THE FIFTH ESTATE

The Students' Voice of IIT Madras

Contents

The Importance of Humanities in Engineering Education

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On 23rd February 2016, Prof. MS Ananth, our former director, gave a lecture titled 'The Importance of Humanities in Engineering Education'. As a Humanities and Social Sciences (HSS) student, I thoroughly enjoyed the talk and felt that both engineering and HSS students could have taken away a lot from it and enriched our respective fields and also the way we approach our studies. I'm writing this article to give a summary of the things Prof. Ananth spoke about and add my thoughts as an HSS student in a technical institute.

A 'definition' of what the humanities and social sciences are can be found here and here. Please take a quick look before you read this.

Prof. Ananth's Lecture: The Importance of Humanities in Engineering Education

Prof. Ananth emphasized the university as subject to a 'wonderful randomness', by which he meant the prospect of continuous improvisation and unending growth. The purpose of a university here is to open and refine the mind. But this lies forgotten, Prof. Ananth lamented, in the culture of placements, where employment is often independent of the education that students have received (say, with engineering students seeking and entering jobs that have nothing to do with engineering). He also criticized the current system of regular evaluation which only tests fragmented pieces of knowledge, stressing that "we must not let evaluation become more important than teaching itself". More widely, holistic learning would mean learning both the sciences, and the humanities and social sciences (referred to collectively as HSS from now on). Another relevant thought here is one which came out in the panel discussion on 'What is the idea of the university?': a university is (rather, should be) a safe space to collectively challenge our assumptions and build knowledge, but these days this is seen as contrary to the process of gaining an education.

Valuing the Humanities and Social Sciences: Why?

Prof. Ananth remarked, "We must not ask why it's important to study the humanities: then we might as well ask, why do we live?", explaining that it is *valuable for its own sake,* for the *scholarship it cultivates,* because it gives us a *distinctive qualitative understanding of culture* and because *ideas of knowledge are inextricable from human subjectivity*. Some important considerations brought up by Prof. Ananth that reflect why a basic understanding of the Humanities and Social Sciences is essential to each one of us include:

- **Preserving a democracy**: HSS develops respectful citizenship by cultivating the ability to evaluate historical evidence, use economic principles and appreciate the complexity of the world around us.

- **Human development:** By developing in us the capacity to visualize and internally revise scenarios of future interactions and possibilities for the human race at large.

- **Creativity**: It's very important to cultivate a synergy between the left and right brain, but contemporary educational institutes often neglect this. Creativity involves developing aesthetic judgments, social emotions, moral sense — things cultivated through an HSS education.

- **Developing leadership**: The world over, Prof. Ananth remarked, few engineers are in leadership positions, not because they are not capable but due to a lack of crucial skills such as critical thinking, self-knowledge and the ability to be a productive member of society: all things imparted through an HSS education.

- **Moving towards a better society**: There will always be two (or more) sides to every issue, but these can only be resolved by extensive discussions without anyone getting personal. Conflict resolution and the ability for constructive debate are crucial to resolve important issues and move forward together, and these are inculcated by studying the HSS.

- **Aliens!**: Quipping about how fast aliens might figure us out if/when they visit us, Prof. Ananth said the process of scientific evolution can be easily figured out, but an understanding of cultural evolution is much more difficult (though equally important) and involves the knowledge of our personal, diverse histories — a record that the HSS has been keeping.

- **Importance of intuition**: Speaking about how intuition plays a big role in many major scientific discoveries, Prof Ananth quoted: "the intuitive mind is a sacred gift and the rational mind a faithful servant; but we have created a society that honours the servant and has forgotten the gift".

- **Cultural literacy**: We should have a grasp of the worlds, metaphors, ideas and core values of the culture(s) we hold in common. The objective of such literacy is communication — and this should be an outcome, not objective, of HSS education. In Prof. Ananth's opinion, this will happen when teachers are passionate.

Finally, he stressed the importance of cultivating the three **critical abilities** brought up by the philosopher Martha Nussbaum: critical self-examination, the ideal of the world citizen, and the development of the narrative imagination.

The importance of the HSS to STEM: A Complementary and Crucial Relationship*

Prof. Ananth stressed the importance of involving several teams trained in the social sciences into science and technology research, in order to ensure efficient and successful implementation. I would add to this, that with regard to solving problems and coming up with innovative products: science doesn't lie in a vacuum. It is impossible to make engineering work sustainably and over a long term basis in the real world without an understanding of the social context and without involving the people for whom it is designed.

Thus, the HSS and sciences should and do complement each other. Talking more fundamentally about the synergy between the two, Prof. Ananth discussed how the interplay between the HSS and the sciences leads to new formats of media and forms of expression, and that innovation arises from the links between beauty and technology, networks and culture: it is up to us to create and cultivate these links at the intersection of science and art.

Prof. Ananth was very right in pointing out a fundamental asymmetry here: he said that while liberal arts aficionados consider those who don't know Hamlet uncultured, they take great pride in not knowing the difference between differential and integral equations (and this may well also work the other way around). But as he remarked, Hamlet and calculus are both difficult and gloriously beautiful, and his contention that every individual must have a basic understanding of all important developments in both HSS and science from the past century at least, was to me very sensible and welcome.

Finally, he also stressed the importance of **ethics** (a topic explored in great depth in the humanities) with regard to work in the sciences, especially when it comes to practical applications of science and technology.

Practical Recommendations For IITM:

This brings me to the last part of Prof. Ananth's talk, where he made practical suggestions to ensure that engineering students in IITM learn humanities and social sciences in a constructive way:

- We follow less than half of the HSS course requirements that universities abroad have for their engineering students, and within this, we also pass off basic courses on speech and writing as HSS, which is detrimental. This has to be remedied.

- Curriculum wise, all students should take that set of courses that the faculty consider most valuable: with this designed set of HSS courses preferably oriented across a specific theme or set of themes in order to allow them to immerse themselves in the topics.

- It is important that BTech electives in HSS are loaded and engage the students thoroughly; "students may protest" but they will come around when they see the value of this knowledge, Prof. Ananth remarked. *(More on this in later sections).*

At a broader level: It is a pity that students with better understanding often score less than students who 'mug' successfully: faculty are capable of, and must have the freedom to come up with ways to test this understanding in students successfully. In the current scenario, he said, students are getting a raw deal.

What the Humanities and Social Sciences Means to Me

As a student in this campus it is difficult not to notice the underlying assumption that HSS has a secondary status to science and engineering and is a 'light' subject. This opinion is expressed not only by students but also faculty members.

I won't repeat the very relevant points offered by Prof. Ananth, but I do have this to say: with its own multitude of research approaches, methodologies and methods — learning in the humanities and social sciences is a creative exercise with its own internal discipline just like in any other field. As Prof. Ananth remarked, there are many ways of reaching the truth, and as a social scientist would argue, there is no one truth, only several ways of looking at it. And HSS helps one find these perspectives by recording, analysing and making sense of the different paradigms and processes that shape our world. (And one of these paradigms happens to be that of science).

It's also worth remembering that the origin of science is inextricable with the discipline of philosophy, and in contemporary times these two have drifted so far apart that we revere one and think of the other as something completely, and only, in the abstract. This is another great pity, because apart from the more intrinsic connections between science and philosophy, the latter also brings in questions surrounding ethics, morals, and usage of science — highly important considerations today, when the products of science have the potential for great devastation.

More broadly, HSS has to do with each one of us, how we construct our identities and through them ourselves, how we behave, what controls how we think and act and feel — and this is worth understanding; if not to understand ourselves better then to under-

-stand the world around us better. Getting a grasp of several different lenses through which to look at the world around us imparts a new kind of "objectivity": instead of one (usually rigid) way to approach things, you now have several. This has the potential to change your outlook towards life, help you make well informed judgments and decisions, and transform the way you approach your work and the people around you as well.

As a final word: the business of social science, as a professor said at yesterday's 'What is the Idea of a University?' panel discussion, is to jolt you out of your common sense, assumed understanding of the world by giving you the tools to unpack common understandings with rigour. It offers us a way of placing ourselves in a rapidly changing world and being able to articulate our discontents so as to resolve them better.

How Humanities and Social Sciences is Learnt in IITM: Some Issues

So far, I've been writing without looking too concretely at our campus. So let me do that now. Well, we all know that most of us don't really have an understanding of what the humanities and social sciences is. I just took a walk around my wing to talk to my classmates and confirm: all of us have faced so many strange questions over these four years about what we study. My favourites are:

- *You do research in arts? Really? (Also the use of this word 'Arts')*
- *So you read novels in your courses right?*
- *Do you learn grammar in English Studies courses?*
- *Do you make new theories in your thesis?*

I don't mind it when people ask questions. In fact, it's super nice when curiosity leads to long, interesting conversations about what you each study. I really enjoy that on the rare occasions when it happens. But I do feel irked facing a question like 'How can you possibly do research in Arts?' for the tenth time. The huge disbelief that accompanies it is even hurtful, because it comes around so often. But it's understandable, because most of us have had very limited and negative exposure to what HSS is growing up, and we are quite dismissive of all of it as a society. This is changing though, as people are slowly realizing the importance of these areas, and I'm glad to see it. Moving on, there is a tendency in insti to only choose HSS courses which are attendance-free and grade-easy and then dismiss all HSS courses or the field at large as lame and/or worthless. To illustrate, here is a sheet for informal HSS elective course feedback that is shared and edited every semester.

This spreadsheet, though it has its fair share of positive comments, is shared among

students every time the need to select HSS electives comes around and rates every HSS elective based mainly on whether you can get away with not attending classes and how easy it is to get grades (and on at least one occasion, also how many girls you will have the benefit of co-studying with). I am sure many other non-HSS electives may be chosen based on these considerations, but the kind of immediate dismissiveness that applies here lies mainly with HSS classes — whether towards professors, the topic, or both — to a degree that is probably much higher than in engineering classes.

Nope, this isn't just an angsty HSS student talking. A third year BTech student from the Electrical Engineering department who prefers to remain unnamed (and several other people I have talked to over the last four years) agrees, "Engineering people just see HSS courses as a way to increase their grades. None of my HSS electives challenged anything except my ability to write long paragraphs". I know there are many BTech and DD students here who have truly enjoyed their HSS courses, but there is no denying that that spreadsheet above represents the broad state of affairs.

We must ask why. For one thing, and this is crucial, the way engineering students are allotted HSS electives is quite bad (and nobody seems to know exactly how it works). On the one hand, the course 'Principles of Economics' is offered 8 times in the same semester, because there is an overwhelming demand to take that course (probably because it will sync best on a resume meant for non-core jobs). On the other hand, most people don't get their preferred electives.

Thus it is not surprising that so many people don't enjoy their HSS classes — if I had wanted to take 'Introduction to Pop Culture' but ended up getting 'Principles of Economics' it's very likely I'd have a very bad time.

Further, the associated problem with this situation is: because HSS profs realize that most engineering students have made up their minds about these electives before they even begin, many eventually end up delivering incredibly diluted versions of these classes, confirming the idea that HSS classes are easy and worthless. Meanwhile, those BTech HSS electives that are also core HSS courses, pose a problem for both HSS and engineering students: the former learn only a fraction of what they would have in a regular HSS core course (losing out on some crucial courses in the process), while the latter may face a large gap in terms of background and familiarity for the particular topic, and consequently get RG-ed. This is a clear lose-lose situation.

So, this allocation system needs a serious revamp, and especially in light of Prof. Ananth's recommendations. A possible suggestion from my side would be to introduce more (i.e. a whole new set of) BTech HSS electives, so that there is something for everyone and the preference is not skewed deeply to a small set of courses. This would also ensure that BTech HSS electives and HSS core courses don't overlap.

As Prof. Ananth discussed, and as is evident, both disciplines can benefit enormously

from learning about each other and incorporating principles from both sides to better themselves. But although we have a five year M.A course and a full-fledged humanities and social sciences department in our campus, I would argue that our engagement with each other is extremely superficial, and extremely limited (and even more so among faculty than students). The fact is that most engineering students do not take their token HSS electives (and they are but token courses at the moment) seriously, and I have not seen any forum on campus where faculty and students across departments can have interdisciplinary discussions to enrich each other.

Can We Do Better?

Let's see what happens when BTech/DD students are faced with HSS courses at the same level that HSS students take them. Aroon Narayanan, our current SAC speaker, is currently taking the core HSS course Religion and Modernity. He says: "Once you do a proper HS course, you realize that the BTech HS electives are just a heavily watered down version of what content/rigour the Professor could've offered in the same amount of time. The BTech electives are designed to be just an introduction for BTech students to life other than tech, so most of these courses rely only on the Professor defining and expounding a few basic concepts which are then tested in a mild manner in quizzes and end-sems. There are only a couple of texts that the Professor prescribes, which often ends up being just one introductory textbook, and even these the students are not required to read beforehand. On the other hand, in a proper HS course, I've been expected to read, understand and reflect on my own using multiple sources/papers before each class. The class itself ends up being a detailed and in-depth analysis by the students and the Prof of concepts and their counters, rather than as a lecture. The amount of effort that goes into just preparing for one class is vastly greater in magnitude than a BTech elective. Doing it properly requires an immense and continuous effort on my part, which contrasts very well with the minimal effort I put in to get a good grade in my BTech HS elective."

Of course, I am not suggesting that the BTech HSS electives be made as rigorous as our core courses. They are meant to be introductory classes. But they should also not become so diluted that the take-away is minimal — they may be introductory, but this does not mean they cannot be challenging and engaging (in fact, they *must* be both). And there are many BTech HSS electives where professors do offer strong, intensive classes, which are thoroughly enjoyed by the students. On the other hand, I also hope that this idea of HSS classes as a way to increase grades, or ensure a 'chill quota' for that semester, changes.

Prof. Ananth's suggestions apply to the academic administration and faculty. But we as students can also definitely do better. Forget our approach to the classes we take; at a more basic level maybe engineering students can start with finding out just what the Humanities and Social Sciences is and then, what studying it entails. Being better

informed about their opinions might in itself help foster constructive discussions amongst all of us. On the other hand, it is also true that many of us HSS students are used to using a certain kind of vocabulary to articulate our views. This might seem like an intimidating barrier, but just like solving integrals may be second nature to you, being aware of the theories behind these words and using them to discuss things is second nature to many of us. Yes, it does pose a barrier and we would do well not to assume that the other person will understand these words and be familiar with their histories and usages.

For all of us, being open about our language usage, opinions and willingness to discuss in such a way that we show respect and sensitivity towards the other person, might be a great place to start from. Certainly the culture of the way we think about the humanities and social sciences and how we learn it has to change, and we can start making it happen, if only by challenging ourselves through the classes we take and the nature of our engagement with each other. This can only benefit each and every one of us. I'll end on that positive note, and I really hope to see more of these kinds of conversations in the campus.

Footnotes:

1 Science, Technology, Engineering and Mathematics

2 It's no coincidence that our slow acceptance of these areas is occurring at the same time that those trained in HSS are starting to gain value in the economy and increasingly, in positions that were previously and mainly occupied by those trained in science and engineering — basically, not for the reason that we value these things in themselves. Still a pity, but an improvement from before.

The Odyssey - A look into the journey: Prof. B. S. Murty

TANEESHA SHEKAWAT

What makes someone a great teacher is not just his/her skill in spreading knowledge but in creating a sustainable environment for this knowledge to thrive and perpetuate in the minds that it resides. Bearing in mind the impact they have on us, this series will delve into the lives and experiences, as well as the academic expertise of the professors of Indian Institute of Technology, Madras. Here, they open up about their specific contribution to their chosen subject and the personal growth they have witnessed over the years. ***Prof. B.S. Murty*** *talks candidly about his journey so far with* ***Taneesha Shekhawat****.*

Bionote: Prof. B.S. Murty is an Institute Professor at the Indian Institute of Technology, Madras and Girija & R. Muralidharan Chair Professor at the Department of Metallurgical and Materials Engineering. His fields of interests are high entropy alloys, nanocrystalline materials and nanocomposites, bulk metallic glasses, grain refinement and modification of Al alloys. He was awarded the Shanti Swarup Bhatnagar Prize for Science and Technology, the highest science award in India, for the year 2007 in engineering science category.

When and how did you discover your passion/niche? You have numerous feathers on your cap. What is the driving force behind it?

Since my undergraduate years, I have loved academics. There's one simple reason for that – you have a freedom in academics which I don't think you can get in any other profession. Here, I can decide the field that I want to work in, I can keep on changing the field once in a while if I wish to do so. This I don't think is possible in any other profession. There is always a boss for you, and here is a profession where you are your own boss. So that's something which really attracted me to academics. It is also because of certain great teachers that I had in my undergraduate days. I should even go back to my schooling and diploma days where I had wonderful teachers. Looking at them and watching them more and more, I felt that teaching is the profession which, possibly, I am cut out for. And that's how everything started. Of course, passion for research started when I joined IISc Bangalore for my Masters. There I met a great gentlemen by the name Prof. Ranganathan (my PhD supervisor). I would say my passion for research started with my journey with Prof. Ranganathan.

When was the idea of starting the Advanced Materials Research group conceived? How has the growth been since then?

Oh (*laughs*) . . . to be honest with you, I had joined IIT Kharagpur immediately after my PhD. I was there for twelve years. IIT kharagpur, for some reason, didn't have a large number of PhD students. The whole of metallurgy department had only 15 PhD students and there were about 25 faculty members. As a result every student was shared by two faculty members, typically. Thus, I could never think of my own big research group there. I was always jointly working with somebody else. Ever since I came here, I realized that I can have my own group. I was given a lot of freedom at the moment when I had joined. I had straightaway come as a professor here and then we looked at what we were working on. We realized we were mostly working on either nanomaterials or bulk metallic glasses and soon within a year of my joining, we started a new area called high entropy alloys. So all these basically fit into what we generally claim as advanced material and many more, but the phrase that represents our area of work is advanced material. In 2004 the group had started and I think we came up with the name in 2005 when I started the group with my own students. It has been fourteen years since then, a wonderful journey.

You've lived in a lot of places across India. You grew up in Vijayawada. You completed graduation from Nagpur. You then joined IISc Bangalore. You were in IIT Kharagpur later. And you've been in here in Madras since 2004. How has that experience been? Has it, in any way, shaped your personality?

I always tell this to people, you learn something from every person you meet, either how to be or how not to be. That is how every place you go, you learn something about their culture. Apart from Chennai, I was in West Bengal for quite a lot of time. One of my uncles introduced me to the Bengali language and thus while growing up I read lot of Bengali books translated to Telugu. I have always been very fascinated by Bengal for some reason. In Kharagpur, I had a lot of Bengali friends and I always admired their way of looking at life.

Nagpur was, of course, my B Tech days. That was my first degree, the first time away from home learning what is called independence, that's what I learnt there.

In IISc Bangalore, I learnt what it is like to work for others and I find this very unique. I used to go to an orphanage nearby every weekend to teach the kids English and Math and in the process, I learnt Kannada from those kids. That's where I learnt that there is something beyond you. Life is all about living for a bigger cause. The place really kindled those interests in me. I learnt what quality research is and what it is to not be satisfied with preliminary results and to probe deeper and deeper until you are happy with what you have done.

Your contributions to the field of mechanical alloying have been widely acclaimed. Could you shed some light on this part of your journey in science?

I joined IISc as a Masters student and the first lecture I heard of Prof. Ranganathan on a subject called alloy design, was phenomenal. I always call it as love at first sight. The moment I heard of him, I decided that if I do a PhD, I will do it under him. I had heard from

my seniors that unless you're a topper of your class, he will never take you. So, I tried my best to get an S grade in his class. He is a person who never gives you a topic on his own, so when I told him that I wanted to do my Masters' project with him, he asked me what exactly did I want to work on. I hadn't expected a question like that so I told him that I would think over it and then come back to him. He gave me a week to think and then I was in the library all the time searching for what is new that is happening.There I came across a paper where somebody had tried to take a crystal and destabilize it to convert it into an amorphous state. You should know that materials are generally in two forms, crystalline or amorphous, so can we actually convert crystals into an amorphous state is what that paper talks about. This excited me. Then I went and told Prof. Ranganathan about it and he agreed. When we started I was probably the first to do mechanical alloying in India. Now when I look at it there are at least 20-25 groups working on it. It is a very exciting synthesis route, but there is one lacuna that there can be contamination of material, if you don't control your process parameters. One good thing about Prof. Ranganathan is that, he gives a lot of freedom to you and that is what I have been striving for my whole life. Now it has been 25 years since then. We have been producing new materials, and at least 25 PhD students under me have gone through mechanical alloying. That's a fabulous journey.

You were also the pioneer of the National Facility for Atom Probe Tomography, here at IITM. How has that helped the institute in furthering research since then? How involved are you in the day-to-day working of the facility?

First thing I should say, it was 1999 and I was working with a gentleman by the name Hono in Japan in an institute called National Research Institute on Metals (NRIM), they call it. He is a pioneer in atom probes. I was there in his group for 2 years, doing nothing but microscopy everyday. Atom probe, for your information, is an ultimate tool among microscopes where you can actually see how atoms are distributed in 3D inside a material. No other microscope is of that nature. After I came back in 2001, I was always looking for opportunities to see if we can have such a facility here. I tried to convince some of the big shots in metallurgy. Bhabha Atomic Research Centre (BARC) Director Srikumar Banerjee and Defence Metallurgical Research Laboratory (DMRL) Director Dipankar Banerjee, both of them got convinced and agreed to buy their own machines. But in 2003, there came a new technology – LEAP or Local Electrode Atom Probe, which was an American invention, but DMRL and BARC, both being government strategic institutes could not buy from the US. When I came here, I was still dreaming about it. In 2012, I conducted a workshop on atom probe and there we agreed to bring LEAP to India. We then made a proposal in 2015 and finally in 2017 were able to set up this facility here at IITM by way of an Inter-Institute Consortium which is comprised of 7 IITs from across India. This is the first remotely operable LEAP in the world. My role right now, is to ensure that the facility runs properly and for that you need funds and this is done through the MoU with the 7 partner institutes. The only thing that is required now is for people to do exciting research and publish exciting research. That, of course, is not in my hands. I hope people will use it for the same.

