MANIPAL SCHOOL OF LIFE SCIENCES
MANIPAL
(A constituent unit of MAHE, Manipal)

Vivus

Vol 6 Issue 4

Editor's Note

Dear Readers,

We hope you are doing well and staying safe in these trying times. Get vaccinated, continue to follow the guidelines which by now must be habits.

This being the last issue of this volume, we would like to thank all our contributors, team and dear readers for the motivation and support.

In this issue, we invite you to be immersed in the products of imagination of the creative minds of MSLS. These soul-touching poems and beautiful artwork are bound to delight everyone. As always, head to the What's Up MSLS section to find out what has been going on at MSLS. The articles in the Get Scientified section are bound to be impactful and will provide food for thought.

We are immensely grateful to our Director, **Dr. K Satyamoorthy** who has been a constant support and has guided us through every step in bringing out this new issue of Vivus. We would also like to thank our faculty advisors, **Dr. T. G. Vasudevan**, **Dr. Vidhu Sankar Babu** and **Dr. Saadi Abdul Vahab** for their reviews and advice. We also extend our thanks to all the faculty, research scholars, students and everyone who makes MSLS what it is.

Designing and Cover page design by – **Ms. Shalon Pinto**
Presenting Vivus – Volume 6, Issue 4
Preksha Mandlecha, Sanjana Bhat, Prahalad Rao
Editorial Board 2019-2020
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"IN THIS ISSUE"

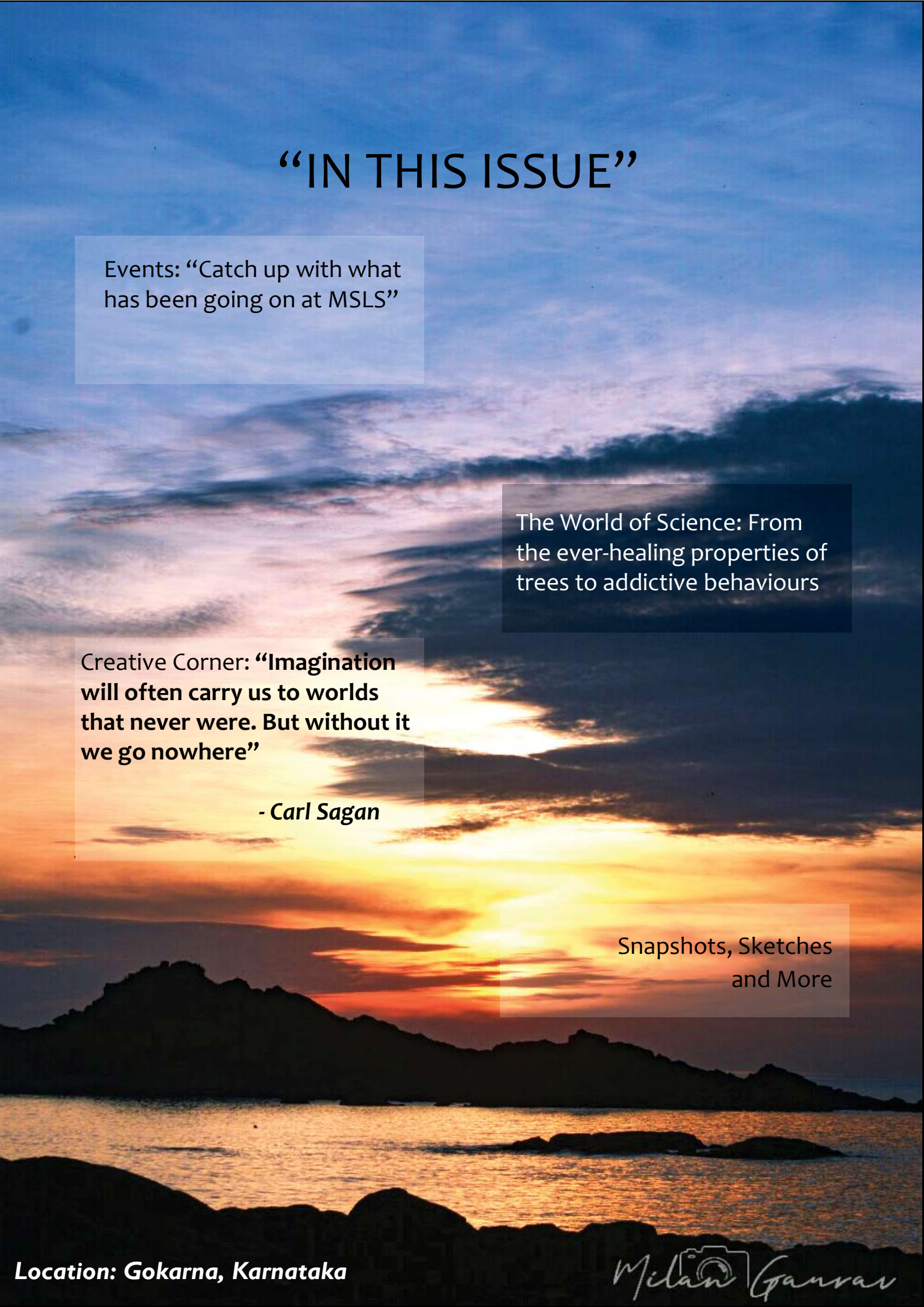
Events: "Catch up with what has been going on at MSLS"

The World of Science: From the ever-healing properties of trees to addictive behaviours

Creative Corner: **"Imagination will often carry us to worlds that never were. But without it we go nowhere"**

- Carl Sagan

Snapshots, Sketches and More



Location: Gokarna, Karnataka

Milan Gaurav

What's up MSLS?

Location: Malpe Beach, Udupi, Karnataka

Sanskrit Day 2020

In view of Sanskrit week celebrations of the Government of India, Manipal School of Life Sciences organized a talk by Dr M.S. Valiathan, National Research Professor, on August 4th, 2020, to celebrate World Sanskrit Day. The virtual talk was attended by students, faculty and research scholars of the school.

Dr. Valiathan spoke on the topic 'Sanskrit as a language for Science' and gave an insight on the importance of Sanskrit language and manuscripts in research, medicine, mathematics, astronomy, etc. He de-scribed how these manuscripts were discovered, edited, and published; and mentioned that many more were yet to be discovered. He also mentioned that Artificial Intelligence uses Sanskrit because of its inexhaustible vocabulary and the process to coin a term if it does not exist already. Sanskrit's relevance today in Ayurveda for treatment using Prakriti – Vata, Pitta, Kapha was also explained.

Dr. Valiathan also noted that recovery of manuscripts is self-recovery of our scientific heritage and it increases confidence in our own selves. He also gave some examples - "Mata Bhumi, Putra Aham" from the Atharva Veda, which means, "Earth is my mother and I am her son". It shows the love of Earth, and if we destroy Earth, it is destroying ourselves.

He concluded the talk with the apt message to "Preserve, Spread, Cultivate and Celebrate Sanskrit".

-By Preksha Mandlecha (M.Sc. MBT)

The World of Science

Location: Brahmavar, Udupi, Karnataka

Linking COVID-19 lockdown to addictions

Ms. Shatakshi Roy is a student in MSLS currently pursuing her Bachelors in Biotechnology. She won the 2nd prize in the ShowYourSkill-Lite contest, organized by Coursera, in the 'Research and Papers' track for her presentation titled "Analyzing the link between Covid-19 lockdown and addictive behaviours". The following are her views on the topic.

The demanding yet restrictive challenges that arise when living in a state of lockdown can cause the development of certain behaviours within vulnerable as well as unaware individuals, often aimed at compensating for the lack of interaction with the society and the external environment.

An addiction is the continuous intake of a substance to induce a physio-biological change in the body, and in the end a loss of control over this intake. What starts off as a casual habit among individuals like checking the internet or playing mobile games or sleeping in as a way to spend the excess time indoors, gradually leads to a craving for it as the effects of the lockdown start to pile up. A lack of social interaction, the increasing disruption in sleeping and eating cycles as well as considerable decrease in physical movement, all interconnected with stress and fear of the situation, count as one of the many effects currently experienced.

The mechanism in the brain, which produces a sense of euphoria, involves neurotransmitter systems namely the Medial Forebrain Bundle or MFB reporting to the reward center of the brain, the Nucleus Accumbens (NAcc). The most relevant chemical whose pathway originates from the MFB is dopamine, which increases in concentration when the body thinks it has done something worthy of a reward. The MFB passes through the hypothalamus which regulates activities like eating, drinking water and breathing; Addiction to substances that trigger the chemicals in the MFB will start to feel equally as or more important than these activities.

