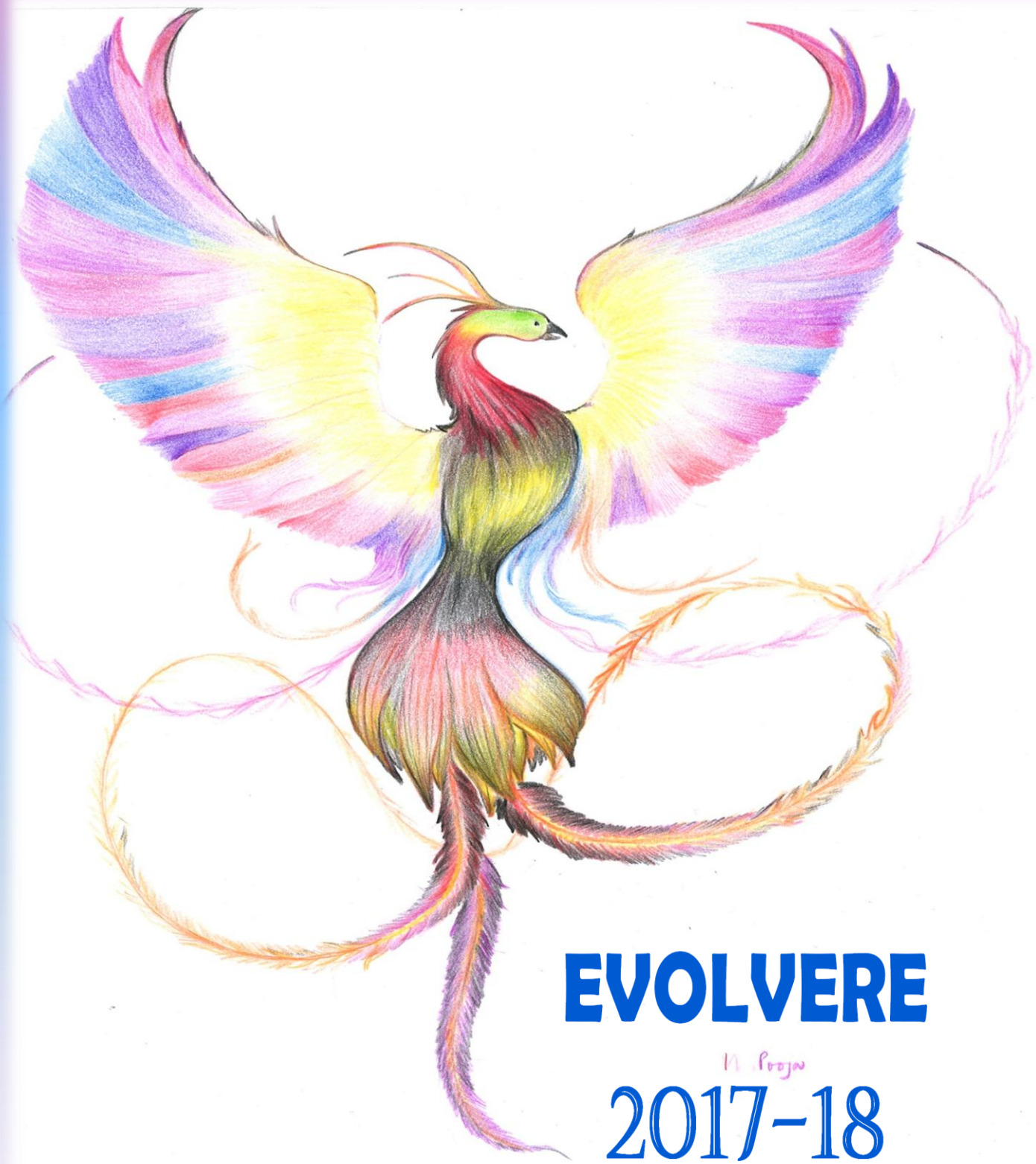
MIRANDA HOUSE UNIVERSITY OF DELHI

स्वाध्यायान् प्रमदितव्यम्

Synapse



EVOLVERE

N. Pooja

2017-18

EVOLVERE

2017-18

Beauty in the beast

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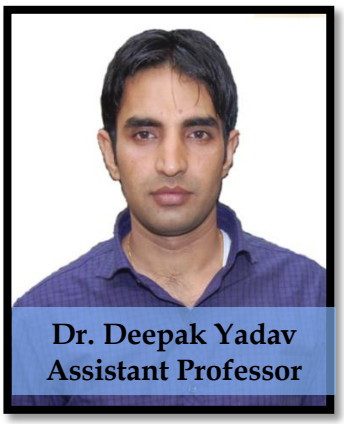

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Message from Staff Advisor

I congratulate the Editorial team members on the release of ***Evolvere,*** the Annual Department magazine of Zoological Society, ***Synapse***. ***Evolvere*** embodies the potential and the literary skills of our students.

The magazine is a blend of thoughts of our students in the form of articles on contemporary science, paper review, movie reviews, interesting facts on science and creative writing in the form of poems. This year also, a special section has been included in the magazine dedicated for students to share their internship experiences.

I appreciate the editorial team for their determined efforts in bringing out the magazine and making ***Evolvere*** innovative and inspiring.

Blessings to our dear outgoing batch of 2015-2018 and sincere wishes for their success!

Dr. Monika Sharma

(Staff Advisor , ***Synapse*****)**

President's Note

Sometimes you wake up.
Sometimes the fall kills you.
And sometimes, when you fall, you fly.

Miranda House has been an institute that assisted me to transfigure myself into a confident being, ready to flyhigh and reach all the possible grails. I shall forever be thankful for all that I've received and learnt from this wonderful place. I feel that I have come out as a better and a stronger person on all grounds. And I'm sure it holds true for all the Mirandians.

Synapse, the Department of Zoology witnessed an utterly event-filled year. The session 2017-2018 kicked off with an extremely didactic lectureby Professor Thelma B.K. The fresher's party was orchestrated to welcome students of the new batch of the Department. An INSCR International Conference was also conducted, in which, distinguished speakers talked about human interference in the environment. A scholastic trip to the Aravalli Biodiversity Park and the National Zoological Park was organized to stimulate learning beyond the walls of a classroom.

I feel immensely thrilled to present to you, the Department's annual magazine 'Evolvere: An Unfolding'. It is an upshot of intense diligence and zeal of the whole Department. Cheers to the editorial team for bringing out this beautiful piece, amalgamating each student's ingenuity.

This is an excellent platform to extend my heart felt gratitude to our Teacher in Charge, Dr. Monika Sharma, staff Advisors- Dr. Deepak Yadav and Dr. Pooja Suman for guiding us and the most sedulous lab staff for helping us throughout. A big shout out to the office bearers for making this beautiful journey as it is.

Avni Gupta
President
Department of Zoology

Editors' Note

' Each time a woman stands up for herself, without knowing it possibly, without claiming it, she stands up for all women'

~ Maya Angelou

With the pinnacle of glory that Miranda House has attained in the last 70 years, this wonderful institution has instilled into us a surfeit of positive changes, moulding us into indefatigable individuals. Miranda has not only changed our perceptions about things, but has also established in our minds our own faculty of thinking, helping us shape our own opinions and perspectives.

SYNAPSE, Department of Zoology is an amalgamation of innovative minds with brimming ideas, filled with creativity and diligence. It has provided us a platform to express the scintillating talents encompassed within us, with our Teachers and mentors standing with us, guiding our way through.

We would like to extend our gratitude to our Teacher-in Charge Dr. Monika Sharma and all other staff members to have inspired us all throughout and for being supportive in all the endeavours we make.

It gives us immense pleasure to present 'EVOLVERE- 2017-18', the Annual Magazine, Department of Zoology, which is our attempt to showcase our inclination for Science with a combination of creativity, orchestrated into a symphony of words, illustrations and colours.

Shruti Acharya

Arshia Bhat

EDITORS,

EVOLVERE, 2017-18,

Department of Zoology

THE THEORY OF EVERYTHING

ALL UP IN SMOKE?

Gas everywhere! Fumes intoxicating every breath! Could one do by preventing an extra breath, hold it till that burst of smoke gets invisible again?

Neither a Nazi gas attack, nor a nuclear bombing. This is now a mundane experience of any individual who steps out on the streets of Indian cities. The *Air Quality Index (AQI)* of our cities is worsening by the minute which is a result of combined lack of action by the governing authorities as well as the citizens. To enable limiting of the global rise in temperature below 2° Celsius, India needs to make improvements to curb climate change soon.

Major health damaging air pollutants are *carbon monoxide* (CO), *sulphur dioxide* (SO_2), *oxides of nitrogen* (NO_X) and *suspended particulate matter* (SPM). The lattermost is found in excess quantity in the air, well beyond its upper safe limit unlike the first three pollutants. The 2011 report by WHO showed a rise in **PM_{10}** (Particulate Matter-10) concentration in the Delhi air of about 10 times its safe upper limit at 198µg/m^3.PM_{10} levels are measured to represent outdoor air quality that include particles having a diameter of 10µm or less. **$PM_{2.5}$** (particle size 2.5µm or less) has an annual average concentration of 150mg/m^3 where it's *National Ambient Air Quality Standard* is 40mg/m^3 (WHO annual standard is 10mg/m^3). There is a separate standard for India because it holds a very low position, 168th, in a list of 180 countries whose pollution statistics have been compared.

