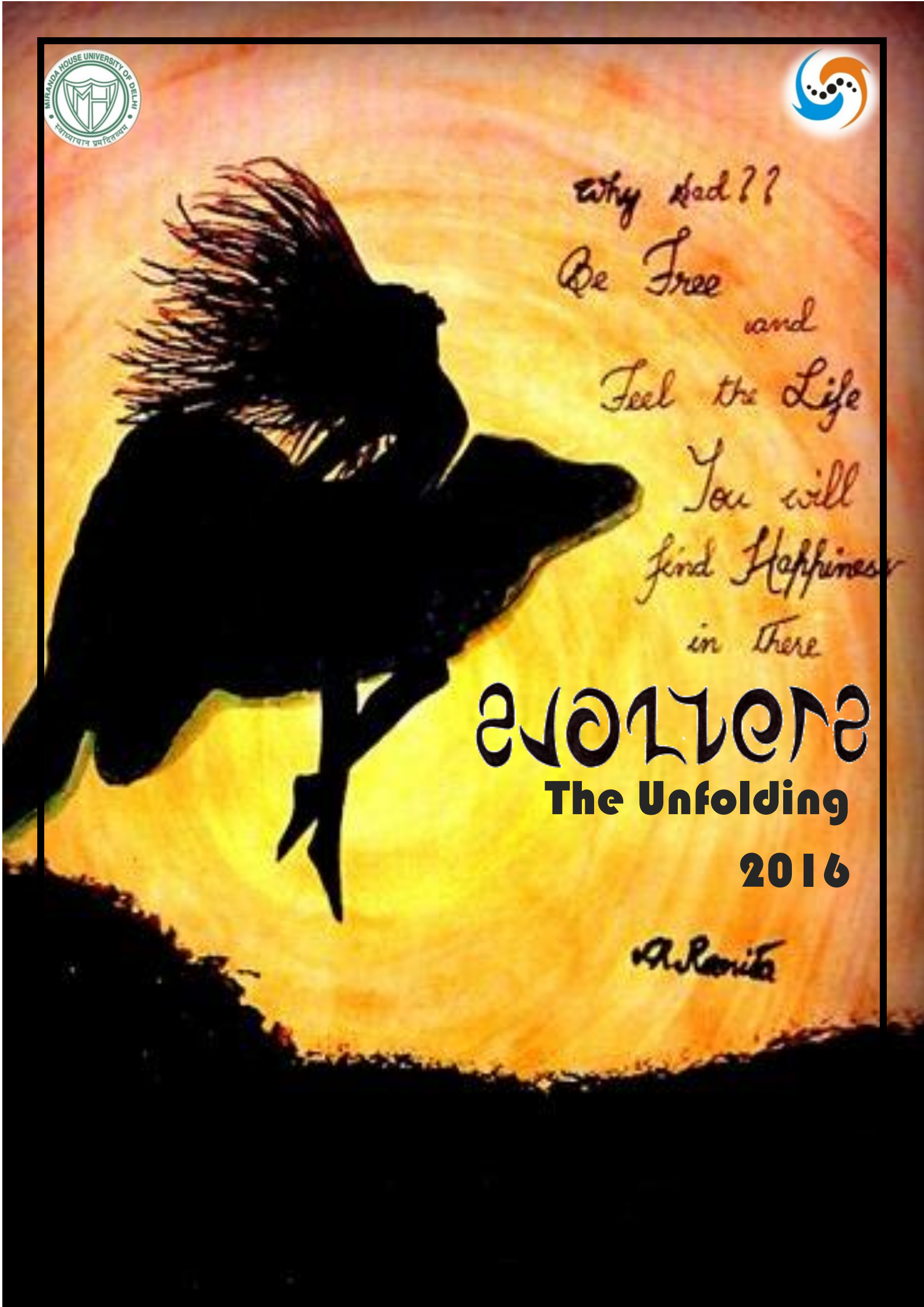


अवलोन

The Unfolding

2016

EVOLVERE

....the unfolding

-BY SYNAPSE, Department of Zoology

ACHIEVEMENTS

THIRD YEAR

ASIMA ABIDI-

1. Best Production Award for 'The Maids' at Rajpal, Annual Theatre Fest of St. Stephens.
2. 1st runner up for Best Play for 'The Maids' at Rajpal, Annual Theatre Fest of St. Stephens.
3. Meritorious Scholarship from UGC for academic excellence
4. First position for Baseline Test organized by DS Kothari Centre for Science Education and Research
5. Recipient for Science Award 2016-17
6. Second position for Extempore organized on Impact of Exponential Technologies on future of Human Species organized by TIFAC in IIT Delhi.
7. Qualified for interview for PhD program at NCBS Bangalore and IISER Pune through the JGEEBILS entrance exam.
8. Intern at Homi Bhabha Centre for Science Education, TIFR, Mumbai, for three weeks in Dec 2015. Worked on credibility of Drosophila as a model system.
9. Summer Research Fellowship awarded by INSA-IAS-NASI from May 22nd to July 20th 2016 at Indian Institute of Technology Bombay, Mumbai. Worked on Mammalian Tnfalpha signalling and elucidation of pERK dynamics in cancerous cell lines.
10. First prize in Debate on 'Odd Even Rule- Success or Failure' as part of fest Impulse.
11. AIR 62 in Joint Admission Test for masters in Biological Sciences at IISc and IITs.
12. Academic Prize for highest marks obtained in the aggregate of two years of the B.Sc course awarded by MirandaHouse University of Delhi
13. Dr. Saroj Kesar Meritorious Award for Highest marks in Physiology awarded by Miranda House, University of Delhi
14. Third position in the Science Quest 2017 organised by Cluster Innovation Centre, University of Delhi along with First position in the Interactive round I.

UDITA BANSAL –

1. Participated in the Summer Visiting Research Programme in the School of Biology at Indian Institute of Science Education and Research (IISER), Thiruvananthapuram, Kerala, India from 24th May-26th July, 2016 under the guidance of Dr Ullasa Kodandaramaiah. My research topic was “Exploring the evolutionary significance of ventral colouration in a family of fossorial snakes, the Uropeltidae”.
2. Attended the Second Winter School on “Foundations of Ecology and Evolution” held at Indian Institute of Science Education and Research (IISER), Mohali, India, from 12th to 26th December, 2016.
3. Worked in Kanha National Park, Madhya Pradesh, India for one month (2015) on two projects under the Wildlife Institute of India, Dehradun viz., “Resource partitioning among sympatric ungulates in Kanha Tiger Reserve, Madhya

Pradesh" and "Monitoring tiger, co-predators, prey and their habitat"under the supervision of Dr Y.V. Jhala and Mr Qamar Qureshi. My work involved studying ungulate behaviour and their habitat ecology, and camera trapping.

4. Worked with a PhD student from Oxford University on his project "A study of resource selection by Black Kites" in affiliation with Wildlife Institute of India, Dehradun.
5. Was part of the NIUS Biology Exposure-cum-Enrichment camp (2014) conducted by Homi Bhabha Centre for Science Education, Tata Institute of Fundamental Research, Mumbai, India.
6. Was selected for the Project- Oriented Biological Education Programme POBE 2015 at Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore, India.
7. DANCE
8. Performed at the 10th Media Excellence Awards 2016 organised by the Media Federation of India.
9. Won the second prize in the group folk dance competition at the annual cultural fest (2016) of Kirori Mal College, University of Delhi.
10. Was given an outstanding achievement award for astrophotography during the Fresher's Talent Hunt, 2014.
11. Won the first prize in the debate speaking on the topic "Odd-even rule: a failure" during the annual zoology department fest, 2016.

SECOND YEAR

ARSHIA BHAT, AVNI GUPTA AND BHAVYA SIROHI

1. First prize in poster presentation in National seminar, Dept. Of Science and Technology at Kalindi College, University of Delhi, under the guidance of Dr. Jyoti Arora.

BINDU VATS

1. 1st prize in Inter-college Netball.
2. 1st prize in Erobern (MH) basketball and net ball
3. 1st prize in Institute of Home Economics in basketball
4. 2nd position in in Kirorimal College in basketball.
5. 2nd position in NSUI in basketball
6. 3rd position in inter-college Basketball.

GARVITA GOYAL

1. Oral presentation on overwintering strategies of mosquitoes along with KanikaAnabh and Shruti Acharya under the guidance of Dr. Vimal Thareja.

JYOTSNA PANDEY

1. Second position in Intra-college Quiz.

KANIKA ANABH

1. Presented a talk in JNU about the overwintering strategies of mosquitoes with Dr. Vimal Thareja, Dr. Anjana and Anina (Phd. scholar)

2. Presented a talk about the overwintering strategies of mosquitoes in Miranda House and Gandhi Bhawan with Dr.Vimal Thareja, Shruti and Garvita
3. Qualified for the National Science Academies' Summer Research Fellowship Programme 2017.
4. Won the first prize in Debate competition organised by Tricord, the Life Sciences society of Miranda House.

KOMAL AHALAWAT.

1. 1st prize in Inter-college Netball.
2. 1st prize in Erobern (MH) basketball and net ball
3. 1st prize in Institute of Home Economics in basketball
4. 2nd position in in Kirorimal College in basketball
5. 2nd position in NSUI in basketball
6. 3rd position in inter-college Basketball.
7. Participation in SRCC, BITS Pilani and Royal Club Championships on Invitation.

SAKSHI SHARMA-

1. 2nd prize in Inter-college Chess Championship, SRCC, Lady Shriram College, Haryana State Chess Championship.
2. 1st Position in KMC Chess Competition and Erobern(MH)
3. DUSU sports president 2016-17

SHRUTI ACHARYA

1. Attended Harvard US INDIA Initiative conference, Mumbai, 2016
2. Presentation on "Overwintering strategies of mosquitoes" along with KanikaAnabh and Garvita Goyal under the guidance of Dr. Vimal Thareja.
3. Book Grant scholarship from UGC.

SHRITI KUMAR

1. Attended Harvard US INDIA Initiative Conference, Mumbai, 2016
2. Book Grant Scholarship from UGC.

FIRST YEAR

VIBHUTI BHATT:

1. 3rd position in Fresher's cross country organized by Department of Physical Education, MH.

ANJU PANGHAL:

1. Silver medal in inter-college 5km walk organized by Delhi Sports Council
2. Gold medal in fresher's cross country organized by Department of Physical Education, MH

ZEBA MALIK:

1. 3rd position in DS KOTHARI baseline test in biology

ALKA SINGH:

1. 2nd position in DS KOTHARI baseline test in physic

OUR SOCIETY

Teacher in-charge :		**Dr. Jyoti Arora**
Staff advisors	**:**	**Dr. Monika Sharma**
		Dr. Simran Jit
President	**:**	**Asima Abidi**
Vice-President	**:**	**Sunidhi Chouhan**
Editor	**:**	**Aishwarya Khare**
Co-editor	**:**	**Kanika Anabh**
		Garvita Goyal
		Shruti Acharyaa
General Secretary :		**Avni Gupta**
Treasurer	**:**	**Vidhi Yadav**
Event Manager	**:**	**Palvi Gotra**
		Sakshi Sharma

CONTENTS

MESSAGE FROM THE STAFF ADVISORS

The happiness that the completion of another academically wonderful and enlightening year is beyond compare. We, staff advisors congratulate our editorial team members on the release of Evolvere the annual department magazine of Zoological Society, Synapse. Evolvere exemplifies the potential and the literary skills of our students.

The magazine is amalgamation 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, a special section has been included in the magazine dedicated for students to share their internship experiences.

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

Best wishes and blessing to our dear outgoing batch of 2013-2016 and sincere wishes for their success!

Dr. Monika Sharma

Dr. Simran Jit

(Staff Advisors, Synapse)

PRESIDENT'S NOTE

You leave one place for another

In the hope that you will get better

You're clueless and anxious about the destiny

But don't you still enjoy the journey?

There are changes in our lives that serve as milestones and alter who we are for forever. Miranda is that wonderful place that transformed me from a hatchling, shyly making her way through her shell into a confident bird with wings wide spread and ready for flight. The journey through Miranda has been a roller coaster ride, thrilling and equally joyous at each high and low point. Miranda has made me a stronger, bolder and a more honest person than I ever was, and if I were to list the ways in which Miranda has shaped me, I might as well come up with another book, so leaving it here.

I can proudly say that Synapse, the Department of Zoology has witnessed an eventful year. The session kicked off with a very informational lecture on Gynaecological concerns in young adults by Dr. Tripti Sharan followed by a workshop on Stress Management by Dr. Avneet Kaur and Mrs. Alpana Rastogi. The fresher's party was organized splendidly to welcome the new batch of students and learning beyond the walls of the classroom was promoted by an educational trip to Yamuna Biodiversity Park. It is an honour to present to you 'Evolvere: An Unfolding', our most esteemed magazine, the product of the intense hard-work, dedication and creativity of the Department.

This is the perfect platform to extend my heart felt gratitude to our Teacher in Charge, Dr. Jyoti Arora, our staff Advisors- Dr. Monika Sharma and Dr. Simran Jit and all other wonderful teachers of the department, the most helpful lab staff and my precious team of office bearers, especially the editorial team. Thank you for the wonderful journey. Thank you for making it all worthwhile. Thank you Synapse. Thank you Miranda House.

There will always be a place for you in me. So what if they just call it a memory?

Asima Abidi
President
Department of Zoology

EDITORS' NOTE

Life is queer with its twists and turns,
As everyone of us sometimes learns,
And many a failure turns about
When they might have won, had they stuck it out.
Don't give up though the pace seems slow,
You may succeed with another blow.

Miranda House is not just a part of my life, its bit of me in itself. The epitome of knowledge has inspired me to think differently. The way it has moulded me shape my perspective, has made me a better person in all grounds. When I was in the midst of a bleak that things are hard on me, it taught me, only when it's beaten, the diamond acquires its true form!