One of the obvious changes taking place in the pandemic is the sudden cessation of social interaction, be it physical or oral. One of the components of the NAcc is the Ventral striatum (VS), which is activated upon such socialization. Along with providing a feeling of community, socialization helps in a person's self-esteem by involving praise and attention from others. The loss of social rewards can pose major health concerns as documented in rodents and humans from controlled social contact and childhood environments, whose VS thus developed long lasting striatal structural changes. This evidence backed up by the current scenario encourages the want to feed on interactions obtained from elsewhere; an easy option is the virtual world. This behaviour promotes the reduction in physical activity like exercise, which, as a result of lockdown, is highly limited nonetheless. Two of the main genes upregulated by exercises like sports or running are BDNF and TrkB. BDNF (brain-derived neurotrophic factor) is important for the growth of neurons and their synaptic plasticity. Along with a receptor protein TrkB, it aids in transcription of genes associated with the glutamatergic system. Exercise also acts like one of the main sources of dopamine, popularly known to show an antidepressant effect for mild depression, similar to other serotonergic medications; but the lack

of this can trigger an addiction to other activities that provide similar neurological effects and are obviously more accessible in the present scenario. This leads to an internet and gaming addiction and most importantly, a smartphone addiction. All three of them act like a place to look for social support, self-confidence and relationships. The smartphone addiction, once developed, further alters the production of other chemicals and neurotransmitters in the brain, for example, GABA neurotransmitters. GABA, which, among other functions, slows down brain signals, is produced in a higher concentration than another neurotransmitter Glutamate-glutamine. The latter opposes GABA by causing neurons to get more excited. Along with the downregulation of the glutamatergic neurotransmission due to the lack of BDNF, the smartphone addiction increases further, like a vicious cycle.

The third main challenge is the disruption of sleeping and eating cycles. The significance of following the circadian rhythm is reflected in nutrient and energy metabolism, maintenance of heart rate, and in hormonal and gastro-intestinal secretions. A correlation between the rejection of this circadian rhythm and using food consumption as a reward involves the VTA (ventral tegmental area) of the reward circuit and two hormones, Ghrelin and Leptin. Ghrelin, which results in the deposition of fat, is produced in larger quantities under sleep deprivation and Leptin, which results in energy exhaustion, sees a decrease in production. Along with these hormones, the non-homeostatic signals .i.e. reward prompted eating, as opposed to the easily overpowered, appetite prompted eating, which are processed in regions of the brain like the VS, can also lead sleep-deprived individuals especially, to crave for food. The dopamine hit when eating tasty foods and sweets also adds to this cycle. The other change stemming from this reduced sleep that make the addiction more unhealthy is the decrease in the resistance to insulin. This leads to more production of insulin, which is a high risk factor for weight gain. The production of gastric acid at abnormal levels throughout the daytime, leads to a decreased nutrient absorption. Because of the addiction, there is noticeable weight gain and a health risk factor.

The existing forms of therapy for addiction are drug therapy like psychoactive medications and non-drug therapy like cognitive behaviour therapy and group therapy. However, in an obvious manner, these treatments tackle the mental disorder after it has taken place. A therapy that aims to recognize any budding addiction that is in abundance in the present scenario, and prevent its development into a serious issue, to the point when drug and nondrug therapies would need to come into play, would require the first step to be the acknowledgement and identification of the above stated and many more consequences of the lockdown, and then to link them to the mechanism of addictive behaviours.

-By Shatakshi Roy (B.Sc. BT)

How do Bats live with so many Viruses?

For almost the past two years, there has been quite a buzz about the Coronavirus hosts – bats, them being hosts for plenty of viruses and also their tolerance as to not get affected by these viruses resident in them.

Bats (*Chiroptera*) are the only mammals which have their forelimbs adapted as wings thus making them capable of flying. They are also the natural reservoir or greater hosts for a diversity of viruses than other non-flying mammals. They are hosts for approximately 137 viruses of which 61 are zoonotic viruses. Bats are also becoming more widely acknowledged as reservoir hosts for viruses that may spread over species barriers (i.e., "spillover") and infect humans as well as other domestic and wild animals. Some of the deadliest viruses carried by bats include Nipah virus, Hendra virus, Rabies virus, Ebola virus, Coronavirus, Marburg virus etc. Although these viruses are deadly and fatal to humans, bats seem to tolerate these viruses pretty well. 'How do they do it?' is indeed the major question here and the answer to this question is in the unique defense mechanism of bats.

Dampened STING-interferon Pathway:

In bats, STING-interferon pathway, an antiviral immune pathway is dampened due to the replacement of the highly conserved serine residue (S358) in STING. As a result, bats may maintain just enough defenses against disease to prevent the immune system from overreacting.

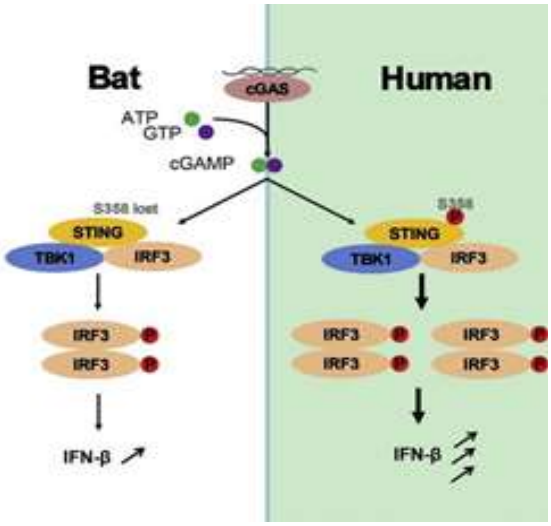


Figure: Dampened STING-dependent interferon pathway (Xie et al., 2018).

Releasing Anti-inflammatory Cytokines:

Bat macrophages mount a rapid antiviral response once a pathogen is recognized. However, by producing anti-inflammatory cytokines, bats may swiftly reverse their immune response. Bats may have developed this unique anti-inflammatory response to neutralize pro-inflammatory stimuli resulting from the flight.

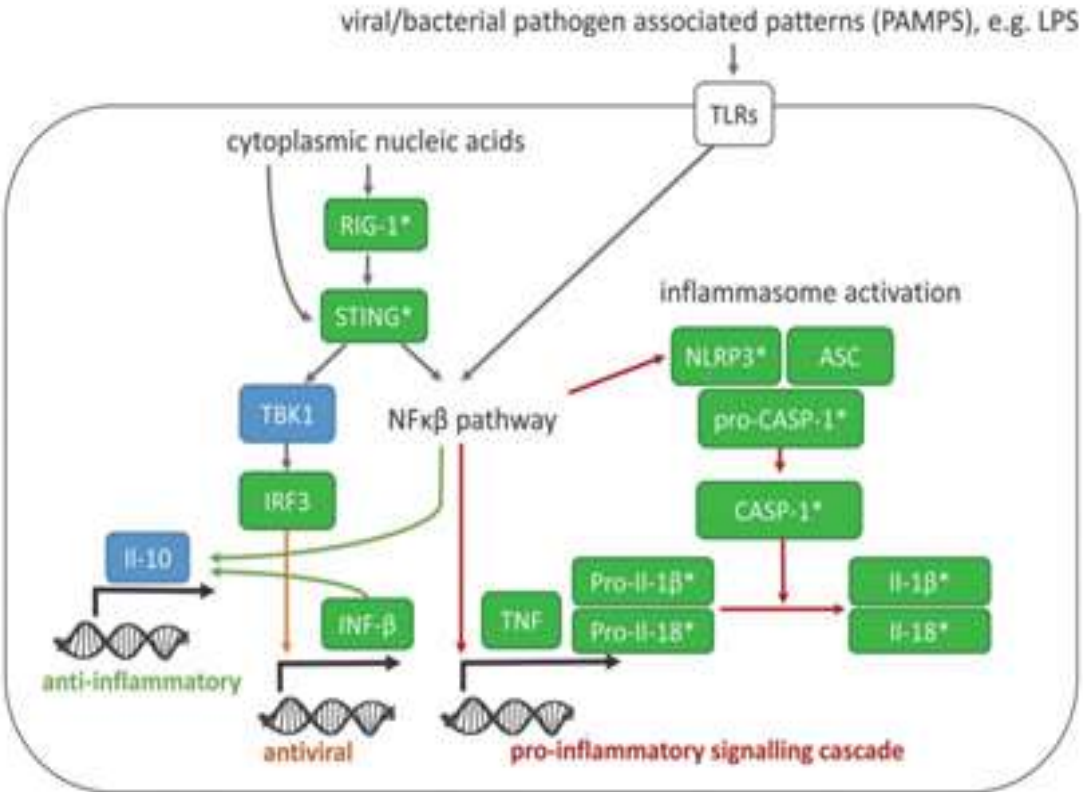


Figure: Evolution in genes responsible for activating antiviral or pro-inflammatory signaling on sensing viral infection (Kacprzyk et al., 2017).

Flight:

The bats' ability to fly requires them to adapt to constant molecular damage, sudden surges in metabolism, and rapid increase in temperature. When bats fly, their internal temperature increases to about 40°C (104°F). Only viruses that have evolved a tolerance mechanism survive in bats, as the majority of viruses are incapable of living at this temperature.

Thus, these robust defenses make bats highly immune to viruses, but the viruses do not disappear. They remain, maybe for the rest of the bat's life, and reproduce at a rate unseen and unheard of in other animals. Viruses can replicate faster in bats without affecting or harming them, but when they emerge into other organisms which lack the bat immune system, they are extremely virulent. As a result, some of the most dangerous diseases of our time were born.

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-By Preksha Mandlecha (M.Sc. MBT)

FORESTS: OUR ANTIVIRUS

Viruses are incredibly simple organisms. As organisms on the edge of life, their goal is simple – survive. They seek equilibrium with their host of choice by evolving to not cause excessive fatality of the host species, as the death of the host would often mean the death of the virus itself. Every time a virus infects a host cell, it can mix its genetic heritage with the other viruses present in the cell as well as with the host. Then it reproduces rapidly at the expense of the host and abandons the host with a different genetic makeup, sometimes allowing it to infect new species. In a new host species, in almost all cases, the fatality is at an all-time high until the equilibrium between the pathogen and host is eventually reached.

