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## Finding Synergy



The audience in rapt attention during the Foundation Day Lecture by Dr. Anil Kakodkar

While April 4 may have been a fairly insignificant day to the rest of the world, at IISER, it marked a momentous occasion. It was the celebration of the day that the foundation stone of IISER was laid three years ago by our Honourable Prime Minister, Dr. Manmohan Singh. The Multipurpose Hall of the Guest House-Cum-Academic Complex (GHCAC) was packed with students, and members of the faculty and the administration, well before the start of the events of the day.

The morning started off with a movie by the Science Media Centre of IISER. It was a montage, with scenes from the previous Annual Days and Foundation Days of IISER. It left the newcomers in the audience spellbound at the level of progress at IISER, which was just barren land a few years ago. Following the movie, the Director introduced our esteemed chief guest, Dr. Anil Kakodkar, DAE - Homi Bhabha Chair Professor and Former Chairman, AEC (Atomic Energy Council). He is an eminent nuclear physicist and engineer, and has played an integral role in the formulation of India's energy policy. He has won innumerable prestigious awards, including the Padma Shri and the Padma Vibushan, and is on the governing boards of several prestigious institutes in our country.

Dr. Anil Kakodkar's Foundation Day Lecture on 'Securing our Energy Future' portrayed the energy crisis in India in a lucid and concise manner with the benefits and constraints of each source described clearly, from the environmental perspective to availability versus cost. The limitations that India faces in comparison to already developed countries, and the plan developed by our nation to overcome these hindrances were outlined by him.

Kalpa 2013, the annual magazine of the institute, was released by Dr. Kakodkar. A short and amusing video on the effort put into it was shown. Afterwards, prizes recognising the academic excellence of students during the previous academic year were given away. The CNR Rao Education Foundation Prize was awarded to Varun Prasad (Semester 2) and Adithya Rajagopalan (Semester 1). Prizes for Academic Excellence were awarded to Sai Neha (Semester 3), Sagar Lokhande (Semester 4), Shiva Chidambaram (Semester 5), Amey Apte and Arun Reddy (Semester 6), Rohit Chikkaraddy and Sravani Shikari (Semester 7), Nishant Singh, Jagruti Pattalkal, Roshni Bano and Iti Kapoor (Semester 8).

The people who go unnoticed, who work behind the scenes everyday to keep IISER running smooth-

**Continued on Page 2**



photos: Gunja Sachdeva  
Neha Prabhu  
Vishnu KN

## Finding Synergy



photo Alisha Pa thak

Dr. Anil Kakodkar releasing KALPA 2013

### Continued from Page 1

ly - from satiating our boundless appetites day after day to correcting even the slightest of discrepancies in IISER infrastructure plans, to the mammoth task of running the library - were presented with Foundation Day Appreciation Awards. Dr. Jayakannan received the 'Best Faculty' Award, and was cheered by his colleagues and students alike, as his many virtues were extolled by the Director, notably his jovial and friendly character and unwillingness to compromise on standards of research.

It was a day to honour the hardworking and brilliant minds of IISER who have elevated it to its current position, and a day filled with nostalgic memories of the year gone by. This important occasion in IISER's annual calendar concluded with our national anthem, instilling a sense of pride in our institute throughout the audience.

## Q C D

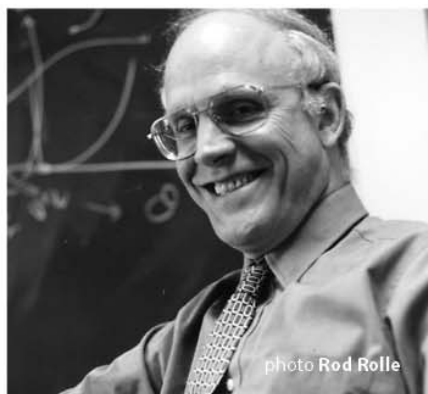


photo Rod Rolfe

On April 12, IISER was visited by David Gross, the 2004 Nobel Laureate in Physics. In this impromptu visit, he toured the IISER labs and had a short informal interaction with the students, where we discussed how he discovered asymptotic freedom (desperation), heard anecdotes from CERN, exchanged opinions on IISER, and received advice for the future - "Never, never, never, never give up!" It was a short but wonderfully memorable visit.

For a full account of his visit, take a look at the Sentience website!

## A New Direction

There is a moment in every Disha volunteer's life where one asks oneself - "Am I giving every child my best effort?" The answer inevitably is, "No!"

High off the success of the Vigyan Mela, the team in charge sat around a dinner table at Invitation, enthusiastically pondering over this question, its causes and its solution.

We came to the conclusion that one never gives the best child in a group one's best, because of the need to help the average. We thought about it again. We felt that it was ironic, since the brightest child is actually the one we can help the most.

That's when the idea of the weekend programme came about. We would hand-pick bright students from classes 5-9 from Someshwarwadi and Laman Vasti and bring them here to IISER, to study on the weekends. We would concentrate on Science, because that's what we're best at, and systematically cover the topics that they learn in

## Any Volunteers?

Vastrasamman

Here's your chance to do a good deed and help the underprivileged by donating clothes. From April 9 to May 1, clothes will be collected in the Vastrasamman boxes located near the elevator on each floor of the hostel and also on the first floor of A-Wing, GHCAC (near the Aquaguard). You are free to donate torn and damaged clothes, but they must be washed and cleaned.

Karavaan '13

Preparations for the annual cultural fest, Karavaan, have started all over again. Meanwhile, the head honchos are looking for volunteers. If you would like to help with any kind of work, from organising events to contacting bands and sponsors, to even helping out with the publicity, contact Shruti Paranjape, Chaitanya Afle, or Sujay Mate. If you do not like getting your hands dirty, but would still like to help, you are welcome to provide any information regarding potential sponsors or about bands who could be invited to perform here.

school in a conceptual way, peppered with activities and experiments. It seemed like a perfect plan that night, but there was no progress for another month or so.

The idea resurfaced suddenly, in the form of an opportunity to take the kids to GMRT on Science day. This was an incredible opportunity, not just for the kids, but for the volunteers too. So on Science day, Disha set up a stall at GMRT where two of the kids from the Abhyasika explained the experiments, while the others (eighteen kids) looked at all the other exhibits. It was then that it was decided that the weekend programme would start. It gives me great pride to announce that it has been running smoothly for three weeks now.