SYNAPSE, Department of Zoology, is not only held together by simple conversation and compatible personalities but talents and passions shared among individuals. SYNAPSE proudly houses exquisite innovators, performers and artists, who continually impress with their outstanding displays of creative talent. Behind the performances we see are the Planners and mentors without whom, none of the various major events could have been executed. Hereby I take the opportunity to express my kindest gratitude to our Head of the Department, Ma'am Jyoti Arora, whose efforts continuously motivate us to do something innovative everytime. And to the respected Staff advisors, Ma'am Simran Jit and Ma'am Monika Sharma, whose valuable feedbacks made EVOLVERE the product it stands today. And to all the staff lecturers, who never step back giving us ingenious ideas.

So here we unfold, "THE EVOLVERE", Magazine, Zoology department, our inspired recollection of this year, transiently fading in background as the year steadily passes by.

Aishwarya Khare
Editor
Department of Zoology

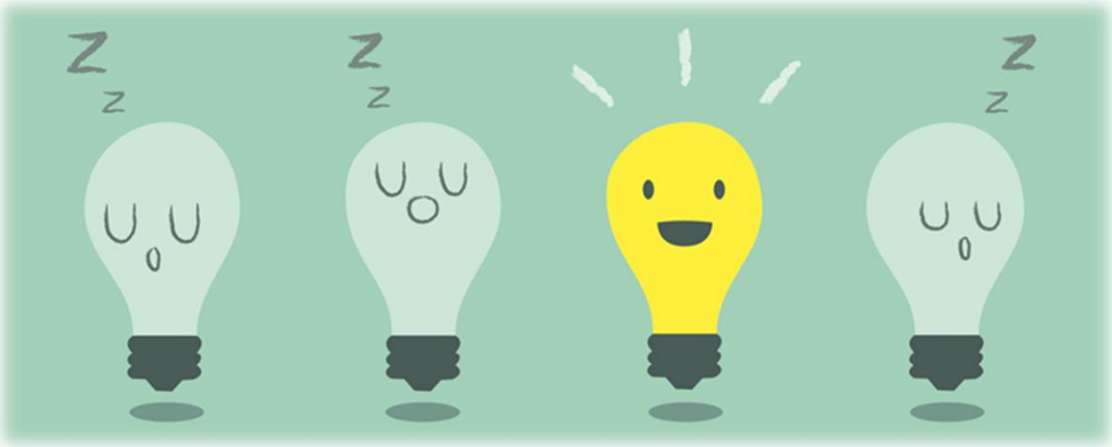
FAREWELL NOTE

With a heavy heart and a mind full of wonderful memories, we bid farewell to a very special teacher Dr. Vimal Thareja, who served as an Associate Professor in the Department of Zoology. Ma'am specialised in Entomology and boasted of a teaching experience of 39 years. She has been a guide, a mentor and above all a beautiful human being who was admired by one and all and was the reservoir of knowledge. Also, she has been a source of inspiration for several generations of Mirandians who are forever indebted to her selfless efforts and understanding nature. She taught, not just what ought to be taught but also what she thought we needed to learn.

The backbone of a good college like Miranda and the wonderful Department of Zoology is not made from fancy classrooms and large campuses. It is made from the excellent education imparted by teachers like Vimal Ma'am

No one can really say good bye to a teacher, for they forever stay in little homes called hearts of their students. The Department deeply misses her.

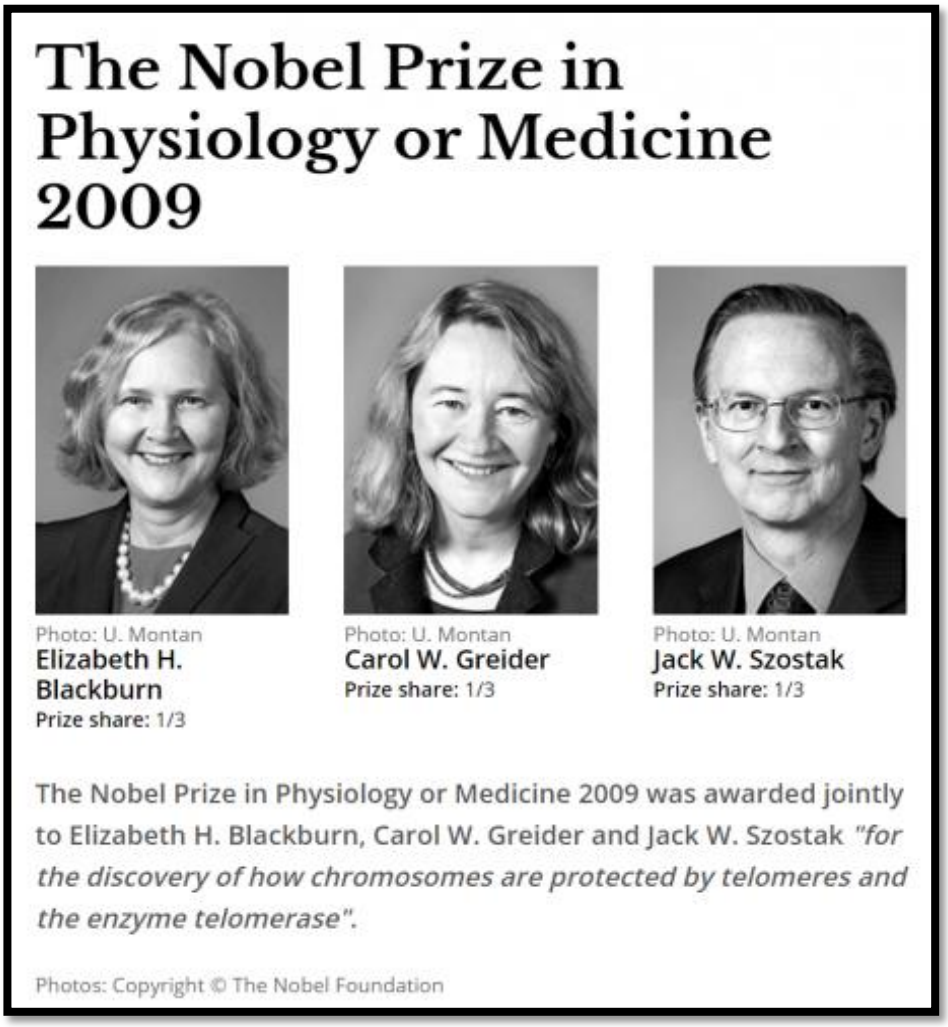
CONTEMPORARY SCIENCE



TELOMERE: A GROUNDBREAKING DISCOVERY

Telomeres are the short terminal sequence present like caps on the ends of long , thread like structures called chromosomes. Telomerase is the enzyme that makes telomere DNA.

During 1930s, Herman Muller(Noble prize 1946) and Barbara McClintock (Noble prize 1983)suspected that the telomeres have protective role and prevent chromosomes from attracting each other. But they were not able to find how they operated until 1982 when their role was unveiled by the Noble Laureate Elizabeth H. Blackburn, Carol W. Greider and Jack W. Szostak.



Blackburn during her early phase of research was mapping DNA sequences of *Tetrahymena,* a unicellular ciliate organism. She observed that a particular DNA sequence was repeated several times at the ends of the chromosomes. The sequence was CCCAA. Its function, however, remained unclear. At the same time, Jack Szostak had made the observation that a linear DNA molecule, a type of mini chromosome, is rapidly degraded when introduced into yeast cells. In 1980,when Blackburn presented her result about the repeated DNA sequence of *Tetrahymena* at a conference, it caught Jack Szostak's interest. Szostak and Blackburn decided to perform an experiment that would cross the boundaries between very distant

species. Blackburn isolated the CCCAA sequence from the DNA of *Tetrahymena* and Szostak, coupled it to the mini-chromosome and put them back into yeast cells. The telomere DNA sequence was found to protect the mini-chromosome from degradation. Later on, it became evident that telomere DNA with it's characteristic sequence is present in most plants and animals.

Telomerase, the enzyme that extends telomere DNA provides a platform that enables DNA polymerase to copy the entire length of the chromosome without missing the very end portion. It thus prevents the shortening of chromosome after every division. It has been observed that cells with short telomeres grew poorly and eventually stop dividing. It led to premature cellular ageing called senescence. It has been known that the DNA sequences in the telomere attracts proteins that forms a protective cap around the fragile ends of the DNA strands. The shortening of the telomere is one of the factor responsible for ageing process.

Cancer cells have the ability to divide infinitely and yet preserve their telomeres. How do they escape cellular senescence? One explanation became apparent with the finding that cancer cells often have increased telomerase activity. It was therefore proposed that cancer might be treated by eradicating telomerase. Several studies are underway in this area, including clinical trials evaluating vaccines directed against cells with elevated telomerase activity.

Some inherited diseases are now known to be caused by telomerase defect, including certain forms of congenital aplastic anaemia, inherited diseases of skin and the lungs. With the discovery of the telomere, it is being hoped that these diseases can be treated and can be cured at the genetic level and gene therapy can be possible in the nearby future.

In conclusion, the discoveries by Blackburn and Szostak have added a new dimension to our understanding of the cell, shed light on disease mechanism, and stimulated the development of potential new therapies. The discovery has revolutionised the medical science and demands better future perspective.

Reference

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NEELIMA SHARMA
I year

FIGHTING THE INVINCIBLE TIGERS: Managing Stress and Tough Times

"NEVER FORGET THAT DIAMOND IS A PIECE OF CHARCOAL THAT HANDELED STRESS EXCEPTIONALLY WELL"!

Anxiety disorders are now recognized as the most common emotional disorder. The increasing rate of traumas to children, which also include school demands and frustrations, negative thoughts and feelings about themselves, changes in their bodies, problems with friends and/or peers at school, unsafe living environment/neighbourhood, separation or divorce of parents, chronic illness or severe problems in the family, death of a loved one, moving or changing schools, taking on too many activities or having too high expectations, family financial problems has produced a "shell shocked" generation suffering from anxiety in many cases. The challenge is to recognize anxiety in children and help them cope.

Some teens become overloaded with stress. When it happens, inadequately managed stress can lead to anxiety, withdrawal, aggression, physical illness, sleep disorders, panic attacks, social avoidance, fears/phobias, obsessions, compulsive behaviour and post-traumatic stress, or poor coping skills such as drug and/or alcohol use, and sometimes devastating deleterious decisions.

It is indeed necessary to help children to identify the causes of their stress and provide them with practical, effective tools to avoid, reduce and manage stress.

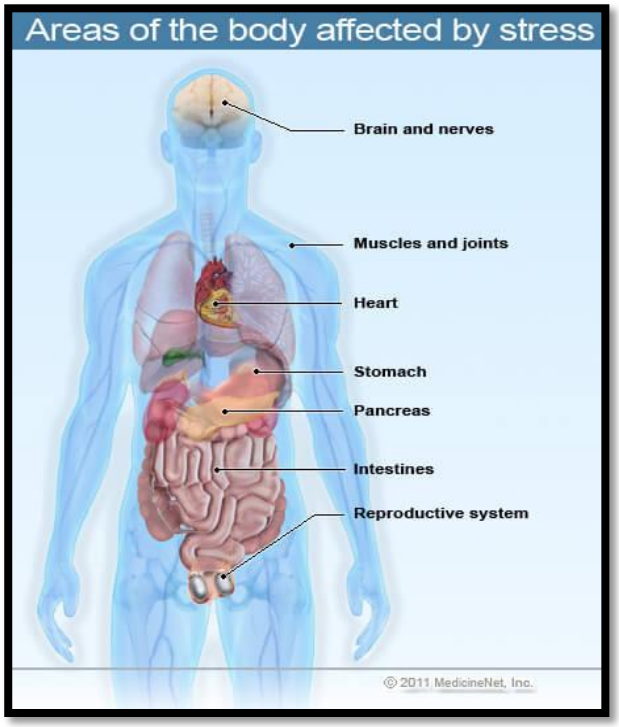
The spheres where they get stuck are vast. We need to make them understand how stress drains the value from their life. How our mind sabotages our peace and our sense of well-being

Certain factors can enhance our susceptibility to stress or act to reduce its severity. Like, people with strong social support networks report less stress and overall improved mental health in comparison to those without these social contacts. People who are poorly nourished, who get inadequate sleep, or who are physically unwell have reduced potential to handle the pressures of everyday life and may report higher stress levels. Children, teens, college students, working parents, and seniors are examples of the groups who often face common stressors related to life transitions. Children disrupt their nutritional cycles, eating habits; they lose appetite; suffer hormonal imbalance; disrupted menstrual cycles in case of girls and many more physiological effects.

"IF YOU BELIEVE YOURSELF, YOU WILL FIND ANGELS OUT OF YOUR DEMONS. BUT YOUR DEMONS WILL ALWAYS FIND WAYS TO OVERPOWER YOU. BRAVERY IS IN EMBRACING THE RIGHT CHOICE"

But before that it's important that they reconcile the nature and causes of stress. It is both, the cumulative effect of EXTERNAL and INTERNAL factors. Managing stress, therefore, can involve learning tips to change the external factors which confront us or the internal factors which strengthen our ability to deal with what comes your way.

- **Exercise & Yoga:** aid in relaxation and improve sleep. Being fit and healthy also increases your ability to deal with stress as it arises.
- **Relaxation techniques and meditation**
  - **Autogenic training**: by repetition of "formulas" one focuses upon different sensations, such as warmth or heaviness, in different regions of the body.
  - **Biofeedback:** control stress responses, or modify the body's reactions through the use of monitoring equipment that provides information from the body
  - **Imagery:** nothing but the use of pleasant or relaxing images to calm the mind and body. By controlling breathing and visualizing a soothing image, a state of deep relaxation can occur. This method is relatively easy to try out.
  - **Meditation techniques**: The meditative state is one in which there is a deep centering and focusing upon the core of one's being; there is a quieting of the mind, emotions, and body.
  - **Progressive muscle relaxation:** muscle groups are tightened and then relaxed in succession. The idea behind this is completely biological that mental relaxation will be a natural outcome of physical relaxation.
  - **Martial arts**
- **Time-management**: learning to prioritize our tasks such that w are not overloaded with work, surely reduces overburden. Banishing procrastination is another time-management skill that can be perfected.
- **Organizational skills:** unorganized and messy surroundings pose a negative impact on our mind. Thus it is necessary to organiz our physical surroundings.
- **Support systems**: Cultivating and developing a social support network is healthy for both body and mind.