You have recently been selected for the "JC Bose National Fellowship". Congratulations on that. How does one stay grounded even after receiving so many awards and honours? Does it increase the pressure to keep working like that? Does it increase the

expectations of others? How do you deal with it?

My feeling is that what is important in life is to enjoy what you do, everything else is a by-product. I always tell my students that you should choose a profession where you don't wait for the weekend to come, that you like it so much that you don't notice how the time passes. And if you keep doing good work, somewhere somebody recognises it. Particularly, people like us who are experimentalists, need a lot of funding for the projects so as to sustain your students. This is why I got interested in JC Bose fellowship. They provide you funds for five long years and that would help me support my research projects. I felt that this is a wonderful opportunity. To answer your question in a nutshell, all these awards are just a small pat your back encouraging you to keep up the good work. I feel the more you learn, the more humble you should be. Humility is something that nature teaches us. As they say, the more a tree bears fruits, the more it bends.

What have been the greatest breakthroughs in your field?

Quite a few, actually. First and foremost, was during my PhD, that we were able to demonstrate, for the first time, that you can predict, when a crystal breaks down and becomes amorphous. That was something which gave me a lot of satisfaction, and led to many more people starting research in that field. I always believed in this that an indicator of a good researcher is that people follow you by taking cue from where you left and start moving in that direction. This is something which is very important. The second breakthrough was during my stay in Japan where we were able to demonstrate that an unwanted element such as oxygen in a material can really play a significant role in changing the nature of the whole alloy. We were able to demonstrate this through atom probe and that was the first time people were shown the importance of oxygen in bulk-metallic glasses and a lot many people after that, started working in that field. The third major breakthrough is in the field of high entropy alloys, where we were the first to show that you can make nano high entropy alloys and show that it is really exciting that the material can produce wonderful properties. Though I am very serious about doing a lot of fundamental research, I am always concerned about the fact that I am an engineer. Whatever we do should be of use somewhere else as well. For example, after 12 years of research at IIT Kharagpur, we were able to make what are called grain refiners for aluminum alloys, and that's another major breakthrough, I would say, because till then India had been importing these refiners. We were the first to actually demonstrate that we can actually develop the technology. Now so many companies are making these refiners, and using them and that is a very satisfying thing. So like that, quite a number of happy incidents, bits and pieces, here and there. Life is all about that.

What are the future trajectories, with scope for expansion of this subject?

Particularly, right now, I am obsessed, if I can use that word, with high entropy alloys. There are so many questions in high entropy alloys that I have in my mind, which I would like to answer. That's why I have at least 12 PhD students, each of them working only on high entropy alloys trying to understand some aspect or the other. There are so many unanswered questions in this field and that is something I think for the next 20-30 years, even if I work everyday, I don't think I will be able to find answers to them. That way, I have a lot of work in store for me. I think that's something that's going to be my future work.

You have been teaching since the initial years of your career and have simultaneously been very actively involved in research. How different are the two for you? How has it helped you grow as a scientist?

I always felt that these two are very strongly connected. One thing is that if you're not a good researcher, it's very difficult to become a good teacher. Teaching is not just taking a book and reading out something from it. Teaching is more of trying, as one of my teachers had once said, not to cover the syllabus but to uncover a part of it, so that you discover the rest of it. He made a very very profound statement. I will never forget it. So to ensure that, to make a student excited about research, you need to be, first of all, in touch with the latest things that are happening so that you bring the latest things to an undergraduate student, tell him that there is so much there, that sky's the limit, that there is so much to explore. This, only a good researcher can really do, otherwise you just get stuck with books and that would always be really boring.

For example, when I was taking a course for the first year, I was very clear in my mind that I should be able to tell these students how exciting material science is, that they should be proud to be studying material science rather than changing the branch. I would say, I was reasonably successful in that. That's only because of the research that we've been doing. In my curriculum in that course, one of the things that I used to do was to tell the students to choose 50 successful people in material science and then talk about them in class for 15 mins, it was mandatory for all to attend that session, so that everyone listens to everyone else and at the end of it, they had to submit a report on that. That kind of a thing really gives a student an inspiration. For example if you are learning tabla, you look up to great tabla players and keep on thinking about them and think that you should at least try to reach somewhere to close to that. This is true for any field. That is possible only if you're constantly a researcher. For some reason I love teaching. Teaching gives me so much of energy that I can use for my research. When you are teaching, particularly IIT boys, they throw questions for which you may not have any answers, that makes you read more papers, more books, that gives you a need to go deeper into the subject and that helps you in doing your research. I think that both teaching and research, feed into each other.

You received the Lifetime Achievement Award of IIT Madras in 2016. How has this journey been here at IITM? What role has IIT Madras played in directing your way in science? What contribution does your stay here have on your life as a scientist?

Though my initial steps in research had started in IIT Kharagpur, IIT Madras is the place where I actually grew up, I became an adult here actually. All thanks to that man who brought me here, Prof. Prasad Rao. In December 2002, he had sent me mail saying that they are looking for a good physical metallurgist at IIT Madras. He gave such a free hand to me. For the first time, I had a feeling that here is a place where I can actually grow, without the need to tag along with anybody else, and that is the first and foremost help that I got from IIT Madras. The moment I came I had a lab of my own, I had my own group of students, and then the rest of the things started falling into place. Collaborations started coming in, so many people from overseas also came. I am grateful to all of them. I am also grateful to my students. I had very passionate students. My research, that I had started in IIT Kharagpur, got nurtured here and I got tremendous amount of support from the institute in furthering that interests in research. IIT Madras is a wonderful place

and in the last 14 years I have seen growth here in the field of research.

Who, in your personal life, has been a source of inspiration? Why?

If it's someone from my personal life no way connected to my profession, it should be my wife. I am called a visiting professor at home, because I think I hardly spend 2-3 hours at home at night. It has always been like that. We got married 30 years ago. When I was a PhD student, she stayed with me for 3 years in the IISc campus. So, she saw me as a researcher, what it means to be a researcher. In those days also, I always came home after 12 in the night more than often. So the kind of patience that she has, the two kids that grew up in our family, in our life, it was all because of her, in spite of her difficulty. She has physical difficulty from her childhood, since she was 3 years old. She has polio in both her legs. She cannot stand up. For 45 years, it has been like that. But in spite of that, she never made me feel that she has a lot of load at home. Everything that was required at home, she knew how to manage. I rarely ever went for shopping with her. She herself could not go, but she ensured that everything was there in place. Amazing lady she is. And that's another thing I admire about her when I talk about her positive attitude. In spite of her difficulty, she was always very positive. She never looked at her lack of something. So, that is something that has always been another source of learning. I think I have learnt a lot from her.

What is that one life lesson, that you think has shaped you as a person? Could you please share some of your experiences that you think would be a learning source for us (the students)?

I would say, I am a very very spiritual person, and I look at myself as a divine in expression. I think everyone of us is a divine in expression. There is a purpose in us being here and if you believe in god, if you think about it, why should so and so create us? I always believed that he didn't know how to express himself and so we are his expressions, and if we are his expressions then, in principle, we should behave like the way the divine would. If we look at a tree outside, the tree is unbiased, and it tries to do its best in whatever it does and whether you go below the tree or I go below the tree, it will provide shade. The kind of beauty that you see in nature, tells you that one of the characteristics of nature is excellence, and that is something that you should reflect in everything that you do. I bring in excellence in whatever I try to do, not just to please anybody else but to please the divine in me. If I don't do it, I am doing injustice to that which is inside me, which is trying to express itself through me. So, we are all supposed to be that expression. If we simply think of that heart which is beating continuously for around 60-70 yrs, it is just a pump, imagine such a pump that has been created. I don't think any mechanical engineer has been able to make a pump like that. That is a lesson for us. So if I have to do my work, I should do my work with that kind of an interest in everything that I do.When I bring my whole heart in everything that I choose to do, I am trying to bring in excellence and from then on the journey will automatically be enjoyable. I feel the rest of the things are simply byproducts. When you do something, you have to remember at every moment that you are here with a purpose to be able to show what is the best in you. I always say this if you're a barber, you should be the best barber, if you're a teacher, you should be the best teacher and if you're a researcher, you should be the best researcher. There is no scope for you to be second anywhere else. You should try to be the best in whatever you do without comparing yourselves with anybody else. I always

believed comparison kills you, either you feel you are superior to someone or you feel you are inferior to someone. Try to excel in whatever you do in the best possible way as per your own capabilities. Each one has his own capabilities, within those capabilities bring the best, then automatically you will be happy. The satisfaction of doing something with your whole heart, at the end of the day, makes you a good citizen in whatever field you choose to be. I think that's what, if anything, I can say.

What should a student considering research in your field, bear in mind, before opting for it?

If he is trying to join me (*laughs*), he should first be warned that if your heart's not in research, don't join Dr. B.S Murty. I am very clear about it. Teaching and research, should not be done by mediocres, particularly, teaching. If you don't like teaching, any other field is okay. Teaching and medicine – these are two fields where on one side, you are giving life to people, on the other side you are giving life in a different way to people. Your whole future is dependent on your teachers. So, if a teacher is not interested in teaching, he should never join teaching. Similarly, if a researcher, simply wants to repeat what somebody else has done, he will never get a PhD. He should feel a sense of pride that what he is doing, possibly, nobody in this world is doing. That feeling that I am unique, that I am trying to solve a unique problem, is something which is very important for every researcher and it is very important for a researcher to keep this in mind all the time while he is doing research. If you feel that research is also a 9-5 job, you are simply mistaken. I always say, research and wife are highly demanding (*laughter*). Research is heavily demanding and it needs your whole heart in it. I always say this, a good researcher should have three qualities – first, you should be able to talk about the research that you are doing over a cup of tea rather than a cricket match or the ongoing politics; second, you should be able to go to bed thinking of the problem that you are working on, many a time, you get solutions in the dreams; third, you should be able to catch hold of a twelfth standard kid and make him excited about what you are doing. If you cannot do that, you are not a good researcher, you should not be in that field. It's very important to feel that excitement of doing something new. If you can think that going to the lab is just one of the things that you are doing in a day, then you should not be in research.

Are there any pitfalls that aspiring researchers need to avoid/anticipate?

The pitfall, I would say, is being satisfied very easily. Quite a number of students, feel the urge to publish their results as soon as they arrive at it. It will never give you a recognition which you would have possibly got by going a little deeper, by taking a little longer time trying to bring out certain fundamental aspects in those results. So quite a number of Indians are stuck in this. Partially, our system has to be blamed because when somebody applies for a position, what you look for is the number of papers that the candidate has, so as a result people jump into these numbers very quickly. People need to learn not to be satisfied until they crack the problem in a more fundamental manner, so that it stands for a longer time. And it needs a lot of patience. If you want to have a long-standing satisfaction, what one needs to keep in mind, as we say in Hindi, *kuch paane ke liye kuch khona padta hai.*

What have been your key takeaways from your journey so far?

Be sincere in whatever you do. Put your heart in whatever you do and never be satisfied. That is what has helped me. I feel that in the long-run what stands for you as a person is your aspiration to be perfect in whatever you do and this is something which has been kind of a running thread throughout my life. That is something which I would say is a major take away from my life.

Personifying Insti: Cyclic Tales

SHWETA VENKATESH

The sun shone weakly through the clouds and a cool breeze blew, causing the leaves on the trees to rustle and wave gently. The weak rays of the sun fell upon a solitary deer, contentedly nibbling at the dew-covered grass. It couldn't have been all alone, deer never move around singly and sure enough, another one came into view up the path leading to the student's mess. My position beneath the corrugated iron of the shed concealed partially the bulk of the mess-building behind a tree. It was nothing new, this was a view I had been privy to for a few months now and I had learned that the deceptively weak sun would progress to blaze forth in all its glory in a cloudless sky in a few hours' time. In a few minutes, however, there would be an exodus of students from the mess-building and the two hostels flanking it. All would pass down the path, past the shed and beyond the library to go to their different blocks for the day. Come noon, most of them would pass up the path towards the mess-building and, for the remainder of the day, there would always be a student or two within my sight.

I'll admit that I wasn't exactly a new machine when my owner brought me to the campus. I had been used for a long time by my previous owner and although I was spruced up, I was far from being a shiny, new machine. My age lent me immediate respectability amongst the other cycles in the shed—many of my companions were fresh from the factory. True, a few of the newer models and more recent machines knew every stone on the campus much better than I could or would, but then, this was the autumn of my life. This was an easy life, not too taxing. I had been ridden around the city from dawn to dusk in the days of my youth and I was right when I expected not to be taken much out of the campus.

A few years ago, I could boast to my companions of having been around the campus at least once everyday. To and from class, to the mess-building for lunch, to Gurunath for some trifling thing or to any one of the four gates leading out of the campus. Then there were the half a dozen or so routes which I would regularly frequent before exams and quizzes, my owner desperate for some fresh air at two in the morning after having slogged away at innumerable books and papers. This was great fun and I looked forward to it very much. But as the terms passed by, I was taken out of the shed less and less often. At first, my owner began to walk to class, then to Gurunath and then, horror of horrors, began to take the bus! The late-night rides grew more infrequent as walks began to

be preferred.

At first, I was rather put-out by this callous rejection. How could one give up the joy of cycling? Especially when I was such a capable machine, in good working-order too! From being parked in one of the very first rows in the shed, I slowly began to be pushed back, into the dark recesses as other cycles, more used by their owners than I was, began to be parked in the easy-to-access rows. Soon, however, I rather began to enjoy my days of leisure, as I termed them. This was largely to do with the fact that my owner one day wheeled me out of the shed to the cycle-repairman by Jamuna hostel and I was given a thorough clean and wheeled back to the shed. I was parked beneath a tree, half-inside and half-outside the shed. It was a most convenient spot— I could see the path, the mess-building and both the Sarayu and Sharavati hostels. All was well until I was noticed by a troop of monkeys. Having seen me beneath the tree every evening, the creatures realised I wasn't being used and decided to perch upon my handlebars, sit in the basket and jump up and down on the carrier! One of them even had the audacity to ring my bell while the youngest of the lot amused themselves by working the pedals backwards. They tired of this sport after a week or two and quickly found themselves other amusements, being the fickle-minded creatures that they are.

The surroundings that I now lived in were a stark contrast to ones that I had been used to previously. For five long years, I had been used to the view of the path leading to Mandakini hostel, in the cycle shed of Jamuna Hostel. My owner, it seems to me now, had a bit of a compulsive habit of parking me in the same spot for the entire time I was his cycle— even a slight change was incomprehensible to him. Therefore, I was used to that corner in the shed near the walls, but still close enough to the entrance. Here, I made several acquaintances, I heard their stories with wonder and amazement and chipped in with some of my own as well. This is where I heard the terrible stories and the plight of some cycles as told by my friends— that several of the cycles were left by the Velachery and main gates to their doom, to a slow and painful end— forgetfulness being the first cause and that dreaded disease, rust, being the second, more palpable, more fatal one. Owners, most often than not, forget us there. They come back to fetch us after a long gap, only to find us rusted and dirty and unfit to use any more. The fear of neglect and gross mishandling by the owners is something that all us cycles live with and have seen our own friends and acquaintances suffer through.

My owners, the previous and the current ones, have been excellent and have treated me with the respect any cycle dreams of. I am always ready to go with my tyres filled with air, my chain and brakes are oiled and I'm ready to go the distance whenever needed. It fills me with a sense of joy and happiness when my owner lends me to her friends, I use these instances to show my complete prowess and make them realize that they need to fix their own cycles soon!

Casual Sexism on Campus: Perspectives from a male student

AROON NARAYANAN

In the second article of the gender series, Aroon writes about casual sexism on campus from the perspective of a male student. In our first article, we exposed some distressing results from a survey of 815 students. These were some of the highlights from the findings:

Total number of respondents:		815
Male:	(73%)	593
Female:	(26%)	215
Other:	(1%)	7

1. The proportion of female students (45%) who said they were sexually harassed is over 10 times that of male students (4%) who faced the same issue. In all, 109/815 respondents reported this issue.
2. 54.5% of all victims said that ignoring or clearly indicating their discomfort had no effect on sexual harassment; 59% of female victims reported that the harassment continued despite this.
3. 80.5% of those who reported being sexually assaulted on campus are females (out of a total of 36/815). 1/7 of the people who identified differently faced sexual assault, as did 1% of all male respondents.
4. Fellow students form the majority of the perpetrators of sexual harassment and assault; 67% of female victims and 67% of male victims said that their perpetrators were fellow students.
5. One-fourth of all female respondents have faced inappropriate behaviour from security guards.

"Oh, you got an S? Nice, I knew that Prof had a thing for women. Haha!"

"Yeah he got that job because they were looking only for male employees anyway."

"Of course she got the coordship – didn't you see her flirting with the cores all last week?"

These are a select few comments (not quite verbatim) that I've been privy to in social circles over my time in the Institute, and the more discerning reader should be able to perceive how they reflect a deeply ingrained worldview. Of course, most of us tend to think that sexism is minor or non-existent in the Institute, so let's perform a simple exercise to test this assumption. Think back to the number of times you've called somebody an "attention seeker" because of the way they're dressed, and see what percentage of those judgements tend to be members of a certain sex. How many times have you made, or heard someone make, sexually suggestive jokes, and what percentage of those were aimed at a certain gender?

A simple reflection on the Institute norm would make us realize that casual sexism is quite deeply rooted here, and sometimes leads to egregious cases of sexual harassment. This norm is established quite early – think back to the freshie night comment screen and how it is filled with sexually explicit comments when women perform. Freshie guys are forced to follow freshie girls and get their room and phone numbers, which dangerously normalizes stalking and falsely equates persistent harassment with reward. We're also introduced to Insti slang fairly early, and one of the most used terms is "rape". When one sports team beats another, the loser is "raped". You "rape" an exam if you perform well in it. This trivializes the fact that rape is a terrifying concept for women because they have to live in constant anticipation of this horror visiting them. What's worse, most women are forced to be okay with all of this being the norm in order to stay socially relevant, because their future, especially placements, depend on how much they're able to accomplish socially in the Institute.

At this point, it is important to understand that the victims of casual sexism are not restricted to one sex. Both sexes can fall victim to casual sexism when discomforting comments on sexual identity are taken to be a part of "normal" conversation. Given the misogynistic nature of society today, it so happens that a majority of these instances affect women, but it is important not to overlook how men are also conditioned into some norms. For example, we always expect men to ask women out. Sensitive and feminine men are automatically classified as "gay", and homophobic jokes are standard stock.

A major enabler of casual sexism in our Institute is the woefully skewed sex ratio. It is much harder for men to incorporate the female perspective into our worldview because our interactions with the other sex happen to be minimal. To make it worse, we live in a culture that propagates unrealistic and unidimensional views on relationships through movies, magazines etc, making it virtually impossible for men to understand what women are likely to be comfortable with. This obviously leads to overt harassment through stalking, but it causes other subtler forms of sexism as well. When a woman works hard for a PoR and achieves her goal, most of us assume a sexual element to it simply because we haven't had the opportunity to see the level of fight she has mustered. In fact, in most cases the woman has to put extra fight (which again men are unlikely to witness) to ensure that her achievement is not trivialized by casual sexist

comments. This analysis neither excuses such behaviour nor does it imply that women don't game the system by winning favours using their sexuality, but it attempts to paint a more holistic picture of these situations.

Another facet to this issue is the slightly impersonal and esoteric nature of the institutional support systems that exist to counter societal and cultural sexism. For example, many companies today have a policy of hiring only women for a certain percentage of their workforce. In isolation, this policy seems unequal – why should they hire women at 30% when the sex ratio in the Institute is 10%?

However, as many of us recognize by now, the context for this policy is much more complicated. Discrimination against women in the workforce had become deeply rooted in corporates, and this policy was in part an institutional response. But more importantly, women face a larger number of roadblocks in their journey from school to a job, and hence it is the 10% number that is worrying, rather than the 30%. Parents are hesitant to send them to good coaching classes, and even when they clear the JEE, are again hesitant to send them far away from home. The 30% policy is more of an attempt to normalize the situation by getting the 10% as much higher as possible, rather than an unthought PR stunt. When discussing the unfairness of this policy to the individual, we should also reflect whether we've unfairly benefitted as individuals due to ingrained sexism in our past.

While our Institute's administration fares better relative to most other institutions in our country, it fails us at some crucial points when it comes to sexism. I personally know of horrific sexual harassment cases in which the first question that the officer in charge asked the victim have ranged from "What did you do to provoke him?" and "Why didn't you do anything to stop him?" to "You should look at him like a brother". When approached with a severe stalking case, during the ensuing discussion, the Chief Security Officer himself allegedly commented – "In India, each person is responsible for their own safety".

Until very recently, there had been no sensitization classes for freshers on proper gender conduct and as a result, casual sexism not only pervaded the Institute's atmosphere, but worse, went unnoticed by most, leaving the victims often confused and defeated. Election rules were skewed against female candidates until a couple of years ago, since female entry into male hostels was restricted, and they remain unequal today since male entry into female hostels is banned. Public spaces for intergender interaction, such as community halls and parks, are also nominal in number.

Even though I believe that the sexist mentality is not representative of the Institute's culture as a whole, it exists and is uniquely hurtful and demoralizing, and hence it is important that we reflect on where it originates from and how it can be tackled maturely. Often, colleges are the breeding ground for change, and some sensible conversations amongst us today can go a long way in ensuring a more equitable society.

A Chronicle of an Imprisonment Foretold

SHILPA MENON

In this fourth article of the gender series, we have a guest piece from Shilpa Menon where she discusses her own experience of facing sexual harassment at the hands of a fellow student in the campus. A recent survey by T5E showed that 67% of female student victims on campus reported being sexually harassed by fellow students, among other disturbing findings.

Prologue

Dear readers, I would like to present for your reading pleasure "A Chronicle of An Imprisonment Foretold". For a few years now, I have been interested in how gender is a fundamental lens through which we perceive the world, even when we presume that we are being 'neutral'. I intend to get people to pay me to conduct research in the area. As a girl and a woman, it has interested me on a very personal level, and I don't think my personal and professional investments in the matter can be separated. This campus is a goldmine in that respect. It has allowed me to have a plethora of conversations and learn from these as much as academic texts.

