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TCTD Symposium 2018

Projects under Healthcare, Food & Agriculture, Energy, Waste Management, Education, Housing and Water, will be discussed across the symposium

IP gains for TCTD

The patent applications from Tata Centre have shown an encouraging figure of 6 more filed in 2017. Three projects from Healthcare, and one each from Waste Management, Water and Energy, have seen applications. This brings the total number of patent applications to 10 for the Centre. Furthermore, two projects are in the process of getting their solutions published in the Creative Commons, adding to the one solution that has been filed here already.

The first annual symposium, TCTD Symposium 2018, is to be hosted by Tata Centre for Technology and Design, at the Victor Menezes Convention Centre, IIT Bombay. This event is planned to showcase the technological solutions, project ideas and research teams from Tata Centre, IIT Bombay, and MIT-Tata Centre, with the objective of collaborating with the relevant stakeholders.

The theme - **'Innovate to Transform'** - is expected to take on the challenges that academic institutions and stakeholders face in

driving social innovation for better impact. Talks by experts, panel discussions, lightning presentations by faculty members from both IIT Bombay and MIT associated with Tata Centre, poster presentations by the Tata Fellows, and interactions with the IITB-MIT faculty members, are on the agenda at this event.

The two day-conclave will offer a platform for interactions with the faculty members from both IIT Bombay and MIT, USA, the Tata Fellows, project team members, the Tata Trusts, governmental agencies, NGOs and impact investors.

- Gayathri Thakoor, Project Manager

Ready to Roll

The final prototype of TCTD Chemplay, the set of games teaching Chemistry, is now ready to roll out



Making the teaching-learning process meaningful, well connected and fascinating, has been a part of the outreach initiative of the Education domain, at Tata Centre. TCTD Chemplay, the compendium of board and card games, brought in by Dr Nitin Bhate, from the Department of Chemical Engineering, M S University, Baroda, Shalini Kumar, from Altop Labs India Pvt. Ltd., Baroda and Pradnya Gokhale, from KGEC, Pune and supported by Tata Centre, is one such ancillary product of the domain.

Having tried out these games in several schools across different boards and various teacher workshops in Mumbai, Pune and Baroda, the final prototype of the set of games is now ready to roll out. The set of games focuses on addressing certain challenging concepts of Chemistry which are dealt in Standards VII and VIII, in schools.

The games include an introduction to the atomic number and atomic mass of the first twenty elements of the periodic table using cards, understanding the concept of valency, formation of ionic compounds, introducing the various groups of elements in the periodic table, formation of compounds with radicals and knowing more about the reactions of metals with water, acids and oxygen.

The media team at Tata Centre has assisted ably in bringing about the final look of TCTD Chemplay, before it rolls out into the market.

- Gayathri Thakoor, Project Manager

Detecting Arsenic Reliably

The devices that currently detect arsenic have problems that limit them from being deployed in the field and necessitate skilled personnel to operate the device

Arsenic water contamination is a major public health concern that affects a large number of people around the world. The problem is especially severe in India, along the eastern and northern belt of India in the Ganga-Brahmaputra fluvial plains, and increases in magnitude down the river streams. Concentrations as low as 10 ppb (parts per billion) are lethal to the human body and can result in arsenic poisoning, leading to skin lesions, keratosis, skin cancer etc. Features such as lack of odor and taste and invisibility to the naked eye have led to arsenic being termed as a 'silent killer'. Currently, the devices that detect arsenic have various problems - need of handling toxic elements like mercury and dangerous chemicals, inferring concentrations via generation of toxic arsine gas etc. All these

To overcome these limitations and develop a method to detect and measure arsenic in a simple and reliable manner, Prof. Rajdip Bandyopadhyaya, Department of Chemical Engineering, and his team have developed a cost-effective, easy-to-use and wide-spectrum arsenic measurement device. The device works on the principle of surface plasmon resonance (SPR) and utilizes changes in color of nanoparticles, measured using a handheld spectrometer, to give a measure of arsenic concentration. The data is logged via an Arduino board and can even be wirelessly transmitted to remotely monitor the water conditions. The device works at both extremes of arsenic measurement- concentrations as low as 0.1 ppb and as high as 400 ppb are covered by the device.

The team has achieved this by designing two nanoparticle based solutions - one to cover the low ranges and another to account for the upper extremes - to cover the entire range of measurement. This is a feature not currently present in any of the existing devices. Another unique feature of the device is that it can be used to measure both forms of arsenic, Ar^{3+} and Ar^{5+} as well as total arsenic- a novelty which makes the device stand-out from the present solutions.