In a sum, stressors need to understand the effects of positive and negative thinking. Manage their attitude and protect them from negativity, harness the power of emotions, the power of Decision Management and working effectively under time pressures. Avoiding the trap of procrastination and last but somehow crucial to exercise their sense of humour for stress reduction, finding meaning in their work, in their relationships and in their life, can feed them a better and healthy life.

References:

Stöppler M.C., Shiel William C., "Stress Management", medicinenet, 2015 (http://www.medicinenet.com/stress_management_techniques/page4.htm)

AISHWARYA KHARE
III Year

INTEGRATED PEST MANAGEMENT AND ITS ENVIRONMENTAL IMPACT

Integrated Pest Management (IPM) also known as Integrated Pest Control (IPC) is a relatively new agricultural practice and came into the fore majorly only in the 1970s when its introduction was urged by both entomologists and ecologists.

The United Nation's Food and Agriculture Organisation defines it as "the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment."

IPM allows for safer pest control and has the least impact on the natural environment when compared to chemical pesticides. This is because it uses biological control agents which utilise prey-predator relationships and competitive inhibition to control pest populations. This technique has several benefits some of which are as follows-

- Leads to decrease in the use of chemical pesticides, herbicides and weedicides which may kill useful organisms along with pests thus destroying the entire ecosystems of fields.
- IPM helps preserve the field communities which are crucial for good crop yield.
- As the soil is no longer degraded by chemical pesticides, it leads to reduction in fertiliser consumption and thus prevents incidents of eutrophication and biological magnification. Apart from these environmental benefits, there is one very significant economic benefit as well. In developing countries like ours where farmers are not the richest of people, it helps reduce expenditure on expensive agro-chemicals. Some common examples of bio-control agents include –
- Use of insect pheromones to disrupt pest mating cycles, parasitic wasps to control flies, dragonflies to control mosquitoes and ladybirds to control aphids.
- *Bacillus thuringiensis* is used to wipe out entire leaf-feeding caterpillar and larval populations. It possesses the *Cry* gene which when ingested gets activated in the gut of insect, and kills it due to the perforations it causes in the intestinal wall.

Another noteworthy mention is that of **baculoviruses**. These are polyhedronucleoviruses, which are species specific in infection. They kill only the pest species without causing any apparent harm to even other species that are closely related. However, nothing comes without its pitfalls. IPM may lead to development of exotic varieties especially in the case of *Bacillus thuringiensis* like **Bt cotton,** of which the environmental impact of introducing in the wild still has not been taken into consideration.

No toxicity to either humans or other animals has been noted as of yet. However, this is a relatively new technique and there is no true way of predicting its long term effects. Hence, this too must be used with precautions. However, a lot of further studies are going on and yet to be carried out in future to find out other potential benefits of this novel method to restrict the insect pests in agriculture.

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- www.ipmimpact.com
- https://www3.epa.gov/pestwise/htmlpublications/ipm_fact_sheet.html
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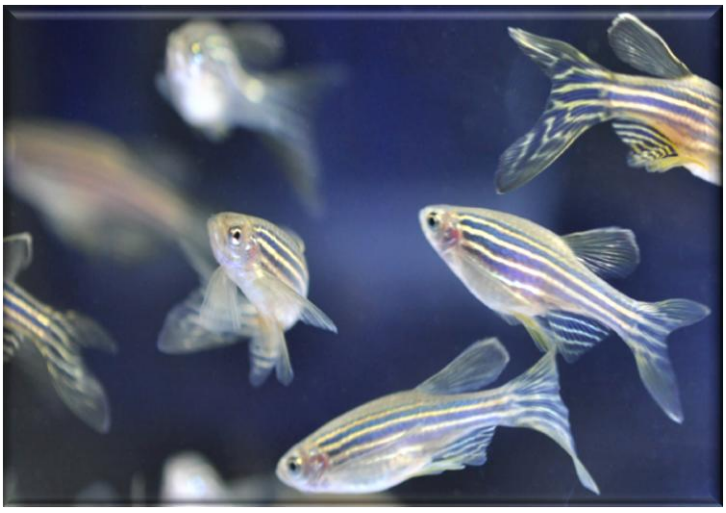
ANUBHUTI KRISHNA
I Year

Danio rerio: TINY FISH WITH A BIG SPLASH

Danio rerio commonly known as Zebra fish is a tropical fish, native to Southeast Asia (Himalayan region). Commonly called as Zebra fish because of their great resemblance to zebras. They are of no economic importance in commercial fisheries as a food fish, but very commonly known and popular in the aquarium trade and used for scientific research.

Zebra fish is a big splash in the field of biomedical research. Since the 1960s, zebra fish has become increasingly important to scientific research, helping us on our way in understanding and treating human disease. Numerous features of it had proved it to be a great model organism.

In its larval stage it is transparent and as it matures it develop strips that run the entire length of the body and looks blue in color. Males are slender while the female tends to be fatter due to eggs, they carry.



Since nearly transparent, allows researchers to easily examine the development of internal structures (blood in a living zebra fish can be seen under even a low power microscope). Aided by the transparency, if researchers modify the fish's genotype at the egg stage,they can see resulting changes in organ shape or dynamic body changes.

The zebra fish is small and resilient. Hence cheaper to maintain,and can be housed at high density. And as a result, they are used in many labs to replace or support higher vertebrate models like rat or mice.

Break of daylight triggers mating in zebra fish (many other fish only lay eggs in the dark). They produce hundreds of offspring on a weekly basis providing scientists an ample supply of embryos to study. They reproduce and grow very easily and at an extremely fast rate (they develop as much in a day as a human embryo develops in one month).

As a vertebrate, the zebra fish has the same major organs and tissues as humans. Their muscle, blood, kidneys and eyes share many features with human systems. Zebra fish have a common genetic structure sharing 70% of genes with us. 80% of genes known to be associated with human disease have a zebra fish counterpart.

They have the unique ability of regeneration. So, if part of there is removed, they can grow it back in a matter of weeks. So, there are researches going on to see if this will help us to develop ways of repairing heart in humans with heart failure or who have suffered heart attack or have heart related diseases.

In 2009, researchers at IGIB (Institute of Genomics and Integrative Biology) in Delhi, India announced the sequencing of the genome of a wild zebra fish strain, containing an estimated 1.7 b illion genetic letters.

The fully sequenced zebra fish genome has noted as an invaluable reference tool for scientists.

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i. Dooley K1, Zon LI. Zebrafish: a model system for the study of human disease. Curr Opin Genet Dev. 2000 Jun;10(3):252-6.
ii. http://eol.org/pages/204011/details

POOJA MAYANGLAMBAM
I Year

Tetrahymena thermophila : A MODEL ORGANISM WORTH BEHOLDING

Model organisms have emerged out to be important tools of biological research. A model organism is a species that is extensively studied for understanding biological processes in a laboratory setting. *Tetrahymena thermophila* is a unicellular, free-living, ciliate, predatory protozoan which is a wonderful model organism used widely these days to answer mind-boggling questions of biology.

This single-celled protozoan is cosmopolitan in distribution and can exist in a variety of climatic conditions. *Tetrahymena* is unique from other ciliate protozoans for its nuclear dimorphism. It has two nuclei-

- The **Micronucleus** (MIC) that contains diploid genetic material and has five pairs of chromosomes.
- The **Macronucleus** (MAC) that contains about 300 chromosomes that are derived from the MIC. This nucleus is expressed during vegetative replication.

The importance of *Tetrahymena* in research is mostly attributed to the presence of these two types of nuclei.

The compelling reasons that makes *Tetrahymena*, a model organism, are-

1. These unicellular ciliates can grow in a variety of media and conditions. They can be grown in high densities with least expensive means requiring only a shaker (literally bucketfuls of them). The genomes of MIC and MAC can be separately bioengineered by recombination DNA technology which enables removing, deleting and addition of new genes.
2. *Tetrahymena* is large in size (40-50μm) and its complexity may even be compared to human tissues.
3. It possesses processes that have been conserved across a wide diversity of eukaryotes which can not be found in other model organisms such as yeast.

Research on *Tetrahymena thermophila*:

1. **CILIA BIOGENESIS:** As a ciliated protozoan, *Tetrahymena* can be studied to understand the formation and functioning of cilia which can also be applied for higher organisms as the presence of cilia is both biochemically and genetically conserved.
2. **TELOMERASE STRUCTURE AND FUNCTION:** Telomerase is an enzyme that adds telomeres (repetitive sequences that act as sacrificial sequences during replication) to the ends of chromosomes. This enzyme is conserved from unicellular eukaryotic species to humans.
3. **NUCLEAR UNICELLULAR EXPANSION:** The phenomenon of nuclear expansion during closed mitosis in eukaryotes is being studied in *Tetrahymena* . The advantage in this case is that nuclear expansion is dramatic (~10-15 folds) during specific stages of conjugation (sexual reproduction). (SOURCE: Mechanism and Regulation of Nuclear Expansion: DR. ABDUR RAHAMAN, NISER, BHUBANESWAR)
4. **STRANGE SEXUAL BEHAVIOUR:** It has been found that *Tetrahymena* has seven sexes (Yes, it has been established!). Each of the seven sexes can mate with every other sex but of its own. How these tiny critters determine sex had been a hard nut to crack for researchers. It has been found that, a pair of genes were active only during mating and there are six copies of these mating type of genes(one for each sex) in the micronucleus.

There is an endless list of undergoing researches on this little bunch of wonder. The most recent development that is being studied on *Tetrahymena* is in the field of epigenetics. Epigenetic studies deal with the stable inheritance of phenotypic characters that result from the alterations in the chromosomes without any change in the DNA sequence. The Nuclear Dualism feature of *Tetrahymena* is being exploited to find out the unconventional details of epigenetics.

Tetrahymena is weirdly and incredibly powerful as a biological tool but is understudied in comparison to other model organisms- the reason being conventional 'safe' research methodologies being adopted in Life Sciences.

There are still many mysteries associated with this organism that are still unknown and unrevealed. Therefore, there is a need to explore the potential peculiarities of this organism.

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SHRUTI ACHARYA
II Year

A NEW LEAP IN GENETICS

Photosynthesis is one crucial phenomenon taking place in green plants. Although plants require sunlight for the same, they too are harmed by its excess dose. In excess sunlight , plants too suffer from sunburn that could be detrimental to them. Therefore in order to combat any such situation, plants have a special phenomenon called **Non-photochemical Quenching (NPQ)** operating within them. Through this mechanism the chloroplast diverts the photons from the light harvestin g molecules and simply wastes them as heat. The entire process is governed by genes specialized for the same. In the presence of excess sunlight, genes producing the required proteins are blocked, which in turn stimulates the process of Photo protection. As the exposure to sunlight reduces, the genes start producing the proteins to turn off NPQ and relax the protection. But unfortunately the time lag between receiving shade and starting the relaxing mechanism was long enough to degrade the yield of photosynthesis thereby reducing the photosynthetic efficiency. This has proved to be a major drawback to all the farmers who want to maximize biomass production.

In 2004, plant physiologist **Stephen Long** from **University of Illinois**, Urbana along with his colleagues calculated that NPQ operating under typical condition for a mid-latitude farm can reduce the amount of carbon dioxide turned into sugar by up to 30%. Therefore many plant biologists, especially **Krishna Niyogi** from University of California, have been studying ways to overcome this drawback in plants. After some time, a major achievement in the field of genetics had resulted in the development of such plants that have the unique feature to master this snag. The strategy was to add extra copies of three genes whose proteins govern the mechanism of NPQ. But since plants usually silence any extra copies of their own genes, similar genes extracted from *Arabidopsis thaliana* were introduced into a

Tobacco plant (which is relatively easy to modify). The results they got after testing and planting these genetically modified plants were amazing. The modified tobacco bulked up their leaves, stems, and roots, weighing 14% to 20% more than unmodified plants after 22 days. Moreover no apparent losses were noticed in these plants. This had been a major leap in genetics which has proved to be quite beneficial in enhancing the efficiency of photosynthesis. But further studies on whether or not similar experiments will be successful on food crops too are under progress. If successful, such an achievement would be a major boon to everyone specially our farmers.

Source- www.sciencemag.org

VARTIKA
I year

NOBEL PRIZE IN PHYSIOLOGY OR MEDICINE

MECHANISM FOR AUTOPHAGY DISCOVERED: ALL THANKS TO Yoshinori Ohsumi

For scientists, cells are their canvas, they can paint an entire new world by discovering new processes of the cell that we are unaware of now but could be a breakthrough for various diseases or even create something new. Cells and their processes have always left scientists wanting for more.

This year, Yoshinori Ohsumi set a similar example, by winning the Nobel Prize in physiology. (Yoshinori Ohsumi)

Ohsumi was born on February 9, 1945 in Fukuoka, Japan. He is head of the Cell Biology Research Unit, Institute of Innovative Research and Tokyo Institute of Technology.

Describing autophagy in general terms, it is a "self-devouring", natural, highly regulated, destructive mechanism of the cell that disassembles unnecessary or dysfunctional components.

This concept emerged during the 1960's, when researchers first observed that the cell could destroy its own contents by enclosing it in membranes, forming sack-like vesicles, called the *lysosome,* for degradation.

Sharing his thoughts on autophagy, Ohsumi said,

"Since our discovery of autophagy in yeast 27 years ago, the primary objective of our research group has been the molecular characterization of autophagy. Through the pioneering use of genetics in our studies, we were able to turn the field of autophagy on its head and trigger an explosion in autophagy research that continues apace. However, there remain many unanswered questions in this field. One major reason that these problems remain unsolved is that the biochemical analysis of autophagy is

not straight forward. To this end, we draw on the vast body of genetic knowledge available in yeast to use maximize the potential of this model organism, addressing fundamental problems in autophagy research using mass spectrophotometry and other cutting-edge technology."

