SCHOOL OF LIFE SCIENCES
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VIVUS

The Newsletter
School of Life Sciences

February 2017, Volume 3 , Issue 2

FOREWORD

OLÀ DEAR READERS,

We are back with our **quarterly** newsletter!

Happy **2017** to All!! The beginning of this brand new year and a new semester has been very happening and we have tried to summarize all of it along with the stupendous contributions of our young enthusiasts.

We would like to extend our sincere gratitude towards **Dr K Satyamoorthy**. His permission and support has proved extremely vital to this edition of ***Vivus: The School of Life Science Newsletter.***

Furthermore, we are extremely grateful to **The Student Council** of the School of Life Sciences(2016-2017) for their kind support.

We thank **Mr. Sourav Patagi** (1st year BSc Biotechnology) and **Ms. Humaira Shah**(1st year BSc Biotechnology), for the help they extended.

Also, we would like to thank everyone (including our **readers**) who has directly or indirectly contributed to the success of this issue.

Lastly and most importantly, we would like to extend our heartfelt gratitude to our respected teachers **Dr TG Vasudevan**, **Dr Saadi Abdul Vahab**, and **Dr Vidhu Sankar Babu** for inevitable their supervision and advice!

Thank you one and all!!

-Bhargavi Karna and Russell Lorenzo Castelino
1st Year B.Sc. Biotechnology
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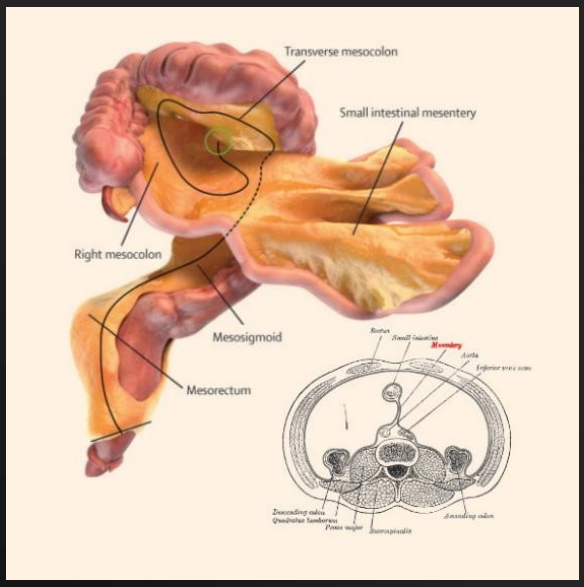
ORGAN 79!!!

SYEDA INAAS, B.Sc. Biotechnology (1st year)



On a regular Monday morning, an announcement by our Professor about **the 79th organ**, which had out passed the sight for several years, had us in shock. It was **"THE MESENTERY".** Excitement filled our nerves and we were looking forward to the lunch break to look up more about this discovery. We had many questions. Had this organ always been there but not considered as one? Or was it always there but never been detected in spite of the advancements in the medical technology? As soon as the clock struck 12, we pulled out our phones and looked up this **'New Organ'**.

The new organ is found in our **digestive systems**, and was long thought to be made up of **fragmented, separate structures**. The **small intestine, transverse colon**, and **sigmoid colon** all were believed to have a mesentery. But recent research(2008–2017) has shown that it is actually **one**, continuous organ with the regions of the mesentery associated with the small intestine, transverse colon, sigmoid colon, and rectum. **J Calvin Coffey**, a researcher from the **University Hospital Limerick in Ireland**, discovered that the mesentery was an organ by identifying its structure, function and disease settings. Coffey says, "It is a **discrete anatomical entity**. One cannot survive without it, and so it provides a **vital function**. It has many unique cellular and tissue-based adaptations that are crucial to it being able to perform its function. Given these properties, and given that it is discrete, substantive, unique, and vital, then there is a strong argument for it being an organ." It is the 79th organ of the body to be discovered and it has always been there, performing important functions that affect systems throughout the body, from cardiovascular to immunological.

"Clarification of mesenteric anatomy has provided the clinical community with a new perspective with which to view abdominal diseases such as **Crohn's disease**, **volvulus, malrotation** and many others. This means that our knowledge of human biology in health and disease is going to expand considerably, and we are enormously proud of that achievement", says Coffey. Mesentery is a double fold of peritoneum - the lining of the abdominal cavity - that attaches our intestine to the wall of our abdomen, and keeps everything locked in place. Among its functions, it **carries blood and lymphatic fluid** between the intestine and the rest of the body. With this reclassification comes a whole new field of medical science that could improve our health outcomes.

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- http://www.sciencealert.com/it-s-official-a-brand-new-human-organ-has-been-classified
- https://www.researchgate.net/blog/post/how-the-mesentery-became-your-79th-organ

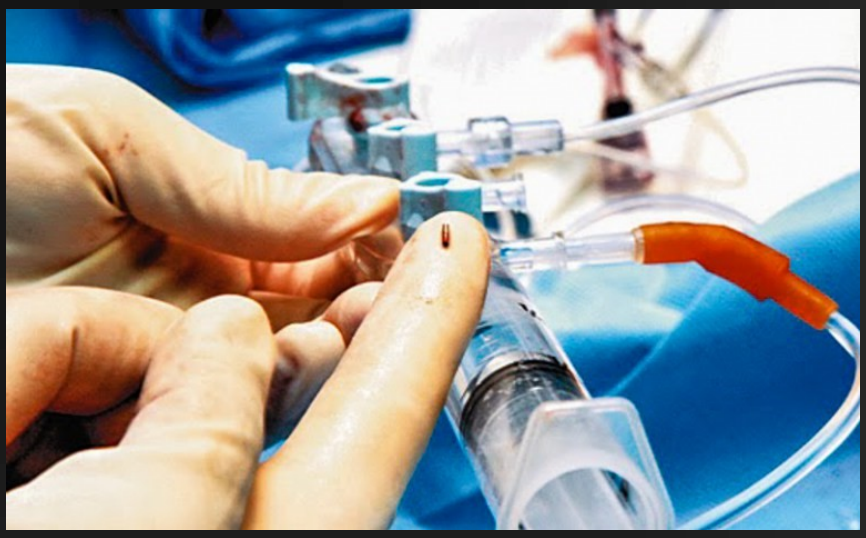
Tiny robots to cure cancer?

TANAAZ M KHAN, B.Sc. Biotechnology (1st year)

Cancer, as we all know, is one of the most debilitating diseases inflicted on mankind. There have been many attempts to cure various forms of this disease with few attempts being successful. Some of the known treatments are Radiation therapy, Chemotherapy, Immunotherapy etc. One of the most important issues faced with these therapies is that they are not target specific and even if they are, they do not completely help in eradicating the cancer cells. This, however, can be solved by a relatively new technology called **Nanorobotics**.

Nanorobotics is a field involving the use of **Nano robots** which are devices that range in size from **0.1-10 micrometers** and are constructed from nano scale molecular components. While the use of Nanorobotics has been a hypothetical remedy for quite a while, recent developments suggest otherwise. Researchers from Polytechnic Montreal, University of Montreal and McGill University have devised Nanorobotic agents that could effectively reach the cancer cells through the bloodstream. A study on mice has shown the administration of the drug into colorectal tumours without any other side effects.

A Nanobot:



The Nano robotic agents were made up of 100 million flagellated bacteria that helped in delivering the drug deep inside the tumours due to their self propelled motion. The bacterial agent used for this experiment was *Magnetococcus marinus* (MC-1 strain). These agents were loaded with Nano liposomes that contained the drug/s and were injected near the site of the cancerous tumour.

The nanobots specifically targeted **hypoxic** regions (oxygen deprived) in tissues since these regions usually develop due to the rapid proliferation of cells and are difficult to target. The reason why nanoparticles were chosen is that it is extremely difficult to navigate through the minute physiological environments that organisms possess. The bacteria basically consisted of **two** systems- One in which they had **magnetic nanoparticles** which helped them to navigate in a magnetic field and the other in which they consist of **oxygen concentration biosensors** which help them identify the cancerous tissues.

Nanobots being used in surgery:

These nanobots can be modified to carry multiple drugs at a time as well (combination therapy) and they can also be timed differently to avoid any drug interactions as such. The advantage with this system is that no new drugs have to be developed for this purpose. Drugs which are already known to work on cancer cells can be made more effective by using the nanobots to deliver them directly. While human trials have been underway, this new study does show a ray of hope to cancer patients all over the world.

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⇒ http://www.nature.com/nnano/journal/v11/n11/full/nnano.2016.137.html
⇒ http://3tags.org/article/dna-nanobots-will-target-cancer-cells-in-the-first-human-trial-using-a-terminally-ill-patient

ALTERING PERCEPTIONS

NADA YUSUF B.Sc. Biotechnology (1st year)

Walking on the pavement, **Neils Harbisson** does not look like any other artist crossing the road. Dangling over his forehead is an antenna that curves up and over from the back of his skull – the device, which he calls an **"eyeborg".** The device has a sensor that was originally devised to help him counter a rare form of colour blindness called **achromatopsia**, which means he sees the world in greys. His antenna is connected to a chip that translates colour into sound. It detects the light's hue and converts it into a frequency he can hear as a note.

Yes, he can hear colours.

He still sees things in greyscale; he hears them in vivid colours, transforming his experience of the world – and of his art. Concert halls and art exhibitions are now synonymous as he can listen to paintings.
"I had to memorise the notes, but after sometime, all this information became a perception, and then the perceptions became a feeling. I started having favourite colours and even began dreaming in colours. That's when I felt that the software and my brain had united. Because in my dreams, my brain was creating the sounds, not the software. That's when I knew I had become a **cyborg**."

