

THE ZOOLOGICAL SOCIETY OF SRI VENKATESWARA COLLEGE PRESENTS

# PHOENIX

8<sup>th</sup> Edition  
2019-2020



Phoenix 2020

# CONTRA SPEM SPERO

Rishabh Yadav, SZH

When the sky would mirror the soil,  
And the soil be burnt beyond recognition.  
When the brittle lions would collapse under the weight,  
Of their own inherited past.  
When the forests would turn into miles of aridness,  
And the dead fishes form the shroud;  
at the funeral of the lakes.

When the sand castles, deep inland, towering,  
in their capitalist might,  
Would crumble as the sea would come to shore.  
When children with naked feet won't find the carcass,  
of Eucalyptus in the parks to swing around on.  
When the sulphurous winds would take  
the parliament by storm,  
and the politicians would find a new reason  
to govern in absentia.  
When a kid peeping out from the windows of a metro,  
would see the decay travel alongside him.

When one would have to walk a thousand miles,  
To find something to crush under their boots.  
Then, maybe then, we'd think of what we've done.

Rishabh Yadav's poem "O cycle Man" secured one of the top 30 positions in Wingword Poetry competition 2019 and published in an internationally distributed anthology.

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Date: 28.02.2020

It gives me immense pleasure to congratulate the Department of Zoology on the release of the 7<sup>th</sup> edition of their annual magazine "PHOENIX". It is the result of immense hard work and dedication of students and teachers alike and I applaud them for the same.

Over the years, the department has built a tradition of excellence. The department's hardworking staff creates a positive ambience where each person's unique strengths and talents are celebrated. The combination of focusing on their student's academic success as well as their social and emotional wellbeing creates an environment where the students thrive with success.

Touching minds and shaping futures is the guiding force of this department and they remain forever committed to this endeavour. The role of an educational platform to not only pursue academic excellence but also empower its students to be lifelong learners is well versed with this department and keeping this in mind, the department organises various educational excursions and visits to national parks in Delhi and around the nation and always tries to put out various informative talks or address various relevant issues in a fun and innovative manner which are all organised by its society, Evolvere.

I would like to conclude by the words of Albert Einstein, "Imagination is more important than knowledge, for a while knowledge defines all that we currently know and understand imagination points to all we might yet discover and create."

  
PRINCIPAL

# From the Convenor and Co-convenor



The Department of Zoology of TTD Sri Venkateswara College, throughout its checkered history of 47 years, has become synonymous with innovation and excellence. The academic calendar of the department being littered with achievements in both curricular and Co-curricular areas is a testament to the fact that the tradition of excelling on all fronts is well alive.

This year the department highlighted the achievements in the field of pharmacology in our Annual event. Beginning with an intriguing and informative lecture by Dr. Jasminder Sahi, who is the senior director and head of TMED Asia Pacific, China. This was followed by an illuminating talk by Dr. Sheetal Gandotra, an integral part of the Institute of Genomics and Integrative Biology, CSIR. We take great pride in having fuelled the curiosity and creativity of the students by complimenting lectures with e-poster making competition and a highly competitive inter-college quiz exploring the pharmaceutical world.

Culminating a year consisting of successes and even greater successes, we present, with great love and a pinch of pride, the eighth edition of our magazine, 'Phoenix'. Filled with a passion akin to the great flames of the mighty beast, and with integrity which will stand the test of time, our magazine is the physical embodiment of the mythical icon. You're welcome to a Zoologist's maze, take a stick and come on in. Readers beware, once you start reading, you may never know when to stop!

Our deepest gratitude goes to Dr. P. Hemalatha Reddy, our honorable principal, for her unwavering guidance and support. We sincerely thank all of our society and department members for burning the midnight oil and always believing in our vision. We wish that we keep on inspiring our students and avid readers time and again.



*Dr. Anita Verma & Dr. Mansi Verma*



# Teachers' Tabloid



**Dr. Anita Verma**  
Specialised in Entomology and Physiology

Warm-hearted and kind, she holds the department together. Simple yet elegant, you cannot help but be in awe of her wisdom.

The storyteller of our department, he is fun loving and lively. The go to person for both career advice and entertaining stories, his lectures are never boring.



**Dr. Riyaz Bakshi**  
Specialised in Neurophysiology



**Dr. Vagisha Rawal**  
Specialised in Insect Behavior

A friendly entomologist, she is always ready to help the students. Cheerful and kind, she approaches every problem with a smile on her face.

Fun loving and witty, she explains the most complex concepts with ease. Attend all her classes for unique and never heard of facts that will stay with you for a lifetime.



**Dr. Vartika Mathur**  
Specialised in Entomology and Ecology



**Dr. Om Prakash**  
Specialised in Fish Biology and Proteomics

By passion very sporty, he is an ebullient teacher with exceptional abilities. Without him, our trips are like a cell without it's powerhouse.



**Dr. Richa Misra**  
Specialised in Biotechnology and Tuberculosis Biology

With a Nightingale's voice and a heart of gold, she makes us all equipped to tackle the brutal outside world. With her vast knowledge in every field, she solves all our problems from Genetics to career options.

Bubbly in demeanour and meticulous in her lectures, she prefers bones over jewels. Teaching every subject with equal enthusiasm, she has the superpower of making the most mundane topics interesting.



**Dr. Namita Nayyar**  
Specialised in Molecular Biology



**Dr. Mansi Verma**  
Specialised in Molecular Biology and Bioinformatics

Multi- talented and versatile, she is always open to new avenues. You can trust her for perfect selfies for your gallery and perfect scores for your exams.

Considerate and patient, he makes sure none of the students is left behind in class. With both humility and skills, he makes every lecture engrossing.



**Dr. Rajendra Phartyal**  
Specialised in Fish Endocrinology

Positive in outlook and energetic while teaching, she explains every topic with utmost zeal. Her learning tricks make us sail through the semester smoothly.



**Dr. Preeti Khandelwal**  
Specialised in Fish Endocrinology



**Dr. Sadqua Shameem**  
Specialised in Ichthyology and Fisheries

With a loving smile and kind heart, she helps us out in every situation. With her meticulously prepared notes, she makes studying easier for us.

Always ready to throw up a challenge, his hands remember more structures than our minds. If remembering 14,000,605 biochemical pathways was a superpower, he would definitely be Doctor Strange.



**Dr. Ajaib Singh**  
Specialised in Molecular Biology



**Dr. P. Jayaraj**  
Specialised in Cancer Biology and Reproductive Biology

He makes constant efforts to make us learn from banana cultures to play doh balls. His tireless devotion towards helping his students makes him truly second to none.



**Dr. Aarti Seherawat**  
Specialised in Entomology and Animal Behaviour

With her boundless knowledge, she holds the attention of everyone in the class. With charm and a knack for perfection, she motivates us to do our best.

*Teachers of  
Our department  
Whose footsteps we follow.....*

*Zoofam  
Evolvere and Phoenix*



# From the

# GORE Team



**Anushka Saxena**  
Editor In Chief

“EDITOR IN CHIEF” – Till date, I cannot wrap my head around the fact that a klutz like me could be entrusted with such a prestigious post. In the beginning of this journey, I was motivated to do this because it was my responsibility but with time, I began to see it as much more – an opportunity to grow, to let my imagination run free, to test my ability to push myself, to work as a team and act as the perfect harbinger that would showcase my department in the way that they so rightly deserve. This journey, though not an easy one was still the most rewarding because of my wonderful team and I owe it to them for making this experience a memorable one. Lastly, thank you so much Phoenix – as you grew, this klutz did too, who joined as an editor in her first year is signing off as the editor in chief in her last.

Behind this 100 page magazine is months of hardwork, numerous sleepless nights, dozens of meetings and brainstorming sessions. Every suggestion, every submission, every edit made me learn something new. As I saw the magazine come to life, I could feel the transformation within myself. From being unorganised to making ten lists every day, I have come a long way.



**Ankita Saha**  
Editor In Chief

When I was entrusted to take the responsibility of being a managing editor, I was shaking with nervousness. Being trusted with someone else's work is always intimidating. I took great care to ensure that my own biases didn't creep in while editing the articles and that their sanctity was maintained. thankfully, I have had excellent guides in the editors-in-chief and our visionary teachers. I like to think that with every comma and capitalized letter, I've left a part of me in these works. Happy reading!



**Rishabh Yadav**  
Managing Editor

Being the managing editor for Phoenix was a tremendous experience. Each article exploring the multifaceted beauty of existence. It truly was a transforming journey from first article to the final print. I would like to thank our teachers for their wisdom and the Phoenix team for their dedication that has culminated in this beautifully illustrated magazine you now hold.



**Vaibhav Sharma**  
Managing Editor



**Harshita Rupani**  
Designer In Chief

Serving as the Designer in Chief for Phoenix was a journey that led to the reclamation of my creative side and helped me to take cognizance of the beauty that science beholds. Sitting all by yourself and creating designs on your phone, surrounded with nothing but your thoughts and eventually creating art leaves you with a feeling of utter satisfaction. The process has its ups and downs but the credit for letting me have more ups than the downs goes to my wonderful team who have lifted so much weight off my shoulders and have constantly supported me. I'm grateful for this enriching experience and this was one hell of a ride!

Working as the Creative head, for the magazine was an amazing experience, I got to learn so much and expanded as an artist. I really enjoyed putting my comics, cartoons and artworks in the magazine. Designing the Pages was hard and took a lot of effort, it made me sleep deprived for some days, but it was fun and it helped me to give my best for the magazine. I'm really happy that everyone's hardwork paid off and we were able to create something we're proud of...



**Akshanshi**  
Creative Head

As the Creative Head, I got the responsibility of designing and bringing to life the otherwise monochrome words of the writer. Doing justice to the words and reflecting the passion of the writer in artworks and designs was tough, and I hope you like it. From sleepless nights, to innumerable caffeine shots, we did manage to put this magazine together. Piece.By.Piece. From being a random BSc Grad to a full fledged Graphic Designer. We did get to learn a lot.

*Hope this piece of work fans your inner inferno and makes u rise from the ashes like a Phoenix*

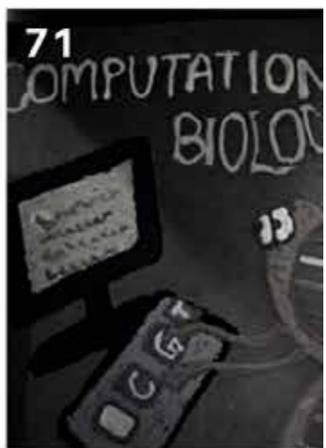
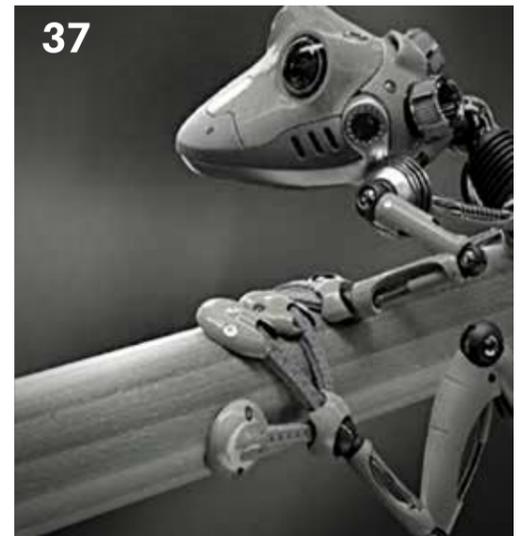
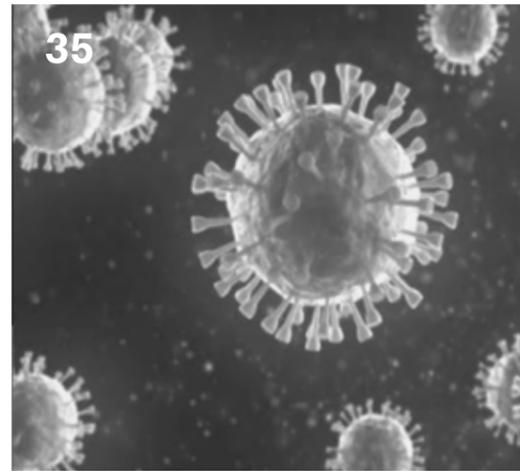
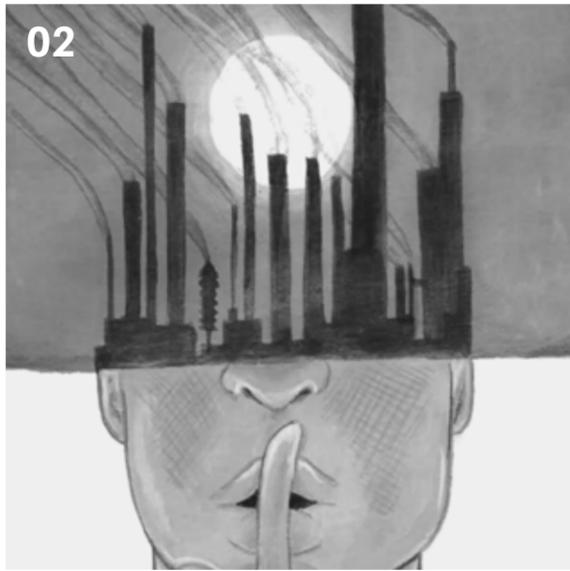


**Nirmegh Basu**  
Creative Head

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# THOSE WERE THE DAYS

Anushka Saxena, TZH

Learning to ride the big bike  
While trading my Pokémon cards  
And understanding how the earth moved  
Along with the ever shining stars  
Yes, it was one of the best times  
Back when I was just nine.

And then I grew and grew some more  
Now allowed to drive on the main road  
How every single moment was vivid and new  
As I finally grew to understand everyone's views  
How we roamed the streets talking about our dreams  
Planning to conquer the world as soon as we're 18

Now I'm sitting in a room alone  
As per the cool kids I'm 45 and hence old  
You're an adult now  
Grow up and win  
It's a dog eat dog world  
Stop whining or quit  
And as I gazed from the balcony of my 3 BHK  
I saw those bikes, those familiar face  
Still high on life  
with eyes that gleam  
with dreams and hopes that I once dreamed  
How eager I was to grow up back then  
And now I wish I could take it all back again  
Oh those were the days,  
How I wish I could go back to being eight .



# ENVIRONMENT

# TO PLANT A FOREST

-Mansi Dhingra, SZH

THE FORGOTTEN HILLS OF ARAVALI

IMAGE CREDITS MANSI DHINGRA

## ARAVALI BIODIVERSITY PARK

Infested with the invasive *Prosopis juliflora*, was this tattered landscape, an abandoned mining site, 380 acres large and wide. It belonged to the Municipal Corporation of Gurgaon (MCG). Since 2009, a citizens' group called 'IamGurgaon' (IAG) is working to restore the flora and fauna of the region, 'rewilding' it. This is the story of Aravali Biodiversity Park, a city forest at the Delhi-Gurgaon border.

IAG journeyed from an idea of only planting a certain million trees to instead, creating a self-sustaining ecosystem, led by Mr. Vijay Dhasmana, an eco-restoration practitioner. Rewilding is restoration of any fissured land or land damaged by human activity. The landscapes are recreated by imitating from nature after referring to enough documentation and visiting forests and landscapes around the area. Forests like the Mangarbani forest, forests in Udaipur and Jaipur were visited and closely observed, hence obtained was a knowledge of native species as well as plant niches. A list of plant species was made according to the niche and association they grow in. For instance, Dhau trees (*Anogeisus pendula*) dominate the hill slopes of northern Aravalli, whereas, Kaim (*Mitragyna parvifolia*) dominate the valleys with high moisture conditions.

They came up with a list of species but couldn't find the plants. At most, 25-30 species of plants could be sourced from various places. So, they decided to build their nursery in 2011.



They sourced seeds and had them grow in their two nurseries.

Thousands of seeds or foot long plants were planted by corporate employees, school children, volunteers and the team members around 2011-12.

Not to conceal the roadblocks, the park had had to deal with the locals habitual of using the land as grazing grounds or for cutting grass, overcome obstacles like ill-informed media reports and, keep patience while the conceived forest was in its gestation period. Invasive species had to be combatted, which was done skillfully in all of the protected land.

The plant community took a little while to bloom above the ground as a plant in its early stages invests its energy in establishing the root system. But after the monsoon of 2015, the first visible signs of a budding forest appeared and since then, the Aravali Biodiversity Park has been growing into a healthy ecosystem with each passing year. Today, ABDP is lush and thriving, exhibiting an outstanding plant and animal diversity. A boastful 400+ species of plants, over 176 species of birds, several species of snakes reside in ABDP among other animals like Nilgai, Golden jackal, porcupines, jungle cats, mongooses, hares, Monitor lizard, etc.

The jungle is ready to flourish in all its might in harmony with the city life.



## A SOLUTION TO PLASTIC POLLUTION

Plastic pollution has become one of the most pressing environmental issues around the world, visible in both the developing as well as developed nations. The reason behind the former is the inefficiency of the waste collecting systems and, in the latter, the low recycling rates of the discarded plastics. We cannot recognize our lives without plastic due to its innumerable advances and it being a major component in literally everything such as a component of industrial, packaging, transportation and scientific materials or daily everyday items. Single-use plastics form part of the 40 percent plastics produced in a year.

Mealworms offer a solution to this plastic menace. Though the name suggests “worm”, these are not actually worms but larval stages of the darkling beetle (*Tenebrio molitor*). These represent an amazing ability to digest “Styrofoam” derived from polystyrene, a petroleum-based plastic.

Polystyrene is a polymer of styrene. Styrofoam, known as expanded polystyrene (EPS) is a form of plastic, where polystyrene beads are steamed and expanded. It has a wide usage because of its lightweight and insulation properties. Apart from its utility, it has several environmental and health effects. It is a carcinogen and causes food contamination. It leads to occupational disorders among the workers who are involved in its manufacturing process. It causes air pollution and floats in water bodies which get digested upon by marine animals and leads to blockages in their gastrointestinal tract.

Mealworms solve this epidemic by having a polystyrene diet. This has been confirmed in recent research led by Dr. Wei-Min Wu from Stanford University where a group of larvae was fed entirely on a polystyrene diet. Mealworms used this substance to carry out their metabolic processes and these larvae were found to be completely healthy and similar to those who depended on normal food (bran). The exact mechanism of digestion remains unknown of yet researchers have suggested the prime role of gut microorganisms in it. Studies were conducted to suppress microbial activity by using antibiotics. This led to the inhibition of the degradation process and the isolation of bacterial strain. Excretion of this polystyrene food takes place in the form of carbon dioxide which accounts for half of the eliminated material. The rest of the fecal matter included tiny fragments upon the depolymerization of plastic.

These organisms are also known to digest flame retardants added to plastics such as HBCD (hexabromocyclododecane), which is highly toxic. Through such immense superpowers, tiny mealworms exhibit a unique way of plastic waste management. They show another opportunity for recycling industries to tackle plastic pollution. In addition to the reduced dependence on single-use plastics and segregation at source, deeper studies in mealworm activity can help to lower plastic pollution.

- Aastha Bhatnagar, SZH



# SunBOT

-Shubhi Agrawal  
FZH



“Where flowers bloom so does hope.” – Lady Bird Johnson

New kinds of flowers are dotting the fields of certain universities in the United States, and they serve a much greater purpose than landscaping. SunBOT (sunflower-like biomimetic omnidirectional tracker) is popularly known as smart flower due to its likeness to a flower. It is a sunlight tracking solar collector used for harvesting solar energy. At present, it is being set up in many universities in the United States such as North Colorado University but has yet to popularize itself in India.

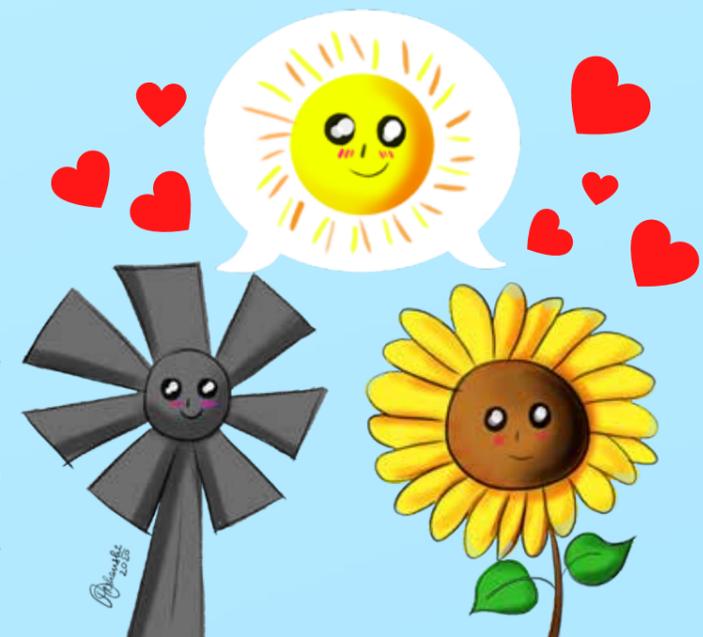


\*This is taken from the internet

Claiming to be the world’s first intelligent energy plant, it works on better technology and low maintenance requirements. It is an overall self-sufficient device that outcompetes conventional static solar panels. A photovoltaic flower system, its solar panels are arranged like the petals of a flower that automatically unfold during the daytime to capture maximum solar energy.

The SunBOT not only bears petals like those of a sunflower but also resembles it in its heliotropism. Due to its dual axis and trackers, it shows phototropism by following the movements of the Sun allowing 400% more energy harvest than the traditional solar cells. One of the most important advantages is its portability and high ease of set up, unlike the bulky installation of solar panels.