The causes for these exceeding limits are several, According to *Centre for Policy Research*, the sources of $PM_{2.5}$ in Delhi air make the following contributions:-

- Vehicle exhaust- 30%
- Biomass burning- 20%
- Soil and Road dust- 20%
- Industries- 15%
- Open waste burning- 15%
- Diesel generations- 10%
- Power plants-5%
- Outside the urban air shed- 30%

Not resembling petrol engines diesel engines get overloaded too soon. When a driver accelerates the vehicle to enhance power, the fuel is injected into the engine at a faster rate leading to improper combustion by the available oxygen molecules. This fuel suffocation leads to formation of high levels of CO and smoke.

Indian roads are dust laden and with every vehicle movement on these roads, the dust particles reduce in size thereby increasing the SPM level. Burning of garbage in open dumping sites, burning of crop residues in winter especially around the National Capital Region (NCR), hazardous industrial emissions are among other causes aiding the already alarming situation.

What can be done you ask? Well certainly another round of unaltered *Odd/Even Scheme*, run by the Delhi Government in 2016, is not a solution. The SPM levels were seen to have elevated during the implementation of the scheme as compared to earlier values. Plantations must be made on the sideway of roads to hold the dust along with soil, along with traffic signal rules and sign/symbol knowledge driving schools must also teach about fuel combustion in the simplest language possible and stricter laws must be passed, implemented and followed to curb open burning of garbage, wood, coal, crop residue etc. A regular mandatory assessment of industrial plants must also be made by *Environment Impact Assessment (EIA)* authorities. This was for the governmental authorities, what can citizens of the country do?

One could start with ensuring usage of energy star-qualified electronic products at home and work place, timely maintenance of machinery used could save money and the air, air pressure in the vehicle tyres must be checked regularly (under-inflated tyres face more wear and tear, prevent proper fuel usage and hence aid fuming of air pollutants) and sometimes vehicles should be given a break too! Spreading the word is of major importance and now a necessity too. Such messages out in the open always help!

Union Environment Minister, Dr. Harsh Vardhan, recently launched 'Clean Air Campaign' initiating a mass movement against air pollution. He also instructed the scientists to begin working towards developing zero-pollution firecrackers. It is time the 'emergency' and 'hazardous' readings of AQI scale down to 'moderate' and 'good' again.

Post the *Paris Climate Conference* in 2015, India pledged to reduce carbon emissions by 33% to 35%, from its 2005 levels, by 2030. Such a bond can only be fulfilled by commitment of all Indian minds working at their logical best. India can be brought from the smoky mornings to the golden dawnings if we begin now!

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Shriti Kumar

B. Sc. (Hons) Zoology – III Year

WHEN PLASTIC BECOMES INCONVENIENT

In 1907, Leo Hendrick Baekaland was working in his home laboratory, combining different concentrations of phenol and formaldehyde in an attempt to create a material which was more durable than his previous invention, Velox photography paper. And he succeeded. He had invented Bakelite which would later pave the way for development of truly synthetic commercial plastic resins. But little did he know at the time that some 80 or 90 years down the line his invention would plummet human civilization into a planet wide crisis.

Now popularly known as the 'Plague of Plastic' this crisis has caught the eye of several naturalists and environmentalists including Sir David Attenborough. He has made special reference to it in one of the episodes of his new documentary Blue Planet II. In this episode he reveals that recent investigations were carried out to shed light on the causes of increasing number of deaths in albatross chicks. When one of the dead chicks was dissected a plastic toothpick was found lodged in its alimentary canal, much to everyone's surprise. The chick had died because the toothpick had actually punctured a hole in the bird's stomach. Incidents such as these show that plastics have slowly but surely invaded even the most pristine of habitats on the Earth.

Put simply, plastic for humans represents convenience. So much so that we have, only in a matter of 60 or 70 years, ended up producing mind boggling quantities of this seemingly harmless compound, 8.3 billion tonnes to be exact. Of this 6.3 billion tonnes has converted into waste out of which a staggering 79% has ended up accumulating in the natural environment. It includes every conceivable object be it nappies, drink bottles, aluminium cans, cutlery and even ear buds. Light weight single-use plastic products constitute roughly 50% of the produced plastic and 9.1 million tonnes of plastic ends up in the oceans every year.

Plastic as we know it has existed only for the past 60-70 years. But since it is designed to withstand all environmental conditions without desiccating it persists for a very long time making it safe to say that all the plastic we have ever produced still exists in the environment in some form or the other. Did you for instance know that a Styrofoam cup takes about 50 years to degrade, an aluminium can 200 years, plastic bottles take around 450 years and fishing lines can take as long as 600 years to degrade completely? Even countries such as the U.S. and China which were believed to be at the forefront of cleanliness have now been listed as the top countries to have mismanaged their plastic wastes.

Taking the current situation into account, plastic without doubt has now become an *inconvenient* truth. Wherever it goes it only destroys and not just land but even aquatic habitats. Plastic debris has descended even to the deepest parts of the world's oceans. Much to everyone's dismay, researchers have found a bin liner near the deep-sea vents in

Cayman Trough and have even discovered tiny plastic fibres in the smallest of creatures living in the Mariana Trench. It's a shame that our garbage has reached these pristine environments even before our researchers could.

In the oceans plastic waste gets accumulated in what are known as gyres. These are areas in the ocean where winds create swirling circular currents which literally suck the garbage in causing these areas to have the highest concentrations of plastic as compared to other regions of the ocean. There are 5 gyres in the world's oceans of which the North Pacific gyre is the most well-known.

Plastics pose unique threats to aquatic fauna. Sea birds and larger creatures such as dolphins and turtles can either get entangled in them or mistake them for food. Turtles consume jelly-fish as part of their diet. They often mistake floating plastic bags for food and eat them. These can prove to be fatal as they can either choke the animal or remain in its gut without being digested and also without providing any nourishment. Another grave threat arises when these plastics get fragmented due to exposure to sunlight and seawater. Then they form what are called *microplastics.* These microplastics can readily enter food chains even at the level of zooplanktons and get accumulated because of biological magnification as we move to higher trophic levels. This can cause havoc even for humans if they accidently consume seafood laden with these microplastics.

As if this wasn't bad enough, plastics often contain additives which may be equally or even more harmful when consumed. These affect the endocrine system and can truly have debilitating effects on humans and animals alike. Phthalates can act as anti-androgens, bisphenol A (BPA) as a synthetic estrogen and polybrominated diphenyl ether (PBDE) can disrupt the synthesis of thyroid hormones to name a few.

All this makes the problem of plastic pollution an important one to solve but it is not an easy one to tackle. This is because it is not efficient to recycle plastic and hence in this case prevention truly becomes better than cure. An Ocean Cleanup programme is planned for 2018 which will aim at cleaning the North Pacific gyre. People are now slowly adopting a zero-waste philosophy which will prove to be critical in limiting plastic use. There have been recent developments such as biodegradable plastic which has all the benefits of regular plastic but can be degraded easily in the environment. A new concept of extended producer responsibility (EPR) has now come into existence. According to this, a producer of plastic also has with it the responsibility of reclaiming it once it has been used by the consumer. This will be an important step in preventing improper plastic disposal and also allowing for some reuse and recycling.

Measures such as these do provide a glimmer of hope but there is no doubt that our planet is choking on all the plastic that we have amassed over the years. Our situation now is truly desperate and the time to act is now or else sadly we might be too late.

Anubhuti Krishna

B.Sc. (Hons) Zoology – II Year

A JAVAN RHINO'S TALE

The Javan rhinoceros is considered to be the rarest of all the rhinoceros species on this planet. A long time ago, they were spread over a very wide territory which covered all the major regions of South East Asia. But in the late 19th and early 20th centuries their population decreased dramatically, and they were eventually declared extinct. But in 1988, a population of 15-22 individuals resurfaced in the Cat Tien region of Vietnam leading to great excitement. However, this was only short-lived as in late 2009 even the last Javan rhino in this region was poached. As a result, this beautiful creature is now found only at the western tip of the Indonesian island of Java, in the rainforest habitat of Ujung Kulon National Park and is currently listed as a critically endangered species by the IUCN.

Javan rhinos are dusky grey in colour and have a single horn measuring about 10 inches in length. Males have longer horns and females either don't have one at all or have a shorter knob-like horn. Females attain sexual maturity first at the age of around 4-5 years whereas males become sexually mature much later only at the age of about 6-7 years. The rhinos are solitary and are rarely found in groups, except when the females are with their calves. Males have larger territories with only marginally overlapping areas whereas females have relatively smaller territories with considerable overlaps. There is a very short period of time when males and females meet for mating and the gestation period is between 16-19 months. After the female has delivered she cannot give birth for the next 4-5 years.

Although it may not seem to be so at first sight, these rhinos play a very significant role in creating and maintaining biodiversity as they help in dispersal of seeds, creating mud wallows and also in removing large amounts of understory plants. Losing them would mean losing the diverse flora of the area.