Yoshinori Ohsumi focused his efforts on protein degradation in the *vacuole in his early years* Yeast cells are relatively easy to study and consequently they are often used as a model for human cells. They are particularly useful for the identification of genes that are important in complex cellular pathways. But Ohsumi faced a major challenge; yeast cells are small and their inner structures are not easily distinguished under the microscope and thus he was uncertain whether autophagy even existed in this organism. Ohsumi reasoned that if he could disrupt the degradation process in the vacuole while the process of autophagy was active, then autophagosomes should accumulate within the vacuole and become visible under the microscope. He therefore cultured mutated yeast lacking vacuolar degradation enzymes and simultaneously stimulated autophagy by starving the cells. The results were striking! Within hours, the vacuoles were filled with small vesicles that had not been degraded The vesicles were autophagosomes and Ohsumi's experiment proved that authophagy exists in yeast cells. But even more importantly, he now had a method to identify and characterize key genes involved this process. This was a major break-through and Ohsumi published the results in 1992.

Ohsumi took advantage of his engineered yeast strains in which autophagosomes accumulated during starvation. This accumulation should not occur if genes important for autophagy were inactivated. Ohsumi exposed the yeast cells to a chemical that randomly introduced mutations in many genes, and then he induced autophagy. His strategy worked! Within a year of his discovery of autophagy in yeast, Ohsumi had identified the first genes essential for autophagy. In his subsequent series of elegant studies, the proteins encoded by these genes were functionally characterized. The results showed that autophagy is controlled by a cascade of proteins and protein complexes, each regulating a distinct stage of autophagosome initiation and formation

Disrupted autophagy has been linked to Parkinson's disease, type 2 diabetes and other disorders that appear in the elderly. Mutations in autophagy genes can cause genetic disease. Disturbances in the autophagic machinery have also been linked to cancer. Intense research is now ongoing to develop drugs that can target autophagy in various diseases. Ohsumi's discoveries led to a new paradigm in our understanding of how the cell recycles its content. His discoveries opened the path to understanding the fundamental importance of autophagy in many physiological processes, such as in the adaptation to starvation or response to infection. Mutations in autophagy genes can cause disease, and the autophagic process is involved in several conditions including cancer and neurological disease.

Thanks to Ohsumi and his team for introducing us to these new processes. With such selfless and persistent efforts ,we are pushing mankind even further to bring out a better day for mankind!

MEGHALI SINGH
II year

PAPER REVIEW: Recent advances in anti-angiogenic therapies of cancer

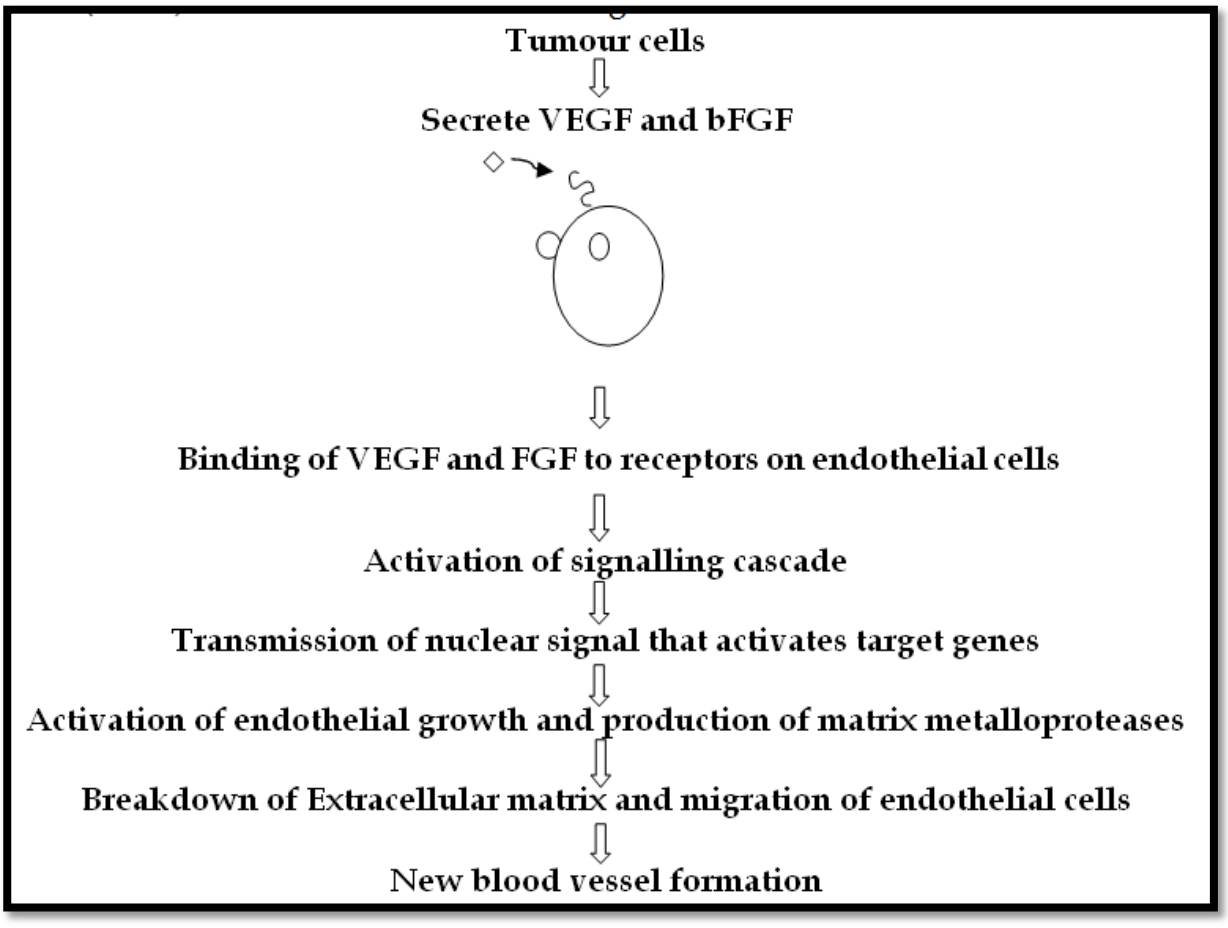
Rajeev S. Samant and Lalita A. Shevde

Cancerous cells show some distinct properties that distinguish them from normal cells such as loss of contact inhibition, increased proliferation and migration, reduced requirement of growth factors, partial or total loss of adhesion property, rounder shape etc. There are two more such factors that also affect the interaction of these cells with other tissue components. First, secretion of proteases to digest the Extracellular matrix(ECM) to facilitate metastasis and second, cancer cells secrete angiogenic factors. Angiogenesis is the formation of new blood vessels from the old ones [Angio (vessel) + genesis (formation) = blood vessel formation]. It performs two fold functions:

- It meets the increased oxygen and nutrient requirement of the rapidly growing tumour cells .
- It provides a migration route to the meatstatic cells.

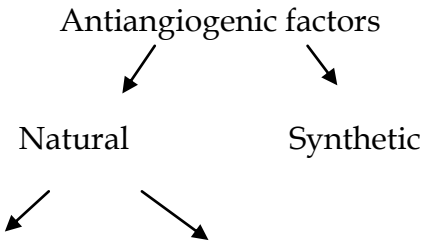
Since angiogenesis leads to tumorigenesis and metastasis, control of this process can turn out to be of great importance in context of Cancer Therapy. The absence of metastasis in case of angiogenesis deficiency has already been demonstrated in mouse models.

Like any other process, angiogenesis has its own activators and inhibitors. Signaling pathways such as AKT pathway, Hedgehog pathway and Wnt pathway serve to



switch on the process by forming proangiogenic intermediates. Other proteins such as Vascular Endothelial Growth Factor(VEGF) and basic Fibroblast Growth Factor(bFGF) are also essential to tumour growth.

Antiangiogenic therapy was launched and popularised after the discovery of Endostatin which is a natural angiogenesis inhibitor present in human body, by Dr. Folkman.



(Angiostatin,Endostatin,Tumstatin) (Green tea,Soy beans,Mushrooms,Snake venom etc.)

Antiangiogenic treatment of tumors can be highly promising. It is also advantageous over chemotherapy as it just inhibits blood vessel formation and it is not devoted towards killing cells.There are therefore fewer side effects of antiangiogenic therapy. There are currently seven approved antiangiogenic anti cancer therapies in two categories:

1. Monoclonal antibodies which bind to specific growth factors and/or their receptors.

2. Small molecule tyrosine kinase inhibitors (TKIs) of multiple pro-angiogenic growth factor receptors.

Avastin was the first angiogenesis inhibitor approved by FDA.It is a humanised monoclonal antibody that binds to active VEGF and prevents its interaction with its receptors(VEGFR-1 and 2).Combination of such monoclonal antibodies with chemotherapy has has been found very effective for colorectal cancer and non small cell lung cancer.

Cetuximab is another monoclonal antibody that prevents ligand binding to Epidermal Growth Factor Receptor by itself binding to the extracellular domain of the receptor.This results in degradation of the receptor inside the cell resulting in inhibition of cell proliferation and angiogenesis.

Trastuzumab binds to the extracellular domain of the HER-2 protein which is overexpressed in 25-30% of breast cancer cases.HER-2 positive breast cancer is more dangerous as the prognosis and survival rate both are low as compared to HER-2 negative breast cancer.

SMALL MOLECULE TYROSINE KINASE INHIBITORS:

Protein tyrosine kinases are important targets in therapeutics as they significantly affect growth factor signalling. Tyrosine kinase inhibitors(TKIs)therefore hold an important clinical value. Three TKIs have currently been approved for anti-cancer therapy.

Erlotinib: Erlotinib hydrochloride is an orally taken active inhibitor of Epidermal Growth Factor Receptor(EGFR) tyrosine kinase. It is reversible in nature. It has proved to be useful in several types of cancer.

Sorafenib: Sorafenib actively inhibits VEGFR-1,2 and 3,PDGFR-Beta and Raf-1 tyrosine kinase activity.

Sunitinib: It again inhibits the activity of VEGFR-1,2 and 3,PDGFR-Beta and RET tyrosine kinase.

All these drugs are undergoing several clinical trials and have proved to be useful in several different types of cancers such as colorectal cancer, non-small cell lung cancer, breast cancer, ovarian cancer, renal ancer, prostate cancer, cervical cancer etc.

Other common modes of action of drugs are mTOR inhibition(which plays an important role in PI3/ AKT pathway involved in cell proliferation and angiogenesis) as in Rapamycin, proteosome inhibition to disrupt cancer cell signalling causing cell death and tumor suppression as in Bortezomib or immunomodulatory, anti-inflammatory and anti-angiogenic effect as in Thalidomide.

DISADVANTAGES:

Anti-angiogenic drugs are based majorly on Maximum Tolerated Doses. Also the target cells involved may be regenerate in the gap(3-4 weeks) between chemotherapy cycles. This has led to the evolution of Metronomic Therapy. In Metronomic therapy, low doses of anti-angiogenic and anti-tumorigenic drugs are administered to the patients daily for a prolonged period of time with minimal or no gaps. This involes minimal side effects and hospitalisation is not essential. It also provides scope for optimum combinations with selective angiogenesis inhibitors.

Thus the overall benefits of anti angiogenic therapy are many and they need to be explored more and more to extract the best out of it. This may possibly involve its combination with anti chemotherapeutic drugs. These drugs can be designed in a way that they either attack the newly forming blood vessels or the pre-formed mature ones. Administration of these drugs metronomically may prove to be of further help.

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KANIKA ANABH
II Yea

EVENT'S GALLERY
Bidding Farewell

Bidding Farewell to the talented batch of 2013-2016

Unfolding of the Department Magazine: "EVOLVERE"

Welcoming the Freshers & Inaugural Lecture

Welcoming Freshers to the family of Zoology Department

Dr Tripti Sharma

Inaugural Lecture:

Dr Tripti Sharma

"Gynaecological Concerns in Young Adults"

Workshop:

Dr Avneet Kaur

"Stress Management"

Panel Discussion:

"Peace for an Anxious Mind"

Dr Tripti Sharma

Dr Avneet Kaur

Dr Alpana Rustogi

Dr Alpana Rustogi

Dr Avneet Kaur

Excursions

An Excursion to Yamuna Biodiversity Park

An Excursion to Aravali Biodiversity Park

Excursions

Visit to Sanjay Lake & Naini Lake (Environmental Management Project)

Attending Lecture at AIIMS: Dr Mary Claire King

IGIB Open Day Visit: Introducing to Students new Scientific Approach & Technologies

Lectures


Delivered by: Dr.Sardar Singh , Central Silk Board. A comprehensive and interesting account of the techniques and processes of Sericulture.


