



INSPIRED BY LIFE

School of Life Sciences

Newsletter

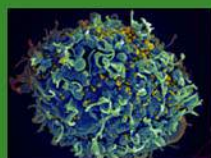


☆ student council ☆

2014 - 2015



Latest
News



Research
Highlights



Funs and
Puzzles

The Director's note

– Prof K. Satyamoorthy

Prof. K Satyamoorthy

Director,
School of Life Sciences,
Manipal University, Manipal



What a wonderful 2014-15 academic year it has been for the Editorial Board members of the School of Life Sciences, who have conceptualized, designed, scheduled and put up considerable effort to bring out the magazine on time four times in the past year. The enthusiasm, the spirit, discipline and 'yes, can do' attitude that is mysteriously infectious pushing even those who are sitting on the fence to be motivated to contribute. The elegant design, contents, memorable pictures, reminiscences, quotes, poems, and thought provoking articles have held out, frankly much to my surprise. These are the very talents which will enable you to face the world, compete better, and succeed more often than most. Now that the benchmark has been set, the challenge is to keep it up. Unlike the people who become complacent over repetitive activities, the brains behind the magazine are going to have new faces in its new avatar starting second stint in this upcoming academic year.

We have few challenges to overcome, which include a) more participation from students to showcase their literary side of personality, b) better circulation of the newsletter, including to the families of our students, and c) to explore more of not only contemporary but future perspectives of current knowledge. I am sure collectively we can get through these challenges. Let me congratulate all the contributors and more importantly, the editorial board members especially Ms Namrata Iyengar, Mr Rayees Ahamed, and Ms Poorva Huilgol who, with the support of other student council members, have planted the first milestone in this aspect, in the history of School of Life Sciences. Congratulations.

Editor's note

Hello everyone and welcome to the 4th issue of SLS e-newsletter. This issue is of special note and nostalgia for us, as it is the last one from the student council of the academic year 2014-2015. The editorial committee is entrusted with the priming of the editorial board at SLS and the making of the e-newsletter. Maintaining the SLS editorial notice board by changing the theme regularly and putting up information that is contemporary, necessary, and or quirky promotes interaction among students. The efforts towards the two activities require a lot of team work not only from the student community but also the faculty members of School of Life Sciences. With that in mind we are elated to thank quite a few of us.

At the outset, we are grateful for the support, encouragement and guidance we receive from our Director, Prof. K. Satyamoorthy, without whom the idea of newsletter would not have materialized, nor would we be looking at the fourth issue.

We would like to extend our immense gratitude to our faculty advisors Dr. T. G. Vasudevan, Dr. Saadi Abdul Vahab and Dr. Vidhu Sankar Babu for taking the trouble of editing a pile of articles and guiding us to help present, an improved and polished version of newsletter each time.

The support from the student council is much appreciated. Compilation of drafts for all the events held, designing, propaganda and honest criticism from the committee and council was extremely valuable in delivering a quality product.

The members of editorial board - Hiranya, Syamala, Anirudh, Samayitree, Aalok, Shank - and some of the students, have helped immensely by contributing scientific articles, pictures, and the fun and facts section, etc. A special thank you to Rayees, whose expertise in cover page making and overall newsletter quality editing, makes the newsletter as impressive as it looks.

Last, but not at all the least, we thank the readers of the newsletter. We have come a long way on this journey, thank you for staying with us. To the forth coming editorial committee, we say, 'break a leg' and to all the students, 'have a great term ahead'. *Cheers!*

"Editing might be a bloody trade, but knives aren't the exclusive property of butchers. Surgeons use them too"- *Blake Morrison*

Namrata Iyengar & Poorva Huilgol, 1st MSc
Student Editors, Editorial Board (2014-15)
School of Life Sciences



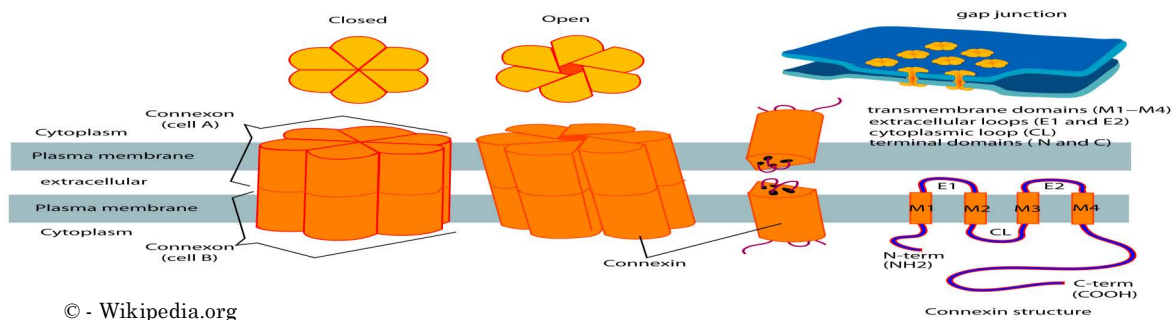
SCIENTIFIC SHASTRAS

Connexins: their functional roles in human diseases

- *Vani Patel, Shashank K, MSc 1st year*

Human genome information had helped to identify all twenty one members of the connexin family of gap-junction proteins, each with a distinct expression pattern and regulation properties. This large family of diverse proteins (26 to 60 kDa and an average length of 380 amino acids) are integral to vital cellular functions; their roles ranging from the intercellular propagation of electrical signals to the selective intercellular passage of small regulatory molecules. The connexin proteins form channels called gap junctions between cells that are in contact with each other allowing the transport of nutrients or charged atoms. The types of connexin proteins involved determine the size of the gap junction as well as the particles that move through them. There are a number of genetic conditions associated with dysfunction of gap-junctions, however, cancer was the first disease associated with the gap-junctions, identified more than 40 years ago. As gap-junctions are clustered channels between contacting cells, they are formed of two hemichannels (connexons), each made up of six connexin protein subunits in the cell membranes, docking to each other forming a conduit. Each of these polypeptides is a four pass transmembrane protein. Out of the 21 connexin genes identified in the human genome, most have only two exons, with the complete reading frame located in the second exon. A great deal of information on the connexin function has been gathered by the study of phenotypes of human genetic disorders caused by mutated connexin genes. The essential nature of connexin function and intercellular communication in tissue homeostasis is revealed by an inventory of mutations in these genes that cause human diseases e.g., myelin-related diseases, skin disorders, hearing loss, congenital cataract, or more complex syndromes such as the oculodendrodigital dysplasia and cancers, among others.

