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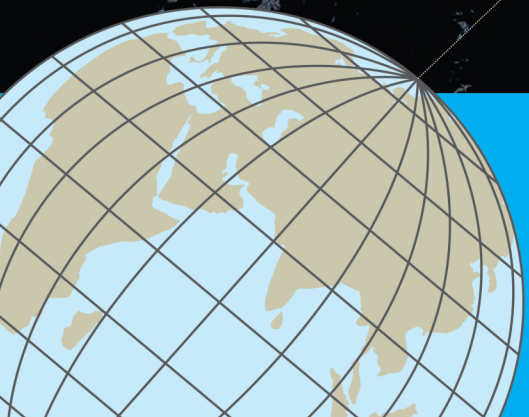


SITARE

GYTI 2020

Gandhian Young Technological Innovation Awards

TECHNOLOGICAL INNOVATION

by Young Creative Minds

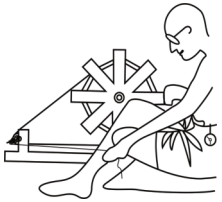
www.techpedia.sristi.org

DHRUV TARA

Dhruv tara, the north star Polaris pointing towards north, discernible through outer edge of Ursa Major stays still, seems like a celestial point of reference for navigation in northern hemisphere.

Can every student innovator find his/her north star and move towards it disregarding any distraction. We wish that all young innovators will discover their own north star and move towards it till they solve the problem and find a new challenge.

The real reward is the relentless journey towards our own north star, good luck



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GANDHIAN YOUNG TECHNOLOGICAL INNOVATION AWARDS

GYTI - 2020

Gandhian Young Technological Innovation Awards (GYTI)

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Foreword

Goverment Of India

In the fifth year of SITARE-GYTI Award, I am happy to note that the bar has been rising not just in scholarship but also in social applications. The DBT/BIRAC has created a complete pipeline for supporting the entrepreneurial journey of the students from various disciplines wanting to set up biotech startups. SRISTI has also been organizing Biotech Innovation Ignition School [BIIS] for encouraging undergraduate students to acquire the skills and perspective for pursuing their a career in life sciences by blending scholarship and entrepreneurship.

All the DBT, DST and CSIR LABS and other science departments including BIRAC's BioNEST incubators have put information about various testing facilities and high end equipments online so that students who lack access to such research infrastructure in their own college, can seek it from other institutions. The process is still evolving but I have no doubt that India as a whole will soon become a collaborative, distributed lab so that students from anywhere can seek mentoring and analytical support in any other part of the country. We plan to unleash the creativity of young minds and generate in them respect for grassroots innovations and outstanding functional traditional knowledge – something BIIS workshops have been able to do so at the college student level. Through E- YUVA centres inculcation of a culture of biotech entrepreneurship will get further push at the UG student level. One of the important lessons of highly speedy self-reliance in various solutions to Covid19 pandemic is that Indian genius lies in not only in mature biotech clusters but tier 2 and tier 3 cities as well which needs careful nurturing & scaling through collaborative excellence among various public/private and civil society organizations.

I am sure that many of the SITARE- GYTI awardees will achieve great distinctions in their future endeavours and will make us proud of their persistent achievements. I wish all the Awardees and Appreciated students a bright and meaningful future. I want to assure you all that the emerging collaborative ecosystem of science and technology institutions is committed to mentor and add wings to your dreams.

Dr. Renu Swarup
Secretary, Department of Biotechnology, Ministry of Science & Technology,Government of India

Preface

I am very happy that SRISTI has brought to the for very young, bright and promising student innovators in life sciences in collaboration with BIRAC and DBT through SITARE-GYTI Awards. For other discipline of engineering and technology, although SRISTI-GYTI awards don't carry any financial support, but recognition is equally precious. I like the idea on the cover page of GYTI Book about everybody looking for his or her own north star which we popularly call as dhruv tara. From the time immemorial, it has shown the way to sea farers and other traveler in the northern hemisphere. The Saptarishi circles around it, keeping the alignment with north star constant.

The Honey Bee Network has always believed that most innovators who make breakthrough in life set their eyes on their own north star. The external recognition is useful and helps in garnering peer respect. But the ultimate reward is the satisfaction one gets in pursuing one's own north star. I hope that you all may have found your north star through the innovations that are recognized today or you will find it soon. Nothing should distract you from your journey. Many of you are closer to your goal of solving problems and some of you might set up your own startup in future. For some others, it may take longer. But I have no doubt that those who are not able to setup their own enterprise, will certainly help those who do.

I realise that some of the Ph.D scholars have to go abroad for post doc without which getting faculty positions in eminent institutions becomes difficult. Sooner or later, we will have to change it and we should make it possible for young people to get academic credit for their entrepreneurial journey regardless of the success or failure one gets. When such scholars become faculty members, they will encourage their students to become entrepreneur and may also support startups through strong linkage with academia. We have to create an ecosystem where both faculty and startups can keep one leg in academic world and another in industry. The policy and institutional incentives will need to be aligned to make India Atmanirbhar in as many domains as possible. Though we will need to be equally ready to absorb good ideas and innovations from other parts of the world as well.

I wish all the students a great success and hope to meet them closer to their north star in future.

Dr. R.A. Mashelkar, F.R.S.
President, SRISTI, Former DG, CSIR

Acknowledgments

We congratulate all the awardees and the appreciated student innovators for having achieved a distinction in a very rigorously reviewed competition. The Honey Bee Network, SRISTI and BIRAC wish the winners all the very best in their future endeavours. We also compliment all the students who may not have been awarded but have shared their ideas with us through birac.nic.in and techpedia.in. This was the second year when all the entries for life sciences under SITARE-GYTI awards were to be submitted at birac.nic.in portal. Some students submitted such entries at Gandhian Young Technological Innovation site. These were not eligible for SITARE-GYTI Awards but have been considered for SRISTI- Gandhian Young Technological Innovation awrads.

The pursuit of self-reliance in every economic sphere of the country's development has made the role of inclusive innovations even more important than before. The partnership between BIRAC-SRISTI for recognizing student innovations that have potential for setting up BIOTECH start-ups is significant. Early stage recognition of outstanding innovations requires help of reviewers well versed in the field. We are grateful to hundreds of scholars from all over the country and some from abroad who have helped us in this labour of love.

I must thank all the colleagues who had worked day and night through the review process of SITARE - GYTI and SRISTI - GYTI awards and helped in timely announcement of awards. We would like to acknowledge the unstinted support of Dr. Renu Swarup, Secretary of DBT and Chairperson of BIRAC to carry forward the initiatives of SITARE (Students Innovations for Translation & Advancement of Research Explorations). We remain indebted to Dr. R A Mashelkar, FRS and former Secretary, Department of Scientific and Industrial Research and currently Chairperson of SRISTI Board for continued guidance and support in every endeavour of the Honey Bee Network. We particularly thank Mrs. Anju Bhalla, MD, BIRAC, Dr. Mohd. Aslam, former MD, BIRAC, Dr. Manish Diwan, Head, SPED, BIRAC, Dr. Shilpy Kochar, SPED, BIRAC, Ms Chhaya Chauhan for the kind support to the entire GYTI Award process and seamless coordination with the SRISTI team.

We are grateful to the SRISTI Research Advisory Committee and mentors of SIIE- SRISTI Bio-NEST incubator including Dr. Rakesh Mishra (Director, CCMB, Hyderabad), Dr. V. M Katoch (Former DG, ICMR, New Delhi, Dr. Anil Koul (Johnson and Johnson), Dr. Kiran Kalia (NIPER- Ahmedabad), Dr. Shashi Bala Singh (NIPER, Hyderabad), Dr. Mrutyunjay Suar (KIIT University, Odisha), Dr. Mahesh Chhabria (L. M. College of Pharmacy, Ahmedabad), Dr. Jitendar Sharma (AMTZ, Visakhapatnam), Dr. Shirshendu Mukherjee (DBT, New Delhi), Prof. Amit Karna (IIM, Ahmedabad), Prof. Debi P Sarkar (Former Director, IISER Mohali, Delhi University), and Dr. Vipin Kumar (Director, NIF).

This year, more emphasis was given to online review than offline. With the help of the SRISTI team members and volunteers, entries were sent to the subject matter experts. Four rounds of evaluation of the shortlisted entries were undertaken by the experts at Ahmedabad. The esteemed experts were part of the

final jury included Prof. Seyed E. Hasnain (VC, Jamia Hamdard New Delhi), Dr Ram Gopal Rao (Director, IIT Delhi), Dr Uday B Desai (Former Director, IIT Hyderabad), Dr. Shashi Bala Singh (Director, NIPER Hyderabad), Prof. PVM Rao (IIT Delhi), Dr. B. Ravi (IIT Bombay), Dr. Renu John (IIT Hyderabad), Dr. Premnath Venugopalan (CSIR-NCL Pune), Dr. Taslimarif Saiyed, (CCAMP Bangalore), Dr. Amit Dinda (AIIMS, New Delhi), Dr. Vidya Gupta (CSIR-NCL Pune), Dr Rakesh Rawal (Gujarat University), Dr. Syed Shams Yazdani (ICGEB New Delhi), Dr. V.S. Reddy (ICGEB New Delhi), Dr. B K Murthy (IIT Bombay), Prof. Vandana B. Patravale (ICT Mumbai), Dr. KK Pant (IIT Delhi), Prof. Makarand Ghangrekar (IIT KGP), Prof. Shashank Mehta (NID), Prof. Neetu Singh (IIT Delhi), Dr. C J Shishoo (Former Director, PERD Ahmedabad), Mr. Atul Bhargava (STMicroelectronics), Prof. Vivekanandan Perumal (IIT Delhi), Dr. Sanjeev Saxena (ICAR), Prof. J. Ram Kumar (IIT Kanpur), Prof. Sarita Ahlawat (IIT Delhi), Prof. Amit Asthana (CCMB Hyderabad), Prof. Pradeep T (IIT Madras), Prof. Jay Dhariwal (IIT Delhi), Prof. B K Chakravarthy (IDC IIT Bombay) and Prof. Vipin Laddha (SKRAU Bikaner).

We also thank the SRISTI team members including Dr. Shahila Parween, Dr. Shyam Reddy, Er. Sagar Panchal, Er. Venushree Patel, Er. Rushi Khambholia, Er. Digvijay Singh Rajpurohit, Er. Yash Patel and Dr. Richa Gupta. The volunteers of the Honey Bee Network including Harshvardhan Tiwari, Mahesh Patel, Er. Rakesh Maheshwari, Dr. Anamika Dey and colleagues in SRISTI viz., Mr. Ramesh Patel, Mr. Chetan Patel, Dr. Megha Barot, Dr. Anubrata Paul, Sumitra Patel, R Baskaran, Manish Doshi and other team members deserve our kind appreciation for their kind support provided during the whole process. In addition, hundreds of online or email reviewers helped in the review process. We are grateful to all of them. All the reviewers have been acknowledged in annexure.

Introduction:

GYTI 2020 Awards have been given in the wake of Covid19 pandemic which has caused a lot of hardships to the people. The kind of contribution that biotech scientists have made to address the technological diagnostic and therapeutic needs of Covid19 patients is exemplary. At the same time, the challenge before young students is even more acute because of numerous associated problems that may have arisen among Covid19 affected people. The scientists are still trying to estimate the long term effect of Covid19 infection even after recovery from the same. The need for strong public health infrastructure is being felt more than ever before. The development of affordable and accessible diagnostic, treatment approaches and other devices has become more urgent. The purpose of SITARE - GYTI Award has been made sharper this year with the focus on those technologies which have potential for eventual establishment of biotech start-ups. The SRISTI - GYTI Award for other engineering disciplines continue its focus on technological innovations which are frugal, on technological edge and have social applications.

This being a transitional year when all the life science entries were to be submitted at BIRAC portal, several students submitted the same at GYTI site. Some of the outstanding ones are being recognised as SRISTI- GYTI award without any financial component. We hope that from the next year onwards, all students with life science and related backgrounds having innovations leading to potential biotech start-up will submit applications only at BIRAC's portal (birac.nic.in).

The purpose of identifying early stage innovations is also to create a pipeline for other bigger grants and investments not only from BIRAC but also other science and technology institutions. It is hoped that incubators set up by CSIR, DST, BIRAC and DBT will be accessible to student innovations recognised through GYTI awards and appreciation. The pursuit of atmanirbhar, self-reliant India will be strengthened with more and more technological and scientific minds developing solutions that address the unmet needs not only in India but globally.

Table 1: Years-wise progress of SITARE-GYTI (2015-2020) Awardees and Appreciated students

Year	Awards (A)	Appreciation (B)	Total Recognitions (A+B)	Patent Granted / Filled	Patent under Process	Publications	Major Awards & achievements after GYTI	Enterprise Set-up or Tech licensed to third party	Grant &Investment mobilised (In Lakh)	Enterprise under planning	Employment/ jobs generated
2020	14	11	25	7	3	14	2	1			
2019	15	-	15	3	2	16	16	3	84.6	1	1
2018	15	-	15	6	4	17	7	4	406	9	
2017	15	-	15	7	2	24	5	3	121	3	10
2016	15	-	15	8	2	25	3	5	234	2	
2015	4	-	4	4	1	7		3	200.6	1	
Total	**78**	**11**	**89**	**35**	**14**	**103**	**33**	**19**	**1046.2**	**16**	**11**

The year-wise progress of SITARE-GYTI award and appreciated students is given in Table 1. It is admirable that more than Rs 10 crore of investment and grants have been mobilised by the student innovators in the last five years. With more than 100 publications, around 35 startups have been set up or under progress and in some cases, innovations have been licensed to third party. Thirty five patents have been filed and 14 are under progress.