Today only 60 rhinos are left in Java. There are various reasons for this sad decline in the rhino population. One of the primary reasons is poaching. These animals are extensively poached for their horns which are highly priced in Vietnam as well as China. The horn is grounded into powder and used as part of traditional Chinese medicine for the treatment of fever, arthritis, high blood pressure and even cancer. At one point of time they were also considered to be an agricultural pest in South East Asia and were killed in large numbers during the colonial era. Their habitat is also vulnerable to many natural calamities. The

coastline of Ujung Kulon National Park, their only remaining habitat, is highly susceptible to tsunamis and the eruption of the volcano Anak Krakatoa. This is posing a huge risk to the slowly recovering population. The Arenga Palms growing in the National Park pose another problem as they reduce the natural flora and hence affect habitat quality for the rhinos.

WWF along with various other government and non-government agencies has come up with strategies to try and recover the dwindling rhino population. It has approached this crisis in two ways. Firstly, they have worked to remove the invasive Arenga Palms so as to increase the forage and habitat quality for the rhinos. The second key effort is to move few rhinos to a new sanctuary away from the Anak Krakatoa so as to protect them in case of any volcanic eruption. However, more intervention will be required in the future if we are to save these wonderful creatures.

In the end we must realise that the Javan rhino has suffered at the hands of humans and humans only, and while its tale is heart-wrenching it is not the only animal subject to this fate. Many other such lovely creatures which once used to dominate the earth have now been pushed to one small corner on it. If this trend of human dominance continues then we might end up losing all of our natural wealth.

Let us unite and work towards the betterment of all creatures and not just ourselves, for they truly deserve it.

Anupama Yadav
B.Sc. (Hons) Zoology – II Year

THE FINE LINE BETWEEN TIGER FASCINATION AND TIGER ABUSE

Tigers are one of the most beautiful animals on the planet Earth. Whether the orange – black or the white striped, they have never failed to fascinate human beings with their beauty.

Tigers are greatly admired in Asia. They are used as symbols for South Korea, where tigers don't even exist anymore. In India, it is believed that the Hindu God and Goddesses use tiger as their 'vahana' which literally means a vehicle but metaphorically represented as companions.

In western culture it has been accounted that tigers were used in gladiator battles and as mascots.

In modern times, tigers have appeared in “Winnie the pooh” stories and in “Calvin and Hobbs” comic strips.

Tigers have always been a poetry weapon, fascinating poets since centuries. Explaining human’s fascination with tigers, the eminent biologist, E. O. Wilson once wrote “We’re not just afraid of predators, we are transfixed by them, because fascination creates preparedness and preparedness, survival. In a deeply tribal sense, we love our monsters.

The United States has a disturbing tiger fascination.

The country with the largest population of tiger isn’t India, Russia or Africa that currently occupy ancient ranges of the massive cats. It’s the United States with the largest tiger population. The private ownership of tigers in the United States is so vast and extensive that the estimated population of tigers there is higher than the global tiger population. There are plenty of horror stories on how these big cats are kept as pets and brutally treated. Private owning of tigers includes declawing and putting them in small pens and cages. Selling cubs has become a business in the United States. There are sellers who sell them to those who butcher them for parts or ranches where they are killed in hunts.

Moreover, there is an increasing case of tiger selfie cruelty. Tigers are endlessly jabbed with metal sticks as endless stream of tourists take turns and pose with them for pictures. Tigers are man – handled, thrown from lap to lap, forcefully hugged and even sat on.

“Tourists need to realize that their once in a lifetime experience of being pictured with a tiger means a lifetime cruelty for the tiger.”

A large fraction of tiger population is kept in captivity. These big cats are featured attractions in many circuses around the world. In circuses, big cats are often forcibly kept in tiny cages, their maternal bond is broken, their basic social and physiological need are denied. They are punished when disobeyed with food deprivation and terrified with fire. These animals must perform against their will to entertain the audiences.

For young children, the circus is a magical place where they get to see and experience wild animals. Under the façade of harmless entertainment, patrons are unaware of what it takes to coerce these animals into performing elaborate tricks they see and the level of abuse these animals endure when the circus' curtains come down.

This is how people's fascination for tiger has turned into tiger abuse. Cruelty to animals is not entertainment neither a fascination.

Tigers are solitary animals. They have certain behavioral needs. They need to hunt their own prey, grow and live in the wild and enjoy their lives as much as any living being.

I applaud and appreciate todays Wildlife sanctuaries and Zoological parks for their large contribution in the wildlife conservation and their efforts in maintaining a wild habitat for these animals.

Moreover, I support various organizations like PETA (People for the Ethical Treatment of Animals), WWF (World Wide Fund) for working to protect these animals and for their commitment to spread the truth about life for captive tigers and other animals.

But people should not just sit and wait for the legal organizations to work. There are plenty of things everyday citizens can do. We can contribute in this by either donating or volunteering at several zoos. Moreover, we can write letters to lawmakers, form our own organizations. Taking a few minutes to support this worthy cause not only will help the animals, it will also make you feel proud about standing up for something so important for the society.

Mayanglambam Pooja Devi

B.Sc. (Hons) Zoology – II Year

LOST: AND THE INEVITABLE HORROR THAT FOLLOWS

John woke up one morning and decided to go on a bike ride. But even in his wildest of dreams he couldn't have imagined the accident that ensued and landed him in a hospital bed. To him all sight was blurry, all voices incoherent and muffled until the sharp reality of him losing his arm reached his now attentive ears. This situation however hypothetical is used by most storytellers to give major twists to the plot. What they miss is the reality that follows, the reality of the pre-existing lurking around like a ghost.

Phantom limb is the sensation that an amputated limb is still attached. These sensations can be both non-painful as well as painful. Non-painful sensation can be the sensation of movement or the perception of touch, temperature or pressure. However about 60-80% of the amputees complain of shooting pain as well as a tingling sensation in the phantom limb termed as phantom limb pain. These sensations are not restricted to the limbs and can also be felt after removal of other body parts, for example, people who undergo gender reassignment complain about phantom genitals. Phantom breasts are also said to exist

after procedures such as mastectomies. This phenomenon does not contain itself to amputees but also affects patients of stroke and people with peripheral nerve injury.

It was first recognised in 1552 by French surgeon Ambroise Paré, who treated wounded soldiers and recorded complaints of pain in amputated limbs. This phenomenon was later observed by American physician Silas Weir Mitchell, who was tending to soldiers in Philadelphia during the American Civil War. Since then it has been an active field of research in neuroscience.

In the 1990's this phenomenon was explained using neuroplasticity, the ability of neurons to modify their connections and behaviour. Phantom limb pain was specifically explained by map expansion neuroplasticity (cortical reorganisation), which talks about flexibility of local regions of brain dedicated to performing specific function. The arrangement of local regions in cerebral cortex is referred to as "maps". Any function performed frequently or repetitively will lead to growth of the region of cerebral map dedicated to that function. It has been observed that these regions grow into or acquire areas of unused phantom maps.

These phantom pains are decremental and reduce to complete absence over time. Most research in its treatment has not shown any consistent results. Various treatments applied includes medication, shock therapy, hypnosis and biofeedback.

A widely used approach is that of a mirror box invented by V.S. Ramachandran to help alleviate phantom pain. The patient puts the good limb in one part and the residual one in another part of the box. This helps in association of the reflected image of limb with the phantom one. With the help of this visual feedback, it occurs to the patient as if he or she is moving the phantom limb and can displace it from a potentially painful position.

With the ongoing research and increasing interest in this field we might be able to put the pieces together to unlock the mystery behind the existence of the lost. Whether it is a mere feeling of the past still lingering around or a bigger phenomenon with more questions to unravel still remains to be seen.

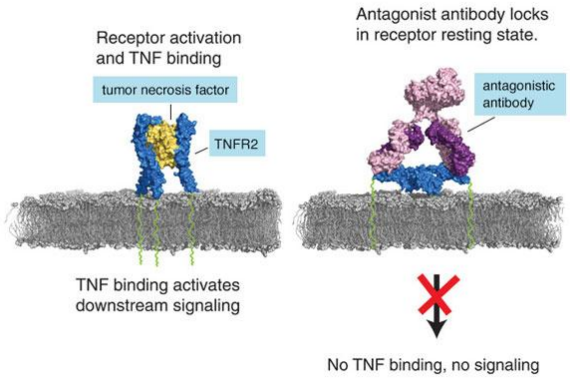
Noor Chhikara

B.Sc. (Hons) Zoology – II Year

A TWO PRONGED APPROACH TO TACKLE TUMOURS

Cancer has always been a burning issue. Everyday puts forth new challenges for the scientists and researchers to combat this disease. Cancer treatment has yet again taken a new turn with the discovery of antibodies that target the TNFR-2 protein as well as the T reg cells that suppress the immune response to tumours.

This therapy tends to target a protein called TNFR2. Tumour Necrosis Factor Receptor 2 is a protein present in elevated levels on tumour cells. This protein is also found on the immune cells called the Regulatory T cells (T reg cells). These are also called the suppressor T cells since they suppress our immune response to tumour cells. The two antibodies discovered target these TNFR2 receptor proteins.



