiety. This behaviour continues until the attachment figure is nearby.

Vaidehi Dhyani
AI B

WHY CAN'T WE FEEL WATER?

Yes, it's true. We humans can't detect water. We can only feel its temperature. But why?

This is because we don't have hydroreceptors in our body. Hydroreceptors are those receptors which allow us to sense water. When we touch a "wet" towel, our thermoreceptors activate and tell us that the towel is cold, and thus wet. That is also why you can't tell if washed clothes are wet or just cold. If we dip our hand in water which has the same body temperature, then we will not be able to feel its presence. Our brain combines an object's temperature, the pressure of the water, and its unique texture to come to a blind conclusion that we are touching water or any wet object. Since humans don't know what water feels like, we simply accept that illusion created by the brain. This combination of other senses is called multisensory integration through which we can thankfully interpret at least, external wetness.

On the bright side, we don't have to suffer from sensory overload, because if we had hydroreceptors, we would feel the change in humidity which could be rather uncomfortable to experience.

Sanghavi Dhanuka
AIII B

Particulate Matter: The Contrasts

Neutrinos

Neutrinos are probably one of the most intriguing and fascinating particles created by the universe. The name neutrino comes from Italian, meaning “little neutral one” explaining its lack of electric charge and extremely small, near negligible mass. They are so minute that literally trillions of them pass through our bodies every day. The most obvious and abundant source of neutrinos is the sun. During nuclear fusion occurring in the sun’s core, hydrogen atoms interact to form helium releasing energy and neutrinos. These neutrinos then travel straight towards the earth. Powerful cosmic events like supernova explosions (the “death” of a star”) and the merging or “birth” of a star also produce neutrinos. Neutrinos are also produced due to radioactive decay on earth, especially in nuclear reactors.

However, it is the manner in which neutrinos interact with matter that actually makes it fascinating. Unlike other particles they can pass through entire planets without being interrupted.

This ability makes it extremely difficult to detect and study, so scientists use large underground detectors filled with water or ice to observe rare interactions between neutrinos and atoms.

Those experiments have helped identify and confirm theories such as the neutrino oscillation theory. In addition to that, they are closely related to the concept of antimatter. For every particle there is usually a complimentary counterpart. Neutrinos have corresponding antiparticles called anti neutrinos which are produced during processes such as beta decay. The study of the relationship between neutrinos and antineutrinos help to explain why the universe consists of more matter than antimatter. By studying them, scientists can better understand the fundamental laws of the universe, including how particles behave and how the universe evolved after the Big Bang.

Ananta Agrawal
SC A

ting Building Blocks of the Universe

Baryons

The laws of the universe clearly dictate that there must be symmetry and an equilibrium in all cosmic processes, meaning that ideally there must be a balance in all occurrences. Fundamentally the greatest and most important process has been the Big Bang, that led to the creation of everything that exists and has ever existed. CP refers to the discrete symmetry given by product of two components: charge conjugation (C) and parity (P). According to this law, there was an equal amount of matter and antimatter created in the universe.

Antimatter refers to particles that have the same mass as their matter counterparts however characteristics such as electric charge are opposite. Matter and antimatter exist in pairs and upon coming into contact, they destroy one another explosively, leaving behind pure energy. In an ideal circumstance, all particles that were created would be annihilated as soon as they can into contact with each other reducing what we now call the infinite universe to leftover energy.

It then becomes intuitive to think that ideally, matter should not have existed in the universe, and the universe should only have comprised of radiation. Our very own existence indicates that somewhere, there was a small error, a discrepancy that led to survival of matter.

Scientists discovered there is a dominance of matter particles over antimatter, as if an intentional imbalance exists that granted matter way to survive in the universe. The laws of physics are not perfectly symmetrical when it comes to baryons and antibaryons. This phenomenon is called baryon asymmetry because of which, in the giant cosmic elimination game, matter survived by CP violation.