Thirty three students have received other awards after being recognised under GYTI and this trend has been increasing year after year.

Four student teams have received BIG Grants from BIRAC of around Rs. 50 lac each. Dr. Vikas Pandey and his team have received the grant of Rs.50 lac under Grand Challenge Exploration - Bill & Melinda Gates Foundation, BIRAC and IKP. Mr. Ravi Prakesh, the awardee of SITARE-GYTI, has received a grant of $25,000 under BRICS Young Innovator Prize-2019, honoured by the Ministry of Science, Technology, Innovation and Communications, Brazil. He also received DST-Lockheed Martin-Tata Trusts IIGP (India Innovation Growth, Program) Award-2019 (10 Lac INR research grant from DST, Govt. of India). Some of the students have not only published in top journals but have also got global recognition for their contributions.

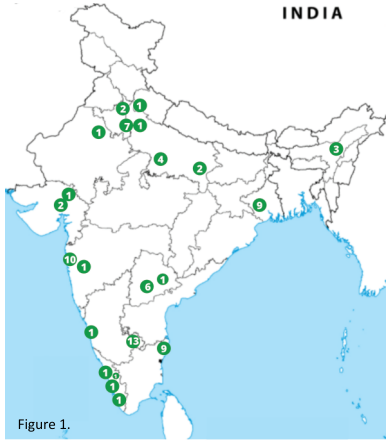

Figure 1.

SITARE-GYTI 2015-2020 Award City-wise

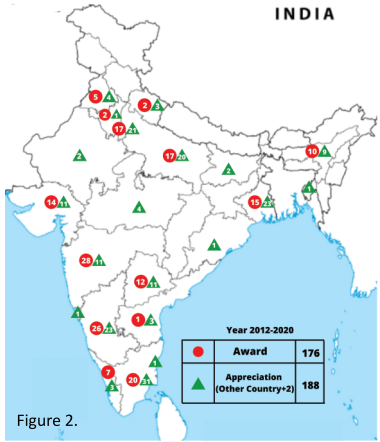

Figure 2.

GYTI (2012-2020) Award & Appreciation State-wise

One example of that is about a young undergraduate student Narayan Lal Gurjarwith his team. He got GYTI Appreciation in 2018 along with Shashi Pratap and Ankit Jain for developing an eco-friendly water retention natural polymer. He had done experiments in the open space around the hostels. He was selected for Okinawa Japan Startup Accelerator Programme out of 1756 teams which applied from 39 countries. Thewinner would get 10 million Japanese Yen funding. They have already set up a company and started to sell their product in India. A student, Jayesh Kumar Sevantilal Mevada, SITARE-GYTI 2019 awardee was nominated for Global Restoration Program-2020 of UN. He was one of the Finalists of Young Champion of the Earth Award-2020 from United Nations. He was also invited to the G20 Youth Summit. Recognition by SRISTI and BIRAC team under GYTI Award or Appreciation can open many more avenues of opportunities for the students. The review of total GYTI awards and appreciation from 2012-2020, shows that the concentration of awards and

appreciation have been in IIT Delhi, IIT Kharagpur, IIT Bombay, IIT Madras, IIT Guwahati, IISc Bangalore and IIT Kanpur. When the bar is brought down slightly, the spatial distribution increases. There are many states in which no award has been received by any student but students have got only appreciation. We hope that in future more students from tier two and tier three institutions and cities will excel and overtake the top institutions.

Since GYTI Awards include technologies on the edge as well, we expect them to excel as a scholar. In 2017, two of the GYTI Awardees had published in Nature. In a very short period of six years, GYTI Awards have built a great reputation in the country and outside. So far IIT Delhi has got the maximum GYTI Awards (12 awards and 16 appreciations) followed by IIT Madras and IIT Kharagpur. The distributed nature of awards and appreciation indicates a very encouraging picture of merit and scholarship. It is true that among the awardees, particularly after 2015, the number of non-elite institutions is very low. This is a cause of concern because the gap between the quality of research and entrepreneurial development between the top institutions and tier two and three institutions doesn't seem to be closing at the pace at which it should. SRISTI and GIAN organise Summer School on Inclusive Innovation every year so that the persistently unsolved problems of disadvantaged people and regions get addressed. SRISTI plans to invite some of the BIIS participants to the summer school in future so that they can take their ideas forward in a focussed manner. During 2020, 250 entries from 96 colleges/universities from 23 states were received for SITARE-GYTI Award and 14 students got awards and 11 were appreciated. For SRISTI-GYTI Award, 712 entries from 270 colleges/universities from 27 states from 42 disciplines of engineering were received. 7 students have been chosen for award and 16 have been appreciated this year. The rigorous review has implied raising the bar for awards. 250 eminent reviewers from 102 institutions have helped in evaluating the entries. Our effort has been to encourage as many students as possible. There is no doubt that in some cases, our judgment might have been different from what the concerned students might feel. In any review process, some limitations remain but the fact that all the reviewers have taken a lot of pain in reviewing the entries, and in some cases, making suggestions to improve the work shows that the process has been quite empathetic without neglecting the excellence and relevance. We hope that the spirit of Honey Bee Network encouraging cross-pollination of ideas and connecting the formal and informal sector of knowledge system will continue to grow among the young scientific and technological minds. We also hope that students will continue to participate in the competition and spread the world around. The start-up revolution under way in the country has to be invigorated further by Biotech and other student entrepreneurs. Please stay in touch and sustain your curiosity, hope and faith in inclusive future.

Please encourage your friends and juniors to apply for SITARE-Gandhian Young Technological Innovation awards at Birac.nic.in and for other disciplines at gyti.techpeida.in

Prof. Anil K Gupta
CSIR Bhatnagar Fellow 2018-21
Founder, The Honey Bee Network, SRISTI, GIAN & NIF,
Visiting Faculty, IIMA & IITB and Academy Professor, ACSIR

Gandhian Young Technological Innovation awards 2020 include 14 students recognized through SITARE- GYTI awards and 11 students whose technology has received SITARE- GYTI appreciation. These awards are part of SITARE (Students Innovations for Translation & Advancement of Research Explorations) scheme of Biotechnology Industry Research Assistance Council (BIRAC) and are given in partnership with SRISTI through SITARE- GYTI awards. Each awardee receives Rs 15 lac as grant valid for two years for translational progress. It is hoped that these awardees will eventually be motivated to become biotech entrepreneur and apply for BIG and other bigger grants. Since these awards are meant to supporting innovative students working towards biotech start-ups, SRISTI recognizes students pursuing outstanding work in various disciplines through SRISTI- GYTI awards. This being a transition year of applications at BIRAC portal, some students applied for life science innovations at SRISTI's gyti.techpedia.in site also. Under the SRISTI- GYTI Awards category, we have awarded 7 students and 16 have been appreciated. While majority of the awardees are from the prestigious institutions viz., IITs, IISc, JNCSAR, NIPERs etc., some outstanding students are from other institutions also. The awards in different categories ranging from healthcare to sanitization and waste management were given to the innovative students of various disciplines. The awards under SRISTI- GYTI carry no financial grant. The Appreciated student projects in both the categories don't carry any financial award.

SITARE-GYTI 2020:

Healthcare- Devices and Diagnostics:

Awards: Anil Vishnu, IISc, Bangalore has developed portable diagnostic platform for the rapid label-free phenotyping of breast biopsy tissues to aid in the surgical margin assessment inside the operation theatre. Microchips integrated with the platform measure the electrical, thermal, and mechanical properties of the sample to determine quickly whether or not the tissue is cancerous. Vaibhav Shitole and his group from NIPER, Ahmedabad has developed an affordable device for self-blood micro sampling for diagnostics and pharmaceutical applications. This blood microsampler device enables blood sample collection, drying, storage, and biosafe transportation from remote locations to laboratory for analysis. This device overcomes the challenges and limitations of the traditional venipuncture blood sampling and conventional dried blood spotting (DBS) on a paper card method. Its simple design and user-friendly operations during sampling enables self-sampling of blood by patient/clinical subject volunteers with minimal training. Siddhant Shrivastava, a student from IIT, Kanpur has developed a highly useful multipurpose proctoscope which can contract and expand manually during the insertion inside the anal canal without damaging the tissues. It contains a silicon layer placed over the proctoscope to restrict the trapping of the tissues when it expands and contracts. This can be disposed after the surgery. The proctoscope can be reused after sterilization as well.

The team of Divagar M, IIT, Madras has developed a plasmonic fiber optic biosensor (P-FAB) for a wash-free detection of Lipoarabinomannan (LAM) down to 50 aM. Although the LAM concentrations typically vary from 10 -12 to 10 -16 aM, the device still offers an affordable and safe diagnosis of TB. Ravindra Gaikwad IIT, Gandhinagar along with his group has developed a microfluidics-based novel Lab on Chip (LOC) platform for monitoring

gasotransmitters for the early stage management of Systemic Inflammatory Response Syndrome (SIRS). Sweta Pant, IISc, Bangalore, has designed a novel, low-cost, portable, non-invasive eye tracker viz., FBGET [Fiber Bragg Grating Eye Tracker] using fiber optic sensor which can capture the displacement of the eyeball during eye gaze movements effectively with the help of other team members. It is an easy-to-implement, hassle free device which can be easily fixed at the bedside of the patients. Sumanta Laha, IIT, Kharagpur has designed a Cardiovascular Replicator (CVR), which is capable of simulating different heart disease conditions and test a host of different implantable prosthetics. This is a unique CVR, consisting of two ventricular simulators for the pulsatile flow of human ventricles (left and right), two atria chambers, aortic chamber, systemic chamber, pulmonary arterial chamber, and venous chambers.

Arthi Sunil Richard, IIT, Madras, has developed a nano fiber Yarn Suture, comprising hundreds of nanofibers twisted together, having the high surface to volume ratio and structure mimicking the bundle of collagen fibers of the tissue matrix as a building block for suture. Prem Dakshin, Birla Institute of Technology & Science University has designed an alternate low-cost electronically-controlled stand-alone mechanical system to effectively control the rate and waveform of air in life-support ventilator systems. Vinoj P.G, SCMS School of Engineering & Technology has designed an artificial deep learning Brain-Controlled Lower Limb Exoskeleton [BCLLE] for the paralyzed patients. This is an attempt to replace the existing Brain Computer Interface (BCI) controlled assistive technology which is often susceptible to error because of its intermittent control of the dynamics of the brain signals.This new design tackles these issues as its functionality is based on the user's intentions. Deepa Dixit, IIT, Gandhinagar has developed a simple and low-cost Surface Engineered Particle (SEP) based filter which can be used as a portable, non-electric, gravity-driven Point-of-Use (POU) water disinfection system. It is a significant innovation particularly for the rural and urban slum areas of developing countries where there is scarcity of water purification system. The easy-to-implement and affordable SEP-based gravity-driven non-electric point-of-use water purifier (materials cost ~ 0.25 USD) can be deployed to the needy places to protect millions of lives from the water-borne diseases. Monalisha Pattnaik, IIT, Kharagpur has developed a poly-unsaturated fatty acid (PUFA) and antioxidant-rich vegetable oil powder for healthy heart. The prime concern of lipid oxidation is resolved by micro-encapsulating oil blend and converting it into a shelf-stable PUFA and antioxidant rich oil powder using novel process technology. The commercial production of this oil powder does not require any complicated machinery and it can be fruitfully exploited by masses.

Appreciation: Vijai Laxmi, IIT Bombay along with her group has developed a low-cost passive micro device for Platelet Rich Plasma (PRP) separation from human blood. Aswathy Nair, IIT Bombay has developed a multi-channel, low cost ohmmeter to measure the resistance change of conducting polymer coated filter paper sensors in response to the organic compounds present in breath. Krishna Sivanand, Kumaraguru College of Technology, Coimbatore, Tamil Nadu has designed a smartglove for assisted physiotherapy for faster and safer recovery of those suffering from stroke and motor impairment issues. Tatahagata Pal, IIT Bombay has developed Colorimetric (Yes/No) type swab-based detection test for the organophosphate and carbamate pesticides in agricultural products along with other team members. Aliarshad Kothawala, IIT, Madras has developed the real-time ultrasound-based acoustic parameter imaging to track spatio-temporal evolution of hotspot in high intensity focused ultrasound and microwave hyperthermia

Industrial Biotechnology:

Appreciation: Sonali Naik, NCL, Pune has developed tannins-based mouthwash; an alternate to chemical mouthwash. This will help reduce the side effects of chloroform and alcohol in the patients who are on mechanical ventilation. Puja Kumari at IIT-Madras has developed a wrapping material which has antibacterial property adopting the green approach. The main raw materials used for the production of the wrapping material are waste materials like potato peel and water. Aritaa Lahiri at IISER, Kolkata has developed the bioactive chicken IL-17A by genetically engineered food grade lactic acid bacteria LAB: From gene to biomedical application in poultry along with her team.