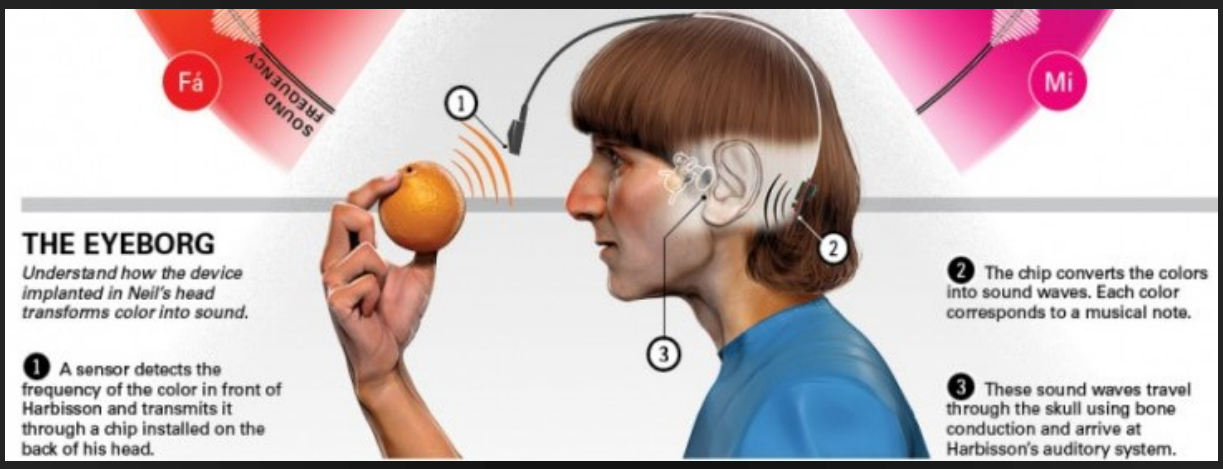
A new race?

Neil would come under the upcoming class of humans under the title of a cyborg. A cyborg (short for **cybernetic organism**) is a being with both organic and **biomechatronic** body parts. It applies to an organism that has restored function or enhanced abilities due to the integration of some artificial component of technology.

EYEBORG

Inspired by naturally occurring **synaesthesia**, Plymouth University cybernetics expert **Adam Montandon** created the eyeborg. Synaesthesia is a neurological phenomenon in which stimulation of one sensory pathway leads to involuntary experiences in a second sensory pathway; in other words, mixing up of your senses to alter your means of perception. It would mean that hearing a trumpet would be accompanied by seeing an orange colour in space.

The antenna also allows him to perceive colours beyond the normal human spectrum: He can **hear infrared and ultraviolet**. "For me, red isn't the colour of passion as it is for many humans," he says. "It's a serene colour. Violet, though, is savage to my ears."



Harbisson: Life and art

He connects what he hears through his ears to colours: a telephone ring sounds green, while Amy Winehouse is red and pink. It has brought about a huge impact in his everyday life –from dressing up to grocery shopping; wearing a B minor chord to a funeral and perhaps a song to a party. His ultimate fashion statement is dressing up in C major, which would comprise of a combination of pink, yellow and blue.

"Going to a supermarket is like going to a nightclub, it's full of different melodies."

His art often involves transposing colours into sound: the results are facial portraits you can hear. He has done **sonochromatic portraits** of Prince Charles, James Cameron and Tracey Emin. According to him, the eyes, lips and hair of his muse would correspond to different notes. These intricately created notes are written down and an mp3 of the said face is created. Harbisson beamed at his TED talk, "Twins sound different too".

Creating pictures from the sound of the human voice is something else he is known for. He painted a speech by Hitler and one by Martin Luther King, translating their sound into colour.

He is altering his means of perception but the big change will come when someone else decides to have an eyeborg implanted. Then Harbisson will no longer be alone on his grey **rainbow ride to transhumanism**.

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A Postural Crime

HARITHAA ANAND, B.Sc. Biotechnology (2nd year)

No, I was not chewing gum nor was I slouched, spreading my arms across the bench while struggling to keep my eyes open. What I was doing, however, was sitting cross legged with my spine erect and looking forward - at the blackboard and the teacher. This act has sparked so many teachers and onlookers (outside of classroom, for I do this in restaurants, buses, trains… you name it) to consider it offensive and disrespectful.

We all know the history, the past glory of the Indian subcontinent. We brought in the quintessential numerical '0', introduced cataract surgery and amongst other things, we have brought to this world, the cross-legged posture, which is now ubiquitously used by ad film makers to convey the state of serenity and peace one gets from either drinking a particular brand of tea or by investing in a housing project which has promised to take care of all retirement vows. This, however, is a very recent advancement and exploitation.

In this vast timeline of human existence, chairs have been around only for a fraction of it and if we consider the time from which they have become omnipresent, we end up with a fraction of that fraction. Our great-grandparents knew this, our grandparents knew this and if the previous parental generation did not migrate to the great West, they also knew that sitting cross-legged is the norm; not the exception but the norm when one is taking a meal, or in a social event. However, in the latest era of modernization, equipment and gadgets have come along and tremendously impacted the very way of human existence. We are producing, consuming, and growing at unprecedented rates in our short human history. This has brought about a paradigm shift, especially with regard to how much we are using the body physically. We have thus moved from a species of hunter-gatherers and agrarians to innovators and economists, and hence from an agile body to a (predominantly) chair bound one. **A chair!** (Webster's defines: a thing made or used for sitting on, such as a chair or stool)

Let us get to the science part now. An average human, according to the **World Health Organization (WHO)**, in the average or above average income range spends 9-10 hours a day sitting. Chair-bound workers are essentially suffering from **sub-clinical bed sores**: muscles start to howl for the physical and neurological stimulation they need to survive and thrive, but we only move just enough and just in time to stop tissue from actually starting to become **necrotic** (dead). But they certainly get "sick," especially in the shoulders, back and hips – which tend to remain relatively immobile even when we get up and go to the water cooler.

An ***active couch potato***, describes people who say "*Oh, I exercise a lot*! Every day! *But, yes, I sit for longer hours every day too*!", the exercisers who sit most of their day. It aptly describes nearly everyone who sits at work but is otherwise active. It's a bit like smoking. Smoking is bad for us even if we exercise a lot. So is sitting too much. And this analogy serves to suggest two things:

1) As with smoking, sitting for prolonged periods was previously thought to be almost completely harmless, and

2) The more recent and much more speculative twist: like smoking, sitting may be harmful even if we are otherwise healthy and active.

If that is one side of the spectrum, the ill effects of sitting for too long; the other side is the '***how-we-hold-ourselves***' part of it. We slouch, we cram, we stretch, and we are anything but ergonomic (relating to or designed for efficiency and comfort in the working environment - *thank you, Webster*). Much "**poor posture**" is just awkwardly coping with a postural strain. Many postural strains can be removed or avoided if one recognizes the problem — but it is surprising how often people don't even notice a postural strain. What if someone is stubbornly unaware of an easily avoidable postural strain? Is that a posture problem? Or is it just **cluelessness about ergonomics**? Or could it be an unholy blend of both? Plenty of research does confirm a logical connection between posture and arthritis. For instance, a 2012 study of knee arthritis — an ideal place to look — showed that people with arthritic knees are bigger leaners, and their gait is "consistently different" than people with healthy knees, and they probably were not walking differently because of pain. The crookedness probably caused the arthritic pain, as opposed to the arthritis just making them walk crookedly.

Emotions, posture, and pain sensitivity probably do influence each other to some degree. Most self-limiting behaviours have both postural effects and causes. The classic example is depression: a depressed person will adopt a distinctively depressed posture, which can be quite obvious to everyone around them. Less obviously, a depressed posture may also generate depression. Happy people who "try it on" will actually start to feel sad. Conversely, sad people who adopt **happy postures and expressions** will feel better. We hold ourselves in a certain ways because they reflect our comfort with the positions — and our discomfort with other positions, such as **"holding our head high."** Just as we eat comfort food to our detriment, we may also slouch comfortably to our detriment, constantly projecting to the world (and creating the reality) that we are not ready, or that we are depressed, or sullen, or bored with life, or other reasons. When we leave poor posture unchallenged, we also fail to leave our emotional comfort zone, which is generally necessary for personal growth. It's not just the quality of the existence that it affects, the quantity/ duration is also affected.

A National Geographic article examining three unusually long-lived groups of people found that **regular activity** was a major common denominator, among other things, in these groups. None of them were programmers. We are certainly soft (w.r.t. to the hunter gatherers we once were, or those tribes which got picked by National Geographic for their longevity studies). Although several issues could probably be precipitated by this lifestyle, musculoskeletal problems, at least, have been directly linked to prolonged sitting and seem to be steadily on the rise.

Apart from all this, there is something called **organ comfort**. Most of the vital organs of the body are in the chest and abdomen region. These organs are not rigid, fixed in place with bolts and clams, but are rather loose, hanging in nets types. Only if one sits with the **spine erect**, the organs will be in the maximum possible comfort. Keeping the body erect is not because we do not like comfort, but to understand and experience comfort in a completely different way. We can train our muscles to be comfortable, with the spine erect, but we cannot train our organs to be comfortable while slouching.

Reporting by Bonnie Berkowitz; Graphic by Patterson Clark

ORGAN DAMAGE

Heart disease

Muscles burn less fat and blood flows more sluggishly during a long sit, allowing fatty acids to more easily clog the heart. Prolonged sitting has been linked to high blood pressure and elevated cholesterol, and people with the most sedentary time are more than twice as likely to have cardiovascular disease than those with the least.

Overproductive pancreas

The pancreas produces insulin, a hormone that carries glucose to cells for energy. But cells in idle muscles don't respond as readily to insulin, so the pancreas produces more and more, which can lead to diabetes and other diseases. A 2011 study found a decline in insulin response after just one day of prolonged sitting.

Colon cancer

Studies have linked sitting to a greater risk for colon, breast and endometrial cancers. The reason is unclear, but one theory is that excess insulin encourages cell growth. Another is that regular movement boosts natural antioxidants that kill cell-damaging — and potentially cancer-causing — free radicals.

MUSCLE DEGENERATION

Mushy abs

When you stand, move or even sit up straight, abdominal muscles keep you upright. But when you slump in a chair, they go unused. Tight back muscles and wimpy abs form a posture-wrecking alliance that can exaggerate the spine's natural arch, a condition called hyperlordosis, or swayback.

Tight hips

Flexible hips help keep you balanced, but chronic sitters so rarely extend the hip flexor muscles in front that they become short and tight, limiting range of motion and stride length. Studies have found that decreased hip mobility is a main reason elderly people tend to fall.

Limp glutes

Sitting requires your glutes to do absolutely nothing, and they get used to it. Soft glutes hurt your stability, your ability to push off and your ability to maintain a powerful stride.