Photo credit – Project team

Sensing materials

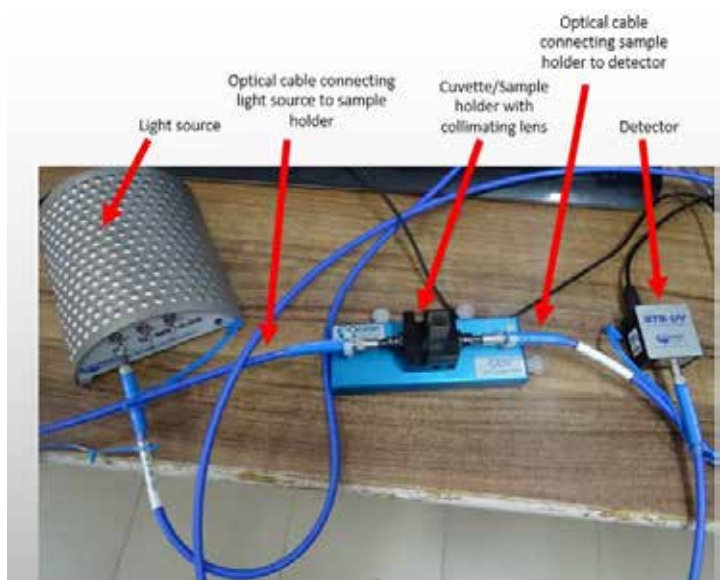


Photo credit – Project team

Prototype

The device has been tested on water samples from lakes and rivers around Mumbai, and the results have been validated with other costly, accurate analytical devices present in laboratories to achieve accuracy levels less than 1 ppb. All this is achieved at a moderate cost of around Rs 30 (0.5 \$) per sample. The team is currently working on miniaturization of the device to make it portable and easy to be carried to different sites. Work is still going on to make the device remotely accessible so that the data can be acquired wirelessly, and even untrained persons can use the device to get the results. The team is currently looking at patenting the device for its novel features and expects the miniaturization and remote sensing work to be completed within the next 6-8 months, so that the device can be widely deployed in the field.

- Jasleen Chhabra, Tata Fellow 2016



An Immersive Voyage

The aim of the TCTD Yatra was to help the Tata Fellows understand community dynamics, and complexities and challenges, in adopting the solutions in the market.



Photo credit – Team

The first year Tata Fellows from IIT Bombay went on the TCTD Yatra - a 10-day immersive program - to visit social enterprises in the south of India. The plan was to get a first-hand experience in knowing about the work in the domains of food & agriculture, energy, waste management, water, education, and micro-finance.

The first day at IIT Bombay campus was interactive with inspiring addresses from G G Sohani, President and MD, BAIF Development Research Foundation, on the role of community participation and effective use of local resources in developing these communities, followed by Jyoti Mhapsekar, President, Stree Mukti Sanghatana, sharing her experiences on the problems of women waste pickers. An experiential workshop conducted on human-centred design thinking by Butool Abbas, a design and research consultant, got the 20 Tata Fellows ready for more.

Having boarded the bus, the Fellows visited Huballi, Bengaluru and Madurai, as part of the agenda.

Accompanying the Tata Fellows were three faculty members from IIT Bombay – Prof Alka Hingorani, IDC, and Prof Shishir Jha and Prof Arti Kalro, SJMSOM - and a postdoctoral fellow and project manager.

The Tata Fellows saw how social enterprises could scale-up using technology, operational efficiencies, trained human resources and how all these aspects could be combined into innovations for social impact. They met leaders and novices of



the social space to understand their approach of addressing an unsolved social problem. The organisations led by these social leaders ranged from intervention at community or local scale to scales spanning several states in India.

The students were happy to connect with Dr Harish Hande, Founder of SELCO, and learn to navigate organisations through the complexities of engineering and social aspects, holding on to being sustainable and profitable.



Photo credit – Team

- Gayathri Thakoor & Suhail Shaikh, Project Managers



Highlights of the TCTD Yatra

Different perspectives of solving a problem, building upon each other's learnings and playing UNO in the bus, were just parts of the TCTD Yatra - a successful learning trip for the Tata Fellows

Travelling to fields in villages in the day, interacting with communities and social entrepreneurs, attending presentations, asking questions, debating and internalising, returning to rest late in the evenings, and then having introspection sessions, they were very hectic and exciting 10 days for the Tata Fellows. On their return, they had much to say.

"An eye-opening experience"

- Arijit Mukherjee

"Learning from 5 year olds at Kalkeri Sangeet Maha Vidyalaya and from an experienced MIT graduate, Almitra Patel, the exposure will help me a lot, through my life."