Dr. Vivek enlightened us about the Silk mark & how to ensure purity of silk products

Delivered by: Dr. Adita Joshi, project scientist from IGIB, Mathura Road- on Development of Zebrafish embryo from one celled stage to adult where students learnt about Zebrafish, its properties, it's developmental biology and genetic manipulation

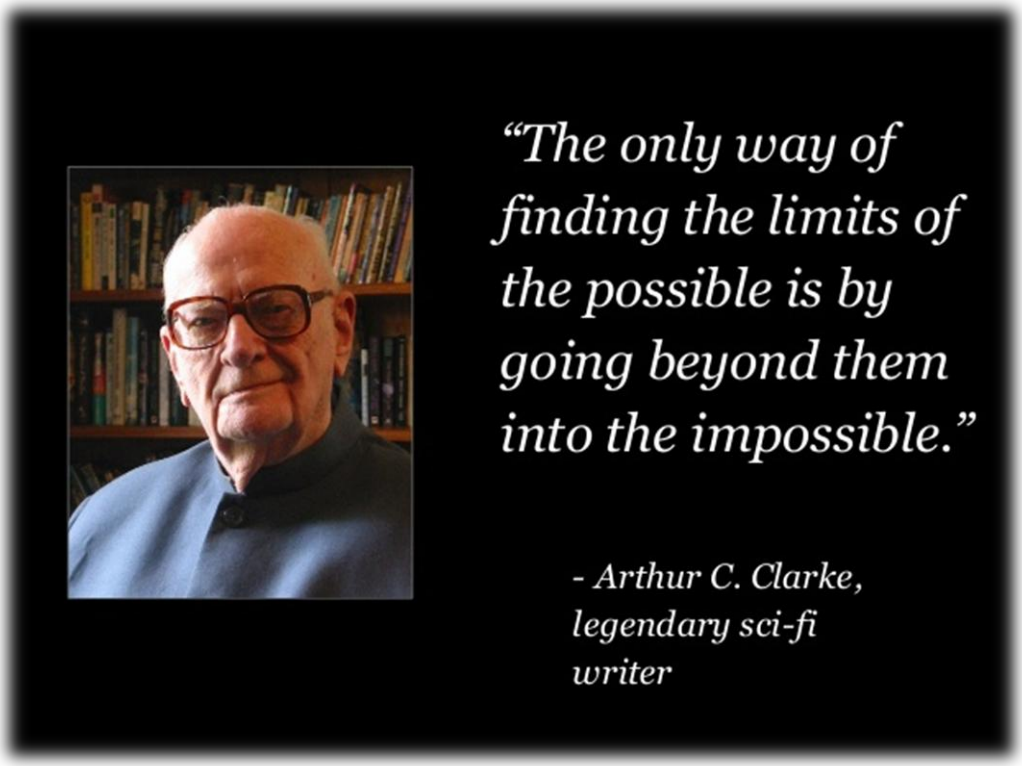
Workshops & Add-on Courses

Two day Workshop: "Bioinformatics & Biostatistics- An Introduction"

Medical Biotechnology Colloquium

SCIENCE THAT THRILLED:

MOVIE REVIEWS



LUCY

Lucy is a sci-fi thriller, where Scarlett Johansson is cast as Lucy – a girl who was against her will forced to become a drug mule of Jang. Jang's underlings sew a packet of CPH4 into her abdomen, which is a pharmaceutical they want to market as a drug to European rich kids. But the packet of drug accidentally ruptures inside her body, bringing about extraordinary effects on her, she soon turns the tables on her captors and transforms into a merciless warrior, a nihilist evolved beyond human comprehension.

The drug worked in an uncommonly fast pace. She could drift to the origin of this world and then to the age of dinosaurs. She felt the drifting void spaces of time. And a time came when her fingers became invisible and soon her whole body got transformed into the matter of this world. She got converted into the invisible vibes of mankind's existence.

A few people on quora suggest that it's just a myth that we only use 10% of our brains. A very convincing fact with natural selection is that anything unused or not needed got removed of the body, to save room for more necessary body parts. Brain is no exception, and we are actually using all of our brain, with different parts responsible for different functions.

While other facts are also true that our point of knowledge is very limited. We hardly know about Universe, Earth, Nature or even our body. Sometimes even scientist get surprised of what brain is capable of. Human mind is very complex and if we try to replicate it with computers, most modern computers can't do a fraction of calculation which human mind is capable of.

If everyone could use 100% of their mind then how can someone be more intelligent than others and everyone should be as smart as Sir Einstein or S. Ramanujan. Human brain has the capability to adapt and evolve as per the requirements that ensure its fittest survival.

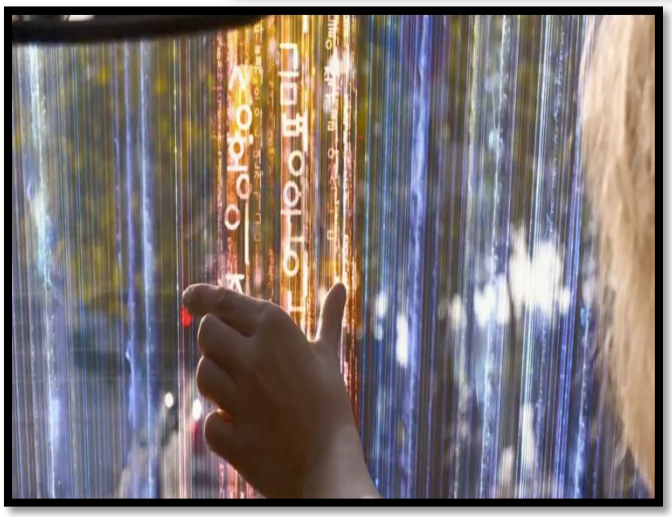
In my opinion, I believe our brains can be simulated up-to an extent, we can't even think about.

Self-learning capabilities of our Brain:

As we all know, that human brain continuously trains itself for whatever it experiences. If we consider the first reaction of Lucy towards the drug, it was her self-learnt ability to fight and mix different combat styles to beat the goons, which she must have seen somewhere on TV or some other media source. While she still didn't know any other language other than English because she never studied that. She communicates with internet via computer to get the knowledge. If we get further into the movie, by-passing security locks is not a big deal. Either it's a key combination or a code algorithm.

Efficiency:

It is scientifically proven that our bodies are the most efficient systems. It has a lot of properties to modify itself and self-heal. Our whole body is driven via the brain. So, it is possible to speed up the process. Lucy was able to heal herself and change her hair and voices. This all became possible with the Great Brain. If we talk about the most advanced processors and servers, they need separate coolants to cool down and work efficiently, while our brain doesn't need anything like that.



This proves that we still don't know enough about our brain. Opportunities are endless and another major premise of movie Lucy is that if we are able to use more than 10% of the brain, we can unlock "wonders of universe".

The movie is gleefully bold and visually adventurous. This is a movie with the directorial flight of fancy. There are moments of real wonder, beauty amidst the slam.

GARVITA GOYAL
II YEAR

INTERSTELLAR

After back to back blockbusters like The Dark Knight Trilogy, Inception and Prestige, with Interstellar, Nolan manages to amaze us yet another time, this time with tears in our eyes. With a felicitously portrayed Cooper by the Academy Award Winner actor Matthew McConaughey, well played supporting role by Anne Hathaway and Matt Damon, the movie is all in all a chef-d'oeuvre.

The movie, while successfully explaining the science on each step, takes us to the world of wormholes, space travel, communications through time, five dimensions and inside of black holes. Apart from the beautiful scenery and infinite black space, it shows us the moral dilemma of a scientist who looks throughout galaxies to find alternate future for humanity. He is given the impossible question of whether to leave the people on the Earth to die and colonize another elsewhere, or to go back to meet his daughter whom he loves beyond anything. The movie is built around a simple promise of a father to his daughter which keeps him going, which gives him the sheer strength and willpower to fight the odds and come out victorious.

Along with the amazing starcast, we get to see some beautiful planets with different climates. Main question faced by the riders is which one of these planets is the best for humankind to flourish. This is where the concept of relativity comes in. As Cooper goes to the first planet he learns that every minute on this planet is equal to seven years on the Earth. This is explained by the fact that the gravity of the nearby star is much greater than that of the Sun which makes the time move faster. Although this concept of science only exists in theory but it is widely accepted by the top scientists of the world.

Scientists of today believe that this type of bending in the space time continuum is possible but it is still only an assumption because of lack of proof.Another very interesting bit of science is explained when Cooper gets the opportunity to go inside a blackhole. It is at this point when he enters another dimension which helps him to

communicate to his past self and send signals to the Earth making it possible for them to travel away from earth and survive.

The more than famous Stephen Hawking believes that the universe is governed by the laws of science and denies any belief in heaven or afterlife. He has published several works, including *A Brief History of Time*, *Black Holes and Baby Universes*, and *The Universe in a Nutshell,*that state the existence of blackholes and wormholes. These would not only answer our questions easily but also act as portals, making space travel faster and explore easily. It would also lead to a series of inventions on the Earth, helping us enter a new era of technology.

The movie resolves to explain some of his aforementioned theories.It smartly raises the question whether love is the way to go, is it the answer to inexplicable queries that science has provided us with. The character of Anne Hathaway makes a compelling argument by saying that everything they had done, was supported by science and had left them nowhere, she believes that instinct of human beings is what keeps them alive, it is what drives them to survive and is the reason mankind has existed for such a long time.

This is just one of the many times Nolan has subtly incorporated science with his tale, making it more complex and at the same time more captivating.

To sum up, the movie grandiloquently delivers breached intergalactic portals, bifurcated timescales, reconciled science and faith. Those who appreciate the concept of wormholes and black holes should definitely invest their time into this awe-inspiring tale.

AVNI GUPTA
II YEAR

STRANGER THINGS

A compelling, expertly woven, somewhat scary and overall a strange experience, an experience like never before. Stranger Things, a Netflix original, has taken the science fiction television world by the scruff of its neck. With actors like 1990s iconic award winner Winona Ryder, David Harbour and upcoming hotshots like Millie Bobby Brown, Finn Wolfhard, Gaten Matarazzo, Stranger Things has changed the game for every show trying to make its name in the sci-fi world.

The show is set in the 1980s in a fictional town, Hawkins, in Indiana. With perfect blend of science fiction and emotional drama, it sculpts the struggle of a mother, Joyce who has lost her son, Will. It also depicts endeavors of his friends, Mike, Lucas and Dustin, a cop, Hopper and his brother, Jonathan, who face the supernatural, a creature created by the Department of Energy. The series successfully shows us the existence of an Upside-Down world inhabited by the supernatural, a world that can be accessed by only one, rather, only Eleven, who is a telekinetic character, beautifully portrayed by Millie Brown.

Psychokinesis or telekinesis, is a psychic ability allowing a person to influence a physical system without any physical interaction.

Claimants of psychokinetic ability who like levitating objects without touching them, generating electric emanations from the body and bending metallic objects, have been observed numerous times throughout history. Even though many scientists consider these ideas as hoax, but they are well accepted by some. Olive Lodge, a Christian Spiritualist, studied the psychical phenomena of telepathy and believed in life after death. His work on electromagnetic radiation convinced him that ether filled the entire universe in which the spirit world existed. After the theory of relativity came into existence, the physics of ether had however been undermined. Charles Richet, a French physiologist, coined the term *ectoplasm i.e.* denoting a substance or spiritual energy exteriorized by physical mediums. Though he rejected the spirit hypothesis, he believed in *sixth sense*, an ability to perceive the hypothetical vibrations.

Due to lack of convincing evidence and violation of several well-established laws of physics, this topic is criticized and generally regarded as pseudoscience.

Humankind has always looked for other forms of life than them and one of the possible answers to that question lies in the existence of supernatural.

Other things such as extraterrestrial life have also left us wondering and I would love to see the show cover that aspect of the theory as well.

The most appreciative part in the series is the phenomenal picturisation and some of the best cinematography I have stumbled across. This riveting and suspenseful series is a must watch for those who like intense mysteries. It portrays an intrigued tale, which gives a perfect thrill to the invested time.

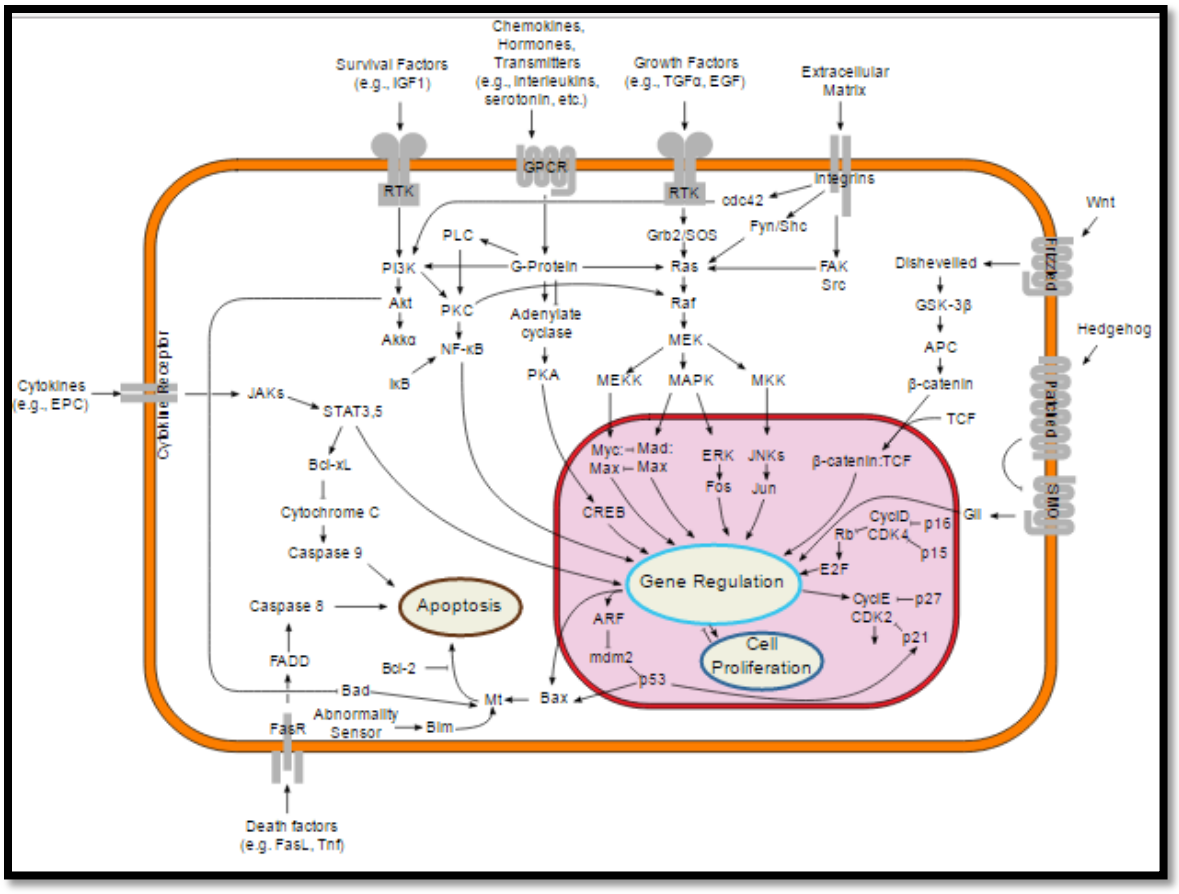
AVNI GUPTA
II year

INTERNSHIP EXPERIENCES

AN EVENTFUL SUMMER

To make my vacations after the fourth semester more productive, I applied for a summer research fellowship at the Indian Academy of Sciences. Fortunately my research proposal was selected and I was allotted to Prof. Ganesh Viswanathan's lab in the Department of Chemical Engineering in Indian Institute of Technology, Bombay (IITB) where I had to work for 8 weeks. And trust me, those 2 months were the best months of the monotonous life that I had been living so far. But, we will talk about the fun part later.