It is now that one realises what Disha is truly about. Turning idle discussions over dinner into fruitful projects, brainstorming for ideas, and implementing them - this is what forms the heart of Disha.

## Academic Buzz

1. 6<sup>th</sup> Practical Summer Training on Chromatography, Molecular Biology, and Bioinformatics (PCMB)

Date: June 5 to June 14

Deadline: May 5

Venue: VIT University, Vellore

Website: <http://goo.gl/XDY2w>

2. International Conference And Workshop On Fractals & Wavelets (ICFW), In cooperation with American Mathematical Society

Dates: November 9 to November 16

Deadline: September 30

Venue: Rajagiri School of Engineering and Technology (RSET), Kochi

Website: <http://goo.gl/BTmFb>

3. US-India Advanced Studies Institute On Thermalization: From Glasses To Black Holes

Dates: June 10 - June 21

Deadline: May 24

Venue: Indian Institute Of Science (IISc), Bangalore

Website: <http://goo.gl/ZgwpV>

4. Symposium on Indian Women and Mathematics

Dates: July 26 to July 28

Deadline: April 30

Venue: Indian Institute of Science Education and Research (IISER), Pune

Website: <http://goo.gl/XEyOl>

5. The 28<sup>th</sup> International Conference and Exhibition on Organic Process Research & Development

Dates: April 15 to April 16

Venue: National Chemical Laboratory, Pune

Website: <http://goo.gl/qNW4y>

6. SSTiC 2013 - International Summer School on Trends in Computing

Dates: July 22 to July 26

Deadline: June 26

Venue: Arquitecte Rovira, Tarragona

Website: <http://goo.gl/jXyhn>

7. 5-Days Hands-on Workshop on Molecular Biotechnology and Bioinformatics

Dates: May 6 to May 10, May 13 to May 17, June 3 to May 7, June 10 to May 14, June 17 to May 21

Deadline: First date of workshop or until ten seats are booked

Venue: ICSCCB, Baner Road, Pune

Website: <http://goo.gl/WUmxR>

## Clearing Up The Mess

You may have questioned what the mess committee does, but have you ever imagined how the mess manages to satisfy a picky crowd - be it the students, the faculty members, or the visiting delegates?

So we, the mess committee members - Vyankatesh and Vishnu M S (2010 Batch), Agrim and Birbal (2011 Batch), Abhishek A, Vished, and Varun (2012 Batch) - would like to acquaint the IISERites with our duties and responsibilities while providing them with the best service possible.

Of all the responsibilities we share, first comes the inspection of food and vegetables. We also have to ensure that the kitchen is replenished with fresh stocks on a regular basis, and that hygiene is maintained at all times. The next challenge is menu-making, which aims to satisfy the taste buds of our diverse IISER family. It tests our patience, given that we know that there are always a few who are constantly cursing us, no matter what. We have begun to experiment with new recipes from all corners of India to sat-

isfy our diverse consumers. The techniques used are also being modified to enhance the taste. Sometimes, the dish doesn't turn out to be as per our expectations, as cooking food for seven hundred people is a tedious task in comparison to a maximum of seven at our homes. Naturally, the taste does go down when the food is prepared in bulk.

We care about the students and the others eating in our mess. We are motivated by their complaints, as they serve to be the next challenge. We work, but without your essential feedback, our work will always be incomplete. To be more interactive, we have created an IISER Pune mess committee page on Facebook, where students can drop their suggestions and complaints, and participate in our polls. We have an email address ([mess@students.iiserpune.ac.in](mailto:mess@students.iiserpune.ac.in)) and a complaint register at the mess counter. We would appreciate it if students contact us directly. We have also have started special food service at 40, but this service has caused a huge variance in the wastage of food, as the mess finds it difficult to judge the amount of

Abhishek A and Varun Srivastava

food needed to be cooked each day.

In addition, we have a treat for all the hungry souls here. The mess has put up three canteens - one at the new hostel, one on the third floor at the GHCAC, and another in front of h block. Very soon, the mess will also be installing a chapati making machine (~3.5 lakh) to serve you better chapatis. The future challenge for us is the addition of 200 more members to the IISER family next semester. The mess, initially set up to serve a maximum capacity of 300-350, now serves around 700. Accommodating the newcomers will be a challenge in terms of both service and infrastructure. The mess guys work day in and day out to fill our bellies; the least we can do is to be courteous to them at all times. Lastly, we would request you to 'eat more, but waste less' and reduce the wastage, which is now very high - exceeding a hundred kilograms per day!

The fulfillment of your demands is our aim and we do so because we care for you!



## Closing On A Musical Note



It all began with Dr Sunil Mukhi's interview with the Sentience team. A wonderful idea was born that day, the idea of the Raaga of the Month, where music enthusiasts would get together and listen to one particular raaga, while discussing the nuances of the raaga and enumerating the instances of this raaga being used in popular music. After discussions with Dr Mukhi, it was decided that the series would begin with Raaga Yaman (in the Hindustani scheme) and Raaga Kalyani (its counterpart in Carnatic music). After much brain storming and song scouting, a final playlist was selected and an innovative way of presentation was decided upon.

On the day of the presentation, as people filed into the hall, the volunteers were visibly nervous and filled with trepidation, for their efforts were to be tested on how the audience received the presentation. The pre-

sentation began with a basic introduction to raagas, in both the Hindustani and Carnatic styles. While Raaga Yaman was presented vocally by Anirban, with Kalyanee on the harmonium, the Carnatic version was introduced by Chaitra on the veena. The presentation included, among other pieces, classics by Parveen Sultanaji and a Carnatic piece by the famous sister duo, Ranjani-Gayatri. The presentation concluded with a very mellifluous, heart-melting rendition by Pt. Hariprasad Chaurasia.

The evening continued with IISER's second in-house concert in which IISER's very own showcased their talents. If the first in-house was a stage for the Bharatanatyam talents, *Trikaya*, the second in-house was to display the Kathak talents at IISER. It began with a very humorous introduction of the evening's artists, compiled by their friends. The first

performance of the night was by Rachana, who presented a *Ganesh Vandana* with poise, in spite of a battle with the Rhinovirus. This was followed by a duet and a couple of solos by Papia and Sharvaree, in which they presented the different techniques used in Kathak, including footwork and facial expressions. The audience sat rooted to their places, spellbound by the performances of the evening. Accompanying the dancers were Harsha and Siddharth on the tabla and reciting *bol*, Sujay on the Harmonium and Kalyanee on vocals. Harsha, in the midst of reciting, explained the significance of each *bol*. The hour seemed to run past really fast, and the performance left the audience wanting more. On the whole, the entire evening was a grand success and a very happy SPIC MACAY team celebrated with a warm dinner.