The experience of being a victim in need of legal support was, therefore, a rather strange one. You know the trope of the bewildered, helpless victim of harassment? I didn't quite fit the bill. At every point, I knew what was happening, and I could guess what would happen next. It was all so predictably awful. You'd think that stereotypes belonged to bad novels, but no. It *is* incredibly hard to report and find resolution to a crime of a sexual nature. It *does* make you feel horrible and guilty, no matter how well you know your laws and theories. There *will* be people who think you're doing it all wrong, that it is your fault.

Mine is not a case you would call "extreme" by today's standards. There is no body mutilation, no death, no placards and angry crowds. It is perhaps worth looking at precisely because it is a very, very common form of harassment, one that so many of us have learned to ignore. We like to think of perpetrators as evil oddities with eye-patches and scars (and lacking the stellar education that a place like IITM offers), and forget that the

scars (and lacking the stellar education that a place like IITM offers), and forget that the problem is widespread, that the perpetrators may be those closest to us, and that we ourselves are guilty of abetment. Well, STOP. And read:

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"I want to see you."

God, another one of those, I thought exasperatedly as I read the latest text from a guy, then a fellow student. He shall be known henceforth, rather generically and uncreatively, as 'the guy'. After over three years as an M.A. student in a male-dominated campus with brutal degree-based stereotypes (and twenty two years as a female-bodied person in this world), I was used to that peculiar point in an acquaintance with a male where an invisible line is crossed. It happened often enough that one was always on guard. One too many texts, the language a bit...off. And in this case, suddenly, nine calls a day. Very weird emails. Okay. Must block. Must carry on with life.

"Hey, so I'm really not comfortable with your calls and texts. Please stop. Thanks :) "

This was one of the usual responses, and it had worked so far. I wasn't going to explain to every one of them about how their way of approaching girls was fundamentally messed up – really, where would I begin? The rot ran too deep, and I was perhaps equally to blame for this culture of male predatoriness. For now, I reasoned, I would be happy with my few rock-solid guy friends whom I would periodically lecture on seeing females of interest not as conquests, but as people.

"I love you," he told me one day when he caught me in person. This was in a bus. I felt the strangest mix of amusement and anger. I thought we were all old enough to stop buying into silly tropes of professing one's deep love for a girl one barely knows (because what, you liked my HAIR? This profusion of dead cells on my head?).

"Okay dude. This is harassment."

The guy looked frankly incredulous. "What, this?"

" Yes. You are repeatedly approaching me despite my saying 'no'. This is not acceptable behaviour. I'll complain. This kind of behaviour will get you kicked out of campus, and in future, at work. So stop."

And I got off the bus.

It was becoming increasingly obvious that this case was different. This guy turned up everywhere. I became used to that awful mix of repulsion, anger and fear that rose up my throat like bile each time I saw that face – staring, grinning. The interesting thing about stalkers is that it often takes so long for one to be sure. For the longest time, you

stave off the growing fear: maybe it's a coincidence in a well-crowded public space. Really, why would anyone stalk *you*? Maybe you're being paranoid. Maybe he'll stop after this. Maybe.

And then, over the vacation, an email:

> "Hey, I know your address. I'm waiting outside on my bike."

Okay. Okay. Don't panic. Don't. For one, you're not even in the country. So it's fine, right?

No.

Over the subsequent semester, the bike became a regular presence in my life. It would be seen parked outside my department, the guy would draw up to me on it as I walked. He would stop my friends and classmates and ask them about me. He tried to get my details from the department office (my address, he got from presumably cooperative officials at the CCW office). He was sending inappropriate texts to another friend of mine, and began stalking her too.

Enough.

I approached the CCASH and filed a complaint. After repeatedly mailing and calling the members, I finally got a response: the case would be taken up. Phew.

With the help of friends, I began collecting evidence – texts, emails, WhatsApp messages. Dates, details that I had forgotten. Anything to show that this wasn't acceptable. At the hearing and subsequent meetings, I was fully prepared for the first questions:

"Were you friendly to him? Maybe he got the wrong message."

Of course I was friendly to the guy to begin with, why would I be unfriendly to someone just because he's male? And what is this "message" that encourages a person to engage in stalking and repeated harassment?

"No, I wasn't, Ma'am. I ceased all contact and asked him repeatedly to stop harassing me. I used those very words"

"You must understand that this will affect his entire future".

Why, thank you for bringing this up. I am very repentant about my attempts to complain. How thoughtless of me.

"I understand, Sir, but I have tried everything else. I have no other means to make this stop."

"At the end of the day, your safety is your responsibility".

I was under the impression that as an Indian citizen and as a student, there were thou-

-sands of people being paid in the police and security forces to ensure my safety at all times, but perhaps I was wrong. My apologies. I forgot that any girl or woman evil enough to invite the attention of a man becomes exempt from constitutional provisions.

"But Sir, he finds me no matter where I go."

"You can file a police complaint, but you know the implications."

Thank you so much for the support, really. At what point is one 'warned' against complaining to law-keepers? How did we get here?

"I understand. I'll settle for internal action."

Finally, the verdict was out. Suspension for a year. Debarment from campus. I was a good chaste student, I had all the evidence and witnesses, I had ticked all the right boxes, the case was open-and-shut. I wonder what would have happened if the perpetrator had been a friend or even an ex-boyfriend.

In the meantime, I had to fend off others: friends who wanted to settle this "between men". Parents who didn't think the system worked well enough for me to pin my hopes on a complaint. In their view, settling things "informally" was a time-tested means of hushing these things up. The perpetrator is persuaded to stop by the sheer macho showmanship of either the girls' male relatives or male friends. To recap, the necessary ingredients would be: a) large family of males b) large group of strong and benevolent male friends and c) testosterone. I was insistent on seeing this as a crime and leaving its resolution to the authorities, and was in turn accused of being naive, idealistic and (gasp!) feminist.

Case closed. It's time for this self-consciously witty excuse of a narrative to end here, you must think. But no such respite is on offer.

He turned up on campus regularly. Nobody stopped him. Friends told me about seeing him carrying on with life as if nothing had happened. I left it at that. He wasn't bothering me and I had wasted enough of my time on this.

And then it all began again. Trying to talk to me, following me to gatherings. Staring, watching. At each point, I complained to the Security. Again and again they assured me that he would not bother me again. And finally, the same bike, the same roadside encounter. After over a year of this bizarre cat-and-mouse game, I finally lost it. I wasn't going to wait for the guy to do something to me. I escalated the case within the means available to me. Having kept them out of it so far, I finally called upon potent parental authority to impress upon the authorities the gravity of the situation (in this institution, you can be a legal major and still need parents to vet how you live, eat and behave. Well, it's not like we are taught to fund our own education like adults, so we must hold our peace). The guy, after several attempts to escape, was finally caught at a public event

where he had come to “meet” me. Somewhere along the way, the exasperated authorities had expelled him.

This time, there was police action. There was the fear of a backlash, of physical harm if the guy were to come back. There were ample cases involving spurned males, female targets and paraphernalia such as sharp objects, kerosene and acid to fuel my parents’ anxieties. There’s not much that we can do to stop one determined person with such, er, tendencies, they all told me. In the absence of any other alternative, I must restrict my movements, keep myself locked up. As a result of over a year of cowering, pleading with authorities, convincing my parents it’s okay don’t worry I can manage, I now have the wonderful privilege of taking a month off my time on campus.

Remember that this article is titled “A Chronicle of An Imprisonment Foretold”. The prisoner is me. The guy is probably going to get bail.

“You don’t know the seriousness of the situation,” they all kept telling me. I didn’t want to tell them that the sound of a bike would always make me tense up, perhaps for the rest of my life. I didn’t want to tell them that every time I walk out alone, I rummage in my bag to make sure I can pull out my pepper spray quickly. That I then look around for rocks, large sticks – anything to save me in case of an altercation. I knew the seriousness, all right. Try carrying on with your life’s daily pressures with the constant need to be alert; fearful. Imagine fearing all sorts of harm to you just because, one day, for no fathomable fault of your own, a random person decided that he wanted to acquire or defile you like a piece of property, at all costs. And if you can, try believing that for most girls who live, work, use public transport, walk on the streets, *this fear is a lifelong companion*. The freedom to walk alone. The freedom to not have to inform a hundred people before you step out. Imagine not having that basic right. And yet that is precisely what I must give up now.

Don’t get me wrong, I am not baying for castration or death sentences. I am asking for due process of law. I am asking all of us, irrespective of gender, to change the way we see the process of male-female interaction. No matter what Dhanush does, following a girl around on a bike is not okay. Even when everything around us normalizes acquisitive behaviour by men and shy submission by women (who, it is believed, will be seeking to land any guy with a bike and money), I am asking you to look at the very disturbing assumptions that underlie our concept of ‘wooing’ or ‘winning over’ a woman.

As I said, my case is an ‘average’ one. I have heard of worse; I have seen what women of my age can go through. I am not one of those girls and women who must continue to see and interact with their harassers and rapists every day. There was action after all of it, and for what it’s worth, justice was served. At every point in this long ordeal, I had the staunch support of my friends, teachers, colleagues and wing-mates. They drove him away when the authorities were absent. They helped me figure out my options at every step.They listened to me when I told them that “beating him up” would make us no

different from the guy. My parents, despite their worst fears, waited until I called upon them, and even then, listened to what I wanted. I wonder how it is for girls who remain silent for fear of judgement, for those who are ignored when a violation of their bodies and rights becomes a matter of honour between two groups of men. After a point, I was able to convince the authorities that it was time to stop considering his future and start considering mine. Beyond a point, I was not forced to shake hands with him, see him as my 'brother', reconcile, because hey, this is all part of campus life. As someone who knew how the mechanisms on campus worked, I was able to retain my sanity and proceed with this systematically: collect evidence, submit, collect evidence, submit, wait for some action, order pepper spray online. I wonder how it is for girls who do not even know that there are ways to find a solution, who do not even know whether what is happening to them can be called a crime.

After narrating this to so many people I know, the act of writing all this down is an odious one. But for all those out there who are fighting the same battles or worse, I want to say, "keep at it". This is not a story with a happy ending, but it's close enough for hope. Perhaps, as parents and guardians, we won't have to tell girls and women to run away because there's no other way.

Yours hopefully,

The Prisoner.

Sub-standard deviation

Anamika writes under a pen-name about her experience as a person whose gender and sexuality does not fall into normative binaries. Inspired by an earlier T5E article, "Standard Deviation", it is a brave personal story that should make every insti student reconsider the impact of the sometimes insensitive comments we both make and let slide everyday.

Note:
1. T5E Op-Eds are written prose pieces which express the opinions of an author, and are not to be considered T5E's views.
2. T5E is a student-run publication, editorially independent from the IIT Madras administration.

Important information for anyone interested:

Vannam is IIT Madras' LGBTQ support group.
Orinam.net, a website (Tamil and English), with information on alternate sexualities and gender identities.
Transgender facts from The Mayo Clinic, a respected non-profit medical practice based in the US
Publications on transgender people, by The World Health Organisation

> *"Hello. You do not know me. Even the people around me don't really know me. Because I have a secret, something I've kept to my world for a very long time; something I wish to reveal. But not confess; that makes it sound criminal. I need closure and for that, I must be true to myself.* So here goes"
>
> – Standard Deviation, T5E (July 4, 2011)

I am transgender.

Yes, you read that right, I do not fit into society's gender norms. I was born male but I identify as a woman. And to add to it, I am bisexual; meaning I've had feelings for both men and women. I do not 'admit' to being transgender or bisexual because it is not a crime to admit. When I write this article hoping to get my message across to you, I know that for some of you, this may start to sound like the start of a joke. It is amidst all these confusion, where my days, weeks and months blurred together, that I lost myself to depression.

I have been denying this part of myself all my life. I can confidently say that I have learned more about my religion than most people because I thought that religion could help me conceal this part of me forever. I have thought of talking about this to my parents ever since I started questioning myself. But like any other kid in our conservative culture, I held my ground. The only conversation I had regarding this was a logical monologue with God to strike up a bargain that if I woke up as a woman the next day, I would do whatever he required me to.

After a couple of years, I understood that religion is not my cup of tea. My next distraction was books, movies, hobbies — anything I could get my hands on. I thought that it was maybe just a phase. For me back then, being homosexual, bisexual, transgender or anything along those lines was one of the biggest sins I could commit. There was no way that I, someone who had always been in good standing with my parents and teachers could have indulged in a perversion like that. It was around this time that we got an internet connection. As soon as I had privacy and learned how to delete web history, I started learning more and more about this part of me and found out that it is not something that can be suppressed. When I was sixteen, I knew that if I need options, I should carefully plan my future. And equally importantly, I knew that I had to stay away from my parents to figure out this part of myself. For the next two years, the daily highlights were nothing other than studying and educating myself regarding sexuality and gender.

After I came to insti, my opinions changed drastically. For the first time, I found people who believed that belonging to LGBTQ community was not a sin, even though they deemed it shameful. Until then the people with whom I could have a dialogue on the topic was in online forums with people far away. In insti I had healthier debates and conversations on this subject. I found hobbies, games and people with whom I could forget this part of myself. Pretending was never difficult for me. I developed skills over the years that helped me hide all of this from my friends. I continued to read more and more about gender identity and sexuality. I read about the disturbing experiences of trans people who did not come out of closet and led a miserable life. I had to accept that I could never hold myself in that position. I had kept these feelings to myself for so long that; approximately one year ago, when I had more academic pressure than I've ever experienced before, everything crashed on top of me.

Coping with this was difficult. I went through eating disorders. Sometimes eating too much and sometimes not at all eating. I slept more than 16 hours a day during these cycles of despair and misery, a couple of times even stayed nearly 48 hours in bed with nothing more than a bottle of water. I used to wake up at 4 AM to do a dangerous climb to my hostel rooftop where I was sure I could be alone and get fresh air. I contemplated suicide several times. But when I thought of my parents, I could never take a step off the edge. After a couple of weeks, my misery grew and reached an unbearable height. On a Thursday morning, I decided to end everything. I dragged myself out of bed, took a bath and cleaned up my messy room. I wrote a letter addressed to my parents and my friends explaining the problems I faced and why I needed to do this. I called my mom and talked for a few minutes, after which I headed out and had my first proper meal in 4 days. I bought a pack of blades and on my way, I coincidentally ran into one of my friends. He sensed something was wrong and he reassured me that he would help me with whatever problem I faced. He did not inquire about the issue since he was sure I didn't want to tell him. After a long discussion, I went to my room and reconsidered everything. I did not and still do not think that what I did that day was impulsive or stupid. Yet, after that painful conversation, I saw hope.

How things work: Stem Cell Donorship

SURYA

DATRI is an NPO (non-profit organization) facilitating blood stem cell transplants in Chennai. Last month, on 8th November, they conducted a drive in IIT Madras where over 300 students registered as potential donors. In this interview, Surya speaks with the founder of DATRI about blood stem cell transplants and how we can contribute as students to this process.

You may have donated blood, but have you considered registering as a blood stem cell donor?

Blood stem cells are needed to help treat a number of diseases. With 45,000 new cases of leukemia and more than 10,000 new cases of thalassemia every year, blood stem cell donation is the need of the hour. Until a few years ago, the only hope for these patients was regular blood transfusions that prevented them from leading a normal and healthy life. Blood stem cell transplants are a godsend for those suffering from blood related diseases as they provide a one-time solution that enables patients to live a healthy life.

Launched in 2009 by Mr. Raghu Rajagopal, DATRI, a non-profit organisation has facilitated more than 210 blood stem cell transplants through unrelated donors. The organisation has more than 1,50,000 registered blood stem cell donors and is looking to spread awareness amongst the people. A genetic match between the stem cells of the donor and the patient is essential for a successful transplant. With the probability of the match between stem cells being as low as 1 in a million, it is no wonder that DATRI is doing all it can to expand its donor base.

Awareness levels today are much better than before and DATRI finds that college-goers are often the most enthusiastic and willing donor-volunteers. One hopes that we, the students of IITM, take the lead in this issue as in everything else.

T5E spoke to the founder of DATRI, Mr Raghu Rajagopal. Here are notable excerpts from the interview, conducted while Mr. Raghu Rajagopal was hurtling between offices, giving a new dimension to ‘walk the talk’!

Could you explain briefly what blood stem cells are? What are their applications in the field of medicine?

Blood stem cells are the mother of all blood cells (white blood cells, red blood cells and so on). Blood stem cells are those which produce new blood cells. These blood stem cells are found, for instance, in the bone marrow and umbilical cord.

There are several diseases related to blood. Some of these are fatal while others are benign. These may be due to the ineffective functioning of the bone marrow or having a lot of cancer cells in the blood. Blood stem cell transplants can cure some of these diseases completely, such as (but not limited to) leukemia (blood cancer), thalassemia and Hurler's disease. In all these cases, the only viable option for the patient to lead a normal and healthy life is a stem cell transplant or a bone marrow transplant.

While reading, I found that stem cell transplants require the donor's stem cells to resemble that of the patient. Won't family members have a higher likelihood of having a matching stem cell type? If yes, could you explain the role played by a stem cell bank like DATRI?

The probability of finding a match within a family is around 25%. In contemporary times, this probability is further lowered due to the fact that most families have only a single child. The need for adult unrelated donors is greater than ever before. This is the role that DATRI plays. DATRI has helped to save the life of more than 218 patients by finding a donor whose genetic type matched that of the patient.

What is the current scenario in our country with respect to blood stem cell donations? What is the attitude of the public towards stem cell donation?

Blood stem cell donation, especially from an unrelated donor is a relatively new idea in our country. There are issues surrounding awareness and people are often blinded by myths. DATRI has been able to spread awareness in the community through its drives, conducted in association with corporates, colleges and religious institutions. We have definitely seen a noticeable change in the mindset of people in India towards blood stem cell donation. A disappointing fact is that there are members of the medical fraternity who are still unaware of the boon that blood stem cell donation is.

The world, as a whole, has more than 30 million individuals registered as blood stem cell donors. However, at DATRI, the number of registered donors is only around 2 lakh. After extensive research, it was found that the blood stem cells of donors belonging to the same family, region and ethnicity as the patient tend to have a greater probability of being a good match. The number of registered donors in our country are too few to help all those in need of a transplant. Hence, we need to spread awareness amongst the people of our country and ensure that we are able to expand the number of donors in order to save more lives.

What are the criterion to qualify as a stem cell donor? What is the registration procedure?

Adults between the age of 18 and 50 are eligible to register as blood stem cell donors. The registration process is simple. Donors need to be generally healthy and must not have long term blood related diseases like HIV. Once they have registered as a donor, their HLA typing will be determined using a swab of their cheek. The registered donor will be asked to donate his/her stem cells only in the case that there is a match with a patient's stem cell type.

In case there is a match with a patient's stem cell type, what would be the next step? Are there any health risks associated with donating blood stem cells?

The donor goes through a master health check-up. Once he/she has been declared fit to donate, the process goes on. The donor donates blood stem cells through PBSC or Bone Marrow Donation.

There are no health risks associated with donating blood stem cells.

As students, how can we help spread awareness regarding the importance of stem cell donation?

Firstly, I would like to encourage all the students of IIT to step forward and register themselves as donors. It would be wonderful if DATRI is given the opportunity to address the students during all major events held by IIT. Stem cell donation today resembles the scenario in which blood donation found itself 50 years ago. In contemporary times, blood donation camps are commonplace. This was made possible due to campaigns and drives held by the people. Hence, we believe that students must spread the message of stem cell donation by conducting campaigns and drives, particularly during student-run events.

This opinion was reiterated by IITM's Chief Medical Officer or CMO, who told us, "Spreading awareness amongst the students is very important, and one way to carry it out is through posters. The regular drives organised by DATRI are also successful at spreading awareness."

We also spoke to Anusha, a 2nd year student in insti who has been involved with DATRI, about her involvement and thoughts on volunteering for the cause. This is what she had to say:

"I got to know about DATRI in August 2016. I immediately registered myself as a stem cell donor as I believed that this was a noble cause. Since then, I have been actively involved with the DATRI team in conducting events in the campus. The team at DATRI is very motivated and enthusiastic about blood stem cell donation. Recently, in the month of November, I was a volunteer in the event conducted at IITM. I was pleased to note the

large number of students who had turned up for the event to register themselves as potential donors."

In the unfortunate circumstance that a donor backs out at the last moment, what steps do you take to save the patient's life?

This is the toughest situation which we encounter in India. If a donor backs out at the last moment, it is very difficult to save the patient's life. The donor needs to be extremely committed and should not back out once the conditioning process is started on the patient. The conditioning process is a method in which all the patient's cancerous cells are destroyed and the patient is ready to accept the stem cells of the donor.

To avoid this situation, we try to educate our donors and encourage them to come forward to us in case they find themselves in two minds.

While reading about stem cell transplants, I came across a second category: the bone marrow transplant. When does the need arise for a bone marrow transplant? Does DATRI accept bone marrow donations as part of it's program?

Bone marrow transplants are required in specific cases when the doctor believes that it would be a better choice for the patient. DATRI does accept bone marrow donations. However, there have been only 3 instances in the past when a bone marrow transplant has been required.

Could you tell us about some of your success stories with stem cell transplants?

One of our most satisfying and recent success stories is that of Manasvi, a ten year old girl who hails from Hyderabad. She was diagnosed with Thalassemia Major soon after birth. Thalassemia Major is a serious blood disorder and the patient requires regular blood transfusion to stay healthy. As a result, Manasvi was unable to lead a normal life. DATRI was able to find an adult unrelated donor with the same genetic type. The stem cell transplant was successful and Manasvi has been able to live a normal life for the past 6 months. She has expressed a desire to meet the DATRI team and we will be organising a get-together within a few weeks.

Datri had conducted a drive in IITM recently. Could you tell us about your experience organizing the drive?

The drive was very successful and we are grateful for the help and support from the organisers and the Chief Medical Officer (who . More than 300 students from IIT Madras registered as potential blood stem cell donors. We hope to organise more drives in the future and aim to see greater participation**.**

Anusha, who volunteered to help organize this drive, added:

"The drive was conducted on November 8 2016 from 10 A.M to 6 P.M. More than 400

students registered themselves as potential donors. It was a wonderful experience. A few alumni of IITM, who had donated their stem cells to a genetically matched patient, were felicitated by DATRI. During the drive, the organisers spoke about the importance of stem cell donation and its potential to save patients suffering from life threatening diseases such as blood cancer."