The effectiveness of this device can not only be seen in its energy capturing efficiency but also as a self-cleaning device. The petals when closed use designing gives it a superior edge with added benefits such as smart cooling and smart system. When detected bad weather conditions, the petals close themselves to minimize the damage. Its innovative design gives us hope for an energy efficient future indeed.



# A Dive in The Deep Sea

-Akshanshi Gulani  
SZH



**T**he Earth is made of 70% water. Yet, all we know about the Ocean is a mere drop in it. The first zone of the ocean, called the Sunlight Zone, is about 200 to 250 meters deep, where sunlight can easily penetrate. Most of our knowledge of the marine world comes from this small portion of the deep ocean, which is teeming with life.

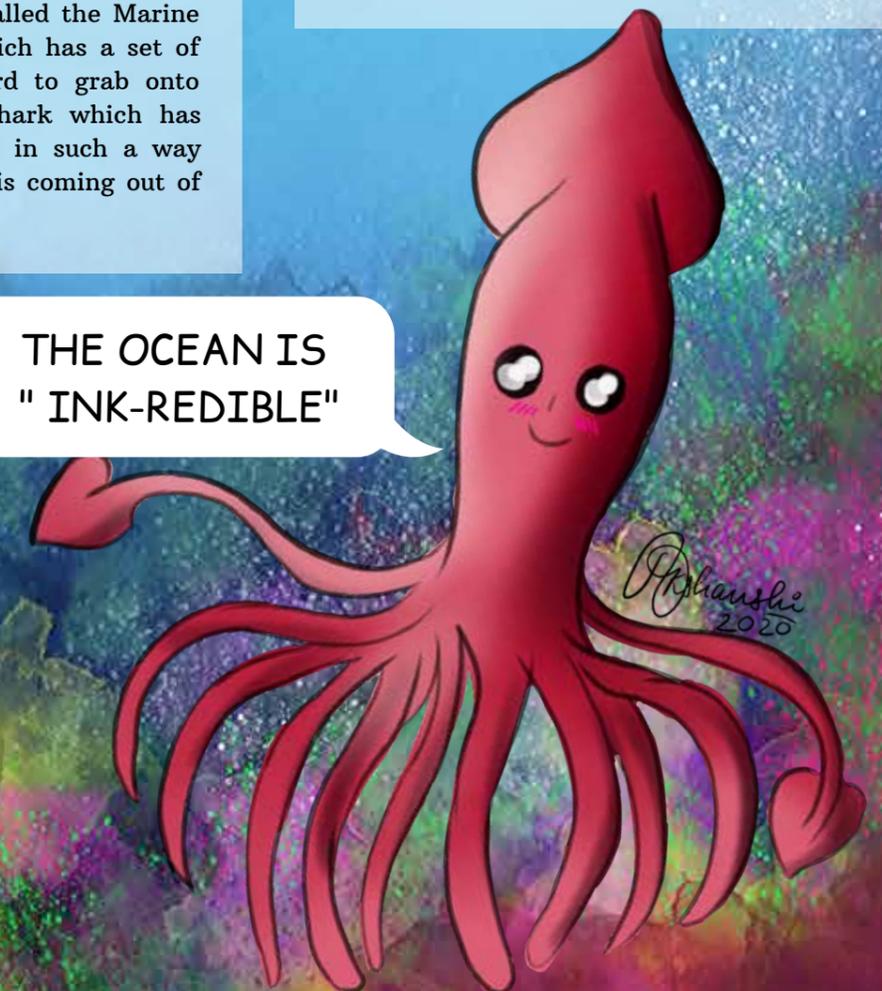
As we go deeper around 300 to 750 meters, comes the twilight zone. With lesser light penetrating the ocean, it becomes darker and darker. The giant squid, a resident of this zone, which can reach up to 40m, truly looks like a sea monster.

Going further down comes the midnight zone, where no light enters. Here, the organisms conserve every last bit of energy and move slowly through the darkness. For example, the Angler fish which lure their prey by bright light, are powered by bioluminescent bacteria. Or the Vampire squid which moves passively, not sucking blood, but feeding on debris and dust which come down from the top (called the Marine snow), the Frilled shark which has a set of 300 teeth, hooked backward to grab onto their prey or the Goblin shark which has teeth attached to ligaments in such a way that it seems another head is coming out of the mouth.

The hands of the most dangerous animal in the world have even reached into the darkest depths of the planet. Protecting the Ocean- and everything in it- is the need of the hour. And it is only the most dangerous animal in the world who can protect it before it is too late.

Around 6000m deep, comes the Hadal zone, called The Underworld Of The Ocean, consisting of trenches, deeper than the sea bed. The Mariana snailfish holds the record for the deepest living fish, in depths of about 7000m. Going further, we finally reach the deepest point on earth (around 11,000m ) called the Challenger Deep, at the bottom of the Mariana trench. Life is very scarce, only a few extremophile bacteria, crustaceans such as Giant amphipods and sea cucumbers thrive. However, in May 2019, a shocking discovery was made by a manned mission to explore the trench: candy wrappers and a plastic bag on the ocean bed.

THE OCEAN IS  
" INK-REDIBLE"



Akshanshi  
2020

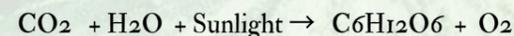
# Artificial LEAF

-Prateek Goyal  
SZH

*"I want you to act as if the house is on fire because it is."*

- Greta Thunberg, Climate Activist and TIME's Person of the Year  
2019.

**C**limate Emergency is Oxford's Word of the Year 2019 and science has played a significant role in dealing with the issue. One, for instance, is the innovation of an artificial leaf. What makes a real leaf special? It converts inorganic nutrients into organic by the magic of photosynthesis. The photosynthetic reaction is represented as:



But we already know about artificial leaves called solar panels. They harness solar energy transforming it into electrical energy rather than chemical energy. Moreover, solar panels don't use carbon dioxide and water. Their use is limited to electricity generation. On a quest to make a better version of an artificial leaf, researchers led by MIT professor Daniel Nocera produced a silicon solar cell. Unlike plants, it's not green; it's not leaf-shaped, and it does not convert water and carbon dioxide into carbohydrates. So what is it that the artificial leaf does? These cells when placed in sunlight break down water into Oxygen and Hydrogen which is an alternative clean fuel.:

But perhaps a step closer to achieving real life-like photosynthesis would be to make hydrocarbons out of nothing but sunlight, CO<sub>2</sub> and water. The rising level of greenhouse gases is a global concern and it would be an amazing alternative if an artificial leaf fixes that CO<sub>2</sub>. Jun Song and Zetian Mi of McGill University, Montreal have achieved a direct photocatalytic production of syngas, an industrially relevant mixture of carbon monoxide and hydrogen. They designed a photocathode that reduces notorious CO<sub>2</sub> that is wreaking havoc with global temperatures into CO which can be used to make methanol. As we enter into the new decade, corporations like Solistra (Toronto) and Synhelion (Switzerland) are already making use of this technology and providing fuel to the industries.



*"You must unite behind the science. You must take action. You must do the impossible.  
Because giving up can never ever be an option."* - Greta Thunberg.

# DIGITALISING INDIA ONE TREE AT A TIME

**F**iber optics is the fastest known communication mode in the present time. Optical signals are carried in thin, flexible fibers of glass or plastic. Light transmission in optical cables allows long distances to be covered without much loss of the input.

Fibers stand out as highly efficient and fast conducting materials compared to DSL (Digital Subscriber Line), co-axial cables and wireless alternatives. Fiber optic installation includes laying of optical cables either underground or aerially (along existing telephone lines).

Underground installation requires digging, placing the cables and refilling the trench. An added task would be to inspect the ground before digging to avoid interruption of any previously laid tracts. Aerial installation is fairly easy when compared to the former, not common in remote areas.

An inspection of the environmental costs of underground global connectivity may provoke an outrageous estimation. However, fiber optics seems to be a rather "green" mode of communication, as most of the environmental assessments of its installation and operation suggest only temporary and repairable disturbance to the environment.

### Less demand for copper

Copper mining is harmful to the environment, it produces hazardous chemicals and toxic byproducts. Copper wires also need to be replaced after 10-15 years.

Optical fibers are made of glass, primarily made of silicon dioxide, silicon is one of the most common elements found on Earth. SiO<sub>2</sub> occurs naturally in sand, clay, rocks and even water. Its extraction is not detrimental to the environment.

### A lasting solution

Once laid, it can last for over twenty-five years. Fiber, made of glass, is more resistant to environmental stimulations, like storms and lightning.

### Less energy consumption

The light technology allows the fiber to use under 1 watt to send data over 300 meters, compared to the 3.5 watts consumed by coaxial cables to carry data a mere 100 meters.

Less energy means less cooling required.

### Greenhouse gas reduction

Less fossil fuel emission for generating energy to send the signal.

For all we know, the internet may be, is reducing our ecological footprint and proving to be more sustainable. Virtual access, globally and locally alike, saves us our commute fuel and time while also reducing the associated greenhouse gas emissions. Digitization also reduces the ecological costs of producing material items like books, movies, and CDs.

This could very well be contradicted by an overtaking of a person by the virtual world, resulting in a much-feared disconnect from the natural world and social structure of our species.

Undeniably, we need people who love the forests out there and would strive to save them. Internet feeders may lose touch with their surrounding world.

Forever could go on this contradiction between the pros and cons of high-speed internet access to all. The present hour foresees fiber internet as an asset and whether it serves so or not only depends on how we choose to use it.

-Mansi Dhingra, SZH



April 26, 1986... This date will forever be etched in our memories as one of the deadliest nuclear disasters, since the days of Hiroshima and Nagasaki, stuck a little town in Ukraine. As the world was moving on at its normal pace, oblivious to them a nuclear radiation accident occurred in Chernobyl which brought the world to a standstill. People were glued to their television sets trying to know more about the accident. The developed world of Europe and USA was in a state of shock, enveloped in the fear that the moving air masses could bring radiation in their wake, creating havoc in the adjacent countries also. Today, the Chernobyl exclusion zone encompasses an area of 30 kilometres from the site of accident.

This disaster not only created fatalities but also adversely impacted most of the biotic world... the flora, the fauna, the waters, the airs and the land itself which nestles all these realms. Many people were killed and a large number were exposed to increased radiations which led to several kinds of cancers and other disorders. Talking about the flora and fauna of the region, again, mass destruction took place as a result of this unfortunate event and many genetic effects as a result of radiation were seen. One of the most immediate effects were seen on the pine forests located near the site of disaster, where the leaves on the trees turned reddish brown due to the radiations and died attaining them the name of 'red forest'. This tragedy has also contaminated the air, water bodies and soil of the area and the invertebrates inhabiting these were also affected adversely as a result of which they were almost wiped out during this accident. Not only this, during the first few years, many animals within the Chernobyl exclusion zone either died or were rendered incapable of reproduction. However, the few animals that could reproduce gave birth to offspring that had gross deformities and genetic mutations.



This region is currently prohibited for humans and hence life in the form of flora and fauna has begun flourishing again. A wide variety of animals including wolves, voles, bison, bears among others and a large number of bird species inhabit this area. Not only this, amphibians like fishes and annelids like earthworms are also predominantly seen. The wildlife is actually flourishing in the exclusion zone at Chernobyl however it cannot be denied that a large amount of radioactive material is entering in these animals through the food chain. Even though most of the serious mutations occurred at the time of accident, currently, the works of various scientists have pointed out towards the ill effects of radiations that the animals still suffer from. One of the most well-known research is that of Danish Scientist Anders Pape Møller and biologist Timothy Mousseau who have proved the effects of radiations on some animals in the exclusion zone, stating "Voles in the area have higher rates of cataracts, useful populations of bacteria on the wings of birds are lower, partial albinism among barn swallows is seen, and cuckoos have become less common."

Though scientists continue to be divided on how well the animals are really doing in this area, it is believed by some that this exclusion zone is the 'largest truly wild sanctuary in Europe' while on the other hand some scientists also believe that these animals are actually living in highly contaminated sites. This debate about the wildlife of Chernobyl continues till date. But all said and done it has been quite surprising to see how life bounces back to prove that destruction in such a scenario maybe paramount but life has ways to create thresholds and now as the Ukrainian government opened the Chernobyl disaster site for tourists and wildlife enthusiasts, it seems that these thresholds will reflect little oasis of interaction between the man and the wild.

**Do nuclear accidents result in uninhabitable wastelands?**

Ecologists, the WHO: Chernobyl has become "a unique sanctuary for biodiversity."

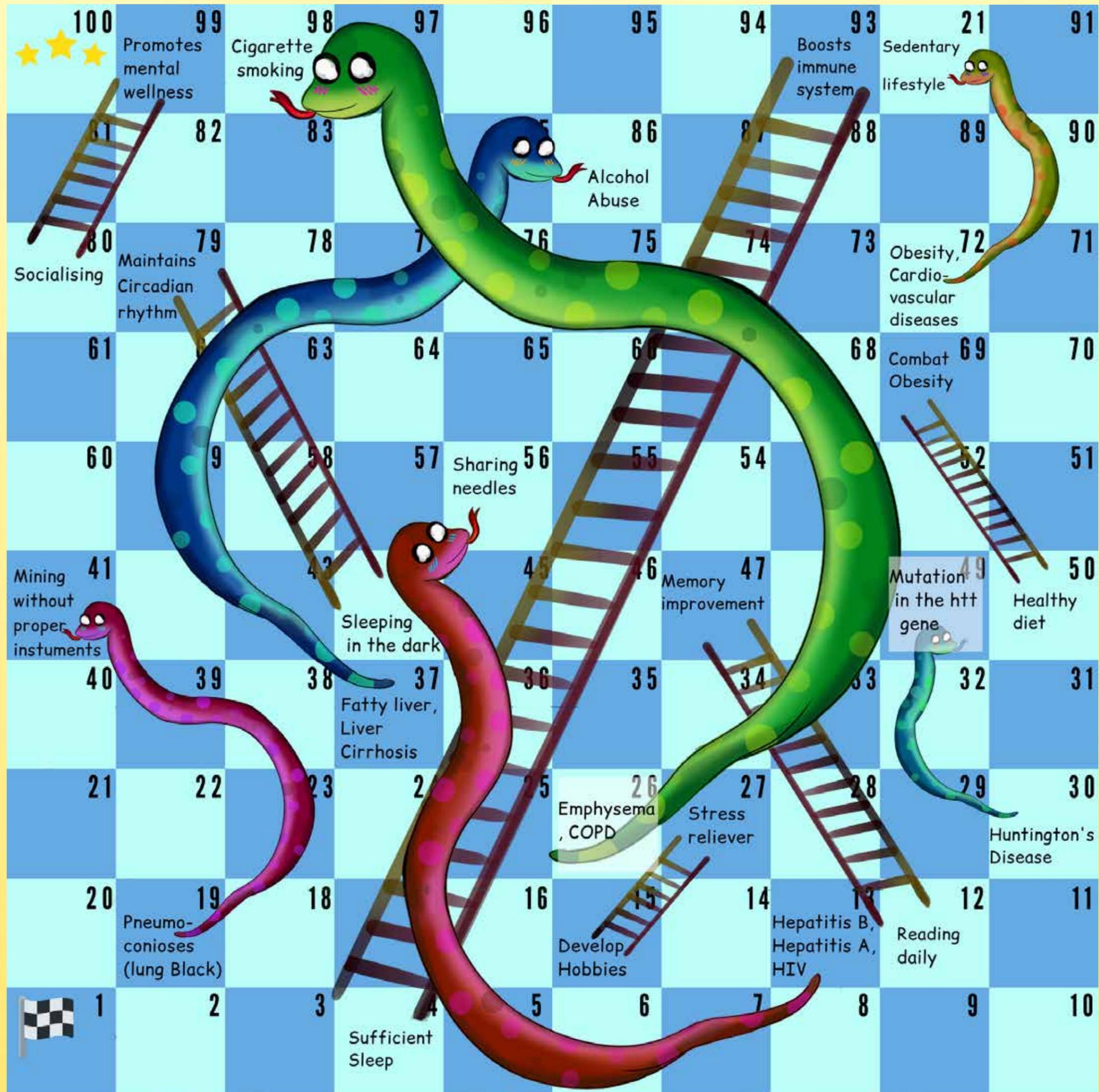
With >400 thriving populations of vertebrates, including wolf, elk, deer, wild horse, lynx, white-tailed eagle, boar, badger, black crane, otter, fox, woodpecker, bison, bear, beaver, raccoon dog, and marten, the Chernobyl Zone is hardly a wasteland.

Sources: Deryabina et al 2015, Long-term census data reveal abundant wildlife populations at Chernobyl, Schlichting et al 2019, Efficiency and composition of vertebrate scavengers at the land-water interface in the Chernobyl Exclusion Zone, and the webcams of the TREE project.

Read more at: [thoughtscapism.com](http://thoughtscapism.com) Thoughtscapism



# Mofsha Patam



The classic board game we have all played growing up has its roots in Ancient India. Popularly known as 'Snakes and Ladders', the game involves rolling a die and moving the playing pieces along the boxes on the board.

## RULES

1. Use coins in place of conventional plastic pieces.
2. Scan the QR code to use the virtual die in place of a plastic one and enjoy the game in an eco-friendly way.

Let's find out which habits result in snakebites and which ones land you on top of ladders.



# THE WINTER *of* DISCONTENT

Few old men live to tell  
The tales Of Delhi of yore,  
When Winters meant smog, burning leaves,  
Groundnuts, quilts and nothing more.  
But riding the waves of Revolution came  
A winter which was cold and white.  
No one can forget the stray winds that brought  
Snow to New Delhi in the winter of '19

Amidst the hallowed halls of Parliament,  
The incessant chatter of the mighty  
Was replaced with pounding clatter of their teeth.  
The Television premiere of the Revolution was promptly halted;  
The broadcasters sighed with a cutting Chai,  
And thanked the power of stray humid winds,  
No need to conjure up enemies for at least a week,  
Scientists blamed the aberrant winter rains,  
Deemed the snow indicator of climate change  
But the voices of nation in shrill compulsion  
Sang the praises of the Almighty and his gift.  
The protesters cursed the devil winds for loss of prime time,  
And jostled the Khaki as they encircled the burning bus,  
Warning tired hands on the rebellious flame in the winter of '19.

The snow settled noiselessly in the beggar's can.  
The voiceless came out of their caving shacks,  
As the snowflakes melted on their broken tongues.  
The transformers announced their vacation with a bang,  
As the melting snow plunged the city in darkness.  
The plastic infested footpaths were hidden  
In a beautiful white veil; its occupants were occupied  
With the task of trying to survive.  
A drunk poet and a rabid cur  
Cuddled together in a slow moving drain,  
Belting out a duet of slurry words and scared growls,  
As the snow bore witness in the winter of '19

The crow's nest was destroyed and  
the eggs received a cold burial,  
The service was organized by the crying cuckoos.  
The hedgehog quickly burrowed beneath the snow,  
Molding what would be its winter abode.  
The wisest of mice decided otherwise  
And chose to hide in the locked up go-downs.  
The songbirds thronged the dilapidated Silos  
To feed on grains rotted by the alien winter rains.  
Life went on in the winter of '19

The event heralded the arrival  
Of a future filled with unequal pain.  
Citizens of the capital showered it's love  
On their city which was now whiter.  
And on the snow they stamped with joy,  
Crushing the conveniently buried past.  
Spirits were crumpled and spirits were raised,  
When it snowed atop The Raisina Hill  
In the winter of two thousand and nineteen.

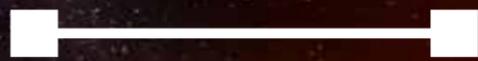
-Richabh Yadav, SZH

# Evolution



PAINTING BY NIRMEGH BASU, SZH

# THE MAMMALIAN UPRISING



-Rishabh Yadav, SZH

Threads of the future, more oft than not, emerge from the past. This Hopi prophecy became true even before the Hopi themselves came into being. When a six mile-wide asteroid struck 66 million years ago, 75% of known species were wiped off the face of the earth. It is now argued that the site of impact of the asteroid, the ocean near the present-day port town of Chicxulub, Mexico, was an oily tinderbox which upon impact blasted enough soot into the atmosphere to cause extreme global cooling. It seems as if the fate of the mighty was etched in stone, for Only 13 percent of Earth's surface is made up of rocks that are capable of burning off that much soot. knowledge about how life survived and recovered so quickly after the mass extinction was at best, spotty. The answer was hidden in tiny, well preserved time capsules of egg-shaped rocks called concretion. These rocks are formed due to the formation of mineral cement and are often older and more resilient than the rocks which surround them. Inside on such concretion, a team from the Denver museum of art and science found skulls of early survivor mammals. Combining these with plant fossils and uranium-lead dating, the path treaded by mammals became more distinctly visible. The late Cretaceous period was warm and filled with forests of broadleaf trees, palms, and relatives of ginger. fossils show that early mammals were ecologically diverse and indulging in gliding, swimming, burrowing and climbing.

"A container of ashes might one day be thrown from the sky, which could burn the land and boil the oceans"  
- A Hopi prophecy



The discoveries are also starting to unravel the evolutionary origins of the key traits of mammals — such as lactation, large brains, and superbly keen senses. Some examples are the groundhog-like Vintana and wolverine-sized carnivore Repenomamus. With the fall of dinosaurs came chaos and it's agents, the ferns. Thriving on disturbances they proliferated on the landscape for over 1000 years, an event known as 'fern spike'. Within two million years the Denver basin had transformed into what would be the world's first tropical rainforest. Many Raccoon-sized mammals, which had co-existed with dinosaurs, were wiped off. Those who survived took over the recovering ecosystems, increasing in size and numbers. There was a rapid change in the behavior of mammals as well. Early mammals were nocturnal, as it wasn't the best of the idea to bask in the sun while giant big-toothed reptiles roamed around. Many of the nocturnal relics of the mammals of yore, like a highly developed sense of smell and hearing, eyes which function well in dark, and sensitive whiskers have made their way into most of the present-day mammals. With no predator around, out they went in daylight, around 200,000 years after the extinction. Primates were one of the first groups to acquire daytime habits. This switch may have even sparked the evolution of humans. The demise of dinosaurs was sudden and the rise of mammals incremental. In this tale lies a humbling lesson for another species which is trampling the ground these days.