LEG DISORDERS

Poor circulation in legs

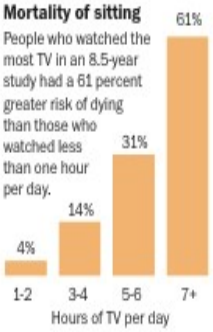
Sitting for long periods of time slows blood circulation, which causes fluid to pool in the legs. Problems range from swollen ankles and varicose veins to dangerous blood clots called deep vein thrombosis (DVT).

Soft bones

Weight-bearing activities such as walking and running stimulate hip and lower-body bones to grow thicker, denser and stronger. Scientists partially attribute the recent surge in cases of osteoporosis to lack of activity.

Mortality of sitting

People who watched the most TV in an 8.5-year study had a 61 percent greater risk of dying than those who watched less than one hour per day.



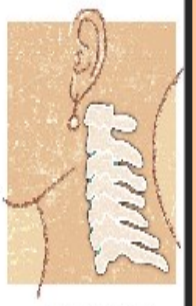
TROUBLE AT THE TOP

Foggy brain

Moving muscles pump fresh blood and oxygen through the brain and trigger the release of all sorts of brain- and mood-enhancing chemicals. When we are sedentary for a long time, everything slows, including brain function.

Strained neck

If most of your sitting occurs at a desk at work, craning your neck forward toward a keyboard or tilting your head to cradle a phone while typing can strain the cervical vertebrae and lead to permanent imbalances.



Proper alignment of cervical vertebrae

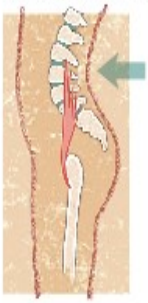
Sore shoulders and back

The neck doesn't slouch alone. Slumping forward overextends the shoulder and back muscles as well, particularly the trapezius, which connects the neck and shoulders.

BAD BACK

Inflexible spine

Spines that don't move become inflexible and susceptible to damage in mundane activities, such as when you reach for a coffee cup or bend to tie a shoe. When we move around, soft disks between vertebrae expand and contract like sponges, soaking up fresh blood and nutrients. When we sit for a long time, disks are squashed unevenly and lose sponginess. Collagen hardens around supporting tendons and ligaments.



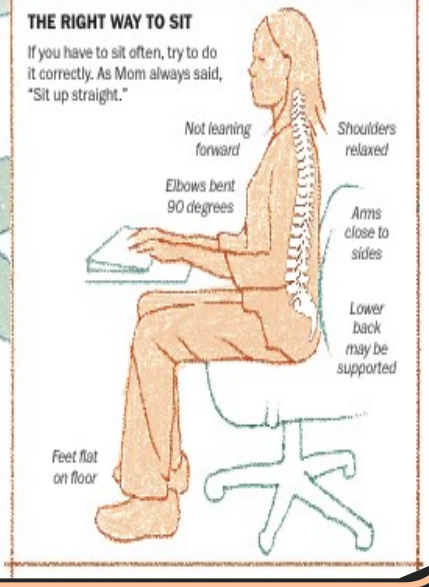
Lumbar region bowed by shortened psoas

Disk damage

People who sit more are at greater risk for herniated lumbar disks. A muscle called the psoas travels through the abdominal cavity and, when it tightens, pulls the upper lumbar spine forward. Upper-body weight rests entirely on the ischeal tuberosity (sitting bones) instead of being distributed along the arch of the spine.

THE RIGHT WAY TO SIT

If you have to sit often, try to do it correctly. As Mom always said, "Sit up straight."



If we see the body as two halves split horizontally in the middle, the lower part weighs much more than the upper part, with the largest muscles and the biggest bones in the lower body. The spine, though subtle and made of **33 vertebrae**, is designed to support a certain amount of weight and even a slight overload of the spine will create problems. One could compare the spine to the suspension of a car. Certain luxury cars in India, are in the garage half the time simply because they have multi-link suspensions, while our roads are made for one-link suspensions. Go a little fast and hit a road hump, the multi-link suspensions may go out of alignment, and the cars need to go straight to the garage, as they are not made for such a level of stress. One can still drive, but it will drag. The idea of a multi-link suspension is enhanced **maneuverability**. Similarly, our spine is a 33-link suspension. Any extra load on the spine, as which is seen during **slouching and cramming**, leads to a **plethora** of problems; from spondylitis to disc bulges.

The middle of the spectrum consists of this **emotional/psychological aspect** of being human, which is tied to our physical stature. It is relatively obvious that posture is shaped by mood and other social and emotional factors. But less well known is that this double-edged sword might cut the other way too: **posture might create and reinforce emotional states!** And, if posture can influence emotions, then it is no surprise that it could also change pain sensitivity, and there is some evidence of that. So, here is a free, easy science-powered pain relief tip: Stand tall! Assume a bold posture, a "power" posture. It might actually reduce pain, even if a little. A temporary reduction in sensitivity is hardly a cure for chronic pain, if it works at all, but is worth trying.

Finally, trying to sit cross-legged for 10-15 minutes a day, with the spine erect, letting the pain settle in, letting the back muscle spasm from the newness of the posture and the effort it takes to sit too straight, we would see that our concentration improves, that we are a little more alert, and a little less sleepy. All of this, apart from incredibly helping the human body from the plenitude of posture associated back pains and neck strains.

And finally, no, I was in no means disrespecting all the waiters, the school teachers, the college professors, the air hostess and the like. And just out of curiosity, if my simple ancient act of sitting cross-legged throws us (who are very much Indian in blood) off balance, then is it not the time to consider the all-time debate of why in an agrarian nation, we are so hooked up in mimicking the West (at the cost of incurring chronic ailments)?

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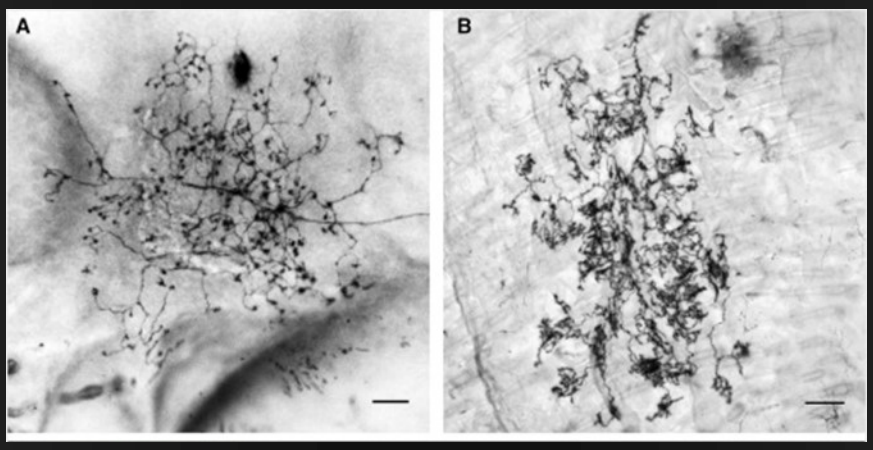
Nociception – Sensing Pain

SHAHINA MAZUMDAR, B.Sc. Biotechnology (1st year)

Sensing the environment is critical to the survival of an organism. **Nociception** is the mechanism by which animals sense and avoid potentially tissue damaging stimuli. It has been observed in organisms belonging to several taxa, but certain primitive organisms like choanoflagellates possess the same molecules which take part in nociception. This shows that the effort to sense the environment for self-preservation began in metazoans far earlier than the development of nervous tissue.

This process relies on nociceptors, which are specialized neurons that detect and respond to potentially damaging forms of energy — heat, mechanical and chemical — in the environment. Nociceptors can be activated by strong heat, intense cold, harsh mechanical stimuli, and a variety of chemical stimuli.



Nociceptive nerve endings visualized by sparse genetic tracing in mice in back (A) and glabrous (B) skin. Scale bar – 100 nm.

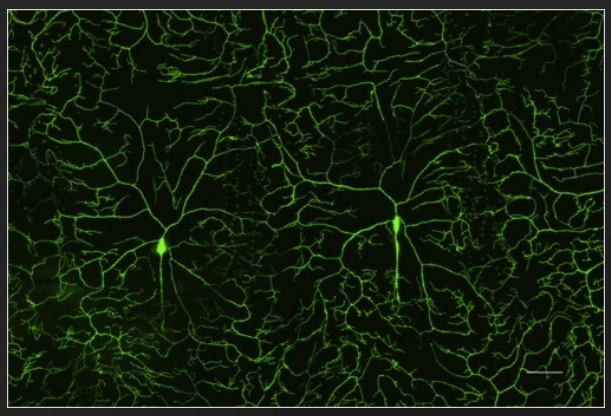
NERVES INVOLVED IN NOCICEPTION

The cell bodies of the mammalian nociceptor neurons are found in the peripheral nervous system in dorsal root and trigeminal ganglion.

The nerves involved in nociception are both C-nerve fibres and Aδ-nerve fibres. Aδ-nerve fibres are thin, myelinated nerve fibres that help in rapid conduction of nerve impulse. C-nerve fibres are unmyelinated and thus slower, but they help with the transmission of a widespread, intense impulse. This is why when we burn our hand, we experience a sharp sensation first and the dull, persistent pain hits slightly later.

Axons, from the nociceptive neurons, output to neural circuits in the dorsal horn of the spinal cord, which in turn, transmit the inputs to the brain through ascending neuronal pathways. It is in the brain where pain perception occurs.

Invertebrate nociceptor cells have been studied in *Drosophila melanogaster* and *Caenorhabditis elegans.* Nociceptive cells in *Drosophila* are class IV multidendritic arborization neurons. *C. elegans* have nociceptive neurons which resemble a candelabra and are thus called **menorah cells.**



Composite confocal micrograph of two adjacent class IV multidendritic neurons in third instar Drosophila larvae labeled with GFP.

NEUROINFLAMMATION, SENSITIZATION AND HYPERALGESIA

Vertebrate nociceptors not only carry afferent information to the central nervous system but also locally transmit information in the periphery. The nociceptive terminals of C-fibres in the skin have vesicles containing neuropeptides. On transmission of nociceptive signals, these neuropeptides are released and they cause inflammation in the localized area. The combined effects produce so-called '**neuroinflammation**'.

On repeated excitation, nociceptive neurons become **sensitized**. In their sensitized state, even the smallest of stimuli causes a heavy impulse to be transmitted across the nerves. This is why when we suffer an injury, the slightest mechanical touch causes a lot of pain in the affected area.