What are DATRI's goals for the near future?

DATRI's main goal is to increase the number of registered donors in our registry. We hope to spread awareness all over India through campaigns and drives. Our long term goal is to provide a genetic match to all patients looking for a stem cell donor.

If you wish to contact Datri or find out more about registering as a potential stem cell donor, you can do so at ***datri.org,*** *calling* ***1800-300-32874*** *or visiting* ***info@datriworld.org.***

Ripples in Spacetime: A new window to the universe

PROF. L. SRIRAMAKUMAR

On February 11, 2016, the two Laser Interferometer Gravitational-wave Observatories (LIGO) at Hanford and Livingston, U.S.A. [1], announced the detection of Gravitational Waves (GWs) from two merging black holes. [2] The GWs are an important prediction of Einstein's theory of General Relativity (GR), a relativistic theory of gravitation which is expected to describe the gravitational field at the largest scales and at the greatest strengths. In what follows, I shall first outline the theories and experiments that led to the formulation of GR. Thereafter, I shall describe GR itself briefly before going on to discuss the concept of GWs, their sources and the recent detection by LIGO. I shall conclude by briefly sketching as to how the detection of GWs opens up a new window to the universe.

PART I: FROM NEWTONIAN GRAVITY TO GENERAL RELATIVITY

Newtonian gravity and the motion of Mercury

The Newtonian law of gravitation which describes the force between masses is well known. According to the law, two masses attract each other with a force that is directly proportional to the products of the masses and inversely proportional to the square of the distance between them. The Newtonian theory has been enormously successful in explaining a variety of terrestrial phenomena from falling apples to long range projectiles, and celestial phenomena such as the motion of planets as encoded in the Kepler's laws. [3] According to the Kepler's laws, the planets are expected to move around the Sun along ellipses indefinitely. However, observations of the planet Mercury over the course of the nineteenth century revealed that, instead of being confined to an ellipse, it followed the trajectory of a slowly precessing ellipse, where its axis of rotation constantly changed. The extent of the precession of the perihelion of Mercury (i.e. the advancement of the point of its closest approach to the Sun) had remained unexplained despite detailed efforts to take into account other effects such as the influence of other planets and the oblateness of the Sun. We shall revisit this issue in the light of GR in due course.

At this stage, it should be noted that, in Newtonian theory, the gravitational force acts instantaneously, i.e. without any delay.

Speed of light and the theory of special relativity

There exist two threads that lead to the formulation of GR. One is the Newtonian law of gravitation, which we described above and the other is the theory of Special Relativity (SR). SR had owed its origins to the Galilean principle of relativity (according to which the Newton's second law of motion is valid in any inertial frame, i.e. frames that move with constant velocities) and the nature of Electro-Magnetic (EM) waves. The theory describing electricity and magnetism was developed during the course of the nineteenth century and culminated in its comprehensive description by Maxwell in terms of equations which carry his name. During the latter half of the nineteenth century, as the concept of EM waves (i.e. light) emerged, it was thought that light requires a medium for propagation, just as sound waves do. In order to explain their propagation, an all pervading ether was invoked to play the role of the medium. If that was indeed the case, light rays propagating in mutually perpendicular directions as Earth travels through ether will have different speeds. While the velocity of light in the direction of motion of the Earth will be modified (according to the conventional Newtonian law of addition of velocities, viz. that the velocity of a person moving in a train with respect to the station is the sum of the velocities of the train and the velocity of the person with respect to the train) by the ether wind generated due to its motion, the velocity of light in the perpendicular direction will not be affected.

This issue was examined by Michelson and Morley using an interferometer towards the closing years of the nineteenth century. An interferometer is a rather sensitive instrument that consists of two arms of equal length along which light is made to propagate back and forth before they interfere with each other at the end. The difference in speeds along the two perpendicular directions as Earth moves through ether will lead to a shift in the interference pattern. However, Michelson and Morley did not observe any such shift.

The result implied that the speed of light is unaffected by the motion of the Earth. This, in turn, suggested that the concept of ether is not supported by the experiments. As we shall see later, the Michelson-Morley interferometer plays a primary role in the detection of GWs.

The null result of the Michelson and Morley experiment led Einstein to formulate SR in 1905, based on two postulates. The first postulate simply states that the physical laws have the same form in any inertial frame (which is a generalization of the Galilean principle of relativity that had applied to Newton's second law of motion). The second postulate states that, in contrast to the conventional Newtonian law of addition of velocities, the speed of light is the same in all frames of reference. These postulates lead to a variety of consequences such as the relative nature of the concept of simultaneity (which was an absolute concept in Newtonian physics), Lorentz contraction (i.e. moving rods appear shorter) and time dilation (i.e. moving clocks run slower). These phenomena are

regularly encountered in experiments involving elementary particles moving at relativistic velocities and the validity of SR has been tested and confirmed in a multitude of situations over the last century. It should be mentioned that the equations of motion in SR reduce to the Newton's laws of motion in the non-relativistic limit, i.e. when the velocities involved are much smaller than the speed of light. [4]

GR and dynamical spacetimes

Time is an absolute concept in Newtonian mechanics. It does not depend on either the location or motion of the observer.

But, in SR, the transformations of the coordinates from one inertial frame to another (called the Lorentz transformations) mix space and time.Hence, it proves to be convenient to merge space and time into a single entity called spacetime.

In SR, the spacetime is fixed (referred to as the Minkowski or flat spacetime) and it basically provides a background arena in which various phenomena take place. As we mentioned above, the Newtonian gravitational force acts instantaneously, which is, evidently, inconsistent with SR, according to which the velocity of light is the maximum speed of propagation.

During the period of 1905 to 1915, Einstein worked towards constructing a theory of gravity that is consistent with SR. An important step in the process was the recognition of the so-called principle of equivalence. In fact, the principle is often stated in different ways and we shall consider two versions of the principle to construct our arguments. The first of the versions corresponds to the fact that the motion of test particles in a gravitational field proves to be independent of their masses or their composition (as Galileo is supposed to have famously illustrated by dropping different objects from the leaning tower of Pisa). Secondly, there seems to be complete equivalence between an inertial frame and a freely falling frame in a uniform gravitational field, say, in an elevator that is in free fall above the Earth. In other words, no experiments carried within these frames can distinguish one from the other. For example, an apple dropped will float freely in both these frames. However, this equivalence breaks down as the size of the freely falling frame is increased. In a wider elevator, dropped apples will begin to move towards each other because of the tidal forces arising due to the curvature of the Earth. Such arguments had led Einstein to recognize that the gravitational field manifests itself as the curvature of spacetime.

The geometry of spacetime characterizes the gravitational field. Geometry is described by the metric, i.e. the quantity that determines the distances between events in spacetime. Einstein realized that the presence of matter curves spacetime, and the curved spacetime, in turn, influences the motion of test particles.

These ideas are best described by the following quote, attributed to Wheeler: matter tells spacetime how to curve, and spacetime tells matter how to move. A popular

analogy that helps visualize the above two points is the behaviour of a rubber sheet under the weight of a large mass that is placed on it. In this analogy, the sheet corresponds to spacetime. It bends or curves due to the large mass. The bent sheet in turn determines the trajectory of test particles (i.e. masses much smaller than the original one).

GR, formulated in 1915, describes the dynamics of spacetimes through the Einstein's equations, which relate the spacetime dynamics to the matter content. [3],[5]

Tests of GR

Since its formulation, GR has been tested in a variety of situations. To begin with, let us reconsider the behaviour of the planet Mercury in the context of GR. Einstein himself had investigated the issue and had found that GR indeed predicts the precession of the perihelion of Mercury. Moreover, the extent of the precession predicted by GR is found to match the observations very well. There exist two other phenomena that GR had predicted (which, along with the precession of the perihelion of Mercury are referred to as the classic tests of GR): bending and red-shifting of light due to strong gravitational fields. [3],[5] Since atomic clocks run based on the frequency of atomic transitions, the latter implies that clocks will run slower in a stronger gravitational field (referred to as gravitational time dilation). The phenomenon of gravitational lensing (i.e. bending and focusing of light by the gravitational field) is regularly observed by astronomers and gravitational red-shift was experimentally established in an exquisite experiment by Pound and Rebka about half-a-century ago. In fact, both gravitational and relativistic time dilation (that we had mentioned earlier) need to be accounted for in the Global Positioning System (GPS), if it is to meet the high accuracy desired for, say, military applications.

GR is not only required to describe gravitational fields at its greatest strengths, it is also needed on the largest scales, wherein Newtonian gravity ceases to be valid. For this reason, GR is essential to study cosmology, i.e. the physics of the universe as a whole. With the advent of increasingly accurate observational data over the last couple of decades, it is often said that we have entered an era of precision cosmology. These data have helped us converge on a standard model of cosmology.

It ought to be highlighted here that GR has proved to be remarkably consistent with virtually all the astrophysical and cosmological observations to date. [3],[5]

PART II: GWS AND THEIR DETECTION

GWs, properties and sources

An important prediction of GR are GWs. It was predicted by Einstein himself in 1916, very soon after the formulation of GR. However, there had remained a lack of clarity about their physical reality for almost half-a-century. It was only in the late 1950's that it was recognized that GWs carry energy and hence they can be detected. [6] GWs are

fundamentally small disturbances (ripples, as the title of this article suggests) in the fabric of spacetime, akin to ripples on the surface of water. GWs have some similarity to EM waves. They too travel at the speed of light. Also, as in the case of EM waves, they are transverse in nature, i.e. the disturbances occur in a direction perpendicular to their direction of propagation. Moreover, they are characterized by two degrees of polarization as EM waves are. However, the fundamental forms of polarization of GWs are somewhat different and are referred to as plus and cross polarizations. A GW impinging on a ring of masses will set them in oscillatory motion. The nomenclatures for the two types of polarization are due to the manner in which the ring of masses are affected by the polarized wave. [3],[5]

In electromagnetism as well as gravitation, radiation is emitted by a system of charges and masses which are in motion.

It is possible to express the radiation emitted by the system in terms of the so-called moments of the charge and mass distribution. These moments characterize the strength and shape of the distribution. They constitute a hierarchy involving increasingly higher powers of the distances of the location of charges or masses from a given origin. For instance, the leading moment of a system, viz. the monopole moment, does not involve the distances at all and essentially reflects the total charge or mass of a distribution. While the next two moments, i.e. the dipole and the quadrupole moments, involve the first and the second power of the distances of the charges or masses from the origin. In the case of electromagnetism, a varying monopole is not possible due to charge conservation. It is the time-dependent dipole moment resulting in a non-zero second time derivative of a charge distribution that leads to the dominant contribution to the radiation from the system. One such simple system is an accelerating charge. In the context of gravitation, while the conservation of mass forbids radiation from a monopole, conservation of linear and angular momenta rule out radiation by a dipole. Therefore, gravitational radiation primarily arises due to a time-dependent quadrupole moment (leading to a nonvanishing second time derivative). [3],[5]

As it is merely a matter of a suitably varying quadrupole moment, clearly, there can exist a variety of sources of GWs. In fact, even simply waving our hands can generate them! However, it turns out that, generating GWs of sufficient strength that can be detected requires rather strong gravitational fields and relativistic velocities, only found in astrophysical situations. Strong sources of GWs include: rotating highly dense and compact objects known as neutron stars, exploding supernovae, binary neutron stars or black holes that are spiraling in towards each other, supermassive binary black holes at the centre of galaxies and quantum fluctuations in the early universe.

LIGO

The frequency of the GWs will depend on the internal frequency of the source that generates them. At the lowest range of frequencies are the GWs produced in the early

universe (of about 10–16 hertz) and those generated by in-spiralling compact binaries correspond to the highest frequencies (of about 102 hertz). The former leaves its imprints as anisotropies in the cosmic microwave background (an ubiquitous thermal distribution of photons that we are immersed in, which is a vestige of the hot early universe). The latter is expected to be detected by the so-called interferometric detectors, which we shall now describe.

LIGO, or Laser Interferometer Gravitational-Wave Observatory, is basically a very large Michelson interferometer, with massive mirrors (weighing about 40 kilograms) that are suspended freely.

The principle of the detection of the GWs using an interferometer is quite simple. The freely suspended mirrors will be disturbed by an incoming GW, leading to a difference in the path length between the two arms and therefore a shift in the fringes. However, the amplitude of the incoming GW, even from quite a strong source, proves to be extremely small – it will at most move the mirrors by a fraction of the size of a proton! Therein lies the challenge. In order to improve the sensitivity of the interferometers, their arms are made very long. The two arms of LIGO are actually four kilometer long optical (so-called Fabry-Perot) cavities. Also, in order to increase the path length, the beams of light are made to travel back and forth as many as 280 times (leading to a path length of 1120 kilometers) before they interfere. (In comparison, the path length in the original Michelson and Morley experiment was 11 meters.) Actually, the source of light is a highly focused beam of sufficiently powerful laser. The laser light is constantly recycled and boosted so that it does not disperse or dissipate even after many trips back and forth. The interferometer is designed such that, in the absence of any disturbance, the laser beams travelling in the two arms arrive at a photodetector exactly out of phase, resulting in destructive interference or no signal. [7] This makes it easier to detect a GW when it arrives, as it will lead to an increase in the brightness. It should be stressed that the characteristics of a variety of other noises, such as the seismic noise, thermal noise and the noise due to fluctuations in the photon number, have to be understood in detail and accounted for before the signal from GWs can be decoded.

The concept of interferometers as GW detectors was originally suggested in the 1960's. The concept was developed over the next two decades and the two LIGO facilities at Hanford and Livingston were completed in the 1990's. They were in operation for about a decade until 2010. Over the last few years, LIGO was completely overhauled. The refurbished detector, referred to as advanced LIGO (aLIGO) [8], with three times the sensitivity of LIGO, began operation in 2015. [9]

Recent observations by LIGO

On September 14, 2015, the two LIGO detectors measured a transient signal of GWs lasting for about half-a-second. [10] The signals had arrived at Hanford about 7 milliseconds later than at Livingston, which almost exactly corresponds to the time taken by the GWs

to travel the distance. The signals at the two observatories were very similar in nature. [11] The peak dimensionless amplitude of the signal (i.e. the strain induced by the GWs on the mirrors) was about 10–21 and the frequency of the signal had steadily increased from about 35 to 250 hertz. These amplitude and frequencies had fallen exactly within the range of sensitivity of LIGO. [12]

At this stage, to interpret the signals detected, we need to digress in order to understand their possible origin. Even as the GW detectors were being planned and constructed, there was a constant theoretical effort during the last two to three decades to arrive at the characteristics of GWs emanating from various sources. One source of GWs that has been investigated extensively are two compact objects (say, neutron stars or black holes) that are orbiting each other in their mutual gravitational field. When the binary system evolves, they lose energy due to the emission of GWs. As a result, their orbits keep shrinking and their orbital periods keep constantly reducing. When the binaries are spiralling towards each other in such a fashion, the amplitude as well as the frequency of the GW emitted by the system increases.

The resulting waveform is very similar to the short shrill sounds that birds often make and for this reason it is referred to as a chirp. The amplitude and the frequency of the chirp carries information about the nature of the objects that constitute the binary system.

The waveform observed by LIGO had corresponded to a chirp. [10], [11], [12] It had suggested that the GWs had originated from inspiralling black holes of masses about 36 and 29 times the mass of the Sun. Associated numerical modelling suggests that the two black holes had merged together into a single black hole of mass about 62 times the mass of the Sun. In fact, the detected signal had also contained the last throes (referred to as the quasi-normal modes) of the merged black hole, before it reached a quiescent stage. Energy corresponding to about 4 solar masses was radiated away as GWs. Amazingly, the corresponding luminosity proves to be much larger than the luminosity of all the stars in the universe put together!

It should be pointed out that the two black holes would have been approaching each other for eons (billions of years), constantly emitting GWs. It is only towards the very end of their inspiral that the GWs emitted are sufficiently strong for our detectors to pick up their signals.

As the signal had begun to be detected, the black holes were about 350 kilometers apart and were moving at about one-third the velocity of light. In less than half-a-second, they had approached each other at velocities close to the speed of light and had merged into a single black hole. [13] The event has been estimated to have occurred about 1.3 billion light years away.

There were many firsts with the LIGO observations. This is indeed the first direct detection of GWs. (It should be stressed that this is the first direct detection. Observations of

of the famous Hulse-Taylor binary pulsar had pointed out to GWs indirectly. [14]) It is also the first direct detection of black holes, not to mention a black hole binary. Moreover, this is the first experimental test of GR in the strong gravitational regime. All the analyses carried out until now point to the fact that GR is remarkably consistent with the observations. [15]

A new window to the universe

Our ability to observe the universe in regions of the EM spectrum beyond the optical domain has revealed many facets of the universe that were hitherto hidden from us. In a similar fashion, the detection of GWs opens up a new window to the universe. As is often clarified, the two LIGO facilities are not just detectors, but actually observatories. They have been designed to carry out GW astronomy. The detection of GWs from the merging black holes (the event is now referred to as GW150914) has ushered in a new era (remarkably, in the centennial year of GR, 2015) and the expectation is that aLIGO's sensitivity is high enough to be able to observe at least a few such events every year. [16] The information carried by GWs is expected to be complementary to the information encoded in the EM waves and, say, neutrinos, if they can be detected. Such a multi-messenger astronomy is expected to lead to a far superior understanding of the physics of the universe.

Role of India

It is noteworthy that many Indian scientists, working from different institutions, have been a part of the LIGO scientific collaboration.

There have been major contributions by the Indian scientists on the theoretical, numerical and analysis fronts.

With a LIGO facility planned in India [17], we can look forward to Indian scientists playing a significant role in GW astronomy over the next decade.

Timeline of the main events leading to the detection of GWs

Year/Period	Events
1887	Michelson-Morley experiment
1905	Special Relativity proposed by Einstein
1905-15	Formulation of General Relativity by Einstein
1916	Prediction of Gravitational Waves (GWs) by Einstein
1955-70	Understanding the nature of GWs
1974	Discovery of Hulse-Taylor binary pulsar
1984	LIGO founded
1999	LIGO inauguration ceremony
2006	LIGO design sensitivity achieved
2011-14	aLIGO installation and testing
2015	Detection of GWs by aLIGO

References and Links

[1] The LIGO web-pages are located here

[2] Videos of the announcement can be found here

[3] For a discussion of gravity and GR aimed at a general reader, see, for instance, B. Schutz, Gravity from the Ground Up (Cambridge University Press, Cambridge, England, 2003).

[4] For undergraduate level texts on SR, see, for example, A. P. French, Special Relativity (W. W. Norton, New York, 1968) and E. F. Taylor and J. A. Wheeler, Spacetime Physics: Introduction to Special Relativity (W. H. Freeman, San Francisco, 1992).

[5] For an undergraduate level text on GR, see, for instance, J. B. Hartle, Gravity: An Introduction to Einstein's General Relativity (Pearson Education, Singapore, 2003).

[6] For a historical account, see, D. Kennefick, Traveling at the Speed of Thought: Einstein and the Quest for Gravitational Waves (Princeton University Press, New Jersey, 2007).

[7] An animation that explains the concept of the interferometer and illustrates how the

interferometer is expected to respond to an incoming GW can be found here

[8] The aLIGO web-pages are located here

[9] A detailed time-line of LIGO can be found at here

[10] The announcement of the detection of the gravitational waves and the technical details of the associated analyses appeared in: The LIGO Scientific Collaboration and The Virgo Collaboration, Physical Review Letters 116, 061102 (2016). For a more popular account, see E. Berti, Physics 9, 17 (2016).

[11] The signals detected by the two observatories and a comparison of the two observations can be found, for instance, on this page

[12] In an interesting animation, the GWs from two inspiralling black holes have been converted to sound waves. To 'hear' the 'sound' from inspiralling black holes, see this.

[13] For a simulation of two inspiralling black holes and the resulting GW waveform, see the video here.

[14] In this context, see, for instance, J. M. Weisberg, J. H. Taylor and L. A. Fowler, Scientific American 245, 74 (1981).

[15] For detailed technical analyses, see, The LIGO Scientific Collaboration and the Virgo Collaboration, arXiv:1602.03841[gr-qc].

[16] The LIGO Scientific Collaboration and The Virgo Collaboration, Physical Review Letters 116, 131103 (2016)

[17] See this page. Also, see the recent article T. Souradeep, Resonance 21, 225 (2016).

SE1010: Introduction to Student Elections

NAOMI KARYAMSETTY

Are you a concerned member of the student body, wondering about the upcoming institute elections scene? Are you skeptical about the elections, maybe feeling like there's no point in exercising your right? Do you even know insti *has* elections? If you answered 'yes', 'yes' and 'no', or a combination thereof, I think you should read this article. (But then I wrote it—I think everyone should read it.)

(Warning: jargon-intensive sentence ahead.) The Institute General Elections is an annual event where the general student body (GSB) elects representatives to the Executive Council (EC, insti-wide representatives) and the Student Legislative Council (SLC), which consists of representatives from each department and hostel. (Phew. Insti obviously has a thing for contractions.)

Important links:
– Candidates: Final nominations
– Manifestos: bit.ly/InstiManifestos
– SEC Campaign Rules
If you see any rules being broken, tell T5E on the Anonymous Tip Line: bit.ly/T5EAnonymousTipLine

Important Dates and The Election Process

Elections to hostel councils had been postponed—you can read about that here—and are now set to take place on the 24th of August, 2018 (with the elections for Sarayu, Cauvery, and Mandakini withheld for now). The Special Election for the post of Cultural Affairs Secretary (Literary) shall also take place on this date, owing to the fact that the post fell vacant when the elected candidate resigned soon after the General Elections last semester due to personal reasons. Furthermore, the election for the post of Speaker, SLC is set to take place on the 12th of September, for which the electorate are the legislators of the SLC. More information on these posts can be found in thisarticle. You are strongly encouraged to exercise your franchise and participate in this wonderful democratic exercise. The following options are available to you:

SE 1010 INTRODUCTION TO INSTITUTE ELECTIONS

CHEAT SHEET

HOW TO BE A RESPONSIBLE MEMBER OF GSB

1. KNOW YOUR CANDIDATES

READ MANIFESTOS

https://dost.iitm.ac.in

score 10

WATCH SOAPBOXES

of Executive Wing Members

SAC Middle Earth

score 10

2. ENSURE FAIR ELECTIONS

ABIDE BY CAMPAIGN RULES

no PA, pamphlets, electronic media

score 10

REPORT ANY VIOLATIONS

secc@smail.iitm.ac.in
fb.me/IITMElections
bit.ly/T5EAnonymousTipLine

score 10

3. VOTE!

VISIT THE NEAREST VOTING BOOTH

Vindhya, Himalaya, Nilgiri messes, CRC
carry ID card

score 60

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SCORE 60 TO PASS

- Vote for your preferred candidate.