This movement of pathogens from one species to another is called **spillover**. Antigenic shift is one of the main reasons for the evolution of virus subtypes. **Antigenic shift** is the process by which two or more different strains of a virus, or strains of two or more different viruses, combine to form a new subtype having a mixture of the surface antigens of the two or more original strains.

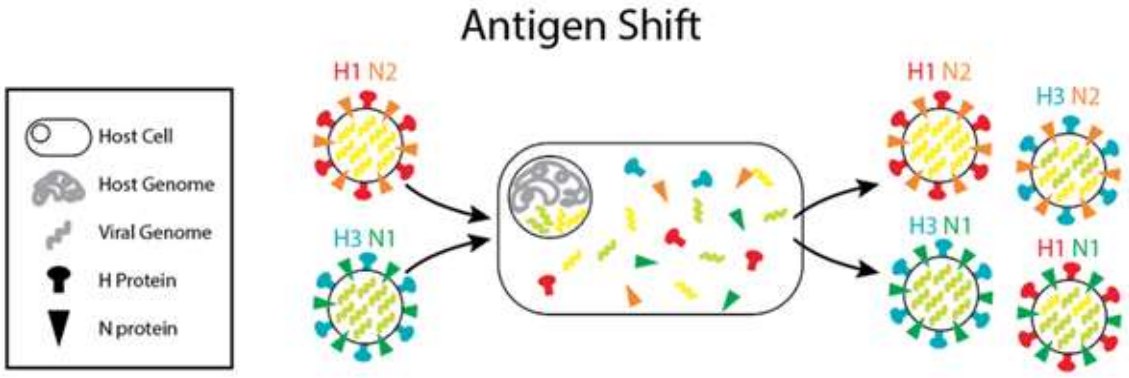

Figure 1: Two flu viruses can sometimes infect the same host cell. When they spill their contents into the cell, their genetic material can recombine, generating new hybrid viruses that are mixtures of their precursors. (Rebecca Senft, Science in the News)

In the past 30 years, the principal driver for spillover of zoonotic infections has been associated with human activities, including the changes in ecosystems, urbanization, international travels, and trades.

Let us look at a case-by-case study:

- The increasing incursions into West Africa brought the human populations close to the bats carrying the Ebola virus.
- In Belize, the runoff of nitrogen and phosphorus from agricultural lands to the deforested sites, hundreds of kilometres away, changed the vegetative patterns of the wetlands. This favoured a more effi cient vector for malaria, *Anopheles vestipennies*, compared to the less efficient vector *Anopheles albimanus*.
- In Malaysia (1998) and Kerala (2019), deforestation and habitat destruction due to rapid urbanization led to the Nipah virus outbreak.
- By studying the public enemy number one: the coronavirus SARS-CoV2, the likelihood of their origin partly linked to the trade of live wild animals is suggested. The alternate view of the outbreak blames unsafe and unregulated research on the strains of the virus in a Wuhan laboratory as an immediate cause.

These inhumane, under-governed practices such as deforestation and wildlife trafficking are the vehicles for spreading old and new zoonoses, increasing the risk of pandemics with enormous health, social and economic impacts.

"A healthy planet is the foundation of our own health and well-being."

Of all the emerging diseases, zoonoses of wildlife origin represent one of the most significant threats to the health of the world population. Globalization, with the ever-growing movement of people and goods, compounds the growing human impact on ecosystems. This enables the widespread diffusion of emerging diseases and old ones that were believed to be under control.

Natural ecosystems have a crucial role in supporting and nourishing life, including ours. Altering these ecosystems can aid the development and spread of infectious diseases. A few ways by which the declining biodiversity aids the spread of emerging infectious diseases are:

1. Increased spread of host species
2. Maintaining wild species captive in close contact with each other and with humans
3. Humans induce genetic changes in disease vectors or pathogens, such as the resistance of mosquitos to pesticides.
4. Destruction and degradation of forests that expose humans to new forms of contact with microbes and the wild species that host them.

To control and prevent zoonoses, scientists have developed methods to reduce the host or vector species. The most drastic measure so far is using controversial GMO mosquitoes to fight malaria in Florida, USA. In the long term, this could have a devastating effect on our ecosystem.

openwho.org

Over the last decade, the **"One Health"** approach has been promoted at a global level. One Health is a collaborative, multisectoral, and transdisciplinary approach—working at the local, regional, national, and global levels—to achieve optimal health outcomes recognizing the interconnection between people, animals, plants, and their shared environment. Only by recognizing that our health and wellbeing are closely linked to that of the natural world can we protect our species from the most harmful effects of pandemics.
The pandemic necessitates an urgent need for an in-depth reflection on the relationship between human beings and nature, the risks associated with current economic development pathways, and how we can better protect ourselves in the future.

Our Answer: Protect and Restore Nature

The fallout from this pandemic will dominate the global agenda for the foreseeable future. We as a community must take steps to reduce the risk of future pandemics.

It is our collective and individual responsibility to preserve and tend to the world in which we all live.

-Dalai Lama

We do not own the planet Earth; we belong to it. And we must share it with our wildlife.

-Steve Irwin.

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-By Manjushri Anbarasu (M.Sc. MBHG)

Creative Corner

Location: Varanga Jain Temple, Karkala, Karnataka

Milan Gaurai

Splash of Colours for Spring/Summer-2021

Ever noticed the underlying greys and browns on an artist's palette and wondered where these presumably ugly shades got lost or how they hid in the myriad of not too ugly hues that managed to make it to the epicentre of the artist's vision portrayed? Every being experiences the magic that mixing of colours is, be it with paints or dyeing of cloth or even the visualization of music with hues!

Meraki, a Greek word, talks about doing a task or any activity with absolute love and devotion for it, with undivided attention. Artists transcend minds' depths to tug on heartstrings and rise high with their souls. Such is a creation made from complete devotion! The greys and browns are the vital signs of struggle, structure, and realization of the hard work put into the process of creation.

Trust in the process; believe that the blacks and greys with only dashes of orange lay the greys and browns base. These are the by-products of your mixing to obtain the brighter shades that you seek. Appreciate every shade. Appreciate the present shade and embrace it. For spring brings with it a fresh canvas that is accepting of your present shade and its predecessors. Even phoenixes turn a pale grey before combusting into ashes, are re-born the same ugly shade, yet in their prime turn a raring red with golden plumage!

Much the same way, 2020 had begun with raging bushfires in Australia, markedly one of the worst in the last quarter-century! The remaining months brought with them the terrifying sights of mortality, casting an ugly grey cloud of uncertainty over the world while spewing hate and insensitivity like ash. Crippled democracies and governments went scurrying for cover under the blues, navy and presidential, seeking immunity under the guise of policies that were brought in too late. Eventually, with nature given some recovery time, teal sprung up, highlighting the issues created by man which he so arrogantly refuses to address; the skies cleared with azure and arctic, revealing the refreshed sights of turquoise renewed water bodies. Nature has taken all its constituent beings to orange depths and, in all fervour, shall raise them to glorious hues this upcoming spring. The question, though, is whether or not the presumably most sapient being shall hop on to nature's ride to the top and realize the pink of their health and the most green of ways to turn things around!

-By Gayatri Vadlamani (M.Sc. MBT)

The Nameless Girl I Knew

Every evening, she waited
With a warm comforting smile,
With a charm that never died.
She never failed to bring ease.
Her presence was soothing,
Her presence was precious,
Her presence, I always treasured it!
The comfortable silences we shared
Were like melodies of heaven,
Or like sweet peaches or mangoes perhaps,
But I enjoyed every second of it!
Her beauty was sweet and humble.
Her face had a soft glow and
Her hair had a calming coolness to it
Her gown flowed seamlessly with its rosy glow,
Persistently glittered bright,
Spread the aroma of solitude
And peace.
She always had said a lot without saying much
She sang through her quietude
She danced through her stillness.
She always embraced me and my thoughts.
She always accepted them, without judgements.
I am happy to have met her.
I am blessed to have seen her.
She was her,
She let me be me.

-By Anupama Balagopal (B.Sc. BT)

Her Garden

She woke up, with shabby eyes
With her thin wiry hair
Falling over her shoulders.
Flaky skin, lean body and a potbelly,
Not so well kept.
She already wore her death.
But no regrets, no shame
She never bothered.
Toiled every moment
For her precious blues and pinks,
And yellows and oranges
And greens
In her garden
She wanted them; she lived for them!
Wanted to see them grow and smile and laugh
And spread their charm everywhere
But her vision was unseen.
Through the hole on the wall
She saw and sensed, the rough
Dry, burnt pieces,
The dead, brown-greens.
Her blues and pinks and yellows and oranges
Were mere dust in the air
It was rotten, no birds,
No pretty butterflies
Everything was dead.
Just like her, it was decaying.
She saw the darkness then
Slowly eating her garden
Slowly eating her.
But she was a fervent nurturer
Stepped out, with a muddy mug
Dust and the dry sticking to her naked, stoney feet.
It was hurting her,
But, with much love,
She held out her pale, wrinkly hands and poured
And sprinkled water to each and every bit
Hoping to see them grow.
Hoping to see them live once again…

-By Anupama Balagopal (B.Sc. BT)

101 Lies

My eyes shimmered the moment I saw you.
I lost my breath while living.
Nothing was there in my mind.
The first accidental meeting was enchanting.