Often the biochemistry of Cx43 is used in literature as the primary framework for discussion on connexins. Biochemically, the most common post translational modification of connexins is phosphorylation, while almost all connexins do not appear to be glycosylated. Lipid modifications for connexins (Cx32) are prenylation and acylation; and amino acid acetylation, hydroxylation and γ -carboxylation are also reported as are proteasomal degradation of misfolded peptides. Activity of several cellular kinases has been correlated to connexin oligomerization and gap junction assembly. Connexin life cycle is also influenced by an array of connexin interacting proteins; prominent among them in addition to several kinases, are cellular adhesion molecules, signaling molecules and components of cellular cytoskeleton. Increased cyclic adenosine monophosphate (cAMP) is seen to upregulate gap junctional intercellular communication in cells expressing certain connexins (Cx43) and downregulate with others (Cx36).



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Disease association of connexin mutations have been extensively studied from the well-known Cx43 coded by *GJA1*, the most extensively studied connexin till date, to the X-linked Cx32 coded by *GJB1* causing the hereditary neuropathy Charcot-Marie-Tooth disease. Some (but not exclusive list of) diseases associated to mutations in connexins identified over the years are: hearing loss, non-syndromic or associated with skin disorders (Cx26 GJB2; Cx30 GJB6; Cx31 GJB3); keratitis ichthyosis deafness syndrome (Cx26 GJB2; Cx30 GJB6); Vohwinkel syndrome (Cx26 GJB2); Clouston syndrome (Cx30 GJB6); erythrokeratoderma variabilis (Cx30-3/Cx31 GJB4/GJB3); atrial fibrillation (Cx40 GJA5); viscerotaxia heterotaxia (Cx43 GJA1); cataract (Cx46 GJA3 and Cx50 GJA8); myelin-related diseases such as X-linked Charcot-Marie-Tooth disease (Cx32 GJB1) and Pelizaeus–Merzbacher-like disease (Cx46-6/Cx47 GJA12/GJC2).

Connexins in human cancers relate to a main characteristic of a solid tumor, the presence of hypoxic cells, which are cells deprived of oxygen - a condition developed due to excessive and unequal oxygen consumption by tumor mass, with distance of the tumor from the blood vessel. A transcription factor playing crucial role is the hypoxia inducible factor (HIF). HIF responds to hypoxia by binding to Hypoxia Response Element (HRE) of the target gene. Studies conducted by Taiwanese researcher Che-Hsin Lee showed an overexpression of HIF1 α in tumors including brain, colon, breast, gastric, lung, skin, ovarian, prostate and renal carcinomas compared to that of the normal tissues. McLachlan et al. (2006) had earlier reported Connexin 43 to reduce angiogenesis in breast cancer. Through various immunoblotting assays, they have shown that HIF1 α is frequently overexpressed in the human cancers. Hypoxia and HIF-1 α transactivate the vascular endothelial growth factor (VEGF), which induces angiogenesis in tumor growth. But cells overexpressing Cx43 have decreased VEGF levels thereby suppressing the process of angiogenesis. The researchers have also found that truncated Cx43 would not form the gap junction but is successful in inhibiting the tumor growth by gap junction intercellular communication (GJIC). Thus, the expression of the Cx43 reduces various tumor formations. Thus, it is suggested that Cx43 can be a target for treating solid tumors through downregulation of tumor angiogenesis. It can be concluded that since Cx43 upregulation and downregulation has varied effects on the cancer cells based on the type of cancer, further research on the Cx43 effects has to be conducted and studied. However, a proof for the role of Cx43 in cancer and malignancy is found.

The complexity of the functional implications of expression and regulation of connexins and connexin-interacting proteins has demonstrated that the future will hold many more exciting discoveries.

(Note: The authors gratefully acknowledge the significant inputs of *Dr. Saadi Abdul Vahab* in polishing this article and improving its quality, multiple-fold.)

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A Human Brain without Cerebellum, is it possible?
- *Rayees Ahamed B, MSc 1st year*

Yes, It is. In an extreme condition called ‘cerebellar agenesis’, described as the complete absence of cerebellum in the brain.

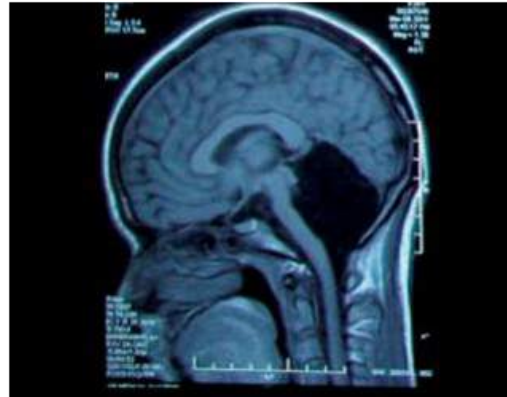
Cerebellum, also known as ‘little brain’, contributes about 10% of total weight of the brain, and houses 50% of the neurons that are involved in the body’s major voluntary, motor actions and cognitive responses. Cerebellar agenesis is a rare occurrence in the history of medicine with little or no solid evidence to prove why cerebellum absence occurs in humans. According to articles by Glickstein (1994) and Boyd (2010) describing the clinical evidences and review of cerebellar agenesis, eight cases have been reported so far. In all cases, the patients lived without cerebellum and died mostly young, with their symptoms being impaired motor functions, mild retardation – symptoms that could be considered circumstantial (See Table 1).

Table 1 Summary of all published living cases with primary cerebellar agenesis

Author	Age	Gender	Motor	Aphasia	Ataxia	Mental and development	Notes
Yoshida and Nakamura, 1982	4 mths	Female	Retardation	–	–	Retardation	Consanguinity, total absence
Sener and Jinkins, 1993	58 years	Female	Normal	N	N	Normal	Subtotal absence
Sener, 1995	6 years	–	Retardation	Y	Y	Normal	Moderate cerebellar symptom
Sener, 1995	–	–	Retardation	Y	Y	Normal	Moderate cerebellar symptom
Van Hoof and Wilmink, 1996	46 years	Male	Spasticity	Dysarthria	Y	Mild Retardation	Total absence, confirmed by surgery
Velioglu et al., 1998	22 years	Male	Retardation	Dysarthria	Y	Retardation	Subtotal absence
Deniz et al., 2002	7 years	Female	Retardation	Dysarthria	Y	Retardation	Total absence
Timmann et al., 2003	59 years	Female	Retardation	Dysarthria	Y	Retardation	Total absence

The diagnosis of cerebellar agenesis in these patients was done after their death and based on oral accounts from family and hospital records, adding to the circumstantial nature (and reaching mythical proportions with some) of these reports. This was until the August 2014 issue of *The Brain* journal published a letter from China about a woman living (yes, living!) with cerebellar agenesis, creating ripples in the neurology community.