- Abstain from voting (in which case you will be considered as not having voted for that particular post), or

- Reject all candidates, the (in)famous 'None of the Above' option (which means you think no candidate is fit for the post).

'There is no use,' I hear you say. 'Candidates and votes are determined by unfair processes far beyond our control.' In which case, I reply, use that beautiful red reject button. You see, a candidate, even if unanimous, cannot be declared winner if the 'Reject' votes are more than 50% of all non-abstain votes and a minimum of 50% of the total electorate has voted. In addition, instant-runoff voting is followed for posts where there are more than two candidates, so instead of strategically casting your vote, you can vote for the candidate you genuinely believe is better. (More on this towards the end of this article.)

Every candidate has prepared a one-page manifesto and a supporting feasibility report, containing the initiatives they propose to implement. You can access these at the Office of the Dean (Students) website, after you use your LDAP credentials to log in. Candidates are allowed to campaign—convince the voting population why *they*should be elected—from 1st to 12th March. You might, therefore, run into tense people dressed in formals outside your mess or in your hostel quadi. You can also find out more about the Executive Council candidates (what are these? see below) by attending the soapboxes, where candidates present their manifestos and face questions from each other, the current Executive Council members, and students in general.

Candidates are allowed to campaign from 5pm to 11pm on weekdays and 10am to 11pm on weekends, but in-hostel campaigning, in this election, is not allowed after 9pm. Candidates are *not* allowed to use PA systems, pamphlets, or electronic means of campaigning. The only exception to the latter is the SECC-mediated release of video manifestos and posters on digital and printed notice boards, as well as a maximum of two emails per candidate, circulated through s-mail.

If you witness any rules (as stated here) broken, do tell us in this anonymous form: bit.ly/T5EAnonymousTipLine.

Boring Figures about the Candidates

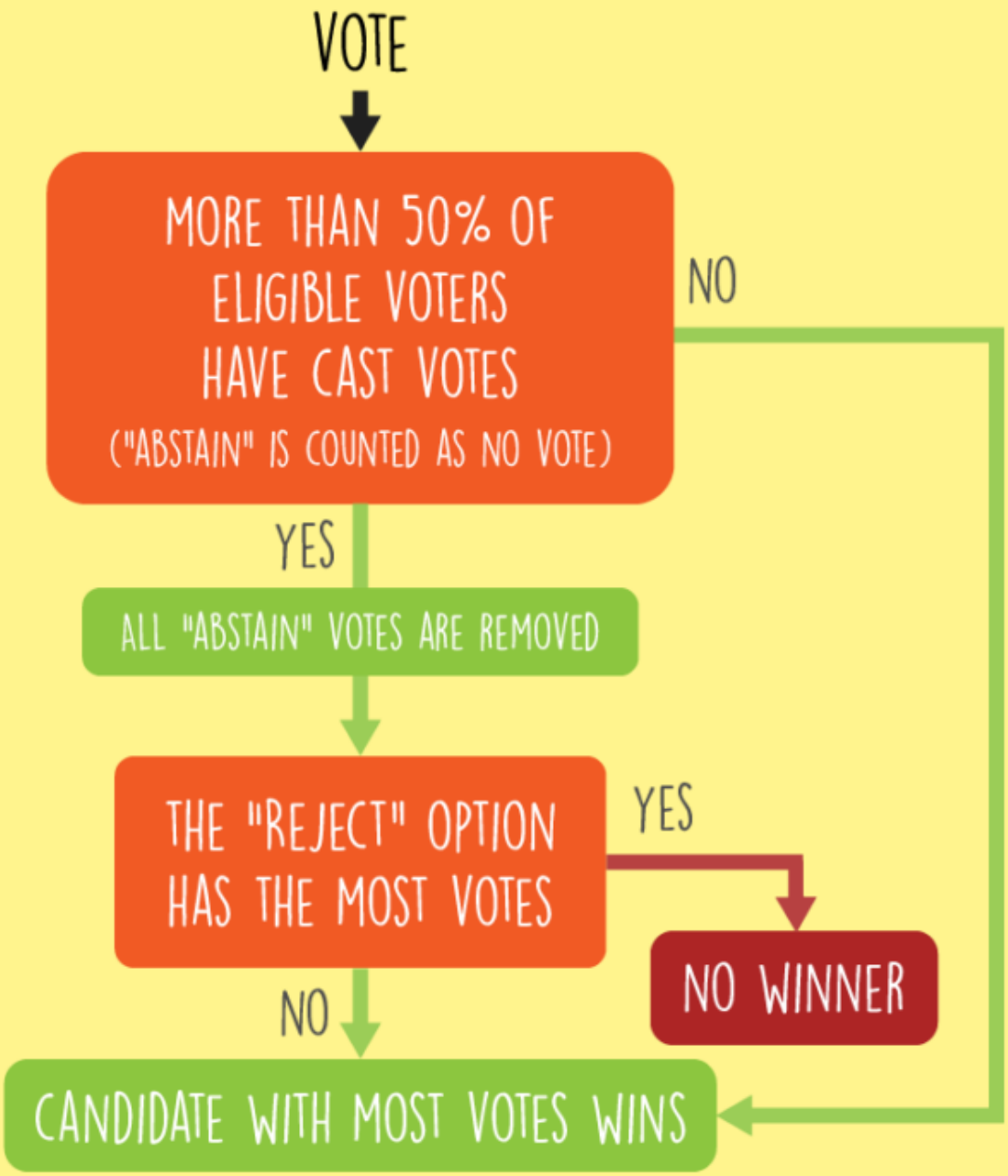
The elected positions to the SLC (Student Legislative Council) are:

- One *Department Legislator*, or Branch Councillor, from each department, elected by all students of the department. Vacant: Biotech, EP and Management Studies. Uncontested (one candidate): Chemical, CS, Elec, Meta, Ocean Engineering, and PhysicsContested: All other departments have two candidates.

SE 1010 INTRODUCTION TO INSTITUTE ELECTIONS

CHEAT SHEET

PROOF THAT YOUR VOTE COUNTS



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This is for posts with one or two candidates. In the event of more than two candidates for one post, instant-runoff voting (see below) is implemented.

- One *Research Legislator* per department, elected by that department's M.S. and Ph.D scholars. Vacant: Chemistry, ED, EP, Math, and Ocean EngineeringUncontested: All departments except BioTechContested: BioTech

- Four *M.Tech Legislators*, elected by all M.Tech students. There are six candidates for this post.

Hostels are represented in the SLC by Hostel Legislators, elected by residents of each hostel. Hostel Legislator elections will take place this semester during the Hostel Council Elections.

The SLC is presided over by the *Speaker*, who will be elected in a subsequent election by the members of the SLC.

The Executive Council consists of the following posts:

- *To be elected by all students:* Students' General Secretary (SGS), Hostel Affairs Secretary (HAS), International and Alumni Relations Secretary, Co-Curricular Affairs Secretary (CoCAS), Sports Secretary, Cultural Affairs Secretary (Literary) and Cultural Affairs Secretary (Arts) (collectively known as CulSecs).

- *To be elected only by undergraduate, M.Tech, M.Sc, MBA students:* Academic Affairs Secretary (AAS)

- *To be elected only by M.S. and Ph.D students:* Research Affairs Secretary (RAS)

The responsibilities of each Executive Council post can be found on pages 25-30 in the Students' Constitution.

Other elected positions are:

- Seven *M.Tech Placement Cores*, elected by all M.Tech students.

- One *Research Councillor* per department, elected by that department's M.S. and Ph.D scholars.

Preferential Voting: Better Reflecting the Majority Opinion

When there are more than two candidates for an elected position, the result can be different depending on the counting mechanism followed. Knowing how this works is especially relevant in context of the three-candidate race for the Hostel Affairs Secretary. Insti elections follow a system known as the *instant runoff, preferential voting*, or *alternative voting system*, which works as follows:

When casting their votes, voters do not simply indicate a preference of one out of three. Instead, they rank all three candidates in preferred order. If more than 50% of voters reject all candidates, no candidate is declared the winner. Otherwise, this is the procedure

followed: The 'Reject' votes are first removed. After this, if no candidate obtains a 50% majority, the candidate with the least votes is removed from the running, and their votes are redistributed to other candidates based on the voters' second preferences. This process is repeated until the required majority is reached

This is a better system than, say, the first-past-the-post system, where the candidate with the largest vote share wins. For example, if Candidate A wins 40% of seats, B wins 35% and C wins 25%, Candidate A wins via the first-past-the-post system. However, A was preferred only by 40% of the voting population. If B and C have similar manifesto points, and if almost all C voters prefer B over A, this result will be unsatisfactory to more than half of the voters. In addition, if popular pre-Election Day gossip is that C is highly likely to lose, and camp C happens to be vigorously anti-A, C voters might strategically shift camp to vote for B just to avoid A coming to power.

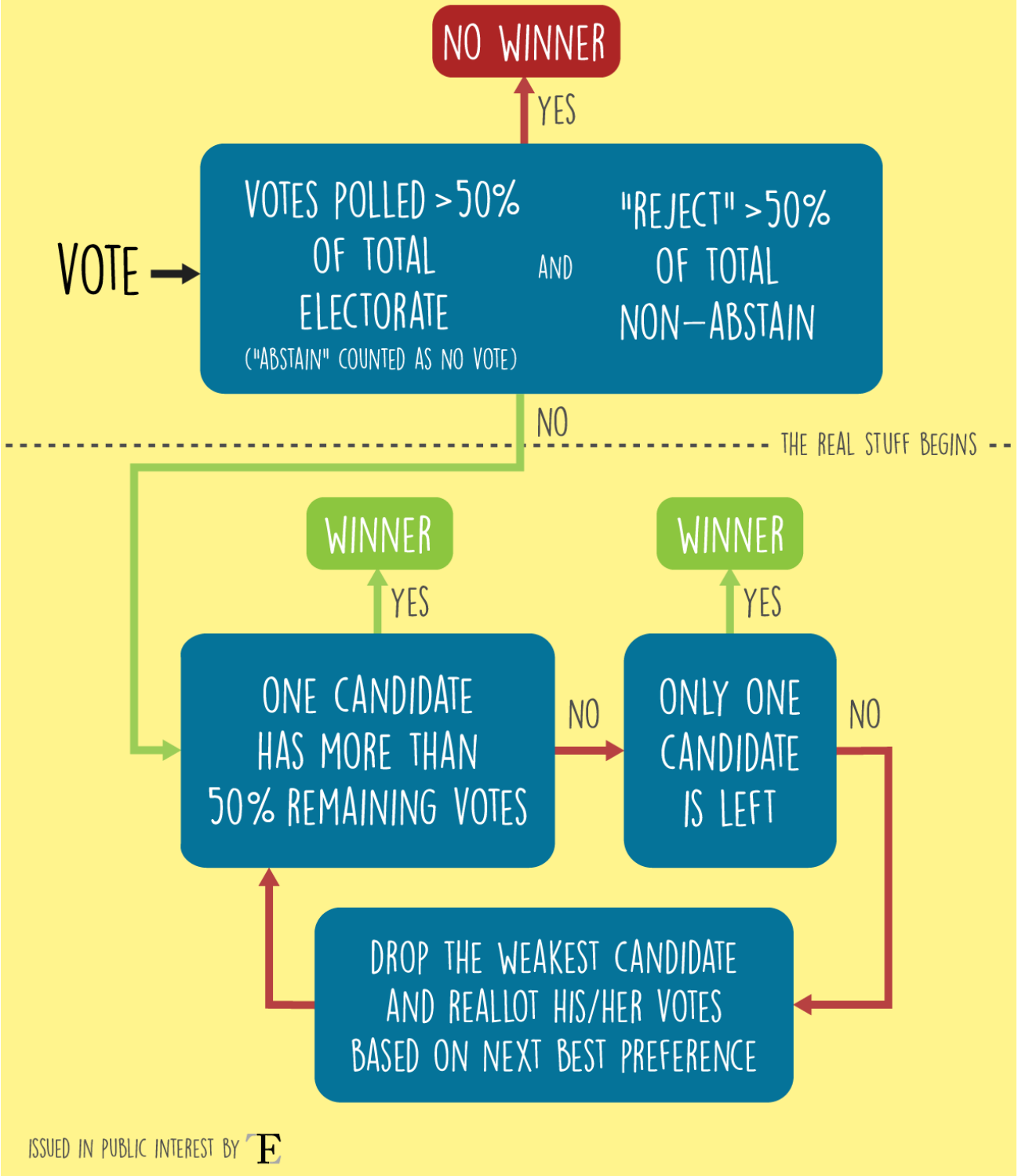
However, through the preferential vote system, voters need not engage in strategic voting, but can reflect their true preference in the polls. C, having the least votes, is eliminated from the running, and the number of C voters who prefer B are added to B's tally (and likewise for A), ensuring a result that better reflects the preference of the majority.

If you'd like to find out more about IIT-M's student government and mechanisms, you can read this T5E article, written way back when the SLC was called the Student Affairs Council. This article is a convenient summary of the Students' Constitution.

SE 1010 INTRODUCTION TO INSTITUTE ELECTIONS

CHEAT SHEET

THE INSTANT-RUNOFF VOTING SYSTEM EXPLAINED



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Personifying Insti: Monkey Business

MEENA CHOCKALINGAM

Gone are the good old days when the air was clean, the earth was green and life was carefree. Ever since these geeks with inflated egos and non-existent tails entered, our life has been hard. And more entertaining.

The other day, just as I was about to retire to my quarters, my baby daddy called out to me, asking me to make it to the third level. I had been in the game for too long to believe his promises of a feast. Even if he were being honest, all that teeth-baring for what would probably be a container of caked noodles did not seem worth the effort to me. I pretended to have a toe-infection and made a dash to my quarters. When I woke up after a few banana hours to start the day with my vocal exercises, I realized that I was alone in my screeching. Putting it down to late working hours and cursing the influence of insti culture on our ancient species, I decided to wait until everything turned light. After the glorious, unreachable orange cake turned everything light and pale, I went to wake my troop-mates up, only to find them huddled in the slippery, stinky room with too many taps. The sight that greeted me is one that I still wear around my neck. I find it difficult to describe just how much food there was without my tails twitching wildly. While I was sleeping, all of them had found an opening and entered a room. It had turned out to be quite big with a few of those irritating creatures inside. My troop-mates had started straining their vocal cords to evacuate disturbances when they realized that it was not necessary. The foolish beings were sound asleep and did not move through the entirety of the hunt. And oh, did they find a feast!

Out of pride, I refused to grab the food and found myself some fruits from the sun-drenched trees. While we take food from rooms, shops and from those who flaunt it on the roads, the trees remain my favourite source for food and space for dining. Peaceful, spacious and far from the reach of those bespectacled creatures, joy lies in munching on leaves and washing it down with Kaapi Nirvana. My parents keep insisting that we are meant to eat leaves, flowers and fruits and that we should stick to that. We have vegetarian teeth, apparently. Chomping on insects and spiders, I feel like quite the rebel.

When the orange cake turns very orange and the trees start sagging with fruits, every day is a harvest. One of my favourite summer activities is to climb those delectable, rooty banyan trees and munch on fruits, while dropping some for the branch horned

friends gathered below to eat. If only the weird, two-legged humans would be symbiotic enough to do the same for us. They leave food for those loud barkers and swift meowers all the time.

In any case, my grandmother has taught me ways to survive in this tough world. I can gather a lot of food very quickly. I have quite mastered the art of storing food in the pouch in my mouth and chewing it later, in safety. While these are important achievements, nothing beats the sense of pride I derive every time I knock on a two-legged creature's room and trick it into creating an opening. They really are quite stupid, those humans.

Being a monkey in a man's world is hard. Being shouted at and pelted every day is not very enjoyable. But every time I am reminded of the fact that there are people whose life mission is to chase me or when I get my hands on a 12-inch corn and cheese pizza, being a monkey seems to be worth it.

Humans of Insti: Prof. Balaganesan

PRANAV BHARGAV

We've all attended (freshies still are), often grumbling, the rather annoying Workshop Training Session "offered" by our institute. But how much do we really know about the man responsible for the winter hullabaloo? Or anything else really, about what the Senior Technical Officer in IIT Madras (yes, that position exists) has to deal with managing a workshop as impressive and humungous as ours? Read on, and find out what it is Mr. G Balaganesan does for IIT Madras.

How did you come to be working here, at IIT Madras?

I initially applied for this position after seeing a newspaper ad. The advertisement was for the position of "Senior Technical Officer" at IIT Madras, and they were asking for basic qualifications and extensive experience in various activities like welding and the other things you see in the Workshop. This was in 2005. Back then when I started working here, this was the third highest post in the hierarchy. But a couple of years ago, the management and the technical sections were divided and currently this is the highest post on the technical side.

What led up to this job?

I had around 12 years of experience before coming to work in IIT Madras. I had worked in KCP Limited, one of the largest cement and sugar plants in India, for almost 10 years as a technical advisor. I did my undergraduate during that time, from 1996 to 2000, at Institute of Engineers, India. Following my undergraduate degree, I attempted GATE in 2001 and was admitted to the Mechanical Engineering department at PSG College of Technology, Coimbatore. I also worked as a lecturer at AMET (Academy of Maritime Education and Training) for 2 years. I have also patented a BEE Certified Energy Auditor.

After listening to this rather diverse list, we were naturally curious as to how the work culture at IIT Madras is compared to all the other experiences he has had. Do we live up to our name?

I have had many wonderful experiences at IIT Madras since the past 12 years of working here. I completed my PhD here, in the Aerospace Department in 2013. I did this along

with my regular work in a matter of 5 years. Speaking of the Workshop, it is one of the biggest workshops I have seen. I have seen NTU's and Chung-Ang University's Workshops, and our workshop is much larger, and our safety standards are also higher. At IIT Madras, we give a lot more importance to this at an early stage. In other institutes, such training is given only at a later stage, and skills like welding are only taught to Mechanical and Electrical students. Even our Computer Science students have some basic knowledge of all of these.

In 2014, the institute introduced the Trailblazer award. I was the first person to get the award in the Technical side. It was a proud moment.

At this point, he casually slipped it to us that he owns a start-up. On being incredulously asked about it, he laughed it off.

It is no big deal! It was a company me and some of my friends started many years ago. It's called PGF Energy Technologies. It's for energy audits for various companies.

Now, this is the second time he's mentioned energy audits, and since we don't have the slightest clue what they are, we proceed to ask him.

What are energy audits? Could you tell us a bit more about them?

Energy audits are ways to analyze or measure the power consumption in any system. The efficiency of various processes is calculated. We can suggest modifications or changes to conserve power. It is, simply put, an approach towards energy optimization You can conduct this at your home too if you please.

We asked him if he had any complaints about the funding or general running of the Workshop. He replies in the affirmative, and proceeds to list a few surprising ones

Funding is generally not a problem, we received 5 crores from the management in 2011. This was the year we introduced the CNC machines and started training our staff members to use them. But the problem I have is that a lot of campus students and people whose research requires materials from the workshop are still going outside the campus for their requirements. We are only producing 50% of the demand. Currently, all staff members work 8 hours a day, 5 days a week. That is 40 hours. I propose a change to 80 hours a week for all of us.

Let's take a moment to pick our jaws up off the floor. He says this enthusiastically. What a man! So crisply explained, we thought he would make an excellent professor.

There is another reason this will be useful. The CNC machines which we bought require constant use for the first few years, which, right now, is not happening.

What is your daily schedule in the Workshop?

My work timings are from 8 to 4 on all weekdays, and I am very punctual, I arrive at 7:45 am without fail. We get a huge list of requests for manufacturing parts of machinery from many people inside and a few people outside the campus. I do the designing work for the complex ones, and oversee the manufacturing for the rest.

In the last few years, we have started manufacturing complete products along with parts. For example, the last few months I have worked on a vegetable chopping/ shredding machine for Owzone, a waste management service in IIT Madras. For buying such a machine outside, it would have cost them 1.5 lakhs. We considerably reduced the production costs of the product.

Is there any teaching work that goes on in the Workshop?

Yes, of course! A lot of it. In 2006, I initiated an Apprenticeship training program here to teach Diploma and ITI students. We have been conducting a year-long coursework, but I am proposing to increase it to 2 years, and the senior students can help us in the workshop and train the newer students too. They can also keep the CNC machines running when staff members are unavailable.

We have a Workshop training course called "Engineering is Fun", where we give demonstrations to school children on the campus. In 2014, along with the Dean of Students, I extended this program to the students outside campus as well. In the last year alone, we have trained as many as 400 rural and suburban area students completely bearing all the charges.

How are you planning to improve the functioning of the Workshop in the future?

I am currently petitioning for funds to buy a number of CAM machines to help with coding for the CNC machines. They will make the entire process much more efficient. When these CAM machines are finally introduced, I will include them in the Workshop training sessions which we offer campus students.

To keep up with modern methods, and to train our staff members in the use of CAM and CNC machines, we send them to ATI Guindy. They attend a few courses there and return. Our production has increased a lot in the last few years.

Do you have any advice for the students?

He chuckles awkwardly before replying.

I don't think I can give our students any advice which they don't already know. Although I do feel that they need more hands-on experience than they are offered now. Students should enthusiastically participate in CFI projects. Many colleges do not offer such an opportunity. You people should make good use of it.

Humans of Insti: Krishna

STANLEY GABRIEL

The following is an exact account of a housekeeping messenger in Ganga Hostel as narrated to Stanley Gabriel. A few dates and names have been changed keeping for anonymity. However, the sequence of events and their elaboration was altered for the interest of the readers.