MECHANISM OF ACTION

Normally, TNFR2 gets activated on binding to TNF produced by some WBCs. Once activated it causes the cell to divide and proliferate. The discovered antibodies function by binding to the receptor site of TNFR2 thereby making it inactive. Research has shown that these antibodies helped to eliminate the T reg cells by preventing their activation and proliferation even in the presence of TNF. The antibodies also directly killed cells from a laboratory-grown ovarian cancer cell line that expresses TNFR2 on the cell surface. So they possess the property of "**killing two birds with one stone**." Firstly, they kill the tumour cells by inactivating the TNFR2 receptor on them. Secondly, they prevent the proliferation of the T reg cells that feed these tumour cells.

Research also suggested that these antibodies eliminated only the T reg cells in the cancerous tissues and did not act upon the cells in a healthy body, the reason being that these cells are present in elevated numbers only in the cancerous cells and barely in a normal body. This proves to be helpful in selectively targeting the T reg cells expressing the TNFR2 in the tumour microenvironment. Hence this line of treatment is more specific and less toxic and has the potential to enhance the efficacy of current immunotherapeutics.

Vartika Srivastava

B.Sc. (Hons) Zoology – II Year

WHEN THAT MOSQUITO BITES

Dengue is popularly known as the 'breakbone fever'. It is a life-threatening disease that has now become one of the fastest spreading tropical diseases globally. If one wishes to tame this beast some of the parameters that need to be addressed include the causative agent, transmission of the disease, medication available and the role of climatic conditions in spreading of this disease.

Dengue is a viral disease transmitted to people primarily by the *Aedes aegypti* mosquito serving as a vector. Open containers with standing water in and around habitation act as ideal breeding grounds for these insects and hence getting rid of these mosquito pools is the first line of action. There is no vaccine or drug currently available for this disease, although the dengue vaccine is undergoing trials at SUNY Upstate and elsewhere as well.

Effect of climatic conditions on disease risk is complex. The main factor that led to widespread distribution of this disease is rainfall as where there is water there will be mosquitoes. However there are other reasons such as carelessness and conditions of drought that make the problem slightly more complex. For instance, increasing rainfall can increase the availability of standing water for mosquito breeding. Droughts can also increase dengue risk in areas with poor access to piped water supply as the drought conditions lead people to store more water which provide the necessary breeding habitat.

The most striking symptoms of this disease include high fever, severe headaches, fatigue, vomiting and rashes.

It can also lead to severe joint pain and muscle pain which is where the name 'breakbone fever' originates.

Quite interestingly, according to a recent report, carbon dioxide and heat are the biggest draws for mosquitoes. Scent or pheromones can also play a role in attracting these insects which is why some people are more prone to being bitten as compared to others, that is, one person's sweat and other skin secretions can potentially attract more bites than other individuals. This can be used to draw an interesting conclusion – people who bathe more often are usually less prone to biting as compared to those who don't bathe regularly. So everyone, get those shower caps out!

Dengue is a disease which has no vaccine or treatment per say. In this case it is only right to say that prevention is truly better than cure.

Nandini

B.Sc. (Hons) Zoology – I Year

ALTERNATIVES TO ANIMAL TESTING

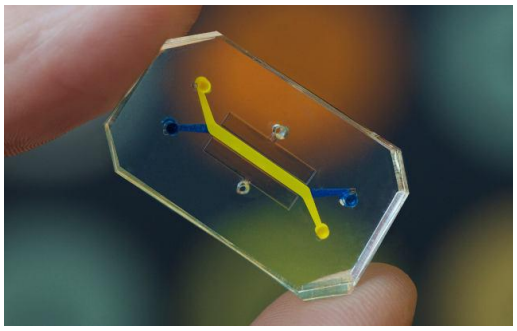
There is no doubt that the best test species for humans are humans. It is not possible to extrapolate animal data directly to humans due to interspecies variation in anatomy, physiology and biochemistry. -MacLennan & Amos, 1990

To predict toxicity, corrosivity, and other safety variables as well as the effectiveness of a new product on humans; traditional testing of chemicals, consumer products, medical devices, and new drugs have involved the use of animals. As experiments on animals are cruel and generally inapplicable to humans, the world's more forward-thinking scientists have moved on to develop and use methods for studying diseases and testing products that has replaced animals and are relevant to human health. These modern methods include sophisticated tests using human cells and tissues (also known as *in vitro* methods), advanced computer-modelling techniques (often referred to as *in silico* models), and studies with human volunteers. These and other non-animal methods are not hindered by species differences that make applying animal test results to humans difficult or impossible, and they usually take less time and money to complete.

Here are a few examples of state of the art non-animal research methods available and their demonstrated benefits:

In vitro testing:

- *Organs-on-chips* – They contain human cells grown in a system to mimic the structure and function of human organs and organ systems. These chips can be used in disease research, drug testing and toxicity testing and have been shown to replicate human physiology, effect of diseases and drug responses more accurately than cruel animal experiments do.



- There are tests that use human blood cells to detect toxicity in drugs that cause a potentially dangerous fever response when they enter the body. They can replace the cruel use of rabbits in these painful procedures.

Computer (in-silico) modelling:

- Researchers have developed a wide range of computer models that stimulate human biology and the progression of developing diseases. These models can accurately predict the ways in which new drugs will react in the human body.
- *Quantitative structure-activity relationships (QSARs)* - They are computer based techniques that estimates a substances' likelihood of being hazardous, based on its similarity to existing substances and our knowledge of human biology.

Research with human volunteers:

- *Micro dosing* - Volunteers are given an extremely small one-time drug dose, and sophisticated imaging techniques are used to monitor how the drug behaves in the body. It can provide information on the safety of a drug and how it is metabolized in humans prior to large scale human trials.
- Advanced brain imaging and recording techniques, such as functional magnetic resonance imaging (fMRI), with human volunteers can be used to replace archaic experiments in which rats, cats, and monkeys have their brains damaged.

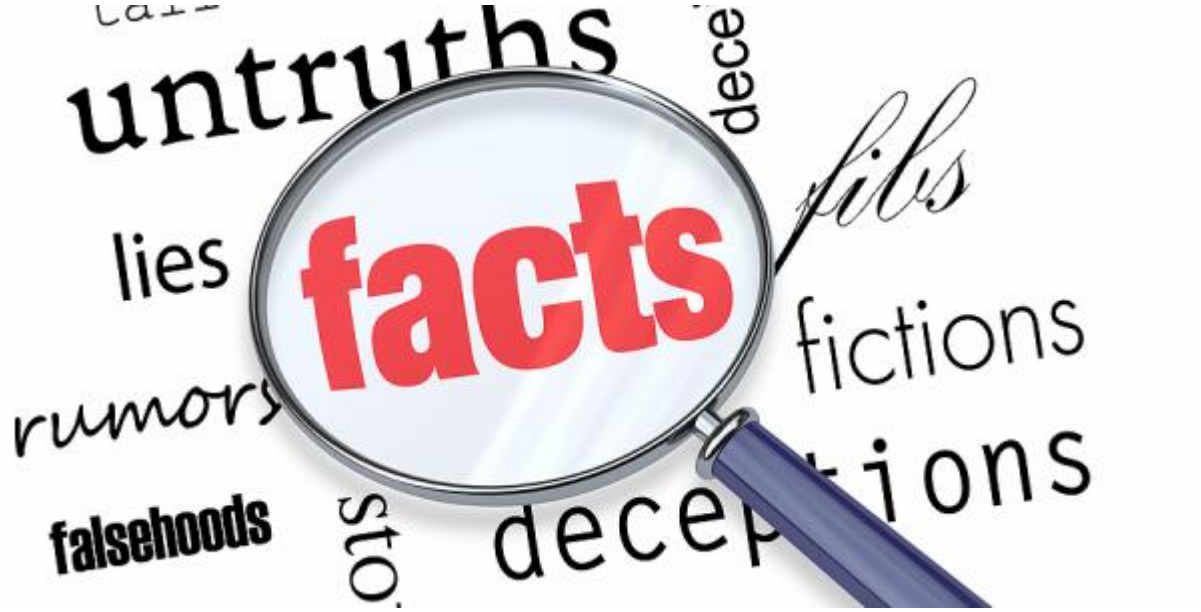
Human patient simulators:

- Strikingly life-like computerized human-patient simulators that breathe, bleed, convulse, talk, and even "die" have been shown to teach students physiology and pharmacology better than cruel exercises that involve cutting up animals. The most high-tech simulators mimic illness and injury and give the appropriate biological response to medical interventions and medications.

Science, fuelled by the work of scientists themselves as well as by public demand for more humane science, is moving toward the day when cruelty-free research and testing will be the *status quo*. It can protect animals , the environment, money, and promote better health and well-being for humans. Thanks to modern technologies, it is finally moving forward to realize the premise that the "best test species for humans are humans"—without any harm and lots of benefits.