Hyperalgesia is a condition where neuropathic pain is caused by the continuous and strong excitation of nociceptive neurons. It is a medical condition.

THERMAL NOCICEPTION

In mammalian nociceptors, noxious heat of more than 40°C activates the heat-sensitive C-fibres and heat of more than 52°C activates A-fibres. The **TRPV** family of ion channels is involved in thermal nociception. These ion channels are also activated by the chemical **capsaicin**, which explains how **chillies**, which possess capsaicin, provide the sensation of heat. **TRPA** ion channels also play a role in thermal nociception.

MECHANICAL NOCICEPTION

Studying mechanical nociception in vivo is challenging due to the naked mechanosensitive nerve endings being embedded in the epidermis. In vitro studies indicate that mechanical nociception is caused due the pressure activated ion channels. Also, mechanical injury causes physical damage to the nociceptive neurons, which makes them hypersensitive and hence the sensation of pain after injury is more.

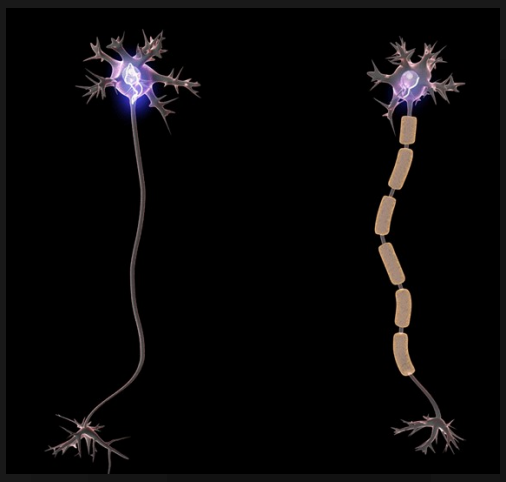
CHEMICAL NOCICEPTION

Chemical nociception is very specific to each family of ion channels. Chemical nociception is caused by chemical irritants. For instance, TRPA1 is activated by isothiocyanate compounds that are found in Japanese horseradish (wasabi). Chemical nociception takes place due to activation of ligand gated channels. **Tear gas** contains active components that target the TRPA1 ion channel. **Pepper spray** contains capsaicin that specifically targets the TRPV1 ion channel.

MODIFICATIONS OF NOCICEPTION

Nociception greatly varies with the specific habit and habitat of a species. There are certain species where the nociceptive neurons are modified to provide an adaptation to these organisms. Naked mole-rats, for example, have non-functional pathways for nociceptor sensitization and are insensitive to acids, traits which are thought to be adaptations to living in a high CO_2, acidic environment. Additionally, recent studies of TRPV1 channels from camels suggest the possibility that these desert-dwelling animals may be resistant to extreme heat via adaptive changes to the amino acid sequence of this heat sensitive channel.

Nociception and pain perception can occur independently of each other. For instance, in case of nerve reflexes, the nociceptive nerves are involved, but pain perception need not take place.



Conduction across a nonmyelinated sheath is slower than conduction across a myelinated sheath. This happens because myelinated nerve cells can perform saltatory conduction.

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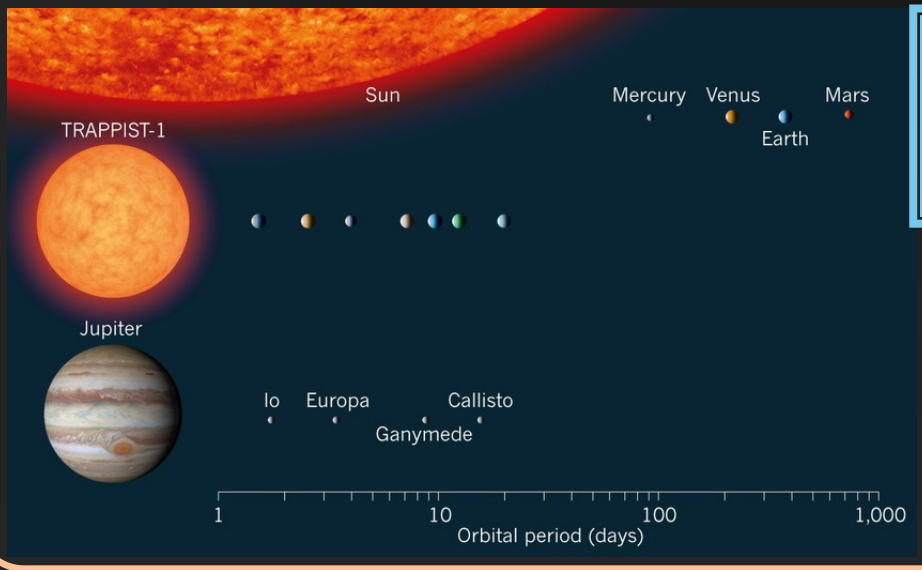


LIFE ON EXOPLANETS!!!

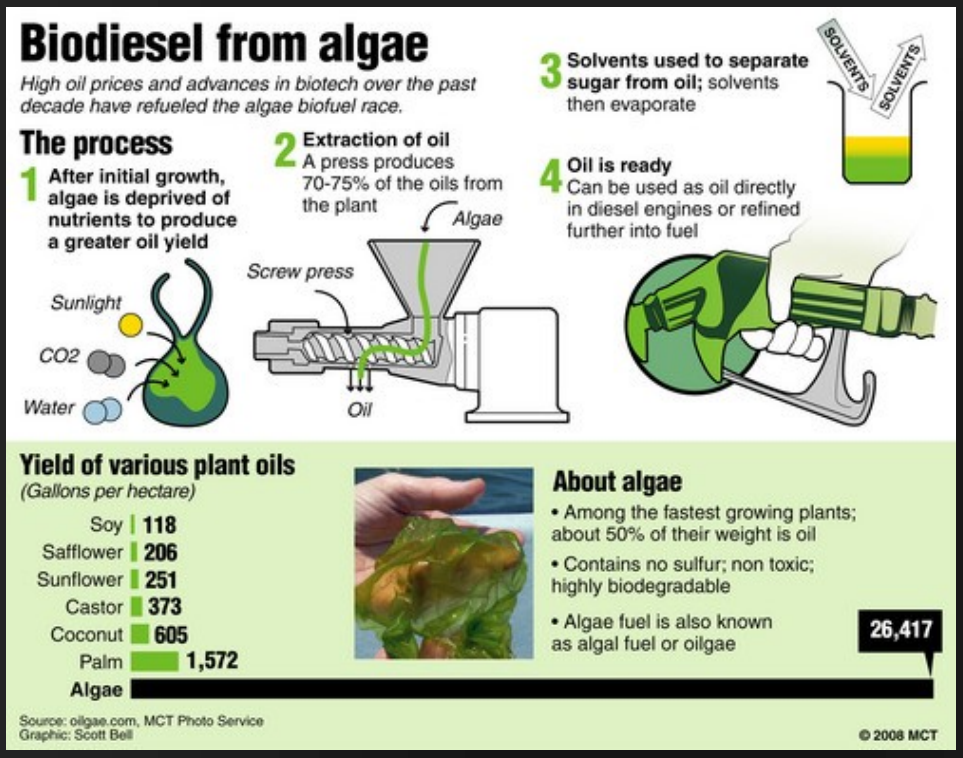
The discovery of seven Earth-sized temperate terrestrial worlds orbiting an ultracool dwarf-star TRAPPIST-1 40 light-years away– and THREE of them suspected to be habitable.

Gillon *et al.* , Nature.

Algal Biofuel: The end of fossil fuels?

LUKE DA'COSTA, B.Sc. Biotechnology (2nd year)

We all know what an alga is, but not all of us are aware of what these marvelous photosynthetic organisms are capable of. When we think about algae, what comes to mind is the green gross material that floats on ponds, but an alga is so much more. A rising interest among scientists and futurists is due to the fact that algae can be used to produce biofuel. And it does so in an highly efficient fashion.



Up to **70% of the energy from algae** can be converted into biofuel, and by using certain chemicals and solvents, we can take that number up to a 100%. Algae, well, microalgae to be **precise**, can produce up to **60 times more oil per acre** than land based plants such as corn. This fuel is very similar in its composition and properties to that of diesel. After all, fossil fuels are in fact just **organic biomass** like algae that has been pressurized and decomposed into fuel over millions of years. This similarity means that algal biofuel can be used as a direct replacement for fossil fuels in automobile engines without any modifications. It can be used as jet fuel, to power buildings, or even in our kitchen. Algal biofuel is also much cleaner than the fuel we use today; it has a lower carbon footprint and is less harmful to the environment. The fact that algae use carbon dioxide to grow makes them a nearly **carbon neutral fuel source**.

Perhaps the best part about algae is their **resilience**. They can grow practically anywhere, in freshwater, saltwater or even sewage water. All they need is sunlight, carbon dioxide and nutrients. Algae grow much faster than conventional crops such as corn and other grains, which are cultivated on an annual or sub-annual basis; algae can be grown and harvested weekly. The fuel output from algae is much higher than that of most other plants that are used for biofuel production today. Algae can be used to produce essential secondary metabolites and nutrition tablets; they can also be used directly as food for humans. The **leftover biomass** from fuel production can be **used as fodder** for livestock. In this way, every part of the algae is made use of and so waste generated is minimal.

Algal biofuel could be the answer to a sustainable and clean fuel source in the future. These plant-like organisms could not only solve the energy crisis we face but also drastically **reduce greenhouse gases** in our atmosphere, thus helping the fight against global warming. Perhaps in the near future, with advanced gene editing tools and cultivating infrastructure, we may have species of algae that are efficient, and industrial technology capable of utilizing every bit of the energy they produce. Until then, let us keep innovating, for, the future of species depends on it.

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Great work, but Unheard–Part 2

HARSH RANAWAT, B.Sc. Biotechnology (2nd year)

The 'OTHER' Lederberg

Just about every graduate student in Molecular and Cellular Biology would instantly recognize the **lambda phage** as a model organism. In contrast, its discoverer is often overlooked.

Esther Miriam Zimmer was born in 1922 as a child of the Great Depression and in a society that was not ideal for a to-be young female scientist.

Instead of pursuing studies in French or literature, as her teachers at Hunter College advised, Esther decided to dedicate herself to science, studying biochemistry and then later gaining a Master's degree in **Genetics** at Stanford University.