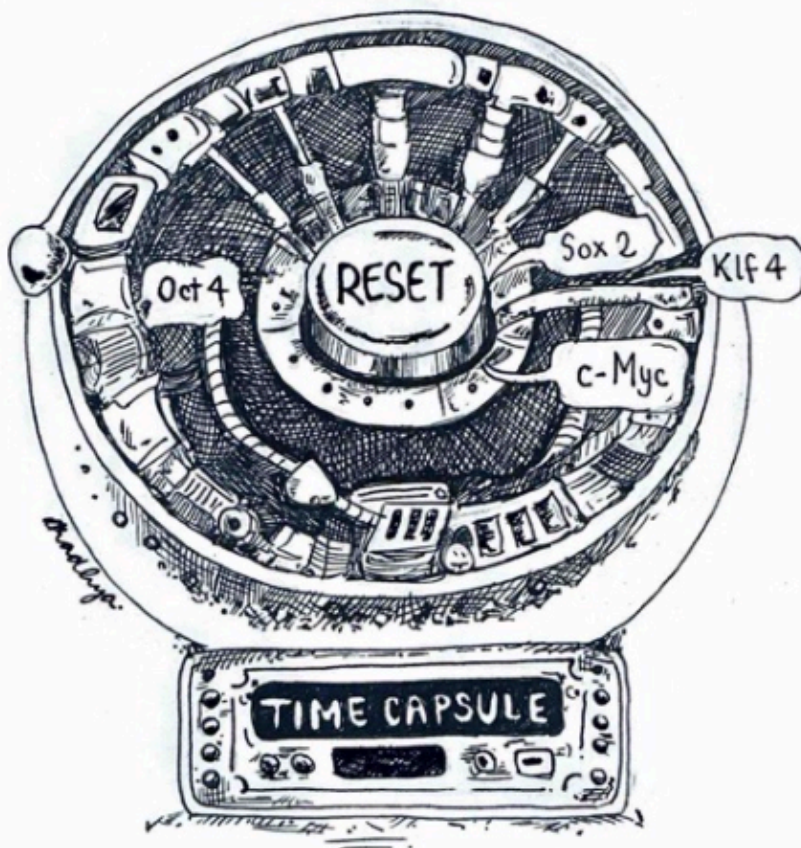
From a billion baryon and antibaryon pairs, a singular baryon survived. The gradient may be huge, however these asymmetric miniscule particles changed everything. These extra baryons completely altered the trajectory of the cosmos as they continue to create atoms, stars, galaxies, and life itself. In other words, the entire visible universe exists because matter won by the smallest margin in the great game of cosmic elimination.

Yamanaka Factor

The incremental advances in biological research had been overshadowed by the discovery of the Yamanaka factor which proved that the aging of a cell is not an irreversible process. In 2006, scientist Shinya Yamanaka discovered four specific genes that, when inserted into an adult cell, essentially press the "reset button" for that cell. This allows scientists to erase the "memory" of age and experience from the cell, returning it to its embryonic (premature) state, called an induced pluripotent stem cell. This process of cellular reprogramming completely redefined the manner in which we perceive the evolution (or lack thereof) of life and rightfully earned Yamanaka the Nobel Prize.

To understand how these factors essentially "de-age" the cell, one needs to consider the epigenome, which is like a bookmark for our DNA. Our DNA code itself never changes, but as we age, these tags essentially turn certain genes off, tightly packaging the genes, and therefore, allowing the cell to become locked onto its specialised purpose and structure. These tags also tend to "collect" errors as they go, contributing to the body's degradation as it ages. Yamanaka's factors essentially insert themselves into the nucleus of the cell, where they then erase, or remodel these tags. By removing these epigenomes, the factors enable the cell to forget its old and damaged state and return to its highly functional and flexible state as a newborn stem cell. The reverted cell can now divide and specialise into any other cell and start anew, which may sound optimistic and hopeful, but in its whole form, is a threat to cell identity and tissue functioning.

The potential applications of this technology are endless and could reshape how we treat and cure many chronic diseases. With the ability of iPSCs to be developed into any tissue type of cell, such as heart muscle cells, nerve cells, and insulin-producing cells, we could replace damaged organs in the body using our own genetic material, eliminating the possibility of rejection. In addition, scientists are now able to use "partial reprogramming," in which the Yamanaka factors are introduced for a very short period. This technique has the potential to rejuvenate the cell and heal DNA damage without reverting the cell back into a stem cell. Though the danger of developing teratomas does persist as a corollary to such rapidly reproducing cells, such an important understanding of them is a crucial step in the march of humankind to wider, riskier, and more unanswerable questions that concern our existence.