You brightened my face with your smile.
I laughed a bit more than usual.
You were the colour in my dark world.
But where did it all go wrong?

I stand here with you by my side.
You're my new dream and the better me.
I feel safe and at the same time like a baby
A baby who stops whining when it gets what it needs.

The first lie was to avoid losing you.
My second lie was to cover the first.
I was a coward who was afraid and trembled at,
The very thought of life without you in it.

Was it my lies that broke you?
Can you give me one chance?
I feel like falling from a cliff but without reaching the ground;
The 101 lies that I told, tore me apart,
Tore me from you and the world I loved.
And my 102nd lie to you will be,
"I Hate You"… …. … ..!

-By Twinkle Merin Thankachan (B.Sc. BT)

The Windy Ride Home

Started my 25 bucks Scooty,
Sitting on it, I had the courage of a pilot.
But I was a mere little panda on my Scooty.
I put on my helmet - the lifesaver.
Smiled, smiled, smiled, and I don't know why?

It's past midnight with the crescent moon smirking,
I had already broken the deadline to reach home.
It was windy and I was in a hurry.
The two didn't go well I supposed first,
But they were made for each other.

The road was devoid,
My mind was void.
My tank was full,
Therefore my heart was full.

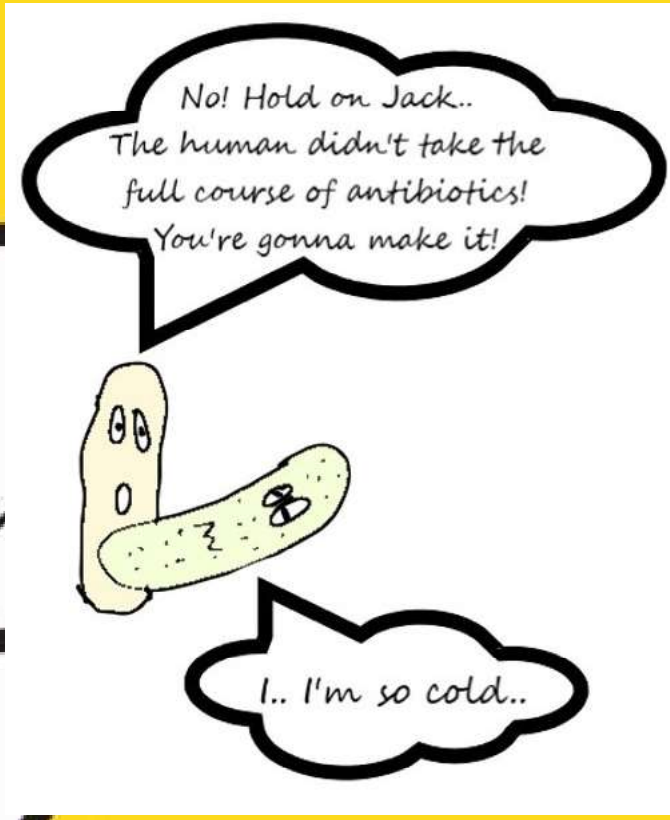
I began humming like a bee,
A once forgotten song.
Was it the wind that made me sing?
The sky was black, but my eyes were probably twinkling.

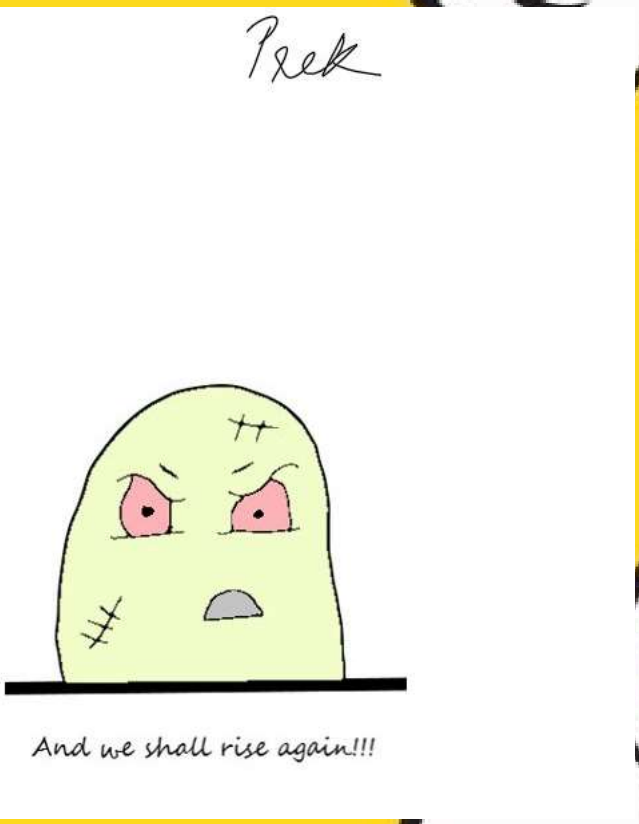
The eighteen hours of work and tiredness,
Seemed like feathers now.
I'm in synchrony with the wind - fast but calm.
I was just enjoying it to the maximum.
But I guess it's enough – a candy once in a blue moon.
I reached my home.

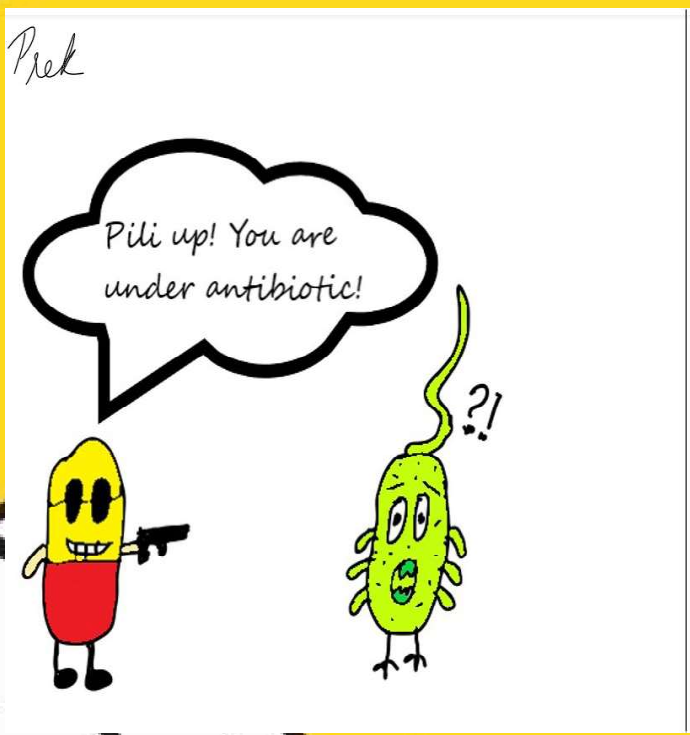
-By Twinkle Merin Thankachan (B.Sc. BT)

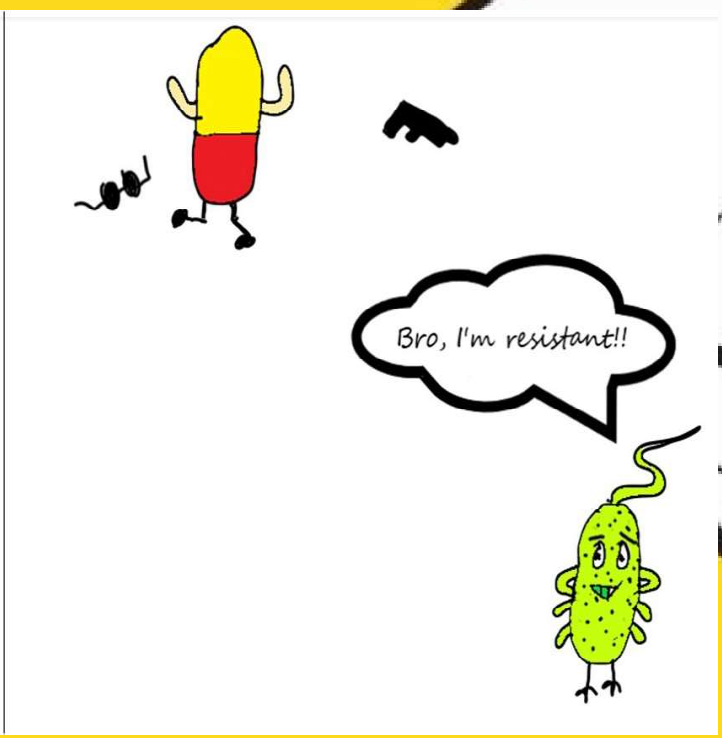

Snapshots, sketches and more...
"Take only memories, leave only footprints"
-By Sourab K Shetty (M.Sc. MBHG)
Location: Kodi Beach, Kundapur
SS PHOTOGRAPHY