The discovery was made by Dr. Feng Yu, when a 24 year old woman, showing symptoms of dizziness, an inability to walk steadily for more than 20 years, and a recent history of nausea and vomiting was admitted to the Chinese PLA hospital of Jinan Military Area Command in Shandong Province. Dr. Yu did a Computer Assisted Topography (CAT) scan and identified that a large part of her brain is missing (*as seen in the images, next page*)



Left: Image of a Normal Brain with cerebellum;
Right: Image of a Brain with absence of cerebellum
Courtesy: Yu et al. 2014

The most common congenital conditions affecting the cerebellum are Dandy-Walker malformation and Chiari malformation, which account for improper development of cerebellum during birth. Due to a lack of diagnostic method for cerebellar agenesis, Yu and colleagues diagnosed the patient to have Chiari malformation IV.

Interestingly, the family of the patient, including parents and siblings, were neurologically normal. Further, CT and MRI scans of the brain revealed no remnants of any cerebellar tissue and the posterior fossa was filled with the cerebrospinal fluid, verifying complete absence of the cerebellum. Along with other neurological examinations such as verbal analysis, they reported, "...in this case, complete absence of the cerebellum results only in mild to moderate motor deficiency, dysarthria (*difficulty in articulation*) and cerebellar ataxia (*lack of coordination due to cerebellar damage*), although clearly present, were less than would be expected". This particular case has puzzled the physicians and researchers as to how the brain circuitry works and compensates its function in the absence of cerebellum, with no clear-cut reason yet.

Earlier Millen and Gleeson (2008) cued in on some genetic underpinnings of mature cerebellum to understand its complex developmental mechanisms. They used the powerful genetic fate-mapping technology in mice models to identify the disease causing genes of common cerebellar disorders. In humans, the cerebellum comprised of two types of neuronal cells (i.e. GABAergic neurons & glutamatergic cells). These cells are generated from two molecularly distinct zones called ventricular zone (VZ) and rhombic lip (RL) within the cerebellar anlage. These regions act as precursors for cerebellar neurons, in which GABAergic neurons arise from VZ zone and glutamatergic cells arises from RL zone.

The fate-mapping experiments demonstrated that the expression of two important genes called *Ptf1a* and *Math1* are the major factors for generation of these neurons from its progenitor zones.

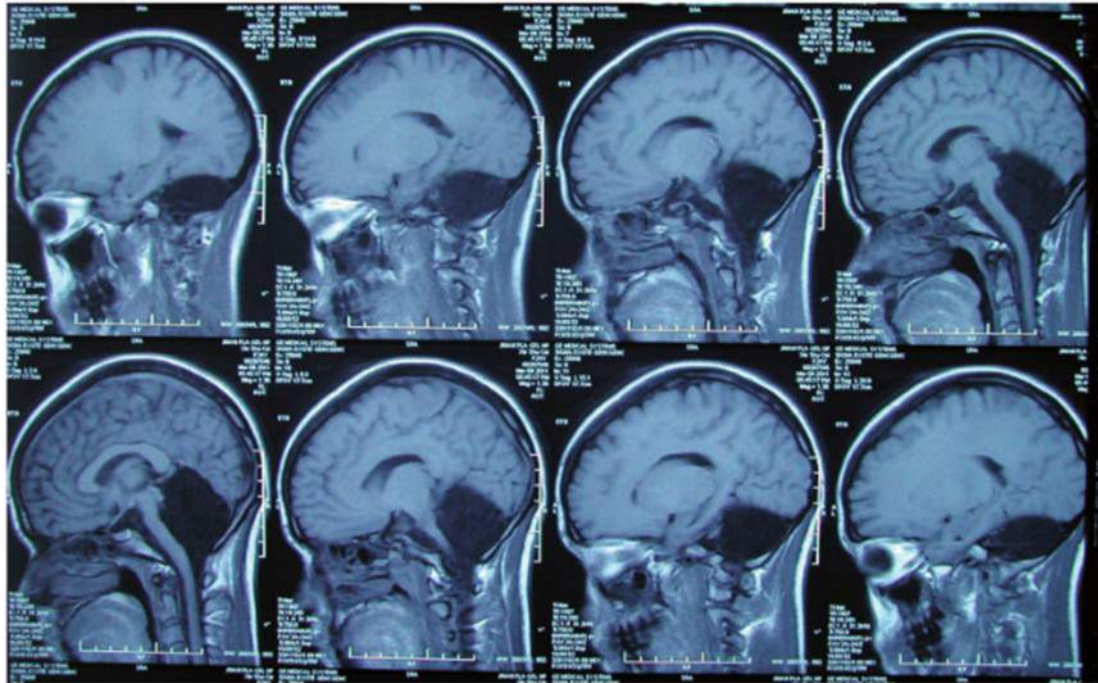


Image: CAT scan images of a 24-year-old woman with cerebellar agenesis. (Yu et al. 2014)

The mouse model elucidated that the *Ptf1a* gene expressed at VZ zone and the *Math1* gene expressed in RL zone leading to production of its neuronal cells for the development of complete cerebellum. The key finding of this study, obtained by a loss-of-function experiment, showed that the absence of *Ptf1a* leads to the failed production of all types of GABAergic neurons from ventricular zone, whereas the *Math1* gene showed no evidence to transform their cell fate during alteration. Thus cells from RL still formed neurons except for a few subtypes. Therefore it has been concluded that the role of *Ptf1a* is very crucial as a cerebellar ventricular zone fate switch and mutations in this gene in human can cause cerebellar agenesis.

This analysis by itself may be not be valid evidence to prove this condition as several other genes have been implicated in congenital human cerebellar malformations (those genes play a significant role in transcriptional regulation, mitochondrial function and cell proliferation during cerebellar development) and are not well understood. But a living patient with cerebellar agenesis such as the one reported continue to add to the myth!

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Your pencil is full of next generation technology
- Namrata Iyengar, MSc 1st year

Confounded? Well not the pencil itself, but a component called *graphene*, the dark carbon allotrope (layers upon layers of graphene form the graphite that we know of) being dragged across your pages has the potential to turn an industry worth \$120 million by 2020. So what is so special about graphene, you ask? It is the thinnest substance to be made, having a two-dimensional carbon atom arrangement in a hexagonal shape. Wielding the strength of about 150 times that of steel, yet seen to be extremely flexible, stretching up to 120% of its length, graphene conducts electricity faster than any other material at room temperature (1000 times more than copper). It even has a cartoon character sketched for its promotion called “Mr. G”.

It was a glorious evening of 2002, when Andre Geim, Professor at the University of Manchester, and previously known for his Ig Nobel award and “Flying frogs and levitrons” paper, discovered graphene on the sticky side of used scotch tape. Geim and his student Novoselov were awarded the Noble prize in 2010.