Devanshee Prakash

B.Sc. (Hons) Zoology – I Year



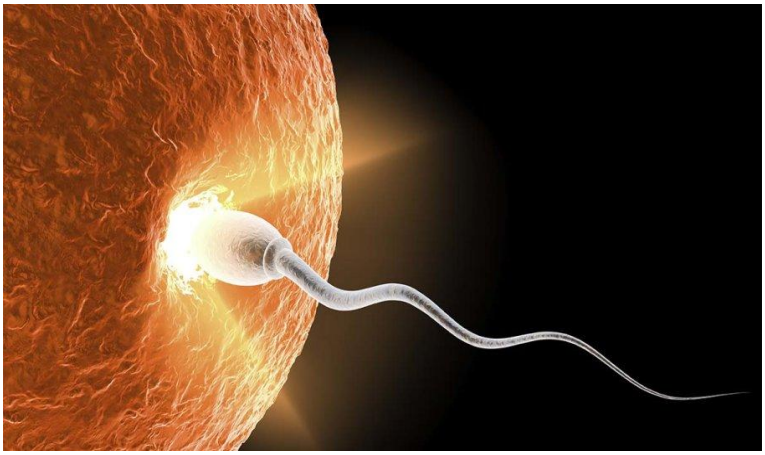
FACT: STRANGER THAN FICTION

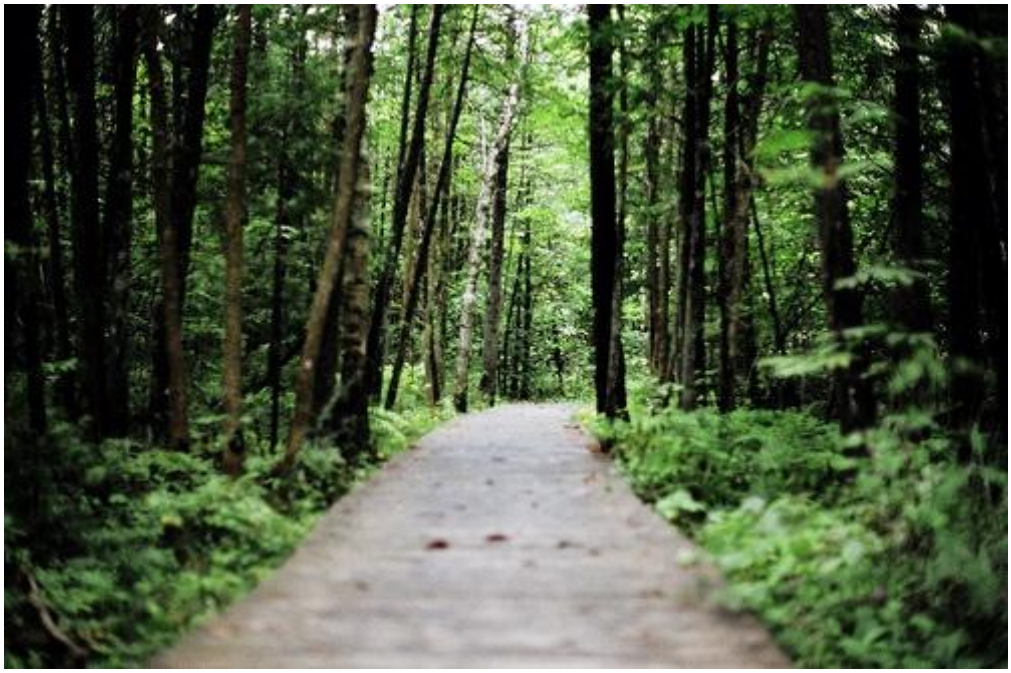
THE HUMAN BODY: CURIOUS AND CURIOUSER

- A single human brain cell can hold as much as five times the information on Wikipedia.
- Stomach acid is strong enough to dissolve razor blades.
- The beginning of life is marked by the fusion of the body's largest and smallest cells, the egg and the sperm.
- Have you ever noticed the nail of the middle finger grows the fastest?
- A pair of feet have 5,00,000 sweat glands which can produce nearly a pint of sweat a day.
- The nose can remember as many as 50,000 scents.
- The energy used by the brain is enough to light a 25-watt bulb.
- Sneezes can travel at speeds of 100 miles per hour.
- Human thigh bones are stronger than concrete.
- Right handed people live approximately nine years longer than left handed people.
- Nerve impulses travel to and from the brain at speeds of 170 miles per hour.
- Like finger prints, everybody's tongue has a unique tongue print.
- Our stem cells have immense regenerative capabilities. In 2008, a patient's stem cells were used to regenerate his own wind pipe.

Anuradha Kashyap

B.Sc. (Hons) Zoology – II Year





A WALK TO REMEMBER

FANTASTIC BIRDS AND WHERE TO FIND THEM

The serene beauty of Miranda House is the result of it being wrapped under the lush greens of nature, but as literature states true beauty is always concealed.The chirping of birds resonates with the vocal cords of mother nature creating the aura that we appreciate every day. The Great Backyard Bird Count held on 19th February was one such experience which lifted the invisible veil between the citizens of the sky and students. The early morning walk around the campus was to impart more practical knowledge of the avian species around us. From familiar birds to some peculiar ones, we learned about them from a different perspective. We were joined by two enthusiastic birdwatchers who let us into their world where their love for birds is far away from just studying them but living with them. We counted an astonishing total of twenty different species in our own college campus. The species we encountered were as follows:

1. Blue Rock Pigeon
2. Laughing Dove
3. Common Mynah
4. House Crow
5. Black Kite
6. Rose Ringed Parakeet
7. Yellow Footed Green Pigeon
8. Red-vented Bulbul
9. Copper Smith Barbet
10. Tailor bird
11. White Eared Bulbul
12. Red Whiskered Bulbul
13. Common Babbler
14. Jungle Babbler
15. Brown Headed Barbet
16. Eurasian Collared Dove
17. Spotted Owlet
18. Golden Flameback Woodpecker
19. Oriental White Eye
20. Purple Sun bird

Encountering such a rich variety of species in such a small area is a rare finding, but it happens only in India. Our country owing to its rich environmental diversity has an abundance of different varieties of birds. These oriental birds are relief to the sore eyes of a bird enthusiast and we were lucky enough to witness the real beauty of our college. This wonderful walk was followed by an informative talk on the birds of Indian origin. We also learned the procedure to document our own list on e-bird, an initiative by Cornell University.

On an ending note I would like to add that the walk was an amazing experience different than the monotonous life of an undergraduate student trying to find meaning of life when it is chirping on a bark outside.

Noor

B.Sc.(H) Zoology- II year

BIDDING FAREWELL TO OUR TALENTED SENIORS (BATCH 2014-2017)

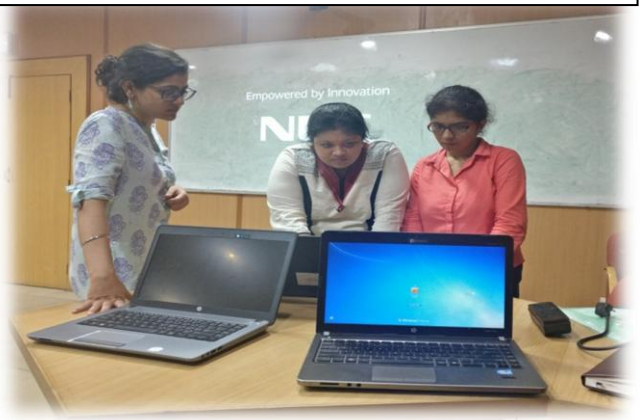
LAUNCH OF EVOLVERE 2016-17,ANNUAL MAGAZINE, SYNAPSE

Workshop on HUMAN INTERFERENCE IN ENVIRONMENT
18th August, 2017

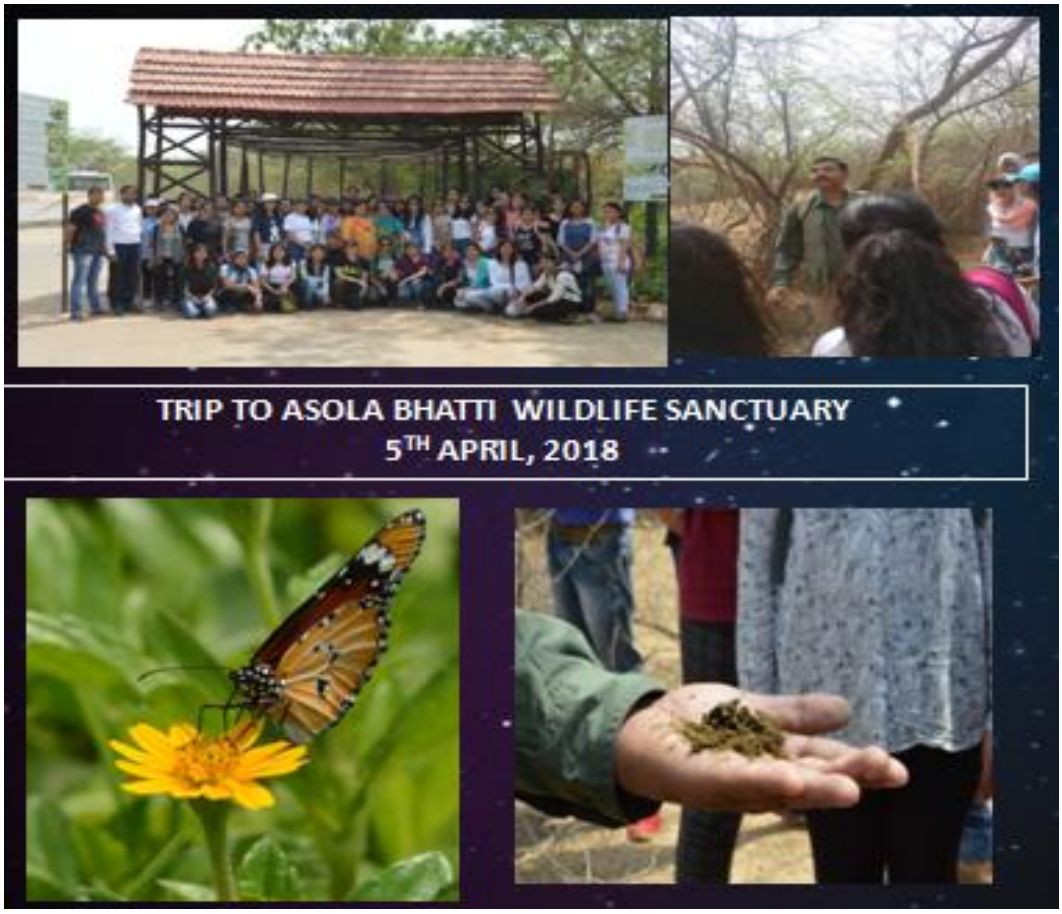
INAUGURAL LECTURE BY PROF. THELMA B.K. ON TH TOPIC 'MANOUVERING TE HUMAN GENOME FROMGATC TO GENOMIC MEDICINE: AN UNENDING EXCITEMENT
14th September,2017

