

October 2015

#### INDIAN INSTITUTE OF TECHNOLOGY BOMBAY

# Inauguration of IIT Bombay Research Park Applied Materials Joins IITB Research Park as Anchor Client



Prof. D.V.Khakhar, Director, IIT Bombay and Dr. Om Nalamasu, Senior VP and CTO, Applied Materials Inc. inaugurating the IITB Research Park.

The Research Park at Indian Institute of Technology Bombay (IIT Bombay) was inaugurated on October 22, 2015 in the presence of Prof. Devang Khakhar, Director, IIT Bombay, Mr. Om Nalamasu, CTO, Applied Materials, Inc., Prof. Abhay Karandikar, Professor-in-charge, IIT Bombay Research Park and many other dignitaries. As a significant step, IIT Bombay and Applied Materials announced that Applied will be the first anchor client of IITB's Research Park. The IIT Bombay Research Park will enable technology-focused companies to co-locate R&D assets at IIT Bombay, and thereby benefit from close interaction with faculty and student researchers, and from seamless access to labs, equipment and services.

At the event, Prof. Devang Khakhar, Director, IIT Bombay, said, "Applied Materials has been a valued partner of IIT Bombay for a decade and we welcome its decision to sign up as the first anchor client of IIT Bombay's Research

# Campus diary

Park. I see it as a testament to the significant value that the Research Park can add to our existing collaborative research and innovation activities in the ESDM (Electronic Systems Design and Manufacturing) sector. Through IIT Bombay's Research Park we aim to enable deeper, as well as broader, engagements between industries in various R&D sectors with our faculty and students. It underscores our commitment to supporting such mutually beneficial academiaindustry partnerships and I hope that this event will encourage many more companies to join hands with IIT Bombay's Research Park in the near future."

Dr. Om Nalamasu, Senior Vice President and Chief Technology Officer, Applied Materials, Inc. said, "The Applied Materials - IIT Bombay partnership combines Applied's leadership in materials engineering with IIT Bombay's research expertise to create one of the most comprehensive industry-academia collaborations in the world. It serves as a great benchmark of how a global innovation-focused company and a leading research university can work together to provide foundation skills for a developing industry. We are proud to be at the forefront of creating a strong ecosystem in India to support the growth of domestic semiconductor manufacturing."

Prof. Abhay Karandikar, the Professor-in-Charge of the IIT Bombay Research Park, observed: *"We are very* pleased to note that Applied Materials has announced it would be the first anchor client of IIT Bombay Research Park. We hope this will significantly enhance





Prof. D. V. Khakhar, Director, IIT Bombay, Dr. Om Nalamasu, Senior VP and CTO, Applied Materals Inc. and Prof. Abhay Karandikar, Professor-in-charge, IITB Research Park during the launch of the IITB Research Park.

the interactions that Applied Materials is already having with IIT Bombay faculty, students and research staff. IIT Bombay Research Park will provide a platform for innovations and cutting-edge research through collaborations with faculty and students. The park is envisaged to house 30 companies in its first phase on an area of two hundred fifty thousand sq. ft., eventually scaling to one million sq. ft. In subsequent phases. We are hopeful that more R&D companies will engage with IIT Bombay Research Park and help us take industryacademia interactions to a new level."

The event was attended by faculty students, and staff of IIT Bombay. Media was also present to cover the event.

# Hon'ble HRD Minister Visits IIT Bombay Campus

Hon'ble Union Minister for Human Resource Development, Government of India, Smt. Smriti Z. Irani, inaugurated Hostel No. 10 on October 6, 2015 during her visit to IIT Bombay. After the Inauguration, she had an interaction with the Students.



Smt. Smriti Z. Irani, Hon'ble Union Minister for Human Resource Development, Government of India, Prof. D.V. Khakhar, Director, IIT Bombay at the inauguration of Hostel No. 10.



Meanwhile, she also visited the Advanced Machining Excellence Cell (AMEC) of National Centre for Aerospace Innovation and Research (NCAIR) and interacted with faculty members involved with the Centre.



Smt. Smriti Z. Irani, Hon'ble Union Minister for Human Resource Development, Government of India, Prof. D.V. Khakhar, Director, IITB and other functionaries at AMEC, NCAIR.



Vigilance Awareness Week Celebration at IIT Bombay

Prof. Devang V. Khakhar, Director, IIT Bombay administering pledge to the Institute functionaries and Heads of the academic units during Vigilance Awareness Week.

Vigilance Awareness Week was celebrated in the Institute from October 26 to 31, 2015. The theme of Vigilance Awareness Week this year was "Preventive Vigilance as a Tool of Good Governance". Preventive Vigilance is broadly described as a package of measures aimed at improving systems and procedures to reduce scope for discretion and eliminate corruption in an organization. A wider publicity to the observance of Vigilance Awareness Week was given by displaying banners at prime locations in the institute. The Director administered pledge to the functionaries of the Institute and Heads of the academic units. The Heads of academic and administrative units were also requested to observe Vigilance Awareness Week along with the pledge in their respective units.