'It took me a rather short time compared to the rest of the world to learn what I know about love, fate and the choices we make, but the heart of it came to me in an instant while I was locked up in a cell and was being tortured. But in the flinch and bite of the rod when all you've got is a pair of handcuffs and a lockup, you understand what unconditional love really means and that freedom is a universe of possibility.

I was born and brought up in a typical Indian village. My house was along the rich and fertile lands of the river Godavari. My father had one and a half acres of rented land from the landlord Devaraju, the richest person in our village. We grew paddy during Kharif and maize for around three months, the remaining three months both my parents worked in construction sites on a contract basis. From the window in my house, I could see men working in the fields in white dhotis and turbans, womenfolk in bright colors against the green background of paddy fields draped like a saree covering our Motherland that almost seemed to inhabit a magical painting. Everywhere people were engaged in some activity which had a rhythm and tranquility about it, men driving cattle, women fetching water from the streams and my friends playing barefoot around the colony. It was the year when the US launched a war on Iraq, finally when the news came that Saddam a tyrannical dictator was captured, it headlined every newspaper in my village.

I was seventeen then and my Dad was fed up of my poor performance at the school and also my lavish spendings of a rupee a day at the movies. He decided to send me to my Uncle who lived at the then capital city of Hyderabad so I could find some work and not be a burden to my family. As I walked through the umbilical corridor joining the railway platform and the city, I was excited and delighted by it. It was the city where I found the struggle of survival, crucial failures that produced the courage I have today and heartbreaks that defined my love.

After a week's time at my Uncle's house, my Aunt boarded me on a bus which was supposed to take me to my Uncle's place of work. The bus was close to full while the driver turned in his seat and scowled at the back menacingly, spat a jet of vivid red betelnut juice through the window and sped away. The engine roared, gears meshed with a growl and thud, through crowds of pedestrians and tall buildings with shining windows. In that rush and hustle, I forgot the place I had to get down. It was not until I saw the same skyscrapers again did I realize I missed my stop. I panicked from my gut. My palms began to sweat. The bus honked to and fro all through the evening until I could see a faint glint of moonlight on my window.

The conductor politely asked me to get down. He explained this was the last ride for the day and the bus wouldn't go any further.

"Do you know the place you should go to?" , he asked in a rather warm-hearted tone.

"I f-f-forgot!", I stammered.

"Did you eat?"

Till this day I never forget those three fistfuls of rice balls I ate or the conductor that fed me. The following day my Uncle threw me out of the house as he found out I was a fit for nothing lad who couldn't even get down at the place I was sent to. I didn't want to go back to my village as the same loser shithead I was. I worked in hotels cleaning tables and toilets at local restaurants for a day's meal. I slept on curbs with people who had wounds rotting to their bones and maggots lying everywhere. The suffering was indescribable. It was unceasing. As days passed and I had no work to do I ate what was left of the plates fed to stray dogs. I woke up one day with curry dripping my beard, rice mashed into my black fingernails and chicken spattered on the ground below.

I cried till I could no more. I went back to my Uncle, borrowed a sum of one hundred rupees as a public statement that I would repay him by the end of the day. I sold tea, biscuit and cigarettes outside the cinemas at midnight. Nights turned to mornings, my bicycle turned into a Luna, and soon I was making five hundred rupees a day that profited close to a hundred. It is not having too little, it is craving which makes a person poor. On a particular night, my Uncle came to me and asked how I was able to earn more than what he did in such a short while. He had his fair share of doubts if I was into gambling or selling marijuana and such sorts. He was not all too wrong for I was a shithead who invested in cigarettes which I thought was easy money.

The next morning was my day of reckoning. A time I thought my life had almost ended. I was put inside a lockup on charges of sexual assault on a girl and of dumping her right behind my regular spot of selling smokes. Like any other young guy growing up, I wanted to run away from all of this and hide. Life had a different purpose for me. I was tortured for three days in a cell to accept the atrocity done. Of raping a girl and dumping her right behind where I almost spend every single minute of my day at! There was a

constable who regularly scared me away for selling late into those nights. I would bribe three packs of select Dunhill cigars and timely teacups to let me be. He knew the timid coward inside me. It was to be proved three days later I had no connection with the crime and that all the accusations were false.

On the night I was left chained in the lockup all I was left with were my handcuffs and the lockup. As a stark incandescent bulb flickered right above me I understood that freedom is a universe of possibility and what unconditional love truly meant. Whenever human beings find themselves alone, as a natural reaction, they start looking for company. Whenever they are in trouble, they look for someone to help them. Whenever they reach an impasse, they look to someone to show them the way out. Every recurrent anguish, longing, and desire finds its own special helper. But that night when the bulb went off, even my very shadow left me. This event changed my outlook of life forever. I realized love lied at the heart of one's own survival. That nobody and nothing in this world would ever come to your aid in times of distress. That happiness and freedom are the crux of solving problems, but not in avoiding them!

I later moved on to GMR constructions in building the Rajiv Gandhi International Airport at Shamshabad. I was a site worker there. I slept in a 6-foot x 6-foot cubicle elevator space with high-intensity power running along its wiring lines. After a month I moved to Chennai for a better offer. I am now married with a daughter. I plan on going to Mauritius as housekeeping staff. The pay there is triple of what I get here. My name is Krishna and I may not be all too right about the philosophy I live with, but this is the life that I know of.'

A Shark's Tale

ABHINAV GOPAL

Abhinav Gopal, a Dual Degree student of Biotechnology who just finished his fifth year, chronicles his journey with the IIT Madras Aquatics team, aka the Madras Sharks. Known popularly as Tokas, Abhinav was awarded the medal for Best Outgoing Sportsman, IIT Madras, 2013–2014.

The Beginning

It was June 2009. I had just received my JEE counseling brochure. My eyes anxiously scanned it, looking for mentions of the phrase 'swimming pool'. A few hours later, after a lot of research and after comparing the pool facilities, I had arrived at my final choice: IIT Madras. Along the way, I found out about its decorated and glorious past. Our sports culture, the best among the IITs, had led us to 17 General Championships (till that point). Further, we'd been crowned champions in the 2007 and 2008 Inter IIT water polo tournaments, and I was excited and raring to join the team. Given my swimming history and experience, I was confident about being selected.

Roll call sessions (extinct now!) had just started in hostel. To my great surprise, I had been allotted Jamuna, the most Schroeter-decorated hostel. I was just *waiting* for the sports fundae session so that I could put pseud in front of my hostel mates. During the session, I acted humble and described my achievements in sports. I had a discussion with one of the team's legends, Sahaj (Gujju). He enquired about my lap timings and called me to the pool the next day to take my timing.

The next morning, when I jumped into the pool, it was after a gap of two years. My excitement and Gujju's expectations nosedived after I barely finished 50 meters in full composure (my worst time ever). NSO selections were the next day, and my nervousness touched new heights. I gathered whatever confidence I had left and stood behind the starting block, looking at the other end. It was my only chance to prove myself. I finished first, and there was an immediate buzz about us having a 33 seconds swimmer this year. That was my first taste of recognition. I was called for institute practice, and I thought that the difficult half of the job was done. *This is IIT, practice won't be that*

rigorous and difficult, I told myself.

Taking Shape

Institute Practice: Entering the depths of the pool, I dived into the realities of passion for sport. Four swimmers were faster than me, and almost everyone had more stamina. My estimate of my chances of making it to the team had dropped exponentially. After finishing our workout, I was asked to pass a waterpolo ball thrown at me. I couldn't even hold it — God knows why, it slipped every single time I tried. On the other side, players were passing it around as if they had spider limbs. I had gotten my reality check. Then, my intros began and I was introduced to some legendary players. like Tattu, Chutta and Prabhat. Tattu — the most respected Inter IIT sportsman — was the biggest inspiration for us.

Only the next day, when Chutta (the captain) called me and woke me up, did I realize that he was serious about 6 am morning practice. When I reached, the entire team was practising and my punishment for coming late (!) was swimming an extra 200 metres. We needed to attend classes too, and we had just entered insti. *Hey, give me some time to relax! I had to put BC (from BT) fight too. I couldn't go this regularly.*These thoughts constantly swam through my mind. But the fame, the team, the culture, the fun and most importantly, the passion, influenced me and I decided to work hard and continue. My timetable became fixed — 5:30 am go to the pool, come back at 7:50 am sharp and attend 8 am class. Finish classes by 5:30 pm, report at stadium by 5:40 pm, finish the overall workout by 8:30 and have dinner. Spend the next few hours 'trying' to mug and sleep.

What were the consequences? I became invisible to my wing mates. Shaastra volships became petty. All my energy was directed towards the single point agenda of getting into the team. I slowed down, I improved, I was punished, I practiced and I swam as much as I could. Finally, I made it into the team and the main seven.

My First Inter IIT

The train journey is the most memorable part. You get to know every other player in the team — you argue, debate, share, hate and in every condition, they always stay your team mates. Once we reached Kanpur, the first match was against the host, IIT Kanpur. The entire pool was surrounded by their supporters — shouting, sledging and hooting. We were leading 3-2. I got free and got a one-on-one chance against the goalkeeper. I took the shot. It went in! The next thing I remembered was gasping for breath with my team mates jumping on me. I had just scored my first Inter IIT goal in my first match! I did it on my own — I got free on my own, dodged my defender and scored! (Actually, not quite — it was Tattu who had held my defender so that I could get free.) Nevertheless, the wheel had started turning. We lost that match 5-4, thanks to the host referees. Their level of partial refereeing was openly criticized and various meetings were held. The next match was very important and we had to win by a big margin. We beat Kharagpur 13-6, with Tattu and Chutta completely dominating the game. We reached the semis.

Things were looking good. But as we returned from dinner, my stomach started aching. I could barely walk. Five out of our main seven players, including me, were down with diarrhea. We were soon on hospital beds — on saline, with no energy even to walk. Spurious sandwiches, affecting more than 400 students in IITK that day, had been the culprits. We had no idea how to play the semis against Bombay. We decided on something unheard-of in Inter IIT history (or even world sports' history, I should think). We all decided to play. Tattu's famous speech got us moving. Going against the doctor's advice, we took out our saline drips and literally dragged ourselves to the pool. It was the first time I was audience to such a display of passion for sport. We played in style and we won, 7-5. We were out of our senses. We just saw the ball and the goal posts. Every single person in the pool was awestruck. The IITB coach said, "We had lost half our confidence when we saw you guys entering the pool".

We were denied re-admission in the Institute hospital. We couldn't play the finals (against Kanpur, no surprise) in our full strength but won silver. The experience made me realize that passion can take you beyond your limits. I vowed to myself that I would carry this legacy forward at any cost.

On my Second Inter IIT

The next year, Tattu graduated. Chutta decided to not to play due to final year commitments. I was going through some tough times. While I practiced consistently, I was forced to quit at the last moment. I couldn't help it. The team was depleted and our morale was down. It was new with little experience.

The Inter IIT was held in Roorkee. That Inter IIT saw the budding rivalry between Bombay and Kanpur. Their group match was dramatic. Mayank Gupta from Bombay scored ten goals alone to annihilate Kanpur. We reached the semifinals but lost to Kanpur in a tightly contested match.

Every Inter IIT gives birth to new heroes. This time another, Krishna Rao, came into the limelight. Playing against Bombay for bronze, we were trailing in the last quarter. He came and he scored two goals in a row from 'zero angle'. With two minutes to end, this lean small guy won us the Bronze. Mayank was totally helpless in front of Ishan, our central defender. Ishan (Hoby) is regarded as one of the best defenders that Inter IIT has ever seen.

It is worth mentioning that this Inter IIT saw the rise of IITM women's swimming. Poorna Kumar, the new entrant, single handedly took her team to Bronze.

We Lose the Pool

The next year, I was given the responsibility of captaincy. Without any experience and having played just two Inter IIT matches, it was a herculean task for me to carry forward the legacy. Just as things were becoming difficult, our luck gave us another big blow. Our pool was shut down. We had to practice at a completely unknown place eight

kilometres from the institute. We only got overcrowded lanes prone to accidents and collisions. Fortunately, we got the diving pool to practice waterpolo. But we had to practice shooting without any posts — the pool had no floating goalposts. It was also too small. Time had become a huge constraint — we spent more than two hours every day just to commute, effectively giving us 45 minutes for practice. We couldn't even follow our swimming schedule. And without a coach, practice wasn't structured.

We got another shocker the night before leaving. Prabhat, our most experienced player, had to cancel his participation, which took a toll on our confidence. Last minute cancellations had started to become a norm in our team.

Inter IIT 3.0 — The Black Chapter

We reached Kharagpur fit and confident and beat Guwahati 17-0. The next match was against Kharagpur. Their team had improved immensely under a new coach. We drew first blood, but the lack of a coach and experienced players undermined our strong position. We succumbed despite our five fast swimmers. Kharagpur effectively utilized the rules under their coach's guidance. They depended on him so much that even shooting required his shouting. That defeat opened our eyes to how fatal it was going in without strategy — talent was not the only thing that mattered. We reached the semis, where we were up against our old foes Kanpur, whom we had not defeated in the last two years. It was a low scoring, tight match, tied at 2-2 until the last one minute.

I remember vividly those last 20 seconds when the ball was in their possession. Their central offender was struggling against Ishan throughout the match, and then he somehow rotated his arm and got the ball past him, and past the goalkeeper. Our dreams and confidence were shattered in that moment. We were out. That day I went completely blank, unable to digest the defeat. The wholehearted practice, endless hard work and effort had been fruitless. The last moment kept playing in my mind. We felt completely helpless and only somehow gathered our confidence the next day. The match for third place was against Kharagpur, who were outplayed by a brilliant Bombay in the other semis. We deployed a defensive strategy which was blown away in the last quarter. Even after a tied score of 1-1 at the end of the third quarter, we lost.

This was the first time in history that we had not finished on the podium. This Inter IIT was regarded as the black chapter in IITM aquatics history. We faced a lot of criticism after coming back to insti. We had broken our promises.

Making a Fresh Start — the Tamilnadu Senior State Waterpolo Championship

The next year, there were no promises, only hope. We started afresh. We got to know about the Tamilnadu Senior State Waterpolo championship, and decided to participate. Just before it began, we were introduced to our new coach, a former national waterpolo player from Kerala. We were the underdogs. The image of IIT was that of a team of nerds who could just about pass and shoot. The first match against an inexperienced team of

national level swimmers was our toughest challenge. We were out-swum but their inexperience gave us the way. We scored three goals in the last quarter to win by 7-3.

In the semifinals, the team we played against included our coach. We cruised until the second quarter till Coach decided to play offence. Within no time, our lead was nullified, with Coach engaging in power shooting. We collected ourselves and started shooting with more confidence. Our luck and hard work blossomed at the right time — we won 9-4! The final match was not as difficult as the others. Our offenders were high on confidence. We all took our chances to shoot and won 11-1. We were on cloud nine, completely filled with happiness, confidence and pride. We were the Tamilnadu State Senior Champions!

This was just the beginning. Our new coach started an intense, rigorous training for us, concentrating mainly on our goalkeeper, Devanathan. We learnt to organize ourselves in the game and were developing very strongly — day by day, session by session. But our history has never been smooth. Every year it promises to twist and turn. All the accidents I was worried about, happened. Hoby, our defense wall, broke his thumb and we had no one but the pool to blame. It was just a week before the meet. He was out of the tournament.

Take Four

Roorkee welcomed us with cool weather. Our memories of losing to Kharagpur were still raw. The first match against Kanpur was drawn 3-3. Once again, we had lost the opportunity to break that talisman against Kanpur. But we had just started to warm up. We routed Guwahati 14-0 in the next match but failed to sense the coming danger — we were playing host Roorkee in the next match, but did not expect any resistance from them. They outplayed themselves and with great aid from the host 'support', they matched us shot for shot. Their various advantages were efficiently blunted by our Devanathan. The score read 2-2 until the last one minute.

Heartbeats skipped their normal pace as we remembered the last year's semis against Kanpur. But this time was ours. This time, I scored the last 30 seconds goal and there was pin-drop silence in the pool. Everyone was disgusted by the refereeing standards, reminiscent of the 2009 Kanpur Inter IIT. Kanpur was terrified after the match because they were playing Roorkee the next morning. This Inter IIT saw, for the first time, a team withdrawing from the match after being stopped after just two minutes of play. Kanpur withdrew, bowing out because they couldn't take the 'penalty blows' from Roorkee.

This was the match we all were waiting for. You can call it revenge. We knew it was coming. The semifinal against a team which had beaten us twice last year, Kharagpur, was standing in the path of our glory. The score at the end of the first quarter stood at 0-0. We assessed our position and decided to unleash our full strength. Turning aggressive, we scored five goals at a trot. Each one of us took turns to humiliate the opposition. On one hand, there were back shots from me, missiles from GPS, lobs from Krishna,

'skipping' from Anand and smarty by Sahaj. On the other, there was Suraj (Gullus) standing like a wall and our great goalie Deva. We trashed Kharagpur.

During the first half, the score was 3-0. In the next half, we scored eight goals against a loner by Kharagpur to take the game 11-1. GPS, one of the most ferocious players in the Inter IITs, regained his form. Anand started finding his shoots inside the goal. Our central defender Suraj (Pie Guy) stood there so firmly that KGP's central offender punched him in an attempt to keep him out of the game. But he continued playing, even with his swollen cheeks. Every player was showcasing his talent. This match had shown us what we were capable of. Our talent, which I believed was above and beyond the level of any other Inter IIT team, had been translated into the greatest shark tale of all time.

Recognition At Last

The members, players and coaches of other contingents came to congratulate me, praising my efforts and shots, but the biggest compliment was yet to come. A Roorkee alumnus from Tattu's time compared my skills to Tattu himself. That had been my dream since I had started playing for insti. I remembered my vow that day and felt like I had lived up to it. I was the happiest person there that day. I felt like we had finally come out of the shadows of those legends.

But the promise was not fulfilled; the final battle was yet to be won. Bombay had made it to the finals for the second year in a row. They were strong but we were confident of our victory. They scored first, but we never allowed them to shoot freely. Traditionally, the fourth quarter had been our strongest point. We had been known to play with the same speed and stamina as the first quarter throughout the match. At the end of the third quarter, the score was 4-4. And then, in the fourth, we scored two goals. It was showtime for Deva's goalkeeping skills. Mayank Gupta from IITB, of the 2010-11 Inter IIT fame, tried everything he could to get through Deva, but in vain. Deva was the hero of that match. People came to him and kissed his hands, for the level of goalkeeping he had shown had never before been seen in an Inter IIT. One man was silently watching all of this take shape in front of him — the creator, the artist: our coach, Sunny Mathews.

The Dean himself welcomed us at the main gate. We had regained the respect we had lost. Congratulations were pouring in from all directions. Still, our names had not been written on the memory stone of the Inter IITs or the history of aquatics at IITM. To wipe out the memory of the last Inter IIT, we needed something more. The swimming podium finish had eluded us for more than four years. We couldn't even complain because our pool had been under renovation all this time. Sunny sir continued coaching us. Most of us were final year students so we spent as much time as possible practising. We were aiming to win 20 points this time, which had never happened in the history of IITM aquatics.

My Very Last Inter IIT

Guwahati, the most beautiful campus I have ever seen, was drenched with heavy rain. It was chillingly cold, the ideal weather for waterpolo. We faced Delhi in our first match, which was a cakewalk (16-2). Next came Kharagpur, the team we had humiliated the previous year. They were new and inexperienced but spirited. Though they put up a good fight initially, our experience prevailed in the later stages of the match. We won 5-2. I tried something which had never been tried before in an Inter IIT — going underwater from our half to the other half and getting a free shooting opportunity one-on-one against the goalie. It was our fifth goal.

Even as the waterpolo triumphs were taking shape, old Inter IIT swimming records were being buried deep underwater. Akshay Krishna, our own Torpedo, was on a rampage, breaking record after record. Being a member of the relay team, I too got an opportunity to write down my name on the record sheet. We broke the 4*100 meters freestyle relay record.

However, we had not forgotten our four-year old talisman, yet to be broken. It was still fresh in our minds; Kanpur was our rival in the semis. Those defeats in the Kanpur and Kharagpur Inter-IITs and the draw in Roorkee motivated us every single moment. The match started with high intensity. Kanpur scored two goals in succession after we missed several opportunities. Everyone in the team was concerned after the first quarter. I started thinking of the jinx again, but there was some confidence, some motivation. When I looked at GPS, we both laughed like predators that have given their prey every chance to escape. The predators had smelt the win. We came back and leveled, and then started leading. We never gave them the chance to lead again. The last quarter, our Mecca, saw us leading by three goals. We sealed the coffin and hammered in the nails. We had broken the the jinx. We had won 8-5. We were in the finals once again.

Coming Full Circle — A Golden Double!

On the swimming side, riding on Akshay's victories, we were cruising towards the swimming championship. But Kharagpur had other plans. Famous for creating swimmers whose reserves never got exhausted, Kharagpur had had an amazing run. They were winning podium positions in every other event. To our complete surprise, on the final day, they were tied with us. The championship came down entirely to the results of the last race — the 50 meters freestyle. We had our 'missile' Krishna Rao in the 6th lane and KGP had their fastest in the 7th lane — and Krishna Rao won us the swimming championship by bagging silver! We were all beyond ecstatic that we had won the swimming shield after a gap of more than a decade.

The water polo finals were held immediately after. Bombay, our arch rival in Inter IIT, was on a winning streak, led by Adwit Kashyap. He had single-handedly led his team to the finals. We were sure of winning if only we managed to stop him. We started out

dominant, leading 3-0 in the first quarter, and maintained the dominance throughout the match — at one point, we led 7-2. Our captain, Anand Parikh, continuously swam to and fro whenever he was required, in offence or defence. He played a crucial role in rendering Adwit ineffective throughout the match. We won easily, the final score being 7-4.

This was a special victory — we had achieved something that the history of sports at IITM had never seen. The 'Golden Double'! We had added 20 points to the tally and given a head start to the Inter IIT campaign. We took both the trophies in style and with great satisfaction and pride.