*"Life finds a way."*

HEY! YOU'RE NOT A ZEBRA!



# THE UNSUITABLE ZEBRA

-Vishal Singh  
SZH

**D**o you remember your salad days, when you saw an animal on your television set, that was way too different from what you saw on your streets by then? You asked your elders what sort of animal it is, with such a ravishing appearance and why God has weaved its body with black and white stripes. Of course, the answer must have been "Zebra" and, your inquisitiveness must have been safely put to rest, and even today, the visual in mind must be that of an animal with those stripes, grazing and looking as bewitching as ever.

But, just try erasing those stripes and put polka dots in their place. You would be adamant about it but, a "Polka zebra" is something that you can't deny off as it has been spotted recently in Kenya's Masai Mara National Reserve and some fous have been seen in Botswana's Okavango Delta.

The colour of our skin and hair is a result of melanin produced by cells called melanocytes, and the extravagant appearance of zebra is also a result of the very same pigment. Mutations can disturb the process of synthesis of melanin that results in unusual pattern development in these zebra fous known as "pseudomelanism". Melanocytes are uniformly distributed in the skin of zebra so that when you shave a zebra it would be a uniform black colour. However, in these pseudomelanistic zebras, the melanin itself is unable to evince the stripes correctly, due to which the stripes are replaced by dots.

The appearance of this abnormality looks astonishing but poses various hurdles to its survival. Stripes in zebras have developed for various reasons, one of which is to deter flies like the blood-sucking tsetse flies and tabanid houseflies. These flies are attracted to linearly polarized light and the stripes disrupt this. In an experiment, striped blankets were laid over on horses and it was observed that the flies were unable to make a controlled landing thus proving the theory that the foul lacking the stripes would suffer from the bites.

The stripes may also have a cooling effect. Air moves rapidly over the light-absorbing black stripes as compared to the white stripes creating conventional currents around the zebra's body. The temperature difference between the two colours is found out to be 10 degrees Celsius on a sunny day creating small air movements, allowing the sweat to evaporate more rapidly. Polka Zebra may not be able to regulate the temperature and may pose a survival threat.

Also, these fous may get predated easily. The stripes help them to confuse the predators by "motion dazzle" where a group of zebras move or stand in close proximity to each other and give the appearance of one large mass of flickering stripes, making it difficult for the predator to pick one.

It is postulated that inbreeding may increase the chances of such abnormality as these animals are spotted more frequently in areas subjected to habitat fragmentation, thus giving a hint.

Whatever the reason may be for these polka zebras, one thing can be said with conviction that these animals are otherworldly and add more beauty to the already beautiful critters. So, from now on, you can add another point to the memories of zebra that you have in your pulchritudinous mind.



# TREEHOPPERS

## "THE ABSURD CHEATERS"

-Vishal Singh  
SZH



**W**hen I say the word "Cheating", you would instantly remember the time when you were caught cheating by your teacher. She must have said that cheating is a sin and must never be done. We should be content in whatever we know and write the same. I bet it must have been a tough exam otherwise you must have never done that, but what if this very cheating becomes essential for survival, then everything seems more or less justified.

Had it been a competition of impersonation, they would have been sure-shot winners. Many of the treehoppers display avant-garde outcroppings, like helicopters like orbs, others mimic thorns, leaves, and insect droppings. Some are even known to copy wasps and ants.

These beautiful structures on their heads are a result of special modifications of the pronotum which is a section of the thorax that in other insects resembles a small, shield-like plate. Treehopper is special kids of nature with their pronota arching into grotesque spires and globes and makes them one of the most wonderful creatures. They are not only excellent mimics but they also have mouthparts for piercing the plant stems and slurping the juices inside. They are equipped with the interlocking needle-like tubes which siphon the fluid and secrete saliva for preventing coagulation of juices.

There pronounced pronota help them a lot when it comes to saving themselves from predators. The thorns and bright colors give a sign that they are something no one should ever eat. The way they mimic ants and wasps is mind-blowing. What is even more astonishing is that these outgrowths are hollow from within that gives them the ability to fly with remarkable ease. Also, these pronotas are provided with a complex network of nerves along with hair-like projections known as setae, that help them to sense their surroundings.

They are also amazing parents where the mothers are vigilant, guarding their offsprings. As a predator approaches a nymph, it swings its body to produce a 'chirp' that is then picked up siblings which amplify it so that mother could sense the danger and soon she turns on her fight mode and buzzes her wings vehemently or may become a Shaolin master by kicking the predator by punching it with her back legs.

Of course, evolution gave them the power to mimic other things to par excellence as a mechanism of defense and they have been quite successful in it taking it a notch higher by mimicking to a wide diversity. The teachers were correct to preach us that cheating is not justified to our moral values, but when it came to the verge of existence, nature allowed these insects to copy others and they were more than successful in doing so and thus, these absurd creatures are amazing copycats.

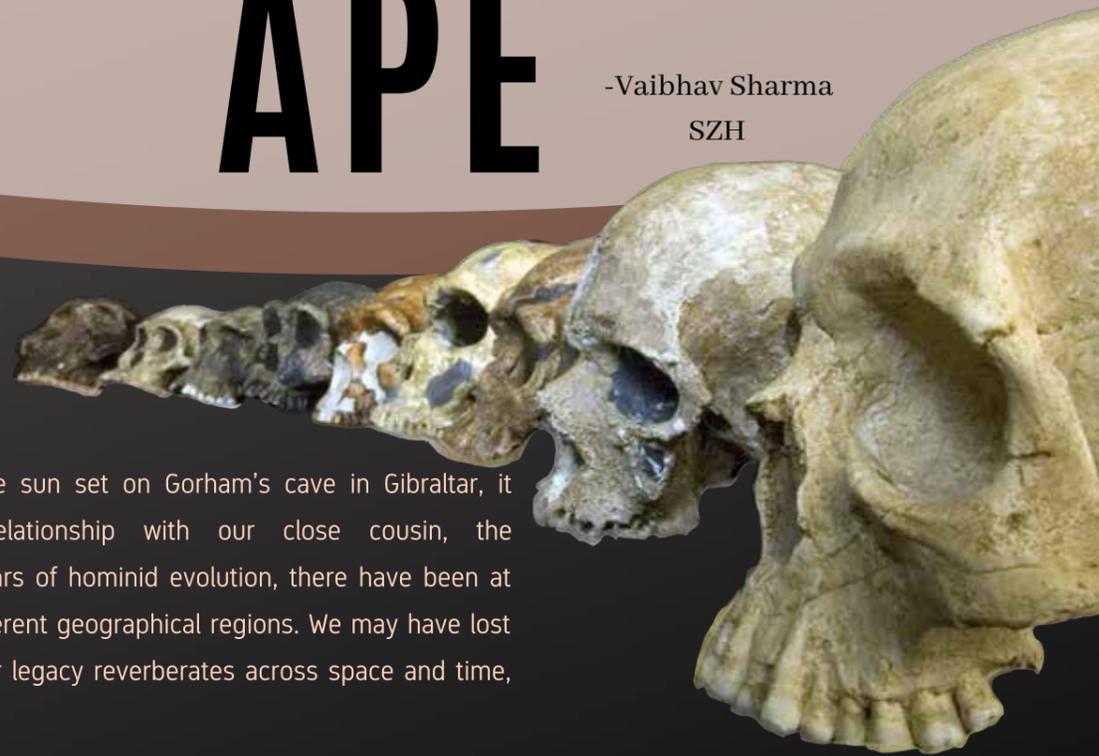


\*The images are taken from the internet



# THE HAIRLESS APE

-Vaibhav Sharma  
SZH



40,000 years ago, when the sun set on Gorham's cave in Gibraltar, it ended our bittersweet relationship with our close cousin, the Neanderthals. In 7 million years of hominid evolution, there have been at least 27 species sharing different geographical regions. We may have lost these other cousins but their legacy reverberates across space and time, in our DNA.

The first hominids resembled a stage between apes and humans which suited their habitat. *Australopithecus* species were adapted to both dense forests and open grasslands. Albeit hairy they did show some human features. Early Pleistocene saw the arrival of *Homo habilis*, *Homo erectus*, and *Homo ergaster*. This was the point where human evolution leaped forwards. African forests increasingly receded to the central region. Survival in grasslands imposing new constraints on the species, something had to give in.

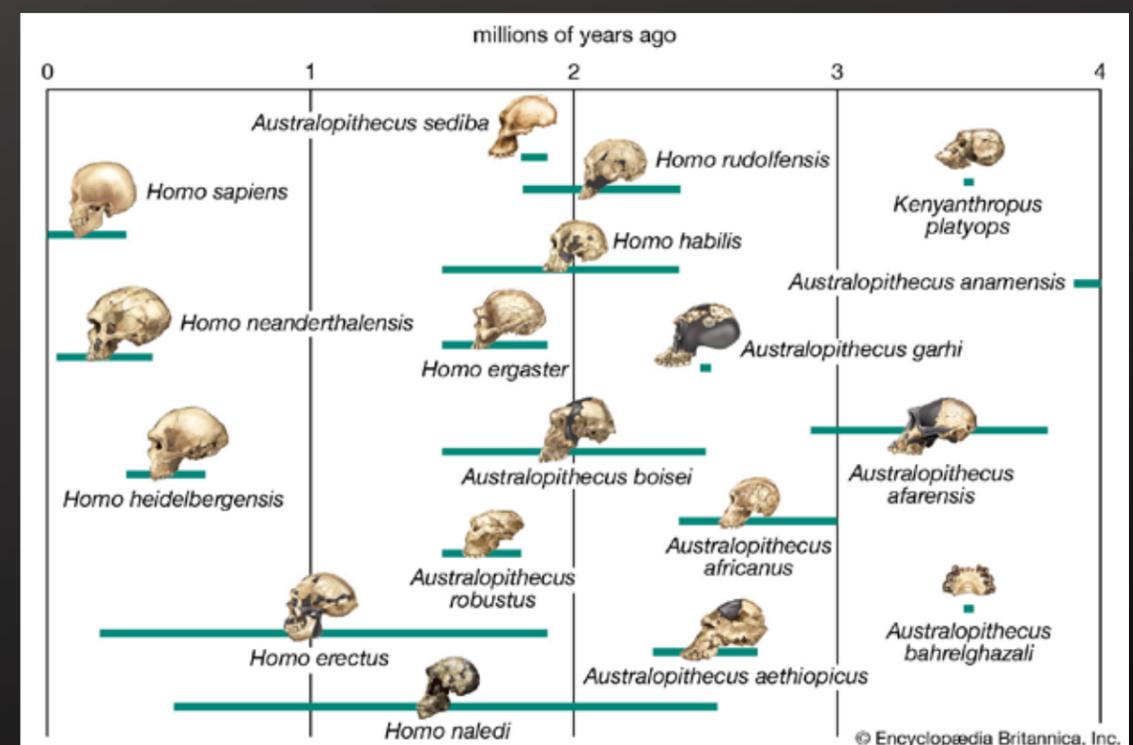


\**Homo antecessor*

There is still a lot to learn about hominid evolution. With technological development and sophisticated analysis, different species are being documented. The evolutionary relationship being redefined by discoveries like *Homo naledi* and Red Deer Cave People. One day we might find a conclusive answer of how we came to be and why we are the only ones to survive, but survival should not be mistaken as superiority over other life forms. All the animals and humans that once existed were unique and thriving in their environment. Every organism is constantly adapting to the environment where extinction is a possibility, even for us. As a fellow animal, it is our obligation that we prevent the extinction of other life forms.

*Homo erectus* found their way out of Africa into the vast expanse of Asia. Whereas *Homo ergaster* made their stand on the soil of Africa in a bitter struggle to survive. The Asian branch gave rise to *Homo floresiensis*, the hobbits of Flores islands, the enigmatic Denisovans, *Homo luzonensis* in Indonesia. Back home in Africa, the ergaster branch led to *Homo heidelbergensis*, the direct ancestors of *Homo sapiens* and Neanderthals.

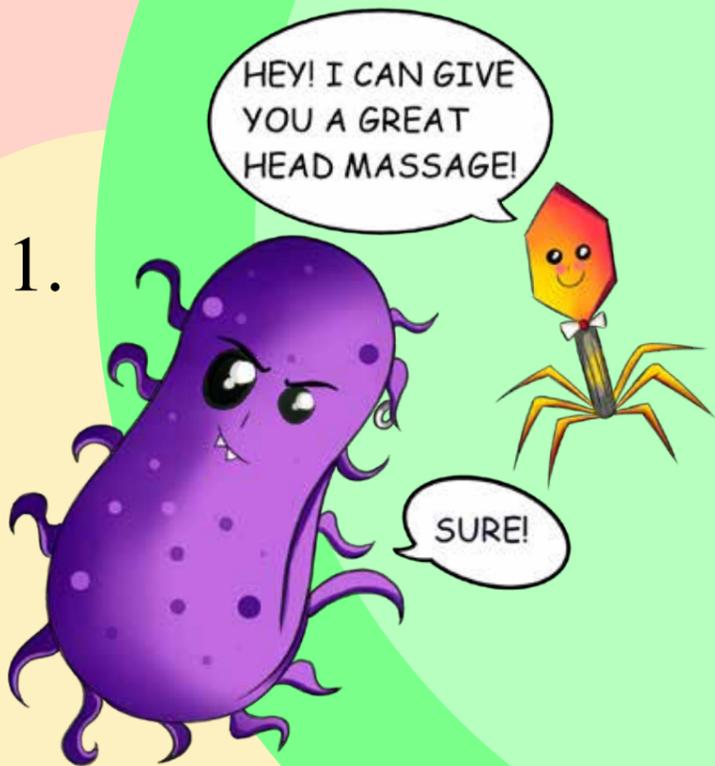
The diversity of hominids soon collapsed due to natural causes and the *Homo sapiens*. When *Homo sapiens* set foot outside Africa multiplying and expanding, they compensated for lack of physical prowess with intellect and innovation. It all culminated in wiping out other cousin human species and mega fauna of every piece of land we ever set our foot on.



# May the phage be with YOU!

-Amit Bhatt  
SZH

1.



2.

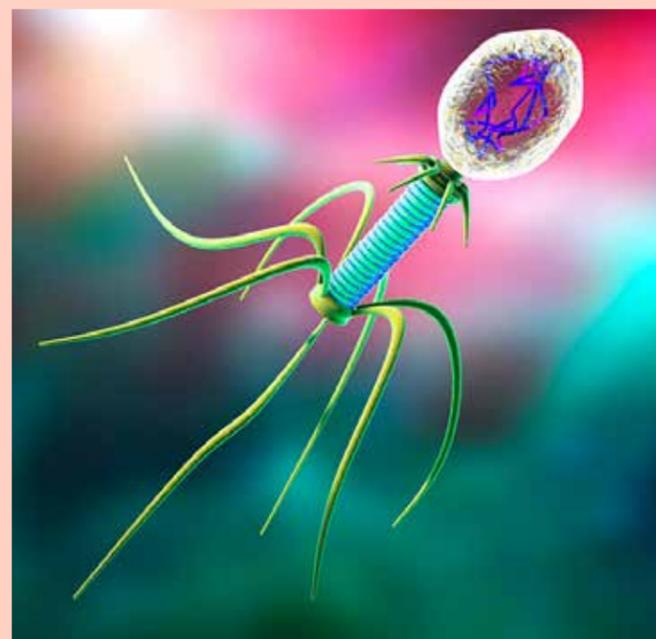


3.



May the phage be with you!  
-Robert Czajkowski.

There were times in the human history when something as small as bruise could prove fatal, by opening the portals of our body to the bacteria outside. But it was until 1928 that by sheer serendipity Sir Alexander Fleming discovered *Penicillin*, the fungus that could kill bacteria. But was this enough for us to win the battle over the deadly bacteria? Well it might have been, but we started misusing our antibiotics for silly things and like every living organism the bacteria evolved to be so strong that they became immune to some of our strongest antibiotics like Methicillin and Vancomycin. We now call them SUPERBUGS.



*Acinetobacter* a bacteria causing infection in the burn patients became the superbug called Multidrug-resistant *Acinetobacter*. Similarly we have Methicillin-resistant *Staphylococcus aureus* (MRSA), Vancomycin resistant *Enterococcus* (VRE) etc. These superbugs are bringing our nightmarish days back from the 19th century into the 21st century. It is stipulated that by 2050 superbugs would kill more of our kind than cancer would.

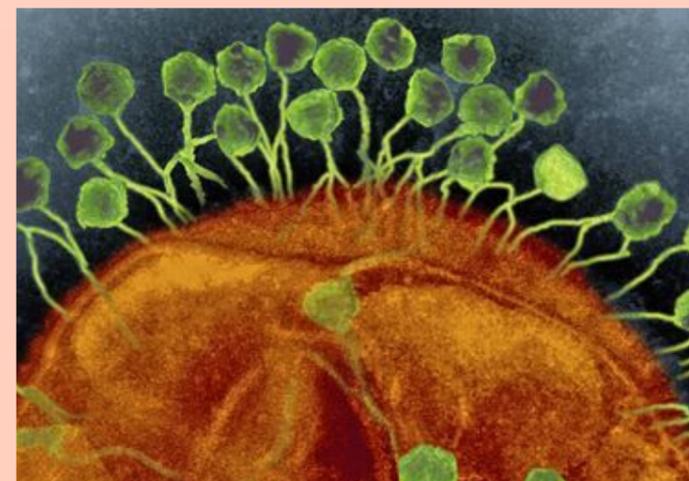
In the rise of the antibiotic resistance, the Bacteriophages have grabbed our attention. The bacteriophages are the tiny virus that infect and kill bacteria. There are more phages on the face of the earth than any other living organism. They kill 40% of the oceanic bacteria on daily basis.

They have a polyhedral head that contains their genetic material, a tail that helps to transfer the DNA to the bacteria, and tail fibres.

Once they infect bacteria they take over the cellular machinery and start the mass production of the previously described phage part, soon their assembly begins and they secrete lysins inside the bacterium in unison and ultimately leading to its death. These phages are very particular about the kind of bacteria they infect and thus our best candidates against the superbugs or for that matter any bacterium even *Bacillus anthracis*.

Although the bacteria would evolve against them too but the phages happen to show co-evolution and so far have been winning the battle. Thus a phage therapy wherein a cocktail of live phages is injected into the body of patients seems to a very reasonable procedure, the phages do no harm to human cell. However we might not see this treatment into the market for another couple of years, primarily because of the fact that the FDA doesn't approve of it, as they are not homogenous purified compounds and the pharma companies would not invest billions of dollars in them, for the reason that they can't patent phages. However the findings of some independent labs have shown promising results in the treatment of some of the incurable cases of drug resistant infections.

So far the phage therapies are allowed in the former Soviet Union and a lot of work has been going on in this field. They claim to harness the world's largest library of phages that have been identified and characterised. The phages might be our last hope before the superbugs bring our doom.



\*The images are taken from the internet

# HYBRID LINEAGE

AM I A DENISOVAN OR NEANDERTHAL?

## HYBRID LINEAGE-

The discovery of a pinky bone of a female teenager who died thousands of years ago has raised important questions. This has led to new research to find out if our ancestors were Denisovans or Neanderthals.

Denisovans are the new hominin in the Homo sapiens tree of evolution. A new map of archaic ancestry published in 2016 suggests that a lot of bloodlines around the world have a touch of Denisovans, a mysterious population of hominids that lived around the same time as the Neanderthals.

In 2016, unusual hominin DNA from a Pinky bone and wisdom tooth, found in the Denisova cave of Siberia Altai mountains, was discovered by a team led by Svante of Max Planck Institute for Evolutionary Anthropology. What led to the conclusion that the Pinky bone was a hybrid? The primary thing researchers did was to study the fragments' mitochondrial DNA – a genetic material passed only from mother to child. The results published in Nature in 2016 verified that the bone belonged to a Hominin with a Neanderthals mother. It became more interesting when researchers started research on nuclear DNA. Nuclear DNA is inherited from both mother and father which allowed scientists to trace the ancient hominin paternal lineage. Paternal lineage matched the genetic signature of Denisovans.

## RESULTS OF GENETIC STUDIES-

Neanderthals and Denisovans were more closely similar than modern humans. The difference between East Asians and West Asians can be explained based on the studies on the bone. Europeans have more patience than Eastern Asians because genetics showed that the mutation in ADSL, GLDC, and SLITRK 1 genes, which are associated with hyperactivity and aggressive behaviour in modern humans.

People from East Asian countries have approximately 20% more Neanderthal DNA than Western Asians and Europeans, so, biologically, white American adults showed increased activation in areas related to language and reasoning whereas East Asians presented stronger activity in perceptual regions.

Finally, the results indicated that our DNA profile has 3-4% Neanderthal DNA and 1-2% Denisovan DNA. There are many shreds of evidence that show that Neanderthals and Denisovans did interbreeding. So, we still carry a mixture of Neanderthal and Denisovan genes.

-Abhilasha Singh , SZH



## REDEFINING EVOLUTIONARY BOUNDARIES

As a fellow science enthusiast, I would like to ask you two basic questions:

1. How many nucleic acids are there?
2. What are they?

I'm sure by now, your face must've lit up like a Christmas tree, and you all would gleefully give me answers that there are two types of nucleic acids, namely DNA and its sibling RNA.