- Pratik Dixit

"The motivation to become a doer, and make a difference to the bottom of the pyramid, was the essence."

- Riddha Manna

" My learnings from the trip - If the project keeps on growing, then the problem is not being solved. When we use technology for need, we develop sustainably, we make the pie bigger and equal."

- Anamika M. P

"The highlight of the trip was having a first-hand experience of how bookish concepts were applied with such ease to make a project work. Also, watching entrepreneurs work across sectors of interest but towards the same goal, gave a sense of belief and confidence."

- Rohan Ohri

"This trip gave me a wonderful opportunity to relate the classroom learnings to real life, it helped refine my view and approach towards any problem."

- Satyam Sahu

"The trip allowed us to witness not just the vision and views but also the compassion and thoughtfulness of a few society changers. The cash flow management and self-sustainable models showcased were remarkable."

- Smartika Singh

"Kalkeri Sangeet Vidyalaya and a visit to the Akshaya Patra kitchen at Dharwad were memorable parts of our Yatra."

- Arnab Pattanayak

"Having the concept of "Fun and Learn", the trip influenced me by showing how I could use my technical education to make a difference in the life of the rural India along with the ways of the betterment of the rural communities."

- Rishabh Chaturvedi

"A journey to know the real YOU"

- Dipen Mistry

"Seeing how minimal resources were used to create solutions at Arvind Eye Care and Kalkeri Sangeet Vidyalaya were eye openers; visiting DHAN Foundation and SELCO were journeys by themselves."

- Pawan Kumar

"The highlight of the trip was understanding the BOP through the eyes of some of the social entrepreneurs that we met during the trip. Dr Harish Hande's session and the visit to Arvind Eye Hospital were by far, learning experiences."

- Priyanka Purty

"This trip was most valued; it showed me the crux of entrepreneurship."

- Sagar HP

"It all started with a term design thinking, common to every organisation we visited, and so were their values and principles, passion towards doing something good for the unprivileged and determination to fight against all the odds."

- Mugdha Indurkar

Collaborating with MIT-Tata Center

Hindi Shabdmitra is the first Education project at TCTD, IIT Bombay, with a collaboration to announce. Michael Beeler, a part of the research team at MIT-Tata Center, will work with the project team to bring in tools of machine learning to make the existing Hindi Shabdmitra platform more automated and data-driven.

At an Interdisciplinary Conference

Dr Disha Bhanot, Tata Centre's postdoctoral fellow, recently attended a conference in Washington DC, USA



Photo credit – Team

Tata Centre's postdoctoral fellow, Dr Disha Bhanot, had the opportunity of attending the Decision Science Institute Annual Conference at Washington DC, USA, in November 2017. Through national, international and regional conferences, competitions, and publications, the Decision Science Institute provides an international forum for presenting and sharing research in the study of decision processes across disciplines. The theme for this year's conference was Innovative Decision Making – Research to Practice, which was appropriately embodied in 379 sessions that included keynotes, workshops, panels and paper sessions.

The diverse range of sessions not only provided Dr Bhanot with the exposure to thought-provoking conversations and reflections but also gave a fine chance to learn new topical knowledge to be shared with peers, new research methods to deploy in scientific enquiries and new pedagogical approaches for teachers to facilitate better student learning. Since it truly was an interdisciplinary conference, it also was a perfect chance to acquire knowledge on topics both within and outside her domain - Housing. Tata Centre encouraged Dr Bhanot to attend and participate in this conference, bringing back home wonderful experiences to share to the IIT Bombay team.

- Dr Disha Bhanot, Postdoctoral Fellow

Interacting with Booth School of Business

Three project teams and a Tata Fellow from Tata Centre, IIT Bombay, interacted with the MBA students of the University of Chicago, Booth School of Business, in December 2017. This was the result of a six-month long discussion between both Centres. The international management school students have taken up three potential projects in the Water domain from the Centre, and are expected to prepare viable commercialisation model. The three projects under study are EIS platform for bacteriological monitoring in water, Heavy metal sensing in water using optical fiber sensors and Detection and sensing of arsenic in drinking water. The projects guided by Prof Soumyo Mukherji, Department of Biosciences and Bioengineering and Prof Rajdip Bandyopadhyay, Department of Chemical Engineering respectively, and assisted by the teams, extended full support to the management school students helping them with details of their projects. Over an afternoon session spent well at the Tata Trusts office, the Tata Centre project teams presented their technologies and solutions, which encouraged an active hour of brainstorming among all. The management students from Booth School of Business are expected to complete their study with lab to market reports on these three projects, as a part of this assignment.