We had earned that victory, with every ounce of energy that we had invested, with every smile despite the numerous lows and tests of patience, and most importantly, with our perseverance. Despite not having our own pool, we never gave up. We swam in crowded lanes. We swam in inadequate facilities. We practiced without the goal posts. We swam our events without their practice but we still improved every single year. We sailed through times of last minute withdrawals. We sailed through times of injury. We got through phases of swimming every moment under scares of collisions and accidents. We travelled ten kilometres every single day — morning and evening. We cycled, we ran, we swam, we played, we got injured, we came back. We deserved each and every moment of that victory.

Thanks and a Final Goodbye

I thank all those who stood by us throughout our journey. Our girls' team had always been there for us. Some people I will never forget and want to thank: Shruti Chandrashekhar — former Spons core — who took care of us like her own family during our gravest times of food poisoning in the 2009 Inter IIT; Roopa Pachak, MSc Chem, 2009 — always made us laugh and was our biggest support throughout; Poorna Kumar — the IITM swimming sensation — for being a wonderful co-captain and a teacher at times; Aparnna Suresh — a freshie in 2011 — for teaching me some life lessons, and last but not the least, Veena Venkat — for being there with the team throughout our four year journey and sticking with us with a smiling face, no matter whether we were winning or losing.

I wish the girls' team the best of luck. They are on the rise and are looking forward to a podium finish next year. All the best, Aditi Malpani and Devika Ghate.

This last para is dedicated to my team-mates, who were like my family. I will cherish those times all my life. I have seen greats like Tattu, Chutta and 1B playing. I have heard Tattu's famous speech about adapting the game according to referees and not criticizing them. I have seen GPS, a monster player, whose shots used to break goalposts, overpowering everyone else. A team together since 2009, our friendship has just become deeper with every year. Sahaj, my greatest mentor, who from time to time advised me and kept me motivated. Ishan (Hoby), who made me what I am today as a player. Your

defensive skills sharpened my offence skills, and your every save made me to work harder to improve. As captains, we saw that black chapter together. Deva, the greatest goalkeeper that Inter IIT has ever seen, was compared to the national keeper by the coach. Your dedication infected us all. Your saves made our shots more precise and accurate. You, as a person made me learn so many things, and as a friend always had my back. Suraj, for making me realize that his defence was better than my offence. Your calmness and coolness got us through tough times easily. Krishna, for being a torchbearer — he led as an example in the front. Jay, for being a wonderful friend, team member and team 'strategist'.

I could go on and on in praise of my teammates. The list is too long. The fact is, each and every one of you has impacted my life in a big way and helped me get to where I am. Now is the time to graduate in peace, assured that we have planted the seeds for the coming future.

Team Speaks: Inter IIT Chess Meet

SOORYA G.

Against the backdrop of sports with sweaty strapping players, chess stands apart in its own niche. This silent cerebral war game often has players breaking into a sweat by the very heat of their scheming brains zipping rapidly as they move polished white and black pieces over 64 squares! Soorya G talks to the Inter IIT team about playing chess in and for the institute.

IIT-M chess team bagged the Bronze at the 51st Inter-IIT Sports Meet this year held in Kanpur. With the team's freshie chessmaster, Shivam Chandak, winning the Best Player of the Tournament Award, let's take a quick look into our whizzes' journey and the state of chess as a sport in Insti.

"When I was in my first year there wasn't even a chess club in Insti" says Nitin M Pai, third year undergraduate and current Institute chess team captain.

Even as a freshie, Nitin scored 6 over 8 in his debut Inter-IIT, leading the score tally of the team.

Every year, Inter-IIT organizing boards dilly-dally about whether to include chess or not. Alleged that it is not even considered a sport event at times, chess's staid and sober appearance doesn't get much fan following even among the Inter-IIT organizers across the country. "Actually, chess was tried only as a trial sport at the Inter-IITs from 2009 to 2011 with Bombay winning all of them, but the organizing IITs refused to conduct it in 2012 and 2013 stating that it wasn't a physical sport", says Nitin.

In stark contrast to IIT Bombay in 2014, IIT Madras's former sports advisor and the organizing committee were reluctant to have chess even as a side event, when we became the host for the 2015 meet. IIT Bombay has had a bustling chess club for many years, while it is only last year that an informal chess club was formed in IIT Madras through the initiative of chess enthusiasts like Nitin. After being denied support from the Gymkhana, the disappointed students took it on themselves to have the event conducted through the chess club.

“We were supported by Dheeresh Chandra (the then General Secretary) and the Dean of Students. A budget of ₹40,000 was passed through the DoST office for conducting it”, said Nitin, expressing his confusion over the objections to playing a world renowned sport. But hard luck struck in the form of the famous floods and eventually spoiled the game in the end.

Last year, the chess club took on the task of rigorous team selection three months before the Inter-IITs. Out of two hundred odd applicants, sixty were selected for the next stage from which nine were chosen. A round robin game among the nine decided the final four that went to Kanpur: Shriram, Shivam Chandak, Nitin Pai and Bala Ganapathy.

Shriram, the sophomore Mechie of the team, recounts to us their gritty training process. All of them have been exceptional players in their school years and had inevitably taken a break for the JEE preparation. Finely coached in the nuts and bolts of formal chess playing, they now focus on developing their own style in the game. Preparation involves going through their personal database of recorded chess games of the Grandmasters.

“If you want to play like Vishy with the white pieces, turn on the database and you’d have 200-odd recorded matches for your reference. But most of them aren’t annotated. That’s when we use books like Bobby Fisher’s 60 Memorable games which he himself comments on.” elaborated Nitin.

All of them agree that it’s absolutely important to attend tournaments regularly to maintain form. Members of the team have attended open tournament sprees during the summer vacations. The club led by Nitin participated in the SSN Inter-Collegiate Chess Tournament and the IIT-M Sports Fest, where they put on a great performance against National level team players from other colleges and stood 4th and 2nd respectively.

But then, when it comes to ranks and tournaments, the team’s freshie player is several notches above most others. 8-times Gujarat state champion through various age categories, ranked among the top 10 nationally in the under 17 competition, and the champion of the international FIDE rating tournament held recently in Ahmedabad, Shivam Chandak is the star player of the club. Initiated into this ultra-competitive sport at the age of six, Shivam’s winning streak continued till the 11th standard when he took a temporary break for JEE. “First sem was quite cool!” he says excitedly. When asked how the Inter-IITs differed from other national tournaments, he mentions the messy aspects of team chess. In team chess, you have to additionally strategize on who plays whom by the way you choose your boards. In a case of meta-chess strategy, IIT-KGP’s team “sacrificed” their weaker teammate to Shivam and managed to score better than Madras. Shivam also emphasises that Inter-IIT chess event was as tough as any other national event because many national players are currently part of their respective IIT teams.”I don’t quite understand why chess is not given equal importance in Inter-IIT”, remarks Shivam on the current state of affairs. Gymkhana is yet to provide the team with a coach and without a single chess clock, the clubmates share the few personal

chess clocks that they have.

“It’s not that we are lacking in talent in any way compared to other IITs; IIT Bombay’s club is regularly trained by an International chess-master”, remarks Nitin who has high hopes for freshies like Shivam and Rajas Chari, a Goa state champion. He says, “When chess becomes a part of the main Inter-IIT, all other problems would be solved and we can even expect NSO to initiate chess. You must cultivate what you are already good at, there’s no point in starting all over someplace else”.

Bala Ganapthy, the current vice-captain of the team, and who had been a strong member of the team from last year, will be taking over as the captain next year. With very many extraordinarily talented chess whizzes in insti striving to give their best in the game – and acing their game – let’s hope that chess gets its due recognition in the Inter-IITs and the institute community in general.

Placements 2015-16: Trends & Statistics (Part 2)

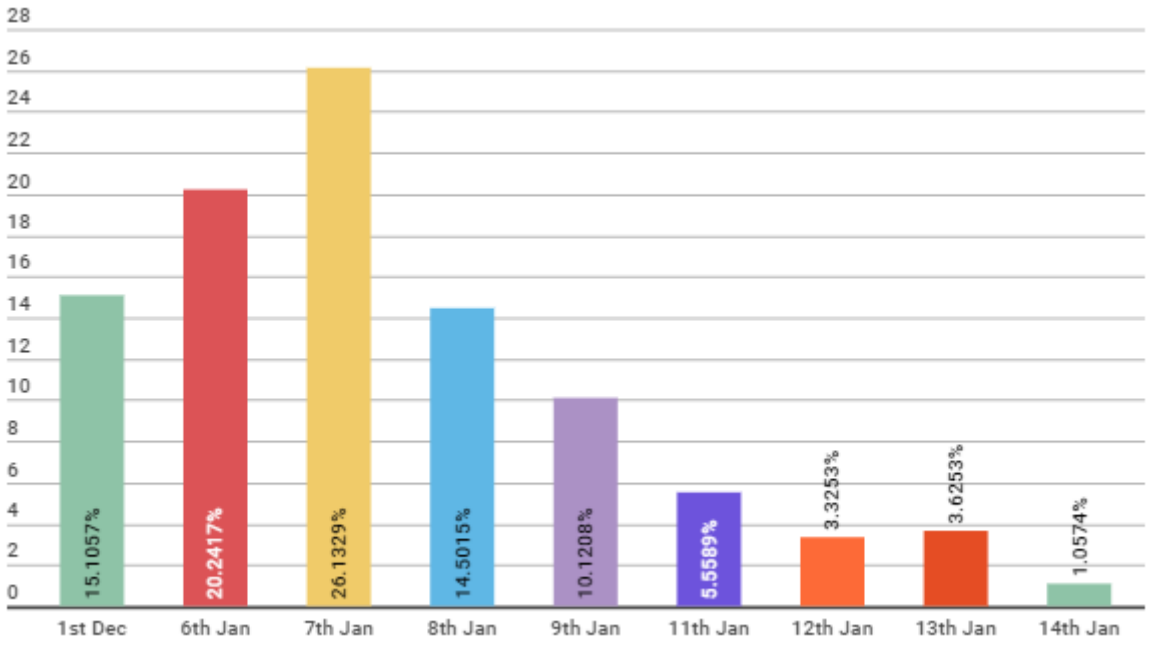
ABHIJIT GUPTA

In the second part of the placement report, we look at sector-wise composition of job offers & profiles, day-wise composition of job offers & profiles and preferred sectors across departments & programmes. Find the first part of the report here.

Day-wise composition of Profiles and Job Offers

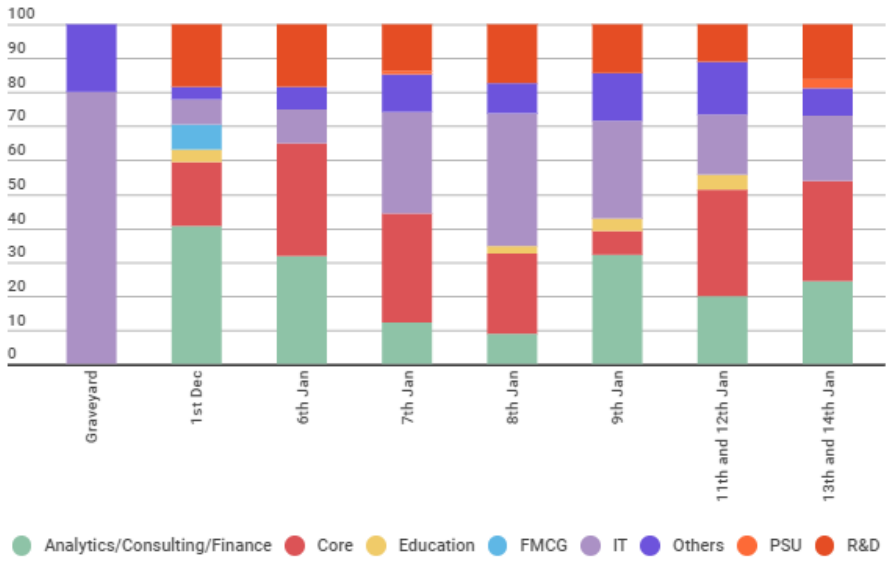
Proportion of Students Placed on Each Day

The graph below tells us what proportion of students were placed on each day. It is clear from the graph that around two-thirds of the students got placed in the first three days. At 25%, the third day of the placement season saw the largest number of students getting placed followed by the 2nd day of placements seeing around one-fifth of the students getting placed. A similar number of students got placed on 'Day 1' and 'Day 4'. The remaining days account for another quarter of the students getting placed.



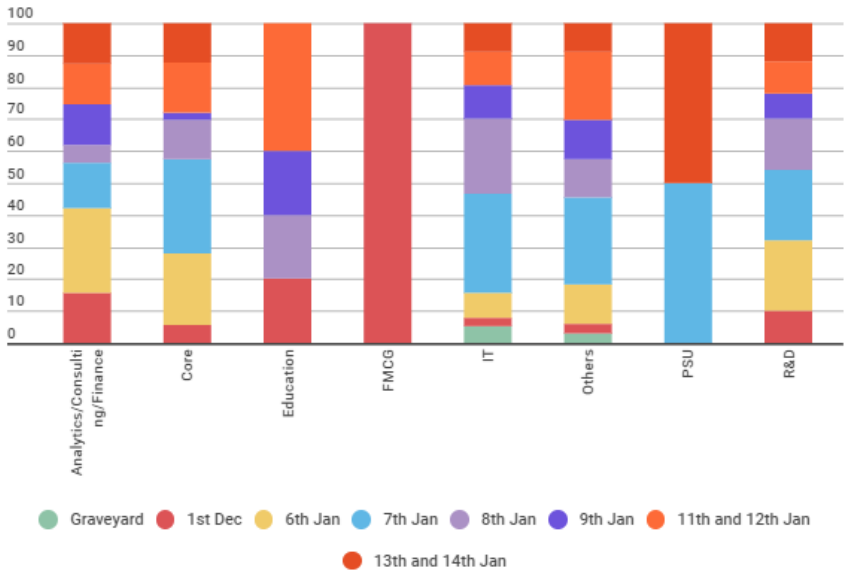
Sector-wise Composition of Profiles Offered on Each Day

The graph below tells us the sector-wise composition of each day's companies. The graveyard slot is clearly dominated by IT companies, most of whom were only open to CS students. There seemed to be enough opportunities for a student to take up a job from IT, Analytics/Consulting/Finance and Core sectors on most days, with higher number of profiles open on certain days. The R&D sector seems to have a decent and constant representation on all days.



Spread of Sectors Over the Placement Season

This graph complements the previous graph. There was a spurt in the number of Analytics/Consult/Finance companies on the first two days of the placement season. A similar spurt was seen in Core companies and IT companies on 6th & 7th January and 7th & 8th January respectively. FMCGs, PSUs and companies from the Education sector could be seen only on specific days.

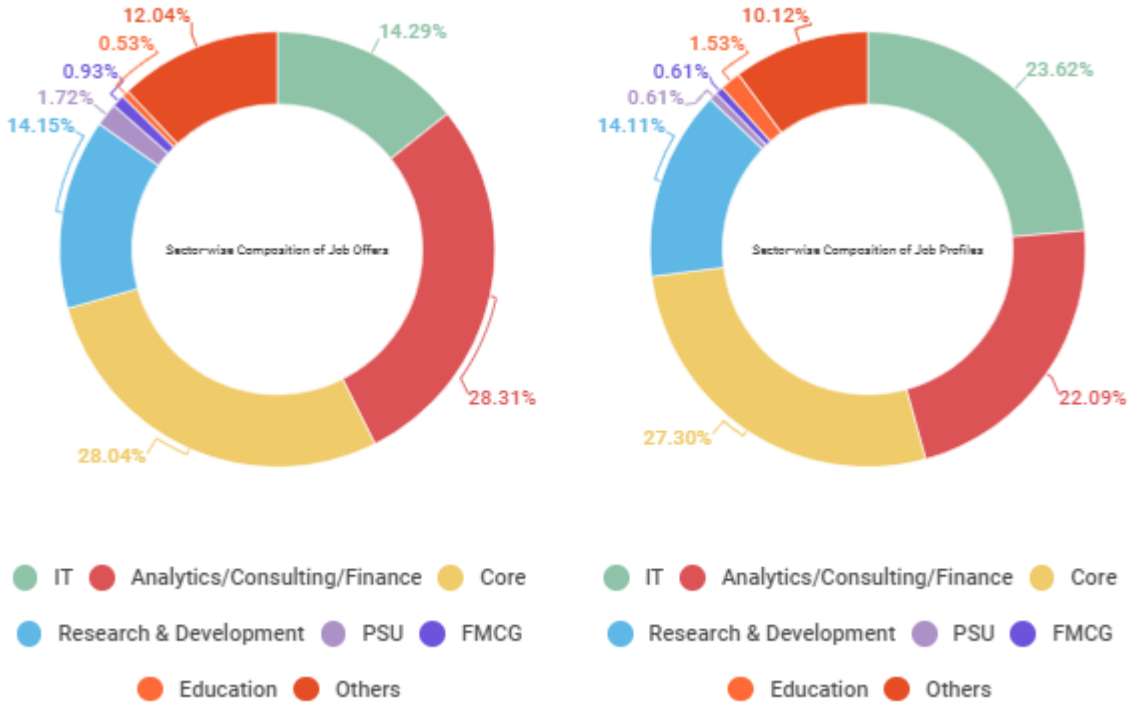


Sector-wise Composition of Profiles and Job Offers

As usual, companies from diverse sectors, including Core, IT, R&D, PSU, FMCG, Education and Others, visited IITM. Offers from Core companies and Analytics/Consulting/Finance companies, at around 28% each, accounted for more than half of the total offers made. This was followed by offers from IT companies and R&D companies, at around 14% each. Offers from PSUs, FMCGs, companies from the Education sector and companies tagged 'Others' made up for the remaining minority.

Please note that this classification is not done by the placement team and the companies themselves choose which sector their profiles belong to, from the eight options provided by the placement team.

Compare the statistics in the two pie charts. The percentage of profiles on offer seems to be significantly more than the percentage of job offers for the IT sector companies and companies in the Education sector. A reverse trend is seen in case of PSUs and Analytics/Consulting/Finance companies.

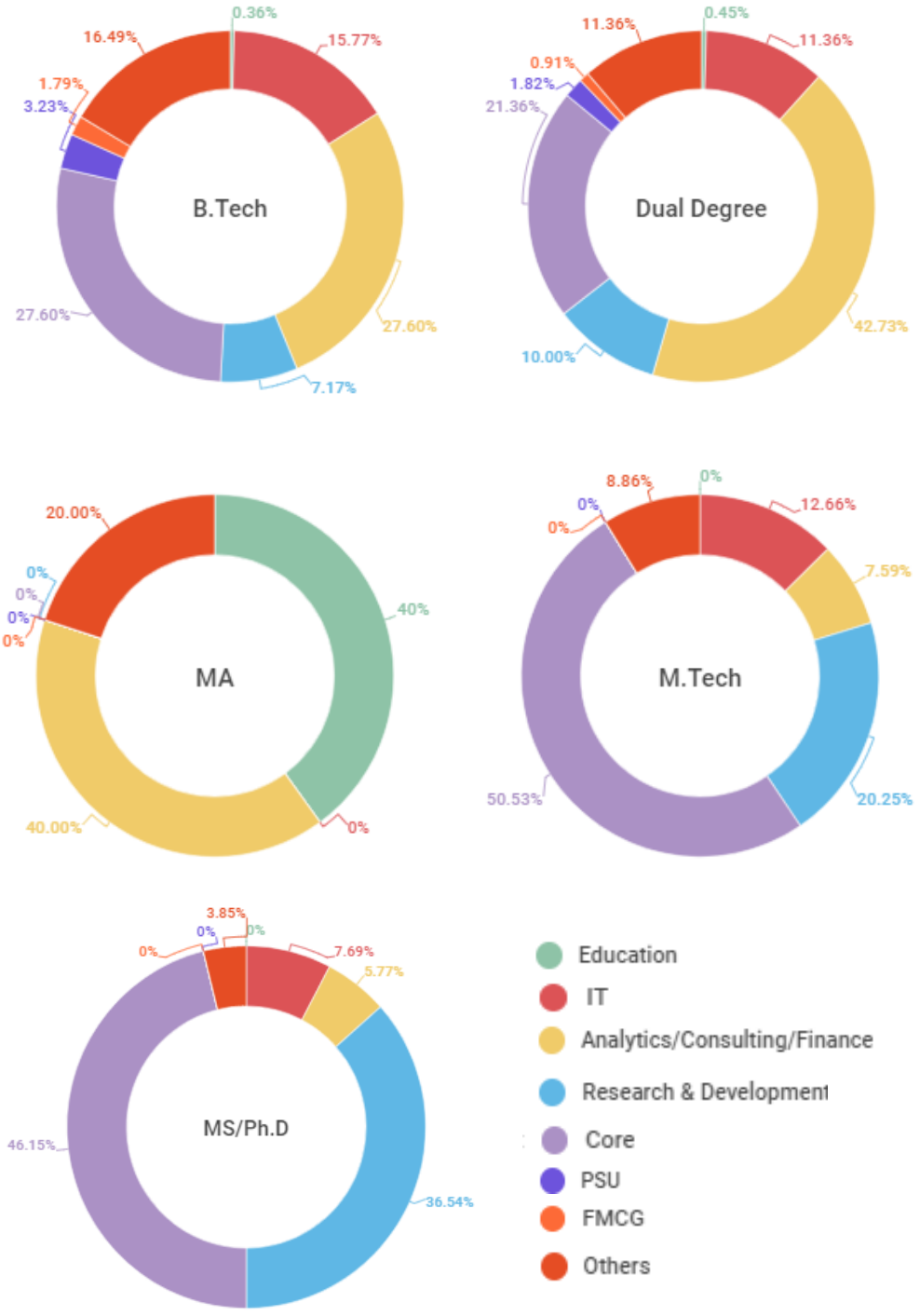


The placement team identifies a company as a startup if it has been in existence for less than 5 years. Although the number of startups that visited IIT Madras this year was larger than the previous years, students missed out on most of the big names because the rescheduling meant that the companies had already completed their annual hiring process from other IITs before they came to IIT Madras.