## The Survival Strategist

Professor Raghavendra Gadagkar was here at IISER from March 9 to April 6, during which he conducted a workshop on 'How To Observe Nature'. He also spoke on 'A unified model for the evolution of cooperative nesting and altruism in the primitively eusocial wasp *Ropalidia marginata*' in a colloquium on March 13. The Sentience Team caught up with him. Here's what he had to say:

ST: How did you get into science, especially into the behavioural sciences?

RG: For as long as I can remember, I have always been into science. When I was doing my undergraduate studies, I read two books that captivated me – 'Double Helix' by James Watson and 'King Solomon's Ring' by Konrad Lorenz, a Nobel Laureate in Animal Behaviour. I wanted to do something related to these books. Later I realised that these were at the two ends of the spectrum of Biology, at least in those days. My interest in Molecular Biology was to the extent that I enjoyed reading about it and being fascinated, but in Animal Behaviour, when I read anything, I felt jealous because it was something I could have done. For me, actors in Molecular Biology were like part of a play in heaven which was nice to enjoy, but you don't aspire to be one of the gods; but the play of Animal Behaviour was going on on earth, which I could be a part of, but I wasn't.

At that time, the Director of IISc allotted one seat for a special course in Molecular Biology, and I jumped at the offer as the possibility of doing a PhD in Animal Behaviour was low. But I kept my interest alive. So I pursued a double life. Usually, at night time I was a student of Molecular Biology and in the day time I worked in Animal Behaviour as insects are active then. I continued my research and went on to publish a few papers in both

“

Is there any point to which you would wish to draw my attention?”

“To the curious incident of the dog in the night-time.”

“The dog did nothing in the night-time.”

“That was the curious incident.” remarked Sherlock Holmes.

fields.

ST: You were an integral part in the opening of the Centre for Contemporary studies. Could you tell us more on how this venture started?

RG: For a long time I had been unhappy with IISc for one reason. IISc is an institute of natural sciences. It doesn't have any course in Humanities, Social Sciences, Arts, or Literature which is what is required in a Liberal Arts university. People from different areas should interact with each other, but IISc is closed. I feel this is very bad for the way science progresses. Worldwide, scientists often look down upon all other disciplines and think they are supreme. I would like an environment in which I could have coffee with a poet, or go attend a History seminar. Such things were not possible in the institute. I became involved with the Institute of Advanced Study, Berlin, where, I am now a permanent fellow. Every year we invite 40 people from various disciplines of different age groups and languages to come and stay there and live as a community. This programme consists of various seminars and workshops.

Back home this wasn't possible, but somehow word got around about what I was interested in and the institute set it up and made me its Chairman. That's how this started.

ST: How did you decide upon your current area of research?

RG: During my UG and Masters days, I was interested in *Ropalidia marginata*. Those days, I used to observe them as a layman. It was only during my PhD that I started doing serious research on them. After my PhD, it was tough to decide because I was more captivated by Molecular Biology. Since I had to choose, I started to imagine myself working in both areas. If I wanted to do Molecular Biology, I would want to do it in MIT or Harvard, someplace with developed technology. But in Animal Behaviour, I had all the insects I wanted to observe, right here, and at the same time I could compete with people in Harvard. So my choice was based on whether I should live in India or go abroad. That was an easy decision to make. I obviously wanted to be home. In retrospect, I am happy about it.

My second hurdle came when I had to choose a particular insect, because of the variety. I had two options: one was to work a bit on each species and the other was to stick to a particular species. I chose the second option because it was harder. To work on a species for twenty years - it makes me think further, as I don't know what the others are



going to find and as all the easy things are done. This was a challenge. So, I decided to go deeper and deeper, until I could say this is all I can do. I see that day has not come and I don't see it coming.

ST: These days, a lot of people think there is a stark distinction between Theoretical Biology and Field Biology. What is your stand?

RG: You are talking about a very narrow area here. I want to break all boundaries and limits. In fact I don't want any distinction between Molecular Biology and Ecology; between Biology and Physics; between Science and Humanities. Boundaries are useful for a particular purpose, but they can't become universal. This is like you should have a bit of *idlis*, a bit of *dosas*, or a bit of *chutney*. I believe you should be given the whole menu and asked to choose. For intellectual development of people, they should be able to choose their own boundaries and make their own constellation of disciplines. We should give people flexibility and the opportunity to do what they want. For this, our own mind-set has to change. We mustn't blame the administrators. We should protest and ask for it. I blame it on teachers, as students should be given a chance. We can always give guidance but they should be left to do what they want.

ST: You are a huge Sherlock Holmes fan, so what is your favourite Holmes line?

RG: "The dog didn't do anything..." is one of my favourites. It is quite attention seeking.

ST: Describe the beauty of Animal Behaviour in today's world in one line.

RG: Exclusively addictive!

## And The Abel Goes To...

Shruti Paranjape



### Pierre Deligne

“for seminal contributions to algebraic geometry and for their transformative impact on number theory, representation theory, and related fields.”

How many of you have heard of Pierre Deligne? That's unfortunate. "As future scientists, you should keep abreast with the happenings and the names in the scientific community." You might think this is ridiculous, but I assure you that it is not. Because, ultimately, you aren't going to be proving Polya's or Noether's or Euler's theorems all over again. You are going to be doing what Pierre Deligne is – working at the front, pushing the boundaries.

So who is Pierre Deligne? He is a brilliant Belgian mathematician who was awarded the Abel prize this year for his work in Algebraic Geometry. In more romantic terms, he's a genius who has worked on some of the most elegant parts of Mathematics.

Now that we know who he is, let's find out what he did. It's a little tricky, but hold on, persevere and you'll see that it'll be worth it.

Imagine that you're walking on a circle. But you are allowed to be only on five points (call them 0, 1, 2, 3, 4). Once you try to move ahead of 4, you get to 0. And once you try moving backwards from 0, you get to 4. This is the rough idea of what a field is. The field just described is an  $F_5$  field.