But sorry to say, your answers are incorrect. It's ONE MILLION!!!

A collaborative study between scientists from the Earth-Life Science Institute (ELSI) at the Tokyo Institute of Technology, the German Aerospace Centre (DLR), and Emory University has proved that there exist over a million variants of nucleic acid that are capable of storing genetic information. Using MOLGEN 5.0 as a platform and working with a predefined formula range of BC3-7H5-15O2-4 and BC3-6H5-15N1-200-4, (here B refers to a recognition element such as a nucleobase, and C, H, O, and N as carbon, hydrogen, oxygen and nitrogen atoms respectively), they were able to generate over a million similar analogs.

This path-breaking research not only gives scope for providing a cure for various life-threatening viral diseases such as HIV or cancer but also gives rise to one very important question: Why then DNA? If there were a million alternatives, then what "special" quality did DNA possess to be chosen as the genetic material? Or whether these analogs were just building blocks in the road to evolution, evolution to the two best forms - RNA and DNA? We cannot rule out that RNA itself is a highly complex molecule whose evolutionary beginnings are still unknown to us. So, it is entirely possible that these analogs could have been responsible for the formation of RNA and subsequently DNA. It also provides implications for proving the existence of extra-terrestrial life a.k.a aliens. To date, our field of exploration for life was restricted to traces of DNA or RNA. With these discoveries, the view no longer remains restricted.

But in my opinion, the biggest feat of this research can best be defined in the words of co-author Dr. Pieter Burger, "It is cross-disciplinary studies such as this that make science challenging and fun yet impactful."

SO LET'S START EXPLORING!!!

ANUSHKA SAXENA, TZH

# SURVIVAL INSTINCT

Instincts are defined as the inherent inclination of a living being towards a particular complex behaviour usually as a response to an external environmental stimulus. Any behavior is deemed to be instinctive if it's performed without being based upon any prior knowledge or rather an experience, and is, therefore, an expression of the innate biological factors. We have a lot of instincts as a gift of evolution that ensures our survival and we call them the Survival Instincts. The sole purpose of the animals is to ensure their survival i.e. to keep perpetuating their species, this is the kind of success Charles Darwin and Herbert Spencer had been talking about.

To survive we have a wide variety of instincts ranging from something as small as a baby crying to the much pronounced hysterical strength, which allows you to exhibit a tremendous amount of strength during distress. Let us evaluate a baby crying, nobody teaches a baby how to cry, but a baby does that anyways, it knows crying as the only way of communicating with its caregivers and thus a means of surviving. Human babies need to have this survival instinct otherwise it will perish. Contrary to the young ones of most mammals who are able to sustain them shortly after birth.

Most of the survival instincts have become so hardwired into our systems that we don't even recognize them as instincts anymore. For instance, take the cooperation and gratitude that we consider as moral values today. Our cave-dwelling ancestors worked out that cooperation was a necessary element of their survival. They could do mundane activities like hunting a giant mammoth by cooperating in a group, to something as significant in the evolutionary history as driving the Neanderthals to extinction. There is a famous saying that you can take a person out of stone-age but you cannot take stone-age out of a person. Most of our survival instincts have come from our ancestors and many of them work perfectly well in the modern setting. So the next time you save yourself instinctively from something dangerous, thank the cavemen for giving you that gift.

- Amit Bhatt, SZH



## CANNIBALISM A CHANGE FOR BETTER OR FOR WORSE?

Sometimes changes make things worse...

If an individual starts feeding on another individual of the same species, it is called cannibalism.

The earliest humans in Europe, 32,000 years ago, practiced ritual cannibalism. The oldest evidence of cannibalism suggests that a human ate another human not for nutrition but also as a part of funeral rites.

In the case of a black widow spider, the female spider eats male spider before, after or during mating. Baby spiders start eating mother spiders. In the case of the sand tiger shark, the pre-mature embryo eats underdeveloped embryos. In spadefoot toads, the larger tadpoles feast upon the other tadpoles in the same pond. Fishes like cods, trout, ocean sunfishes, guppies also show cannibalism due to starvation. The male lion tends to eat the newborns of a rival male after occupying his territory. In some species, parents selectively cannibalize on lower quality offspring.

No single benefit led to the evolution of cannibalism. Its significance is associated with the reproduction and survival of offspring.

A rational explanation of cannibalism is that it would be favored under the condition of crowding of a conspecific individual or low availability of prey for the predators with the fear of starvation.

Cannibalism at first might seem to be a freak of nature. But the unending evidence of its existence proves it isn't as dreadful to other species as it is to us, humans.

Priyanka Meena, SZH



## SALAMANDER SUPERPOWER

Axolotl (*Ambystoma mexicanum*) or "Mexican salamander" has a remarkable ability to regenerate its complex structures such as limbs, tails, retina, spinal cord along with some sections of heart and brain, at any stage of the life cycle which is denoted as its "superpower".

It shows a perfect example of regeneration because the regenerated limb looks the same as the lost or amputated one, with all the nerve and blood vessel connections. It is used as a research tool in cell-based regenerative therapies.

According to recent studies, the Neuregulin-1 molecule has been identified that is responsible for the regeneration of certain organs. Administration of Recombinant Neuregulin-1 has been safely tested in some mammals.

A recent study has shown that salamanders can achieve this extraordinary feat by utilizing microRNA (miRNA) in their body. Studies have shown that these miRNAs are also found in humans and might help in cartilage regeneration. These miRNAs are abundant in human ankle cartilages as compared to knees and hips. Expression of three miRNAs (miR-21, miR-31 and miR-181c) helps to activate collagen proteins.

Researchers are working on the prospective transfer of regenerative capability in mammals. Studies have shown that humans possess the same genes as some of nature's best regenerative animals. This may take us closer to a future where we have real life Dr. Connors' amongst us!

# The Toolsmiths of Animal Kingdom

-Ankita Saha  
TZH

“Clearly, animals know more than we think, and think a great deal more than we know.”-

Irene M. Pepperberg

**W**e grew up reading tales from the Panchatantra and listening to fables. While most of these stories personify animals, some of these are based on some truth. Just like the story ‘The Thirsty Crow’, crows have been observed to use a variety of tools. Known as one of the most intelligent animals, they have impeccable problem solving abilities. While tool usage by animals like parrots, Chimpanzees and Elephants is quite well known, let us take a look at some of the most bizarre and unexpected tools employed by members of the animal kingdom.



**1. Bolas spider:** For Bolas spiders, commonly found in California, fishing is more than just a hobby. Using spider silk, they fashion a tool that works quite similar to a fishing rod ending in a sticky ball. These sticky globes are hurled at unsuspecting flying prey which are then reeled in just like fishing rods. The chemicals produced by the female spiders which are similar to the chemical female moths produce to attract males, act as bait.



**2. Pigs:** Visayan warty pigs, native to Phillipines have recently been observed to use sticks for digging up soil during nest building. Fernando “Dino” Gutierrez, president of the Philippine conservation non-profit Talarak Foundation, Inc. observed pigs using rocks to test electric fences. “**As soon as they push and the rocks make contact, they would wait for the clicking sound or absence thereof. Clicking means the wires are hot, and they will back off and not cross; no sounds mean it is safe to investigate what’s beyond the wire.**” While pigs making intelligent decisions and wielding tools seems impossible while reading ‘Animal Farm’, a political satire in the form of a fable, this latest discovery forces us to consider the possibility of animals showing human- like traits.

**3. Dolphins:** What astonishes researchers about the Indo- Pacific bottlenose dolphins is their ability to design and employ tools even though their limbs lack fingers. The females use sponges as gloves to protect their rostrum from the stings of predators and to stir up the ocean floor to catch prey. What makes this more bizarre is the matrilineal cultural transmission of this trait. So, a female dolphin came up with the tool and shared the knowledge with her daughters and the tradition continued since then. This perfectly demonstrates how just like humans, certain animals are perfectly capable of coming up with discoveries and sharing that knowledge,



**4. Octopus:** Veined octopuses, observed off the coast of Indonesia teach us a lesson or two about recycling as they successfully stack and use coconut shell halves discarded by humans to design their shelters. According to museum Victoria biologists, “**The discovery of this octopus tiptoeing across the sea floor with its prized coconut shells suggests that even marine invertebrates engage in behaviors that we once thought the preserve of humans.**”

**5. Dresser crabs-** Dresser crabs seem to have quite an interest in dressmaking and playing dress-up. They design their disguise by attaching sponges and aquatic plants to their backs and convincingly pass off as just another aquatic plant in the presence of danger.



Answering the question of why animals use tools, ecologist Meredith Root- Bernstein says,

“**Learned things and cultural things work that way. Maybe, it just feels like the right thing to do.**”

These examples prove that our knowledge on animal cognition just scratches the surface. While humans applaud themselves as the tool wielders of the animal kingdom, other animals have been designing ingenious tools even before we came to be.

## How exposure to blue light affects your brain and body

BY DISRUPTING MELATONIN, BLUE LIGHT RUINS SLEEP SCHEDULES. THIS LEADS TO ALL KINDS OF HEALTH PROBLEMS:

The disruption to your sleep schedule might leave you distracted and impair your **MEMORY** the next day.



A poor night's sleep caused by blue light can make it **HARDER TO LEARN**.



Over the long term, not getting enough sleep can lead to **NEUROTOXIN** buildup that makes it even harder for you to get good sleep.



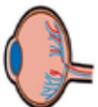
People whose melatonin levels are suppressed and whose body clocks are thrown off by light exposure are more prone to **DEPRESSION**.



By disrupting melatonin and sleep, blue light can also mess with the hormones that control hunger, potentially increasing **OBESITY RISK**.



There's some evidence that blue light could damage our vision by harming the **RETINA** over time - though more research is needed.



Researchers are investigating whether or not blue light could lead to **CATARACTS**.



There's a connection between light blue exposure at night and the disturbed sleep that come with it and an increase risk of breast and prostate **CANCERS**.



## SEMI IDENTICAL TWINS

"Sometimes miracles come in pairs." -Richard Branson

It was nothing short of a miracle when the first case of semi identical twins was registered. Till now, only two cases of semi- identical twins have been registered, one in Brisbane, Australia in 2014 and the other in New England in 2007. This tells us about the rarity of such cases.

Before these cases, we were familiar with only two terms- monozygotic twins and dizygotic twins, with siblings having 100% and 50% of their DNA as identical, respectively. But semi identical twins share between 50% to 100% of their DNA. So, a new technical term, sesquizygotic, was coined to describe these twins.

Three sets of chromosomes are involved, one from the mother and two from the father. These twins are nourished by a single placenta. The researchers are still not sure and still haven't been able to successfully explain how semi identical twin formation takes place, but, they have given two hypotheses or possibilities.

According to the first hypothesis, the ovum gets pre-divided into two egg cells of equal size without separating, which is unusual as well as rare. Two sperms from millions of sperms fuse separately with both the egg cells to form two separate zygotes.

According to the second hypothesis, the twins may form when two separate sperms fuse with a single egg to form a triploid cell, carrying three sets of chromosomes. In such cases, it is unusual that it leads to pregnancy. As a consequence, the twins are rare. Most of the genetic DNA inherited from the mother is identical in both the siblings, however, only a small portion of DNA inherited from the father is similar in both. The twins have the same genes from the mother and different genes from the father. Such pregnancies can be described as stochastic at best because they are unpredictable events.

-Priyanka Meena  
SZH

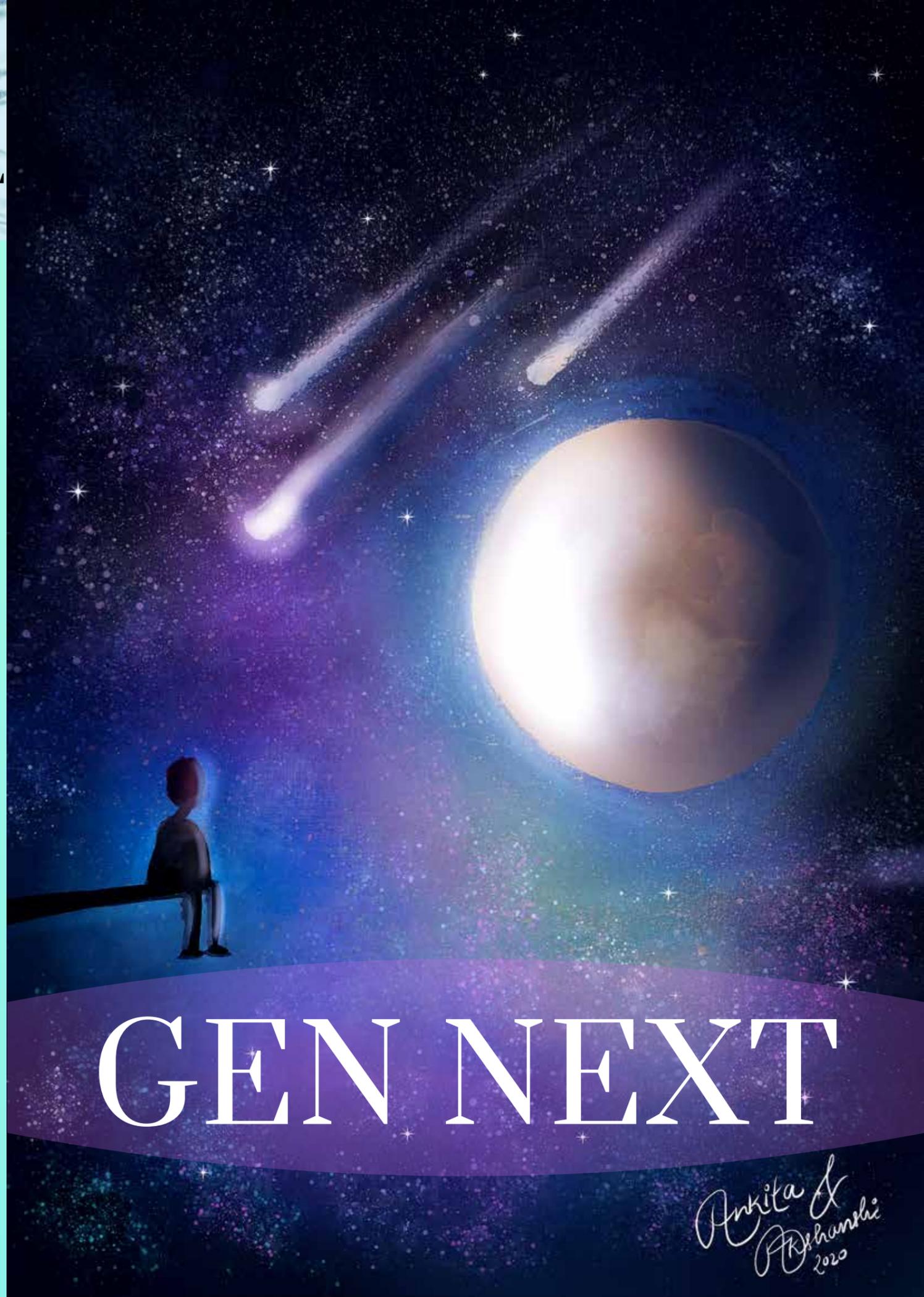
## BLUE LIGHT: EUPHORIC OR INIMICAL?

Is all blue light bad? It is well documented that some blue light exposure is essential for good health. Research has shown that high energy visible light alertness helps memory and cognitive functions and elevates mood. Blue light does affect the body when it has a wavelength between the 415 and 455 nm . It also has many biological effects on skin and eyes as well.

Blue light not only affect human beings but also the other objects from sky to underwater. Juvenile Salmon migration gets affected and make them vulnerable to predators. Zebrafish have melanopsin expressing cells in the retina. Larval fish generally move up in a water column during the day and downwards at night and this behavior is controlled by circadian clock overwritten by blue light.

Artificial lights during the night are the causes of rapid declination of insects population .Blue light from the LED affects insects breeding and makes them vulnerable to predator causing a decline in their population. Pet owners are always bothered by the behaviour of dogs at night which can be traced to blue light of LED. The American Medical association sent a warning letter in 2017 to cities not to install LED street lights . Sometimes you have to go through Darkness to get the Light.

Abhilasha Singh SZH



# GEN NEXT

Ankita & Priyanshi  
2020

Does our social status or geopolitical situation have anything to do with our microbiota? Well, it seems it does.

Microbes are integral to us and greatly impact our health. Inequalities in access to proper diet, prenatal care, housing, water and sewage management as well as working conditions, that arise from social inequality greatly impact our microbiome. The way we humans are socially organized influences every aspect of life. Daily we encounter billions of bacteria, fungi, and viruses, and the social structure of them, in turn, depends on our social hierarchy.

The way our cells and these microbes interact depends on our social upbringing and early development of the immune system, our diet, and the quality of our surrounding environment. Thus social inequality not only is bad superficially but, in a way also impedes our access to good microbes (a lack of which causes health issues) and amplifies chances encountering bad microbes (a causative agent of the disease itself!) Exposure to appropriate microbes in early life is critical for the proper immune development of the fetus and has a crucial role in determining long term gut microbial structure, and alteration in it has shown to affect multiple generations. The acute stress and ill conditions that a mother is subject to in abject poverty can alter both the maternal and offspring immune profile by altering the gut microbiota, deprecating immunity, and magnifying risk of autoimmune disorders.

# FREEDOM! EQUALITY! AND... THE RIGHT TO MICROBES!?

-Nirmegh Basu, SZH



**“YOU ARE WHAT YOU EAT”**

It's seen that breastfeeding creates a more diversified gut microbiome and curtails chances of allergies, asthma, and fewer cases of diarrhea, infections, etc. are witnessed in infants. But as the number of births per individual is generally higher in socially backward classes, the breastmilk available for each infant decreases, and early termination shunts this protective effect.

Variation in diets of the elite class and low-income groups with feeble food diversity and low fiber diet is affecting the gut microbiota and increasing the risk of obesity and disease. Diminished gut microbiota can have a permanent effect on the neurological processes and cause mental issues such as anxiety, schizophrenia, and depression, as bacterial dysbiosis affects the production of serotonin and GABA in the gut.

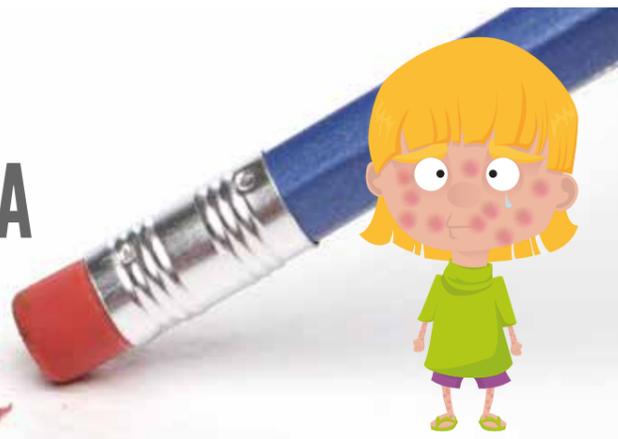
Overcrowding and poor sanitation promotes the transmission of contagious agents, and air pollutants have been directly associated with a decline in gut microbiota and IBD. Communities living in economically weaker geopolitical zones bite the bullet of these stresses, social barriers, and inadequate nutrition. The socio-political barriers against the resources needed to maintain our microbiota is an issue of social equity.

Today's divided society is endangering the future of mankind, and the price of inequality is being paid by our microbiota, yes, **EQUALITY** is utopian, what the society just wants is **ACCEPTABLE INEQUALITY**.

All in all, a loss, gain, or retention of microbes greatly impacts our well-being. And we as humans, have a right to get access to microorganisms as we have the right to public resources. If we do regard microbes as a “collectively owned resource”, do we not collectively have the right to benefit from them?



# MEASLES: IMMUNE AMNESIA



Harshita Rupani, TZH

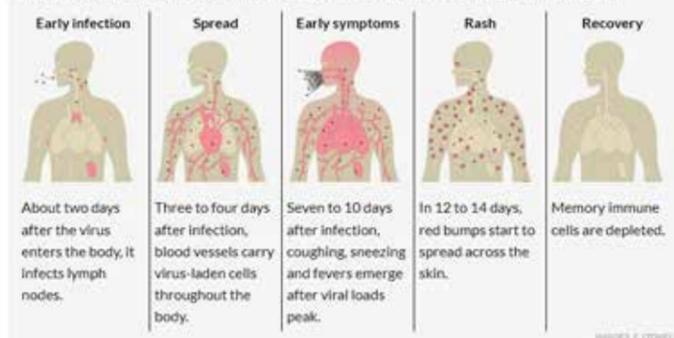
Since time immemorial, coming down with measles has been regarded as a rite of passage. Measles is a communicable viral disease indicated by fever, cough, watery eyes, and a distinctive rash. Measles is most frequently reported in children but may emerge in adults who evaded it when they were young. Once caught with measles, it provides a lifelong immunity to further attack by the virus.

Measles declined gradually in the 20th century after establishment of widespread vaccination and immunization programs all over the globe. This gave hope for the complete eradication and elimination of the disease, but unfortunately it resurfaced in the second decade of the 21st century with a particularly high occurrence in the year 2019. This resurgence can be attributed to low vaccination rates since the disease is thought to be rather harmless and to the rise in the anti-vaccine attitude among the masses.