Comics by Preksha



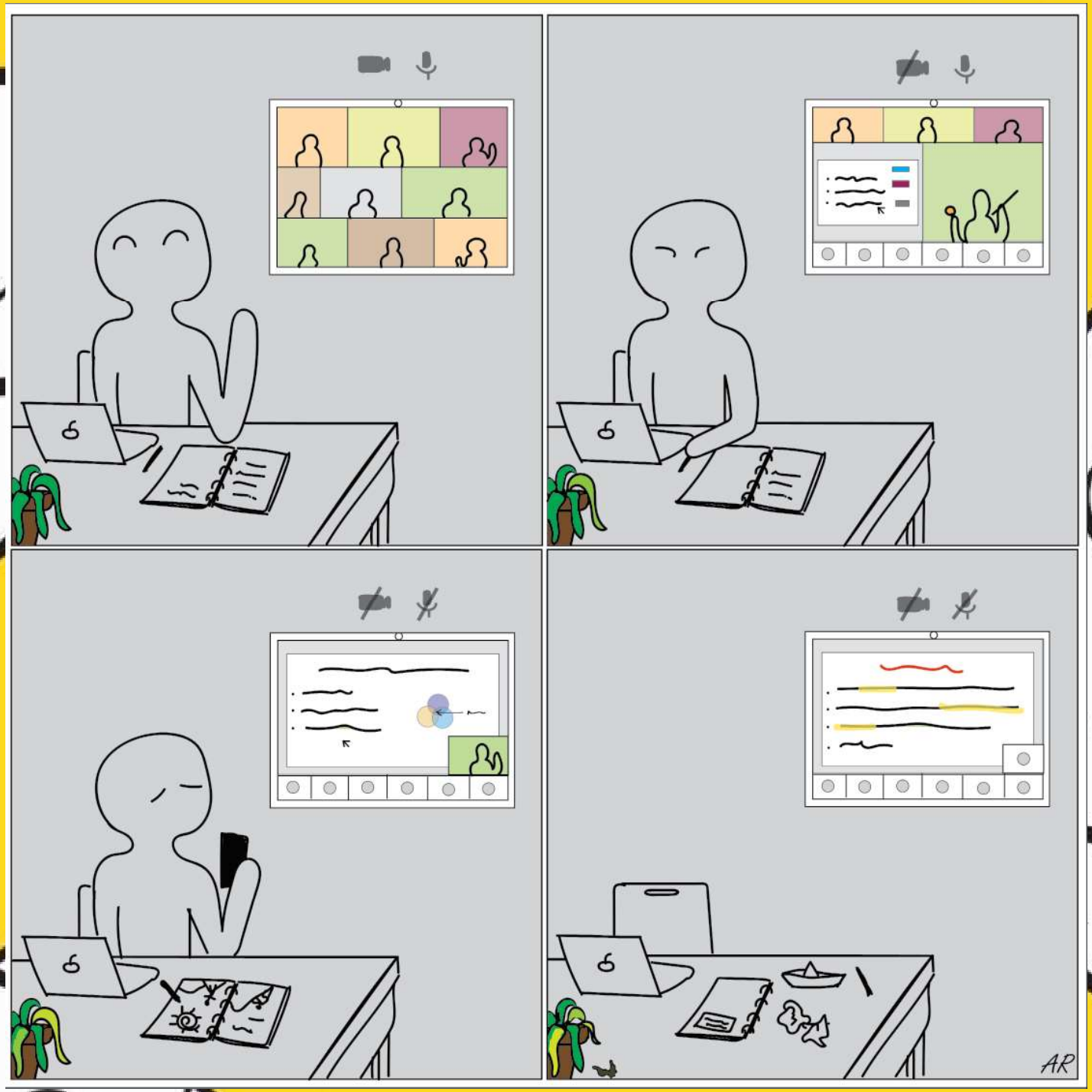






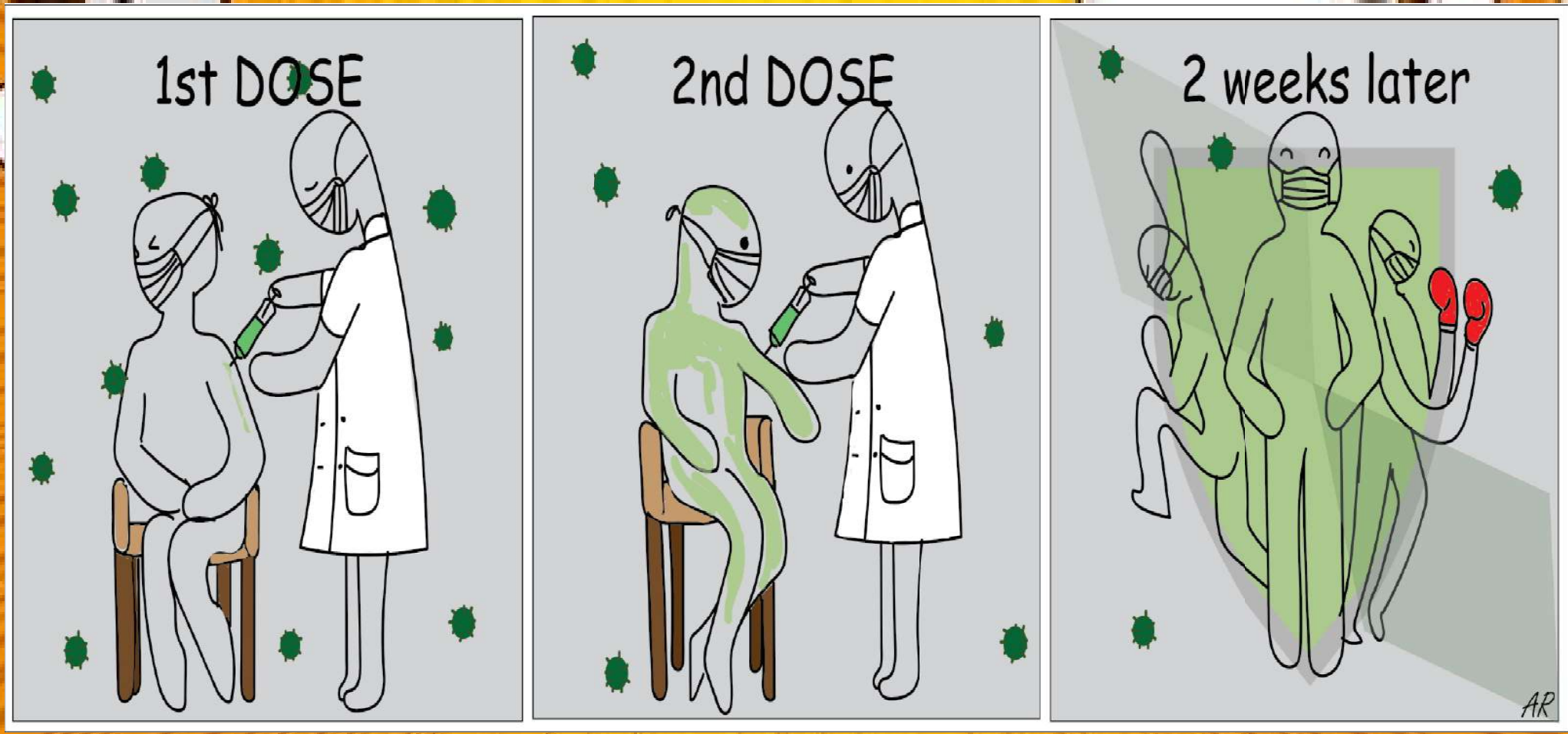
-By Preksha Mandlecha (M.Sc. MBT)

Comics by Ananya



-By Ananya Rao Kedige (M.Sc. BI)