Does the solution to  $x^2 = 2$  belong to  $F_5$ ? No. So we construct another field  $F_{5^2}$ , which has numbers of the form  $a + bq$ , where  $a$  and  $b$  belong to  $F_5$  and  $q$  is the solution to the equation. We call this field  $F_{5^2}$  because it contains  $5^2$  numbers. I'm sure it's clear now that one can construct a sequence of fields:

$$F_5, F_{5^2}, F_{5^3}, F_{5^4}, F_{5^5}, \dots$$

This is not unique to 5, nor to  $x^2 = 2$ . One can construct such a sequence of fields for any prime  $p$  and any set of polynomial equations as:

$$F_p, F_{p^2}, F_{p^3}, F_{p^4}, F_{p^5}, \dots$$

Back to walking on circles. Earlier, what we were doing was walking on a circle and only allowing the points belonging to  $F_5$  to be stepped on. Assume, for  $F_5$ , we had  $b_1$  such points. How many would we have for the rest of the fields in the sequence?

Once we find that out, we can construct another sequence of numbers  $b_r$ , each of which corresponds to the number of points in  $F_{p^r}$  that lie on the circle and then define a function  $Z(x)$ :

$$Z(x) = \exp(b_1 x + b_2 x^2 / 2 + \dots)$$

These are considered to be some of the most beautiful functions in mathematics. These are called Zeta functions – you must have heard the name.

Andrè Weil made a bunch of conjectures about these functions,  $Z(x)$ . Out of these, one was related to the zeroes of these functions and was like an analogue of the Riemann Hypothesis (which states that the Riemann Zeta function gives information about the error term in the prime number theorem, which states that the number of primes below a number  $n$  is approximately  $n/\log_e(n)$ ).

And it is this conjecture that Pierre Deligne

proved and won the Abel prize for. Phew. Did we have to dig deep!

But you must be feeling very dissatisfied. How are these random field-theory-related functions an analogue to the number-theoretical Riemann Zeta functions? How is this Weil conjecture an analogue to the Riemann hypothesis?

I can't tell you so much here. Go look it up! However, I will leave you with this example of the analogy between the Riemann Zeta functions and the Zeta functions we just constructed.

Let us pick a natural number  $n$  and decide for some crazy reason that we want to write it as a sum of 57 squares:

$$n = x_1^2 + x_2^2 + \dots + x_{57}^2$$

The number of solution sets,  $x_r$  is given by an approximate formula in  $n$ , just like in the prime number theorem. And just like Riemann Zeta functions give you the error term to the approximation  $n/\log_e(n)$ , these Zeta functions give you information about the error term for each  $n$  in the formula for the number of solution sets.

I leave you with a nugget of information for the Indian patriot in you. One of Deligne's earliest results was to prove one of Ramanujan's conjectures on his "tau" function. Also, in 1916, well before its time, a bound for the error term was suggested by Srinivasa Ramanujan which was proved right many decades later. Hail Ramanujan!

# The Hunt For Higgs

Amey Apte

The past year has been an important year for Physics due to the discovery (and recently confirmed existence) of the famed Higgs Boson, which has been the Holy Grail of physicists for more than four decades. The success is comparable to the likes of the development of theories of Relativity and Quantum Mechanics, which have rocked the foundations of Physics in the early half of the 20<sup>th</sup> century. The latter gave the basis for understanding the atom, and when coupled with the former, provided the framework for understanding the atomic nucleus and what lies inside. Thus, Physics has been akin to a 'journey to the center of reality', in the sense that smaller and smaller length scales have been probed with higher and higher energies and the meter currently reads slightly north of  $10^{-19}$  m. All these efforts have culminated into a theory of fundamental forces based upon non-abelian gauge fields, for which a more pragmatic term (physicists think it is prosaic) has been coined, (drum-roll) "The Standard Model of High Energy Physics".

The Standard Model provides a theoretical basis of almost all of known Physics except gravity (smells like 'string' spirit, eh?), and reduces the complicated universe to its basic building blocks. It states that the universe is made up of twelve matter-particles (six quarks and six leptons), and four forces (electromagnetic, strong and weak interactions, and gravity). The matter particles are indivisible whereas the forces are represented by carrier particles, which are actually bosons (integral spin particles); the EM force is carried by the photon, the weak nuclear force is carried by the  $W^+$ ,  $W^-$ , and Z bosons, and gluons carry the strong nuclear force. These bosons can be thought of as transiting their respective forces to matter, and you begin to wonder, "Could there be another such particle with a similar function, but transfer mass itself?" Well, physicists have pondered over it, and the answer is the Higgs Boson.

But then you think further, "Why cannot particles having mass simply have it for its sake? Why cook up a completely new method to rigorously explain it? Are we reinventing the square wheel?" Apparently, the Standard Model doesn't allow that, but physicists have found a DIY guide that has a solution – the particles themselves have no inherent mass, but gain it on passing through some field; this is known as the Higgs Field (named after its proponent, Dr. Peter Higgs, circa



## Unravelling the mysteries of the Higgs Boson

1964) and pervades across the entire universe. Different particles interact differently with this field, and respectively gain different masses – this is the celebrated Higgs Mechanism (spontaneous breaking of symmetry). So, the field plays with the photon in such a way that it gets no mass, whereas the  $W^+$ ,  $W^-$ , and Z bosons acquire mass. But the field also leaves behind a relic, a massive (spin one) particle, the Higgs Boson. And this is what high-energy physicists have been looking for, by building giant accelerators to smash particles in order to probe their innards. (Dan Brown slammed this philosophy by comparing it with the smashing of two grandfather clocks in order to understand how they work.)

Amber Hudson, a writer at Sklar Wilton & Associates, simplifies it in the following way - "Imagine you're at a hot Hollywood party. The crowd is thick and evenly distributed around the room, gossiping and drinking. When Angelina Jolie arrives, the people nearest the door gather around her. As she moves through the party, she attracts the people closest to her, and those she moves away from return to their conversations. By gathering a cluster of people around her, she's gained mass. She's harder to slow down than she would be without the crowd. Once she's stopped, it's harder to get her going again. This clustering of fans around her is the Higgs mechanism."