Preferred Sectors Across Departments and Programmes

Sector-wise Composition of Each Programme's Job Offers:

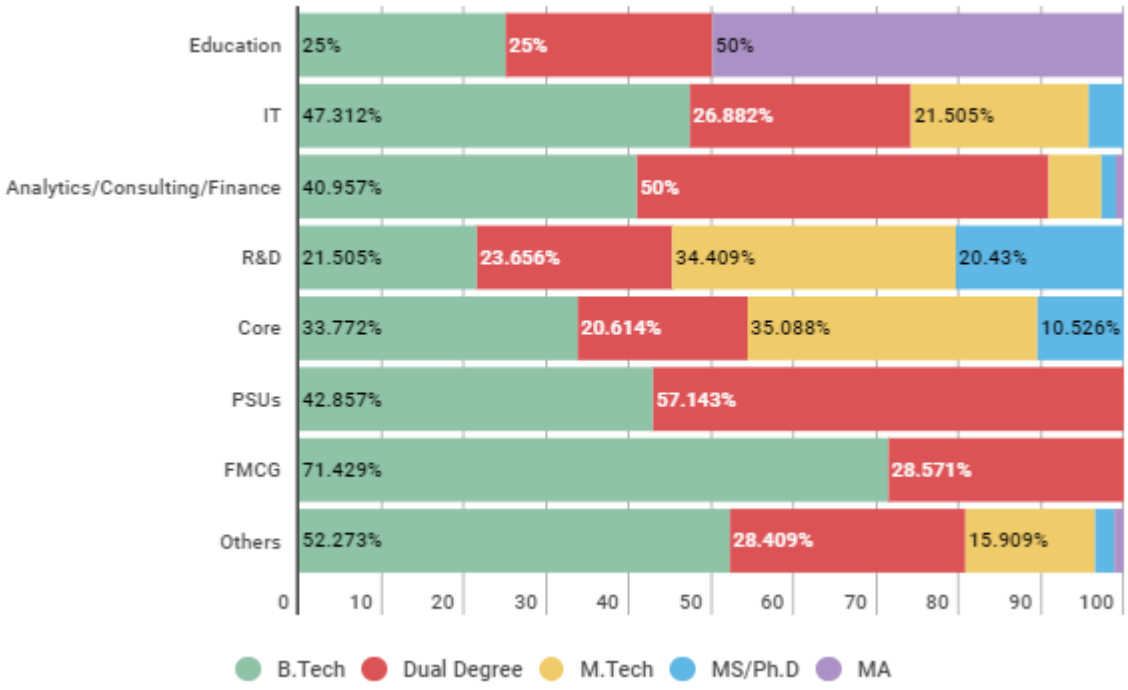
From the pie charts below, the biggest sectors for B.Tech and Dual Degree students seem to be Analytics/Consulting/Finance and Core. More specifically, Dual Degree students seem to be taking up Analytics/Consulting/Finance and R&D than B.Techs. For the M.A. students, Analytics/Consulting/Finance sector and Education sector look equally big. M.Tech students and research scholars found the highest number of jobs in the R&D sector and in Core companies, as expected.



Programme-wise Composition of Job Offers from Each Sector

Let us look at the same statistics from a different angle. The programme-wise composition of job offers from each sector is given below.

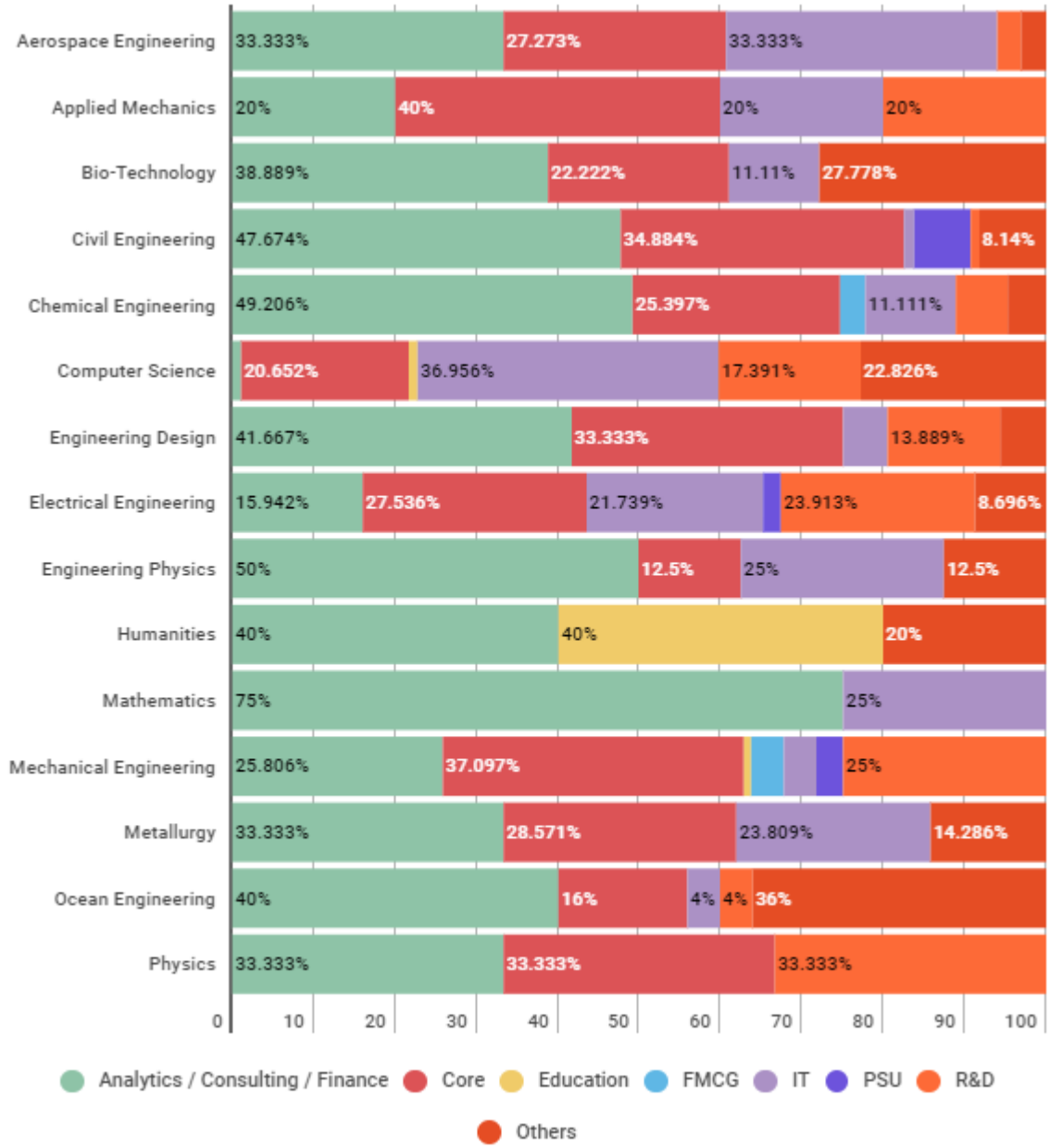
Offers from PSUs, FMCGs and the Analytics/Consulting/Finance sector seem to be dominated by the B.Tech students and the Dual Degree students whereas IT, R&D and Core sectors have a more equitable distribution of B.Tech, DD, M.Tech and research scholars. Education sector has a significant share of MA students other than B.Tech and Dual Degree students.



Sector-wise Composition of Job Offers for Each Department

Analytics/Finance/Consulting seems to be the biggest draw in most departments followed by the IT and the Core sector. Only in the Electrical Engineering and Computer Science departments, the percentage of offers from the Analytics/Finance/Consulting sector is lower compared to that of Core, IT and the R&D sector. The Education sector dominates the Humanities placements while the PSUs and FMCGs seem to make an appearance only in the Chemical Engineering, Mechanical Engineering, Electrical Engineering and Civil Engineering departments.

The rescheduling of the placements affected the companies as described before, but how did they really affect the students? Those who had not prepared well enough got an extra month to prepare while a lot of students were under tremendous pressure to get a



good job seeing that their comrades from other IITs had bagged good offers. However, as we can infer from the above statistics, placements have been quite good at IIT Madras this year, and have improved in terms of certain parameters as well.

The key take-aways from the report are that placements – both in terms of salary and sector – are highly dependent on one's CGPA, department and programme and the average number of job offers that can be expected from a given profile is dependent on the sector and day. Moreover, it is to be noted that the sector-wise composition of companies and the number of jobs offers made varies across the different days of the placement season. Therefore, it is important to analyze the placement data of the previous years and draw inferences while one is preparing for placements. To quote Prof. Babu, "Pre-final year students should look at the data as well as the inferences and strategize accordingly for their Placement."

Book and Movie Recommendations: Professor Edition

Professors- those distant, learned entities whose storehouse of knowledge seems, at times, to be unattainable. We know they have obviously done a lot to get here, but what do they do when they aren't pondering quantum mechanics, electrical circuits, postmodernism, or other such incomprehensible concepts? We asked a few of them the same question, to be pleasantly surprised at the answers we got- turns out that professors have more of a life than most of us! Here are their riveting recommendations.

Professor Uday Khankoje

Electrical Engineering

Books

Search in Secret India – Paul Brunton

This book details the travels of Brunton, an Englishman, who came to India in the first half of the 19th century in search of a "real" yogi. When a lot of modern India seems to be in a state of disarray and decay, his experiences bring out the living treasures of India that lurk below the surface — the sages and the wisdom continuing an unbroken tradition from ancient India.

Zen And The Art Of Motorcycle Maintenance — Robert M. Pirsig

Just a very quirky and interesting book about the larger than life search of the author for that indescribable thing called "quality". In doing so the reader is taken through some very the annals of ancient Greek philosophy.

Gödel, Escher, Bach: An Eternal Golden Braid — Douglas Hofstadter

This is a riveting book bringing together math, art, and music with such flair and style!

Films:

Rashomon – Akira Kurosawa
12 Angry Men — Sidney Lumet
Kai Po Che — Abhishek Kapoor

Professor Ayesha Iqbal

Humanities and Social Sciences

Movies

Le Quatre Cent Coups (*The 400 Blows*-Francois Truffaut, 1959)

One of the seminal films of the French New Wave movement, the film is told completely from an adolescent, Antoin Doinel's (Jean-Pierre Leaud) point of view. The film shows you actual Paris locations shot in natural lights. Truffaut and Jean-Pierre Leaud went on to make a series of films over a period of years, tracing the different stages in Antoin Doinel's life. Consider how this style anticipates Richard Linklater's *Boyhood*.

Becket (Peter Glenville, 1964)

A slice of the English history, with friends-turned-archenemies, King Henry II and Thomas Becket , the Archbishop of Canterbury. The cast is the who's who of the British stage and cinema: Richard Burton, Peter O'Toole and John Gielgud. If you like high-voltage drama, with intense performances, this period bromance is for you. Based on a play by Jean Anouilh. The Hindi film *Namak Haram*, with Rajesh Khanna and Amitabh Bachchan, was inspired by *Becket*.

Sleuth (Joseph Mankeiwicz, 1972)

Sleuth is clever, thrilling, and brims with rapier sharp wit. Its charm lies in the way the lead characters indulge in violent mind and verbal games. Laurence Olivier and Michael Caine are perfect in this masculine theatre of one-upmanship. There is a recent version with Jude Law and Michael Caine, where the latter plays Olivier's role this time. Based on a play by Anthony Shaffer.

Once Upon a Time in America (Sergio Leone, 1984)

Sergio Leone's requiem for the American Dream is also an epic about organized crime in America of the 30s. Unlike the Italian mafia of the more celebrated *The Godfather*, the focus is on Jewish gangsters, with Robert De Niro (excellent) heading the cast. I find *OUATIA* an essential viewing for its non-linear narrative, morally ambiguous characters, and closure that requires reflection. The soundtrack by Ennio Morricone is one of the greatest ever, and underscores the film's elegiac mood. The director's cut is almost 4 hours long. Recommended for those who consider cinema as an art form, and not just a means of killing time.

Bright Star (Jane Campion, 2009)

This is one of the sweetest films of the last decade, making one believe in good, old-fashioned romance. Ben Whishaw is John Keats, the great 19th century English Romantic poet. The film is an account of Keats' love for Fanny Browne, his muse and inspiration

for some of the most celebrated poetry, including *Ode to a Grecian Urn* and lines such as, "A thing of beauty is a joy forever."

Books:

***Bonjour Tristesse* (Fancoise Sagan, 1954)**

French cool. Literally, the title means "Hello, Sadness." It's about a group of extremely wealthy people whose major business in life is to have a good time. At the core it is the story of a precocious teenager who believes that she can control the lives of the adults around her.

***Perfume: The Story of a Murderer* (Patrick Suskind, 1985)**

Perfume is pure magic and a historical bathed in magic realism. Set in the pre-revolutionary France, it gives us a most unlikely hero, Jean-Baptiste Grenouille, a Devil-meets-saint-crossed-with-a rockstar-like figure, who has an exceptional sense of smell. Amazing incidents happen, and you will get sucked into the hero's fascinating journey. And don't miss the ending that is as stunning as the rest of the novel.

***The Bonfire of the Vanities* (Tom Wolfe, 1987)**

Tom Wolfe's letter to New York is a gargantuan novel, along with an anthropological study of the city, its social hierarchies, its people, its accents and its claims to that most clichéd of all terms "multiculturalism." Wolfe takes you right there with the prejudices, social mores and excesses of the New York people . You will enjoy Wolfe's language — he coins the expression, "social X-rays", socialites so thin that their rib cages are visible, just as in an X-ray photo.

Professor Arunn Narasimhan

Mechanical Engineering

A week back I was watching (again) Solaris by Andrei Tarkovsky, so let me begin with that. I would consider this a good sci-fi movie, along with '2001, A Space Odyssey' (Interstellar is a bad movie, before becoming a bad sci-fi one). Solaris is based on a book of the same name by the Polish sci-fi master, Stanislaw Lem (not to be confused with Ulm, the scientist, which I used to do until one of my students made enough fun of me on this to make me never forget who is who). Now, Lem is a master of the genre and all his books (including the sendup of a detective fiction) needs to be read for their 'quirky and interesting' quotient. Both the movie and the book Solaris offer a different (and interesting) perspective on human-alien communication, if we humanity get to meet them, aliens. We may not be able to interact with aliens at all if we are to meet them, as ours is 'only' a human consciousness, perhaps utterly incapable of communicating, leave alone understanding an alien consciousness. An interesting perspective written and presented neatly in both formats without doubting the intelligence of the

reader/audience (unlike, say, an Interstellar does, and in doing so, resorts to making the characters sit around and 'tell' the story out to each other within the movie, instead of just narrating/showing it). Of course, there are differences between the book and the movie, enough to cause a permanent rift between the author and the director. The only two occasions I could remember this is not so — and the writer of the book and the maker of the corresponding movie had a continued good relation years after the success of both — were Lolita (Nabakov/Kubrick) and the more recent Prestige (Christopher Priest/Christopher Nolan), both of which would score on the 'interesting and quirky' — the former is interesting study on the human mind and its quirk and the later, a quirky sci-fi.

Speaking of Tarkovsky, his movie — previous to Solaris — Andrei Rublev is a masterpiece. It has a vague canvas of a storyline about the 14th century priest/saint Rublev with few other interesting and quirky forays — historical and fictional — discussing in general about art, creativity their meaning and purpose for humanity and so on. It is a must watch for understanding how thoughts can be communicated through the medium of the cinema.

Speaking of thoughts into cinema, the best director who has repeatedly done this, in an era before I was born, is Masaki Kobayachi. Again, by coincidence, I was watching last week his The Human Condition, a nine-and-half hour trilogy. The trilogy is an adaptation of a six volume novel written in Japanese and recounts, if we look in one level, the anti-war struggle of one man against an army (both Japanese). On another important level, the movies try to convey to us what it makes/take to be human. I would love to watch this trilogy for the sheer epic-ness and the brilliance in movie making. But I wouldn't rate this as the best one to influence me on humanity and its spirit. I couldn't take bleak movies to represent the spirit of the human struggle. Let us say that is the quirk of my spirit. But not to take anything away from this director, let me recommend another of his easily approachable movie, Kwaidan. This movie is a collection of ghost stories from Japan. Now, the interesting thing about ghosts of Japan — or in general, Eastern ghosts? — unlike the ones of the West is that, these Japanese ghosts are not incarnations of evil and so on but are understood to pervade the human life in a much more natural way, with complex feelings, more than just pure evil. Four different stories introduce to us the flavour of such Japanese ghosts in Kwaidan, where theatre and cinema seamlessly merge with haunting music and rapturous visuals — many of the colourful background for the scenes were hand drawn by Kobayachi — into an enjoyable adventure in cinema.

Speaking of portraying the human spirit, I would rate Vittoria de Sica's The Roof (Il Teche, 1953) to be a notch above The Human Condition trilogy even. Of course, de Sica is known by his other movies (like The Bicycle Thieves) but I would rate The Roof to be his best for the elegance and the positive way in which the same feelings about the indomitable human spirit, which The Human Condition attempts to showcase, are conveyed.

The storyline is simple: a newly wed poor couple wants to have a roof over their head — a house — in a 'poramboke' land in Italy at the turn of WWII. Their struggle and success in this endeavour is The Roof, a masterly portrayal of the human struggle and associated spirit kept deliberately hence conveyed effectively at an ordinary daily-life level.

Speaking of art expressing feelings in daily-life settings, one successful directorial team that keep doing it in recent times repeatedly are the Belgians, the Dardene brothers. One could start with their Kid with a Bike (2011) and move on to other movies like Two Days One Night and so on.

While all of the above — provided from the top of my head — are certainly interesting and unique and made an influence on me, just to complete the series with a quirky and modern one, I would recommend Midnight in Paris (2010) by Woody Allen. Now, Woody is known to most (all?) of us: the theatre-guy mistaken for a movie director by Hollywood, and hence has made the same story with minor modifications into about 30 movies in as many years. His Midnight... is quirky in the cute sense with a sci-fi-ish plot that talks about artists and creativity and nostalgia and so on, in the city of Paris, across a few decades, displaying the smartness of the director in spinning an enjoyable yarn. (BTW, both Midnight... and Two Days... employ the beautiful Marianne Cotillard in very different roles)

No Indian movies? I would recommend the movies of Rithvik Ghatak (Mega Dhaga Dhaara for instance) and K. C. George.

I guess that is more than a handful of movies for now. My book recommendations can perhaps wait for some other time — if there is one, after the reception of this.

Prof. Rupesh Nasre

Computer Science

Steve Jobs- Walter Isaacson

The book was gifted to me by my first MTech project advisees, along with a pack of liquor-filled chocolates. Unsure how I treated my students for a year that I received those gifts, but reading Steve Jobs turned out to be an intense experience, worth repeating.

Many of us know him as Apple or MacBook or iPad. Walter Isaacson does a good job that by the end of the book, we start knowing him as a genius.

It starts with a depressing experience of getting *abondoned* — by his parents. And it repeats, when he is thrown out of his own company — Apple. These two experiences mark two saddest events of his life. If I want you to read this book, it is less so to know the genius, but more to experience the making.

Clearly, life is much more than a few saddest moments. Jobs is *chosen* — by his new parents first, and later as iCEO – by Apple. The story highlights a genius's inventions but

does not fall short of exposing his persistence.

I presume our Engineering Drawing students would be able to better understand Jobs's drive towards looking at a gadget as a piece of art. His father mentions: perfection is caring about the craftsmanship even of the parts unseen.

We witness inventors associated with one invention for their lifetime. Jobs was prolific, and gave the world a sequence of innovative products: be it iPod, iPhone, App Store, or Pixar movies. His contributions overshadow his extremism, his ability of reality-distortion, and his fight against cancer. We start liking him despite his meanness.

The book also consists of several light reads: getting his head shaved in India, parking at the spot reserved for the disabled, and drawing a salary of $1.

I hypothesize that the book tastes better than those chocolates.

Beyond the Gates: Chamiers Café

SRIRAGHAV SRINIVASAN

Looking for a nice, quiet place with a cool ambience to read, work or hang out? Chamiers Café, located in a cosy little corner near the Crowne Plaza hotel in R A Puram, instantly makes us fall in love with its amazing British ambience and lip-smacking food. Sriraghav, in yet another Beyond the Gates piece, explores this café and the various other things you could do during a visit to Chamiers.

Upon entering Chamiers, the first thing we see is the *Anokhi* boutique (which is home to quite a lot of pretty things; yes, some of them are affordable too) at the base of this beautiful, ivory-coloured, archaic building. No visit to Chamiers is complete without (window) shopping at Anokhi. Thereafter, take the stairs up to the first floor, and turn beside the gift shop to enter the cosy Chamiers Café.

The chandeliers, beautiful white curtains, the litany of wall hangings and the ever-so-comfy chairs all scream elegance. Once we were settled down, we looked through their elaborate menu – which offers a wide range of continental all-day breakfast options, Italian and a melangè of French/Danish pastries – in quest of something we liked.

We ended up ordering the Spanish Breakfast Set (which comprises a Patata bravas on a sizzler plate with sauteed veggies, two pieces of toast and choice of beverage), cinnamon-topped waffles and the Anti-oxidant powered breakfast (which was a Muesli-Yogurt dish with fresh fruits, honey and cinnamon). All the dishes were pretty great in terms of taste and texture. However, I would have to admit that the Spanish breakfast set was definitely the best thing we tried there for the portions were pretty generous, the sizzler was quite good and they had an assortment of breads and marmalades for the toast alongside great coffee.

It's wise to ensure that you're not in a rush when you visit Chamiers for the waiters take quite some time to get the order onto the table. But the good news is that it's mostly worth the wait! And personally, I don't mind the wait at all because I usually spend a good 3-4 hours there. The crowd seen in Chamiers is also quite different from many other cafes ranging from people having formal business conversations to friends

catching up and foreigners enjoying the lovely food.

PS: I find it hard to resist those gorgeous Danish pastries in the counter every time I visit.

How to get there:

The easiest way to get to Chamiers Cafe from insti is to get a cab from the main gate (Adyar Gate). It costs just 60 rupees on Uber (without surge), and split between four friends, that's just 15 rupees per person! For the walking-enthused, being it going around catching Pokémon, hatching Poké-eggs or trying to reach your Fitbit goal of the day, it's a 3.3 km walk from Main Gate.