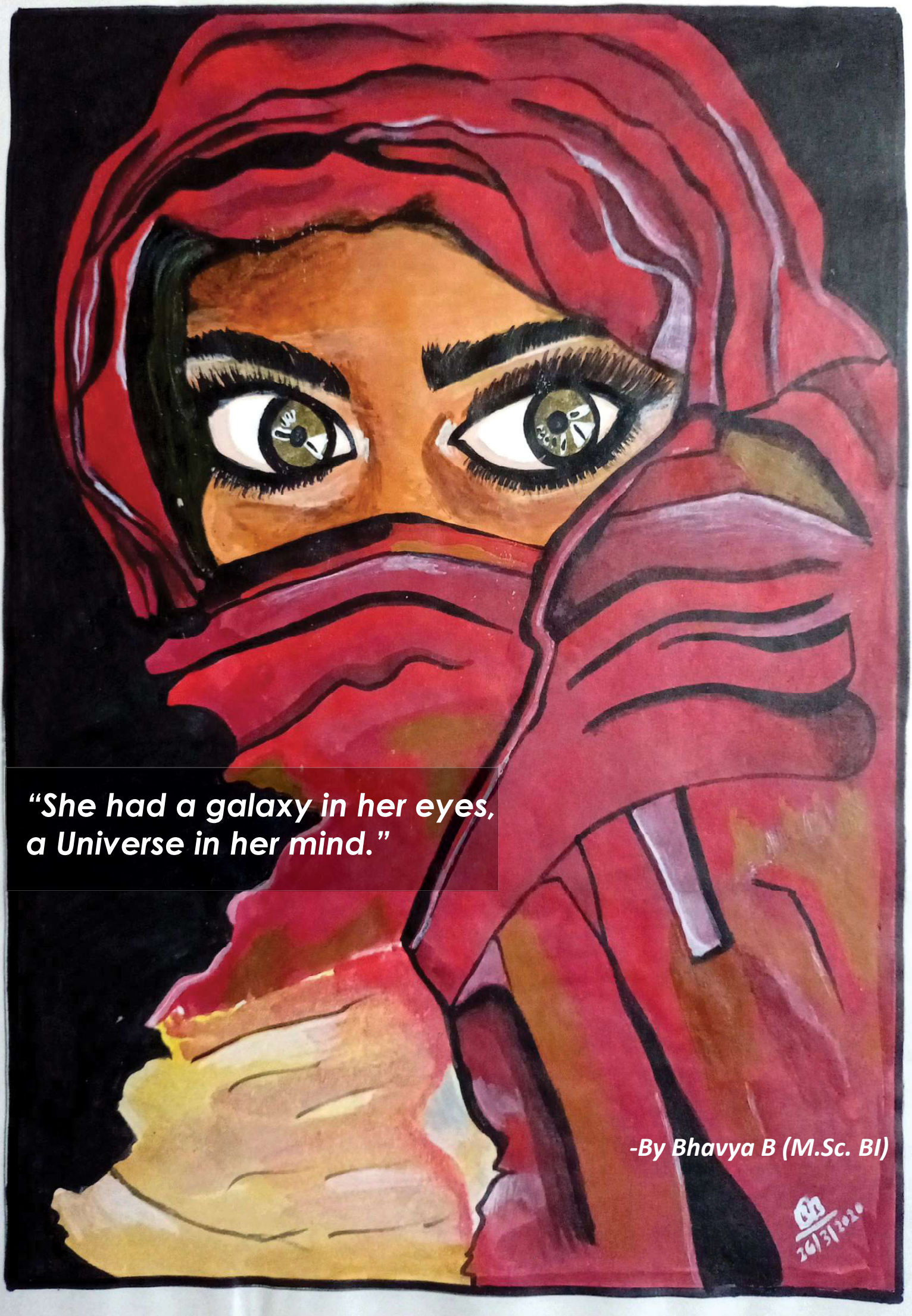
Comics by Ananya

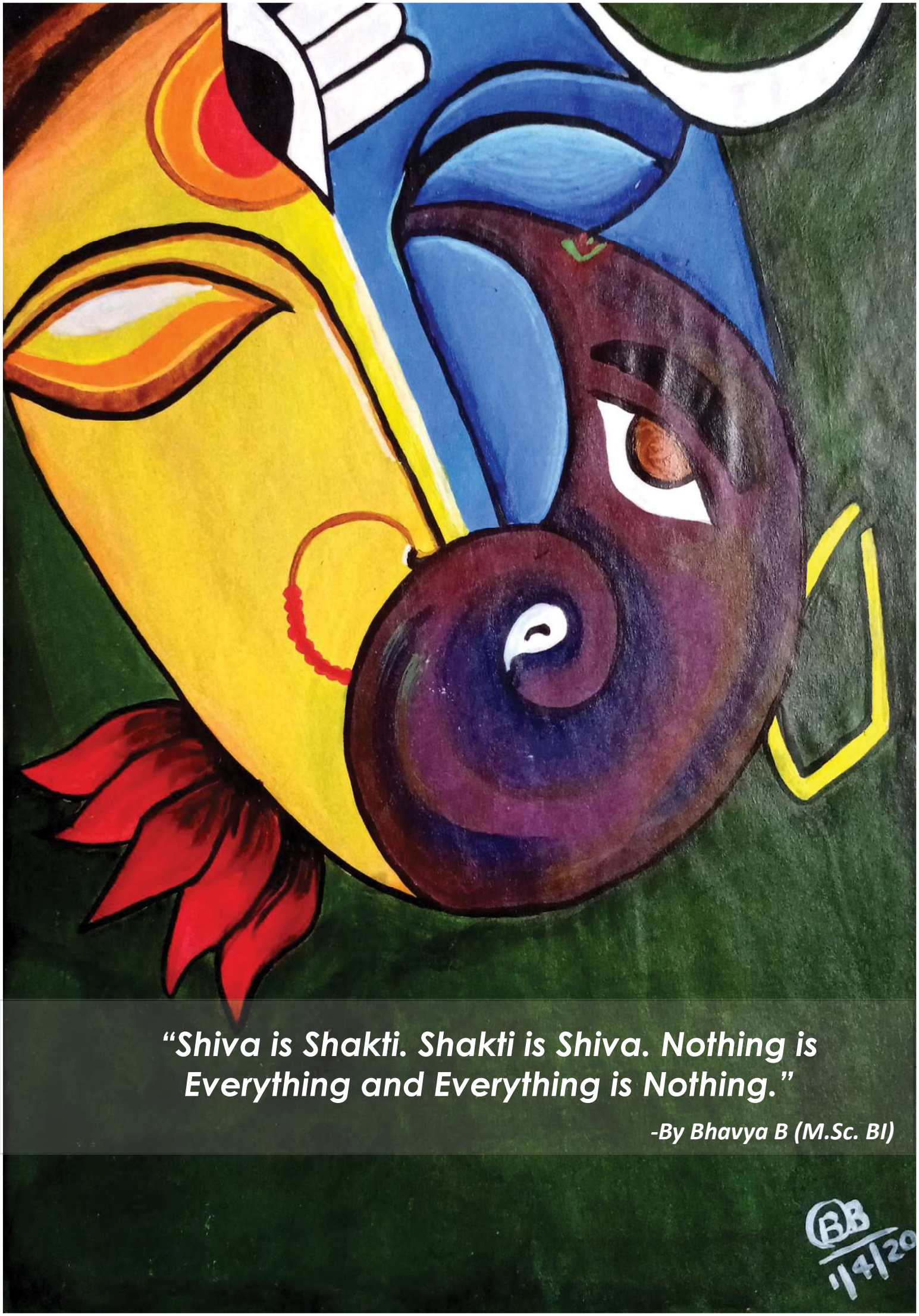


-By Ananya Rao Kedige (M.Sc. BI)

Origami snowflake

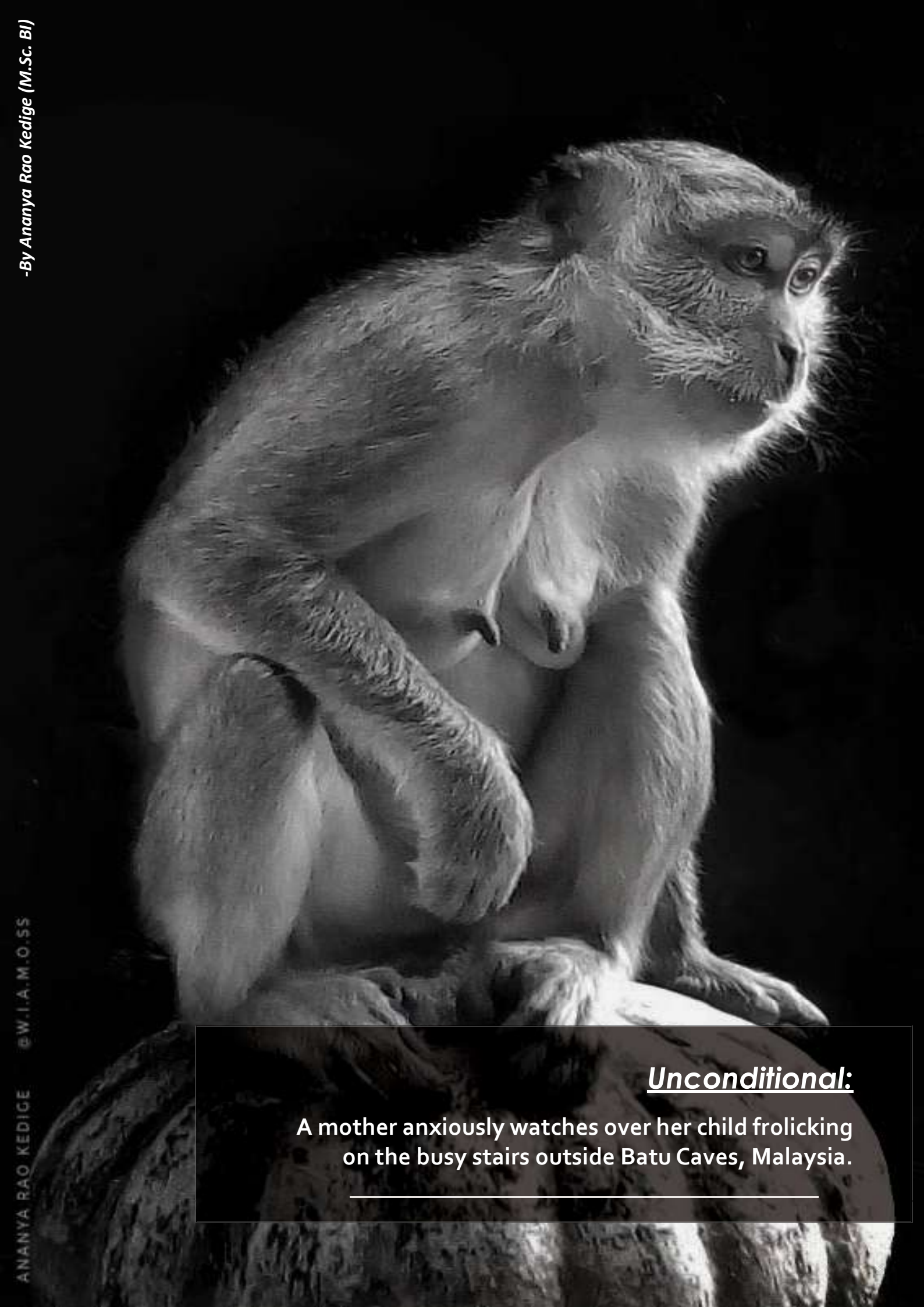
-By Poojita Kondur (B.Sc. BT)


"She had a galaxy in her eyes,
a Universe in her mind."
-By Bhavya B (M.Sc. BI)
26/3/2020