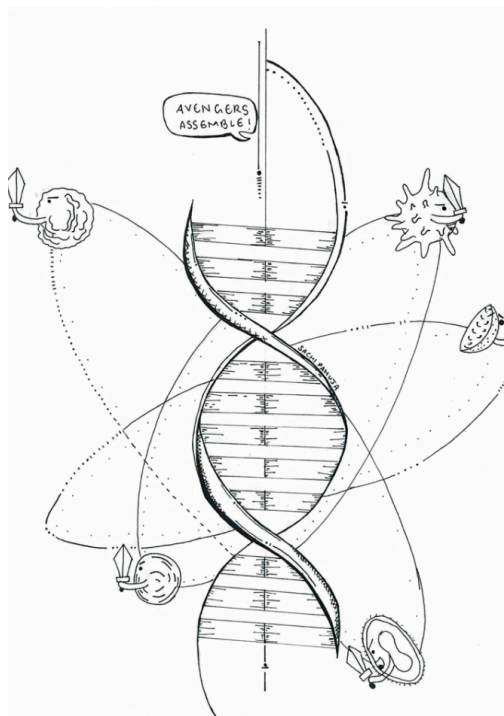


Spontaneous Recovery of Cancer

What if cancer was capable of involuting spontaneously without the pain and invasiveness of surgery, chemotherapy, or radiological treatments? Although such spontaneous recoveries from cancer are extremely rare, estimated at only one in 60,000 to 100,000 cases, they do hint at the potential for the human body to have an intrinsic biological mechanism for the regression of tumours. While recent advances in oncology have greatly helped in the treatment of cancer, there are still a number of challenges associated with the treatment of cancer in the contemporary era. These include the occurrence of drug resistance, severe side effects, as well as the inability of treatments to completely eliminate cancer cells. In response to these challenges, there is an increasing interest in spontaneous oncologic regression, which is the spontaneous regression of cancer. Historical reports provide an early perspective into spontaneous oncologic regression.

One of the most commonly cited cases is that of Saint Peregrine Laziosi who reportedly had a malignant tumour in his leg cured just before a planned amputation. Similar occurrences have also been seen in modern clinical practice.

In the wake of the COVID-19 pandemic, there have been a few reported cases of the spontaneous regression of cancers like lymphoma, leukaemia and melanoma in SARS-CoV-2-infected people despite the absence of anti-cancer therapy.



In the wake of the COVID-19 pandemic, there have been a few reported cases of the spontaneous regression of cancers like lymphomas, leukaemia's, and melanomas in SARS-CoV-2-infected people, despite the absence of anti-cancer therapy. Scientists speculate that the strong immune response to the virus may inadvertently trigger the immune system to attack the cancer cells.

It must be emphasized that COVID-19 cannot be considered a therapy for cancer, say medical experts.

An important scientific basis for this concept was established in the late nineteenth century by William Coley.

He noted the spontaneous regression of cancer in some cancer patients after contracting severe bacterial infections. Based on this discovery, Coley created "Coley's toxins" – a combination of killed bacteria intended to cause fever and stimulate the immune system.

As a result, signalling molecules like tumour necrosis factor- alpha (TNF-alpha) were released by the immune cells, causing cancer cells to undergo programmed cell death. What is particularly noteworthy is the fact that the cancer went into remission in several patients with untreatable forms of cancer, making this the first form of immunotherapy. While spontaneous remission is rare, these cases serve to direct current cancer research and point to the vast potential of the human immune system to shape the future of cancer treatment.

Aahana Modi
SCA

The Deception of Reductionism

“Human science fragments everything in order to understand it, kills everything in order to examine it.”
- Leo Tolstoy, War and Peace

A sort of fallacy that is deemed necessary to grasp even the smallest essence of life, Ontological Reductionism, talks of what lies at the crux of every organism's being: its metaphysics. To strip away layers of consciousness to derive the ultimate truth seems to be what attracts the great minds of our society to ask the same question that has been left unanswered since the late 19th century,

“To what extent does the dichotomy of faith and science stretch?”