The on-going project in the lab in which I assisted was the study of signalling of Tumour necrosis factor-alpha. TNF-alpha is a pro-inflammatory cytokine mainly secreted by macrophages. It can bind to, and thus functions through its receptors TNFR1 and TNFR2. This cytokine is involved in the regulation of a wide spectrum of biological processes including cell proliferation, differentiation, apoptosis, lipid metabolism, and coagulation and has been implicated in a variety of diseases, including autoimmune diseases, insulin resistance, and most importantly cancer. It has a very complex signalling network.



Mammalian TNF-alpha signaling network

SOURCE:https://en.wikipedia.org/wiki/NF%CE%BAB#/media/File:Signal_transduction_pathways.svg

My term in the lab was divided into two components where I initially focussed on computational aspect of the project called Gene Ontology. Gene Ontology is a tool that assists in the task of representing and processing information about genes, their products and their functions and allows the derivation of information in a specific and context related manner from a large, complex database. The signalling network of TNF-alpha was then constructed using a Cell Designer software which is a modelling tool of gene-regulat ory and biochemical networks. The resulting network had nearly 400 nodes and about 310 different interactions between these. For ease of study the network was divided into 15 smaller modules. I read numerous research papers to find out the direct annotations (functions) of each protein/signalling molecule in each module of this manually curated mammalian TNF-alpha signalling network and hence validate each and every interaction shown by the network. Once the functions were validated, I sorted the functions of each protein based on their relevance to cancer causing or suppressing properties. This way the highly complex network was comparatively simplified and the signalling cascade was evident more clearly.

While studying this network, I learned that binding of TNF-alpha to TNF Receptor 1 induces the stimulation of Erk1/2 pathway which is very important in regulating cell's survival, proliferation and differentiation, but is poorly understood. In most cancers, a defect in Erk pathway leads to uncontrolled growth and discovery of drugs which can inhibit steps in the Erk pathway can be used as a potential cure of cancer. To study the effects of TNF-alpha on the Erk pathway, we carried out western blots in human cell lines like adherent cancerous cell line HeLa(cervical cancer) and suspension cell line U937(lymphoma). In two 6 well plates, $0.8X10^6$ HeLa cells and $1.5X10^6$ U937 cells were seeded in each well and then serum starved for 24 hours. After which, they were stimulated with TNF-alpha of varying concentrations for varying time periods. For example, in one of the experiment, cells were stimulated with 50ng/mL of TNF-alpha for 15minutes, 30minutes and similarly with 100ng/mL of TNF-alpha for the afore-said timings. One well was also kept un-stimulated and one well was stimulated with PMA which is a well-known stimulator of Erk pathway.

After stimulation, cells were put to Bradford assay for protein estimation and the corresponding amount to be loaded for separation of the proteins was calculated and the proteins were then put to SDS-PAGE. The resulting electrophoresed proteins were transferred to a PVDF membrane by Western blotting. Primary antibody and later secondary antibody was added and the blot was developed using Enhanced Chemiluminescence (ECL) reagent and imaged using Geliance 2000(Perkin Elmer) and Gene snap software. Although the results obtained did not give absolutely concordant readings for each experiment carried out however the general conclusion was that greater stimulation was seen with greater concentration of TNF-alpha and for longer time period. But several more experiments in many more different cell lines still needs to be carried out to establish it completely.

With better understanding of the molecular mechanisms of TNF-induced cellular signalling, it is clear that TNF plays a major role in the development of different types of cancer. Thus, TNF could be a molecular target for cancer prevention. The cancer cell killing and anticancer immunity modulation properties of TNF render it a

potential cancer therapeutic. Due to the dual and organ-specific roles of TNF in carcinogenesis, TNF-modulating approaches should be carefully evaluated and monitored in regard to cancer therapy and prevention.

The work was very engaging and I loved every bit of it. The added benefit with this internship was my stay in the overwhelmingly awesome campus of IIT-B. In spite of being home to thousands of people, the campus was most peaceful and serene. Surrounded by Sameer hills on the periphery and enveloped by the cover of lush trees with soothing sounds of cuckoos, unexpected visits from crabs, glittering fireflies, 24X7 drizzling and cool breeze, innumerable cafés, highly equipped Gym, Playing area, Swimming pool and Wi-Fi at the speed of 150Mbps, this place was undeniably perfect. Powai Lake and Hiranandani market were my hangout spots with my prospective engineer friends. I cannot express how friendly my guides were and how family like the PhD students were who have taught me lessons for life.

Time spent in the hostel was the most precious to me and even if I forget tiny details, I shall never forget the bliss that place gave me. I urge everyone to join in projects like these for they are a huge learning opportunity in terms of deciding the subject of study in higher education and gaining a first-hand experience in scientific research under the able guidance of expert professors and researchers.

ASIMA ABIDI
III Year

STANDARDISATION OF PCR

The time I spent in Defence Institute of Bio-Energy Research , DRDO , Haldwani as an intern under the supervision of Mr. S Merwyn , Scientist 'B',DIBER, Haldwani from June 1 2016 to June 30 2016 was a memorable one for me as it was rich in experience sharing & helped me discover my potential. I have had so many experience & opportunities that I personally believe will forever shape & influence my professional life.

The work I did there was though basic but I got a chance to explore the lab experience. My work included extraction of DNA from different bacterial strains & standardization of PCR parameters for the primer set Rs 759 & Rs 760. My main focus was on strains of Ralstonia solanacearum which is a soil–born bacterium that causes the widespread disease, bacterial wilt & is able to survive for long periods in soil.

In this work DNA was extracted from various bacterial species including R. solanacearum & the PCR parameters [Effect of Betaine, Annealing Temperature & Time of extension & Annealing] were standardised using R. solanacearum DNA as template.

The primer set 759 (forward primer) & 756(reverse primer) gives specific amplification of 281bp with R. solanacearum strain (Rs0418) which was observed in reaction mixture with betain confirming its necessity in PCR amplification of DNA having high GC content. There were many non specific amplification observed at all

annealing temperature which gave the expected 281bp amplification so in order to reduce it I shortened the annealing & extension time so, at around 53.9oC, I got the result where no non-specific amplification was observed. The annealing & extension time after 2-3 experiments was reduced to 15 seconds where no non-specific amplification was seen. This is all about my work which would not have been possible without the contribution & collaboration of others.

Reflecting on my experience at DIBER, apart from the work I did there, I also got the opportunity to attend so many educational talks & conferences which have broadened by knowledge base & have made immeasurable impact in my aptitude in varied fields.

ANUJA PANT
III Year

EXPLORING THE EVOLUTIONARY SIGNIFICANCE OF VENTRAL COLOURATION IN A FAMILY OF FOSSORIAL SNAKES, THE UROPELTIDAE

From 24th May to 26th July, 2016, I worked as a summer research fellow at the Indian Institute of Science Education and Research, Thiruvananthapuram under the guidance of Dr. Ullasa Kodandaramaiah. Seeking to answer questions in evolutionary ecology, I investigated the purpose of the bright ventral colourations observed in the family of fossorial snakes called Uropeltidae.

Uropeltids are a group of small, harmless, fossorial snakes found in areas of higher elevation in peninsular India and Sri Lanka. Most species of this family (Uropeltidae) are characterized by the presence of bright ventral colouration (generally shades of orange and yellow) or structural iridescence. Bright colours in animals are often attributed to visual signaling in relation to sexual selection or antipredatory mechanisms such as deflection, mimicry and aposematism. As this group of snakes does not display sexual dimorphism or mimicry and are non venomous, the above listed reasons could be assumed to be not true for them.

Many Uropeltids (also called shield tail snakes) display head-tail automimicry, and have a disk like tail with modified scales and all Uropeltids have a tail ending in one or two spines which helps them escape predatory attacks. Thus, we tried to find out if bright colouration in Uropeltids evolved as a signal to enhance predator learning about the unprofitability of the prey. We used spectral reflectance from specimens to make similar coloured models with clay and carried out a field experiment in western ghats in an area where shieldtail snakes are known to be common.

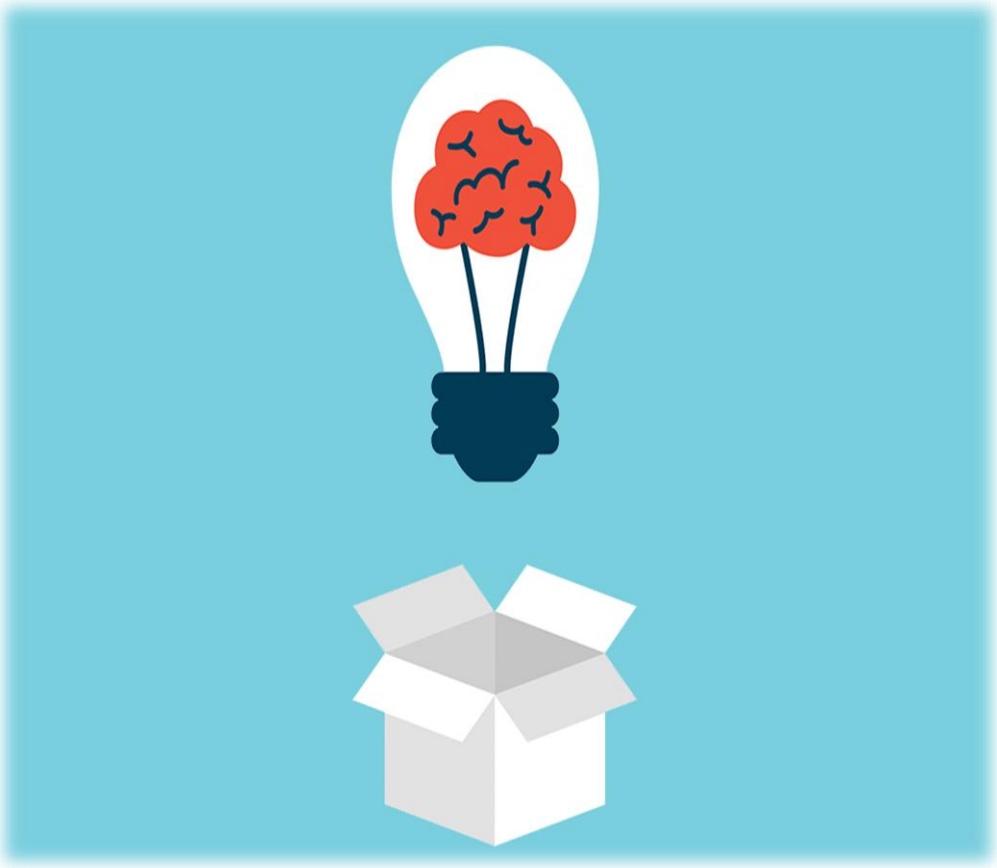
On analysing the observed number of attacks versus the expected based on the conspicuousness of the models, it was found that predators (majorly terrestrial birds) have learnt to avoid the more conspicuous colours found in Uropeltids. This result supported our hypothesis according to which our controls should've experienced higher number of predatory attacks as compared to models mimicking the Uropeltids. Further laboratory and field experiments are yet to be carried out to validate our hypothesis.

I thoroughly enjoyed working on this project, starting from understanding the question, designing the project and building my way through the experiment to the statistical analysis part, all of which was mostly new to me. The field work in western ghats was an added perk and definitely the best time I had.

I did not just learn to look for herpetofauna in the darkness of the forest and handle snakes but also got to learn about the evolution, taxonomy and ecology of various amphibians and lizards as well. Experiences such as these played an imperative role in determining my future plans and gave me knowledge beyond the books.

UDITA BANSAL
III Year

MUSINGS OF A CREATIVE MIND!



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THE BRIDE

She was sitting next to the man who was going to be her husband very soon, on the wedding dais. Clad in bright red silk saree and laden with gold ornaments she appeared like the incarnation of a Goddess. The smoke coming out of the auspicious fire had made her eyes look red with the meticulously applied Kohl spreading from her eyes, making her look a sort of adorable in its own subtle way. A whirlwind of thoughts soared in her mind- the happiness of starting a whole new life, with a new person whom she expects to be standing in all thick and thin, the grief of leaving her parents to whom she is the whole world, the anxiety of encountering new responsibilities that she must carry out even though she apprehends.

The priest chanted the holy mantras and called upon the girl's father, and her mother to tie the sacred marriage bond and do the kanyadaana. The priest said, " Let all the gods and goddesses be witnesses, and keeping all other thoughts aside, meditate upon the almighty say, may the bridegroom be together for ages to come." I was among the onlookers, the so called guests who were invited to attend the big fat wedding, which starved the parents of the girl of all the savings that they had. Looking at the father, I realised that neither was he interested in the gods and goddesses nor in the meditation that the priest asked him to do. Getting parted from his own daughter, seemed to be a burden that his eyes could not hold. Tears rolled from his eyes that were tired and puffy due to sleeplessness. With a heavy heart, without any inclination towards the pestering words of the priest, he performed the rituals.

The time came for the newlyweds to depart. Bidding farewell to the world she grew up in made her beautiful face filled up with the unending stream of tears. She was reluctant to go with her husband who stood behind her wondering what he ought to do. The girl was crying clinging to her mother's arms. The mother broken from within was trying to console and convince her daughter. With all the apprehensions she carried in her mind, the heaviness of her heart lessened gradually and she departed with her husband to a new world, to start a whole new life.