"Shiva is Shakti. Shakti is Shiva. Nothing is Everything and Everything is Nothing."
-By Bhavya B (M.Sc. BI)
BB
1/4/20

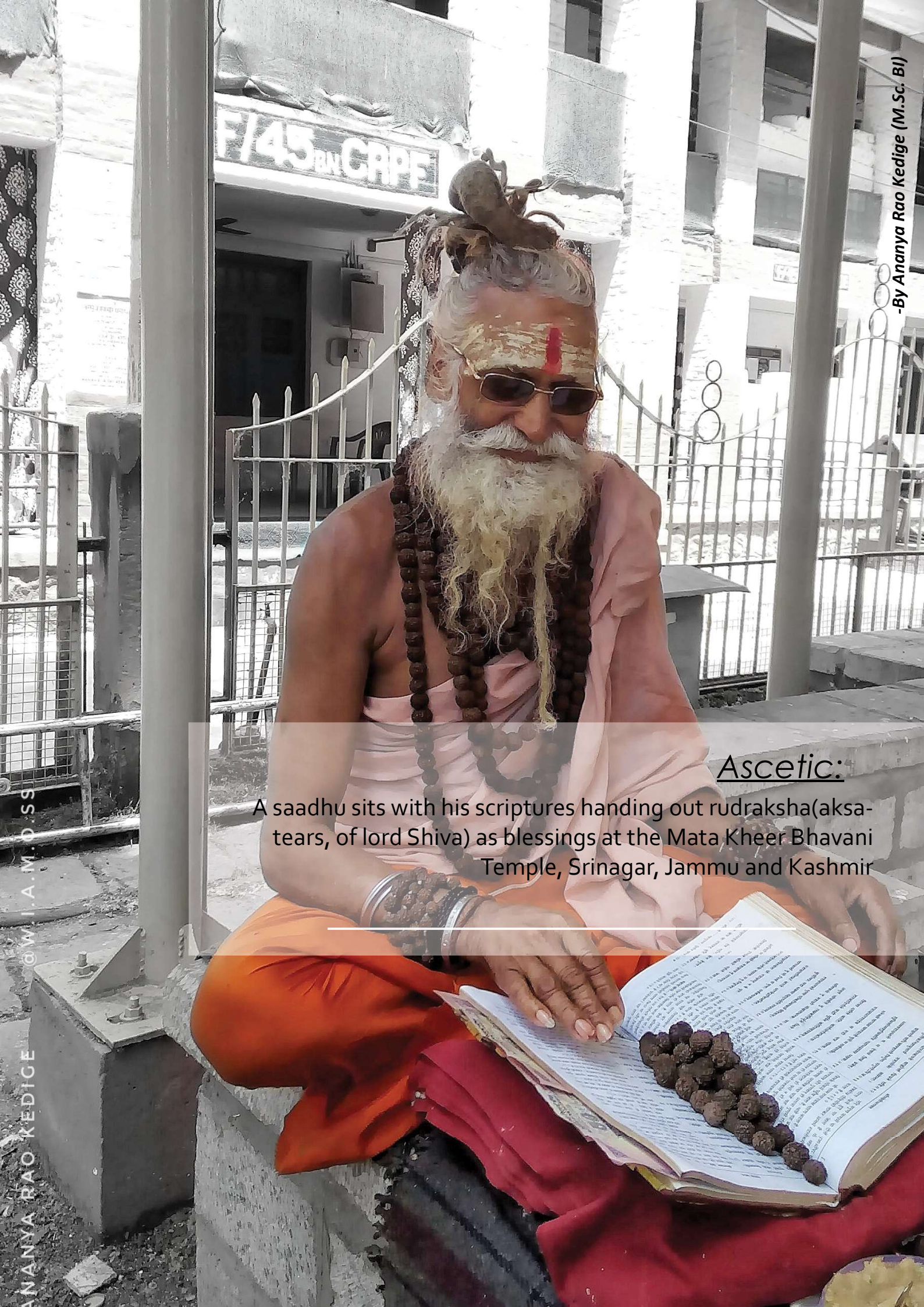
-By Yashaswini Valanja (B.Sc. BT)

-By Mahima Shenoy (M.Sc. MBT)



Unconditional:

A mother anxiously watches over her child frolicking on the busy stairs outside Batu Caves, Malaysia.



-By Ananya Rao Kedige (M.Sc. BI)

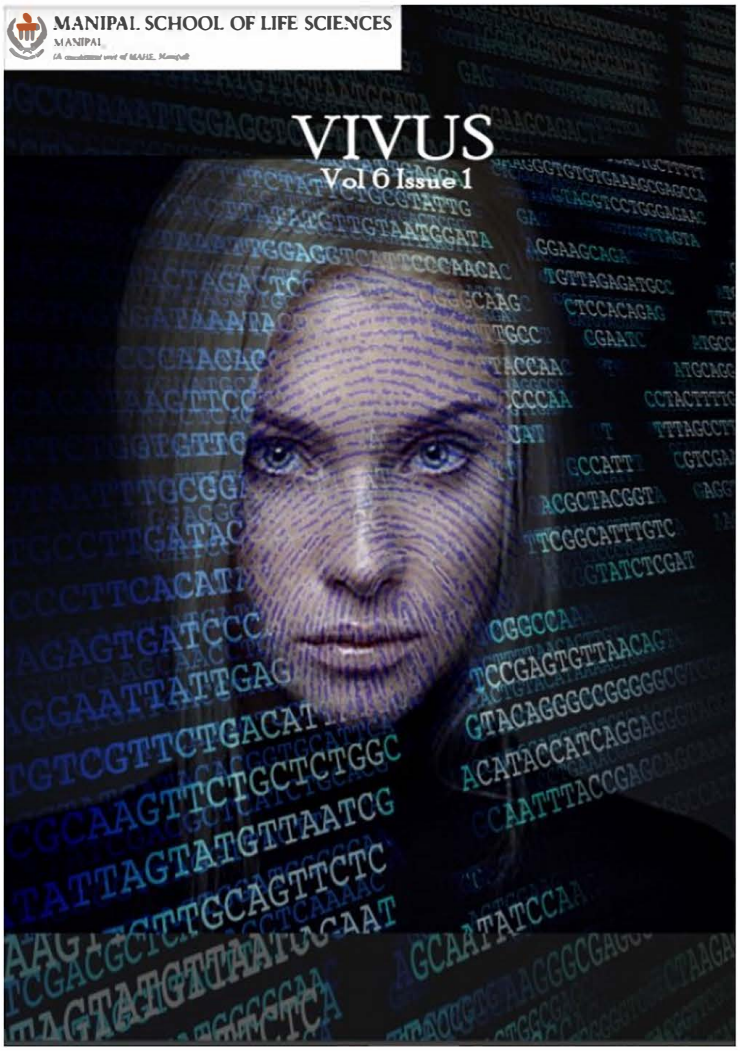
Ascetic:

A saadhu sits with his scriptures handing out rudraksha(aksa- tears, of lord Shiva) as blessings at the Mata Kheer Bhavani Temple, Srinagar, Jammu and Kashmir

"Beauty attracts the eye but personality captures the heart"

