STAB
Students' Technical Activities Body

Maths and Physics Club
IIT Bombay
Annual Progress Report 2014-15

Anchal Gupta
Manager, Maths and Physics Club
Students' Technical Activities Body
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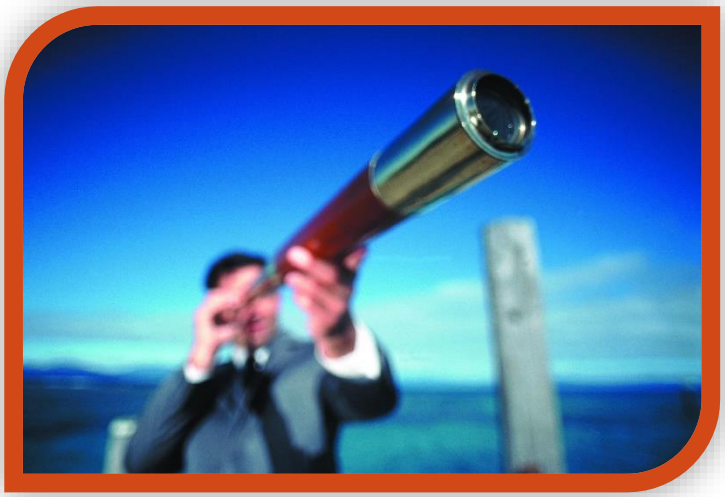
anchal.physics@gmail.com

Vision



"Nobody ever figures out what life is all about, and it doesn't matter. Explore the world. Nearly everything is really interesting if you go into it deep enough"
-Richard P. Feynman

All people currently working or studying in fields of science and engineering were once greatly fascinated about the phenomenon and logic of the world around us.
We recognized mathematics and physics as our favorite subjects for they seemed simple and sensible, and most importantly, fascinating.
Unfortunately, as we grow up, the practicalities of the world make us forget why we chose the field we are in at the first place.
The motive of this club is to live that phase of our life again, when we were passionate about reading, hearing, discussing and doing things related to mathematics and physics. If we look back, what made us fascinated were not courses or textbooks, instead they were documentaries on science channels, encyclopedia and science fiction books, chats with elders and trips to fascinating structures and laboratories.
Hence, our vision is to recreate the scenario, at a more matured level in order to feel and enjoy the apparently complex subjects again and share and increase our knowledge.

Table of Contents

Quizzes and Competitions

Bazinga

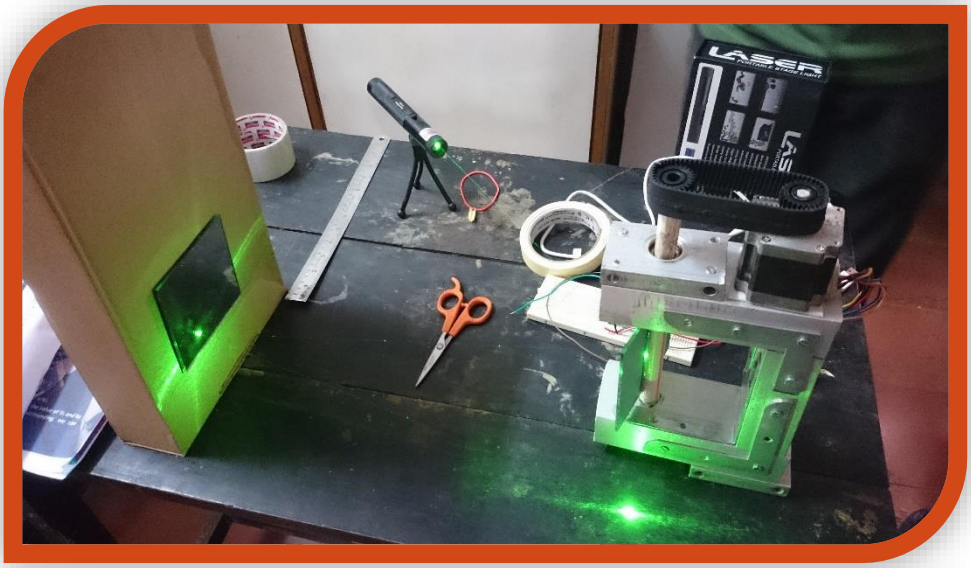
- Conceptual Quiz, no factual questions.
- One day each for Physics and Mathematics. Each session went for around 3 hours.
- Three rounds:
  1) Explanation Round
  2) Video Round
  3) Buzzer Round
- Subjective answering judged by Professors
  For Physics: Prof. K.D. Gupta, Prof. P. Sarin, Prof K.G.Suresh
  For Mathematics: Prof. R. Raghunathan and Prof. S.Krishnan
- One day each for Physics and Mathematics.
- We had a huge response even after being at the very start of semester.
- Approximately 120 Participants on Physics Day and 100 on Mathematics Day.