At that moment, I felt as if my heart skipped a beat or two. I dared not to imagine how the parents of the girl might be feeling. Memories of their daughter, her likes, dislikes, playful naughtiness and the all the time that she spent with them might have clouded in their minds. I realised that the institution of marriage brings in a lot of changes in not only the lives of the two persons who are meant to be together, but also in the lives of the families of both the parties. A girl's transition from a free bird to a mature woman is inevitable...this is what marriage epitomises.

SHRUTI ACHARYA
II Year

LEAVING BEHIND!

Creeping and crawling.... Jumping and rolling
We come to the line...
With scorpions in our mind!!

What's to that.... I m leaning on to..
Whether its holding my back... Or pacing me through

The learnings I behold... Or future that enrols...
The friends I made... Or mentors that carved!

Labs that shaped
The scientist out of me..
Classrooms that maintained the mischievous learner in me!

Events and lectures.... Giving out of the box
Still reading... To what. I am leaning on!

May be the hidden packed ahead...
With faces similar More or less ..
Strange unaccustomed
But filled with energy to rejoice and renew!

Yes... Found the answer... To the trailing question!!
Its just my nostalgic mind counting evocative number...
Feeling bad to leave my mates!

But energy, I came leaving, Some faces n peers....
Will pace forward..With even more,
and try hold you too, with yet new to behold!

AISHWARYA KHARE
III year

THE UNTITLED

Not every drop reaches the ground
Not every bud ought to sprout
Pain is almighty's best megaphone
To rouse this deaf world on roam!

Have all the patience ....to lead ahead
But for nobody else
The soul inundating, inside the bed

Step back but to lean forward
No one in universe is there to drag you onward
All friend faces..have battles of their own
Will surely help you, but
Ultimately its you...to walk the path alone!

Grieves and sorrows ...shadow every life
but lend an ear.. to turn the turmoil
Empathy for another....will take you to sigh
A compassionate heart...is what lives more than a "while"!

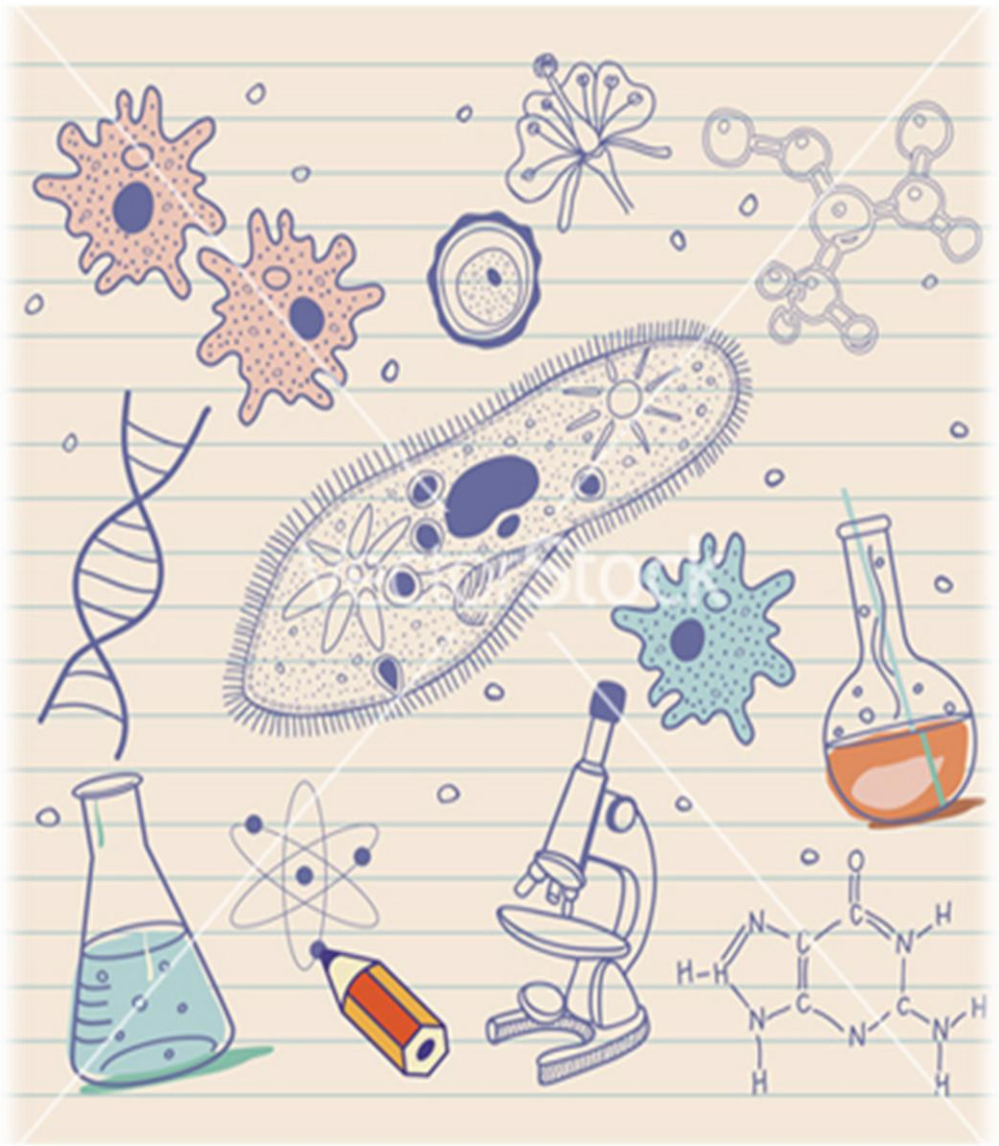
Just remember you sunshine of lord!
Even the most beautiful pearl
is formed of an agonizing sore!

The more wounded you are
you learn the healing better
Don't quit to your sufferings...
Since no pain is UNSURMOUNTABLE!!

AISHWARYA KHARE
III year

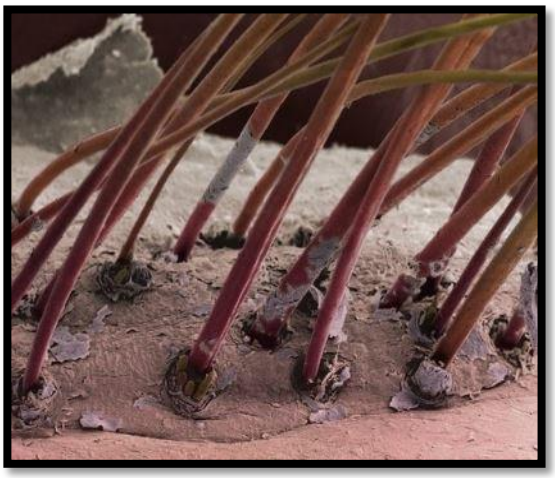
WHEN SCIENCE BEFRIENDS:

Fun with Science!



MIGHTY MITES

Various kinds of fauna are present, not only in the environment but also in and on human body…that's a fact we all know. Some of them are inside our body e.g. ***E.coli* bacteria in our gut**, also some are present outside our body e.g. **Lice in our hairs as an ectoparasite.** But do you know that our eyebrows are also home to some type of mites? Isn't that interesting and not only eyebrows, eyelashes and nose hairs are also a habitat for a specific type of mites .



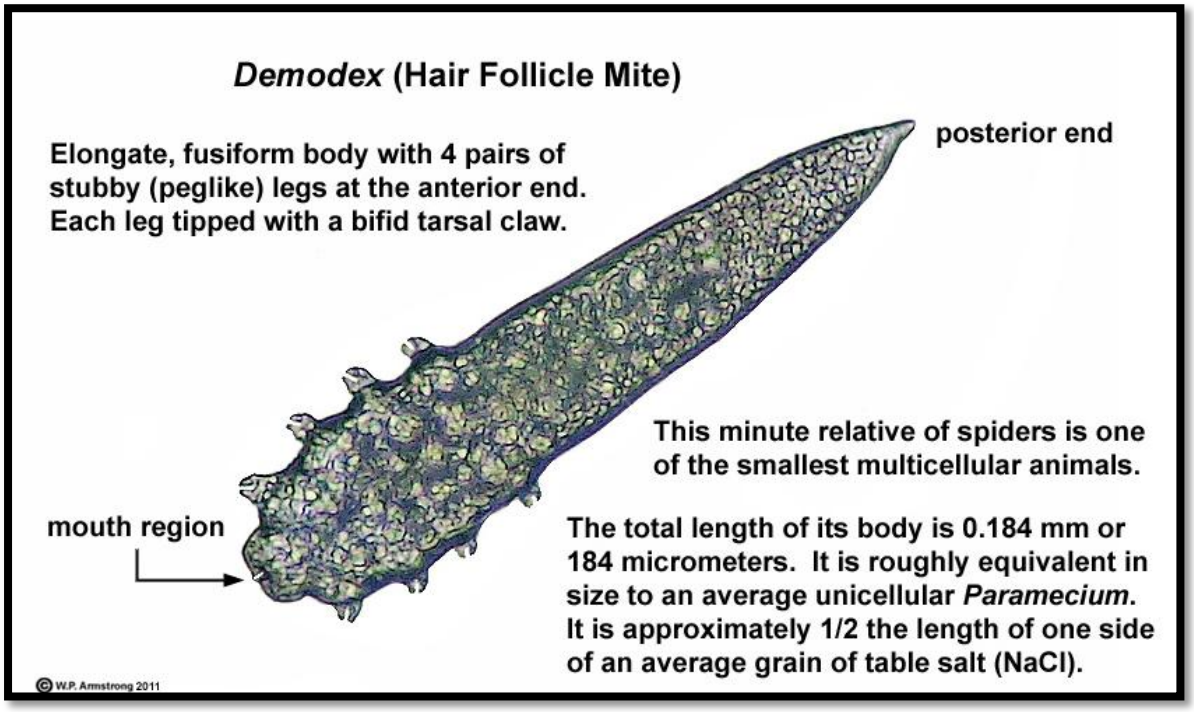
Follicle mite (Demodex **folliculorum)**

Demodex Infestation of eyelashes

These are scientifically called *Demodex* and commonly called as 'face mites' or 'follicle mites'. There are usually two varieties of *Demodex* – which are found on our face- *Demodex folliculorum* which are comparatively larger than other varieties and live in gangs i.e. in groups whereas other variety called *Demodex brevis* is smaller and

found generally alone i.e. solitude. The larger is seen to feed on dead skin cells(…that means free facial for girls!!!).

They can live anywhere they find accessible hairs(sebaceous glands to be particular) and human face provides that condition which attracts them to survive there. These organisms, however, are inconspicuous- they only grow 0.3 to 0.4 millimeters long. Also, they are semi-transparent and have a long body consisting of two segments and eight short legs. They have a pin-like mouth which is used to eat dead cells and have scales to attach to body surface.



Dorsal view of follicle mite (Demodex brevis) (Magnification 400x.)

These minions spend majority of their life time with their heads in follicles and feets gripping the hairs and interestingly as the sun goes down they start looking for a new follicle as they are **PHOTOPHOBIC**.

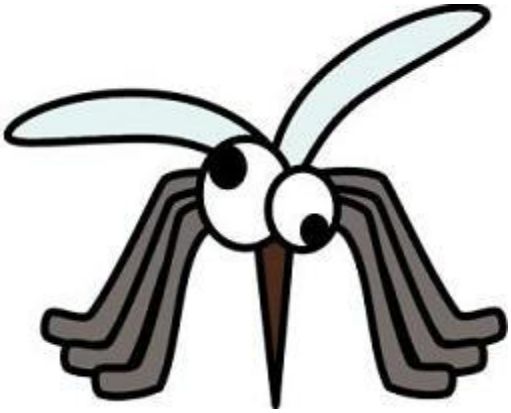
Whether these mites are useful or not, nothing much is known. Some studies demonstrate that there is a correlation between some skin problems like rosacea and acne , with these mites. It has been shown that if the population of these mites increases, then this might lead to a problem called **'Demodex mite bite'** which is characterized by inflammation and itching which may also possibly be due to an immune response. So, there is no serious health issue related to these facial mites. Rather by eating up the dead skin, these little wonders prove to be scientific and harmless mode of face clean up!

Vidhi Yadav

II YEAR

DID YOU KNOW?

The world's fastest land animal, the cheetah, is sprinting towards the edge of extinction & could soon be lost forever unless urgent, landscape-wide conservation action is taken, a study has warned. Study also estimates that just 7100 cheetahs remain globally



Mosquitoes survive being hit by a raindrop, even though it is 50 times their weight & would be like a bus hitting a human & this is the highest ever recorded acceleration that animals have survived.

Our fingers get wrinkly in water because wrinkled fingers would give us stronger grip on slippery objects underwater.

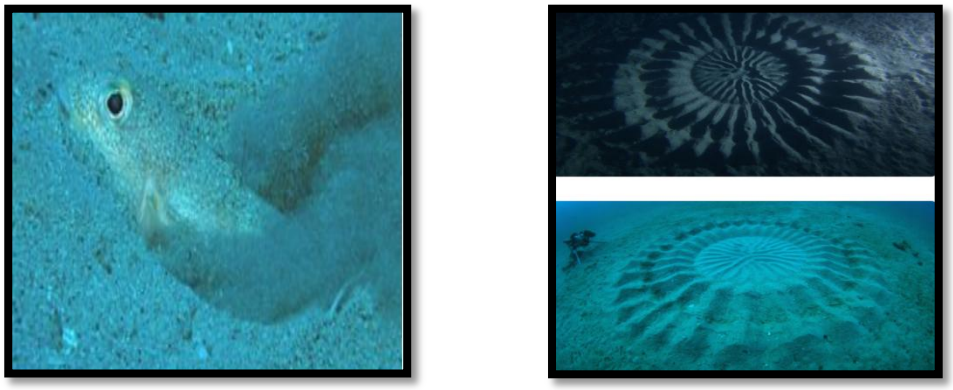
Our eye lenses are convex, so images formed on your retina are actually completely upside down. Our brain reorients the images to make us see things right side up.

A recent study revealed that late night binging can cause several problems apart from sleeping disorders and weight gain.