It was at Stanford where she met her future husband and giant in the world of microbial genetics, Joshua Lederberg. The two were married and Esther followed him to the **University of Wisconsin** for his first professorship. At the University of Wisconsin, she received her PhD and developed the ideas that would eventually change the landscape of microbiology forever.

Esther Lederberg's contributions to the field of microbiology were enormous, ranging from the discovery of lambda phage, the first virus characterized as lysogenic, to the establishment of the **Plasmid Reference Center at Stanford University**.

At this time in the history of the USA, men dominated the scientific landscape and consequently, many of Esther's accomplishments were overshadowed by her husband's **Nobel Prize in 1958**.

PHAGE LAMBDA AND SPECIALIZED TRANSDUCTION

In **1950**, Esther studied a previously uncharacterized coli phage, known as phage "lambda." At this time, viruses were all considered lytic.
What Esther noticed was that this particular virus does not lyse the cell immediately. The infected cell divided normally and hence replicated the viral genome undisturbed and free of **lysis**. In effect, the viral genome was somehow integrated into the host cells' genome. It was only under certain environmental conditions that the virus underwent replication, thus killing the cell. This viral pathway would later be known as the lysogenic cycle and is a constant in every biology book published since.

The discovery of lambda phage marked a milestone in microbial research.
Ultimately, Esther's work with lambda phage revealed the pathways for transduction (viral DNA into cells) and horizontal transfer (DNA from bacterium to bacterium), along with many mechanisms by which viruses can regulate the host genome.

Bacterial fertility factor (F-plasmids)

Esther's discovery of lambda phage was published in 1953, with her as the sole the author. While continuing to describe lambda phage and its integration into the host, she noticed an interesting phenomenon — some uninfected bacterial strains that had been crossed, failed to give rise to recombinants. She speculated that the bacteria "lost" a factor that was necessary for division. She describes her initial observations as:
"In terms of testing available markers... the data showed that there was a specific locus for **lysogenicity**... In the course of such linkage [genetic mapping] studies... one day, **ZERO** recombinants were recovered... I explored the notion that there was some sort of 'fertility factor' which if absent, resulted in no recombinants."
The factor that she discovered was to be officially named **Fertility-factor** and was found on a plasmid exchanged between bacteria (F-plasmid).

Esther Lederberg and Joshua Lederberg

REPLICA PLATING

A longstanding problem that puzzled microbiologists for decades was how to screen large numbers of bacterial colonies for a desired phenotype. Traditionally, a **single colony** was streaked onto a separate plate containing **a selective pressure**, i.e., a plate containing an antibiotic or lacking a certain growth nutrient. If the colony still grew on the selective plate, the bacterial colony originally streaked was said to have a different phenotype. Scientists longed for a method of reproducing the geometric pattern of colonies from a single plate.

Esther speculated that the fibres in simple velvet cloth could act as **tiny inoculating needles** to transfer the pattern of colonies from plate to plate. This methodology allowed her to later discover that **spontaneous mutations** could arise with **adaptive advantages.**

Esther followed her husband to Stanford University where he later founded and directed the Department of Genetics. Once again, Esther continued to be a leader in the field and founded the **Plasmid Reference Center**, which she directed till her retirement in 1985.

Living in her husband's shadow had proved to be a tragedy. In a twist of **cosmic irony**, Esther Lederberg chose to study the invisible world of microbes, yet remained largely invisible herself. How would the world be different if Esther was afforded the same benefits as her male counterparts? Despite these obstacles, her contributions to science were nothing less than remarkable.

In Joshua Lederberg's Nobel Prize acceptance speech, he recounted how he had enjoyed the company of many colleagues, especially that of his wife. He referred to the replica plate method and the **F factor**, but **without** mentioning the role of Esther in both discoveries.

As **Luigi Cavalli-Sforza** (population geneticist at Stanford) commented : "Dr. Esther Lederberg has enjoyed the privilege of working with a very famous husband. This has been at times also a setback, because inevitably she has not been credited with as much of the credit as she really deserved. I know that very few people, if any, have had the benefit of as valuable a co-worker as Joshua has had."

Esther and Joshua got divorced in 1966 and later, at the age of 70, Esther married Matthew Simon in 1993.

Esther died at the **age of 83**

Her ex-husband Joshua's website in the Profiles of Science Web of the U.S. National Library of Medicine has not a word about Esther and no mention of her death.

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EMSI CONFERENCE in Manipal

BHARGAVI KARNA, B.Sc. Biotechnology (1st year)

Inaugural Address by Dr. Lehrach

The 41st Annual Meeting of the Environmental Mutagen Society of India (EMSI) and an International conference was organized by the School of Life Sciences, Manipal University from 27th to 29th January, 2017.

Since the origin of life, all organisms are advertently or inadvertently exposed to various xenobiotics from the environment through air, water or food, affecting adversely the biota. The consequent damaging effects at the cellular and molecular levels caused by those chemical substances / physical factors are being counteracted by cellular defense mechanisms, especially related to DNA. Failure to do so may lead to mutagenic, carcinogenic and hereditary effects. In addition to this, recent findings have highlighted the changes in gene function modified through epigenetic effects. This is where the "genes and environment" interaction plays an important role at the population level highlighting the importance of public genomics.

The epigenome is the interface between genome and environment in any living organism. The impact of mutagenesis on the genome and epigenome leading to altered biological response affecting life and particularly human health was the primary theme of the conference.

Over 380 participants from India and overseas, congregated in the Fortune Inn Valley View to share their research findings on the conference theme of "**Advances in Cellular, Genomic and Epigenomic Insights on Environmental Mutagenesis and Health**". The conference was inaugurated by Dr. Hans Lehrach (Director, MPI for Molecular Genetics, Germany), in the presence of Dr. H Vinod Bhat (Vice Chancellor, Manipal University), Dr. GB Maru (President, EMSI), Dr. Birajalaxmi Das (Secretary, EMSI) and Dr. K Satyamoorthy (Director, SLS). Addressing the audience, Dr. Lehrach noted the future possibility of personalized healthcare that will minimize not only cost of health care but also mortality and morbidity due to adverse drug reactions.

In his presidential address, Dr. Vinod Bhat commented on the importance of the interplay between genes and the environment, and said that this conference would help in filling the gaps in knowledge and lay a foundation for future collaborations.

Scientific sessions covered wide areas of research such as environment and human health, implementation of personalized medicine, environmental risk of cytostatic drugs, skin equivalent models for toxicology study, environmental carcinogens and their molecular mechanisms in causing genetic/epigenetic alterations. Some of the highlights of the conference were the full attendance of participants in all sessions, reflecting on the topics as well as the presenters, and the opportunity offered to student participants to have interaction with the experts.

Over 60 invited talks by experienced as well as young scientists from Australia, Europe, India, Singapore, UK and USA and 100 poster presentations offered plenty of learning experience for the student and scholar delegates of the conference. Two young researchers (Ms. Suma Prabhu of SLS, Manipal and Mr. Vinay Jain of BARC, Mumbai) were bestowed with the 'Young Scientist Award' for the best presentation of research work, while three more youngsters received awards for their poster presentations. The valediction of the conference was held in an informal gathering, wherein top experts shared their conference highlights and feedback, including those from the participants.

EMSI-conference participants

An interview with Dr Ramesh Bamezai

Professor of Genetics and Director (Coordinator)
National Centre of Applied Human Genetics
School of Life Sciences
Jawaharlal Nehru University

♦ **What has been your favourite part in this Manipal trip?**

⇒ I liked the university. I've had the opportunity of visiting it earlier. It's vibrant and the infrastructure is excellent and of course it's got bubbling students. It has all the ingredients of a perfect institution. And I feel the University Grants Commission, among other private institutions it should consider this institution too.

♦ **Of all the fields in science, why did you choose to specialise in cancer?**

⇒ I work on three different subjects. I work on three model diseases. One of them is infectious diseases i.e., leprosy and tuberculosis, to understand the susceptibility mechanisms. Although it affects only 5-10% of the population and 90-95% of them are protected. Still, it's very interesting to understand as to why it affects those 5%. And since tuberculosis and opportunistic infection in terms of when people get AIDS or any other diseases, so it's important to look into these diseases. Similarly we looked into Type 2 diabetes, which is another complex disease where more than one genes are involved; breast cancer where genes are not implicated and 20% of the population suffer from this disease so all these are interrelated.

♦ **Tell us something about being a scientist that no one else knows about. (*Behind the scenes in a lab*)**

⇒ I don't know what behind the scenes you expect me to talk about. I was talking to some students the other day and I spoke of being a scientist.
It not only throws challenges but is non-monotonous. It's very exciting.

Towards the end of the day, when you get positive results, you get so excited and elated that this by itself sets the tone for you to enjoy life even more. Being a scientist, if you are clear headed and you are doing it out of passion, you will succeed. Any scientist is any real person to be fun and frolic. We are no different.

♦ **Tell us something about yourself as a student. When you were younger like us.**

⇒ Naughty! Not mischievous, but naughty. Curious to know things and explore even unknown areas and curiosity has always been the reason to drive me to take up science.

♦ **What is going to be the most popular research work on cancer in the coming days?**

⇒ One wants that there should be a kind of therapeutic intervention. There are varied levels of interventions - surgical intervention, therapeutic intervention etc. So there are many ways by which cancer is being helped with. Some of the cancers have really good prognostic information available at the moment, survival rate is very high in some of the cancers, but unfortunately we haven't reached that state yet, so obviously one would look forward to molecules emerging which are natural in character, which do not damage the rest of our system, but help in cleaning the cell. So these are some of the issues that future would look into.

- **What's the scope of cancer in the newly budding students like us?**

⇒ HUGE! Because to me it's a lifestyle disease too and the lifestyles are changing, so in such a situation obviously more and more cancer incidents are going to be there, although as compared to Western Europe, India has relatively less, but it's too increasing. Thus, we need to pay attention to this. So there is definitely scope for cancer for the budding students.

- **A piece of advice for the young scientists.**

⇒ Whatever you do, do it with passion and thought, towards the job you are at and do it in a very dedicated and honest, ethical manner. And rest be happy and don't be upset about anything. Ups and downs happen in life but ultimately if your goal is clear you will achieve it.