On the July 4 2012, scientists working at the Large Hadron Collider (LHC - the Mecca

of physicists) in CERN (European Organisation for Nuclear Research), Geneva, announced the discovery of a Higgs-like particle with a very high experimental certainty. It took time to confirm that the humongous amount of data spit out by the LHC detectors proved that the particle could indeed be identified as the Higgs Boson. However, on March 14, CERN scientists were happy to announce that the particle is indeed a Higgs Boson. Champagne corks flew, backs were slapped, and Higgs wiped a few tears. Folks are excited because this could lead to new discoveries into how the universe works!

The LHC is currently being upgraded over the next two years so it can smash atoms together with more energy, which will help gather more data to delve deeper into the mysteries of the Higgs Boson. That higher energy allows for the detection of a possibly heavier Higgs particle, if such a thing even exists, along with the one that scientists have currently discovered, is a cause for even more anticipation and excitement. So, the next time you stand on a weighing scale, you can definitely curse the Higgs Boson for giving you (extra) mass!

### References

Howstuffworks: <http://goo.gl/sxd9K>  
 Forbes: <http://goo.gl/aKntW>  
 CBC News: <http://goo.gl/o6hqR>  
 Fox News: <http://goo.gl/UaeUu>  
 Sean Carroll: <http://goo.gl/2cxbc>  
 sw+a: <http://goo.gl/IH11m>  
 Resonance: <http://goo.gl/azjRB>



# We Don't Need No Education

Vishak Sagar

**Q**uestion: Will a system of inquiry-based scientific education, lead to a state of anarchy?

Currently, our system of education is based on the student believing what a teacher or the textbook says. Is this a good way to learn? Perhaps so, since we have already collected an edifice of knowledge (defining knowledge as something that we know to be certain and can be tested through experiments) which needs to be passed on. We don't want to invent the wheel again. There's no use of inventing the wheel again.

For example, when you say that the Earth revolves around the Sun, it actually contradicts common sense. It is not possible to prove that Earth revolves around the Sun easily. Consider our history - if the Earth revolving around the Sun was obvious, people would have agreed to it and we wouldn't have had such episodes where it was contested. The way to actually prove that the Earth revolves around the Sun is through parallax. But the technology required to verify this wasn't available till the 18<sup>th</sup> Century. At most, we knew that there were planets (excluding Earth) that revolved around the Sun, and that prediction of eclipses and other astronomical phenomena was easier if we considered a Sun-centric system.

But this method of learning is no better than any religious dogma or doctrine. And believing anything without questioning makes us like dumb and mute animals. If you can believe that what your teacher teaches you is sacrosanct, then you can believe anyone. For

instance, I can make you believe what I do is right. And not just this, I can even make you believe that what others are doing is wrong.

This has some serious consequences. If there are people who believe in one thing or a person and hold a point of view then it will lead to clashes and bloodshed (speaking in the context of communal riots, party workers' clashes and so on). This we have witnessed all our lives.

Schools also preach (teach) another thing - the duties one must fulfill to be a good citizen. They tell us about our rights. They tell us that we are all equal. (Not just by law, but in general). Now consider a person who does not follow these rules. Someone who says that their rules are their own. Such a person is a leader. They have a mass of people who believe in them and do not question them. To this person, these people are just like cattle, and are expendable. The leader can take from them not only their sweat and blood, but their very life. Each one of them is a puppet in the hands of a puppeteer. This can be a most dangerous outcome of blind belief.

What is the alternative, you ask. Make schools which do not preach, but make students question instead. It is true that you can't teach them everything that is known. To teach a student by experimentation and observation that the Earth revolves around the Sun would take several years. However, we can teach them to be logical inquirers. It is not necessary that everybody should learn science (factual science). In my opinion, it would be better if students were taught to

question, to observe, to reason, and to arrive at logical conclusions.

However, the consequence of such a system of education is that you have created people who can think, but you cannot control such people. A state can arise where no one will follow another. You cannot rule such people and you cannot have a ruling system. The Merriam-Webster dictionary defines anarchy as a state of lawlessness or political disorder due to lack of governmental authority. This is a dangerous idea since we have a hundred people thinking in a hundred different ways. No consensus on any matter will be achieved. Anarchy is also defined as a utopian society of individuals who enjoy complete freedom without government.

Though this is a dangerous line of thought, it need not be true. If you have, in a family, a doctor, an engineer, a scientist, and a politician living under the same roof, though what they do is different, they can still sit at the dinner table and share bread. Although their outlooks may differ, they still need to eat, drink, and sleep. Whoever you may be, however you may think, there are things which need to be addressed as a collective body.

Though it is reassuring that even if we hold a perspective of our own, we can have a state which is ruled by other necessities, I feel it seems false that we lead two different lives - one holding our own view, another holding a collective one.



The wheels of time turn nonchalantly. Sometimes the nature of things changes, sometimes they strive to remain the same, much like the Red Queen. In most scenarios at IISER, the former is the case. Try as you may, the atmosphere is so dynamic that it is difficult to hang on to anything, however important. The numbers increase, new courses and faculty are introduced, green spots shrink to mere dots, and dogs go missing quite mysteriously from the campus. It is indeed impossible to hold on to things. The end of another year is upon us and as we pack our bags to leave for various stations for summer research, it is time to assume The Thinker pose, ponder deeply, and sharpen our Vision for the future. As rational students (in that we have completed several semesters of Rational Inquiry courses), the IISER student community has a few suggestions to offer to improve the quality of life of an average IISERian.

First and foremost is the pressing and quite dire issue of safety. Building contractors at IISER have been diligently following safety measures by addressing the construction workers for the National Safety Week celebrations and subsequently distributing *laddoos* while the later stages of implementation have been systematically forgotten. The fire escape map of the hostel building clearly marks four exits via stairways. As per rules of the Ministry of Urban Development, all fire exits must be open at all times and free of obstruction. If a locked door isn't an obstruction, I wonder what is! Having to deal with wayward students and immoral activities seems a small price to pay for the benefit of fire safety, forgoing which, all girls are locked inside their respective floors almost every night. A simple solution that can be thought of is to position guards at the entrances to these staircases and leave them open throughout the day, so that both fire escapist and health conscious non-'gymmers' can use them and improve the quality of their lives immensely.

Clearing space in the hostel has one more aspect, one of common rooms. Preposterously, there has been no planning for any common working or relaxation space which both male and female students can use simultaneously. This affects a lot of coursework and organisational work negatively as a mixed group gets shooed away from common places like the reading room or the ground floor spaces in the new hostel, post curfew. With an increasing number of group assignments and projects to submit, the need for at least one common room for

use by everyone at all times, replete with good speeds of internet, takes root in every mind. This vision is easily realised by converting any of the ground floor rooms to such a space and it would be a much-appreciated move. In connection with this, a better reading area within the library, for reference and light reading, is also a simple solution to the common space conundrum.