The risks that measles poses is much bigger than what was previously anticipated. Two studies which were published in *Science* and *Science Immunology* help us understand how the viral disease cripples the immune system. Whenever we are exposed to a pathogen, our immune system recognizes the pathogen, develops immunity against it and further stores it as immune memory. Measles erases the memory immune cells, developing an immune amnesia and leaving individuals more prone to further infections by pathogens. However it paradoxically leaves a strong immunity against measles in its wake. The researchers at Harvard T.H. Chan School of Public Health lead by Michael J. Mina

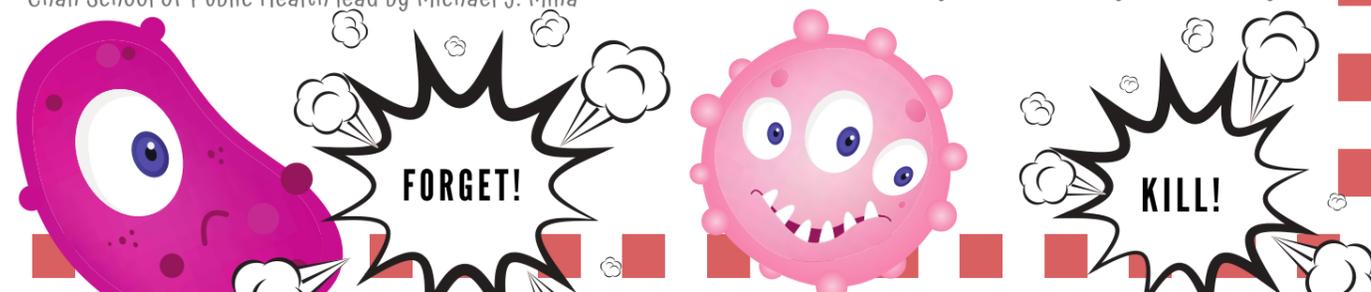
## Viral cycle

After the initial infection, measles-packed cells spread widely throughout the body before the symptoms, including a red, bumpy rash, appear. In the aftermath, the body has fewer memory immune cells.



investigated blood samples of unvaccinated children from Netherlands before and after contracting measles and found out that the virus decimates 11-73% of the patients' antibodies, putting them at higher risk of pathogens they were earlier immune to. The study used a pathogen antibody profiling technology called VirScan. For instance: a person has 100 antibodies to fight chicken pox before developing measles and is later left with 50 antibodies thereby reducing the patients defense against chicken pox by half. Thus measles outbreaks can spike acquisition of other illnesses by converting the immune system to an immature baby-like state which has limited ability to fight infections. Individuals surviving measles can ultimately regain these immune losses if they are re-exposed to the illnesses again to develop a fresh immune memory.

The fact that measles diminishes the antibody repertoire of an individual along with its immune memory to the pathogens that it earlier encountered helps us to understand the importance of the MMR (measles, mumps, and rubella) vaccine, which can prevent thousands of deaths caused by measles directly and indirectly.



instagram

## MOBILE NOTIFICATIONS A NEW DRUG IN TOWN

Do you involuntarily want to check the phone as soon as it vibrates? If so, congratulations! You are addicted to the new drug: Notification. Receiving notifications triggers the release of dopamine, a neurotransmitter linked with reward-seeking behaviours and addiction. It's released when we eat delicious food, have sex, exercise, and, importantly, when we have successful social interactions. In an evolutionary context, it rewards us for beneficial behaviours and motivates us to repeat them. Like drug or alcohol addiction, notifications make us feel euphoric when we're receiving them, and when we aren't they cause withdrawal symptoms and distress (reason being that the negative outcomes accumulate & the loss of dopamine activity encourages us to dissociate). There is always a Fear of missing out (FOMO) and to know what the email, notification, or text says. This is impacting our ability to pay attention to things and leads to social anxiety, insomnia, mood swings, and loneliness. The dopamine centers in our brain are also getting impacted which is making these behaviours stressful and less enjoyable the more we do them over and over again.

The companies now understand the science behind this and are using it for their benefit. Instagram's notification algorithms sometimes withhold "likes" on your photos to deliver them in larger bursts. So when we post our pics, we may be disappointed to find fewer responses than we expected, only to receive them in a larger bunch later on. Our dopamine centers have been primed by those initial negative outcomes to respond robustly to the sudden influx of social appraisal. The social media platforms now take advantage of our dopamine-driven desire for social validation, so that we get more pseudo-rewards and be happy on their platforms.

A study has shown that a single notification can distract you for 25 min on an average from a given task. Multiply that into the number of notifications we get per day. So, are we even doing any task with full concentration? Most of us have become so entwined with the digital lives that we sometimes feel our cell phones vibrating in our pockets when they aren't even there; a type of hallucination called "PHANTOM RINGS", a common sign of digital drug abuse. We have trained ourselves like Pavlov's dog to salivate over the rewards of our notification. That is why an average person checks his phone about 60 times per day, even when there's no notification.

During our prehistoric times, we humans have adapted to various sounds in nature, of which most are associated with threats; the rustling of leaves, fluttering of bird's wing, the roaring of ferocious animals, all these caused alertness to increase as well as preparing the body for overcoming these stress. The mobile notification sound also creates a similar kind of pseudo-threat reaction in the body. Even a simple "Hi" message can momentarily cause the body to generate a similar response as the roaring of a tiger.

We, humans, are social beings; and thrive because of this. But it's calculated that the social structures in which we thrive contain about 150 individuals, whereas the Smartphone in our pocket connects billions of individuals worldwide which is causing an information overload in our ancient brain in this high-tech world. A Friendly Reminder: the blurred image around your phone screen is called life. Your texts will stay there... the people around you won't.

Nirmegh Basu, SZH

# XENOBOTS

## WORLD'S FIRST LIVING, SELF-HEALING ROBOTS MADE FROM FROG STEM CELLS

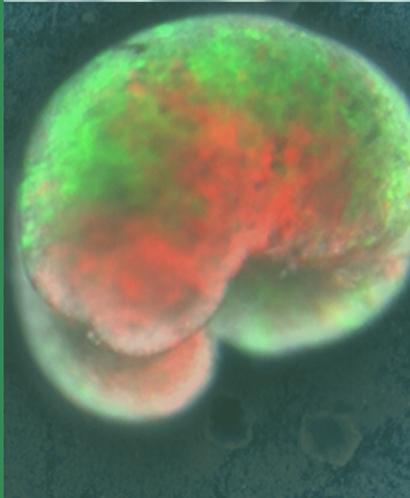
We are born, we live and in the end, we die, but robots are machines. They are made and then dismantled as they cannot live on their own. However, if someone says robots are also living, in today's time one cannot deny this statement. Scientists in the United States of America have designed the world's first-ever living machine by bringing together the cells from African clawed frogs and created them into tiny robots. They are entirely new lifeforms that have never before existed on Earth.

The industry of robotics has always been inclined towards metal and plastics for toughness and durability, but the scientists Michael Levin of Allen discovery center at Tuft University in Medford has now discovered a better material for building the robots and it's not a new metal but biological tissue!

When injured, these living robots can mend their wounds themselves and once their work is finished, they are broken down into pieces, mimicking a natural organism. These tiny robots are named 'Xenobots', after the *Xenopus laevis* species of frog from which they are made. The xenobots have raised the ethical boundary but are efficient to perform tasks like robots made up of plastic and metals in the coming future. The xenobots or living programmable organisms are designed from frog's stem cells. The scientists knitted together the skin and heart cells taken out from the embryo of African clawed frog using a tweezer and cauterizing tool.

Stuti Kumari, TZH

The designing of the xenobots was done by an evolutionary algorithm, that runs on a supercomputer, and the programming of the shapes was carried out by the generation of a random 3-D configuration of 500-10,000 skin and heart cells. The trail for the verification of the design was done in the virtual environment, to test how far it can move when the cells of the heart are all set to beat. The skin cells provide the passive structure and as the heart cells have the innate property to contract and relax continuously on their own, they act like miniature engines that run the robots along, till their energy stock gets exhausted. For 7-10 days the heart cells can maintain the survival state of the xenobots. Once their work is done they are just like simple dead skin cells becoming fully biodegradable. These tiny bots may lead to novel machines working extensively in various useful fields like collecting microplastics in the ocean, identifying toxic contamination in the environment, removing clots from blood vessels and intelligent drug delivery with the use of these computer designed organisms, achieving all this without polluting the planet like plastic and metal robots. As they are extremely small, the main aim is to make them scale and build these xenobots with a full system of blood vessels, sensory cells and nervous system that can form rudimentary eyes. By designing them from mammalian cells, they will be able to move on dry land as well leading to the question of whether these xenobots will be called living creatures or machines!



# Personalized Medicine



Personalized medicine is the tailoring of medical treatment to the individual characteristics of each patient. The poorer outcomes for patients in terms of adverse side effects, drug interaction malfunctions, etc. of the "ONE SIZE FITS ALL" approach led to the development of this newer form of technology in Pharmacogenomics.

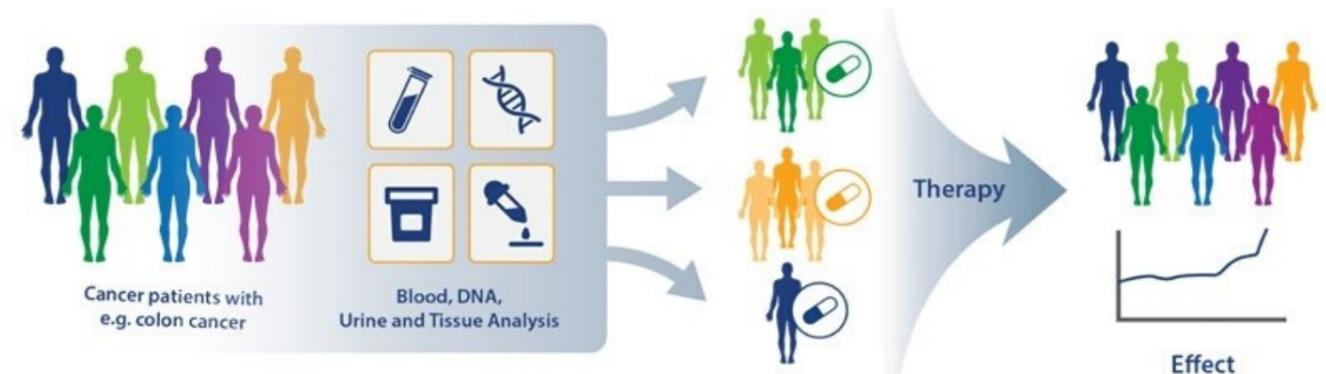
Personalized Healthcare (PHC) is about providing the right treatment to the right group of patients. We all are unique. Our health is determined by the combination of our inherent differences, our lifestyles and the environment around us. By analyzing our genomic information with other clinical and diagnostic information, we can customize the medicines we use which better suits our individual health needs.

One of the earliest and the most popular examples of Personalised medicine is "TRASTUZUMAB". It is a monoclonal antibody drug that interferes with the HER2/Neu receptor. Its main use is to treat certain breast cancers.

The latest innovation in Personalised medicine is the SMART PILLS which are sensors encapsulated with oral chemotherapy drugs that help patients and physicians to keep track of the prescribed doses. In 2019, Edward Greeno, a professor of medicine at the University of Minnesota, headed a pilot program offering orally administered capecitabine to colorectal cancer patients in partnership with Proteus Digital Health, a company that produces miniature sensing technology. Each pill consists of one of the company's sensors and can record when it is ingested—a trick which aims at helping doctors; ensuring that their patients are taking medications as prescribed. Upon ingestion, the device is activated which sends a one-time signal to a receiver patch worn on the torso of the patient and is subsequently broken down by the digestive system. The patch can also track heart rate, steps taken, and other health-related metrics. The patient can see in the mobile app at what time they took the pill, and all the data is shared with their doctor and anyone else the patient grants access to. The sensor received approval as a medical device by the US food and drug administration (FDA).

Harmful effects of Personalised medicine Millions of genetic variations may exist and identifying them all could take many years—if its even possible. And to add to this, how one person responds to a medication might not be determined only by one gene, but instead by the interaction of many genes. All this happens to be very expensive and time-consuming. Moreover, for now, Personalised medicine is available only on a limited basis and still remains an uncertain science.

Chandni Mysa, FZH





# SPACE Salad

-Akshanshi Gulani  
SZH

Science has taken incredible leaps with the innovation in ideas flooding from the human mind. Humans have been exploring space for a long time now, and in no time, humans will be going for deep space expeditions, but for missions like these the ability to produce fresh food would come in handy.

Astronauts on the International Space Station generally consume freeze-dried pre-packaged meals from earth, with all essential vitamins, but with limited stock, and they never get to eat fresh food in the earth's lower orbit. Eating such meals can affect the astronauts' health, and it will not be very practical if humans want to venture deeper into space. Plants need sunlight and gravity, but these are not available in the space station. The interesting news is that scientists have already succeeded in growing plants in space.

Veggie or the Vegetable Production System is a space garden set up on the space station. It is about the size of a suitcase and has the ability to grow around six plants by providing it blue and red light, with LEDs, water and nutrients filled up in a pillow beneath the plant. In 2014, Veggie was used to grow Red Romaine lettuce (*Lactuca sativa*), which were brought back to earth to test for toxicity, and whether it was safe for consumption.

These samples were found safe and in 2015, the red lettuce was harvested in the space station and the astronauts enjoyed their first ever, fresh salad in space.

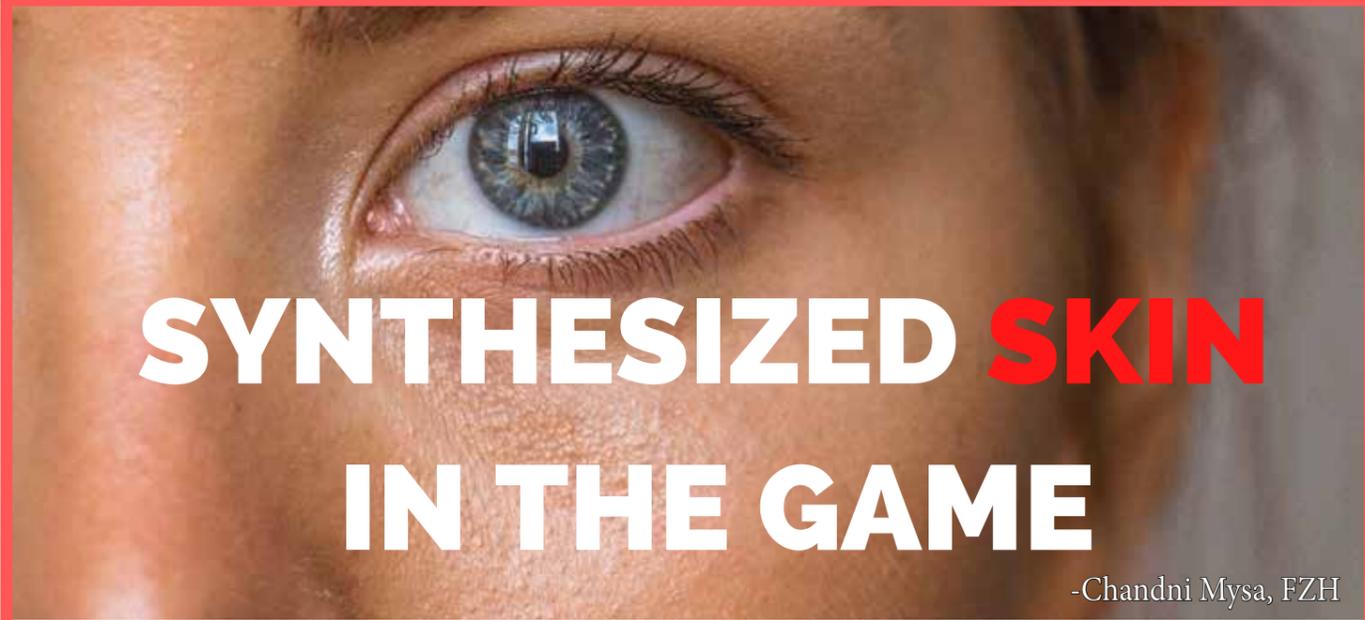
After that, the space station has been growing different plants like *Arabidopsis thaliana*, cabbage and Zinnia flowers. Although, food is not just limited to veggies, recently in October 2019, an Israeli food technology company, Aleph farms, grew meat on the Russian segment of the space station. Cow cells were taken to space in a growth medium and were grown using a 3D bioprinter.

Earlier in January 2019, China's mission on the moon was successful in growing sprouts of cottonseed, however, sprouts did not grow into plants because of extreme temperatures, but still, it is a valuable achievement.

Growing plants and fresh food in space will help astronauts take a piece of earth in deep space missions and will be crucial for establishing an intergalactic civilisation.



\*Cabbage being grown in Veggie



# SYNTHESIZED SKIN IN THE GAME

-Chandni Mysa, FZH

Skin is the largest organ of our body and plays an important role in both protection and sensation. Thus, skin becomes the primary organ which demands high degree of protection.

In recent years, Dermatology has witnessed several technological advancements which will be considered a boon in healthcare sector. One of these dermatological innovations includes **3D BIOPRINTING OF HUMAN SKIN WITH BLOOD VESSELS**.

3D BIOPRINTING is a very new technology which enables formation of skin grafts/tissues resembling human skin with proper independent and operating vascular system.

Dr. Pankaj Karande, Associate Professor of chemical and Biological Engineering and member of the Centre for Biotechnology and Interdisciplinary Studies (CBIS) of Rensselaer Polytechnic Institute, in Troy, New York, was the head of the research project involving 3D Bio printing of the living skin with blood vessels. This technology uses a material known as BIO INK to create these tissues in a layer-by-layer manner.

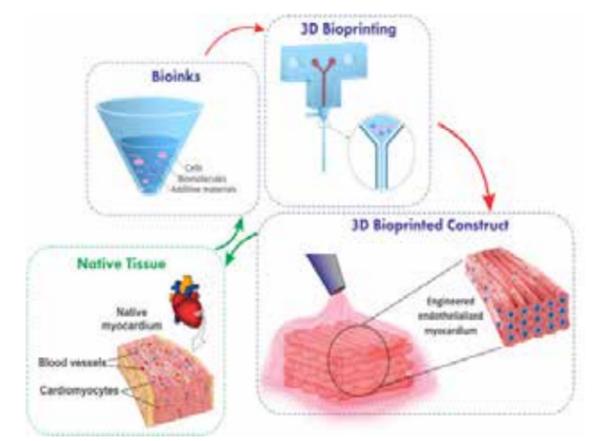
The graft is formed using one bio-ink containing human foreskin dermal fibroblasts (FBs), human endothelial cells (ECs) derived from cord blood human endothelial colony-forming cells (HECFCs), and human placental Pericytes (PCs) suspended in rat tail Type 1 collagen to form a dermis followed by printing with a second bio ink containing human foreskin Keratinocytes (KCs) to form an epidermis. In vitro, KCs replicate and mature to form a multi-layered barrier, while the ECs and PCs self-assemble into interconnected micro vascular networks. The PCs in the dermal bio-ink associate with the EC-lined vascular structures and appear to improve KC maturation. Mouse was chosen as the animal trial.

When the 3D printed grafts are implanted on the dorsum of immunodeficient mice, the human EC-lined structures inosculate with mouse micro vessels arising from the wound-bed and become perfused within 4 weeks after implantation. The presence of PCs in the printed dermis enhances the invasion of the graft by host micro vessels and formation of an epidermal rete.

Dr. Karande said, "We are still not at that step, but we are one step closer." This technique needs much more work and once this is accomplished, this method can then be widely used for the treatment of burn patients, diabetic patients or patients with pressure ulcers. The problems of organ replacement can also be met through this method. Cosmetic surgery process will also be positively affected.

This technique is still in its developing stage. Let's see where this technology would be in a few more years!!! It is very rightly said:

*"The ultimate goal of science is the betterment of humanity."*



Myoko festival



Kumbh Mela



Holika



# SCIENCE & FESTIVITIES

Muskaan Gupta, FZH

Let's take a dive into this fascinating world of festivals and culture, and take a look at how science is strongly bonded with various aspects of the same. While the tech-savvy kids of today's world understand most customs as superstitions, science proves otherwise.

Can we even discuss festivities without mentioning Holi? Holi is finely placed in a period of seasonal transition. The winter and summer are perfectly balanced like all things should be. Humans are more prone to diseases like viral fever and the common cold during this time. This transition also brings about the proliferation of various bacteria in the body, which, according to some studies, are 'naturally detoxified or killed' by the traditional bonfire of Holika Dahan. In some parts of India, people mix sandalwood paste with young mango leaves and flowers, which is said to have advantageous effects on human health. Now, moving on from mainstream festivals, scientists realize the importance of Indigenous Knowledge Systems (IKS) of India. To dig deeper into such a case study, a scientist duo (Bamin-Gajurel) reaches the remote Eastern Himalayan state of Arunachal Pradesh to research the IKS of the Apatani tribe. The Apatanis have three major festivals called Murung, Myoko and Dree for which they utilize various plant species. They have a certain 'ecological and ethnobotanical' knowledge. The Apatanis' rituals are found to be directly attached to forest plant species (which have been documented in taxonomic literature) and their conservation.

They're known to be skilled farmers, and carry out plantations of these species in gardens, community forests. Their conservation strategies have helped ecologists and Forest Department officials alike in understanding the science of conservation and maintaining greenery in the region. There are restrictions over the felling of the trees sacred to this tribe, for example, bamboo. Their festivals and traditions, therefore, strengthen conservational practices.

In these ways, biological studies and festivals are inter-related. However, physics is also applicable to various aspects of festive culture; we talk about pilgrimage and religious gatherings. Recently (in February 2020), the fine scientists of IIT Madras applied principles of fluid dynamics to control and streamline huge religious gatherings like Kumbh Mela, Hajj. Using a computer simulation, they can scientifically plan the placement of police personnel to quell disturbances which could otherwise lead to a stampede. The researchers captured the rules of a person navigating in a crowd into a mathematical model, the predictions of which were similar to experimental observations as well. This is quite useful, as it is an effective method of preventing stampedes.

Science and festivities, therefore, are inter-related and mix beautifully. Both hold extensive importance in our lives, as science sustains us and festivals entertain us.