The science we know today continues to dissect every aspect of one's sentience, leaving us with a statement so demeaning yet rational, ‘We are nothing if not simply composed of sets of lower entities - molecules and their time-to-time collisions.’ Yet life all around us seems to be so much more than simply material reality. It transcends even the extremities of our intellect, because everywhere we turn our attention to, we see adaptation, symbiosis, parasitism, but most importantly, we see coexistence.

Looking at the pious facet of this polarity, we see that faith describes the human mind to be an entity enshrined with a soul that unifies everything sacred that we possess as a being. So, from where does this stark disjunction arise? Is it a question of truth, or does the mirage of logic subjugate what we believe to be the veracity of our world?

The answer lies not within the obscure explanations faith provides us with, and nor in the anomalous disbalances we receive from science. Here, the answer arises from the contrariety between human value and the body's utilitarianism. We see from just about any scientific theory that we, as beings, are made of biological systems that can further be broken down into molecules, atoms, and finally sub-atomic particles alongside their occasional particle collisions. Utilitarianism in this context can be easily defined as the ethical theory that uses the best aspects of a body so as to promote utmost contentment and therefore uphold the dignity that we, as humans, consider to be the most regal fragment of our personalities.

Therefore, embracing the revelations science provides us with but wielding the views of faith to consider a being a tapestry of microbial interdependence becomes crucial to allow progress to make its way into the modern, fast-paced world we live in today, because to allow ourselves to be deceived by fallacies would be to fragment and oversimplify everything in order to finally believe the same veracity we never considered to be our guiding light.

Tamaira Sapra
AI C

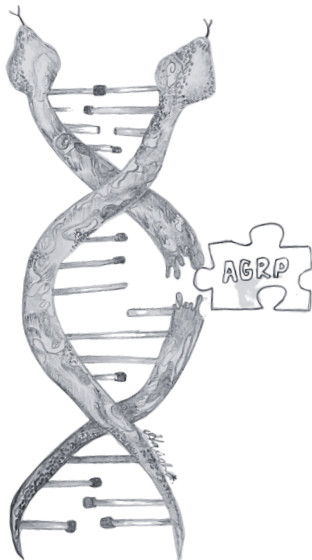
WHY SNAKES DON'T FEEL HUNGRY

Humans can't imagine living without eating food beyond a day, the thought itself makes many miserable. Hunger is a basic survival instinct. Well, this holds true for most animals, but snakes are a remarkable exception. They can survive for months without food, while being completely healthy. Most humans have the AGRP gene, which produces agouti-related protein (AGRP), a neuropeptide. This messenger-protein stimulates hunger appetite and slows down energy use in humans.

This is where snakes differ from most animals. Evolution has caused snakes to lose that gene completely, not without reason though. As ambush predators with slow metabolisms, constant hunger signals would be wasteful. Instead, they use energy slowly and utilize each calorie from every meal. Snakes eat when they get a chance, not because they crave food. They sense prey by "smelling" the air with their tongues and strike when food appears, not out of hunger but instinct.

Snakes don't lack a hunger system, they simply have an efficient one, adapted to their biological needs—a system that differs greatly from humans'.

Srinika Agarwal
SC B



WHY GOLD ISN'T *Gold*



For most of us at Welham, chemistry is mostly about equations and experiments, while Physics is the big, bad bully who everyone is terrified of. But they are so much more than that. Let's take the element gold. The Schrodinger equation suggests that it should be a silver grey colour, just like all the other metals. But it's not, I mean, it's gold.

#

As for mercury, the Schrodinger equation predicts that it should be a solid at room temperature, but it's a liquid. So, what is wrong? Well, I'll give you a hint, because both gold and mercury are heavy elements. They have a high number of protons in the nuclei, which attract orbiting electrons more strongly.

So if you're thinking in a classical sense, the electrons would be bound tighter in and they'd be whizzing around at higher speeds than in other elements, you'd be right. And for electrons in some orbits, those speeds start to get a little too close to the speed of light (which is a lot).

So let's go back to the Schrodinger equation.

You see, this equation doesn't hold true if the speed is close to the speed of light. So essentially, the Schrödinger equation falls apart and there we have the properties of gold and mercury.

Now this might be alright for you and I, having some inconsistencies in an otherwise perfect equation. But for scientists this presented a huge failing and they set about to correct it.