Since then several methods to isolate and prepare this novel material have been discovered: mechanical exfoliation (use of adhesive tape technique), chemical vapour deposition (extraction of carbon atoms from a rich source by reduction), sonication, cutting open carbon nanotubes, carbon dioxide reduction and graphite oxide reduction, to name a few. The world acknowledged graphene as a “wonder material” and patents filed subsequently suggested numerous applications, from improved solar cells to flexible computer screens. The Graphene Flagship, a billion dollar research initiative, sees scientists and industries from 29 countries in the European Commission working on the properties and applications of graphene.

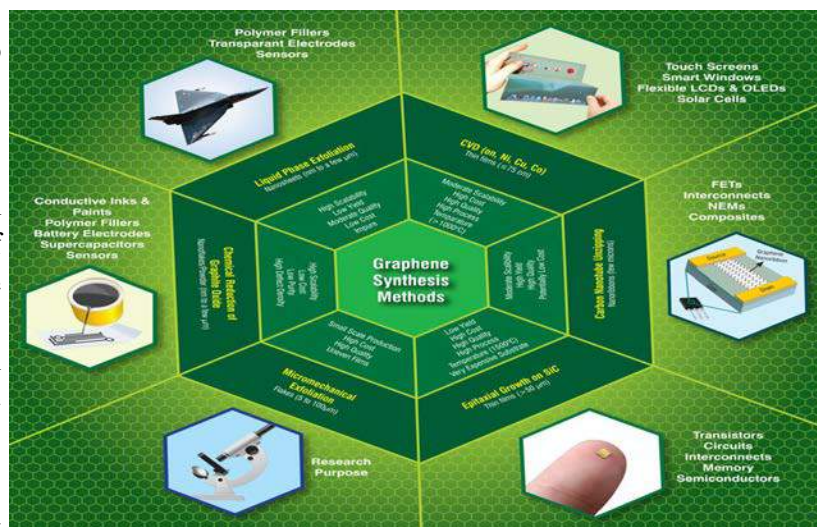


Photo courtesy : nanowerk.com

The Graphene Flagship, a billion dollar research initiative, sees scientists and industries from 29 countries in the European Commission working on the properties and applications of graphene.

1. Graphene and Cancer therapeutics: Cancer stem cells (CSC) CD34+ and CD38-, implicated in the recurrence of cancer, are related to normal stem cells and resist conventional cancer treatments. A group of scientists from University of Manchester, discovered that varied sizes of graphene oxide flakes (small flakes = 0.2 to 2 microns, big flakes = 5 to 20 microns) specifically target a highly conserved property of cancer stem cells in breast, prostate, ovarian, pancreatic, lung and glioblastoma cancers. The flakes also bring about differentiation of breast cancer stem cells, thus managing the killing of CSCs. This therapy, along with a parallel cancer treatment program for non-cancer stem cell mass, significantly reduces chances of remittance of the cancer. Graphene flakes are proven to be non-toxic to the surrounding normal stem cells.

2. Biological imaging: The terahertz radiation whose wavelength lies between that of infrared and microwave radiations, can be produced at room temperature using graphene, and has potential applications in biological imaging machinery.

3. Graphene based sensors puts forth an ultra-sensitive and highly specific signal on the levels of toxin in the body. Examples: Aflatoxin B1

4. Graphene and electronics: Laser scribed graphene super capacitors, the most conductive material known, are being used in batteries that not only are easier and cheaper to manufacture but also cater a host of benefits such as being lightweight and flexible, able to get fully charged quickly, and a long lifespan.

5. Graphene electrodes, which are transparent, are being used in smart phone touch screen and envision a future of wearable technology.

6. Graphene is also gaining momentum in the semiconductor technology, due to the fact has it has a small band gap (energy required to help electrons escape from the substance atom) and experiences field effect (the ability of a material to alter its electric conductivity due to application of external electric field).

7. The material is also being used in the manufacture of photo-detectors and computer microchips, due to their optically omnivorous (ability to absorb light from across the visible light spectrum and transfer energy on to the electrons) nature. As a result of this, data handling becomes easy and energy efficiency becomes an added bonus.

8. Security systems in airports and night vision goggles use the detectors which are capable of analyzing the terahertz radiation. Antennae made from graphene can carve out a niche in the field of wireless devices and detectors. Manufacture of light bulbs with graphene costs less; the light bulbs are energy efficient and have greater life span than the current standard LEDs.

9. Aircraft technology: The use of graphene as a coating material for aircraft, makes it lighter and rust resistant (paint, containing graphene are also used for rust proofing cars and ships), increase fuel efficiency and range. The same paint can be used for houses, thus weather proofing them.

10. Food packaging is yet another application (graphene coat prevents entry of oxygen and water into food molecules).

11. Condoms made of graphene are thinner, better in heat conduction and safer than conventional latex condoms.

12. Aero gels made up of graphene and air form highly absorbent structure find application in cleaning oil spills.

13. Graphene foam, which is easily synthesized at low cost in bulk quantity, can be used in the form of tea bags in case of water purification systems.

14. The same graphene composite layers are used for water desalination and can thus solve water shortage problems. These filters are reusable and not affected by changes in pH. Purification of factory release water and even ground water contaminated by toxic substances like mercury can be carried out.

Even world number tennis champion Novak Djokovic uses rackets reinforced with graphene. So, seems like now would be a good time to stock up on those pencils....

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On the Sexuality of Humans and Other Creatures

- Aalok Varma, BSc 3rd year

Ancient India must have been amazing. They knew about the celestial movements, the art of time keeping and about health and medicine (Ayurveda, surgery). History books are filled with descriptions of ancient India’s prowess in several fields. But, by far, one of the things that ancient Indians were brilliant at, but which modern Indians refuse to talk about open-mindedly, is sex - not



only as an act of procreation, but as an act of pleasure, love, and physiological need. With increasing instances of rape and physical abuse, sex education is the need of the hour in India. However, the kind of information being provided about the said topic happens to be sourced from friends, family and ridiculous media articles, which are woefully inadequate.

But this article is more about the setting up of a stage for understanding sexual orientation and a related topic, homosexuality - another taboo of paramount sin apparently. Sexual orientation refers to an individual's physical and/or emotional attraction to the same and/or opposite gender. People usually like to, and tend to, categorize sexual orientation into two groups - "heterosexual" and "homosexual" (or, in common parlance, "straight" and "gay"). There is a need to comprehend the fact that homosexuality is not a scientific aberration, but an understandable predicament. The zoologist and sexologist Alfred Kinsey said: "The world is not to be divided into sheep and goats... The living world is a continuum in each and every one of its aspects". Alfred Kinsey himself is renowned for introducing the first ever Heterosexual-Homosexual Rating Scale (eponymously called the Kinsey Scale). This scale ranges from 0, for those who identify themselves as *exclusively* heterosexual (with no experience or desire for same-sex sexual activity), to 6, for those who are *exclusively* homosexual (with no experience or desire for opposite-sex sexual activity), and 1-5 for varying degrees of homo or heterosexuality. Those who have "no socio-sexual contacts or reactions" (asexual, if you will) are given a special score of "X". The Kinsey scale is hardly comprehensive, as it assumes gender to be a binary variable, despite Kinsey's philosophy of not dividing the world into "sheep and goats". There are numerous other scales (over 200, according to the *Handbook of Sexuality-Related Measures*) that are used to measure sexual orientation, such as the Klein scale. The very subject of measuring

sexual orientation, thus, is a field in itself. It is not clear if there ever will be a universally accepted scale, but for most practical purposes, the Kinsey or the Klein scales suffice.