Location: Korgi village, Kundapur

-By Sourab K Shetty (M.Sc. MBHG)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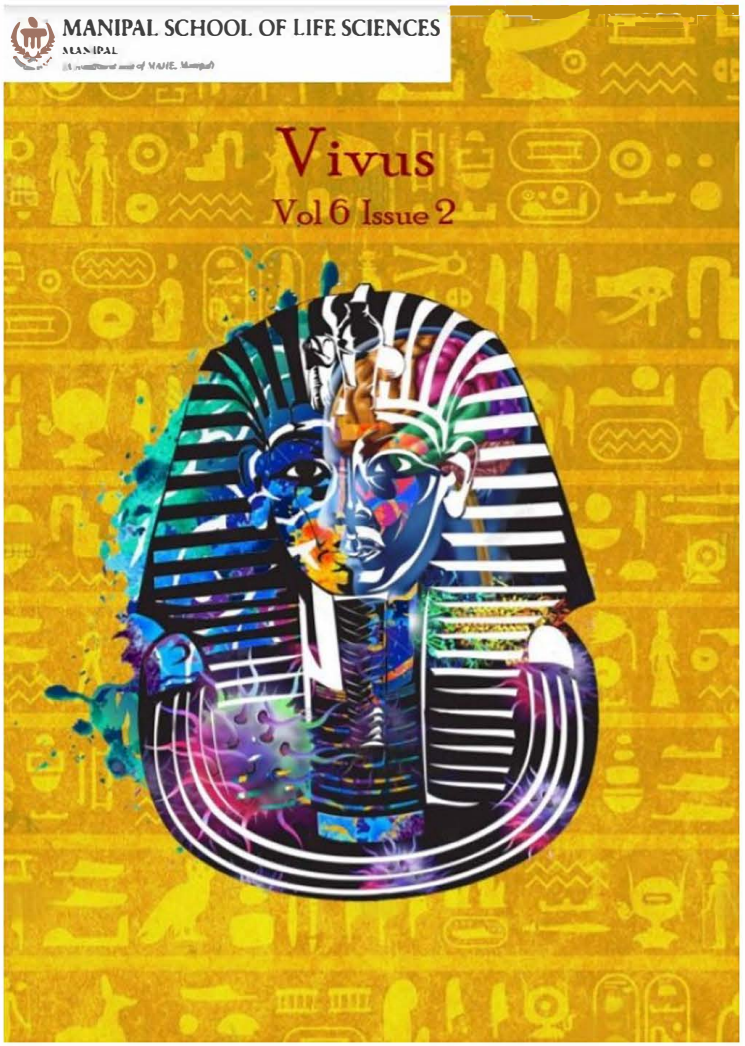
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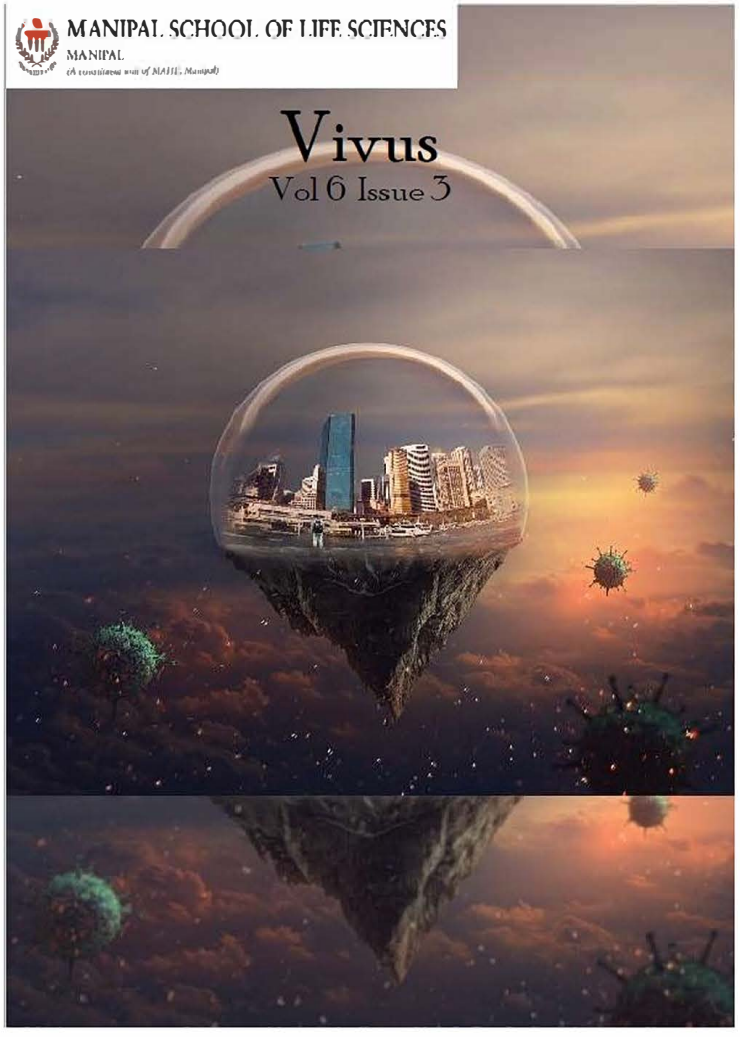
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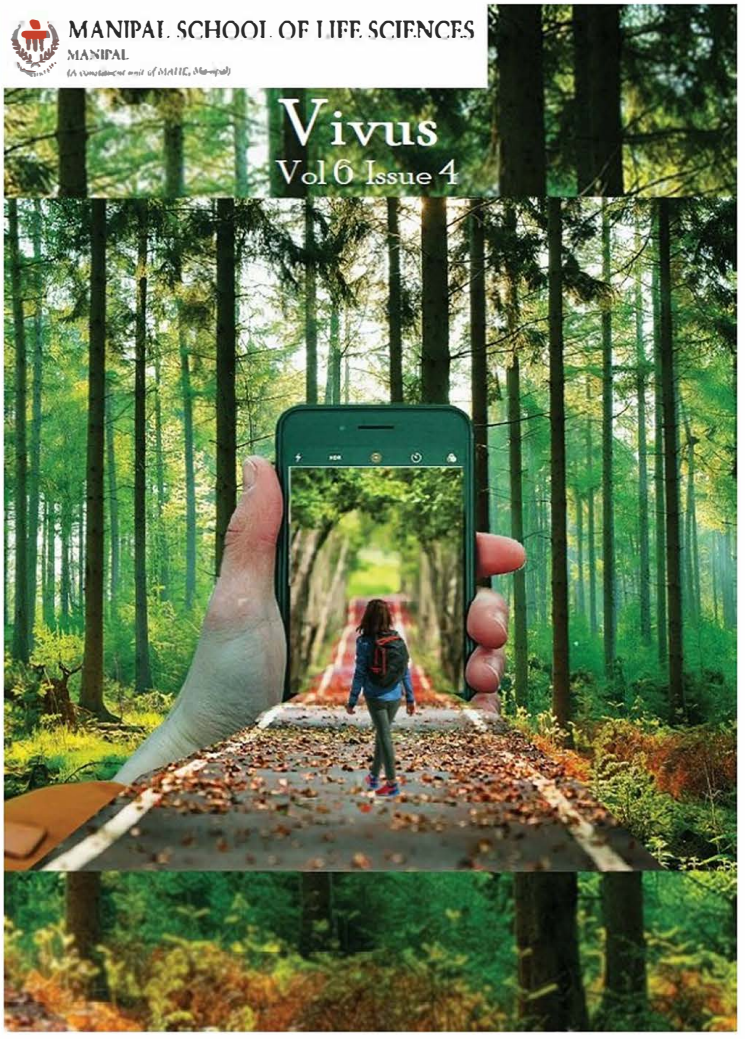
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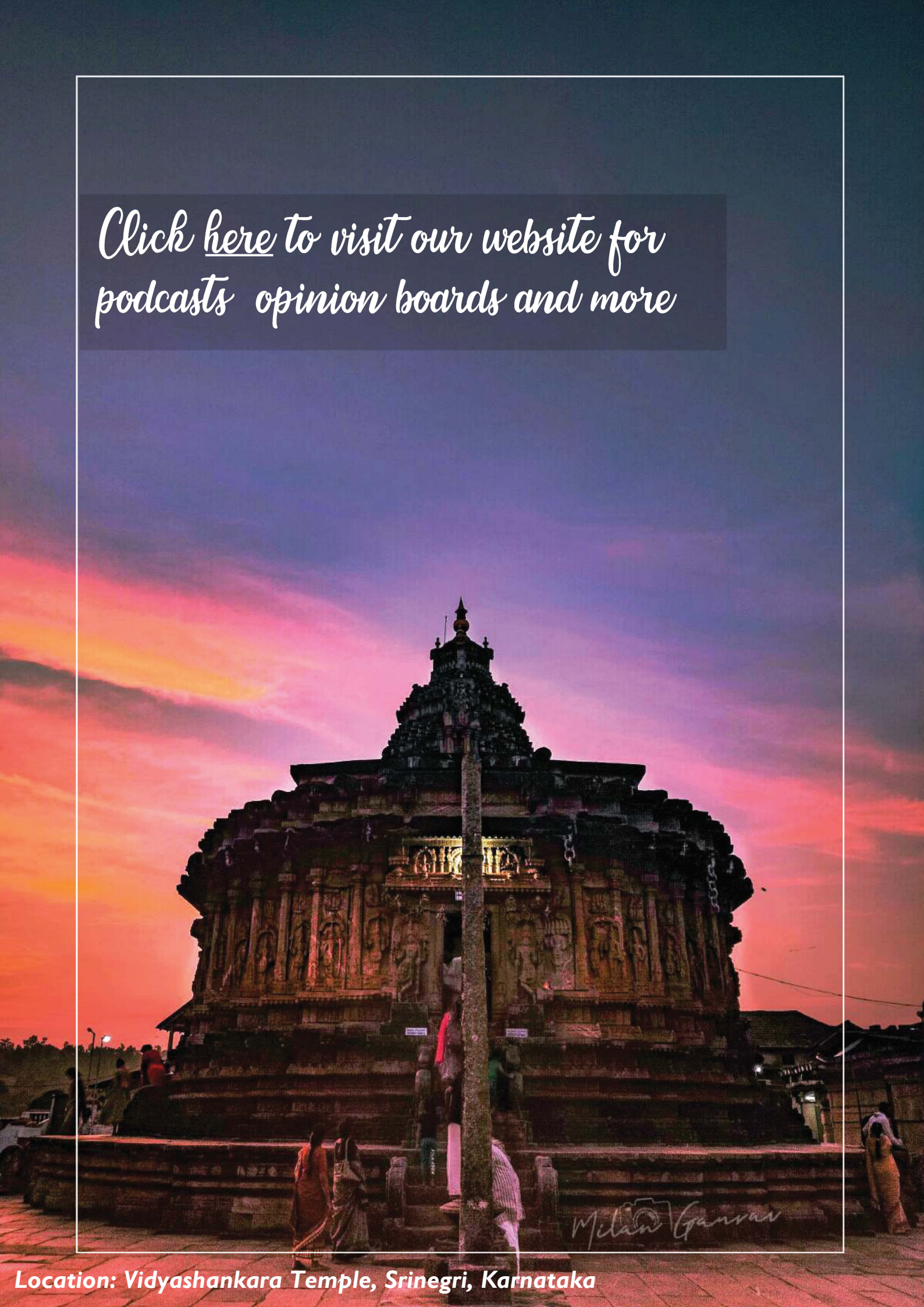

Location: Vidyashankara Temple, Srinegri, Karnataka