COMPILED BY:

HUMAIRA SHAH AND NADA YUSUF, B.Sc. Biotechnology (1st year)

A Talk with Dr. Yuri Dubrova

Professor of Genetics
University of Leicester,
Leicester, UK

He was born and bought up in Kiev, Ukraine. He pursued his undergraduate degree in Biology at Kiev State University, and his PhD and DSc in Genetics at NI Vavilov Institute of General Genetics, Moscow. He later analysed the 1986 Chernobyl nuclear power plant accident. In 1996 article in Nature, he reported a statistically significant increase in the mini-satellite DNA mutation rate in the children of the parents who had received a high dose of radiation from the accident.

It was a very interesting story, back in Moscow, he was researching about: Human population Genetics. In April 1986, one of the biggest ever disasters happened, the Chernobyl Disaster, which drew everyone's attention towards its cause and effect. It had a similar effect on Dr. Dubrova, but mainly on its effect on humans and their off-springs. After this catastrophic disaster he and his team, started researching about the effects of this disaster, and what they could do about it.

At that time, the head of his institute returned from his trip from England and told him about Alec Jeffreys' lab and his work. He joked saying "nowadays Sir Alec Jeffrey is, 'The big boss'". He read Alec Jeffreys' publications and immediately realized what the aim of his experiments was. They (Alec Jeffreys and team) had isolated an 'absolutely insane, crazy' part of the human genome: mini-satellites, whose mutation rate was very high even under non-exposed circumstances. Then it occurred to him, that if the rate of spontaneous mutation is so high, then what might happen if the parents of a particular offspring (whose genome was to be analysed) were exposed. The scenario for his thought was already there: the Chernobyl accident.

He wrote a letter to Jeffreys, disclosing his thoughts and opinions, and was invited to Jeffreys' lab. From here, his journey towards his current research topic began. He went for half a year fellowship to The Society of UK (Leicester) in 1991 with already collected samples, from families of irradiated mice.

Later, he went on published his first publication on Irradiation in Nature. He shuttled between Moscow and other places, from where he collected samples and also convinced some of his friends from Belarus to collect and culture the samples. He told Jeffreys, that they might organise a blood sample collection from those who were exposed to the fallout after the Chernobyl accident.

After returning back with the samples to UK, to his surprise, not only did it work on irradiated mice but also on humans. After this discovery, he published another paper in Nature. He quoted, "the logic of science is very simple, you start doing something, and then you realize that you have not done everything and you'd like to continue your research". Saying that, he decided to stay in UK for further research and he established his own lab there, and he has been there for 23 years.

Initially he experimented on mice, then he studied the blood samples of exposed people, and then he went back to studying mice. The reason behind this is that, in humans the major problem is that we don't know the dose of the exposure. In mice, all you have to do is, put it under the X-ray machine and press the button and you'll know what exactly is the dose. He tried exposing mice to x-rays, gamma rays, and fission neutrons. He also experimented with chemicals and anti-cancer drugs. After that they decided to have a look at what's going on with the offsprings of the irradiated parents. They analysed not only the frequency of mutations that the off-springs got from their irradiated parents, but also at the rate at which these off-springs generate the mutations. And to their surprise, the rate at which the off-springs generated the mutations was at least 3-4 times higher than they could have induced. The off-springs were genetically unstable for completely unknown reasons. This is what he called Trans -generational effect, and it travels from one generation to another. And the reason behind it is epigenetics. They spent many years trying to figure out what went wrong with those animals and till date they still haven't got an answer.

Usually you'd expect the mutation rate of the exposed parents (in mice) to come back to normal but that is not exactly the case, because in the non- exposed children, the mutation rates are also high. They then exposed male mice to 1gy of acute exposure and 1gy of chronic. After experimenting, they concluded by saying that, acute exposure is more severe than chronic exposure and also depends upon the dosage. But whether the level of dosage was passed on to the children of the irradiated parents is unknown. On the other hand they also exposed male mice to anti-cancer drugs along with drugs given to humans during sessions of chemotherapy. And they concluded that, offspring of these mice were genetically unstable. After this, a question arised: Which one is more dangerous? Chemotherapy or radiotherapy? This is a major ally of their investigation.

And only with new techniques like next generation sequencing you can see the whole genome. They came across many fascinating facts that they had never even anticipated.
They radiated mice and realised what was going on at the level of the whole genome. This can be done by using Next Generation Sequencing techniques. These types of studies, where you have to irradiate mice are very expensive. He firmly believes that this is the future, the cost will dramatically reduce. And soon we will be in a position to afford these studies. He referred to his already collected samples as a gold mine where you go on digging and you discover more samples with more variation.

COMPILED BY:

SHREYA GUDI AND AARTI RAMCHANDRAN, B.Sc. Biotechnology (1st year)

Interview – Dr. Kathleen O'Connor

SANIA KOUSER, ADITI KANDLUR, AMITHA, RAMYA GUPTA, ANJU ARAVIND, SUDIPTA PATHAK

Dr. Kathleen L O'Connor
Professor and the Associate Director of Cancer Education,
Markey Cancer Center, University of Kentucky

Dr. Kathleen L O'Connor is a Professor and the Associate Director of Cancer Education, Markey Cancer Center, University of Kentucky. On her first visit to Manipal University she delivered a lecture on "Integrin Signaling in Breast Cancer" at the 'Breast Cancer Evidence Update' on 23rd February, 2017, a collaborative venture of School of Life Sciences and Centre for Community Oncology, Manipal University with Markey Cancer Center, University of Kentucky. She is interested in understanding how integrins and integrin-mediated signaling contribute to the late stages of carcinoma progression, where cells acquire the ability to invade into the surrounding tissues. Her work has uncovered a link between integrin signaling and cyclic AMP metabolism. a6β4 integrin is one of the integrin species on which she has done extensive study.

On her visit to School of Life Science, Manipal University we got an opportunity to interact with and interview her. Talking about her motivation to take up science and research, she told that she has always been passionate about science and mathematics. As a child she always used to ponder on the differences in plant and animal development. In her early education she took advanced mathematics and biology as her major subjects. Later, she chose biochemistry as her minor and biology as her major subject. She always had several questions to ask her professors.

After her schooling, she moved to Texas where she worked in the Department of Pathology on pathologically immune viruses (HIV). Back then DNA sequencing was a major experiment though not automated, so she had to do manual base calling, which required a lot of time and patience. Amidst all these obstacles she was able to base call 800 base pairs of the genome of a virus that infected rabbits.

For her further studies she joined Case Western Reserve University, where she rotated in laboratories which dealt with neuroscience, biochemistry of protein translation, gonadotrophic hormones in pregnancy and development and cancer. It was during this time that she developed an interest in extracellular matrix and receptors and how they function and their role in cancer progression. Later she went to Harvard Medical School for her post-doctoral research and it was at Harvard she started working on integrins, which has contributed significantly in enriching the knowledge.

Emphasizing the importance of setting correct priorities, she said that she enjoys playing baseball especially with her kids. She motivated us by saying that we should believe in our ideas but at the same time be critical in developing it - by doing this we can drive science forward.

Matribhasha Diwas Celebrations 2017

Matribhasha Diwas or International Mother Language Day was celebrated with great enthusiasm in the School of Life Sciences (SLS), Manipal University on February 21, 2017. An hour long program was conducted for the students, research scholars and faculty, who participated with fervor. The program started with Dr. K Satyamoorthy (Director, SLS) delivering an address about how linguistic diversity plays a pivotal role in our day-to-day interactions in SLS. This was followed by an address by Dr. Gopalakrishna Bhat (Faculty, SLS), who explained the history and significance of the day. Following this, there were a variety of events highlighting the richness of the languages and the talent of people at SLS. This included a lively medley song performance by MSc (I year) students in Kannada, Malayalam, Telugu, Hindi and Punjabi. There was also a soulful Malayalam song sung by Mr. Arman Firoz (Research scholar). Ms. Padmavathy Ramanarayanan (MSc student) presented a slide show on the richness of language diversity in India, followed by a talk on the Tamil language by Ms. Aishwarya Srinivas (BSc student); a talk on the Assamese language by Dr. Nirmal Mazumder (Faculty); a talk on the Oriya language by Ms. Ipsita Pujari (Research scholar). Mr. Sagnik Pal (BSc student) recited the original Bengali version of Tagore's poem 'Where the Mind is Without Fear' along with a translation in Hindi. The event concluded with a vote of thanks by Ms. Pratheeksha (MSc student), who also conducted the program.

National Science Day at SLS

HUMAIRA SHAH, B.Sc. Biotechnology (1st year)

SRAVASTI MUKHERJEE, B.Sc. Biotechnology (2nd year)

"*You're not disabled by the disabilities you have, you are able by the abilities you have*".

School of Life Sciences (SLS) celebrated the National Science Day and the theme for this year was "Science and Technology for Specially Abled Persons", as prescribed by the Government of India. Manipal University, Manipal has been celebrating National Science Day through a variety of activities for more than 18 years. SLS, as in the previous years, conducted one week long science internship for 24 school toppers from Udupi and nearby districts. These students listened to expert talks, but also gained hands-on experience in scientific techniques related to biology, microbiology, physics and chemistry. Later these students also demonstrated their new learnt knowledge and confidence by being part of the science day exhibition.

On February 27, 2017 a science exhibition displaying models and experiments covering the various aspects of science was inaugurated by the Registrar of Manipal University, Dr. Narayan Sabhahit, in the presence of the Director-Research of Manipal University, Dr. N Udupa. They also distributed certificates to students who underwent one-week training program. This year, the 50-odd exhibits included models of engines, lasers, eyes and ears, telescope, gut microbiome, mitochondrial functions, bioinformatics, rainwater harvest, and also experiments in fields of biology and chemistry. In addition, there was also a set of models on optics and light, as part of the Manipal students' chapter of the Optical Society of America (OSA). The exhibits were demonstrated by top students of classes IX and X, and UG and PG students from SLS. The exhibition was open till 28th February 2017 for children, students, parents and teachers, who enthusiastically explored and gained knowledge.