Having defined sexual orientation, let us tackle a prevailing opinion regarding sexuality with a scientific outlook - "homosexuality is unnatural". Even if we deny it, it is very likely that we (or people we know) believe so. However, if "natural" is "what occurs in nature", then homosexuality is *far* from unnatural. Humans are not the only documented species to show homosexuality. And it is not just some abstruse organism that no one has ever heard of that demonstrate this behaviour. 90% of all documented sexual activity in giraffes is between two males! (It is important, here, to specify that "sexual activity" does not always involve penetration, though it often does). Similar high rates of homosexual activity are seen in flower beetles. But it is not only male homosexuality that is documented in the animal kingdom - long-term female homosexual relations have been observed in the *waved albatross*. These relationships temporarily terminate during mating season, during which females look for a male mate to procreate, but once done, they return to their same-sex partners! Probably the most pertinent example of homosexual behaviour is in the bonobos, since these primates are extremely closely-related to humans, not only in genetics, but also in behaviour. Considering this, it is hardly surprising that humans too have a spectrum of sexual orientations. It is important to note these are just a few examples of *documented* homosexual behaviour. A lot of the animal kingdom activity goes unnoticed and could be documented in the future, increasing our understanding of the concept.

Now let us consider this from a genetics perspective – is an individual's sexuality determined by genetics, or is it environmental: the “Nature vs. Nurture” conundrum. To study the relative effects of genetics and the environment on any trait, the most logical method is to survey the trait in individuals with the same genotype. You guessed it – identical twins. A study conducted in 1991, showed that 52% of monozygotic (identical) brothers and 22% of dizygotic (fraternal) twins were concordant for homosexuality. Other studies have yielded different results, showing even *lesser* concordance. A concordance of just over 50% is really not enough to say with certainty that a trait is inherited. So clearly this could not just be about genetics – epigenetics must also be considered. One hypothesis suggests the involvement of prenatal hormones on the developing foetus in determining sexual orientation. No conclusive proof has been gathered either for or against this hypothesis.

Another approach to finding any genetic basis for a trait is to map that trait back to a particular locus in the genome – through a “linkage study”. To do so, one first draws a pedigree chart to represent the inheritance of the trait and then compares the genomes of the people with different phenotypes. This (usually) helps zone in on the region of the genome in which the gene for the trait lies. Such a study among homosexual males in several families, published in 1993 by Dean Hamer found that there seemed to be some correlation in the inheritance of one region of the X chromosome and homosexuality. This is a region in the long (q) arm of the X chromosome– the ‘Xq28’ region to be more specific. The moment this study was published, the media, as is their wont, announced that the “gay gene” had been discovered. Beware, though – scientists have found a *correlation* (which does not automatically imply *causation*) between *male* homosexuality *in this family* and the entire *region* of the X chromosome, and not a single gene. Most recently, another study confirmed a correlation in another region – in the long arm of chromosome 8, specifically ‘8q12’ – once again with *male* homosexuality. Considering how a complex trait such as this is bound to be a multi-gene characteristic, many more studies are to be carried out before conclusive proof of the genetic basis of homosexuality can be obtained. As yet, no single gene has been conclusively linked with homosexuality. [An interesting article in ‘The Daily Beast’, see ref. no. 5]

The other aspect to consider in this area is from the neuroscience perspective – to determine if there are differences in the brain between homosexuals and heterosexuals. If indeed there were, could there be sufficient differences that could help differentiate a brain as either that of a homosexual or heterosexual subject? Neuroscience studies of this kind require two kinds of imaging – MRI (Magnetic Resonance Imaging) and PET (Positron Emission Tomography) scanning. MRI scans are usually *functional* (fMRI) studies, which look for brain regions that activate or deactivate in different situations, and not merely the structure of the brain. Such studies have revealed that the structure and activation patterns of the brain of homosexuals are similar to those of heterosexuals of the opposite sex. For instance, the right hemisphere was found to be slightly larger than the left in heterosexual men and homosexual women, while in homosexual men and heterosexual women, the two hemispheres were more symmetrical. This seems to be far too more subtle a difference, and may not even be true, since “more symmetrical” is only relative, and cannot be used to designate an unknown brain image. That being said, there have been connection patterns in the amygdala (a part of the limbic system, which is involved in processing emotion and memory) that have been observed to be similar between homosexuals and heterosexuals of the opposite gender. Alternate theories regarding the effect of the sex hormones on the development of the brain have also been suggested. The main issue regarding this particular subject is ignorance. We have some data, but not enough to conclusively determine the hows and whys of this behaviour.

Frustrating enough as that is, the most atrocious and in humane things that are done as a result of our ignorance are even *more* frustrating. One example of such atrocious things is “corrective therapy”, or “conversion therapy”, which aims to “correct” the “disease” that is homosexuality. One method of corrective therapy is called “electroconvulsive therapy”, wherein a subject is given repeated shocks of a high voltage to try to change his/her orientation, with not a care given to the other changes in the brain that might result. As degenerate as this method sounds, it is not as bad or worse as something called “corrective rape”, which, as the name suggests, involves a person of the opposite sex raping a homosexual individual so as to *convert* the latter into heterosexuality. In a documented case, a lesbian was raped by a man for the purpose of correction, and that one act of intercourse left her pregnant and gave her AIDS. She lost the child, her position in society, and her normal life [a NYTimes report (2014), see ref. no. 6]. These are absolutely repulsive practices which are prevalent and not just in “backward villages”, as one might assume.

In conclusion, homosexuality is a less documented and discussed phenomenon that is seen in many other animals, birds and insects, not just humans. However, humans are likely the only ones who seem to have a problem with it. Indeed, it would appear that it is not homosexuality, but homophobia that is unnatural.

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HIP, HIP, HORAE...