TEACHERS' DAY CELEBRATION

BIOINFORMATICS WORKSHOP: 20-21 SEPTEMBER 2017




Synapse
The Department of Zoology, Miranda House
presents
CAMPUS BIRD COUNT (CBC)
in association with the
GREAT BACKYARD BIRD COUNT (GBBC)
Date : 19 February 2018
Timings : 8 - 9:30 A.M.
Venue : Miranda House Campus
For more information visit: https://birdcount.in/event/cbc2018/


TRIP TO ASOLA BHATTI WILDLIFE SANCTUARY
5TH APRIL, 2018

IMPULSE 2017-18, ANNUAL FEST, SYNAPSE

FROM THE DIARY OF AN INTERN

A SUMMER INTERNSHIP EXPERIENCE

Being a student of biology, I have always had a keen interest in Human health problems and wanted to pursue some research in this field. Then I came to know about Summer Research Fellowship Program 2017 awarded by Indian Academy of Sciences, Bengaluru. To apply for this competitive fellowship, I was required to develop a research proposal describing my area of interest and an innovative idea to do something new in that field.

After receiving the fellowship, I started working with Dr. Saroj Kant Mohapatra, an assistant professor at National Institute of Biomedical Genomics, Kalyani, West Bengal from the first week of June, 2017. As my guide, Dr. Saroj and his PhD Student were working on the gene data analysis of pediatric patients of Septic Shock (caused mainly due to bacterial infections), they offered me an independent project in which I had to perform the Gene data Analysis of 25 sets of genes involved in the osteoclast differentiation pathway. This set of genes was found to be upregulated in pediatric patients of sepsis (work done by a PhD student of Dr. Mohapatra). So, I had the task of investigating whether these 25 genes were up/down- regulated in pediatric infections other than sepsis. This was pure computational work and needed knowledge of coding and basic programming. As I was not familiar with programming, initially I faced a lot of difficulties in understanding the tit bits of the computational work. During my internship, my guide helped me in learning 'R – an open source programming language' used for statistical computing and graphics. With the help of National Centre for Biotechnology Information Gene Expression Omnibus, I collected the human genome datasets and series matrix files of patients of pediatric infections. A lot of sorting was done with datasets and finally I retrieved the information of the set of 25 genes for each infection, and analysis was done. By using R version 3.4.0, various statistical tests were performed and statistical heatmaps and 3D plots were made for the information that we were able to get after rigorous analysis. I am bound not to discuss the results of the project as Dr. Mohapatra's group is working on it.

At the end of the internship I submitted a detailed report of my work entitled "Gene Expression Analysis of Osteoclast Differentiation Pathway in Pediatric Infections" to IAS, Bangalore and they have published it on an online portal named Authorcafe (an authoring and publishing platform for scholarly writing). After completion of my work, I came back to college with a lot of new experiences along with a reasonable stipend amount. I realized that the most important aspect of any research is that you must be immensely focused and devoted towards your work and that you also need a good power of analysis because that can give you tremendous ideas to work further even if you are getting a negative result.

Jyotsna Pandey

B.Sc. (Hons) Zoology – III Year


AND THE
AWARD
GOES TO...
www.MUSINGSBYMEGHA.wordpress.com

THE NOBEL PRIZE IN PHYSIOLOGY OR MEDICINE, 2017:

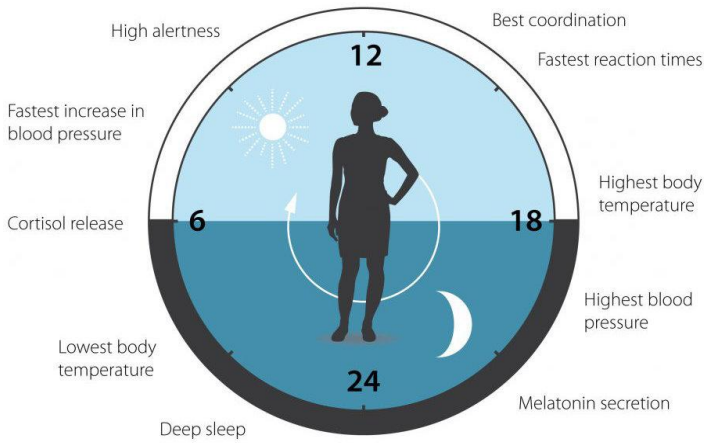
What sets the tick-tock of Biological clocks?

The Nobel Prize in Physiology or Medicine has been awarded to three American scientists: Jeffrey C. Hall, Michael Rosbash and Michael W. Young, for the discovery of the molecular mechanisms that are responsible for the control of the circadian rhythms.

What is a Circadian Rhythm?

With environmental rhythms like spinning of the earth on its own axis, the movement of the earth around the sun, and the movement of the moon around the earth, organisms have inherent mechanisms referred to as 'biological rhythms' which help them adapt to these cyclic changes.

Circadian rhythms are biological rhythms which are characterised by a period of 24 hours. These rhythms anticipate day/night cycles and help regulate physiological and behavioural aspects of an organism. These rhythms are elicited by the internal biological clock (pineal gland-in vertebrates; additional nerve cells which constitute the suprachiasmatic nucleus in the hypothalamus). These rhythms keep us in sync with the world, maintaining our routine bodily tasks such as regulating our blood pressure, body temperature, bowel movements, hormone release etc. Humans share these circadian rhythms



with animals, plants, fungi and even with single celled archaic organisms such as archaebacteria which do not even have a well-defined nucleus.

How do these circadian

rhythms operate?

Jeffrey C. Hall, Michael Rosbash and Michael W. Young were able to peek inside the internal biological clock and elucidated the molecular mechanisms that are involved in the control of the circadian rhythms. Using fruit flies as a model organism, the Nobel laureates have discovered a gene that encodes a protein which seemingly regulate the circadian rhythms.

So, the story of the discovery of what makes us tick, goes like this...

In 1984, Hall and Rosbash isolated a **period gene**, which was quite a cumbersome enterprise at that time. In 1990, it was then found that the mRNA transcribed from the gene moved out to the cytoplasm from the nucleus, and synthesized a 'period protein', which drifted back into the nucleus and blocked the 'period gene', preventing further formation of the mRNA and subsequently, the protein. This on and off sequence occurs rhythmically, with a periodicity of 24 hours. This is how the tick-tock of the biological clock is regulated.

Circadian rhythms are endogenous in origin. This means they are self-sustainable and are independent of influence of environmental cues. However, Circadian rhythms are open to correction, in the sense that they can be entrained or harmonised with the environmental oscillations. This feature of 'entrainment' enables cells in our body to synchronise and connect with the biological clock in the Central Nervous System, when they go out of phase. For an instance, Jet lag is such a phase shift disorder in which the sufferer is likely to be in a state of confusion until external cues reset the internal clock. People suffering from Jet lag are advised to follow the sleep cycle of the destination as soon as possible.

Sensory stimuli, otherwise referred to as timing signals or 'Zeitgebers'; entrain the whole system with the environmental rhythms. A completely blind person has working circadian rhythm, but in the absence of external correction or 'entrainment', he or she could go out of phase with the world.

The elucidation of these molecular mechanisms has helped in undertaking peripheral studies concerned with circadian rhythms especially in the emerging field of 'Chronophramacology', wherein the timing of administration and effectiveness of medicines are correlated with the circadian rhythms. Melatonin, a sleep-management hormone which is secreted by the pineal gland, is prescribed to manage Jet Lag and insomnia. Lifestyle disorders such as cardiovascular diseases and diabetes have also been associated with disordered circadian rhythms.

Better understanding of the ground-breaking work of Hall, Rosbash and Young, will eventually help unravel the secrets of the complex physiology of the internal biological clock and functions associated with it, and will probably serve to answer the fundamental human question of what defines and regulates our very existence, calmly and scientifically so.