MYSTERIOUS "UNDERWATER CROP CIRCLES"

In 1995, divers noticed a beautiful, strange circular 7 feet wide pattern on the seafloor of Japan. Soon after, more circles were discovered nearby. The divers started linking them to the CROP CIRLCES and thought them to be extra-terrestrial, extra-intelligent creations. These geometric and eye catching formations came and went mysteriously. Nobody had a clue! Everybody was barking up the wrong tree! These remained a mystery for a decade and it was only in 2011, that the real "Architect" was discovered.

It is indeed quite surprising that the creator of such marvellous designs is a small, poisonous species of the **PUFFER FISH** that belongs to the genus *Takifugu*. It is indeed incredible that these are only about 12 cm long and the formations they make are about 7 feet in diameter. These small creatures prove the fact that "SIZE DOESN'T MATTER!".



A male Puffer fish and the fragile structure it constructs to attract a mate.

The male Puffer fish works day and night, and takes about 7 to 9 days to construct the circles. Males laboriously flap their fins as they swim along the seafloor, resulting in disrupted sediment and amazing circular patterns. These circles have radially aligned ridges and valleys outside. Moreover, the males decorate these ridges with fragments of shells and gather fine sediments to further beautify the pattern and give it a distinctive look and colouring.

"A PICTURE PAINTS A THOUSAND WORDS". In the true sense of the statement, when the circles are finished, the females come to "inspect" them. If they like the creation, they reproduce with the males. Mating involves females laying eggs in the fine sediments in the centre of the circles, and then the males fertilize them externally. Thereafter, females vanish and the males stay for another six days to guard the eggs. Moreover, the grooves and the ridges of the sculpture help in neutralizing currents, protecting eggs from being tossed around and potential exposure to predators. There is still a mystery about what the females actually look up for into these circles, is it the eye catching design or the beauty of the shells, or is it the geometric fashion that upholds some mystery??? One proposed idea is that, due to the small size and low visibility, the males have to build up such large patterns to be easily identified by the females. In spite of the tiny size of this fish it is definitely a DARK HORSE, too DOOZY to believe!!! The circles are the most perfect and complex structures created by any animal.-a true story of love, craftsmanship

and the desire to pass on to descendants. So indeed now you know what these UNDERWATER CROP CIRCLES actually are… THE CAT (or rather the FISH) is out of the bag!!!

AMISHA SANWARIA
I Year

SCIENTIFIC EVENTS THAT SHAPED THE YEAR 2016

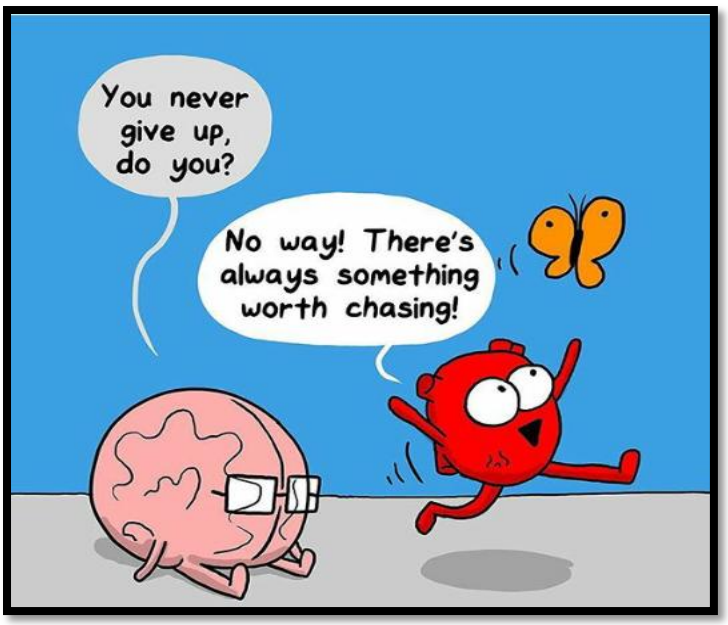
The year 2016 witnessed several significant scientific events and discoveries that out of which the most remarkable ones are listed below:

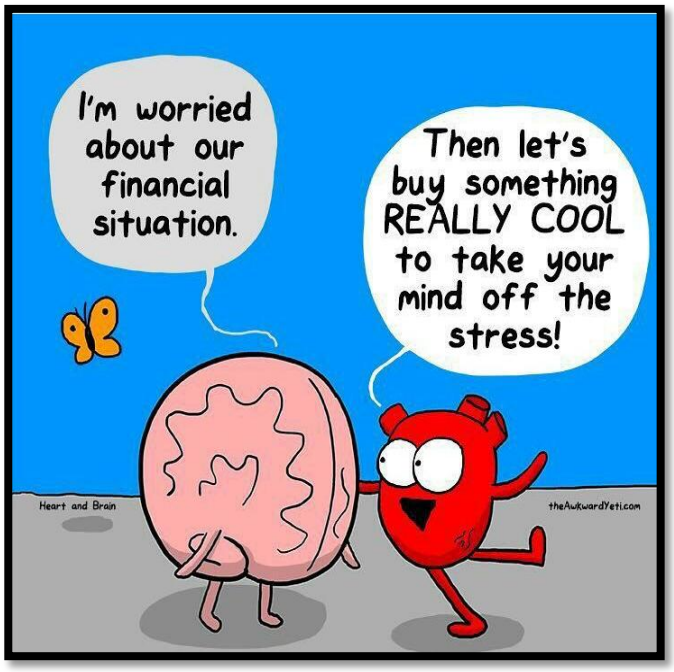
1. On 11 February, researchers announced that they had finally sensed the ripples in the structure of space-time known as gravitational waves — capping a decades-long quest. This signal was spotted by the twin detectors of the Laser Interferometer Gravitational-Wave Observatory (LIGO) in Louisiana and Washington state. This announcement provided an affirmation for Einstein's Theory of relativity after 100 years of his prediction.
2. Representatives of a record 174 countries and the European Union gathered on Earth Day, 22 April, to sign the international climate agreement forged in Paris in December the while 2015. As global warming continued, an epic El Niño in the tropical Pacific Ocean helped set global-temperature records in the first five months of the year. This put 2016 on track to become the third straight warmest year in a row.
3. A global health emergency was declared by the World Health Organisation on the account of Zika virus outbreak in Brazil that resulted in clusters of birth defects in newborns.
4. In September, researchers working in a clinic in Mexico, confirmed the birth of a child that was conceived through assisted reproductive techniques that involved the mixing of DNA from three people. Such procedures, the scientists claimed could prevent the children from inheriting metabolic diseases that are caused due to defects in the mitochondria, the energy- producing structures of the cell.
5. The International Union of Pure and Applied Chemistry(IUPAC), announced 4 new elements that helped complete the seventh row of the Periodic Table. These elements are-
    a. Nihonium and symbol Nh, for the element 113,
    b. Moscovium and symbol Mc, for the element 115,
    c. Tennessine and symbol Ts, for the element 117, and
    d. Oganesson and symbol Og, for the element 118.

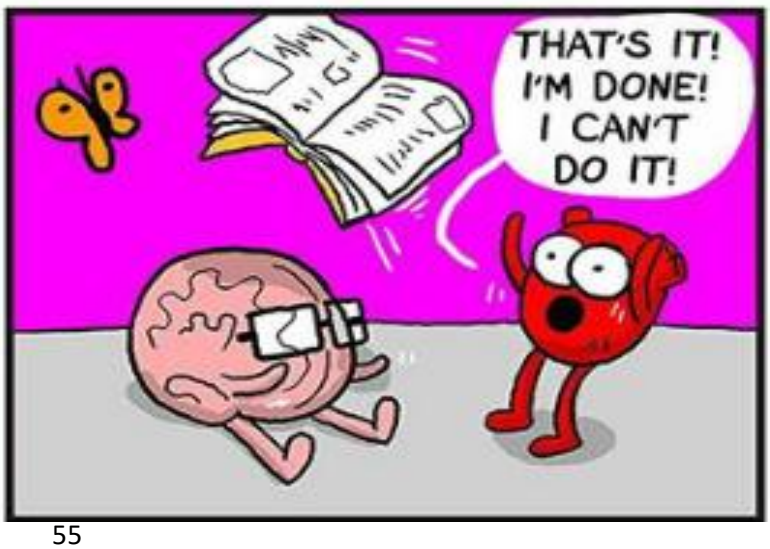
SOURCES:

- https://iupac.org/iupac-is-naming-the-four-new-elements-nihonium-
- moscovium-tennessine-and-oganesson/
- http://www.nature.com/news/2016-in-news-the-science-events-that-shaped-the-year-1.21159

THE HEART -BRAIN DILEMMA







SOURCE: theawkwardyeti.com

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FIRST YEAR

SECOND YEAR

THIRD YEAR

Remembering our Beloved Ones

Those we love
Don't go away
They walk beside us
EVERY DAY...
Unseen, unheard,
But always near,
Still loved,
Still missed
AND VERY DEAR.

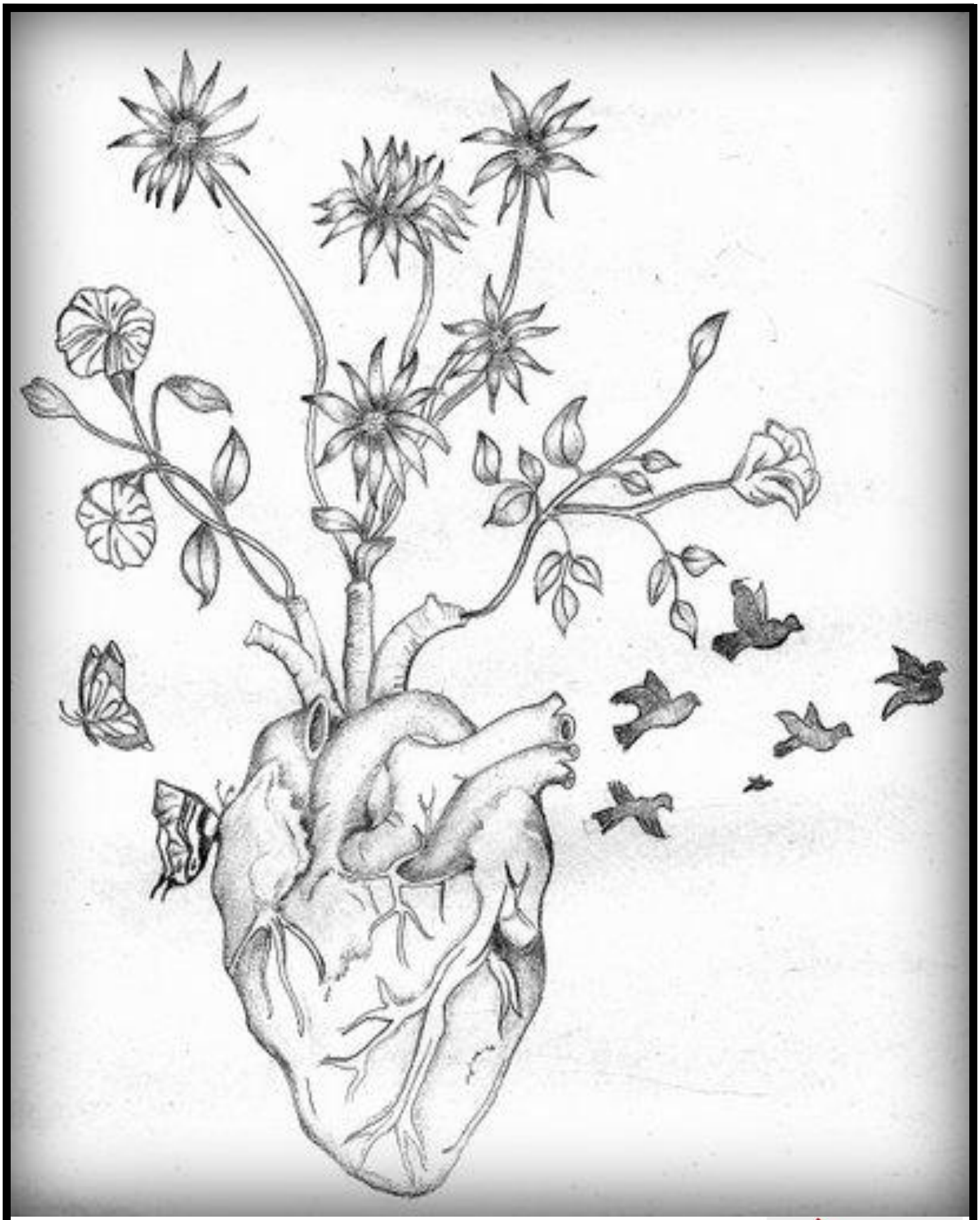
With deep sorrow, we write about the two beautiful gems that we lost this year, **Sir Chandrashekhar** and our friend **Anuradha**, who have taken rest in heaven. The loss is massive as the budding flowers have been shed to the ground. **We offer my condolences for the untimely loss of two of our beautiful gems and wish for strength to all of us to encompass the same.** No words can heal the pain their parents, family and friends had to bear, but remembering the wonderful memories of the time we spent together, leaves a curve on my face that enlightens us all over again.

The tide recedes,
But leaves behind bright seashells on the sand,
The sun goes down,
But gentle warmth still lingers in the sand,
The music stops,
Yet it echoes on in sweet refrains,
For every joy that passes,
Something beautiful remains.

Starting from the morning till the dismissal bell, we were all connected and shared a strong bond. The ultimate selfless smile on the face of Chardrashekhar Sir always left a grin on the face of the passersby. We remember him for his duties and as a humble man of grounds, who always made the lab staff and teachers laugh on his jokes. He left us to always remember him with a smile.

In a class of over 40 students, she always made her voice heard out loud. Anuradha was not only a tremendous student, but a beautiful person and a great friend. We all have shared a couple of good class memories with her and her memory will be in our hearts, forever. From scoring great marks to delivering spectacular presentations, Anuradha was always in the good books of the teachers. Her sweetness and kindness drew everybody to her and we equally felt the warmth of her friendship.

Coming to terms with the loss of two of our close ones, our hearts wept in pain. Nothing can fill the gap, but we wish they feel peace wherever they are. We miss you.



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