After space and water (which is always in good supply and we appreciate it), food is the essential resource for sustenance. Quality and variety of food has been a natural replacement for weather as a topic to break ice, to tackle an awkward silence and to seal friendships and allegiances at IISER. Keeping this in mind, it seems a reasonable and practical vision for the cafeterias to be run by different retailers or caterers so that there is price regulation (as opposed to the current monopoly) and the benefit of choice for stu-

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dents. It will also be quite helpful if Maggi, in any form, was sold in the cafeteria as it has been integrated into the student staple diet. The optimum solution in this case is to provide a common cooking space or allow students access to the cooking appliances in the cafeteria for limited hours at least. It will also reduce the need to store and use illegal cooking equipment in individual rooms, reducing risks of accidents and fires.

Resolving the issues concerning basic amenities, we can move on to the academic section of the Vision. Education is unarguably the ultimate aim of our existence in IISER grounds. Ideally, one should not let grades come in the way of this education, as is happening. The rule that came into being, as if by divine intervention, that a student will not be allowed to write the final exam in case of an attendance shortage, is nothing short of absurd. It is unfair to assume the pointlessness of the student giving the examination if he/she falls short of the required percentage of attendance. Some restriction on the stipend or the old system of lowering the

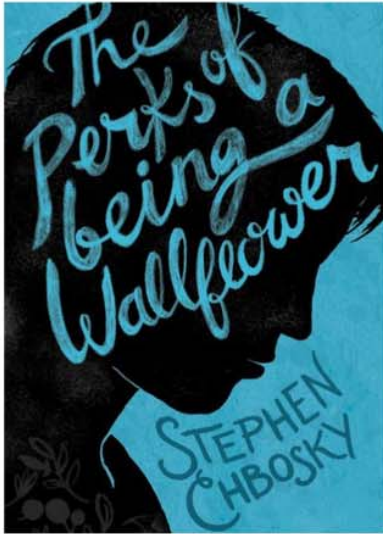
grade by one seem much better in comparison, at least to the first and second year students, as a lower attendance in any course in any of the semesters will effectively lead to the wastage of one year of their lives. This is an unfair exchange, however you choose to look at it. Then there is also the issue of the alternating positioning of the one-week holiday in the semester. The idea of a week's leave before the examination might be seem like a blessing to many, but it is rather pointless in a four-month semester. Holidays could have been put to much better use had they been in the middle of the semester as the study holidays are so filled with special lectures, quizzes and assignments that they cease to exist as holidays anymore. Instead, for better attempts at examination, Sentience recommends the creation of puppy rooms (as in a certain Canadian University) as petting puppies has proven to reduce stress and increase performance in tests.

With the dawn (or late afternoon, as the case may be) of each new day, many IISERians hope that they are one day closer to cycling in a campus resplendent in green and rich in chlorophyll. However, the Vision is incomplete if it does not speak of a student's role in the upkeep of its spirit. It is the duty of the students to make use of these freedoms and amenities wisely and responsibly without conflict. It is also the duty of the student community to make sure that their exploitation is not robbing their peers or the future batches of such luxuries. Each student also has the obligation to look beyond academic aims and to take constructive interest in the co-curricular activities at IISER as well. With the increase in the populace, interestingly, there seems to be an increase in the enthusiasm about participation in Institute activities. Foundation Day, Republic Day, Math Day and Science Day are heralded with renewed vigour and packed halls of excited folk. This enthusiasm not only needs to be sustained but also extended and developed into a feeling of oneness with the traditions of IISER and the need to carry them forward. Many of the clubs seem to be comatose and requiring revival. IISER also needs fresh, young leadership for its various organisational efforts from its growing student pool.

As a certain Math professor once said, we have a lifelong assignment to be less timid and everyone is expected to take it seriously. And this Vision that was planted in my brain still remains within the sound of silence.

## The Perks Of Being A Wallflower

Darshini Ravishankar



The Perks of Being a Wallflower is a pleasant epistolary novel about a boy's life in his first year of high school, sometime in the '90s, in the United States. He describes his life through his letters to an unknown person addressed only as a friend, who does not actually know him or the people he writes about. We read these letters, and come to know about his family, friends, problems, and thoughts about the world around him.

Charlie, the boy, is shy and withdrawn. As he describes it, he needs to 'participate' more. He befriends two seniors, Sam and Patrick, who become a big part of his life. He talks about music and getting mixed up in drugs; about his English teacher, who notices his potential for writing, and about his friend's suicide. He talks about how things have changed from his middle school years, when life was simpler, and how hard periods of depression are.

In his own quiet way, he notices Sam's and Patrick's problems, and helps them. They call him a Wallflower, and to them this is a

beautiful thing. Charlie himself struggles with panic attacks though he doesn't know why. The way this is gradually resolved in the book is both powerful and sad.

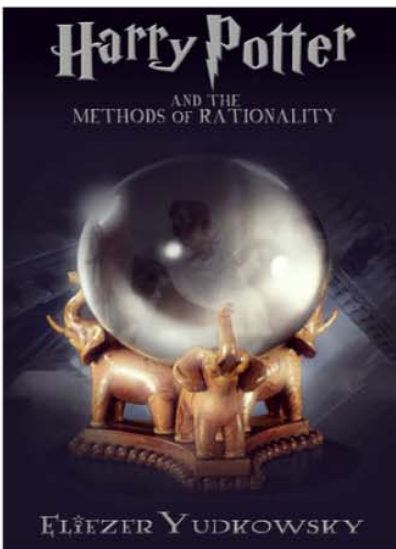
He talks about the people around him like he really loves them, and the way he articulates these things reveals real insight. They make you think about events from your own life, and this is why I like the book: one can relate, truly relate, to it.

Some parts of the year are very hard for Charlie, and some parts float by like a breeze. When glum, he doesn't think that it's the end of the world, and when he's happy, he recognises that he will be sad again. It is very refreshing to read about a mature child with problems he tries to solve without resorting to drama or hysterics.

There are no unrealistically stupid characters in the book, and no villains. It is just a boy talking about his life and what he makes of it, and I loved it.