Health care- Drug Development:

Awards: Shivraj Naik, ICT, Mumbai and his team have come up with a novel nanotechnology-based non-invasive spray formulation which can be administered via nose to brain for the effective treatment of Alzheimer's disease or any other neuro-degenerative diseases where blood-brain barrier is the major hindrance. This team has developed the proof of concept and proto-type formula for this innovation which can be scaled up

Appreciation: Sukanya Patra, IIT- BHU has developed a "Time-Temperature Dose-Dependent" polymer-based nano medicine to treat cerebral malaria.

Agriculture:

Awards: Sumit Kumar, NDRI has developed a electrochemical impedance-based aptasensor for Semen Sorting in Cattle.

Appreciation: Sanjit Debnath, Tripura University has developed a protocol for the commercial cultivation of noble wild edible mushrooms in Tripura. It will help uplift the socio-economic status of the rural people by generating substantial profit from mushroom business. Shubhangi Mahajan, Amity University has developed the nano-embedded mycorrhizal fungus Piriformto increase the yield of black rice with enhanced value addition supported by her team.

SRISTI- GYTI 2020

Biomedical Engineering:

Awards: Murali K. from IIT- Bombay has developed an inexpensive deep tissue blood flow measurement system using low frame rate camera Rajesh Srinivasan, IISc, Bangalore has developed a cost-effective method to count CD4 cells using hematology analyzer instrument supported by his team. This method can also be used to tackle HIV epidemiology in rural India. This principle includes three steps: 1) Testing process; 2) Diluting blood incubation with SPIONs and 3) Analysis by using hematology analyzer instrument. Gunjan, IIT, Madras has developed a wearable device viz., AbleFit for patients of orthopedic and neurological disorders along with other team members. Detection of adulteration in food products is in the forefront of research to ensure health and safety.

Appreciation: Kuldeep Mahato, IIT, Guwahati has designed a portable paper-based kit to detect milk pasteurization indicator.. This is used asa naked-eye qualitative estimation technique. The detectable limit of ALP [Alkaline phosphatase]is 870 U/L when integrated with smartphones.

This will address the systemic problems arising from the entire process of microbial invasions. Syed Muntazir Andrabi, IIT, Kanpur has developed a ready-to-use haemostatic bandage for military and civilian trauma care. This is a an advanced low-cost haemostatic bandage having efficient and rapid blood clotting ability. Also it is an economical and affordable material with promising potential to fulfill the much-required healthcare needs of the emerging global market.

Mechanical/Textile:

Awards: Jasvinder Singh, IIT, Delhi has developed a customizable, patient-specific vascular stent by the three-dimensional (3D) printing technology with the help of other students. This is a novel 3D printing based approach used to fabricate customized shape polymeric tubular stent using linear CAD model. The 3D printing has emerged as an effective system for producing customized biodegradable stents using CT scan and MRI data. Jeetendra, Motilal Nehru National Institute of Technology, Allahabadhas developed asediment microbial fuel cell [SMFC] as renewable power source in remote area using the Ganges River water-sediment. A single SMFC produces a maximum voltage of 1.160 V using copper and zinc electrodes. Eight SMFCs are stacked together in parallel series combination to power a LED light, where a battery is charged by the SMFC module and then DC of the battery is converted into AC to provide power to a LED bulb (7 W, 230 V, 50 Hz).

Appreciation: Ashish kumar, IIT, Delhi has designed and developed advanced CNC micro-machining system as a part of a larger student team. This is an all-in-one cost-efficient, indigenously developed, micromachining center which can be used to manufacture micro-components, perform metrology, and provide all the data in a user-friendly HMI. SankhaSubhra Das, IIT, Kharagpur has designed anelectrical power generator from wetfabrics. The power generation has been done using acentimeter-sized simple wet fabric pieces, deploying the interplay of a spontaneously induced ionic motion across the fabric nanopores due to capillary action and simultaneous water evaporation by drawing thermal energy from the atmosphere. Parth Joshi, IIT, Jodhpur has developed a new electro-mechanical device which is used for muscle fatigue measurement. Nagender Singh, IIT, Delhi has developed a sustainable mosquito-repellent cum multi-functional textile using micro-encapsulation of essential oil. This fabric is designed using microcapsules containing thyme oil which is prepared by using a spray dryer to suppress the volatility of the oil. The finished flame-retardant fabric displays excellent mosquito repellence of antimicrobial properties, antioxidant activities, and aroma. Sri Navya at IIT Bombay developed a currency identification aid Not-IS for the visually impaired in India. Suresh Nuthalapati, IISc, Bangalore has developed a strain sensor which has a highly sensitive, scalable, reduced graphene oxide with palladium nano-compositeas a part of student team. This uses a nanocomposite with reduced graphene oxide (rGO) and palladium nanoparticles. The fabrication is done using a commercially viable, flexible strain sensor with a biocompatible substrate like polydimethylsiloxane (PDMS). It is also tested with the same sensor for human health monitoring applications like pulse measurement and finger tapping.

Nanoscience and Engineering:

Awards: Souvik Ghosh, IISc Bangalore has developed a system for remotely controlled manipulation of nanomaterials in fluids. This technology may enable isolation, manipulation and chip-level assembly of nanomaterials and allow non-invasive manipulation off ragile bio-specimens, such as bacteria, virus and various macromolecules in the bulk fluid.

Appreciation: Pradeep K R, JNCASR developed harvesting-delayed fluorescence in Mn-doped perovskite quantum dots using vibrationally assisted delayed fluorescence (VADF). A acetone breath gas analyzer was designed by Ramji and group from SRM University. It is an important diagnostic tool to evaluate Diabetes Mellitusbecause it is non-invasive and inexpensive.

Chemical Engineering:

Appreciation: Bukke Vani, IICT, Hyderabad has designed an indigenous atmospheric water generator (AWG) for the economical production of drinking water in the water-scarce hilly, arid and coastal regions supported by other group members. This AWG technology is a green process producing re-mineralized drinking water from the moisture in atmosphere or air. This is a safe, economical and affordable technology in the water scarce regions as compared to desalination, evaporation or distillation. Furthermore, this AWG technology can produce three types of water: 1) Potable water, 2) Ultrapure medical grade water using membrane and resin post treatment, and 3) Healthy alkaline water. Prashant Ram Jadhao, IIT, Delhi has developed a self-sustainable e-waste recycling technology. This innovation provides an eco-friendly technology for the recovery of resources from e-waste materials. In this technology, e-waste ispyrolyzed at 400°C to produce liquid and gaseous fuels, leaving behind solid residue consisting of metal and char. The solid residue is further treated by using the ultra-sonication process to yield 90-95% metal fraction and leftover residue materials. Subsequently, individual metals i.e. Cu, Ni, Pb, Zn, Ag and Au are recovered using the low-temperature roasting and 90% of recovery is achieved at optimized conditions. SriGanesh, IIT, Kharagpur has developed the self-sustainable smart, flexible, and multi-functional thermal and energy management systems for next-generation electronic devices.

Agriculture:

Awards: Amrinder Singh Chitkara University has worked on a movable machine viz., MOKSH that walks in the field after harvesting the crop along with his team members. While moving in the fields, it picks up the bio-residues from the front end, dries it and produces a fine dried powder. This novel radio frequency-based technology for drying waste is 100 times faster than the conventional drying method. The advantage of this machine is that it clears one acre of waste in an hour, and secondly it produces dried powder from the waste which is compressible 20 times more and it reduces the transportation cost of waste by 20 times.

Material Engineering:

Appreciation: Ravinder, IIT Delhi has developed a machine learning (ML) package to design novel functional glasses supported by other team members. This ML approach will reduce the time and cost associated with the design cycle of functional glasses. A deposition reactor is designed for low-cost low-temperature deposition of high-quality oxides films for next-generation electronics developed by Vivek Singh, IISC, Bangalore. Rahul Singh, IIT Roorkee has developed an eco-friendly and robust process to recover various precious and critical metals like Co, Li, and Mn from spent Li-ion batteries along with other group members. The group developed recovery of Lithium Cobalt and Manganese from discarded Lithium-ion batteries.

CONTENT

SITARE-GYTI 2020

SRISTI-GYTI 2020

SITARE-GYTI APPRECIATION 2020

SRISTI-GYTI APPRECIATION 2020

Annexures

SITARE - GYTI 2020

I-ways or information ways are as important as highways. Progress is incomplete without I-ways
- Shri Narendra Modi, the Hon'ble Prime Minister

Anil Vishnu G K

A Portable Diagnostic Platform for Rapid Label-free Phenotyping of Breast Cancer

Anil Vishnu G K
Indian Institute of Science, Bangalore

Guides:
Prof. Hardik J. Pandya,
Prof. Annapoorni Rangarajan

Breast cancer is the most frequently occurring cancer among women, impacting on an average 2 million each year and causing the highest number of deaths. The gold standard diagnostic techniques for breast cancer are immunohistochemistry and histopathology which look for key biomarkers and atypical morphology of cells. These techniques have limited use inside the operation room for margin assessment during surgery owing to time constraints. Determining an accurate and optimum margin of the tumour is important to avoid relapse and limit disfigurement. The existing standard method for determining margins during breast cancer surgery is the frozen section examination, which requires the surgically removed sample to be sent to the pathology lab. Further, the frozen section quality is often compromised owing to poor fixing/sectioning, thus confounding proper diagnosis. We have developed a portable platform integrated with microchips and electronic modules for label-free and rapid phenotyping of breast biopsy tissues to aid the determination of tumour margin using multiple modalities (electrical, thermal, mechanical) for a quick diagnosis to determine whether an extracted biopsy tissue is cancerous or normal. The microchips are fabricated on a silicon substrate using standard microfabrication techniques. The platform has been developed using additive manufacturing and incorporates electro-mechanical components for actuation and data acquisition. The electrical resistivity and thermal conductivity of the breast biopsy tissues are currently being measured using the platform and the data is analyzed to study the delineation factor between normal and cancer. The next step will be to integrate a sensing layer onto the existing microchip for measuring stiffness along with resistivity and thermal conductivity. In addition, the platform may be used in the future to phenotype breast cancer in the pathology labs.

Other Contributors:
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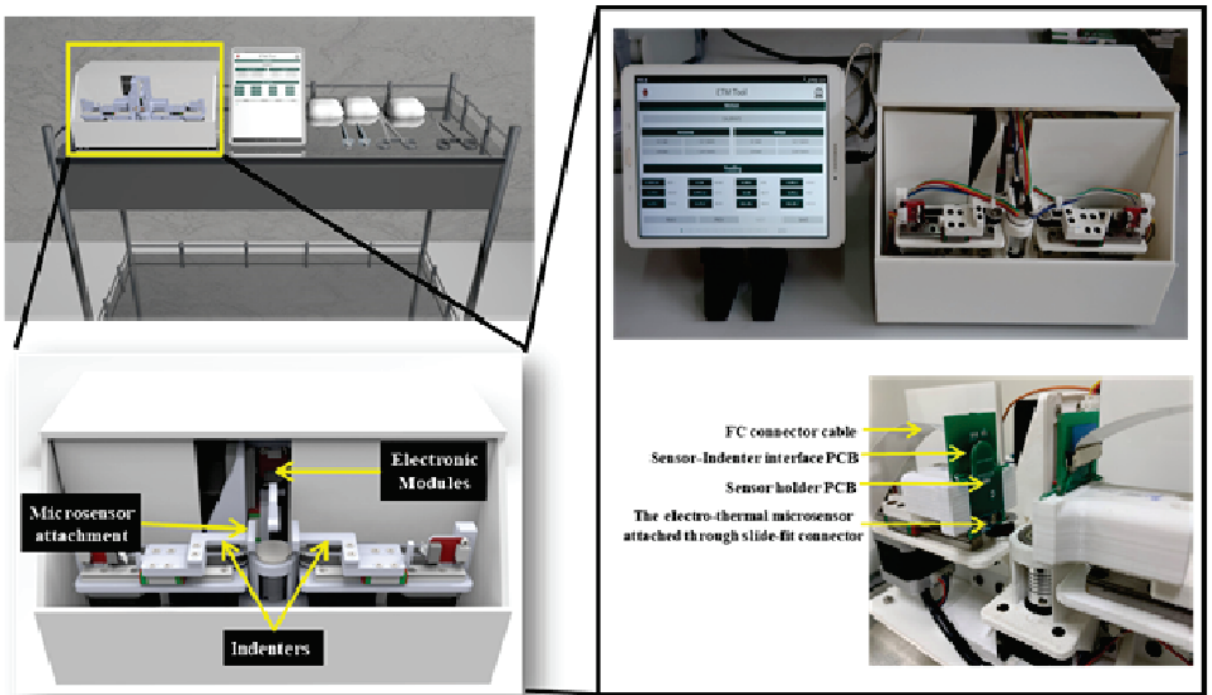