Some of the highlights of the exhibition:

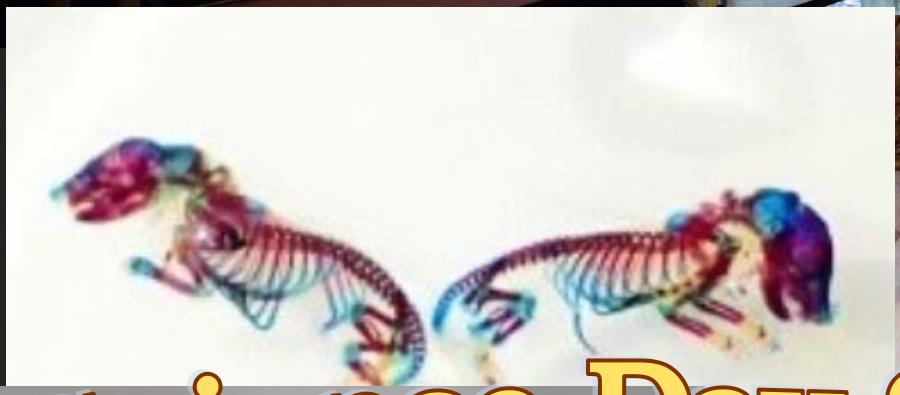
- The chemistry show, where different chemical principles were used to show interesting colour changes and effects.
- "The talking gloves", "The walking stick" and "The note detector" – meant to help the deaf and the blind people and to make their life easier.
- Specimen of various species was also displayed and it contributed a lot to the knowledge of the students.

The Manipal OSA Student Chapter had quite a bit to contribute in the annual Science Day Celebration. There was a working model that explained the basic principle of Optogenetics, followed by an explanation on synaptic transmission of impulses.

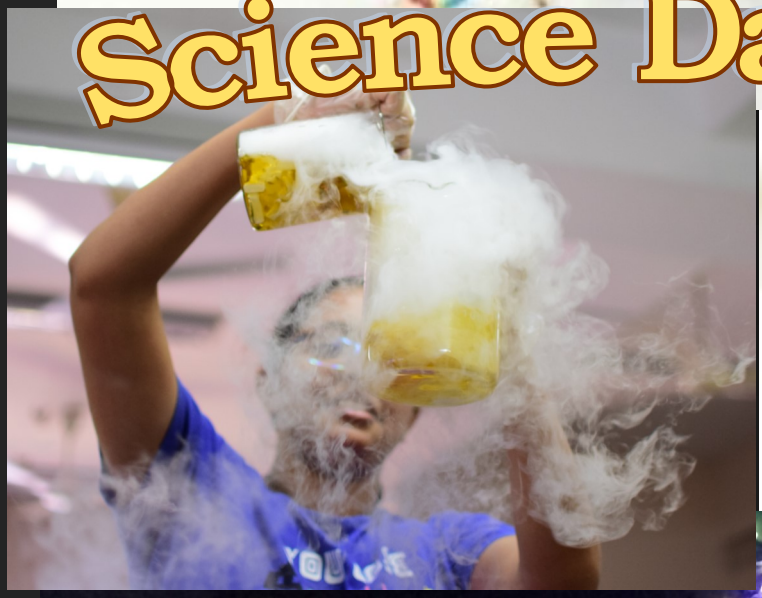
There were demonstrations of Fluorescent dyes excited using an UV pointer to get an array of colours! A beautiful glance of bioluminescence by the organism Cypridina hilgendorfii was available.

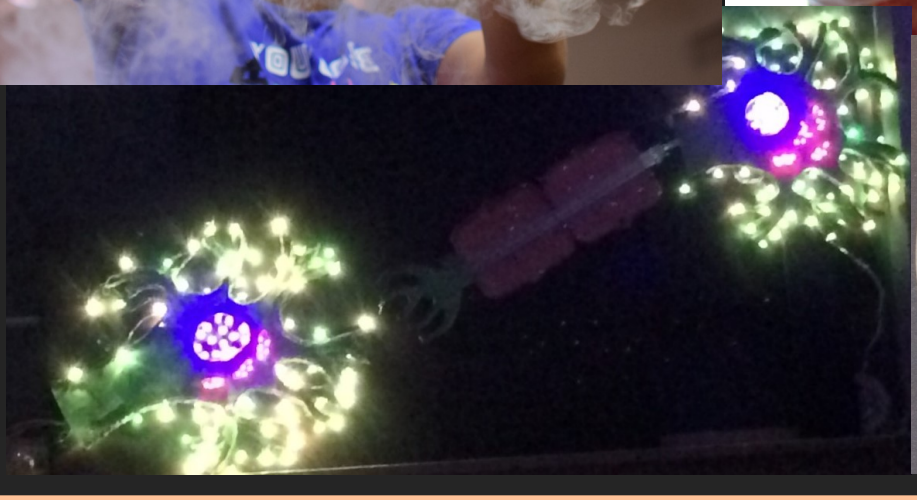
Apart from these, there were minor experiments on Raman effect, Diffraction, Refraction and a comparison between LED and Laser was made. A hologram to explain Reflection was presented. Different types of lenses and mirrors were displayed for explaining their applications.

On the whole, the event was a successful platform for young science enthusiasts to learn.



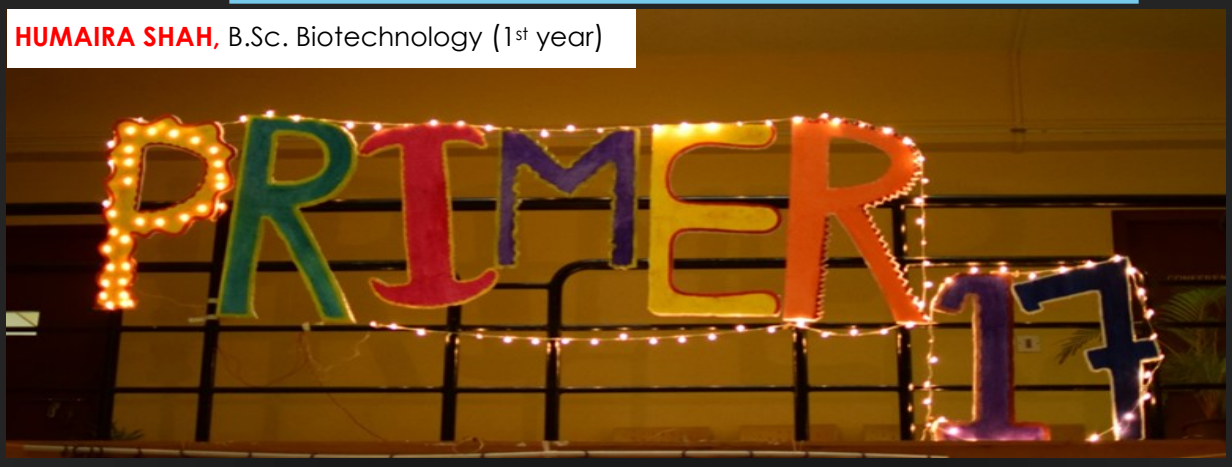
Science Day 2017





PRIMER'17 – SLS cultural fest

HUMAIRA SHAH, B.Sc. Biotechnology (1st year)



Like every other college in Manipal, School of Life Sciences also had its cultural event, named "Primer'17" on March 2 and 3, 2017. Rather than being a competition, it looked like a festival where everybody participated and enjoyed every single moment, with the premises beautifully adorned with artwork by the students.
The events for "Primer'17" started with the Rangoli competition, where students from both BSc and MSc participated and made beautiful and colourful rangolis. That evening, there was Music at SLS, with solo/group singers singing and performing classical, Hindi as well as Western music and songs. Such sweet and melodious voices only made it difficult for the judges.

Up next was the mime where the MSc students did a very entertaining act on 'Expectations Vs Reality'. Mad Ads on "Chameleon perfume" were all entertaining and hilarious. The last event for the day was Potpourri which was another fun-filled event.

The next day started with a quiz on General knowledge and on Bollywood songs.
There were online events held too on creative writing, poem writing, sketching and Painting.

And finally the most entertaining event of day: The Dance performances. There were both solo and group dance performances and both were equally graceful.
Primer'17 finally came to an end with the prize distribution and the stage was left for the students to celebrate its success. Primer is not only a fest but an opportunity for the SLS family to come together and a platform for all to showcase their multitude of talents.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Connecting
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ALUMNI INTERVIEW : Mr. KUNAL SINGH

BHARGAVI KARNA, B.Sc. Biotechnology (1st year)

Mr. Kunal Singh did his BSc (Biotechnology) and MSc (Molecular Biology & Human Genetics) from SLS between 2008-2013. Currently he is a Research Scholar at Indian Institute of Science, Bengaluru. He is also one of the founding members of Scrapshala, that aims to recycle waste by converting them into artworks. During the course of his program at Manipal, he was also diagnosed with a critical disease condition, which he was able to overcome through prompt diagnosis and treatment regime. We had an opportunity to interact with him through an email interview. Here are the excerpts.

1. How do you identify yourself?

⇒ Well as of now I identify myself as a researcher in Centre for Neuroscience IISc. Bangalore

2. That is a long way you've travelled. Tell us about your journey from SoLS to IISc.

⇒ I took science in my 11th grade. After school unlike most of my classmates I was not sure what stream I wanted to get into but I was sure I wanted to help people and that I did not want a future in clichés like Engineering or MBBS. I liked Biology and Mathematics so I decided to do B.Sc. in Biotechnology. It was a choice, not an option.

I am glad I chose Manipal. It was a good place to broaden my horizon. The exposure one gets is not only limited to MLSC (SOLS now) but also outside. And it's not only excellent for career and academics, I grew socially and made plenty contacts.

3. So how did you narrow down to your subject of choice, BSc. biotechnology being a HUGE stream?

⇒ Science! I was always good with practical but my theory didn't score me much. Well, I was never good in mugging up.

During my B.Sc., I was not sure whether I should pursue M.Sc. or MBA. In the sixth semester, my project in Pharmacogenomics under Dr. Padmalatha Rai made me decide that I'd do M.Sc. from SoLS itself as I was very comfortable and the facilities were optimum. My M.Sc. was in Molecular Biology and Human Genetics. But apart from Science I have always had a keen business mind as I belong to a business family. So I started my M.Sc. with a mindset that I may, further, do a PhD or MBA or both.

4. We heard about your victory over your health issues; It was such a motivation to "Never lose hope". But what pushed you to move on? Was it passion?

⇒ During my M.Sc., I had some health issues and it was during those days that I started being honest to myself about what I wanted.