## Harry Potter And The Methods of Rationality

Avani Gowardhan



This isn't a new book by J K Rowling, but an ongoing fan-fiction based on the same characters, only with a subtle change: what if all the characters were intelligent, most of them manipulative, and all looking to outsmart each other? Written by Eliezer Yudkowsky, an AI researcher and decision theorist, it begins with Harry Potter Verres Evans, who has been brought up by his aunt Petunia and his uncle, a biochemistry professor at Oxford, receiving the now-famous owl inviting him to Hogwarts. The rest is a brilliant alternative version about how drastically smart choices affect the outcome. It deviates at some major points, with a darker, sneakier Harry ("World domination is such an ugly phrase. I prefer to call it world optimisation.") Harry sets himself the task of reclaiming Malfoy to the side of Good, Malfoy sets himself to converting Harry to Evil, Ron is sidelined, and a new team of Harry, Malfoy, and Hermione plays the central role. From the wizarding vs muggle economy (any competent accountant could bankrupt the wizards in a week, since they don't have inflation), to the Use of The Scientific Methodology to decipher magic, from Par-

selongue to using rockets to break out of Azkaban, this is the perfect mixture of geekiness and magic. And finally, finally we see the time-turner being used for purposes other than attending more classes! The eBook is freely available online, and is the most popular piece of HP fan-fiction ever written. Someone has accurately described it as having elements of Ender's game, Deathnote and Artemis Fowl. The writing is nearly indistinguishable from the original, the editing is good, and many hold that it is better than the original series (though slightly prosy at points) and often inspires out-loud laughter. Though somewhat biased towards physicists, it is a must-read for any Harry Potter fan who has longed for another book. It is funnier and somewhat darker than the original. But the best part is that it's still ongoing! A mammoth of a book at 87 chapters, over 1000 pages, and still only in Harry's first year, readers have a long, wonderful read to look forward to. It is a perfect kick-off to your summer reading.

Read it here : <http://goo.gl/tbdrg>



# pression

## Feeling Good

Rabindro

April starts with the universal fool's day. A day when we are prepared to get fooled by others and, unlike other days, very happily accept our foolishness. I see this act of accepting our foolishness as a very important step toward understanding our existence because, you see, being a fool is very important to live a good life. Neglecting what the whole world offers us to see, we believe and think what we want to believe and think. And that's what makes me write this passage, because feeling good is closely associated with our amazing ability to fool ourselves. We seem to live very easily with words and concepts that we hardly seem to understand. What is truth, anyway? What we observe is what we observe, and nothing can be closer to our perception of truth. I don't mean to go to the deep quantum mechanical and philosophical levels of reality; rather I would like to address the problem at a much simplified level of daily beliefs and perceptions of the general knowledge that our society feeds us with.

The World Wars took the lives of millions and showed the whole world and all the coming generations how dangerous a single human being can be. Adolf Hitler was, indeed, not a good person - after all, he took the lives of millions of Jews; but who is there to account for the million and a half Japanese lives that were taken in August 1945? It was President Roosevelt who gave clearance to the Manhattan project and it was President Truman who finally gave the orders to drop the two bombs. Both the presidents are highly respected in history, probably for "establishing peace" in the world. We live in a world where the truth does not always win, but what wins, most of the times, becomes the truth. The truth in such cases is always biased and we don't have any reason to believe or not believe what we are told because of the lack of authenticity. But for centuries we have believed in the ideal principle of Satyameva Jayate (Truth alone prevails). And why should we not? There is nothing wrong with believing in the 'just' when you have the choice of believing or not believing in the 'just'. After all, it makes us feel good.

There are other deeper aspects of reality and the problem mentioned becomes more serious at those levels. What I have talked about can be referred to as the Gandhian truth, the truth that is independent of our belief and exists because of our unbiased

observation. Gandhi said we should always follow that truth but what we end up doing is follow the powerful, the influential, many a times very consciously, and then justify our actions by choosing to believe that what we believe in is the real truth.

And why is believing in the truth so important for us? Why is the ideal of Satyameva Jayate so sacred to us that we have not abandoned it even after being aware that the world and we ourselves are not consciously as just as we think we should be? It seems that there exists another level of abstract notion that we are fooling ourselves with. We call it goodness. Truth 'should' always win because it is a 'good' thing. We can better use the word 'just' that holds the same meaning and also brings out the subjective aspect of the word 'good'. Killing the enemy soldier is just for one's country, not killing another human is just for humanity, running vegetarian campaigns is just for one's particular moral inclination, and killing plants is just for one's

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It seems that there exists another level of abstract notion that we are fooling ourselves with. We call it goodness.”

hunger. And yet we have such a high regard for the word 'good' - so high that we like to believe goodness to be the most essential attribute of God. It means that we want to believe that there exists an essential goodness in the universe. Something that is not subjective is invariant, and thus, justifies the actions that we do in the name of good deeds.

There exists yet another, and perhaps the most abstract, notion where we mix all our undefinable notions into one. Love is what always fills our lives. All of us live to love and to be loved. Leaving aside the question of the 'why' and 'how' of love, we might want to address 'what' love is. Though a behavioural definition might be very subjective, being the author, I give myself the freedom to define it my way.

Love is mainly about recognising the other being; to understand the other so well that you readily accept all the good or bad qualities you see in the other, to become aware

of the essential goodness of the other being. It is a process that builds up day by day, a struggle of human stubbornness to achieve, bit by bit, the perfection that probably does not exist. And why this doubt about its very existence? Because there doesn't seem to be a reason for God to create love in the sense we like to think of it. And we probably don't want to think of it the way God created it. We surely don't want to talk about oxytocin or serotonin or the arguments of social evolution. We have taken the notion of love far above from its mechanical nature and probably above our notion of God itself. And that's what makes us feel good. To attach meaning to our actions, to believe that our practices and beliefs have a purpose and that we can go beyond the self and can achieve perfection. Why can't we simply accept reality as it is? Maybe because the reality is too mechanical, and to develop a society, the social members need to have the tendency to rise above the self. And that's why many of us consider selfishness a sin. I consider it the greatest sin! Very few of us rise above this evolutionary constraint and try to forget the self altogether. They end up in the Himalayas, becoming monks and meditating to understand the nature of the universe. Some of them do the opposite (trying to understand the self), but one can understand that discovering the self is discovering nature itself. And most of us end up fooling ourselves.