Eventful hours

INSPIRE — 2015

Encouraging the next generation of excellence in science

- Dr. T.G. Vasudevan, Asst. Professor

The sixth INSPIRE (Innovation in Science Pursuit for Inspired Research) internship program conducted by the School of Life Sciences (SLS), Manipal University, Manipal was inaugurated at the Fortune Inn Valley View by Prof. YS Rajan (Dr. Vikram Sarabhai Distinguished Professor, ISRO, Bengaluru) and Prof. Vinod H Bhat (Vice Chancellor, Manipal University) on 26 May 2015. More than 170 toppers from different schools of Karnataka participated in the five day



Who knew water had so many different properties...

event, which is part of a Department of Science and Technology (Govt. of India) sponsored initiative to inculcate a scientific spirit to toppers in schools and to promote science research as career option.

In an entertaining, informative and interactive inaugural speech, Prof. Rajan helped the students to gain an understanding of the achievements of mankind in different fields. Speaking in a vibrant tone and spirit that pervaded the members of audience, he asked the youngsters to develop a curiosity and determination to learn, not in just a singular area of interest, but be adept in multiple skills.

Pointing out that the average human life expectancy is to increase further due to innumerable advancements, and that people will have more time to contribute to this planet, he urged the students to maintain healthy lifestyle and habits irrespective of their accomplishments. He concluded by stating that science never stagnates and that it keeps on advancing at a relentless pace and we should be able to move along.

Delivering his presidential address, Prof. Vinod Bhat focused on the need to develop



The INSPIREd lot?- the INSPIRE 2015 participants

inter-disciplinary knowledge among students by citing the example of Dr. Frits Zernike, who contributed to the fields of physics, chemistry, biology and mathematics. Earlier, Dr. Herman D'Souza (SLS) welcomed the gathering, while at the end, Dr. Vidhu Sankar Babu (SLS) proposed the vote of thanks.

The five day residential program between May 26 and May 30, 2015 at Manipal University, Manipal saw the students interacting with renowned experts and mentors such as Dr. KN Ganeshiah (UAS, Bengaluru), Dr. V Nagaraja, Dr. Usha Vijayaraghavan, Dr. SV Bhat, Dr. KP Gopinathan, Dr. Prosenjit Ghosh (from IISc, Bengaluru), Dr. Sher Ali (NII, New Delhi) and a host of others. The 170-odd students learnt through interactions, demonstrations and hands-on training in various disciplines of science. They also visited educational and scientific places of interest in and around the region.



Oh! Is that what is it made of?

With its ancient traditions that were based on scientific principles, India had a rich culture, which has disappeared over the years so much so that not many recent scientific discoveries and principles are by Indians. To remedy the same, youngsters should start thinking about pursuing pure science as a career option. This was the message of Mr. Chakravarthy Sulibele, renowned journalist and author, to young science interns of the sixth INSPIRE 2015 science internship program conducted by the School of Life Sciences (SLS), Manipal University, Manipal. In a spell-binding talk during the valedictory event, Mr. Sulibele urged the students to 'look within' and be inspired to understand and pursue the scientific questions that pervade our everyday life. He wanted the youngsters to think of resolving such pertinent issues as renewability of our resources and energy consumption. He wished that every one of the selected INSPIRE 2015 participants at Manipal will develop a scientific mindset that works towards the improvement of



Words of inspiration - *after* the event too

our country, so that the world too will benefit. Earlier, Dr. Vinod Thomas (Director, Manipal Institute of Technology, Manipal) welcomed the gathering. Dr. KK Mahato (SLS) proposed the Vote of thanks.

Appreciating the bounty of Mother Earth – World Environment Day

- Namrata Iyengar, MSc 1st year

Students of SLS, Manipal University enthusiastically participated in the ‘World Environment Day’ celebrations of the Manipal University on 5th of June 2015. The celebrations included a walkathon, flagged off by Dr. HS Ballal (Pro-Chancellor, Manipal University), and a planting ceremony at the MIT ground of the University. The event saw numerous students from nearby schools of Manipal and of Manipal University, walking through the streets raising awareness on the precarious situation of natural resources today due to our merciless exploitation. The United Nations vision for 2015 World Environment Day was “Seven billion dreams. One planet. Consume with care”. In his welcome address the Registrar (Manipal University, Manipal), Dr. GK Prabhu stressed on the need for proper management of resources and urged the young generation to come up with green technology that could benefit the nation and the world.



Getting ready for the walkathon in style

Putting forth the requirement for appreciation and judicious usage of our environmental assets Mr. Aryaman Shetty, a student of Sharada Residential School, spoke eloquently about how simple measures like switching off lights when not required, would save the energy and the resources of this planet. Dr. Vinod Bhat, (currently the Vice-chancellor, Manipal University, Manipal), spoke about the rapid growth of population in the past few hundred years and how that predicament has led to the squandering of our resources today. He also put forth the idea of having a Manipal University Environment Committee to oversee situations wherein chopping down of trees in the campus was required. He also encouraged the students to come up with eco-friendly ideas and pledged his support to such developments. The vote of thanks was offered by Dr. Suma Nair, Director of Student Affairs (Manipal University, Manipal).



Here we go. One more plant to make our planet a greener one

Achieving a state of health , serenity and discipline— International Yoga Day

- Melissa Andrade, Raghu Shekhar and Kiran K , PhD scholars

Over 177 countries across the world celebrated the *International Day of Yoga* on June 21, 2015 as declared by United Nations General Assembly. Yoga is a physical, mental and spiritual practice having its origin in India that aims to transform the body and the mind.

As a part of the International Day of Yoga celebrations at the School of Life Sciences, Manipal University, Manipal, renowned Yoga and Ayurvedic practitioner Dr. Ganesh Bhat (Yoga Vidya Centre, Mangaluru) was present to demonstrate and enlighten the students, research scholars, teaching and non-teaching staff on the profound benefits of yoga.

The program began with a brief introduction to yoga and its importance in daily life by Dr. K Satyamoothy, Professor and Director, School of Life Sciences. He also introduced Dr. Ganesh Bhat and his colleagues, Mr. Shivashankar and Mr. Arvind to the gathering.



Yoga is much more than just exercise - Dr. Ganesh Bhat

Dr. Ganesh Bhat began his speech by reciting the Patanjali shloka as a tribute to all the great sages and his gurus. He stressed that the selection of this particular day relied on the fact that it is the longest day in the Northern hemisphere and has special significance in many parts of the world. He highlighted the 8 sutras of Patanjali yoga: Yama (the act of deliberate self-sacrifice), Niyama (practice of observance), Asana, Pranayama (control over breath), Patyahara (withdrawal of senses from objects), Dharana (fixing the attention on one particular object), Dhyana (Meditation) and Samadhi. He stated that by studying the 196 Yogasutras of Patanjali thoroughly, one can raise their level of understanding to that of the great sage himself.

He explained that practice of yoga can help in synchronizing the body, mind and soul using the concepts of 'Chitta' and 'Buddhi'. He emphasized that practicing yoga is not mere performance of physical exercises but more about attaining salvation by following the essential rules and regulations of Yoga.