The time I had those issues, I really used to wonder what I wanted to do in life. I knew I wanted to make a difference in other people's lives and I knew I was not afraid of working. I was also confident that I was good at delivering and convincing. This boosted me a lot.

5. So, what after MSc.?

⇒ I went to the National University of Singapore for my Master's thesis and I was offered a PhD position that I declined. Later after M.Sc., I got TATA Fellowship and started working in Centre for Neuroscience but by this time I was sure that I did not want to pursue a PhD. (I was worried it'd take time and be difficult.)

When I came to IISc. for my fellowship interview, I was asked why I did not attempt PhD since I already had two papers. I said, "PhD is a big commitment that I do not wish to make. I want to work before I decide on it rather than getting into it and regretting it later and wasting my country's money."

6. Our faculty said that you've held positions in school activities. Would you agree that to reach pinnacles of success, its necessary to take co-curricular and extra-curricular hand in hand with Academics?

⇒ Yes, I was the Sports Head for once.

I believe extra-curricular activities make you more active. You are able to find out what it is that you care deeply about and you should push yourself hard to find it. You learn to manage time, prioritize and you grow as a person.

7. So how amongst all these, did you come up with Scrapshala?

⇒ It was while working here in IISc. that a friend of mine back home came up with the idea of "SCRAPSHALA": SCRAP because we wanted to use the waste that people throw and "SHALA" from "Pathshala". We agreed upon it because, it was a wise idea and an economic engagement would do no harm. Scrapshala basically works on the principlel of recycling and once we have our artisans work on it, we sell the products online on Amazon, Flipkart etc.

It has been over a year since the company started and we currently employ 23 people.

8. "Scrapshala" is an amazing idea; Scraps that people discard normally after use being used to make something of more utility and with such ease of skills.
Didn't it bother you to be working simultaneously with something so different from Science itself?

⇒ I am from a business family so it didn't bother much. And it was the idea that drove us into it. The way I have seen life is that there are only two types of people: one type is for people who complain about everything and the other for who decide to do something about it. The complaining type always finds a reason to complain. Only the other looks for a solution like we did. We got an idea for waste management because waste bothered us.

In fact, we have recently started with a new initiative called "SPOT FIXING" and that has nothing to do with cricket. Basically, we decide up on a spot that is dirty and with the help of Varanasi municipality public and NGO clean up the place. We have the support of the local officials and students.

9. So would you (in context to your life) suggest putting our feet into two boats at a time?

⇒ No one should. But that's only if they aren't sure as to what they want. Even if you do it, the idea should be clear and one shouldn't be afraid of hard work.

For a youngster, I feel hardwork is the cure to all our problems.

We can all complain about our problems that we face like health or personal issues but we also have the capacity to solve it.

10. Research is dedication. How do you manage time with Scrapshala while you're at IISc.?

⇒ We have divided work that suits us and per our potential.

I am in Bangalore which is sort of the startup capital of India. So, I try to market the idea and there are alot of meetings that I attend. My work is marketing.

Then, there is Shikha who works on the business model and Kriti on Logistics. They are back home in Varanasi.

12. That's a great team work!

IISc. is a huge platform. At least 9 mountains away from us (being babies in Science) How does it feel being there? Did you see yourself there 7 years ago?

⇒ IISC is a great place very open minded people. It is a global institute where people from all background come. So it has been a great learning curve. It's an amazing place for research. I never thought much about where I'd be. But yes, I am here now and I am happy.

13. Okay before we end, people say that research makes less money, what do you have to say about that?

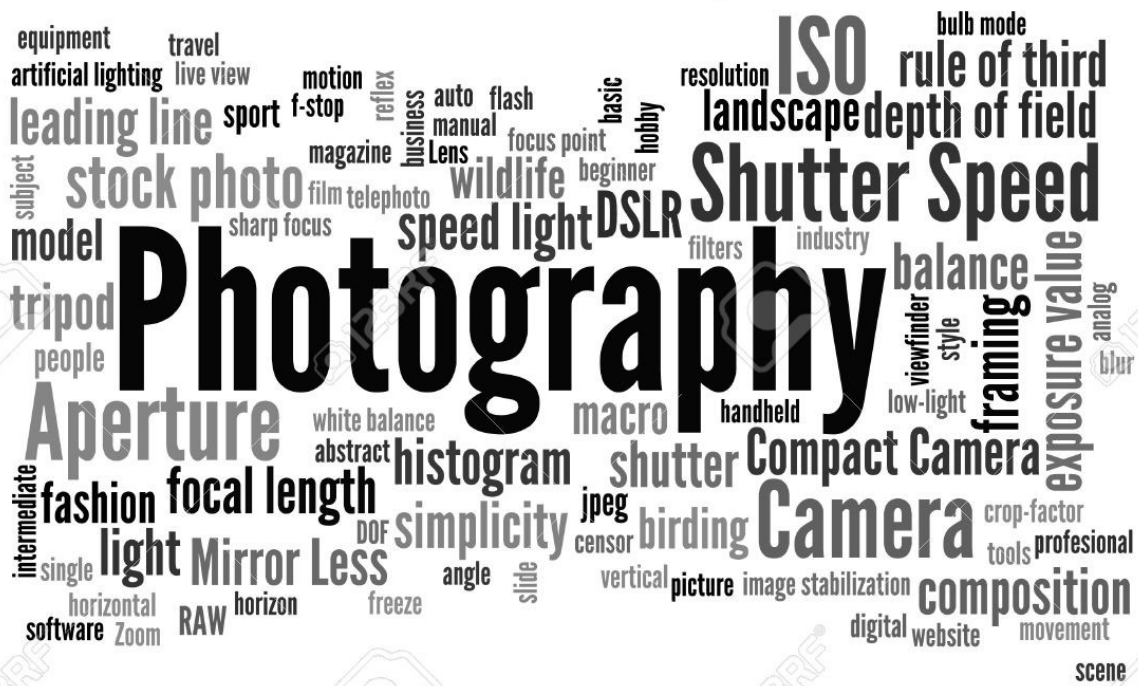
⇒ I feel the Rights and Duties together make the engine required to run the society. Once we are into some work, doing it sincerely, we get what we deserve.

Only belief and passion drives a subject like research; money-mind may not.

14. Lastly, do you want to say anything for the ending note? A piece of advice to budding scientists maybe?

⇒ Science is a very demanding field. Pursue it only if you are really passionate about it then only you can hope to make a contribution in it. It requires a lot of sacrifice in the name of time especially if you are doing cell culture work.

In life we all want success but it is not a good teacher, it's the failures that teach you. So don't be afraid of failures. And if you haven't failed it just means you have followed a set pattern.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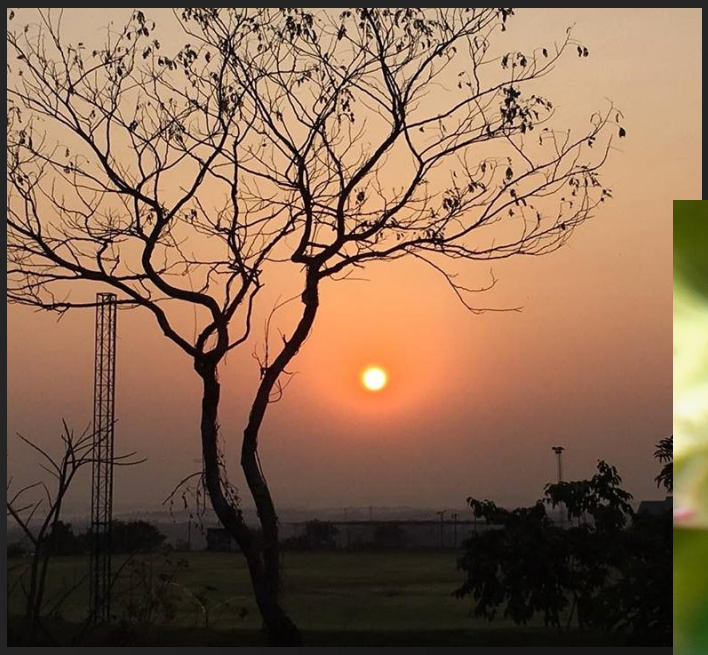
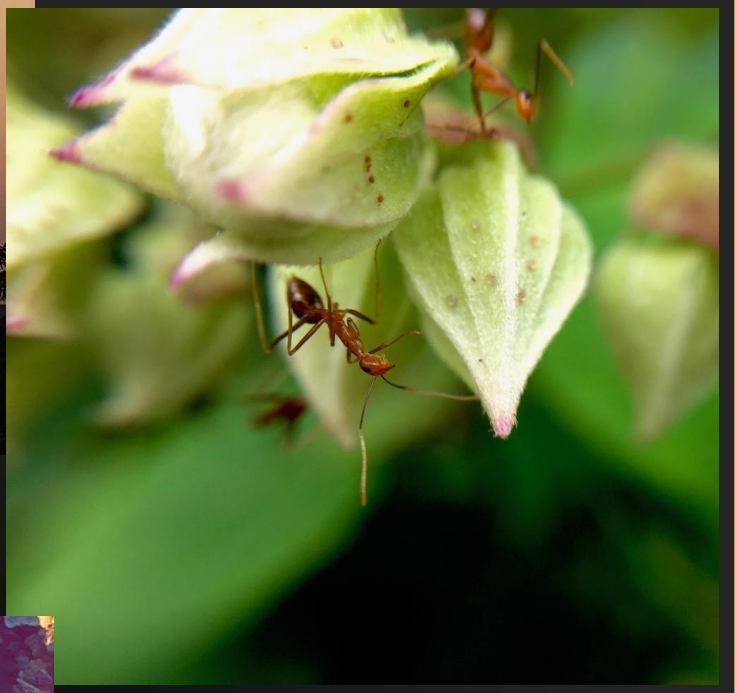


‘Silence of Dawn’- Syeda Inaas

(1st Year BSc. Biotechnology)



‘Anti-Side’ -Harsh Ranawat

(2nd Year BSc. Biotechnology)

‘Beaches bring serenity’ -

Humaira Shah

(1st Year BSc. Biotechnology)

‘Admire me or don’t’ -

Bhargavi Karna

(1st Year BSc. Biotechnology)

‘Break the bubble or just float’ -

Sourav Patagi

(1st Year BSc. Biotechnology)

‘Beauty is fragile’ -

Thyagarajan

(1st Year BSc. Biotechnology)