Portable diagnostic platform for rapid label-free phenotyping of breast cancer

Siddhant Shrivastava

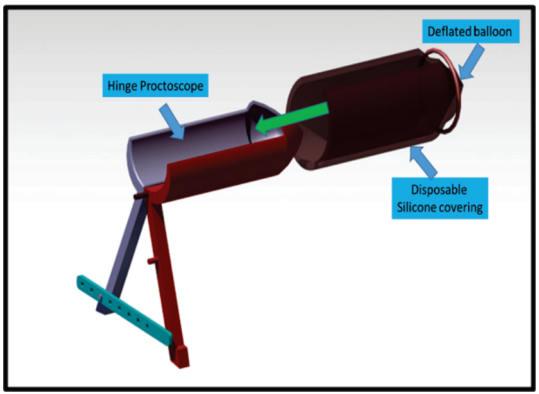
Multipurpose Proctoscope

Siddhant Shrivastava
Indian Institute of Technology, Kanpur

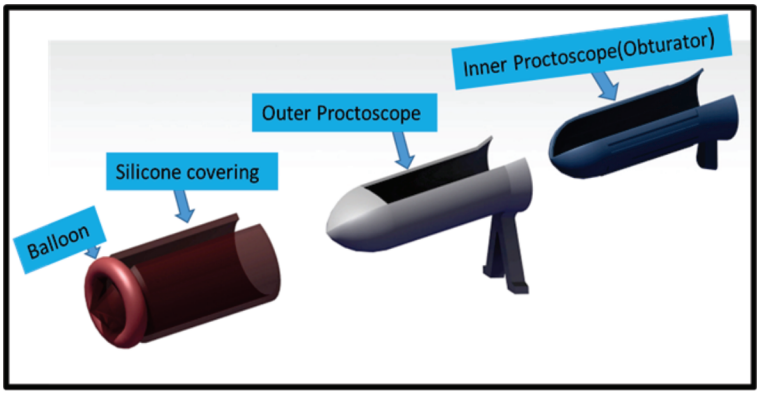
Guide:
Dr. J RamKumar

Proctoscope is prominently used in surgical operations, biopsy and inspection of the anal rectum region for diseases, such as anal cancers, hemorrhoids, internal opening of the fistulous tract, anal polyps, fissures, ulcerations and others. Different operations use different proctoscopes as each proctoscope works differently. Our multipurpose proctoscope, however, can perform multiple functions thus, minimizing the use of different devices during an operation. Besides, it also reduces damage to the rectum tissues during insertion. We have developed two types of proctoscopes, hinge type and nested type. The hinge type consists of two parts hinged together. The hinge allows to increase or decrease the diameter of the scope inside the anal canal. The nested type proctoscope is made up of two scopes one over the other. The internal proctoscope (obturator) is designed to rotate inside the external proctoscope in 360 degrees. The rectangular protrusions over the outer surface help to lock the device in any position to change the exposure of the anal wall. A silicone layer is placed over both the proctoscopes to prevent tissues from being trapped when they expand or contract. This silicone covering is very similar to a condom which is a sheath-shaped barrier device designed to facilitate easy insertion inside the canal. An inflating balloon in the front helps to retain its position inside the canal. The proctoscope can be sterilized and reused, which increases its utility.

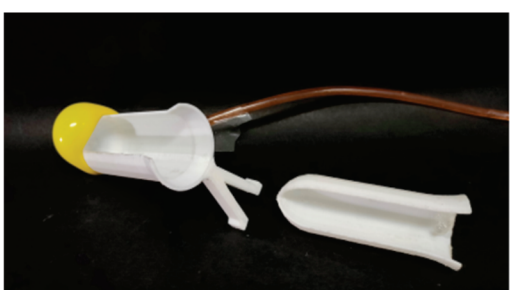
Other Contributors:
Dr. Arshad Ahmad, Dr. K. S. Venkatesh



Hinge Type 12

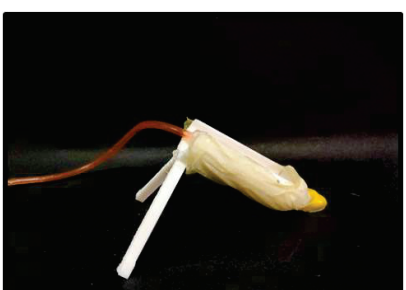


Hinge Type 1



Nested Type 3

Nested Type 2



Hinge Type 3

Divagar M

An Affordable and Easy-to-use Optical Biosensor for Mannosylated Lipoarabinomannan (manLAM) in Urine for TB Diagnosis

Divagar M
Indian Institute of Technology, Madras

Guides:
Dr. V. V. Raghavendra Sai, Dr. Vani Janakiraman

Tuberculosis (TB) is a resurgent infectious disease affecting a large number of people in developing countries. An on-site, affordable diagnostic screening at an early-stage for immediate anti-TB treatment is known to minimize the high mortality rates tremendously. The standard TB diagnostic tests rely on detecting Mtb through sputum smear microscopy and the cell-culture (2-3 weeks) in sophisticated biosafety level 3 (BSL3) laboratories. The presence of several Mtb antigens in the serum, urine, or other bodily fluids has been widely investigated to establish them as potential biomarkers. Lipoarabinomannan (LAM), a surface glycolipid, has been identified as a potential TB biomarker. LAM is known to be released into the blood stream during an active TB infection, and it is cleared through the kidneys to appear in the urine in an antigenically intact form, irrespective of the anatomical location of the infection. Therefore, urinary LAM could be a potential biomarker not only for conventional pulmonary TB but also for extra-pulmonary TB. However, the Mtb LAM concentrations are typically below pg/mL in an unprocessed urine sample for an active TB infection, which most of the current point-of-care technologies fail to detect. Hence, several efforts are underway to develop highly sensitive detection techniques. We have developed a plasmonic fiber optic absorbance biosensor (P-FAB) strategy for mannosylated LAM (Man-LAM or Mtb LAM) detection down to attomolar concentrations. The Mtb LAM is quantified in terms of the absorption of light passing through the fiber probe using a green LED and a photodetector readout device. P-FAB enables the detection of Mtb LAM down to 1 fg/mL and 10 fg/mL in the buffer and synthetic urine, respectively. More details available at https://doi.org/ 10.1016/ j.bios.2020.112488

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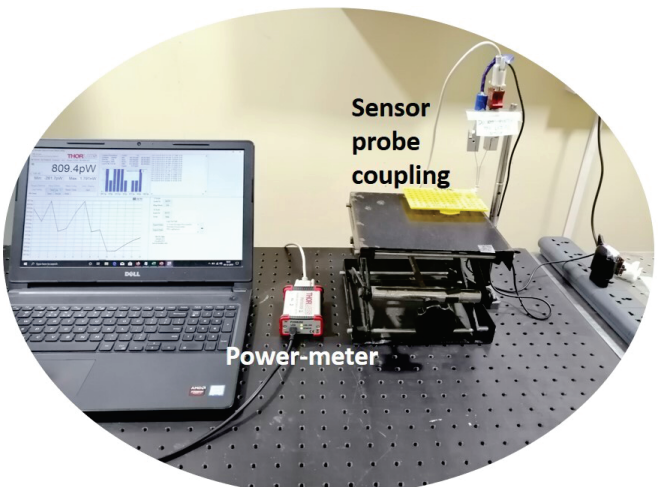
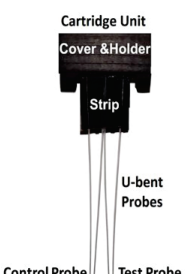
Lab-setup



Prototype

Readout device with mobile and PC interface



Sumanta Laha

An Automated Cardiovascular Replicator for Online Assessment of Cardiac Assist Devices, Prosthetics and Beyond

Sumanta Laha
Indian Institute of Technology, Kharagpur

Guide:
Prof. Prasanta Kumar Das

Heart is the most vital of the organs in the human body with an intriguing complexity of physiology and function. It is very difficult to carry out an in-depth study of this organ in the live form. The study of a cadaver heart does not throw much light on its functioning in live condition. The current study proposes a novel heart analogue model, Cardiovascular Replicator (CVR) as a platform for studying the cardiovascular system. This is an electromechanical system which can mimic the entire hemodynamics of the human heart along with its pulmonic and systemic circulations. Further, to combat heart failure, different implantable devices, and other prosthetics have come into existence with the ventricular assist devices leading the race. These implantable devices need to be tested rigorously during the developmental stage. CVR can also be used to evaluate their performance through hardware in the loop (HIL) simulation prior to animal testing. Here, its application has been extended to mimic cardiac malfunctions by simulating different diseases. There is scope of simulating a wide range of heart diseases and conditions like aortic valve stenosis (AVS), ventricular septal defects (VSD), fetal circulation, cross-circulation, single ventricle conditions and Fontan correction. This system is made in a modular way to ease transportation and enable improvisation. Online real-time data monitoring and logging can also be done with installed sensors and wide screen display in the system. This device can also be used for pedagogy and training, and can cater to both medical students and researchers.

Other Contributors:
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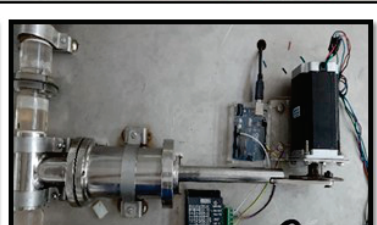


CARDIOVASCULAR REPLICATOR

Monalisha Pattnaik

Development of Polyunsaturated Fatty Acid (PUFA) and Antioxidant-rich Vegetable Oil Powder for Healthy Heart

Monalisha Pattnaik
Indian Institute of Technology, Kharagpur

Guide:
Prof. Hari Niwas Mishra

The innovation involves the tailoring of vegetable oils by preparing oil blends which are inherently endowed with natural AO as well as well-balanced fatty acids (FA). For lowering the risk of cardiovascular disease (CVD), the consumption of nutritionally balanced FA along with AO is highly recommended. The momentous negative effect of synthetic antioxidants like TBHQ, BHT, and BHQ in commercial vegetable oils makes it imperative to limit their use. The research team has aptly accomplished the mission of formulating a nutritionally balanced PUFA-enriched synergistic vegetable oil blend at Food Chemistry and Technology Laboratory (FCTL), Agricultural and Food Engineering Department, IIT Kharagpur. Owing to the susceptibility of PUFA-rich vegetable oil to rancidity and reduced shelf life under severe environmental conditions, the research team has also developed a novel and propitious process technology such as microwave drying, along with a conventional technique (spray drying) to protect lipid from oxidation by microencapsulating in appropriate wall materials. It is found that the developed novel method had a two-fold increase in shelf life and improved quality parameters in comparison to the conventional one. Cholesterol being one of the risk factors in many diseases, it needs to be replaced by non-dairy fat. The use of microencapsulated PUFA-rich oil powder to replace dairy fat/shortening in many bakery or confectionery products will suppress their adverse impact, particularly mitigating risk of heart-related diseases on the consumers. Additionally, PUFA-enriched oil powder can be easily availed by huge masses on account of its low cost and utilization of unsophisticated machinery. This innovation has already been patented and published in peer-reviewed international journal.

Other Contributor:
Dr. Mousumi Ghosh

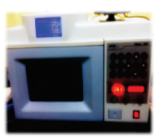
Oil blending

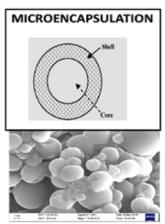
Wall materials

Homogenization

Oil blend → Oil-wall material solution

Drying





PUFA & Antioxidant-rich Oil Powder

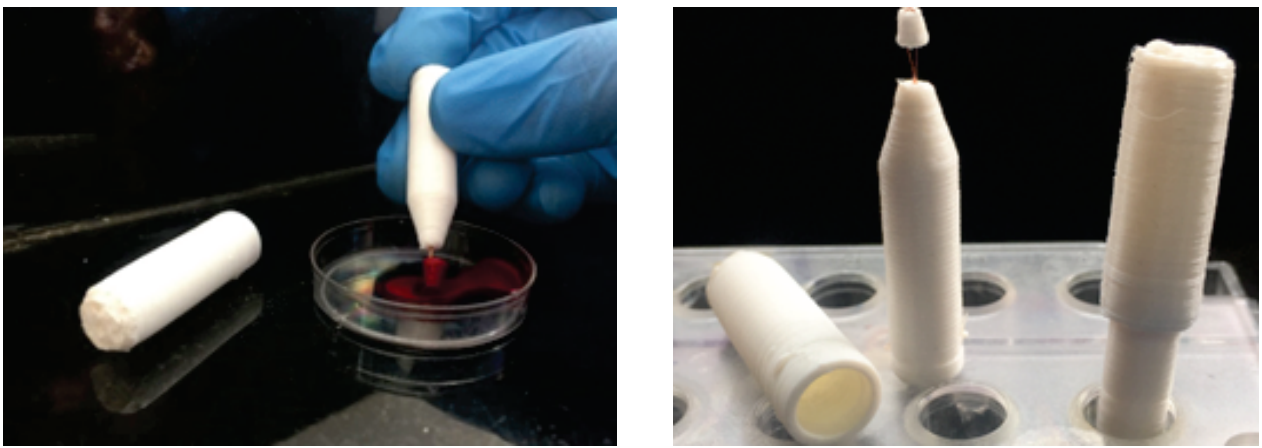
Vaibhav Shitole

A User-friendly, Affordable Device for Self Blood Micro-sampling for Diagnostics and Pharmaceutical Applications

Vaibhav Shitole
National Institute of Pharmaceutical Education and Research, Ahmedabad

Guide:
Prof. Prasoon Kumar

The blood sampling is a challenging task in remote locations like villages/hilly areas where the poor lab resources and infrastructure facilities are there. Thus, blood microsampling is quite a costly affair due to the added logistics of cold chain storage and transportation. In addition, the blood collection using the on ventional blood collection method from geriatric and pediatric patients is quite painful. Apart from the diagnostics, blood sampling is an integral part of the drug discovery and developmental process. Herein, blood samples are drawn from animals and patients for therapeutic drug monitoring studies during lead optimization and development process in preclinical and clinical trials. Thus, considering the constraints and problems of blood sampling for bioanalysis and other biomedical applications, we have developed an alternative dried blood matrix sampling technology for pharmaceutical and biomedical applications. We have designed a blood microsampler device that enables blood sample collection, drying, storage, and biosafe transportation from remote locations to laboratory for analysis. This device overcomes the challenges and limitations of the traditional venipuncture blood sampling and conventional dried blood spotting (DBS) on a paper card method. The major advantages offered by our blood micro-sampling device are that it accurately samples 30µl of blood from a pediatric; geriatric patient, enough for any molecular analysis. The simple design of the device and its user-friendly operation during sampling enable self-sampling of blood by patient/clinical subject volunteers with minimal training. The material properties are such that the device can draw defined volume of blood irrespective of blood hematocrit volume. Therefore, this device has the potential to sample blood from pre-clinical and clinical subjects for quantitative analysis of drugs or other blood analysis using this bioanalytical assay method.