He and his assistants then demonstrated the various yogasanas while explaining the significance of each one.



The various asanas

Swastikasana: It is the meditation pose resembling the auspicious ‘swastik’ symbol. It improves backbone functioning and pulse beat.

Padmasana: It is another meditation pose that resembles a lotus. It improves memory power, provokes kundalini, keeps the joints and ligaments flexible and reduces hypertension and osteoarthritis.

Trikonasana and Parshvakonasana: This asana aims at reducing stress and anxiety, body fat and cures indigestion.

Parshvottanasana: This asana increases the blood flow to brain and keeps the joints flexible.

Paschimottanasana: Practice of this asana reduces belly fat and prevents diabetes.

Kurmasana and suptakurmasana: These asanas prevent piles and help in relieving painful menstrual secretions.

Pavanamuktasana: This asana prevents Vata and controls indigestion.

Bhujangasana: Practicing this asana strengthens heart muscles.

Makarasana: This asana helps in controlling blood pressure.

Matsyasana: This asana strengthens the thigh muscles, knee joints and controls asthma.

Yoganidra: This is good for back and chest pain.

Apart from these, he also demonstrated Shavasana, Ushtrasana, Sarvangasana, Sheer-shasana, Ardachakrasana and various pranayamas. The demonstrations by the yoga practitioners and the students left the audience fascinated and inspired.



The lecture and the demonstration were followed by an interactive session between the expert and the audience. Dr. Ganesh Bhat also distributed the prizes to the winners of the essay competition on the topic 'Practice of yoga' and for demonstration of yoga.



The chief guest Dr. Ganesh Bhat and yoga instructors with the director, faculty members and prize winners of the essay competition held on the occasion of International Yoga Day

The program concluded with a vote of thanks proposed by Dr. P. M Gopinath, Senior Scientist, School of Life Sciences.

MEET THE COUNCIL IONE MORE TIME!

– Namrata Iyengar, MSc 1st year



Core student council: Aarushi Jain, President (aka *Punjabi pataka*, on the right) and Preeta Ananthanarayanan, Vice-President (*Bengaluru brainiac*, on the left) These lovely ladies and their band of misfits (who are called the core council) rule the student world with their uncanny ability to extract work and bringing out the best (or is it worst, huh?) in people. They scream with melody and should be definitely crowned as Tsarinas. They are also super fun and chilled. Their shoes will be tough to fill in the coming councils, mind you!

Cultural committee: Pallavi Mathur (left) and Dheeraj Prakash (right): These two and their awesome team were responsible for our full-on-masti-and-maaza filled cultural week this year, *CONTINERE*. The pretty voiced Pallavi and dancing maniac Dheeraj bring out the hidden talents from within the geeks. Always smiling and dexterous folks are also extremely focused. No mucking about when they mean business, but you can always make them swing, dance and sing.



Sports committee: Vinita Kaulgud (right) and Dhruv Seth (left): A week full of games ranging from fast and furious football to Indian eeshtyle lagori, these guys did a bang up job of making the entire School of Life Sciences folks run about and compete. The sports days saw their efforts finding a grime, sweat and dust filled crescendo, with people competing and winning in good spirit. Sports-people themselves, they keep the entire council on their toes. (*sigh!.. this is how I lost weight*).



Social and media committee: Janith Maben (left) and Rayees Ahmed B (right): The supremely tech savvy Rayees and the sweetest smiling Janith make us work towards kinder and media friendly existence. From our visit to a orphanage to collecting money for the needful, she has it all covered. Rayees is responsible for almost all of our technology chic endeavours including the vamping up of the newsletter. Way to go guys!

Recreational committee: Simran Jain (right) and Ninad Ranadive (right): Now these people know how to put a party, that you will remember for all the right reasons. From our rocking Halloween movie night to putting up decorations for major festivals, Simran and Ninad are responsible for the overall calm and serenity of the student body (wink, wink) and boy, do they do it well.



Finance and business development: Sanika Apte (right) and Bhaumik Patel (left): As serious as this committee sounds, the leaders are equally, seriously cool, though tight handed with money all the same. They also bring in sponsorship for our large scale events and contribute to the overall well being of the committee (Of course, they hold the purse-strings!! We keep them happy at all times, at all costs.)





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Editorial committee: Poorva Huilgol (left) and me (I mean Namrata Iyengar, right): Last but definitely not the least, my infinitely awesome team of literary buffs. Poorva and I basically constitute the grammar police (fine, its mostly me, Poorva is chills that way). From putting up various themes on the editorial board to coming up with a newsletter every three months, the Ed board commits itself to bringing out the hidden poet or author amongst us. A special mention to all our science feature authors and members.

On behalf of the council and the committees, I would like wish to wish all the students of SOLS, Manipal a great term ahead. And as for the next council members, all we can say is ‘break a leg, guys and have lots of fun.’



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2014-15 Students Council and Editorial Board - Its adios from this lot!

Left to right: Dr. T.G. Vasudevan, Dr. Saadi Abdul Vahab, Janith Maben, Preeta Ananthanarayanan, Aarushi Jain, Ninad Ranadive, Bhaumik Patel, Vinita Kaulgud, Simran Jain, Sanika Apte, Namrata Iyengar, Prof. K. Satyamoorthy, Dheeraj Prakash, Rayees Ahmed B, Poorva Huilgol, Pallavi Mathur and Dr. Vidhu Sankar Babu.

ON A LIGHTER VEIN...

21st December, 2014

-° DJ004

On this day, I wake from a nightmare,
so bright was the morning Sun's flare.
I step out into the freshness and wonder -
"A couple of years back, on this day, it was said 'the doomsday', that mother Earth would be no more herself.

Her children prayed, some took advantage,
some ran for their lives knowing there was no escape.
Soon, when days passed, we giggled at our beliefs. Nature stayed the way it was...

Felt like rebirth, another opportunity...
Another warning for us to co-exist with our planet. But it is forgotten again!
Today, the flower fields still blooming, the beautiful blue sky still glowing, the serene wind still whistling,
birds still singing, but we... Still destroying..

Is mankind that blind?
Aren't we inviting trouble?
This is our chance, maybe one last!
Today is Mother so kind, that we might not, another day, find... "

So don't be mean, try keep clean
and get back the green
as now we are the cause & later, would be the victims.

Change our world now
Else it's never
Don't make it too late to turn back
Build the humanity which we now lack.
Let's not be responsible for another 'End'!!