Maths Olympiad

- Less number of questions were given with more time to solve.
- High difficulty level as people demanded.
- Separate judgment for freshmen and seniors.
- 74 people turned up for 2 hour mathematics solving.

Logic GC

- Three rounds of mindboggling puzzles with new pattern.
- Over 270 students participated.
- Screened teams after first round in order to make subjective answering in following rounds.



PhysX GC

- Introduced a new GC in which students had to measure a scientific constant by preparing an experimental setup.
- We conducted an exhibition open to all displaying these experimental apparatus.
- Prof. T. Kundu, Prof. K.G. Suresh and Prof. Dipankar judged the teams and gave comments.
- Teams measured constants like speed of light, Boltzmann constant, Planck's constant and e/m ratio.

Lectures, Talks and Group Discussions

Group Discussions

Conducted weekly group discussions on different topics.

Lecture on Linear Algebra

- By Prof. Zafar Ahmed, Nuclear Physics Division, Bhabha Atomic Research Center.
- Approximately 230 people turned up.

Interactive session with Prof. A. Gopakumar

Helped in organizing an interactive session with Prof. A. Gopakumar , TIFR who was visiting IIT Bombay for a day.

Talk on Galois Theory and general 5th degree polynomials

- By Shanay Shah, fifth year undergraduate, Electrical Engineering, IIT Bombay.
- Discussed group theory, fields, automorphisms, Galois theory and solvability and rough proof on general solvability of 5th degree polynomials.

Talk on Symmetries in Modern Physics

- By Mimamsa 2015 Finalist team representing IIT Bombay at IISER Pune.

- Started from basic intuitive concepts of symmetry, then symmetries in classical mechanics, conservation laws, groups, group invariance, isospin symmetry and discrete symmetry.

Lectures on International Linear Collider

DST-JSPS sponsored lectures on International Linear Collider by Prof. Junji Urakawa, Prof. Hitoshi Hayano, Prof. Kenji Hosoyama and Prof. Susumu Ikeda.

Talk on Collatz Conjecture

- By Sanat Anand, first year undergraduate, Civil Engineering, IIT Bombay.
- Discussed his research work on generalization of Collatz conjecture.

Talk on Large Scale Structures of Universe

- By Digvijay Wadekar, fourth year undergraduate, Engineering Physics, IIT Bombay
- Discussed Dark Matter, Dark Energy and his research topic in Zoldovich Pancakes.

Lecture on Challenges in Elementary Particle Physics with Muons

- By Prof. Yoshitaka Kuno, Department of Physics, Osaka University, Japan
- Discussed the CLFV experimental detection experiment.

Lecture on Open Issues in General Relativistic Astrophysics

- By Prof. Luca Baiotti, Department of Physics, Osaka University, Japan
- Discussed general relativity, black hole physics and gravitational waves and their detection.

Lecture on What, How and Why of Particle Physics

- To be delivered by Prof. Pradip Sarin, Department of Physics, IIT Bombay.
- Discussed the meaning of particle physics, particle accelerators, particle detectors, experiments and techniques that we will be seeing in upcoming SAMEER and RRCAT trip.

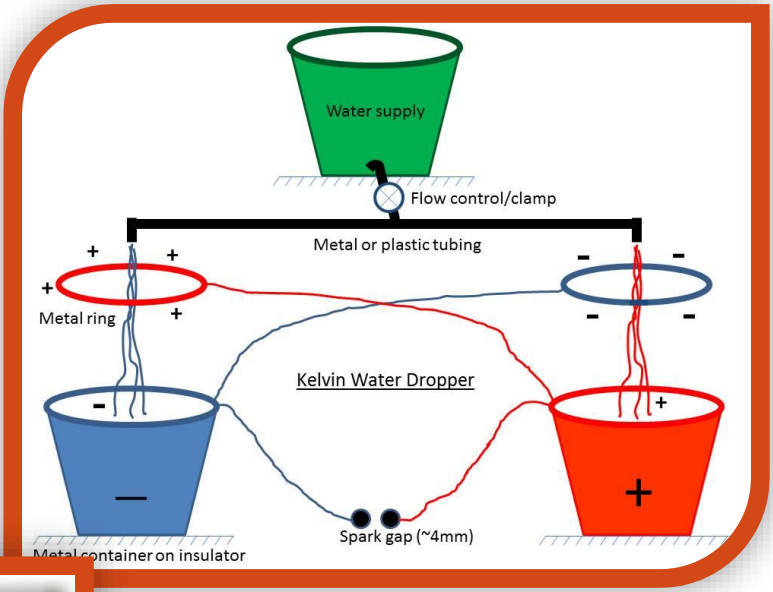
Talk on 'Seeing is believing – Direct observation of the wavefunction in Quantum Mechanics'

- Will be given by Jash Banker, fourth year undergraduate, Engineering Physics on 30th March.
- A brief idea of concept of measurement of wavefunction in quantum mechanics will be discussed.