# GOODBYE INSIPID MEDICINES !

Prateek Goyal FZH

"Childhood should be carefree, playing in the sun; not living a nightmare in the darkness of the soul." – Dave Pelzer, A Child Called "It"

Don't we remember the tough times we had as children when we had to swallow medicines? Why are medicines so bitter? Can't we do anything about it?

According to Mennella, a researcher with the Monell Chemical Senses Center in Philadelphia, children are born with a stronger preference for sweet flavors which naturally attracts infants to mother's milk. The distinct odor and bad taste affect children more than adults. There exist only three human sweet taste receptor genes, but a massive 43 human bitter taste receptor genes. They help in preventing children from downing a bottle of drain cleaner accidentally or getting intoxicated by other means. The other side of the coin is that the best ingredients in a pharmacist's cookbook are plant-based. The active ingredients in medicines contain salts and bases which are often bitter or acids that are unbearably salty. Seldom, the inactive ingredients which give the drug its texture or increases its shelf life may also have a bitter taste. This makes it a tough job for the parents when they have to give medicines to their kids.

Moreover, in the case of extremely unpleasant drugs such as antiretroviral drugs prescribed in AIDS, missing a dose can be a life or death scenario. Patient compliance is one of the goals of drug development. Thus, modifying the taste attributes of aversive drugs is important. Some of the current techniques employed are:

**Flavorings:** Flavor chemists act as perfumers and blend in flavors depending upon the drug and its concentration. Sweeteners or more acceptable bitter flavors such as coffee or chocolate are added. However, this method is problematic for high doses where it cannot mask the taste.

**Complexation:** The drug is complexed with ligands such as beta-cyclodextrin or resin which prevents its interaction with taste receptors or decreases oral solubility. However, there is a potential risk of alteration in the pharmacokinetics of the drug.

**Coatings/ Capsules:** The coating of starch, cellulose or gelatin-like substances covers the drug effectively and provide a barrier so that drug does not interact in the mouth. But this can increase the cost of production significantly and also affect the release of the drug.



**Bitter blockers:** Biotech firm Linguagen of New York received a patent for the discovery of a family of bitter blockers in January 2003. These bitter blockers prevent the release of gustducin, a protein that results in a nerve impulse causing the brain to say 'bitter'. Essentially nucleotides, these blockers can help us get rid of the need for masking the taste of the drug. These blockers can also be used to make foods such as broccoli and soya more palatable.

These techniques coupled with findings from the research will contribute significantly to drug acceptance and patient compliance. Thus, the pharmaceutical industry would benefit from investing in research on how to ameliorate the bitter taste.



# AWARENESS



## VIA STARDOM



LADY GAGA

IRRFAN KHAN

MICHAEL JACKSON

HONEY SINGH

### FIBROMYALGIA (LADY GAGA)

Fibromyalgia is signified by painful tendon and ligament along with fatigue, altered sleep, and mood as well as depression. While the cause is not yet clear but there might be an underlying genetic cause, traumatic injury, and other autoimmune disorders. While there is no specific test for it, 11 specific points on the body experience acute tenderness when pressed. Relaxation techniques, various therapies, and proper medication can help to an extent. Lady Gaga is now working towards raising awareness about the condition.

### BIPOLAR DISORDER (HONEY SINGH)

The popular musician Honey Singh suffered from Bipolar Disorder that lasted for 18 months. It is a mental condition in which the person suffers from extreme mood swings. It is characterized by a high energy phase involving elated mood followed by a depressing state in which the person feels extremely sad and hopeless.

### DISCOID LUPUS ERYTHEMATOSUS AND VITILIGO (MICHAEL JACKSON)

Michael Jackson, who is regarded as the King of Pop and who immortalized the moonwalk had an autoimmune disorder called discoid lupus that leads to painful coin-shaped red lesions on the skin of mainly face, neck and scalp. He also suffered from vitiligo which led to depigmentation of the skin in some areas. Sun exposure could worsen the condition and that was the reason he was seen wearing gloves.

### NEUROENDOCRINE TUMOR (IRRFAN KHAN)

Irrfan Khan quotes Margaret Mitchell saying, "Life is under no obligation to give us what we expect" as he tells everyone about the disease neuroendocrine tumor that he suffered from. It is a rare condition in which the neuroendocrine cells (cells that receive neuronal input from nerve cells and then release hormones into blood) develops into tumors that may spread to other parts of the body. The symptoms are based on the location of the tumor. The disease may develop due to changes in certain gene 'RET gene'. Treatment methods typically include chemotherapy, radiation therapy, etc..



DEEPIKA PADUKONE



KIM KARDASHIAN WEST



SELENA GOMEZ



RISHI KAPOOR



AMITABH BACHCHAN



SALMAN KHAN

### DEPRESSION (DEEPIKA PADUKONE)

"I felt empty and directionless, I had become irritable", said Deepika Padukone as she accepted the crystal award at WEF Davos for her efforts to destigmatize mental health issues. She suffered from depression, which is a serious illness characterized by loss of interest in virtually everything and impacts how one feels, thinks and acts. There are changes in sleep, energy levels, appetite, and self-esteem. While there are several methods to treat the condition including psychological help, medication; the biggest medicine, as said by Deepika herself is, "HOPE".

### BONE MARROW CANCER (RISHI KAPOOR)

The great actor of Hindi Cinema, Rishi Kapoor, suffered from bone marrow cancer. Bone marrow is the part of the bone where the stem cells produce new blood cells but in its cancer, the marrow cells multiply at an exponential rate that can lead to pain and destruction of bones.

### LUPUS (SELENA GOMEZ)

Lupus is a non-contagious lifelong disorder of the immune system in which immune cells attack the body's healthy tissues, leading to inflammation and tissue damage. It is very difficult to diagnose. It affects women 10 times more than men. Various types of lupus include Systemic Lupus Erythematosus (SLE), Discoid (Cutaneous) Lupus Erythematosus, Drug-induced Lupus (DIL) and Neonatal Lupus. "It was life or death nothing in between!", says Selena Gomez after being operated.

### TRIGEMINAL NEURALGIA (SALMAN KHAN)

Salman Khan, who is known for his amazing acting skills suffered from trigeminal neuralgia, for which he underwent surgery. It is a chronic pain condition in which the trigeminal nerves, which are the facial nerves of forehead, cheeks and lower jaws are affected and pain signals are received by the brain even during brushing the teeth.

### MYASTHENIA GRAVIS (AMITABH BACHCHAN)

Myasthenia gravis is an autoimmune disease in which nicotinic acetylcholine receptors are blocked or destroyed at the junction between the nerve and muscle that leads to skeletal muscle weakness. The most commonly affected muscles are those of the eyes, face, and mouth that result in double vision, drooping eyelids, trouble talking, and trouble walking. Amitabh Bachchan was diagnosed with this disease in 1984.

### PSORIASIS (KIM KARDASHIAN WEST)

Psoriasis is a non-contagious, autoimmune disease leading to skin inflammation that is extremely itchy and leads to the development of silver plaques and according to Kim it is much more than just these physical signs, it can harm life. It is an excessive proliferation of keratinocytes. The disease is known to run in families and can occur due to environmental triggers like trauma or certain infection. Treatment includes emollients (specific moisturizers) as well as UV phototherapy.

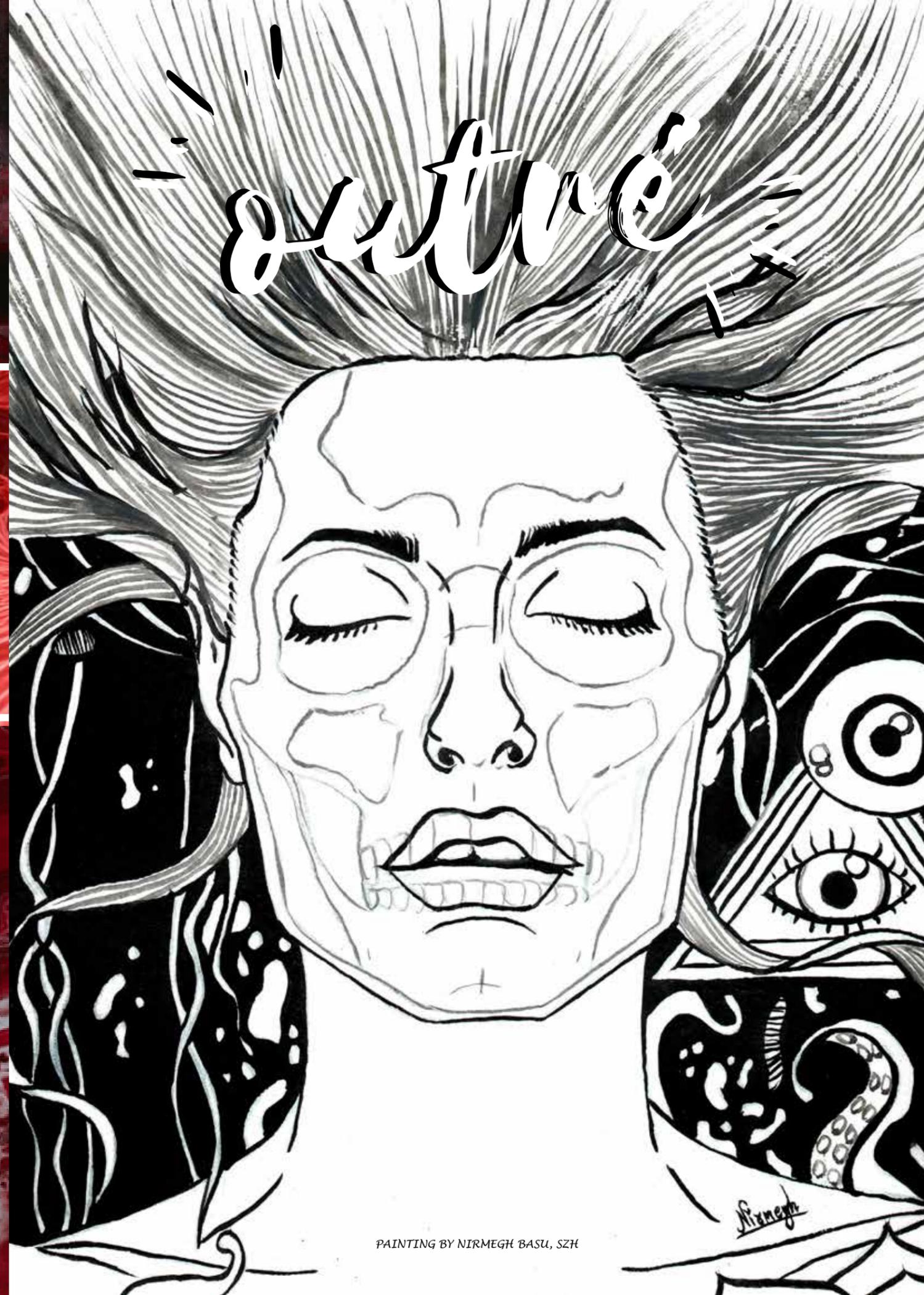
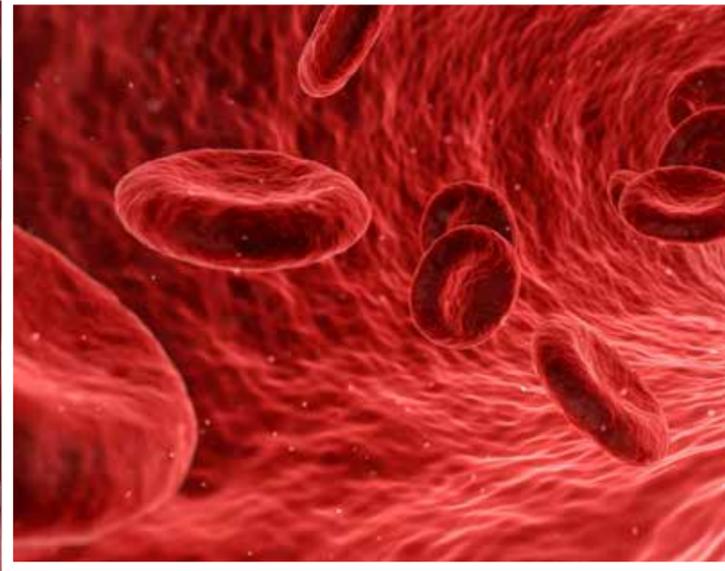
# MIMICKING UNIVERSAL BLOOD GROUP

-Pooja Singh, TZH

Well, we all know that all of us have different types of blood groups. Humans have 4 types of blood group (A,B,AB,O) depending on presence or absence of antigen A or antigen B on the surface of RBCs. People of blood group A have antigen A on surface of their RBCs while people with blood group B have antigen B, AB contain both A and B antigens, while a person with O blood group have no antigen that would otherwise cause a person's immune system to reject blood cells of different blood type.

So what is an antigen? Antigens are certain sugar or glycol-proteinaceous molecules on plasma membrane of RBCs. As we saw people with blood group O, both A and B antigens are absent, so they can donate blood to persons with any other blood group that's why is called universal donor. Type O blood group is rare, so scientist found new way to overcome this problem.

Of course, now we can analyze that by removing antigens either from blood type A or B, we can get O blood type, specifically O-which does not contain any antigens. Now the problem was how would this work? So, for this researcher at the University of British Columbia in Vancouver, Canada found group of enzymes in human gut that efficiently remove sugars from gut wall. Some of these microbes latch onto the gut wall, where they "eat" the sugar-protein combos called mucins that line it. Mucins' sugars are similar to the type-defining ones on red blood cells. These enzymes originally comes from gut bacterium called *Flavonifractor plautii* that are more focused on type A blood conversion because type A blood is more common. Research is still being pursued in this because they found only 30% efficiency in their work thus providing hope for a future with no issues due to blood unavailability.



PAINTING BY NIRMEGH BASU, SZH

# POSSIBILITY OF A Zombie Apocalypse!

-Akshita Khosla  
SZH

CAN ZOMBODIE  
GIVE ME SOME  
BRAINS?



**C**an a walking dead become a reality? Will such a creature become the reason for the tragic end of this world? Give these ideas a thought before you jump to a conclusion! As these were some of the questions that intrigued enthusiasts to such an extent that it led to the creation of the Zombie Research Society.

A zombie is defined by different sources as an undead person that has somehow managed to be resurrected. There are several reasons to believe that even if a dead body manages to come out of its grave, it cannot roam around in want of human flesh without proper muscles, immunity, metabolism and, decaying flesh.

So, what is worrying the scientists? Why have the Centers for disease control and prevention come up with preparedness measures for fighting zombies? It is not a zombie that has been defined but something that is much more complex. Several scientists have come up with a different hypothesis about how a zombie apocalypse might become a reality.

If a zombie is considered to be an organism that has no control over its activities with a stumbling walk and insatiable hunger, then it can be compared with a hypothetical disease caused by prions or misfolded proteins. Such disease will lead to malfunctioning of the brain, allowing them just to walk. It will also affect the portion of the hypothalamus that increases the feeling of hunger and hence the flesh-eating instinct. Shockingly, if some warped scientist can attach the prion to influenza-like airborne virus, then it will only need a few hundred sneezes and coughs to spread the zombie effect the world over.

According to another hypothesis, a viral mutation can lead to a zombie apocalypse. Rabies, for instance, is a virus that spreads by a bite from one animal to another, creating a major effect on brain functioning and behavior

Now, suppose a mutation makes rabies virus airborne and capable of changing human eating habits; that is theoretically possible! Then it will take no time to create a zombie pandemic.

.Now coming to reality, (if the hypotheses are not enough) have you heard of real zombie ants? Yes, Zombified ants controlled by a fungus. The fungus *Ophiocordyceps unilateralis* grows in the ant controlling their brain and grows out of it like a stalk. It firstly drains the nutrients from the animal, then moves to brain, progresses to muscles and eventually spreads to others via sporulation to other ants. The uniqueness to this fungus is the interconnection that its cells show around various muscle fibres of the ant which is not shown by any other fungus.

A zombie rat is infected by a parasite (*Toxoplasma*) that controls the rat's brain. This makes the rat dance in front of a cat and thus it is eaten by the cat. There are studies on zombified fish and cockroaches as well. Their parasites control them for completing their lifecycle and make the host self-destructive.

So mutation in a microbe, induced naturally or by a strange scientist is enough to change what we think. Still, think a zombie apocalypse is impossible? Think again!

# Indian Lifestyle Makes You Healthier

“The Indian way of life provides the vision of the natural and real way of life. We veil ourselves with unnatural masks. On the face of India are the tender expressions which carry the mark of the Creator “ - George Bernard Shaw

Are you tied up with your hectic schedule? Do you have a healthy lifestyle?

How do you think can the Indian lifestyle make you healthier? Let's find out!

## 1. ALL WE NEED IS 'THE RHYTHM DIVINE!'

So, starting with a simple saying by our forefathers, “Early to bed and early to rise, makes a man healthy, wealthy and wise”. It is the first pillar of a healthy lifestyle. It helps you procrastinate less and be more productive.

## 2. EAT 'EM ALL!

Have you ever enjoyed an Indian thali with a variety of food items served on a banana leaf? It consists of roti, rice, dal, curd, chutney, pickle, beans, legumes along with meat. Yogurt is loaded with several essential nutrients like Calcium, Vitamin B-2, and B-12. Rice prevents premature wrinkling. All these food items are packed with carbohydrates, proteins, and micronutrients like calcium, potassium, magnesium which provide energy to the body.

## 3. BACK TO BASICS!

Even drinking earthen pot water and using clay utensils add a special flavour to Indian food. These practices improve metabolism and also help to maintain a level of testosterone, thus, help in virility. Every Indian home has a kitchen garden in which vegetables and fruits are cultivated, ensuring a supply of fresh food. Eating jaggery after meals and breastfeeding are also important aspects of the Indian lifestyle. Only in India is turmeric, a natural organic product used not only in cooking but also as a face pack. Turmeric has curcumin, a bioactive component that has anti-inflammatory and antioxidant properties. The anti-inflammatory qualities can target our pores and calm the skin.

## 4. YOGA AND EXERCISE

Social and emotional well-being are elements of a healthy lifestyle that can be achieved by exercise and yoga. The roots of yoga are embedded in India. Yoga not only helps relieve stress but also in your spiritual awakening. The relaxation techniques incorporated in yoga can lessen chronic pain, such as lower back pain, arthritis, migraine, and carpal tunnel syndrome. It increases flexibility and muscle strength. “Exercise is a celebration of what your body can do. Not a punishment for what you ate.”

## 5. O' BROTHER, MY HEART THOU!

India is a country with cultural diversity and joint families. The celebration of different festivals promotes brotherhood. Now, we all face challenges in our lives which make us anxious, tensed and stressed. I define stress as “Someone Trying to Repair Every Situation Solo”. So, with the love and support of family and friends, we can deal with any obstacle.

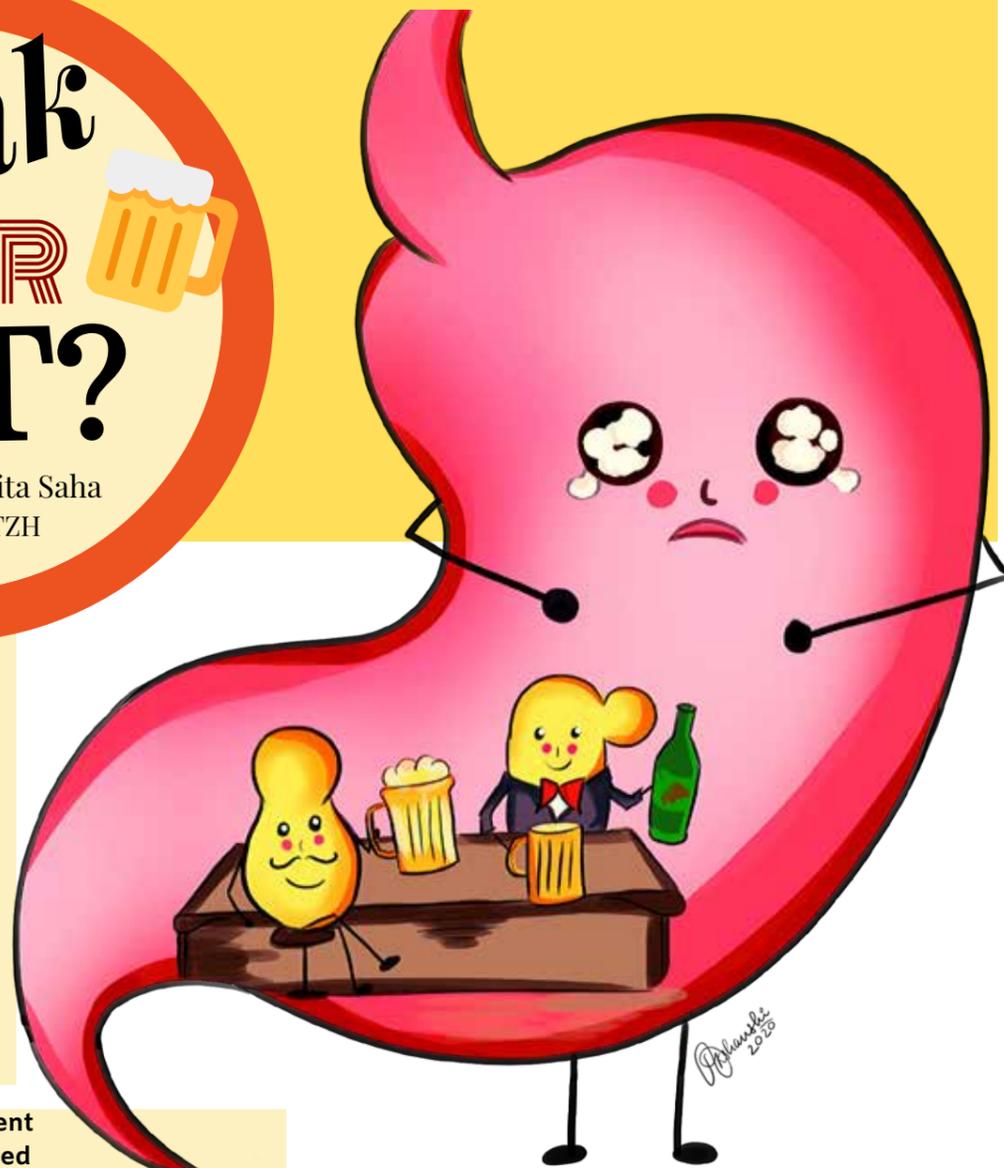
## 6. IN THROUGH THE EARS, OUT THROUGH THE LEGS!