Blood Micro-sampling Device

Vinoj P.G

Artificial Deep Learning Brain-Actuated Lower Limb Exoskeleton for the Paralyzed

Vinoj P.G
SCMS School of Engineering & Technology, Kerala

Guide:
Dr. Sunil Jacob

Brain Computer Interface (BCI) controlled Assistive technology is the new paradigm, providing assistance and rehabilitation to the paralyzed patients. Because of the dynamic and uncertain nature of brain signals, most of the BCI systems result in miss-operation and mental fatigue, and are hard to produce continuous control. In phase 1, the proposed framework tackles these issues utilizing a Brain-Controlled lower limb exoskeleton (BCLLE) in which the exoskeleton movements are controlled based on user intentions. In the phase 2 of the research, AMIDL is designed to reduce miss-operation and user fatigue, and enhance user capabilities. The human intentions are monitored in real-time employing 16 channel EEG sensors. TENS machine is integrated with Muscle Inspired Algorithm (MIA) to produce movements on the upper limb. The AMIDL transforms thoughts into different movements on the unique upper limb structure. The EEG activated movements are utilized for communicating paralyzed person's emergency needs to the caregivers. The contributions of this research are: A Brain-Controlled Lower-Limb Exoskeleton (BCLLE) in which the exoskeleton movements are controlled based on user intentions; A flexible design for the exoskeleton which can be customized according to the degree of disability; Artificial skin incorporated with sensors which can provide a sense of touch to the users' body parts. Automatic status identification of the paralyzed and secure transmission of information to caregivers in case of emergencies; Artificial Muscle Intelligence with Deep Learning (AMIDL) system without exoskeleton structure, in which movements of paralyzed body parts are controlled based on user intentions; An adaptive mechanism based on recorded muscle movements integrated with the system to enhance continuous control and facilitate rehabilitation; Communication aid incorporated in the system using gesture recognition and subject concentration is improved by using multimedia feedback.

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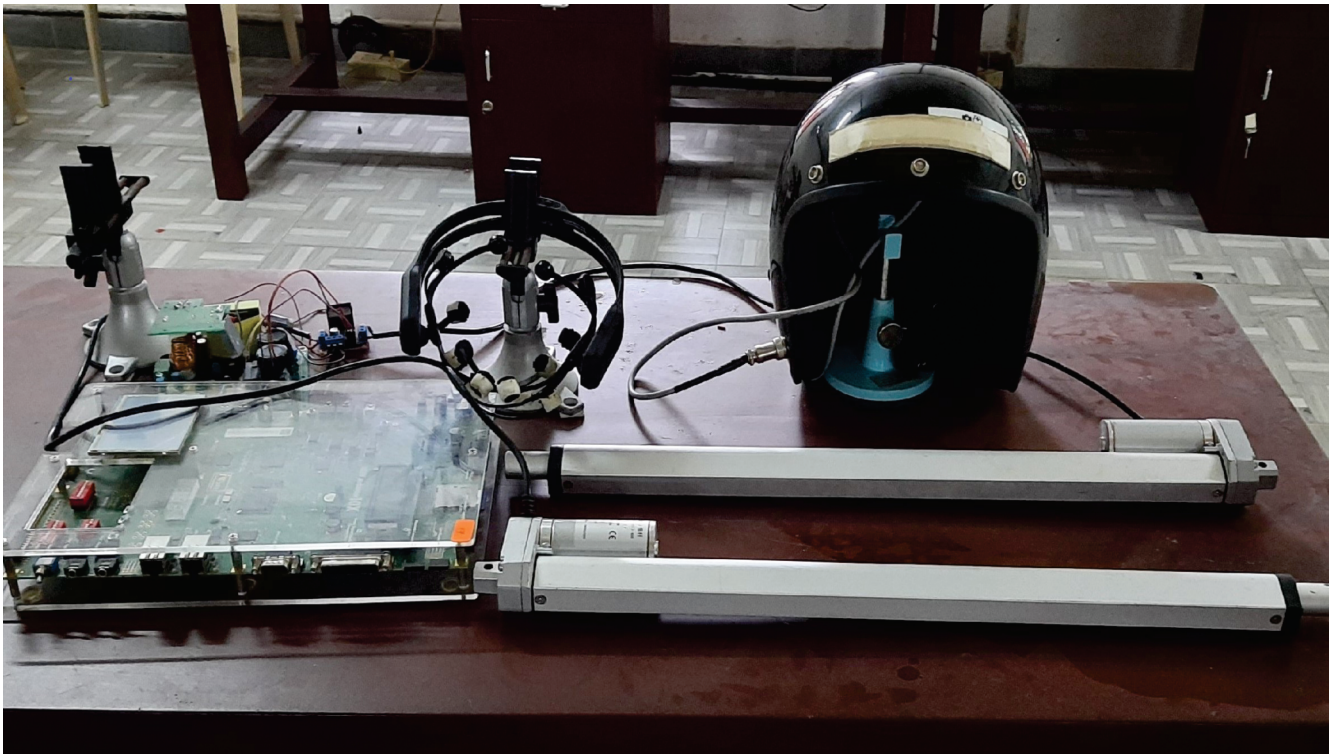


BCLLE - Prototype

Arthi Sunil Richard

Nano-fiber Yarn Suture: A Medical Device

Arthi Sunil Richard
Indian Institute of Technology, Madras

Guide:
Dr. Rama Shankar Verma

Sutures are the most widely used healthcare devices for surgical procedures worldwide. They have various uses in surgery, for instance, holding together tissue, and connecting vascular conduits and ligation of cartilages. While other alternatives such as staples, glues and strips are available in the market, sutures continue to hold high demand due to its high reliability and its use over the years. The innovation involves synthesis of suture material using electrospinning technique with single syringe pump, single high voltage power supply and a custom-made, frugal and simple modified aluminium rotating collector for collecting the nanofibers. A grounded rod (with wooden handle) initiates the formation of thread-like structures composed of hundreds of nanofibers known as "Nanofiber yarns". These synthesized yarns are collected by rotating the collector on to a bobbin. Nanofiber yarns possess a high surface to volume ratio and mimic the collagen fibrils of extracellular matrix of tissue. The mechanical property of the yarns can be increased by twisting nanofiber yarns to form 2-ply and 3-ply yarns of varied diameters. The fabrication method can be applied to synthesize yarns from a wide range of polymers by incorporating therapeutics and tailorable mechanical properties. Preliminary studies of nanofiber yarns as suture were performed to study properties, such as hydrophilicity, hemocompatibility, antibacterial property, mechanical strength, stem cell interaction and in vivo immune response. The results suggested that the synthesized nanofiber yarns possessed enhanced mechanical and biological properties with great potential for suture applications.

NANOFIBER YARN SUTURE: A MEDICAL DEVICE

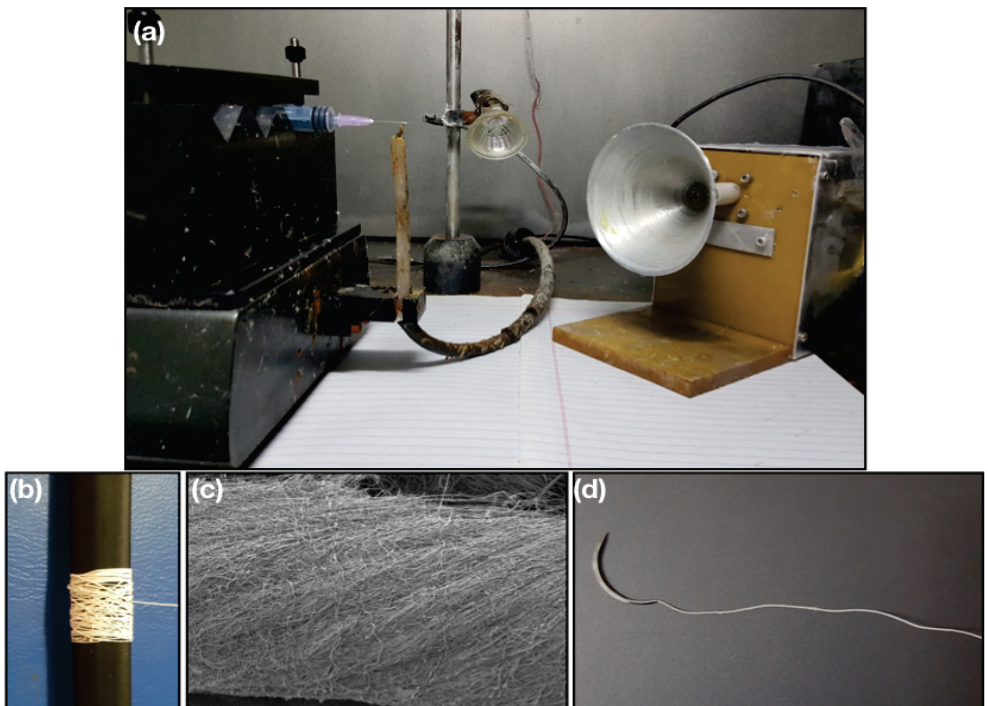


Fig.(a) Electrospinning modified collector assembly, (b) nanofiber yarns wound on wire, (c) SEM image of single nanofiber yarn, (d) synthesised yarn attached to needle

Sumit Kumar Singh

Development of Electrochemical Impedence-based Aptasensor for Semen Sorting in Cattle

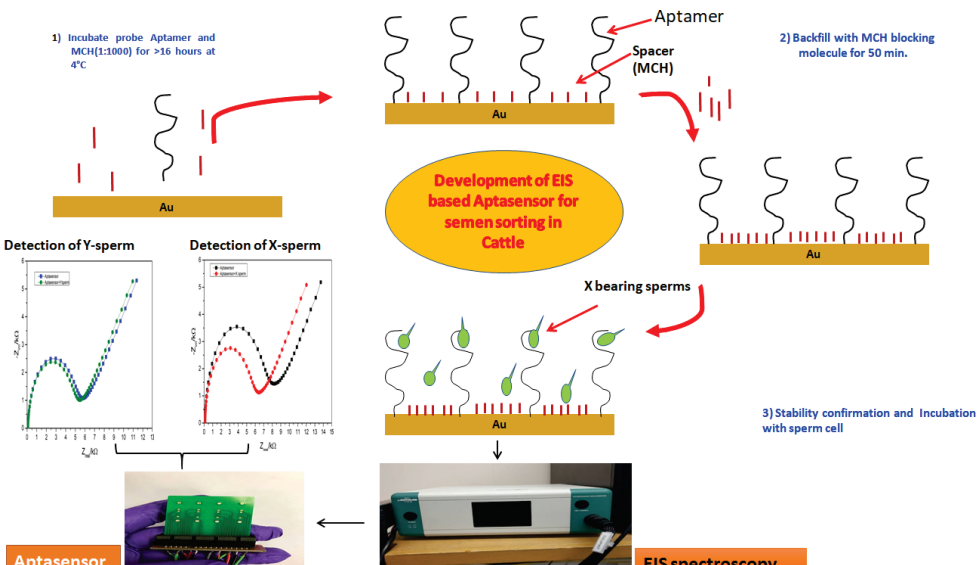
Sumit Kumar Singh
National Dairy Research Institute, Haryana

Guide:
Dr. Sudarshan Kumar

The united Nations Food and Agricultural Organization (FAO) has estimated that the world's food resources need to increase by 100% in the next 50 years and 70% of that increase has to come from increased agricultural efficiencies and advances. The demand for livestock products like meat, milk, and dairy products has increased globally. To meet this demand, utilization of modern technologies for promoting sustainable production from animals assumes paramount importance. The production of pre-sexed livestock by sperm or embryo sexing, combined with other biotechnologies, genomics, proteomics or nanotechnology, offers a promising breeding strategy to help meet the increased demand for food production. Commercial dairy farms producing and marketing milk can use sexed semen to produce replacement daughters from genetically superior cows and crossbred bull calves from the remainder of their cow population. Currently, the only established method to separate X and Y chromosomes bearing bovine spermatozoa is on the basis of DNA content by using a flow cytometric sperm sorter. However, this technique has several drawbacks including the high cost of equipment, high cost of maintenance, and lack of skilled manpower. The fact that about half of the sperm sample is unsexable results in to low sorting efficiency and low pregnancy rates. Also, this process is very slow. In India, although we use the sorted semen from this technology, the IPR protection of the technology by the developers is a serious bottleneck for pan-India application. Therefore, alternative approaches to attain this feat of sorting semen into X and Y type are required. Aptamers (single strand oligonucleotides) have emerged as potential tools for identifying specific target molecules including the whole cell. The principle behind is the Systematic Evolution of Ligands by Exponential Enrichment called SELEX. In this technique, target to be identified is allowed to interact with the aptamers. The interacting aptamers are selected after several cycles of incubation with target and their selective enrichment is achieved by amplification using

Polymerase Chain Reaction (PCR). At last, this yields a uniform population of aptamer sequences capable of detecting specific targets in the samples. Two cell types can be identified based on the differences on its cell surface. Aptamers, made of a large variety of fixed length of nucleotides interact differently with different molecules present on the cells. A similar concept has been applied to exploit the differences on the X and Y chromosome-bearing sperm. Aptamer-based biosensors are emerging and promising devices to recognize cell surface proteins. Our study focuses on the use of EIS aptasensors to detect unique surface proteins on sperm cell of X and Y type.