October 2015

As a part of the Vigilance Awareness Week, the Vigilance Cell of the institute organized an Essay Competition inviting participation of students and employees of the institute. A total of 35 entries were received from Students, Faculty, and Staff. The topic of the essay was "Promoting Ethics, Moral Values & Fighting Corruption: Role of Youth" for students, and "Promoting Ethics,



Mrs. Sridevi D.S, Vice Principal of Campus School administering pledge to fellow colleagues.



Teachers and the Non-teaching staff of IIT Campus School and Junior Colleagues taking pledge.

Moral Values & Fighting Corruption: My Role" for the employees. The winners who come first, second and third in each category will be awarded with Rs. 10,000; Rs. 7,000; and Rs. 4,000 respectively.

Meanwhile, "Vigilance Awareness Week" was also observed in IIT Campus School & Jr. College. As a part of the programme teachers and all non-teaching staff assembled on the School Assembly Ground and shared their views about the theme of the Vigilance Awareness Week "Preventive Vigilance as tool of Good Governance" and took the pledge.

#### CEP Course on "Environmental Management of Pharmaceutical Industry"

A five days custom made CEP course on "Environmental Management of Pharmaceutical Industry" for officials from Andhra Pradesh Pollution Control Board (**APPCB**) was organized by Centre for Environment Science and Engineering (CESE) from October 5-9, 2015. The course was inaugurated on October 5, 2015 by Chief Environmental Officer, APPCB and the coordinator of the course Prof. A.K. Dikshit. Over 5 days, wide range of topics were covered, which were very intensive and delivered by the expert in that

area like the Introduction and Environmental Profile of Pharmaceutical Industry by Prof. Anil K Dikshit, IIT Bombay, Policies and Legal Guidelines and Regulations for Pharmaceutical Industries by Prof. Ramesh D Dod, MIT Pune etc. The course was attended by 21 senior level officers from Hyderabad head office, Tirupati, Vizag, Vijayawada, Kurnool and Eluru zonal offices of APPCB and five students from IIT Bombay. The course ended with certificate distribution and valedictory function on October 9, 2015

#### IIT Bombay team stood first in Summer School – Behavioral Modelling in Transportation Networks at University of Tokyo

Fourteenth behavior modelling summer school, organized in September 2015 by the Civil Engineering Department (Behaviour in network studies laboratory) at University of Tokyo, intended for graduate engineers and young researchers working in the fields of transportation planning, social infrastructure, architecture, urban planning, basic and specialized knowledge of discrete choice modeling, the summer school in its earlier version saw participation from universities across Japan. The summer school overlaid the concepts activity based travel behavior modeling through lectures given by professors from the participating universities. Prof. Arnab Jana (IIT Bombay), Prof. Giancalos Troncoso Parady (University of Tokyo), Makoto Chikaraishi (Hiroshima University), and Hideki Yaginuma (University of Tokyo) gave lectures in the English session. The keynote address was given by Prof. Masahisa Fujita (Kyoto University) on the role of diversity and culture in knowledge creation. The participating teams were provided with probe person data for trips conducted in the Tokyo metropolitan region. The teams were expected to conduct basic analysis before reaching Tokyo and finish estimating the model by simulating policy decisions during the course of the summer school.

The team from IIT Bombay mentored by Prof. Arnab Jana had four participating student members, Rohan Joshi (Civil Engineering), Varun Varghese (CUSE), Naveen Krishna Alla (CUSE), and Sayantani Sarkar (CUSE). The team decided to conduct a cohort based modal choice analysis for the Tokyo metropolitan region, identifying areas which are public transport and non-motorized transport friendly. In the process, the team created mixed logit (MXL) and multinomial logit (MNL) models predicting the probabilities for mode choice, with travel and age as predictor variables. The predicted probabilities were spatially plotted to create statistically significant hotspot clusters, identifying areas with concentrated use of different type of modes. The same were plotted against the existing contours and slope to see its variation against the terrain. Finally, a policy analysis was conducted by creating prediction success and elasticity tables that elaborated the correctness of the predicted model. The team from IIT Bombay was awarded with the Davis Prize for excellence in behavior modeling at the summer school by Prof. Yamamoto Toshiyuki (Nagoya University). The team also secured an overall 1st position at the summer school.