Sometimes, listening to Indian classical music can soothe your nerves, but how? According to research, physiologic stress effects are regulated by top-down CNS processes, and by subcortical processes within the limbic system. Then both these areas transfer their message to the hypothalamus which intertwines with two major stress systems, the hypothalamus - pituitary- adrenal (HPA) axis and sympathetic nervous system (SNS). HPA axis and SNS then coordinate with endocrine and cardiovascular processes and help maintain homeostasis, which gets disturbed due to stress. The main effector of HPA is stress hormone cortisol and of SNS is Salivary alpha-amylase. As music was found to be effective in suppressing a stress-related increase in cortisol, music helps relieve stress. Dance is a significant part of Indian culture. Have you ever danced in the rain? If not then try it out, sometimes all these little things help you to more gleeful.

-Mohini Yadav, SZH

# Drunk OR NOT?

-Ankita Saha  
TZH



In 2016, a 46-year-old man was arrested for a crime he claimed didn't commit. All evidence pointed at him, but he pleaded innocent. He was charged for drunk-driving but maintained that he didn't have a drink that day. The breathalyzer test showed otherwise, according to which he was five times over the drink-and-drive limit.

A year later, he was proven innocent when the real culprit was identified as his gut microbiome. He was suffering from a rare medical condition which led to the production of intoxicating levels of ethanol in his body. Known as Auto-Brewery Syndrome or ABS, this condition is caused by the presence of elevated levels of certain fungi in the gastrointestinal system. These may include *Saccharomyces cerevisiae*, or "brewer's yeast," *S. boulardii*, *Candida albicans*, and *C. parapsilosis*. These fungi produce excessive amounts of alcohol, through endogenous fermentation of the carbohydrates one consumes, in other words, they brew beer inside the gut.

In this case, ABS was triggered by the administration of antibiotics after the man suffered a minor injury in 2011. This changed his gut microbiome, leading to the overgrowth of these beer brewing fungi. The surge in blood alcohol level was usually observed after he consumed a carbohydrate-rich diet. Excessive levels of blood alcohol led to dizziness, memory loss, aggression, and brain fog. However, these symptoms were misdiagnosed as symptoms of depression. He was getting treated with antidepressants until a doctor in Ohio diagnosed his condition as ABS.

An antifungal treatment followed by a probiotic course helped flush out the brewing fungi and restore his gut microbiome to its healthy state. He was also put on a strict carbohydrate-free diet. Dr. Fahad Malik, a gastroenterologist at Richmond University, who treated the man, said, "He was extremely happy when he started to recover because, for years, no one believed him. The police, doctors, nurses and even his family told him he wasn't telling the truth, that he must be a closet-drinker." A weak immune system, Crohn's disease or post-surgical complications can also trigger a change in the gut microbiome leading to this condition.

How the patients function with alarmingly high levels of alcohol in their body, when a normal person would die or become comatose at such levels, is a question that is yet to be answered. However, it is clear that not only can ABS lead to health problems, but it can even land people in prison. Free beer is not always great, after all!



## HUMAN ANIMAL Chimeras

-Shubhi Agrawal  
FZH

According to Greek mythology, a chimera is known to be a hybrid creature represented by a lion with a goat's head protruding from its back and a tail terminating with a snake's head.

Science has been successful in preserving the mythological roots of a chimera but this research has also been quite transgressive in its approach.

A chimera is a single organism which has been made of cells from different individuals, meaning it contains two different sets of DNAs. For example, tissue chimera may result from organ transplant or tissue transplant such as that of bone marrow. Not only restricted to being a lab experiment, it is known to occur naturally as well. This may happen when the mother and the fetus swap cell during pregnancy via placenta (micro chimerism) or when in a case of fraternal twins, if the two embryos somehow fuse together to form a single fetus having genetically distinct cells (tetragametic chimerism). The total number of chimeras in the world isn't known but there have only been 100 cases recorded so far making it a very rare condition.

Most often, chimeras have been a result of lab experiments performed by humans for genetic research. With advancements in science and technology and an increasing need for performing organ transplantation, scientists have developed a technique called xenotransplantation which can be understood as the implantation of live cells, tissues or organs from a non-human animal source into human body.

Hiromitsu Nakauchi, a Japanese stem-cell scientist has been the first person to receive government support after the ban on this practice was uplifted recently. The team headed by him aims to produce animals with organs made of human cells that can be used to facilitate organ transplantation. This research has been active in other countries as well such the United States but has not been brought to terms because of the prohibition on its funding since 2015 imposed by the National Institutes of Health.

The first interspecies chimera sheep-human chimera was created by scientists in which human stem cells were introduced into sheep embryos resembling 99% sheep but also showing a tiny bit similarity to humans. Bioethicists have argued against this idea because there may be a possibility that human cells may go beyond the development of the targeted organ and may reach other organs of the animal such as the brain and interfere in its cognition.

The main strategy of the scientists working on this research is to perform only targeted organ generation, so the cells do not sway away from their original path and penetrate other organs. The necessary concerns need to be taken into consideration regarding this research. Nakauchi plans to address the issue and plans to maintain a dialogue with the public so as to eradicate all of their concerns.



## THE MASKED MONARCH

*Menace of lethal make up*

Life in England in the 17th and 18th centuries, before the revolutionary discovery of vaccines by Edward Jenner, was a nightmare for many because of the aberrant spread of smallpox. The disease with its current status of being completely eradicated does not create fear in mankind today and is considered as one of the most famous success stories by the World Health Organisation. Yet, a few centuries ago, the outbreak of the disease terrorised communities and amongst millions who suffered from the plight of this deadly disease was the well-known face of Queen Elizabeth I of England.

The Queen suffered from this fatal disease at the age of 29, and although she resolutely fought her battle with small pox and emerged a winner, but the disease scarred her mind and blemished her face for a life time. Consequently, she made dire efforts to make her face presentable to her subjects and this marked the beginning of the story of 'the masked monarch.' During those times, a white face had nothing to do with racism, but rather symbolised youth and fertility. It was believed that a whiter and clearer face meant a higher class and the irony is that this fetish for a fairer complexion and youthful appearance continues to influence many all over the world even today.

To meet these unrealistic beauty standards, the Queen, post the small pox episode disguised herself in white makeup which we also currently refer to as lethal makeup in order to conceal her scars and blemishes. The queen used face makeup made of white lead and vinegar which was also referred to as Venetian ceruse or Spirits of Saturn. No wonder this cosmetic left her skin smooth and white however it did more damage than good. This clown like makeup was left on the Queen's skin for a good period of over a week before it was removed not knowing that ceruse was a corrosive and caused lead poisoning, skin withering, hair loss and rotting of teeth. Not only this, mercury was used as a potent ingredient for removing makeup that even though left the skin soft but eventually ate away the skin. Moreover, the Queen also used lip stains that contained heavy metals like mercury that had a high chance of entering the body through her mouth

Eventually with age, the queen started to apply thicker and thicker layers of makeup in order to fight the catastrophic effects of the same and it was believed that when the Queen died, she had an inch of makeup on her face. Even though the Queen did not allow for a post mortem but the symptoms that she suffered from prior to her death pointed to the fact that lead poisoning did play a role in her ultimate demise. She suffered from symptoms that included memory loss, hair loss, digestive problems, and extreme fatigue among many others that clearly indicated lead poisoning. The Royal Museums of Greenwich, in a page about the myths and mysteries that still surround her death, writes that Elizabeth Southwell, one of the queen's ladies-in-waiting reported that the "Queen's corpse was so full of noxious vapours that it exploded in her lead coffin."

Probably when our succeeding generations look at us, they might call us fools for getting facials out of bird poop and injecting toxins in our skin in the name of Botox but beauty in the Victorian times just like ours was also an essential component in a women's life and more so in the case of a monarch. In order to imitate these unrealistic beauty standards, the Queen did walk a path of self-destruction by using lethal makeup which played an important role in her death. Not only this, Mary Queen of Scots (a movie that largely talks about Queen Elizabeth's life) director Josie Rourke, in her interview about the clown face of the Queen stated: "We're left with this mask-like version of a person, who is no longer a person by the end, but a throne and a representation of power in a country. I loved that she kind of built the mask for herself and then was inherently trapped by it."

Pranavi Kumar, TZH



# HUMANS WITH MUTANT SUPERPOWERS

## Who are superheroes in your eyes? Have you ever seen them?

The realm of comic books is full of people with various superpowers. Even if telekinesis is beyond our world, we still have individuals with unique abilities and amazing powers which make them as superhero material. Their abilities can easily be mutant superpowers. There are people with real gene-based super abilities resulting from minute changes in the genetic code and some defects. Here are some real people with mutant superpowers.

### 1) Memorizing power:-

**Kim Peek**, an American savant, could memorize everything he saw and could recall around 12000 books whenever he was asked to do so. It was because he was suffering from a congenital birth defect called "agenesis of the corpus callosum". The bundle of nerves that connected two hemispheres of the brain was not present in his brain and due to this, his brain had unique connections which made him too good at memorizing things.

### 2) Super Endurance:-

Finnish sportsman, **Eero Mantyranta** has superhuman endurance. The reason: a mutation in his erythropoietin receptor gene due to which his bloodstream carries 50% more oxygen. This mutation became advantageous for him in sports and gave him super strength which others didn't have.

### 3) Super Strength:-

Let us introduce you to our Hulk, a small boy from Michigan, **Liam**. Myostatin is a protein that inhibits muscle growth but his body is deficient of it. Due to this deficiency, he has comparatively much larger muscles with little body fat.

### 4) Disease Resistance:-

**Stephen Crohn** was found to have a "delta 32 mutation," which protected his CD4 white blood cells from HIV. Due to this, he was completely immune to HIV.

### 5) Super flexibility:-

**Javier Botet** suffers from Marfan Syndrome. This syndrome affects connective tissue throughout the body and people are unusually tall, with long limbs and fingers, and have 'abnormal flexibility'.

### 6) Alcohol resistance:-

**Ozzy Osbourne**, an iconic English singer, actor whose longevity and success have earned him the informal title of "Godfather of Heavy Metal". He smokes, drinks and snorts and in spite of all this,

-Mohini Yadav, SZH



CRIME SCENE DO NOT CROSS  
CRIME SCENE DO NOT CROSS

# Epigenetics & Criminology

ARE CRIMINALS MADE OR BORN ?

Is it an individual's genetic makeup that makes them a criminal *or* is it the environment in which they are raised that determines their outcome? Well... Maybe **both**.

Genes **load** the gun but environment **pulls** the trigger, and out comes a bullet named "Epigenetics" which causes alterations in DNA or histone structure that do not affect the sequence of DNA but affect gene expression and therefore cellular function.

Having a genetic tendency for criminal behavior does not determine the actions of an individual, but if exposed to the right environment, **then** their chances are greater for engaging in criminal or anti-social behavior.

"Environment prepares for the crime, criminal just commits it." may very well be true scientifically.

Our experiences—such as how our parents treat us—alter how our genes are expressed, thus impact our physiological and psychological development. Research in epigenetics indicates that alterations in DNA methylation may provide a link between social adversity and mental health. In addition to parenting quality, other environmental or life experiences are related to methylation. Early life experiences have also been tied to differences in epigenetic patterns for genes related to mental health & drug addiction.

**Think of lifespan as a movie.** The cells would be the actors and actresses, units that make up the movie. DNA, in turn, would be the script — instructions for participants to perform their roles. Subsequently, the DNA sequence would be the words on the script, and certain blocks of these words that instruct key actions or events to take place would be the genes. The concept of genetics would be like screenwriting.

Understood so far? Good. **Epigenetics**, then, would be the Director. The **script** is the same, but the director can choose to eliminate certain scenes or dialogues, altering the movie for better or **worse**. After all, Steven Spielberg's product would be different than Ray's for the same movie script, wouldn't it?

However, this research area is still nascent and the mechanisms that lead to changes in methylation or how that methylation modifies mental health are still unknown. Biologists are starting to express their fear with the use of epigenetics as "**the currently fashionable response to any question to which you do not know the answer**". Every problem is a nail, and epigenetics is the hammer. The new GOD in town.

Virtually, Genes are destiny and the genetic destiny of future generations is in our hands. In reality, lifestyle choices such as watching T.V. or drinking a Starbucks coffee may not determine the genetic fate of our progeny nor may it determine if a person turns out to be a murderer.

There is an understandable concern that the identification of genetic susceptibility to criminality may lead to genetic screening of the population for susceptibility to criminal behavior, which may lead to innocent people being tagged as criminals even before committing a crime!

To put it in a nutshell, this domain is still in its infancy, and should not be taken as a verdict. But it can't be denied that upbringing is the mother of all crimes.

- Nirmegh Basu, SZH

# WHAT DRIVES US TO LISTEN TO OUR FAVOURITE SONGS ON LOOP?

TWINKLE KATHURIA  
TZH



Why do we choose to listen to the same songs over and over again when we have an unending list of new songs released every year? The answer may be rooted in evolutionary science. The traits that favor the survival of an organism to have offsprings are favored by natural selection and evolution. Our ancestors trusted what was known to them and distrusted what they had never encountered: that's how they learned the art of survival. Psychologists call it the "mere exposure effect." The principle says: we like things just because we've been exposed to them repeatedly.

Music is the art form with the most repetitions. The recent book, *On Repeat: How Music Plays the Mind*, authored by Professor Elizabeth Hellmuth Margulis says, "Musical repetition gets us mentally imagining or singing through the bit we expect to come next." The sense of anticipation is what drives people to listen to a song on loop. The feel "as if you are singing it" is what Margulis calls "virtual participation" that makes the listener feel more connected to the music. Peter Vurst, a professor at The Royal Academy of Music in Aarhus, Denmark, grounds the reward center of our brain as the reason behind the desire to repeat songs that accolades us for behaving in a way that enhances our chances of survival.

But this does not hold true for every song. Many songs get annoying if repeated. The result of a recent study conducted by the University of Michigan explained that the most repeated songs are generally the most complex ones. The songs with different voices and melodies were generally reported to be listened multiple times in a row than the novel songs. Complex songs allow the listener to notice something new every time.

# MUSIC THERAPY

Research shows that Indian ragas have a significant effect on enhancing working memory and cognitive performance based tasks as compared to pop music. The Indian concept of rasa or bioenergy which is partly physical and partly mental is considered to be the reason why certain Indian melodies have a calming effect. Rasas are associated with ragas. A listener of raga Bhupali, for example, would be affected by the rasa Shringara or love which instils a sense of calmness and relaxation. Thus, listening to Indian music has proven to be therapeutic and the scope of Music therapy is bright!

Ankita Saha, TZH



# KAALINK: AN INCREDIBLE DEVICE

An idea can come, to anyone, anywhere and the same happened with Anirudh Sharma, a graduate from Cambridge, Massachusetts. At a conference he noticed black particles on his white shirt because of the pollution in surrounding air and he got an idea to turn carbon pollution into ink. He developed a device that can be fitted onto the exhaust pipe of a car or portable generator and collected the soot that forms from burning diesel fuel and after mixing the powder with solvents, ink is produced. By-products produced after burning fossil fuels such as gasoline and coal caused health problems and effects climate around the world. The black ink used in our pens is made from soot, a pollutant produced after burning hydrocarbons. He said that we shouldn't need to burn new fossil fuels just to make ink. He reflects on a quote from 20th century inventor and architect R. Buckminster Fuller, "pollution is nothing but resources we are not harvesting. We allow them to disperse because we have been ignorant of their value." The product obtained is called AIR-INK and device which is used to make it is called KAALINK, derived from hindi word 'kaala' meaning black, comprised of steel cylinder that could be affixed to an exhaust pipe. A 45 minutes of diesel car pollution can produce about 30 millilitres of AIR-INK. Sharma started his company Graviky Labs, which handles operations for both KAALINK and AIR-INK. Sharma's AIR-INK is on display at the Cooper Hewitt, Smithsonian Design Museum in New York in the exhibition "Nature-Cooper Hewitt design Triennial."

GARIMA CHAUHAN, SZH



# E C L E C T I C A

Eclectica is a word-based game for two or more players. Teams compete to decipher clues, get words, and phonetically rearrange them to find answers.

## CARD 1 CLUES

\_\_\_\_\_ and seek (4)

The oars \_\_\_\_\_ the boat in water (3)

\_\_\_\_\_eration gap can be frequently seen in rural population (3)

## CARD 2 CLUES

someone who cannot hear \_\_\_\_\_ (4)

An \_\_\_\_\_ for an eye makes the whole world blind (3)

The structure present on a deer's head is an \_\_\_\_\_ler (3)

## CARD 3 CLUES

The first two letters of the online shopping platform created by Jeff Bezos (2)

The handheld tool used to steer a boat (3)

A hand-\_\_-down outfit (2)

\_\_ elections are dishonest (3)

## CARD 4 CLUES

The first four letters of the plates that shift to cause earthquakes (4)

Noah's \_\_\_\_\_ (3)

If something is under lock and \_\_\_\_\_ it is secure (3)

## CARD 5 CLUES

The first three letters of the country with highest population (3)

The abbreviation Sn stands for th element \_\_\_\_\_ (3)

Let's cut to the ch\_\_\_\_\_ (3)

## CARD 6 CLUES

Drawing is a form of \_\_\_ (3)

Opposite of catch is \_\_\_\_\_ (5)

Like two peas in a \_\_\_(3)

## CARD 7 CLUES

The Great Barrier \_\_\_\_\_ is located in Australia. (4)

The informal synonym for fire from employment is \_\_\_\_\_ (4)

"\_\_\_\_\_ baby" is a song by Vanilla \_\_\_ (3)

## CARD 8 CLUES

One should always \_\_\_ pool (3)

First two letters of the most popular video streaming app owned by Google (2)

He's not my \_\_\_\_\_

## CARD 9 CLUES

A rounded roof is a \_\_\_\_\_e (3)

Scientists like to spend their time in a L\_\_ (2)

\_\_ route (2)

## CARD 10 CLUES

First four letters of the most common milk based breakfast (4)

A social insect that forms hives (3)

\_\_\_\_ and coke is a famous drink mix.

Answers: 1. Hydrogen 2. Defiant 3. Origami 4. Architect  
5. Chitinase 6. Anthropod 7. Sacrifice 8. Karyotype 9. Abdomen 10. Cerebrum



Third Year



**Riya**  
First



**Wasima Sultana**  
Second



**Kanishka Baisoya**  
Third



Second Year



**Ankita Saha**  
First



**Stuti Kumari**  
First



**Priyamvada Singh**  
Second



**Jassika Gupta**  
Third



First Year



**Vishal Singh**  
First



**Vaibhav Sharma**  
Second



**Akshanshi Gulani**  
Third



**Amit Bhatt**  
Third



**Akansha Saxena**  
Third



**Mohini Yadav**  
Third

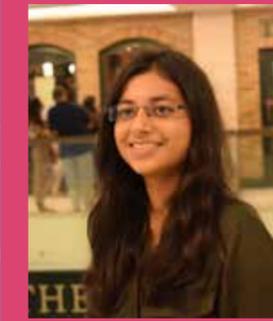
# ECA ACHIEVERS



**Saksham Setia- TZH**  
Verbum



**Ankita Saha- TZH**  
Leonci



**Aastha Saini- TZH**  
Leonci



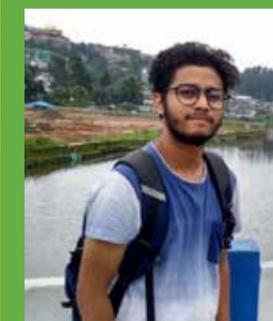
**Kartikey Saxena- TZH**  
Vimarsh (Vice President)



**Nikhil Zutshi- TZH**  
FAA (Gen Sec & Treasurer)



**Shradha Pandey- TZH**  
Nrityangana (Secretary)



**Saptarshi Jana- TZH**  
English Debating Society



**Akshanshi Gulani- SZH**  
Leonci



**Mansi- SZH**  
Leonci



**Ayushi Saraff- SZH**  
Women Development Cell



**Akshita Khosla- SZH**  
Placement Cell



**Rishabh Yadav- SZH**  
Petrichor



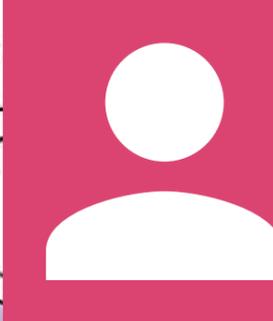
**Muskan- FZH**  
English Debating Society



**Anuj- FZH**  
Conquistadors



**Vipasha Soni- FZH**  
NSS



You could be next!