The aptamers so obtained are under different stages of validation for their applicability in semen sorting. It is expected that when EIS probe is incubated with a mixed sample of semen it will selectively interact with either the X or Y chromosome-bearing sperms.



Shweta Pant

A Novel, Low-cost, Non-invasive Eye Tracker Using Fiber Optic Sensor

Shweta Pant
Indian Institute of Science, Bangalore

Guide:
Prof. Sundarrajan Asokan

Eye movement evaluation is vital for the diagnosis of various ophthalmological and neurological disorders. Tracking of saccadic movements is used to detect the onset and evolution of many psychological and cognitive disorders. For example, saccades are known to be perturbed in numerous neuro-developmental and neuro-psychiatric disorders like Parkinson's disease, Alzheimer's disease, Autism, Schizophrenia and Attention-Deficit-Hyperactivity Disorder. The development of an easy and affordable method to detect eye movements with high accuracy would tremendously help in the early diagnosis of such disorders. Our Fiber Bragg Grating Eye Tracker (FBGET) is a novel, non-invasive, wearable device which can effectively acquire the eye movements. It is validated by dynamic tracking of the eyeball movement for various eye movements like fixation amplitudes, saccades and main sequence. The proposed FBGET can have a strong impact on the biomedical field due to the following Virtues: Easy to mount/demount, non-tedious, non-invasive eye tracker; Portable; easily deployable at the bed-side of a patient, and so it can serve as the point of care device; Features such as electrical passiveness, wearability, compactness, light-weight, cost-effectiveness and portability make FBGET effective as an early- level diagnostic device for many ophthalmological and neurological disorders; Both the eyes can be tracked simultaneously eliminating the time synchronization complexity; Being a fiber optic sensor, FBGET is electrically and chemically inert; hence, proves to be the most suitable option for biomedical sensors; Apart from being a biomarker for neurological disorders, FBGET can also be used in fields such as cognitive linguistics, psychology, medicine, engineering, and gaming, and also in enhancing HCI by using eye movements for navigation and control.

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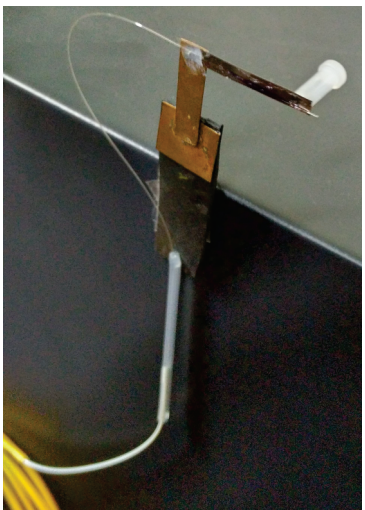
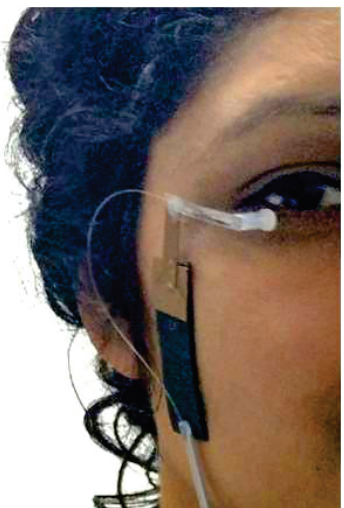
Dr. Sharath U, Srivani Padma, Sumitash Jana, Varsha V


FBGET- Prototype

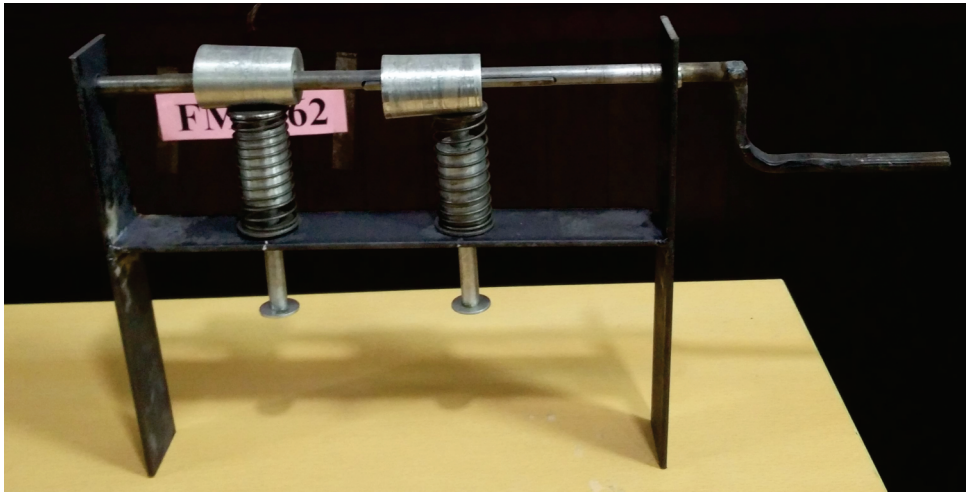
Prem Dakshin

Frustum CAM in Medical Ventilators

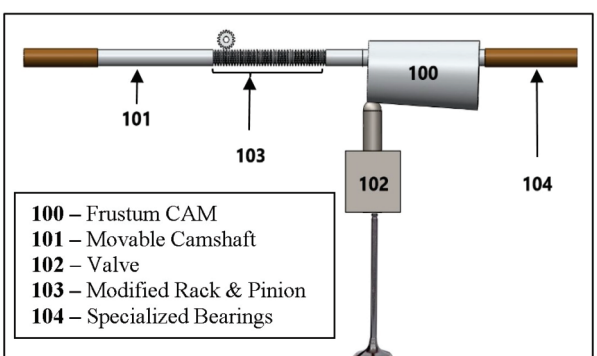
Prem Dakshin
Birla Institute of Technology & Science University, Pilani

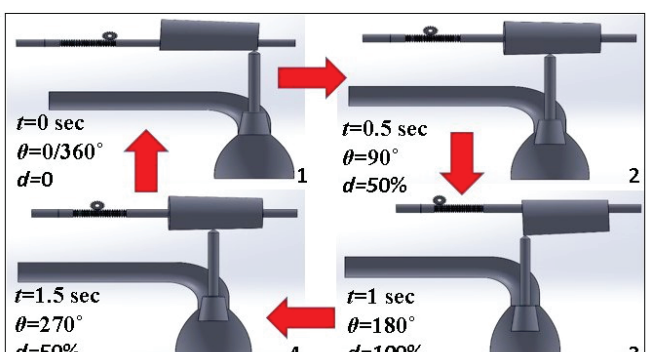
Guide:
Dr. Shashank Khurana

Life-support mechanical ventilation saves a lot of lives, but an inappropriate application may turn fatal. The existing ventilators can perform with great accuracy with the aid of new technologies but are very expensive, making them inaccessible in remote areas. This project aimed to develop an alternate low-cost electronically-controlled stand-alone mechanical system to effectively control the rate and waveform of air in Life-support Ventilator Systems. The modern ventilators use valves for the ventilation process, actuated mostly using solenoids. This system replaces solenoids with Frustum CAM or FC Mechanism - a first of its kind patented mechanism. The FC Mechanism uses the concept of Variable Valve Lift (VVL) to control the lift of the valve, thereby controlling the air flow rate. The FC consists of two circular eccentric CAMs of different diameters on either end and a solid taper in the center connecting them. The end diameters are defined by the range of lift required. The valves are stationary and positioned using springs. Linear movement is provided to the camshaft so that the tapered surface of the camshaft slides over the contact tip of the valves and is positioned at the required point to achieve the required valve lift and flow rate or tidal volume. The waveform of respiration is controlled by the speed of camshaft rotation. A single camshaft with two Frustum CAMs can be used to control the inspiratory and the expiratory valves. By effectively integrating this FC system to the conventional ventilators by using proper mechatronics systems or by building the concept itself into a ventilator, the cost can be cut down to a great extent while still achieving high flow control.



FC Mechanism





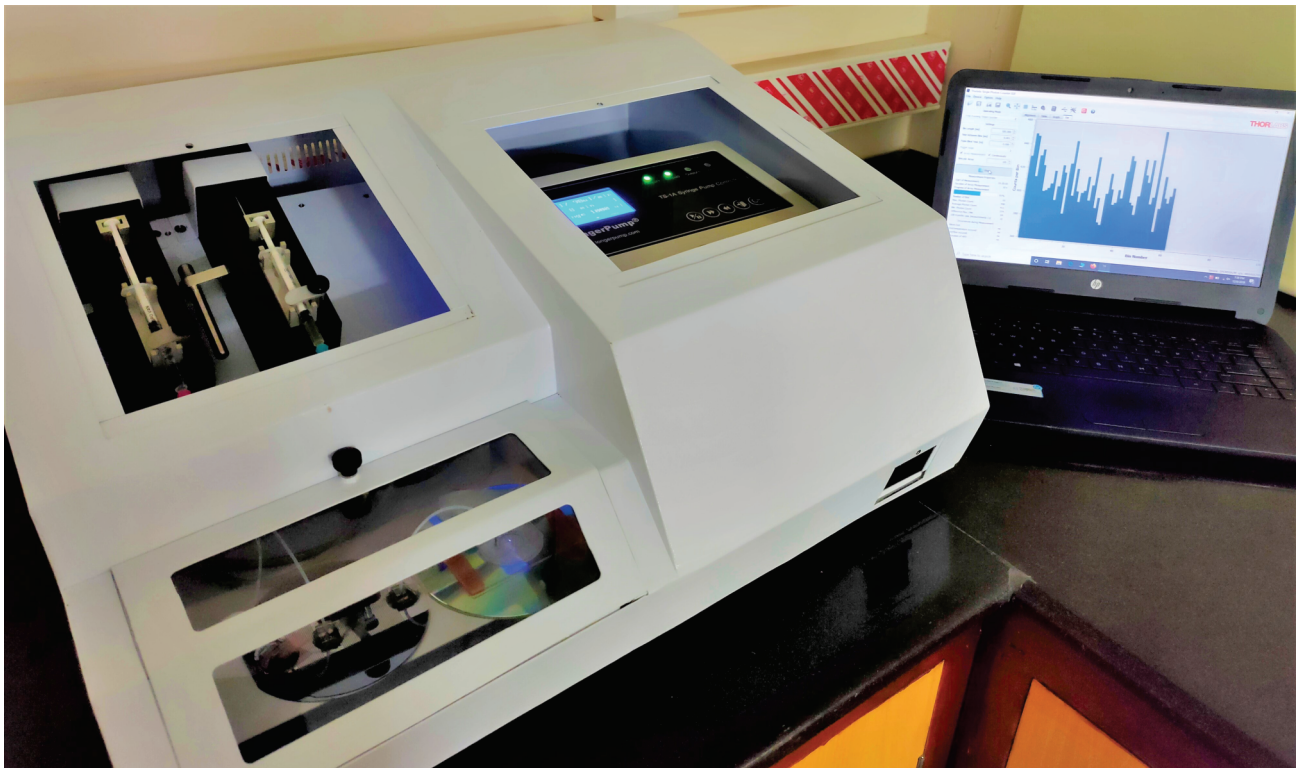
Ravindra Gaikwad

Continuous Monitoring of Gasotransmitters for Early Stage Management of Systemic Inflammatory Response Syndrome

Ravindra Gaikwad
Indian Institute of Technology, Madras

Guide:
Dr. Ashis Kumar Sen

Sepsis or systemic inflammatory response syndrome [SIRS] is a severe and life-threatening clinical condition that primarily occurs due to bacterial infection, triggering multiple organ failure by a cascade of events. One-third of all in-hospital patients, greater than 50% of all ICU patients and more than 80% of surgical ICU patients suffer from SIRS-induced morbidity and mortality with diminishing chances of survival due to delayed diagnosis and poor prognosis. Traditional sepsis detections methods are either time-consuming or unspecific and can detect sepsis only at the later stage. Recently, a novel concept of early prediction of sepsis based on the detection of gasotransmitters (CO, NO, H_2O_2 and H_2S) in patient's blood has received significant attention. Here, our goal is to correlate the dynamic change in the gasotransmitter levels with the occurrence and progress of SIRS (leading to sepsis). We are developing a microfluidics-based novel Lab on Chip (LOC) platform for continuous monitoring of vascular gasotransmitters with high selectivity, specificity, and accuracy for detecting SIRS. The device being developed can be used at the bedside. It will contain two different modules: (a) blood plasma separation will be performed using acoustophoresis on a chip fabricated using silicon and glass substrates, (b) mixing, incubation, and detection will be performed on a chip fabricated using silicon and glass substrates. A microfluidic platform is being designed to separate plasma from sample blood, mixed plasma (containing the gasotransmitters) and probe solution will be mixed and incubated in a serpentine channel to enable detection based on fluorescence.