- Gayathri Thakoor, Project Manager



The Tata Fellows' trip to MIT

Meaningful discussions amongst the Tata Fellows and guides of both IIT Bombay and MIT helped in bringing new insight to the ongoing projects – these could serve as source for new interventions

“MIT-Kendall Square- The most innovative square mile on the planet”- This sign greets you everywhere the moment you enter Massachusetts; and Tata Fellows from IIT Bombay had the opportunity to see that first hand. Having hosted the MIT Tata Fellows earlier during their trip to India, it was time for the second year Tata Fellows from Mumbai to reciprocate the visit to MIT Tata Centre.



Photo credit – Team

The group comprising 13 fellows, 1 project manager, 1 post-doctoral fellow and guided by Prof. Debjani Paul, Department of Biosciences and Bioengineering, reached Boston after a 24-hour long and exhausting journey. With jet lag hardly being the dampener, the group spent the first day exploring the historic city of Boston. The harbor cruise, describing the history of Boston, was the highlight of the tour. Having explored the city and eaten to their hearts' fill in the “gullies” of Boston, it was time to switch back to business mode.

The next five days had been elaborately planned with talks from various post-doctoral fellows on the technologies and projects that they were working on. Discussions between both IIT B and MIT Tata Fellows and the postdoctoral fellows brought in better co-operation and collaboration between both sides. Such interactions could help resolve the technological and field related barriers bringing around effective solutions into practice quickly. The group also became acquainted with MIT- Lectures over Lunch (LOL!) concept. These sessions were highly intriguing and “fulfilling” as the professors gave talks over lunch and explained their work.



Photo credit – Team

Another thought-provoking component of the trip was the vertical group discussions. These discussions were significant in terms of learning about projects from other domains and many interesting ideas emerged from such open discussions. One of the major things learnt was that projects at both MIT and IIT Bombay had similar challenges and a combined effort could go a long way in accomplishing useful solutions. These discussions also served as a pot for new ideas and projects having collaborations between Tata Centers at both Institutes.

The group had the opportunity to visit MIT Plasma Science and Fusion Centre, and also visit the thriving entrepreneurial culture of MIT- visiting Mass Challenge, Boston and Martin Trust Center at MIT. Diwali night was celebrated in the middle of all this, at the ISKCON temple, which was a peaceful affair and quite different from the usual noise-filled and brightly lit atmosphere in most parts of India.

The trip to MIT helped to understand the work culture and research methods adopted there. It also helped in getting to know each other well and served as a platform for possible future collaborations.

- Jasleen Chhabra, Tata Fellow 2016



A different way out

Sujit Modi is one second year Tata Fellow with a different story to tell

Sujit Modi, a Tata Fellow from the Department of Chemical Engineering, had the freedom to choose a project as a part of his Fellowship, like any other Fellow. But he weaved in an alternative: he defined his own project.

Having decided to understand the Indian agricultural scenario before taking on any project, Sujit went on to spend time with the NGO – Dindyal Bahuddeshiya Prasarak Mandal, in Yavatmal – to interact with the farmers in the district, and understand their needs. His mentor from the same NGO, Dr. Vijay Honkalaskar, gave him equal support with field experience through participatory investigation with farmers. An added challenge for Sujit was that the solution had to be related to the core element in chemical engineering.

Sujit spent every alternate weekend in Yavatmal, studying the problems of the farmers there. While this routine went on for three months, there were those times in the library at IIT



Bombay, where he pored through agricultural research journals and papers. “I slept in the library for days together, as that was the only time I could read and get clarity on the topics, with the hectic schedule in the first year of M Tech,” he recalls.

While Sujit had three topics in mind, he gathered that there were few methods in composting that the common farmer could work with on a small scale, with Chemical Engineering having a major role to play in the solutions. Maintaining one on one contact with the farmers, it was important that they adopted relatable composting practices and methods that were beneficial to them, and not just something that was built in the lab.

Having conducted experimental studies in composting on field with Dr Honkalaskar's support, it was evident that the modelling element also needed to be incorporated into the project that he was interested in. Almost a year later, at the end of first year of M. Tech, Sujit came up with the topic: Experimental and Modelling Studies of the Composting Process, guided by Prof Sanjay Mahajani, from the Department of Chemical Engineering.

What made his story different was the effort and the initiative taken by him, to research on, define and defend a project of his choice. Sujit plans to publish a paper in the next few months, and is enthusiastic that there is enough potential for more. While applying for a PhD is on the cards, he is sure he wants to further his research on the same topic. What he is positive about is that the NGO and the farmers he has been associated with are now waiting for the solution.

- Gayathri Thakoor, Project Manager

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