Some may want to disagree with me - may be the mechanical picture that we have built up is a delusion and there 'actually' exists a purpose for our existence. Such a reader is allowed to disagree because either he/she may be basing the arguments on a different set of axioms, or different rules of inference, or may not be using any logical framework at all. But what science has taught us is too mechanical for us to accept it as a part of our daily life. It's essential that we keep fooling ourselves and live happily, be good, speak nothing but the truth (and lie occasionally for the bigger purpose of being good) and love everyone (at least the special ones!).

It is April and so let's celebrate the foolishness and happiness that is so central to our existence!

*If the reader wants to pass any comment on to the author, it can be done through the Sentience email address. The author will be more than happy to respond.*

# pr e s s i o n

## From IISER, With Love

For the 2008 batch...

**Dr. HARINATH CHAKRAPANI**

Dear 2008 Batch,

You'll soon leave behind your spirally-bound thesis with 1.5 line spacing in Arial font that you spent many sleepless nights typing... but that's not all.

Your batch certainly had them all - the jokers, the brilliant ones, the con-artists, the shy ones, the know-it-alls and of course the legendary trouble makers. Whichever one (or more) you are, you'll take with you some extraordinary memories and leave behind some amusing ones. Your batch is quite special to me as it was the first one at IISER that I interacted with quite a bit, especially in the Organic Chemistry lab. It was my first experience with a proxy (on the other side, of course :)), dealing with students who swore they couldn't see clearly through the safety goggles (you just had to wipe the dust off), and hearing how unpredictable Organic Chemistry was and how Physics and Mathematics were superior (for the record, I disagree).

In all, these five years were spent experimenting, even outside of labs. While we experimented with how you could be motivated to understand concepts discussed in class, you experimented with how to improve your hand-eye-foot coordination by gaming. While some of you experimented with climbing statues, some of us experimented with how many students and pieces of furniture can be fit in one room. While we experimented with implementing attendance rules, you experimented with finding a doctor who could write you a chit of not-so-good health on days when you were actually present. We'll probably continue such experiments long after you leave IISER. And I'm sure you too shall continue experimenting... I wish you the best for yours.

**NIKHIL Y L K**

When my father was sick and I was in need of help, our seniors gave me money for the right. This year when I underwent an operation, I had no room to stay in the old hostel and the same seniors made me their roomie. I always think they were generous and helpful. They made me a part of their life. They never treated me as a junior in the past seventy days, but as an equal.

The 2008 Batch students are the best Seniors of IISER. They define how seniors should be.

**PRANAV KUMAR**

9/8/10. Having decided to wake up early, we went to watch the sunrise. Outside stood a guy, looking at random stuff on the ground. We asked him

what was he doing, and he replied that he was looking for something to do a project on. That was the first encounter we had with our 'super-seniors'. As time went by, we saw more of them, sometimes as saviours from awkward situations, sometimes as advisors. They formed the line between the mystic, unknown first batch and the very reality of our batch. They are the cool nerds of IISER.

**NIHARIKA SANE**

The 2008 batch is the first senior batch I properly interacted with in my first year at IISER. Everyone was very friendly and extremely willing to talk and help us kids out whenever we had troubles. They were part of a lot of the clubs that slowly came to be. When they dispersed to do their final year projects, things felt incomplete. I wish them all the best in whatever they plan to do. We'll miss you.

**PRARABDHA JAGDHANE**

I know that these friends need no introduction. This is the most talented, ambitious, respected, supportive, loving, and the craziest batch of IISER. They are the ones who initiated many activities at IISER. Their enthusiasm was remarkable. They set an example of how to balance curricular and extra-curricular activities at the same time. I will definitely miss the 'hustle-bustle' in their regular place in mess. I wish all of them a very, very bright future.

**MONTU PATAR AND DINESH KUMAR**

Two IPL sessions in your company, under your guidance, and as winners of course; the past years were life-changing and memorable.

I will always remember that chilly morning when two of you rushed into my room, kicked me off my bed and shouted, 'We are making a cricket team, The Rascals (2008+2009)'. No doubt, this news had put me on cloud nine.

Next were the rigorous practice sessions guided by 'Sir Gaurav Arya', who was highly encouraging throughout and had high expectations from all of us. His cricketing shots were delightful to watch.

Vasumitra S (Batman): The most celebrated elder. Performer at hard times, a fast hitter of the ball, and a favourite among the audience.

Amit K (AK47): Opening bowler and bowling machine. He has been unlucky in taking wickets, partly due to me dropping catches.

Ankur P (Pali): Our captain 'Cool' and the leading wicket taker so far.

Nishant S (Dexter): Attacking opener with a great sense of humour.

Jeeten P (Heera): For moral support to our team.

**ANANDITA DE**

Kaustubh bhaiyya, you inspire me to work hard and be a better person.

## Foodie Corner

Aashay Patil

This had to come. I, being an ardent momo fan, was disappointed by the momos here in Pune, especially after I tasted them in Darjeeling (they are the staple snack there). I was in search of a proper momo place when my friend took me to Momos' Corner in Bavdhan.

Momos' Corner is the best (and as far as I know, the only) place in Pune to go to if you want to taste authentic momos. It's a small stall just besides Tasty Tongues (the chaat place), a few hundred metres before Chandani Chowk. The owner is from Darjeeling, which explains the authenticity of the momos. They are available in vegetarian and chicken varieties, and come steamed or fried. I do not recommend the fried ones, as momos are best eaten steamed. The momos are served with the classic chilli sauce. The Veg. steamed momos cost ₹45 (6 pieces) while the chicken steamed ones cost ₹50. He also gives a complimentary soup along with the momos, which is some kind of vegetable stock, with added spices. The soup is used to steam the momos and tastes great with them. On Saturdays and Sundays, he also sells Chicken Biryani for ₹120.

Trust me, once you taste these momos, you will not want to eat momos anywhere else in Pune. Be careful though - being extremely popular, the stall is heavily crowded by patrons. The guy opens shop at around 6 PM, and all the momos are devoured before 8! So, head to Bavdhan for a delightful evening snack.

To get there, take a bus or a six-seater from Pashan Circle and get down at Bavdhan, the stop just before Chandani Chowk. You'll notice Tasty Tongues towards your right when walk towards Chandani Chowk. Momos' Corner is right next to it.

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