# Creative Corner



Proud as a Peacock  
(Simran Prajapati,FZH)



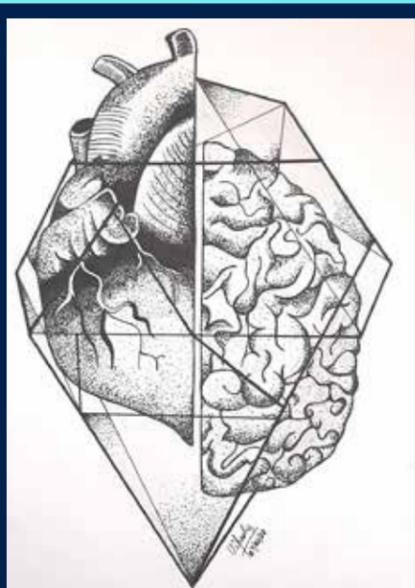
I'm a su-paw-star  
Aashi Bansal (TZH)



Love you 3000  
(Kartikey Saxena,TZH)



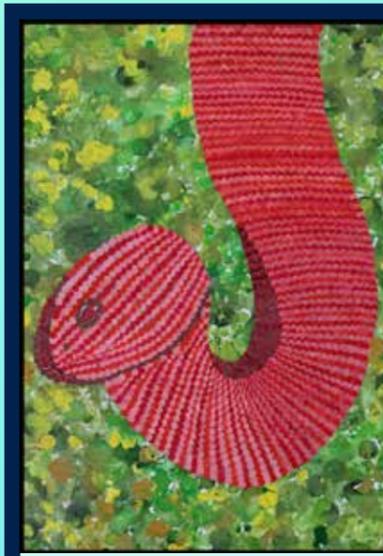
There's no end to one's  
imagination....  
(Akansha Saxena,SZH)



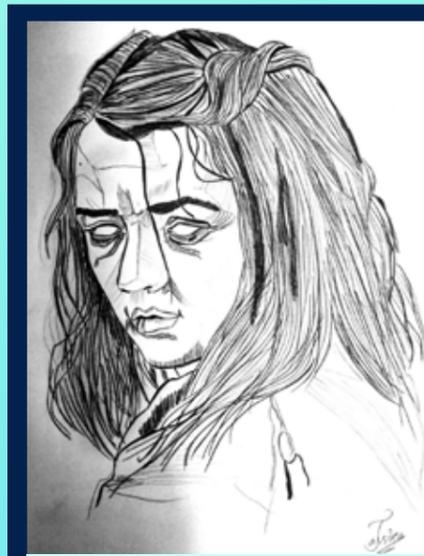
Conflict  
(Vipasha Soni,FZH)



Isolophilia-Seeking Solitude  
(Aastha Saini,TZH)



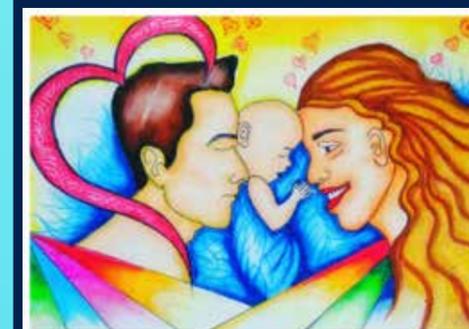
Venom  
-Ankita Saha,TZH



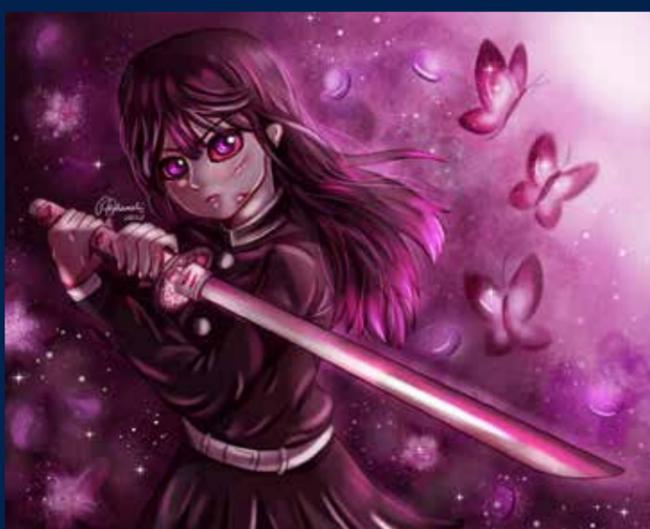
Valar Morghulis  
-Jassika Gupta,TZH



Ukiyo  
(Shubhi Agrawal,FZH)



Infinite love,from one life to another  
(Vishal Singh,SZH)



Tsui no kata: Higan Shugan  
Akshanshi Gulani,(SZH)



Strip and Stroke  
(Nirmegh Basu,SZH)



I'm not in danger,I am the danger  
-Heisenburg  
(Shalini Panwar,SZH)



"Never let anyone burst your bubble"  
(Ritika Semwal,FZH)



Enchanted Utopia  
(Amit Bhatt,SZH)

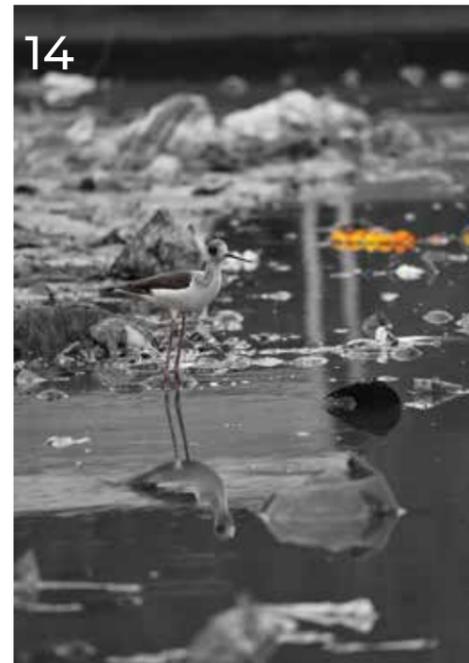
# THROUGH A ZOOLOGIST'S LENS



1. Aastha Saini, TZH  
2. Aastha Saini, TZH  
3. Amit Bhatt, SZH  
4. Abhilasha Singh, SZH  
5. Anjali Gupta, FZH  
6. Harshita Rupani & Anushka Saxena, TZH  
7. Kartikey Saxena, TZH  
8. Vishal Singh, SZH



9. Jassika Gupta, TZH  
10. Mansi Dhingra, SZH  
11. Soumya Mallick, SZH  
13. Soumya Mallick, SZH  
14. Nirmegh Basu, SZH  
15. Twinkle Kathuria, TZH  
16. Vishal Singh, SZH







The Phoenix Team



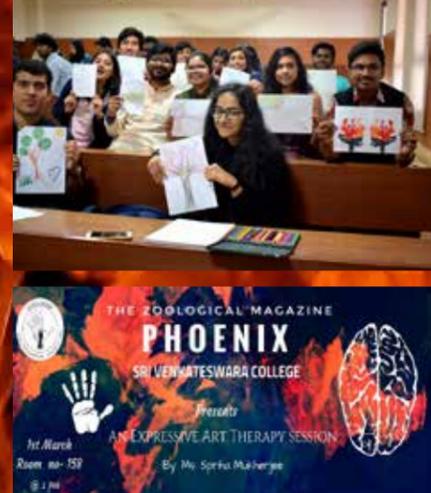
# PHOENIX 2019 RELEASE 7TH EDITION

The 7th Edition of our Department's annual magazine "Phoenix" was released on 1st March, 2019 by Prof. Syed E. Hasnain, VC Jamia Hamdard University. The magazine this year featured articles on anthropological disasters, human-technology interface, genetics etc.

The department also organised an innovative session of Art Therapy conducted by Spruha Mukherjee, Art Therapy practitioner at VIMHANS hospital. The session brought out the creative side of everyone present, allowing precious few moments of mindful creation.



Expressive Art Therapy By Ms. Spruha Mukherjee



## 2019



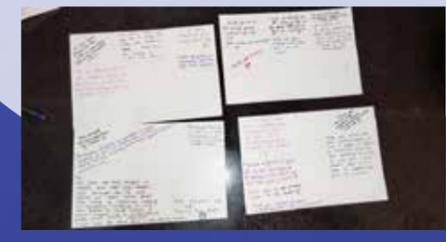
## EVOLVERE ANNUAL FEST

This year the department highlighted the achievements in the field of pharmacology in our Annual event, organized by Evolvere. The event was set in motion with an intriguing and informative lecture by Dr. Jasminder Sahi, who is the senior director and head of TMED Asia pacific, China. This was followed by an illuminating talk by Dr. Sheetal Gandotra, an integral part of the Institute of Genomics and Integrative Biology, CSIR. Complimenting the lectures was a highly engaging e-poster making competition that fueled many creative minds to display the latest and greatest in the world of pharmacology in an eye-catching manner. Lastly, Evolvere also successfully organized a highly competitive quiz competition called 'Chill Pill' which had enthusiastic participation from various colleges.

COBIBALLY INVITED TO  
*Teachers' Day party*  
TO CELEBRATE  
*You*  
September 5, 2019  
Zakir Husain Lab  
12:00 onwards



# Teachers' Day Celebration



# Diwali Celebration



# Alumni Acumen



As students, the most prominent question on our minds is about the future. Thoughts of what career to pursue, which masters to opt for and whether research is our calling often riddle our minds. To help students streamline their choices and gain a clear perspective of research, the department organized a talk with one of our alumni, Avantika Ghosh. She earned her Ph.D. from the National University of Singapore, Department of Microbiology. She talked about her time in the department and how to efficiently manage studies with the extracurricular activities. She also talked in brief about the new cutting edge technology in life sciences like CRISPR. The session was greatly informative for students willing to pursue a career in research.

# A trip to Chopta, Tungnath and Rishikesh

*A grueling 24-hour bus ride failed to dent our spirits as we arrived at our tents at Chopta, hidden in a veil of clouds. The tea in the rain, slippery slopes, wooden deities and fear of leeches made the first camping experience of many a memorable one.*

*The hours of trekking up to Tungnath temple were rewarded by otherworldly sights and mesmerizing experience. Some of the zoology enthusiasts went further up to the Chandrashila peak and many would attest to the spiritual awakening they had on that beautiful mountain.*

*The journey of the soul found it's natural ending at Rishikesh, which was buzzing with people from all over the world converging to find meaning in their reflection in the Ganges, under the Laxman Jhula.*

*Amongst the clouds, bathing in Molten gold,  
A monal danced to the tune of the flute.  
I prayed here till dusk when it dawned upon me;  
I had forgotten to visit the temple.*





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To make the students at par with the current advances in the field of research, the Department Of Zoology in collaboration with INSA organised a three day workshop on computational biology for metagenomic analysis. During this training, the students were introduced and given hands on training on the various tools being utilised till date in metagenomes and microbiome studies under the impeccable guidance of Dr. Rup Lal, Dr. Vipin Gupta, Dr. Utkarsh Sood, Dr Princy Hira and Ms.Nirjara Sanghvi. The biggest feat of the event was not in its successful conclusion but rather its imprint, its power in igniting a spark in the young scientists for the future.



# FIRST YEAR

*Salty BUT Sweet!*

*Our future is as good as our taste in memes!!*



# Second Year

*"We are basically a bunch of grown up kids..."*

73



74

# THIRD YEAR

*Introducing the babbling, bumbling band of baboons of our zoology dept., TZH*





International Workshop on "Air Pollution and Public Health: Challenges & Intervention"



## RESEARCH AT THE DEPARTMENT OF ZOOLOGY

Since its establishment in the year 1984, The Department Of Zoology has always been forwardly progressive in the field of research. Our amazing faculty highly believes in providing quality education to students along with inculcating in them the knack and enthusiasm for research which will help them in their overall academic growth. Juggling between their classes and labs, our teachers have left no stone unturned to set benchmarks in their respective fields. Painting further, our enthusiastic students have also gathered to be a part of this legacy.

### WORKSHOPS ORGANISED/ATTENDED

Dr. Vartika Mathur along with Dr. Richa Misra, Dr. Namita Nayyar and Dr. Preeti Khandelwal organised a two day International Workshop on "Air Pollution and Public Health: Challenges & Intervention" on Feb 5-7 at Radisson Blu, Dwarka. The workshop comprised of 78 participants which included 13 experts and professionals from developing countries and 65 eminent medical professionals, scientists and government officials.

Dr. Mansi Verma organized an International Workshop on "Bioinformatics and its tools" in International Conference on "Bioinformatics and System Biology" held in Singapore on March 20th-21st, 2019. She further went on to organise yet another International Conference on – "Integrative Chemistry, Biology and Translational Medicine(ICBTM-2019)" from 25-26 February, under collaboration from Loyola University Chicago Stritch School of Medicine, USA.

Dr. Jayraj has innumerable oral presentations under his belt, one of which was "Immunohistochemical analysis of immune check point regulators PD-1 and PD-L1 and their correlation with p53 mutational status in sebaceous gland carcinoma."

Thirteen students from the department participated in the TERI- NCSTC Eco Next Investigation for Youth and eight students went for the National Workshop cum training on Genome editing CRISPR conducted by Kirori Mal College, Delhi.

Jassika gupta won "TERI NCSTC eco next investigation for youth fellowship" catalysed by DST. She has conducted training on vermicomposting for employees of ERNET India (under Ministry of Electronics and IT, Govt of India) and has also presented her work at the international conference on molecular medicine at Amity University, Gurugram.



Kartikey Saxena has secured 3rd position in poster presentation in the category of "innovative idea" in the International conference on "frontiers in biochemistry and biotechnology: Strategies to combat human diseases" at shivaji college, university of Delhi and is currently involved in research projects as well.



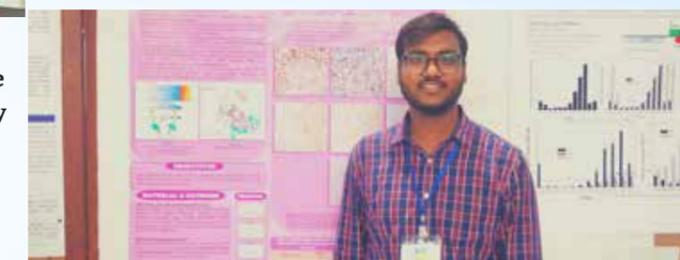
Aastha Saini worked as an intern at Wildlife Institute Of India, Dehradun under the guidance of Dr. Abhijit Das.



Vaibhav Sharma has been selected as a KVPY scholar, a joint programme of DST and IISc and has presented a poster along with Amit Bhatt at INSCR international conference on Current trends in microbiology and microbiome research.



Stuti kumari, Twinkle Kathuria and Jassika gupta won First prize poster presentation on "Immunohistochemical assessment of telomerase reverse transcriptase in eyelid carcinoma" deen dayal upadhaya college under the aegis of DBT star college.



Pranavi Kumar has presented her work on "Road building and landslides: Genesis and Ecology" at an international conference at the Norwegian University of Science and Technology, Norway.



Anushka Saxena is currently involved at an active research project under the guidance of Prof Y. Singh, Department of Zoology, North Campus and was a member of the abstract presented by Dr. Mansi Verma in the International Conference in Nepal.



Arsha Liz M Jos is doing a project on "Dietary and Lifestyle Habits" under the guidance of Dr. Kameshwar Sharma.

# Connect the dots!

- Fill in the blanks by finding answers from the articles mentioned.
- All the clues are interconnected, so, you cannot move to the next clue without solving the previous one.

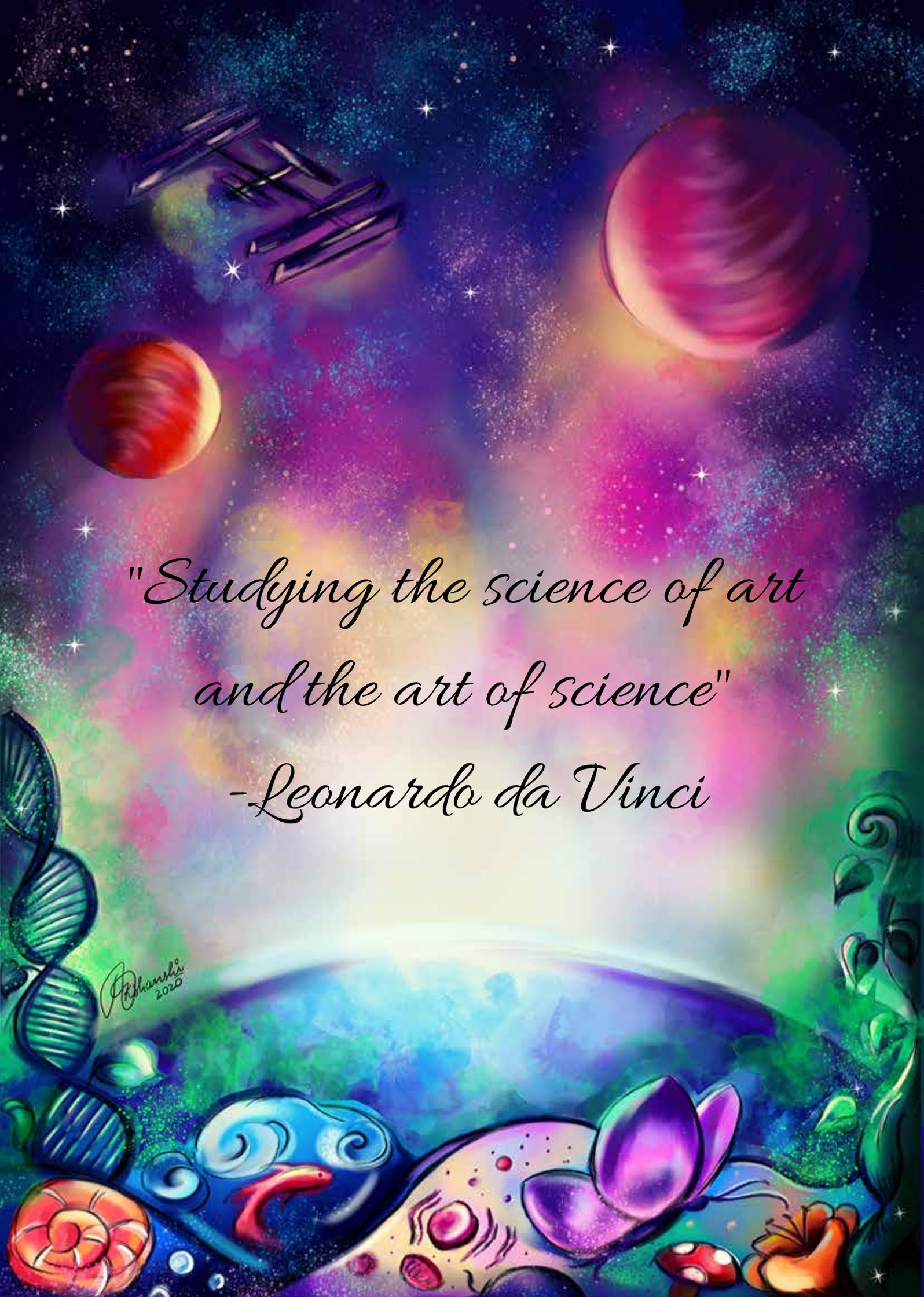
1. IAG came up with a list of \_\_\_\_\_ for plants. (To Plant a Forest)
2. Mealworms are \_\_\_\_\_ of a beetle (1) . (A Solution to Plastic Pollution)
3. Female angler fish (2) do not have abundant bioluminescent \_\_\_\_\_.(A Dive into the Deep Sea)
4. (3) can sometimes become \_\_\_\_\_ resistant. (May the phage be with you)
5. At high doses, flavouring cannot mask the taste of \_\_\_\_\_ that also includes (4). (Goodbye Insipid medicines)
6. TRASTUZUMAB is a (5) to treat a type of \_\_\_\_\_. (Personalized Medicine)
7. Rishi Kapoor suffers from (6) that affects a part of \_\_\_\_\_(Awareness via stardom)
8. Pinky (7) of a teenager confirmed a Neanderthal \_\_\_\_\_(Hybrid lineage)

9. Some \_\_\_\_\_(1) when young, start eating the (8) (cannibalism)
10. A (1) of (9) produces chemicals similar to a \_\_\_\_\_ moth. (The Toolsmiths of Animal Kingdom)
11. According to the first hypothesis of formation Semi identical twins, the (10) gamete gets pre divided into \_\_\_\_\_ cells.(Semi Identical Twins)
12. A chimera is a single organism containing (11)different sets of \_\_\_\_\_ (Human Animal Chimeras).
13. The \_\_\_\_\_ of a bacteriophage helps to transfer the (12) to the (3). (May the Phage be with You)
14. Mexican salamander can regenerate structures such as limbs, (13), retina, spinal cord, and some sections of \_\_\_\_\_ and brain. (Salamander Superpower)
15. The scientists knitted together the \_\_\_\_\_ and (14) cells taken out from the embryo of African Clawed frog. (Xenobots)
16. \_\_\_\_\_ is an autoimmune disorder that leads to painful coin shaped red lesions on the (15) (Awareness via Stardom)

## Answers

1. Species 2. Larval stages 3. Bacteria 4. Antibiotic
5. Drugs 6. Cancer 7. Bone 8. Mother 9. Spider
10. Female 11. Two 12. DNA 13. Tail 14. Heart
15. Skin 16. Discoid Lupus Erythematosus

ALL IMAGES IN THE MAGAZINE WITHOUT A DIGITAL SIGNATURE ARE TAKEN FROM THE INTERNET.

A vibrant, multi-colored illustration of a galaxy. The background is a deep purple and blue space filled with stars and a nebula. In the upper left, there are several purple, rectangular objects resembling a satellite or space station. To the right is a large, glowing pink and purple planet. In the lower left, a red and orange planet is visible. The bottom of the image features a DNA double helix on the left, a blue and purple biological structure in the center, and various colorful flowers and plants on the right. The overall style is artistic and scientific.

*"Studying the science of art  
and the art of science"*  
*-Leonardo da Vinci*

*Prakash*  
2020