Shruti Acharya

B.Sc. (Hons) Zoology – III Year

IT'S SHOWTIME

THE MARTIAN – The Thirst to Survive

For years, the scientists have been trying to make it possible for the human race to flourish on the red planet, Mars. But while we are still working on unearthing ways to make that feasible, Ridley Scott, very beautifully, turned the conceivable into a movie. A science fiction film, The Martian, is a clenching saga of human strength and the perseverance to survive.

In 2035, astronauts land on Mars, when a sudden colossal sandstorm leads to premature abortion of their mission. Matt Damon felicitously portrays Mark Watney, a botanist, who is presumed dead and left behind during the mission. But Watney is still alive and against all odds, he must find a way to communicate with other astronauts on Earth. He formulates scientific procedures to ensure survival hoping that scientists will soon devise a rescue plan to bring him home. With a perfect blend of efforts to outlive any hardships he witnessed there and the constant emotional jolt, the film is an artist's magnum opus.

The Martian is a love letter to science, but what does science exactly think of it? All in all, the way it practices science is reasonably realistic. The film successfully depicts immense strength manifested by Watney while he craves survival. First and foremost, he performs a self-surgery to get rid of the antenna stuck in his torso. Immediately, he comprehends the need to produce enough food for his survival on the planet. This concern makes him devise a strategy. As a result, he contrives a farm using soil fertilized with human waste, water from rocket fuel, and potatoes. Scientists currently working in NASA believe that microbial organisms do have a potential to survive in the conditions provided by Mars. Simultaneously on the planet Earth, NASA asserts the communications that Watney constantly tries to establish with them. Their venture to deliver food to Watney goesin

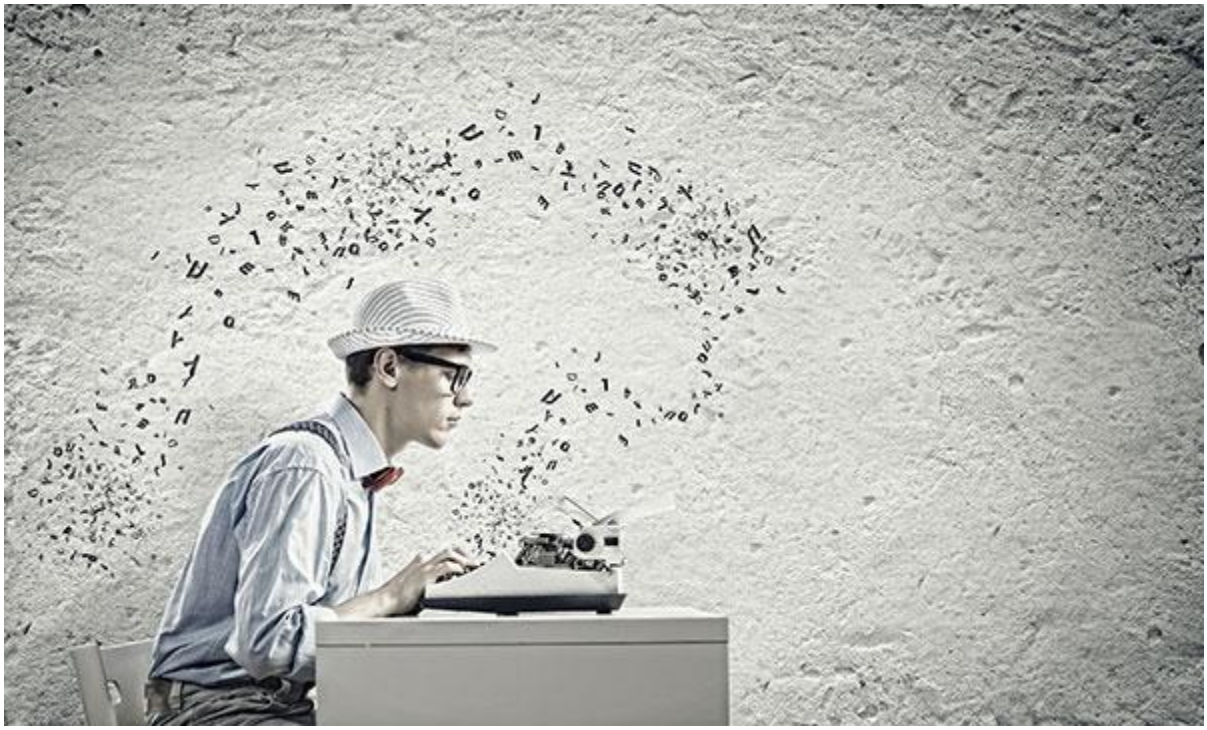
vaindue to an explosion of the rocket which was supposed to deliver him the food. However, by the end, a gravity-assisted trajectory rescues the mission.

Acknowledging the endeavors of all the actors and the filming crew, the movie acquired positive reviews from the critics as well as the public worldwide. It has received several accolades including the Golden Globe Award, Academy Award, Hugo Award, BAFTA Award, and Critic's Choice Award. The then United States President, Barack Obama named The Martian among the best science fiction films he had ever seen.

Avni Gupta

B.Sc.(Hons) Zoology – III Year

THE UNTAMED ARTIST



HAPPILY EVER AFTER

BY NOOR CHHIKARA

The summertime wind, touching my cold cheeks;
Old drum's broken, have my own new beats.
Fight is over, no longer I'm tired;
Fresh air, not bonded, not wired.

Purity, truth always lasts;
Past is left in the past.
Brightness, sunshine not just a dream;
Now that I wiped the slate clean.

The stains of blood are getting brown;
Pain from my life is sinking down.
Glory, shine and my laughter;
One day, I'll have my happily ever after.

Snow white had her apple, beauty had her sleep;
Long lengths of floor Cinderella had to weep.
Magic is there, so is a fairy god mother;
Everyone has seven dwarfs as their brother.
My fairy-tale will end with a charismatic chapter;
One day I will have my happily ever after.

Hope for best, prepare for the worst;
Destiny will strike even under witch's curse.
Afraid of dark, look towards the east;
Even little Red Riding Hood faced the beast.
Mending my life, I'll be my own crafter;
Just a few steps from my happily ever after.

NO LIFE BEYOND BOOKS

BY NOOR CHHIKARA

Looking at the stars,
Peeping way into the past;
Staring at the ruins of the wars.
Agony, pain will ever last.

The world is big, a lot to see;
Surrounded by paperback, where I will be.
Silence and bright light hanging by the hooks;
For me there is no life beyond books.

Not enough money, no ringing pockets;
A fish on Mars, in my own paper rocket.
The scent and glittering leather bound looks;
How can there be a life beyond books?

For all I know, I want a powerful me;
Every warrior knows how mighty a pen can be.
Mere knowledge can take you to the moon;
Only verses remain till the day of doom.
To fulfil every part that destiny took;
I don't need a life beyond books.

He adored books, I'm my father's daughter;
True it is, blood is thicker than water.
Always a bibliophile, with the nerd looks,
How would I love, a life beyond books.

SWEET LITTLE NOTHINGS

BY SHRITI KUMAR

Drizzle over the Sun's ray;
Or a flash of twinkle on all that's grey,

Maybe all work, no play;
Or just swaying in the Hard Rock Café,

A song that makes your heart skip a beat;
Or wet sand embracing your feet,

Tracing etched walls of monuments;
Maybe just friendly discourse and arguments,

Believing 'eco-friendly' will take action;
Or finally solving 'integration with partial fraction'!

Counting steps uphill;
Or juicy meat on a grill,

A walk with your best mate;
Or grinning at the reduced price rate,

Positive even when 0.1% odds are in favour;
Or free Wi-Fi, a life-saver!

Upholding the grace of one's culture;
Or the mere sight of a Greek sculpture,

Winsome chuckle of a teething infant,
With pure lack of bother, so indifferent!

O for the warmth of Darjeeling tea;
Or just loud singing, carefree!

Maybe all that makes you smile;
And that resonates with your heart,
To walk another mile;
To just live for a while!
That brings peace to your soul;
And then never do them apart,

Let lose all those strings;
Cherish your sweet little nothings!

I AM NOT SORRY

BY SHRUTI ACHARYA

I am not sorry...for I am not the favourite chapter of the book that you have written.

I still hope that when you flip back to the pages I was part of, you smile, probably.

I am not sorry...for I tried.

I tried getting you back, despite knowing that you won't come.

I am not sorry...for what I have been is that is how I am...for perceptions is what I cannot change.

I am not sorry, for I gave what I could and I gave it with all my heart and soul.

I am not sorry, for it was not I who shooed away things like a drift of dust...

I am not sorry... because I heard my instincts, whispering into my ears, to let it go, to rise and think big, and reiterating...

That this is how people, things and sometimes feelings, come and go...

That a heart must be broken before years can mend it into a wiser one...

That whatever be the circumstances, one has to get up and face things, bang on.

I am not sorry...for my tears took it all.I have let them flow, allowing them to carry away the darkness that was there, killing me inside.

I am not sorry...for what I have been is, that is how I am, cold to some, and an inexorable warmth, for some others.

I am not sorry...