The answer was proposed by Paul Dirac in 1928. He asked: what if you rewrote the Schrödinger equation in such a way that it never violated the principles of science. Lo and behold, the Dirac equation was born.

It correctly explains electron behaviour in heavy atoms, the electron spin and predicted the existence of antimatter (positron) before it was ever observed experimentally.

For gold, it explained its characteristic yellow colour and for mercury its liquid state at room temperature.

So the Dirac equation wasn't just a fix, it was a fundamentally deeper theory that revealed entirely new physics.

Neuroaesthetics

Neuroaesthetics asks a deceptively simple question: why do people find certain images, sounds and forms beautiful? Rather than leaving the answer to philosophy or criticism alone, it examines how the brain reacts biologically to aesthetic experiences from motifs and logos to a fruiting tree glimpsed among barren ones. The field gained popularity through the works of Semir Zeki, a neuroscientist, who proposed that the brain functions as an "aesthetic organ," meaning our appreciation of art is rooted in neural processes that evolved to recognize patterns, meaning, and emotional significance. Your Pinterest board, in other words, is a creation of the brain, not the heart.

We can look at Vincent Van Gogh's *The Starry Night* as an example. When you look at the painting, it makes a lot of different parts of your brain work together. The primary visual cortex (V1) processes the basic features of the painting, like its colour, contrast and design orientation. The visual pathway (V4) in the occipital lobe, on the other hand, handles chromatic information. The painting's swirling, repeating curves directly stimulate this motion-sensitive circuitry, making it feel like the image is moving even though it is still. At the same time, the brain's pattern-recognition systems look for structural similarities, and the quick and easy processing of those repeating curves creates what researchers call "perceptual fluency," which is a cognitive ease that the brain sees as good and enjoyable.

One of the main mechanisms underlying this happiness is the production of the neurotransmitter dopamine. The neurotransmitter dopamine produces a pleasant effect, motivating us to repeat the experience. In other words, we may seek out works that have previously led to reward once the brain gets used to a particular style or composition. A person whose eye is caught by the swirling movement in *The Starry Night* might also gravitate towards other expressive dynamic painting styles. Repeatedly acting from this place of attachment creates your personal tastes in art. That can explain why two people can stand in front of the same painting and experience very different feelings.

The brain works constantly to balance between predictability and novelty. There is a prediction error signal which means that there is a mismatch in expectations and what happens in the event that an artwork fulfils perceived expectations but also has some unexpected elements.

Neuroaesthetics importantly does not narrow art to only chemistry. The framing of visual information is shaped by one's cultural conditioning, personal memory and historic context.

In this way, experiencing art is both intellectual and neurological. When we stand in front of a painting and feel unexpectedly moved or captivated, we witness not just the artist's skill, but also the brain's remarkable ability to find beauty in colour, form and motion.

Moving **WHAT CANNOT BE MOVED**

Recently, in a seemingly understated experiment, the scientists at CERN pulled off something remarkable. They figured out how to transport antimatter, or more precisely, anti-protons.

This may not sound remarkable but once we delve into the nature of antimatter, it truly feels like impossible science fiction.

Antimatter, or more specifically, anti-protons, that is, the antimatter counterparts of protons, as the name so obviously suggests, annihilate as soon as they come into contact with ordinary matter. So, we can't possibly transport them in a truck, can we?

As it so delightfully turns out, we can.

In a four kilometre loop around the CERN campus, these particles are confined within electromagnetic traps, suspended in a vacuum more pristine than outer space, and stabilised by superconducting magnets cooled to near absolute zero. The journey must be handled with absolute precision, as sudden motion could disrupt the entire system.

As physicist Christian Smorra rather reassuringly notes, "If you transport 1000 anti-protons and it gets lost, you won't even notice it." It is, perhaps, the only delivery scenario in which losing the package is scientifically acceptable.

Now, why are we so excited about this?

This means a huge leap in the scale of quantum research. When these anti-protons are transported all across laboratories in Europe, as far as the current plan is considered, more scientists can directly experiment on them, and hence it happens that better research is conducted on them. This research has immense applications across fields, from technology to cancer cure research.

For now, however, all we know is that a truck somewhere in Switzerland has moved what can't be touched.

Zara Khan
SCA

CREDITS