Experimental Exposure

Experimental Demonstration - Kelvin Water Drop Experiment

- Kumar Ayush and Sandesh Kalantre made a demonstration of Kelvin's water dropper experiment.
- Displayed the demonstration to an audience of 30 people and had interesting discussion later.



Laboratory trip to SAMEER, IIT Bombay

- We have organized a laboratory visit to SAMEER (Society for Applied Microwave Electronics Engineering and Research), IIT Bombay in March last week.

Laboratory trip to RRCAT, Indore

- We have organized a laboratory visit to RRCAT (Raja Ramanna Center for Advanced Technologies), Indore to explore the current research in field of nuclear and particle experimental physics in India.

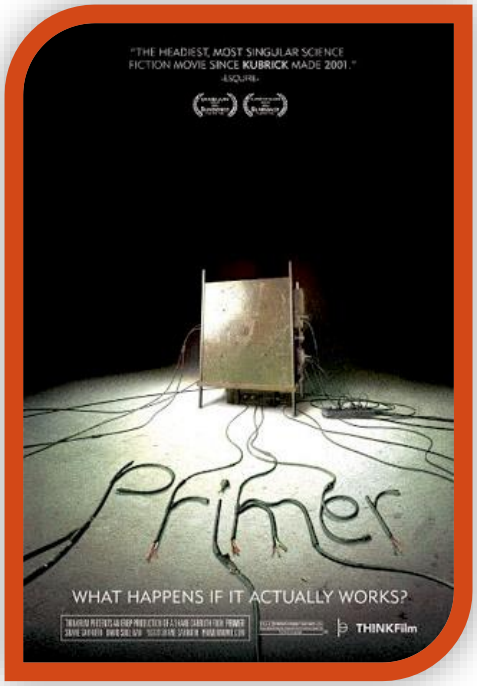
Leisure Events

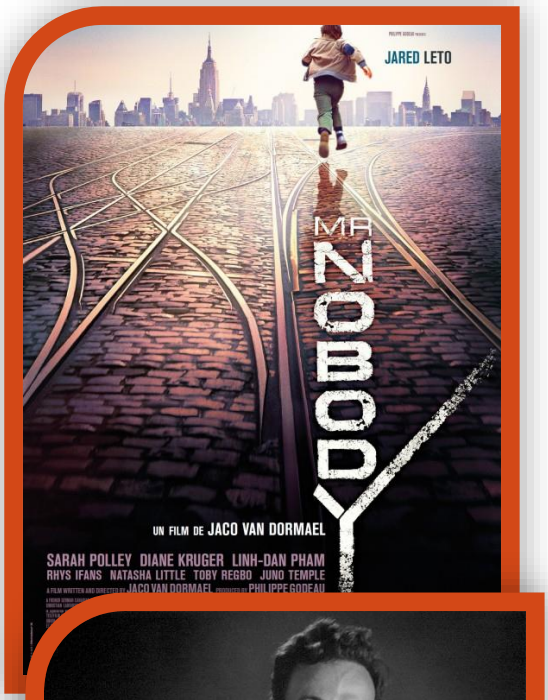
Gaming Night

- Brought logical board games like chess, checkers, connect4, tangram etc.
- Logical PC games like Limbo, Velocity raptor etc.
- Discussed more such mind boggling activities.

Movie Screenings

- **Primer:** Screened science fiction movie 'Primer' on time travel. It is known for its closeness to working circumstances of physicists.