### **Research in Focus**

Efficient tracking and maneuvering of Chandrayaan is crucial for the success of the mission. An efficient and low cost tracking algorithm from IIT Bombay could be a solution to this. The recent success of the Mars Orbiter Mission (MOM), also called Mangalyaan was a milestone in space technology and research capabilities of the nation. Determined to continue its success streak, ISRO is planning its second lunar mission, the Chandrayan-2 to be launched by the end of year 2016 or in early 2017. Space missions are amongst the most technology and research intensive projects a country could take up. Chandrayaan-2 will comprise an orbiter, a lander, and a lunar rover. A number of extremely complex systems have to work in perfect synchronization to ensure a successful operation and execution of the project. Once the spacecraft reaches the outer space, satellite navigation becomes the most crucial part of the mission. The basic task of a satellite navigation system is the prediction of spacecraft position and velocity. Extensive research is employed to find novel methods to do this accurately in realtime, for efficient tracking of spacecrafts and initiation of steps for trajectory correction, if required.

A M.Tech. student Sanat Kumar Biswas and Prof. Hablani of Aerospace Department in IIT Bombay, took up this daunting challenge to develop a navigation system that could be put into use for the Chandrayan2 mission. Sanat's project focuses on building algorithms to predict the trajectory of a spacecraft using the data collected by the ground stations (via spacecraft transmissions) while the spacecraft is in flight. The work started with the simulation of a cislunar trajectory, which the spacecraft would supposedly follow. The simulation of the trajectory of any object in space requires the knowledge of the nature and magnitude of the forces acting on it. The major forces identified for this specific problem were the gravitational forces of the sun, the moon and the earth and solar radiation pressure. Quantifying the influence of these forces was difficult because of their complex, nonlinear nature. Hence, a more complex model called J2 was used which even accounted for the the non-spherical and irregular shape of the earth and the moon, instead of assuming complete spherical shape.

#### Aiming for the moon and beyond



After simulation of the trajectory, the next step was to run the simulations to obtain data similar to what would be received by the ground stations from the spacecraft. Such signals get distorted and corrupted with noise before reaching the ground stations, hence, the sources of distortion and error were taken into account as well and ground station data were generated via simulation. The work also incorporated estimation of the position and the velocity of the spacecraft; the two most essential parameters for navigation, from the data gathered by the ground stations. The authors also took into consideration the time delay between the broadcast of the message and its reception due to the finite speed of electromagnetic waves.

The results from this work were extraordinary. The final error in position and velocity at the time of arrival at the moon were within 30 kms and 1.5 m/s respectively. Although the error is low in view of the length of the trajectory, the authors believes scope for improvements exists and could be incorporated to make the algorithm application ready. These results were obtained without the use of any high end computational facilities. With higher computational power at disposal, more complex and accurate models can be incorporated into the algorithm.

For more details, Please visit : http://www.iitb.ac.in/ en/research-highlight/aiming-moon-and-beyond

# Institute Colloquium / Lectures & Seminars



**Dr. Sunita Narain**, Director General, Centre for Science and Environment, New Delhi, delivered the third Annual Girish Sant Memorial Lecture on "The energy question for India? Clean energy or energy access?" on October 9, 2015.



**Dr. Srikanta Mishra**, Institute Fellow and Senior Research Leader for Energy & Environment, Battelle Memorial Institute, United States, delivered an Institute Colloquium on "Shale Gas Development: Energy Supply Game Changer, or Environmental Quagmire?" on October 13, 2015.



**Prof. Avi Wigderson**, School of Mathematics, Institute for Advanced Study, Princeton, delivered the third Annual - Indira Foundation Distinguished Lecture on "The "P vs. NP" problem: Efficient computation, Internet security, and the limits to human knowledge" on October 28, 2015.

# Departmental Lectures

#### Department of Humanities and Social Sciences

**Dr. Paramita Dutta**, Rammohan College, Kolkata, delivered a talk in a seminar on "World Drama in Bengal: The Nandikar Way" on October 28, 2015.

#### Computer Science and Engineering

**Mr. Doug Carucci**, JP Morgan Chase & Co, delivered a talk on "Technology Solutions for Trading in Global Markets" on October 7, 2015.

#### **Climate Studies**

**Dr. Bimal K. Bhattacharya**, Crop Inventory and Agro-ecosystem Division, Space Applications Centre, ISRO, Ahmedabad, delivered a talk in a seminar on "Land – Atmosphere Interactions over Indian Vegetative Systems through Energy and Mass Exchange" on October 14, 2015.

#### Centre For Technology Alternative in Rural Areas (CTARA)

**Mr. Kunjan Gandhi**, Gram Power, an energy technology company, delivered a talk in a seminar on "Energizing Rural India, Leveraging advanced technology" on October 8, 2015.

**Prof. M Rajivlochan,** Panjab University, delivered a talk in a seminar on "Agrarian Crisis and Farmers' Suicide: Dealing with Historical Transformations." on October 26, 2015.

#### SJM School of Management

**Prof. R. Vaidyanathan,** IIM, Bangalore, delivered a talk on "Role of India in the new world order" on October 27, 2015.