LOC Platform

Deepa Dixit

A Non-electric and Affordable Surface Engineered Particle-based Point-of-use Water Disinfection

Deepa Dixit
Indian Institute of Technology, Gandhinagar

Guide:
Prof. Chinmay Ghoroi

Though significant progress has been made to meet Sustainable Development Goal (SDG) target 6.1 to achieve safe and affordable water, World Health Organization (WHO) reports that 1 in 10 people still lack basic water, including the 144 million people who drink microbial-contaminated water in low-middle income countries (LMIC). According to WHO reports, the traditionally used method of boiling and chlorination is the most popular among the low-income communities to disinfect the household water (HWT). While boiling needs energy (which costs more than 5% of the household income), and leads to recontamination due to poor handling and unsafe storage, chlorination involves the disinfection of the by-products. Moreover, many waterborne pathogens resist chlorination, which limits its application. Therefore, it is necessary to develop a low-cost and easy to use filter which can replace the conventional treatment methods in low-income groups. We report the inexpensive method to develop surface engineered particle (SEP) which itself has potential to remove 99.48% bacteria (initial concentration 3×10^8 cells/ml) in a continuous mode without using any disinfecting agent like silver nanoparticles (nAg) or silver ions (Ag+) for point-of-use (POU) application. The proposed SEP carries a unique combination of surface chemistry and randomly distributed nanoscale roughness, which can arrest the bacteria when microbial-contaminated water flows through it. In addition to the bacterial removal, the SEP-based filter also removes turbidity from 27.1 NTU to 0.36 NTU (~99%), maintaining the pH of filtrate in between 7.5 to 9.0. In this regard, the proposed product can connect directly to the water tap or the stored water source or any water bottle at the point-of-use (POU). Additionally, material can also be used during natural disasters where bacterial pathogens are the major cause of water-borne diseases.

SEP based filter - Prototype

Shivraj Vasantrao Naik

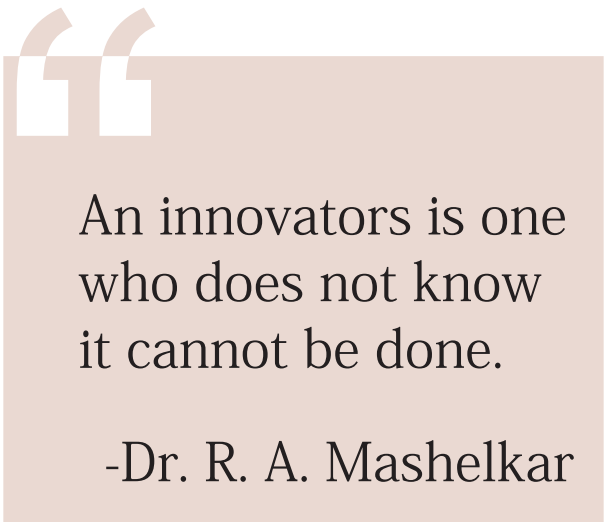
Nanotechnology Based Intranasal Spray Formulation for the Effective Treatment of Alzheimer's Disease

Shivraj Vasantrao Naik
Institute of Chemical Technology, Mumbai

Guide:
Prof. Vandana Bharat Patravale

Alzheimer's disease (AD) is the most common form of dementia impacting the ability of a person to think clearly and perform daily functions. If adequate measures are not taken, India, which currently boasts of the youngest population, may adversely be affected socio-economically in the coming decades. AD is associated with intracellular accumulation of beta-amyloid plaques and neurofibrillary tangles. Current treatment approaches offer only symptomatic relief. No biomarkers are available for the early detection of the disease, further compounding the problem. Japan, a country that regularly consumes a fermented soybean food 'Natto', reports lesser incidences of AD. 'Nattokinase' is an enzyme present in it which is a potent thrombolytic. Currently, it is used as a nutraceutical cardio-tonic in the form of oral capsules. But being an enzyme, it poses many limitations following oral route. These facts motivated us to systematically explore the utility of nattokinase in AD. A 3-D structure of nattokinase was constructed using homology modeling. Molecular docking studies revealed its amyloid degrading ability. Dose and in-silico study results were validated using 'Thioflavin T binding assay'. We formulated nattokinase micro emulsion-based spray, which is thermodynamically stable and commercially viable and can by pass blood-brain-barrier to reach the brain in sufficient amount when delivered via nose-to-brain route. Higher permeation and mucoadhesion were observed in ex-vivo studies. Further, in-vivo pharmacokinetic and biodistribution studies were undertaken in rats. We iterated the results of ex-vivo and found that in comparison to orally administered microemulsion at the same dose, higher brain concentration of nattokinase was seen by the intranasal route. Histopathological investigation confirms safety of the developed formulation. We obtained promising results in pharmacodynamic studies showing enhanced efficacy. In conclusion, we are ready with the proof-of-concept and prototype formula which can be translated to industrial scale.


Microemulsion based nasal spray


An innovators is one
who does not know
it cannot be done.
-Dr. R. A. Mashelkar

SRISTI - GYTI 2020

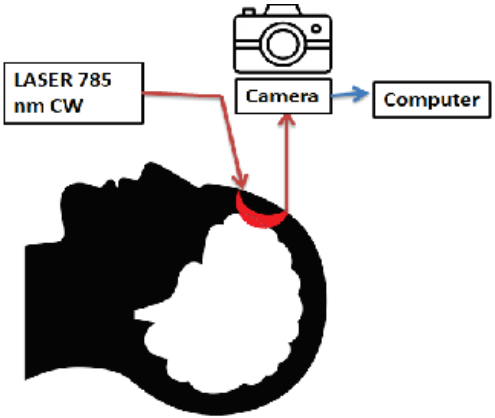
Murali K

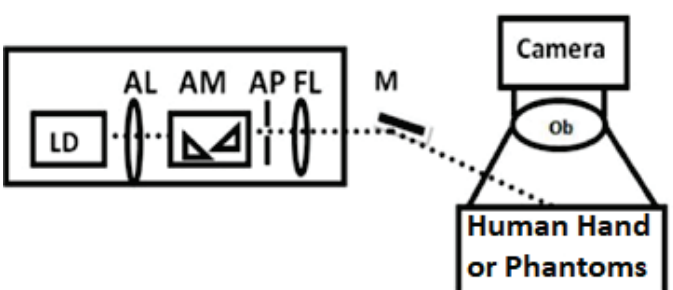
An Inexpensive Deep Tissue Blood Flow Measurement System using Low Frame Rate Camera

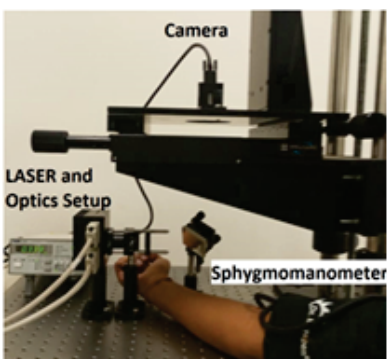
Murali K
Indian Institute of Technology, Bombay

Guide:
Prof. Hari M Varma

Stroke and cancer are two of the leading causes of death and disability in India, with both diseases triggering changes in the local blood flow. One of the modalities to measure deep tissue blood flow is Diffuse Correlation Spectroscopy (DCS), which makes use of the Near Infrared Spectroscopy (NIRS) principle, by employing expensive contact-based multi-channel fibre-coupled Avalanche Photodiodes (APD) as detectors. To increase the SNR of the system, several source detector pairs are needed, which add to the cost of the system. In this work, we have developed an inexpensive DCS system using a camera as a detector, resulting in high density measurements. One of the stumbling blocks in employing a camera for DCS is that it requires a very high frame rate (in order of MHz), very low readout noise and high dynamic range. The requirement of low noise with high frame rate is always associated with a trade-off between the two. Additionally, this adds price to the camera, which is typically around INR 50 lakhs. In our work, we circumvent the need of high-frame rate by using a novel multi-step volterra integral-based algorithm, thereby employing a low-frame rate camera (less than 100 Hz; cost less than INR 1 lakh). We validated the system by measuring blood flow and its associated changes in adult humans. We plan to extend our studies to make two products: (a) a small animal imaging platform for researchers using NIR light with potential application in stroke and Functional near infrared spectroscopy (fNIRS) studies; and (b) a bed-side blood flow monitoring system (in the brain) for longitudinal studies, targeted at clinical researchers, to measure tissue oxygen saturation and blood flow in real-time.







Experimental Setup of the proposed system using low frame rate camera. LD - Laser Diode; AL- Aspheric Lens; AM- Anamorphic Prism; AP - Aperture; FL- Focusing Lens; M - Mirror; Ob - Objective lens.

Rajesh Srinivasan

Vikram S

Niraj N Jadhav

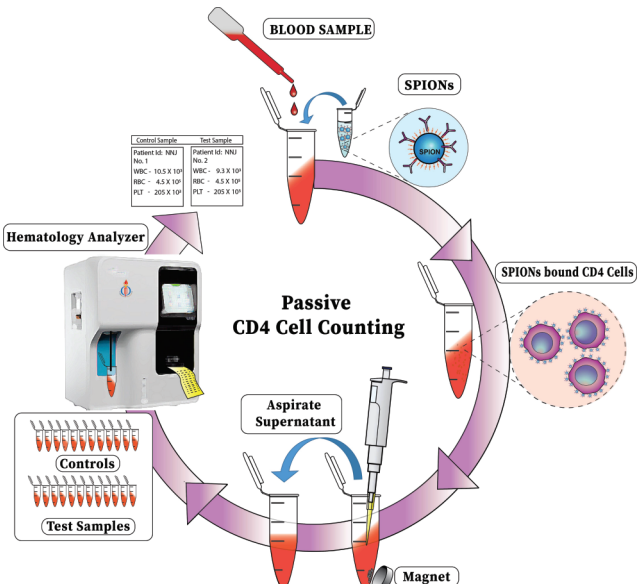
A Novel CD4 Cell Count Method for HIV Infected Patients using a Hematology Analyzer

Rajesh Srinivasan, Vikram S, Niraj N Jadhav
Indian Institute of Science, Bangalore

Guide:
Prof. Sai Siva Gorthi

Cd4 (T-cell) count is an important test parameter to determine HIV infection condition. Conventional techniques are expensive and cannot be accessed in resource-limited regions. This project has been designed with the twin motives to develop a cost-effective method to count CD4 cells and to tackle the HIV condition in rural regions of India. Basic automated Haematology analyzers are available in rural diagnostics labs. By utilizing the analyzer's capability to count cells and combining our technology of target cell separation, it is possible to count CD4 cell levels with minimal handling procedure. The highlight of this work includes diluting whole blood, incubating it with antibody conjugated SPIONs and analyzed using a hematology analyzer. With these three simple steps, it is possible to determine the CD4 cells count to monitor the HIV condition. The major element to reduce the tes tcost is the elimination of the need for a flow cytometer. The next important frugal innovation is using the common automated hematology analyzer for target cell counting. The total cost of the test reduces to less than 150 (INR), which is 1/10th the cost of the current test (2000 INR). This technology eliminates the need for installing additional systems and can be used with existing hematology analyzers in the lab. Hence, the developed technology changes the current scenario of performing CD4 count test at centralized labs in metropolitan cities to perform tests at rural clinical testing labs. This helps to improve anti-retroviral therapy (ART) monitoring, and reduce the death of HIV patients as also the spread of the HIV infection.