A MIDNIGHT REFLECTION

BY NOOR CHHIKARA

I was slowly walking into an abyss, darkness all around me. A cold feeling was spreading throughout me engulfing me in its raw existence. But like the light at the end of a tunnel, there was warmth making its way to me, a hand identical to mine holding it and that sure was the moment I felt alive. Fear is like quicksand, the more you fight it, the more you sink in, until you quit breathing.

I suddenly roused out of fear, fear of being alone. The clock read 11:00 P.M. It was about time. I got out of bed and dressed up. Heading down towards the car, I was uncertain about what I was about to do even though this had been my ritual for the past four years. Putting all the thoughts aside, I got in and drove towards my one escape from the bleakness that my life was. The starless night sky was wearing its darkest veil and sun would not grace the horizon for the next five hours. When I saw the gas station, the crippling effect of fear started getting hold of me. I got out of the car. The breeze sensed my fear, cold was once again flowing through me. Only this time it felt more real. I spotted the scarlet phone booth, standing as dejected as I felt. I got in the booth, took out the crushed piece of paper and dialled the number. Instead of putting it on my ear I was holding it close to my chest and the click sound assured me someone was on the receiving end like I had been four years back. I turned around and there she was the other me, the better me. I slowly lifted my hand, till my fingers brushed the glass, she reciprocated from the other side and her warmth seeped into me. True to her promise standing in front of me was my twin, the one I shared my mom's womb with. She caught me sunken into my reverie, my fear was beginning to drain out.

'Halley, I missed you so much. I'm so relieved you are here' I told her. Typical of her she just smiled and looked at me to search the long lost affection that would surface any moment now.

I glanced at my watch. It was five past midnight, the next 24 hours would just be us. I motioned Halley towards the car. I rolled down the windows on my side, as for Halley she never liked her window down. Our first activity was to drive all the way to Mt. Whitney and trek our way up to watch the sunrise together. I got out of the car and Halley followed. All the things we needed were stacked inside the trunk. As I picked them up, I asked, 'Hal, how's dad?'

'Fine' she said. Halley spoke rarely after that incident that happened four years ago. It was me who did all the talking. She went with dad, I stayed with mom. The last we talked was the phone call she made at midnight from the gas station.

We started our expedition, quietly as always. Silence was the winner here. We reached 'our' place just in time. I sat down, Halley was nowhere near. She must have been lurking around in the shade of the trees, trying to avoid the light, while light was all I needed. The sun rose, wrapped in its beautiful amber, bringing with itself hope for the world. I got up and followed

the less trodden path to the lake where on the brink of the water was Halley smiling back at me.

Our next stop was all the way across the city, which meant countless more hours of driving in silence. Was it the warm breeze of July or my sister's presence that made me feel complete but yet not safe, I couldn't be sure? The county fair was the most colourful place in the city right now. The first thing we did was walk through the mirror maze and spend an ample amount of time trying to get hold of each other. Rarely was this place visited by anyone, so it was our own universe away from chaos that the world was.

Next we crashed our favourite place to get food. Look Through, is made completely out of glass, reflecting the red of the sun going down somewhere in the west. We ordered our usual and I gulped mine like a hungry hyena but Halley's plate remained untouched. I took a bite out of her plate, this initiative helped her to get started.

Like each time, we departed at midnight at the gas station. Time flows like sand slips through a worn out hand, through continuity of life. We reached the gas station, five minutes before midnight. It was my turn to stand out while Haley went inside the phone booth and as always said what she had four years ago 'I will be with you always. Our souls were entwined before we were ever born and you will always carry a part of me as I do so too.'

I turned around and walked towards my car avoiding to look back, as I imagined her leaving as she always did.

The door clicks open followed by the creaking sound of despair. My mom, waiting by the stairs tries to avoid any interrogation, but out of habit remarks ' Lizzy, the more you go trying to find yourself, the more lost you come back. Accept the reality, our family is not coming back together.' Not having the strength to fight her, I headed upstairs quietly. I needed sleep, my eyes felt sore, I couldn't tell, there were no mirrors in our house as my mother had gotten rid of them.

Tomorrow was an important day, the only day we went to the church. To pray for peace, to mourn the loss we suffered. Tomorrow marks the horrible day, the day my sister suffered a horrible death four years ago at midnight at the gas station.

THE ECONOMY OF LIFE

BY SAMIKSHA UNIYAL

In today's world man is so busy in his daily pursuit that he eventually fails to appreciate things that surround him. We pay huge amount to procure stuff giving fallacious promise of adding ease to our life and ignore things in our radius which are of vital importance and costs nothing.

The best things in life are free. This is undoubtedly true for there is one vital aspect of life that is 'nature', which is available in abundance for each one of us and that too free of cost. **William Wordsworth once said, "The world is too much with us, late and soon. Getting and spending we lay waste our power, little we see in Nature that is ours.**" Thus in nature we have the lovely spring, the cold snowy winters, the soft moonlit night, the beautiful rainbows etc. Miranda House too adorns a beautiful campus. Once we enter the colossal gates of Miranda House, a subtle feel captures us and reaches within. The campus is all green with highly maintained gardens margined with beautiful flowers and lush green trees which also mark as a home to a variety of fauna.

Besides nature, there are other aspects of our life that are overlooked like the love of our parents and loved ones. Which is of critical importance even though it is not of any monetary importance. The words of encouragement and approval from our teachers or peers is something that we look forward to every day.

Our friends are another source of delight as some of our best moments are spent in their company. It is said that' **Life is brief – a little hope, a little dream and then good night'.** In this short period, we must therefore learn to enjoy life for there are some good sides of life which do not demand any financial success. We must learn to appreciate and enjoy them.

REACHING THE SUMMIT:

STUDENT'S

ACHIEVEMENTS

THIRD YEAR

BHAVYA SIROHI

- Qualified JNUEE 2018-19 for M.Sc. In Environmental Sciences.

JYOTSNA PANDEY

- Summer Research Fellowship from Indian Academy of Sciences.
- Bose Karkun award of excellence in Biochemistry and Molecular Biology
- Chandra Sathiraju award of excellence in Biochemistry
- IIT JAM BL- AIR 528

KANIKA ANABH

- Summer Research Fellowship from Indian Academy of Sciences.
- JNU CEEB AlR 9
- Qualified JNUEE (Molecular medicine and Life sciences)
- Qualified for NCBS and IISER Pune Integrated Phd Interview
- IIT JAM AIR 17
- Second Rank in Baseline test conducted by DS Kothari Centre for Research and Innovation in Science Education, Miranda House
- Received DS Kothari Science Award Certificate of appreciation.

RAJKUMARI NIKITA

- JNU CEEB: OBC RANK 256

RITIKA GOYAL

- IIT JAM BL AIR 250
- IIT JAM BT AIR 820

SHRITI KUMAR

- Qualified for TISSNET 2018 for M.A in Natural Resource and Goernance.
- Book Grant scholarship from UGC.

SHRUTI ACHARYA

- Qualified TISSNET 2018 For M.A Social Work in Public Health and M.A Social Work in Mental Health

- Dr. Saroj Kesar Meritorious Award for securing Highest marks in Physiology and Functional Histology(Miranda House)
- Academic Award 2017 fornsecuring highest cumulative marks in Univrity Examinations Semester I to Semester IV.
- Book Grant scholarship from UGC.

VIDHI YADAV

- JNU CEEB : OBC RANK 40; AIR 310

SECOND YEAR

ANUBHUTI KRISHNA

- 3rd position in the poster presentation at Daulat Ram College.

VARTIKA SRIVASTAVA-

- Recipient of INSPIRE scholarship.
- Part of National Service Scheme 2017-18.
- 3rd position in the poster presentation at Daulat Ram College.

VIBHUTI-

- 1st position in Erobern-college sports fest in Taekwondo.
- 3rd position in MHH fresher's marathon.

ANJU PANGHAL

- 2ND position in walking 5km in inter-college competition.

FIRST YEAR

RACHNA

- Delegate at Utkarsh Youth Convention 2018.

- Participant in the Global Wildlife Programme Conference organized by the Ministry of Environment, Forests and Climate Change, Government of India at Ashoka Hotel New Delhi.
- 2nd prize in photography competition in Fresher's Talent hunt.
- Selected as City head of New Delhi , IRSC.

SAPNA DABAS

- Bronze medalist at Inter College Taekwondo Championship at Multipurpose Sports Complex , Delhi University dated 31-01-2018 – 02-02-2018.
- Silver medalist at Erobern Sports Fest at Miranda House, University of Delhi in Taekwondo dated 07-02-2018 – 09-02-2018.

LAB STAFF

RAKESH KUMAR
RAMESH SHARMA
SANJAY DUTT

UDAY CHAUDHARY
MUKESH MANIK
DAAN SINGH

SURESH PRAJAPATI
PUNEET RANGA
KULDEEP SINGH

FIRST YEAR

SECOND YEAR

THIRD YEAR

M. POOJA

VIBHUTI

AMISHA

MALE DAMSELFLYY AIDING FEMALE DAMSELFLY TO LAY EGGS (POST MATING)

PICTURE BY: KANIKA ANABH

AFRICAN MONARCH BUTTERFLY

PICTURE BY: KANIKA ANABH

LADYBUG (FAMILY: Coccinellidae)

PICTURE BY: SHRUTI ACHARYA

M. POOJA