### Blood Donation Camp at IIT Bombay

SAMWAD - Student team of IIT Bombay and Sthaniya Lokadhikar Samiti with the help of KEM Hospital Blood Bank organized a Blood Donation Camp on October 10, 2015. Smt. Snehal Ambekar, Mayor, Mumbai visited the blood donation camp to encourage the participants. The drive witnessed participation from Faculty members. Student and Staff community of the Institute. Residents of IIT Bombay campus also participated in the camp and contributed towards this noble cause. In all, around 400 people participated in the event and donated their blood.



# 'Protolith 2015'

**Department of Earth Sciences**, organized a National level Technical Symposium "Protolith 2015" during October 9 – 11, 2015. The symposium aimed to showcase research work going on in the Department of Earth Sciences. It also provided an adequate opportunity for students to interact and connect with Industry professionals. A total of 12 workshops and seminars on different topics by eminent speakers were conducted over the period of three days.



#### Awards and Distinctions

**Prof. C.P. Rao,** Department of Chemistry has been elected for the fellowship of the Indian National Science Academy.

**Dr. K. Mahesh**, Project Research Scientist, Cell for Indian Science and Technology in Sanskrit, Department of Humanities and Social Sciences has been chosen for the prestigious "Young Historian of Science Award" by Indian National Science Academy, New Delhi in recognition of his research contributions to the field of History of Science.

# 2015 Global Innovation Award Winner

**Mr. Manju Naika**, Ass. Librarian, Journal and Computer Application Section, Central Library, IIT Bombay was awarded Turnitin Student Engagement Award winner for Asia. Mr. Naika was awarded with the prestigious award for his efforts in creating awareness about plagiarism and Turnitin at IIT Bombay by Turnitin, USA.

# Publications

**Prof. Sanjeeva Srivastava,** Department of Biosciences and Bioengineering, served as the Guest Editor for Volume 127, Part A, Pages 1-222, Special Issue "Proteomics in India": Gazing Forward while Reflecting on the Lessons Learned in Global Proteomics in Journal of Proteomics.

#### Errata

In the earlier issue of Campus diary, on page number 4, the caption for first photo under 'IIT Bombay Review Paper Award for the Year 2014' was misprinted as 'Prof. Sanjeeva Srivastava, Department of Biosciences & Bioengineering'.

It should be read as 'Prof. Dulal Panda, Department of Biosciences & Bioengineering, receiving the award on behalf of Prof. Sanjeeva Srivastava, Biosciences & Bioengineering'.

Campus diary regrets the error.

# **Appointments**

#### Dr. Namrata Singh, Department of



Chemistry, has been appointed as Post Doctoral Fellow on Oct. 1, 2015.

#### Dr. Ankita Srivastava, Department



of Bio. Sci and Bio. Engg. has been appointed as Post Doctoral Fellow on Oct. 1, 2015

#### Dr. Ashish Bhateja, Department



of Chemical Engineering, has been appointed as Post Doctoral Fellow on Oct. 5, 2015.

#### Dr. Namita Behera, Department of



E I e c t r i c a I Engineering, has been appointed as Post Doctoral Fellow on October 5, 2015.

#### Dr. Nikhil Balaji, Department of



C o m p u t e r Sciences and Engineering, has been appointed as Post Doctoral Fellow on October 7, 2015.

#### Dr. Aga Shahee, Department of



e, Department of Physics, has been appointed as Post Doctoral Fellow on October 14, 2015.

Dr. Bhanu P. Joshi, Department



of Physics, has been appointed as Post Doctoral Fellow on October 15, 2015.

# Retirements in October 2015

Shri Vikas G Pawar, Sr. Assistant



Engineer, Estate Office, retired after 32 years of service.

#### Shri M.K. Mohandas, Sr.Tech.



Supdt, Electrical Maintenance Division, retired after 34 years of service.

#### Shri Radhyesham J. Tiwari, Library



Attdt. (SG), Central Library, retired after 37 years of service.

#### Shri Ramawadh I. Singh, Sr.



Helper, Dept. of Metallurgical Engineering and Material Science, retired after 36 years of service.



CEP courses scheduled during December 2015			
No. Course Title		Course Coordinator / Department	Duration
1.	Ground Water and Surface Water Management	Prof. T.I. Eldho, Prof. A.K. Rastogi, Department of Civil Engineering	December 7-11, 2015 (5 days)
2.	Piping Engineering	Prof. A.S. Moharir, Department of Chemical Engineering	December 9-19, 2015 (11 days)
3.	Building Global Cio Competencies	Prof. S. Bhargava, SJM School of Management	December 10-12, 2015 (3 days)





Photo Credit : Mr. B. Nagarkar Retired Staff, IIT Bombay salt'n pepper by Dr. Arun Inamdar





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BOOK POST