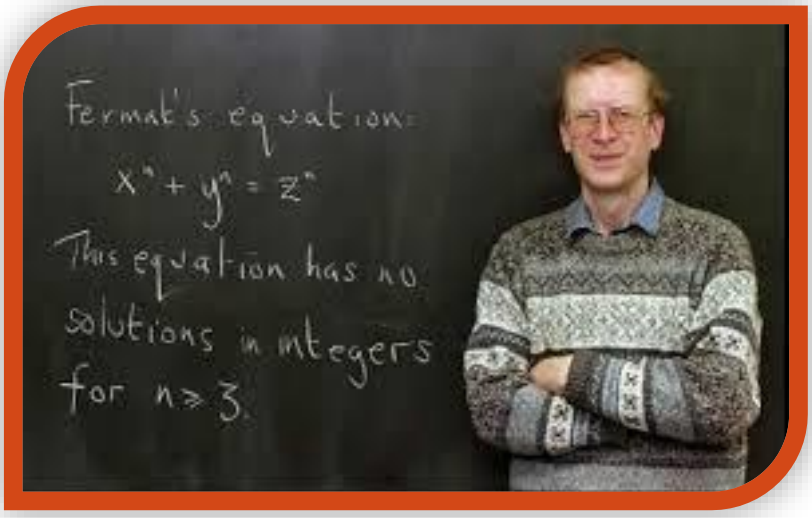


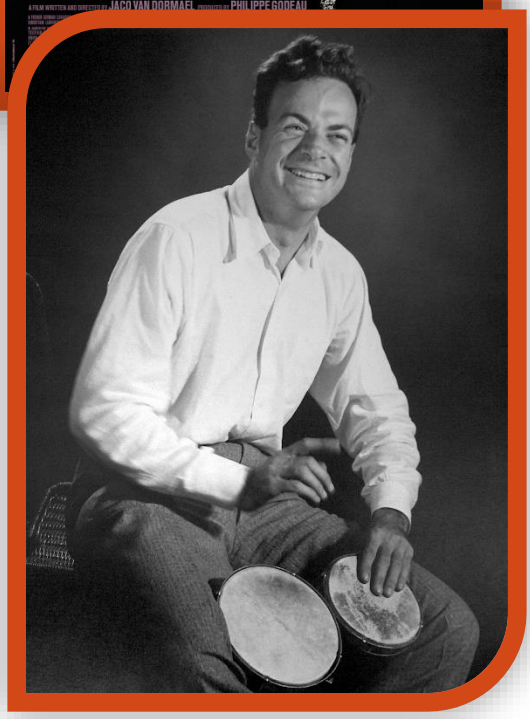


- **Mr. Nobody:** Screened science fiction movie 'Mr. Nobody' on the concept of Alternate Realities, Chaos theory and Butterfly effect.

Documentary Screenings

- **Fermat's Last Theorem:** Screened documentary 'Fermat's Last Theorem' on the inspiring story of Andrew Wiles and his efforts to prove Fermat's Last Theorem.





- **The Fantastic Mr. Feynman:** Screened documentary 'The Fantastic Mr. Feynman' on his inspiring life story and description of how he saw physics and life in general.

Anchal Gupta, Manager, Maths and Physics Club, IIT Bombay

Other 'behind the curtains work' that we did

Popular Science Library

Moved the proposal for popular science books in Central Library.

Inter-IIT Radio Telescope Project Kicked-off

In collaboration with IIT Delhi, started project 'Inter-IIT Radio Telescope' which aims to make an interferometer with roughly 1100 km baseline. This can be used later to observe sun and other radio sources in the sky as well as for training purposes to students in radioastronomy.

Jigyasa 2015 and Mimamsa 2015

Helped in organizing Jigyasa 2015, Inter-college science quiz conducted by UMDAE-CBS. One team from IIT Bombay qualified in the first round and won the final round.
Helped in publicizing Mimamsa 2015, Inter-college science quiz conducted by IISER Pune. One of the teams from IIT Bombay reached finals among top four teams in India. Scored third position in finals.

Introduced the concept of Club Members

Introduced the concept of Club Members for freshers who wish to involve in the club acitvites from the other end. This step was in spirit of improving the meaning of club as a bunch of students interested in Mathematics and Physics.

Other activities

- Introduced new logo and new introductory video for the club.
- Regularly updated everyone with recent research activities, awards and talks on google group.
- Discussed nice puzzles and problems on google group.
- Assessed interest level among students for a possible 10 days course on Quantum Mechanics and Computation by Prof. George Sudarshan.
- Mirrored NEWTON- ask-a scientist program's website to preserve more than 25k questions as the site closed down on 1st March.

All STAB activities

Fresher's Orientation

Organized Fresher's orientation with other clubs of STAB in the start of the year. We demonstrated experiments with liquid nitrogen.

Tech Treasure Hunt

We are organized Tech Treasure Hunt with other clubs on 15th March where participants completed some technical tasks and solved clues in order find their way to the prizes.

Anchal Gupta, Manager, Maths and Physics Club, IIT Bombay

Vote of thanks

Maths and Physics Club is thankful to all the people who regularly attended our events and made our vision possible. Without the support of students, no discussion or competition could have been a learning experience. We also thank our Faculty Advisor Prof. Hemendra Arya for their valuable suggestions throughout the year. We would like to thank Prof. P. Sarin, Prof. R. Varma, Prof. K.G. Suresh, Prof. K. Dasgupta, Prof. T. Kundu, Prof. R. Raghunathan, Prof. S. Krishnan and Prof. Dipankar for their support in our events.

Finally, nothing would have been possible without the support of our Overall Coordinator Rahul Prajapat, my fellow managers of other clubs and the hardworking conveners of Maths and Physics Club viz. Darshil Dave, Vaibhav Bhosale, Shashank Sharma and Bhumesh Kumar.

From left to right: Shashank, Bhumesh, Anchal, Vaibhav, Darshil

Anchal Gupta, Manager, Maths and Physics Club, IIT Bombay