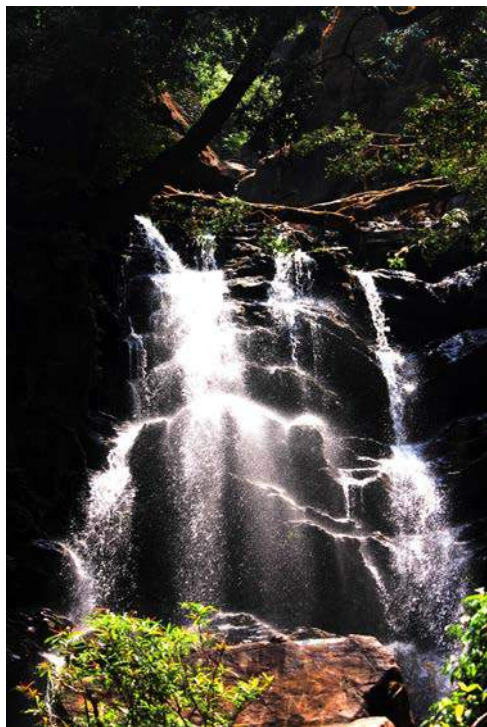
Photography corner
© Kapil Joshi, MSc 1st year



You, wanted to see me?



The calm yet ferocious sea.....the ultimate paradox



The majestic waterfall - Serenity abound.

LEARNING FROM EXPERIENCE

Evolve through Erasmus Mundus – you will never be the same again

- Apoorva Jnana, MSc 2nd year

It all started with ‘THE’ plane. That tiny paper plane full of dreams and hopes that I rushed into, completely unprepared and unaware; for all the paperwork at the VFS and the embassies that preceded this flight had subdued the euphoria of flying abroad for study in Europe. It was not until I was in Mumbai on the day of my flight to Geneva (for a brief orientation at Archamps, France) that I came to terms with the most obvious fact. I was about to spend 12 months studying and working on a project in *two* European cities, courtesy of the Erasmus Mundus BioHealth Computing program. This is a European Masters program that aims to promote mobility in higher education system by organizing students from across the world to different host institutions in Europe (France, Spain, Italy and Romania). I was to spend a semester each in Barcelona (Spain) and Torino (Italy), while my friend Surabhi was to be in Grenoble (France) and Barcelona (Spain). Two countries (3 if we include the summer school in France) in one year; the benefits speak for themselves. It is an amazing opportunity for diverse academic, cultural and culinary exposure, and much more. But it comes with an inevitable cost in terms of the huge distance in space AND time away from a familiar environment and people one has known.



Initially, the cost seemed quite low. It was just the summer school and everything was organized. We were in a protective bubble - the hotel, the food, the excursions and the schedule for classes were all planned by the coordinators. There was not much effort required from our side. All we had to do was attending the classes. Then the bubble broke, as we moved on to our respective institutions. My inherent sense of trying to ‘wing it’ by dragging myself and my luggage through the streets of Barcelona to find my hotel, did not work out really well. Well, I can say from experience now, it never hurts to plan ahead and be a little more aware of what the problems could be, for everything around you is going to be different - new apartment, new food, new

people, new campus, new everything. If at least one has some kind of a plan, that plan will be the one constant that can help get one through. You, my dear reader, might argue and say ‘Oh, but it’s the same. It is just that you study abroad. Sure, there is the adaptation time, international exposure, new culture but the academics remains a constant. You attend classes, write exams, do your best and enjoy the benefits of being in a foreign country, right?’ If only. I am not sure how it worked elsewhere in the program, but at the Universitat de Barcelona, each subject (4 in total) is graded in a completely different way from how it is in India and from each other. There was continuous assessment (weekly questionnaires based on articles related to the topics taught in the week), which would contribute to the final grade at the end of the semester. While one subject would have 100 MCQs (multiple choice questions), other would have printed questionnaires with answers to be filled in the space provided, or with 1 page of questions to be answered and printed for discussion in class (with a strict page and word limit). So, the usual way of not knowing what is asked but writing anything related to that does not work, as the questions are much more analytical. For example, our first assignment on ‘exome array’ had questions like ‘*What is the depth of coverage achieved for the sequenced exome bases and why is it not the same for all of them?*’ or ‘*Which of the two papers do you find most interesting and why?*’. It was such a different experience.

Then time passed and as is the nature of the program, after 5 months it was all anew in a different country for the project semester. That, for me, was not easy. I had just made friends in Barcelona, found the best people I have ever known and found a second home far away from home and now, I had to start all over again in Torino. This restart can be disorienting for the unprepared but a restart it will be, because irrespective of how one feels about it, time goes on, ruthless and merciless. At a certain point though, you grow, you adapt and you realize how far you have come from who you used to be. That is the best part. These experiences educate you, broaden your thoughts and help define your personality; euphoric exposures or vexatious legal procedures, you make it through and you will never be the same.

There are moments where one could feel all alone and a bit confused when the native culture/population does not respond as expected. I have come across remarkably detached individuals with no inclination to support (un)known persons. There were some testing moments such as the theft of my laptop at a conference in Barcelona (turns out it was an organized operation where every laptop was ‘targeted’) and of my travel documents at a random outlet in Torino. The latter issue is still being resolved as I write. I suppose it was rather fun explaining to the authorities in (broken) Italian, "Yes officer, that’s right. My wallet with my credit card issued in France, Visa issued in Spain and residence permit issued in Italy was stolen. Yes, France, Spain *and* Italy!" Yes, *molto divertente*. Thankfully, there are also fortuitous moments where one meets the most interesting people in the park, in a random solo travel, in a coffee shop, at the permit office (this was a very welcome company, because the waiting time in an office can get R.E.A.L.L.Y long) and wherever, provided one keeps an open mind and a welcoming smile. Every one of them, the French, the Nigerian, the Spanish, the Lebanese, the Austrian, every encounter shapes you little by little and you realize that time can be as you choose, merciless or memorable.

If I can give some suggestions based on my experience so far it would be this:

(a) *Be wary of strangers, not afraid*. I have made some wonderful acquaintances and friends, who were strangers just a few months ago. But the fact that I have also lost certain important things makes me realize what our parents tell us about strangers is true...be wary.

(b) *Be cautious, not paranoid.* The cultural difference can shock both sides – they do not know us either. A little research and effort to learn the local language will help in overcoming several issues, especially in day-to-day activities. It's fun *and* educative, so why not?

(c) *Be assertive, not aggressive but never acquiescent.* This one comes from my travel documents saga. I have never been assertive by nature. But, when dealing with the administrative side of the society it became necessary for me to become assertive, proactive (yet polite) to make people care about my plight, so that the wheels started turning. No, people will-not/are-not-expected-to care about you by default and they won't unless you take action and M.A.K.E people care.

The experiences from these 12 months – the best and the worst–have taught me many lessons. Now, these may last for long, or be forgotten soon. Either way, when you make it through; you will board 'the' air plane with stories to tell, memories to treasure, lessons learnt and you will fly, fortified and inspired by faith to face the choices for the future.

Previous Issues (2014-2015)

May 2015



Feb 2015



Nov 2014



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