Hematology Analyzer



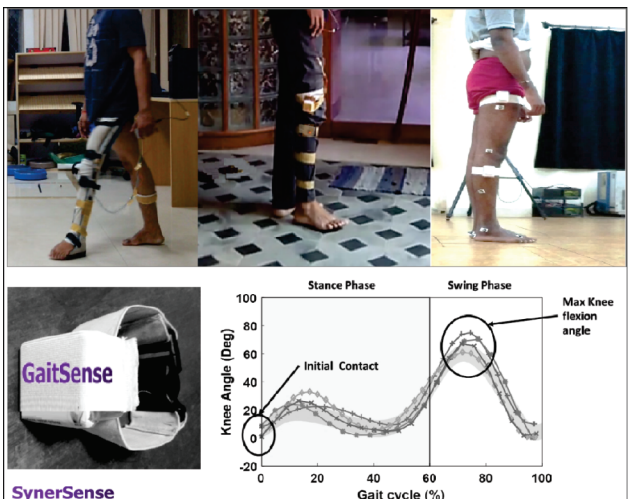
Gunjan Patel

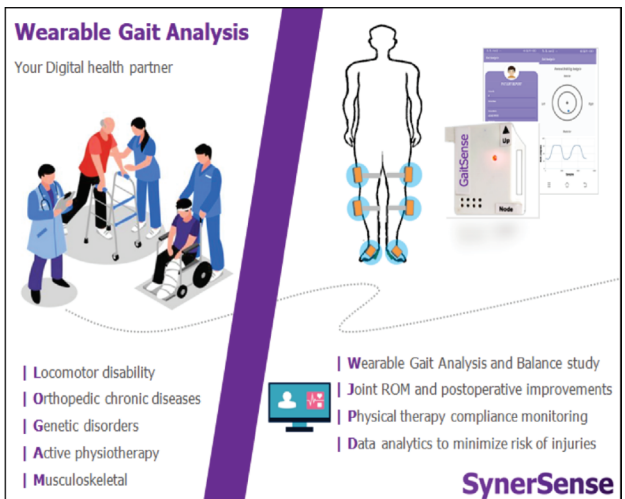
AbleFit: Wearable Device for Orthopedic and Neurological Disorderes Patients

Gunjan Patel
Indian Institute of Technology, Madras

Guide:
Dr. Sujatha Srinivasan, Dr. Rajdeep Ojha

WHO reports that worldwide, over one billion people have some form of disability. There are estimated 32.5 million people in India with Locomotor Disability (MSHFW, GoI). Management of locomotion disability arising from orthopedic and neurological conditions often requires gait analysis for an accurate clinical assessment and diagnosis of the pathological state of the lower limb joints and muscles. The gait analysis study provides biomechanics evidence-based quantitative clinical assessments of joint range of motions. This research presents a novel wearable and wireless inertial sensor-based Gait Sense device design to estimate joint angle range of motions. Further, a devised novel scientific algorithm for estimation of joint angle is developed and optimized using sensors data fusion post- processing algorithm to obtain gait results by leveraging a data analytics platform. The study reported preliminary results of the gait trials that were conducted on people who used the developed novel system during walking, both in outdoor and indoor environments. The results showed joint angles range of motion within 5 degrees, which is within the normative data range, suggesting high accuracy of the joint angles estimation. Hence, the Gait Sense will be useful for the body-movement analysis of the lower limb at different joints (ankle, knee and hip) under various pathological and environmental conditions in physical medicine and rehabilitation, neurological disorders, and orthopedics. Gait Sense solves the unmet clinical need problems of people with locomotor disability arising from orthopedic and neurological conditions and wearable IoT med-tech frugal innovation that leverages a data analytics dashboard to assist doctors in decision-making. The device is affordable with 95% accurate scientific validation. It is targeted to deliver solutions in COVID-19 crisis and after. It will help reduce unnecessary visits to hospitals and also assist people with locomotor disabilities.





AbleFit - Prototype

Varinder Singh

Gurditt Singh

Amrinder Singh

MOKSH - Convert Crop Waste into Wealth

Varinder Singh, Amrinder Singh, Gurditt Singh, Nitika Dhingra
Chitkara University, Punjab

Guide:
Dr. Nitin Saluja

Imagine a scenario wherein you are unable to dispose-off your domestic waste and then juxtapose the same situation in the context of farming land. It is generally observed that farmers are unable to dispose-off their waste and so end up burning it off, leading to pollution and its resultant problems, especially breathing.

MOKSH is a movable machine, designed to address this problem. It 'walks' in the field after the crop is harvested and picks up the waste from its front end, dries it using patented technology and indigenously developed non-thermal drying process. At its rear-end, this waste is then processed into fine dried powder. The waste is dried using the patented and novel Radio frequency-based technology which is 100 times faster than the conventional drying process. This enables the machine to clear one acre of waste in one hour. The dried powder is 20 times more compressible, thus, reducing the transportation cost by 20 times. Otherwise farmers have to spend INR 3,500/acre to bundle and transport the waste to the nearest processing units or burn it in the fields after drying it for 7-10 days. Both these methods are not viable, for one, they are very expensive, and second, they are very time-consuming and can delay the sowing of the next crop. Hence, MOKSH is an ideal answer to the waste collection problem, enabling farmers to clear the waste within 24 hours without burning or spending thousands on bundling and transporting it to distant units.

Nitika Dhingra

MOKSH Machine

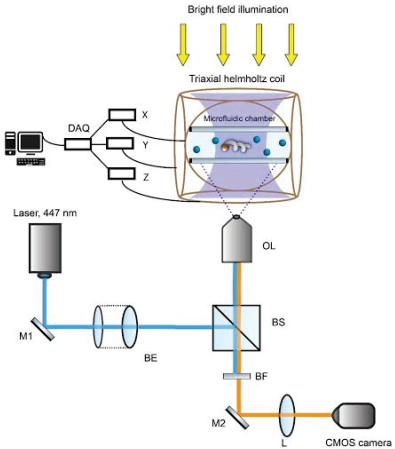
Souvik Ghosh

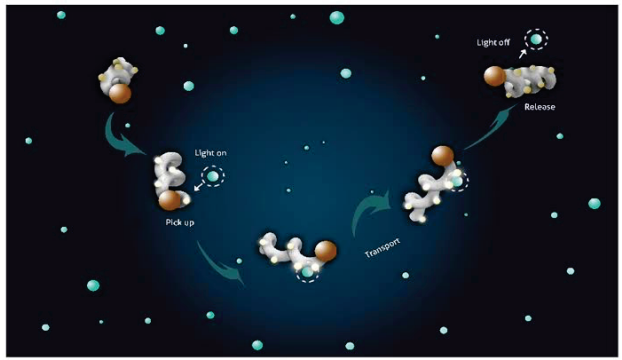
A Method and a System for Remotely Controlled Manipulation of Nanomaterials in Fluids

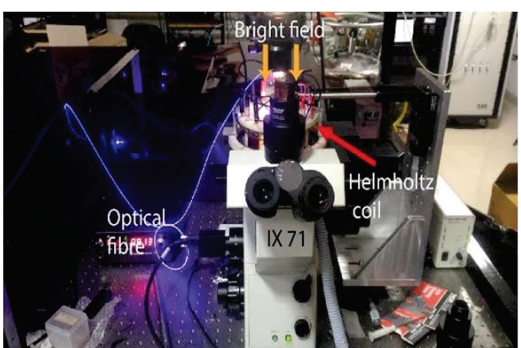
Souvik Ghosh
Indian Institute of Science, Bangalore

Guide:
Prof. Ambarish Ghosh

An important goal in nanotechnology is to control and manipulate nanoscale objects in fluidic environments. Optical traps based on strongly localized electromagnetic fields around plasmonic nanostructures can provide a promising solution. Plasmonic Nanotweezers allow the trapping of smaller particles at optical intensities far lower than the conventional optical tweezers, which can impact diverse research fields ranging from soft condensed matter physics to materials science and biology. However, conventional near-field optical trapping occurs at predefined spots on the surface of a nanopatterned substrate and is, therefore, severely speed-limited by the diffusion of colloidal objects into the trapping volume. As a result, the trapping process is inherently slow and inefficient for transport, unlike the conventional optical traps. As discuss, these limitations can be overcome by integrating plasmonic nanostructures with magnetically driven helical nanoswimmers and maneuvering them under optical illumination. In an alternate strategy, a similar functionality has been obtained in a unique'tweezer-in-a-tweezer' concept, where sub-micron colloids can be manipulated using optical forces alone. These next-generation of plasmonic nanotweezers have achieved new functionalities,such as selective trapping and positioning, collective transport, independent and parallel control and size-selective sorting of various nanomaterials including fluorescent nanodiamonds, magnetic nanoparticles and even single sub-micron-sized bacterium at a low laser power, which were not demonstrated before. The demonstrated technology may enable isolation, manipulation and chip-level assembly of nanomaterials and allow non-invasive manipulation of fragile bio-specimens, such as bacteria, virus and various macromolecules in the bulk fluid.







Prototype: schematic and photograph

Demonstration: schematic and photograph

Jasvinder Singh

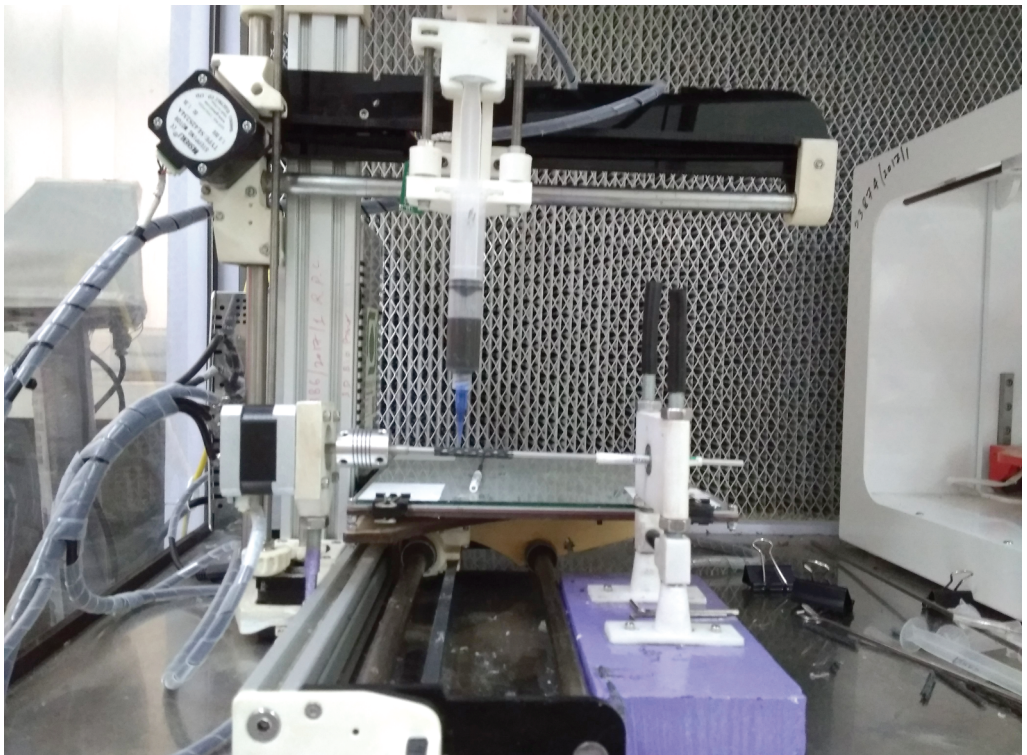
Gurminder Singh

Development of Patient Specific Customized Shape Vascular Stent by 3D Printing Technology

Jasvinder Singh, Gurminder Singh
Indian Institute of Technology, Delhi

Guide:
Prof. Pulak Mohan Pandey

Cardiovascular Diseases (CVDs) have now become the leading cause of mortality in India. Premature mortality in terms of years of life lost because of CVD in India increased by 59%, from 23.2 million (1990) to 37 million (2010). One of the most common medical interventions is the Percutaneous Coronary Intervention (PCI), which opens clogged or damaged coronary arteries. PCI uses the permanent stents with balloon angioplasty, which improves the necessary blood flow. Stent geometry influences the local hemodynamic alterations (i.e. the forces moving blood through the cardiovascular system) associated with adverse clinical outcomes. Moreover, in the current scenario, a new generation of stents are required matching with the anatomical data of patients to degrade after performing the specific function. The solution of the above-mentioned the problem is the development of a customized stent by the help of CT scan or MRI data. To address the problem, novel methodology to fabricate customized shape polymeric tubular stent has been developed. The novelty of the technique is the use of the linear CAD model of the customized stent to fabricate tubular stent of biodegradable polymer. The 3D printing is used to fabricate the required shape of the tubular scaffold by printing on rotating mandrel or shaft layer- by-layer with the help of a nozzle. The cost of the machine and fabricated stent in the developed methodology is low as compared to the existing technologies. Even after coating of drug on the stent produces a low-cost stent in comparison to existing drug eluting stents. Hence, the developed methodology is economical as compared to other methodologies used for the fabrication of customized patient-specific stents.



Vascular Stent - Prototype

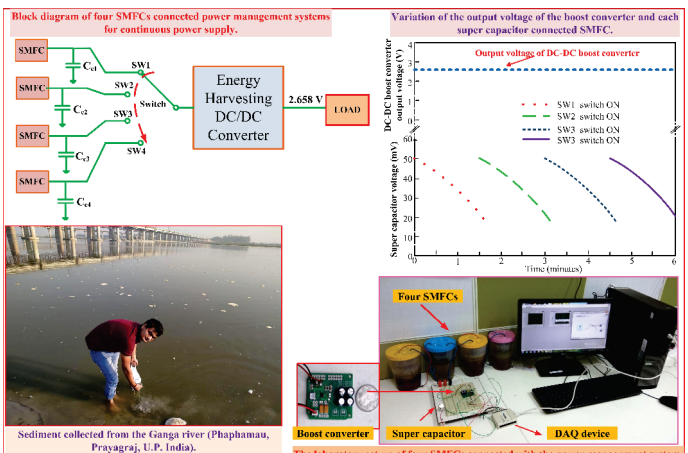
Jeetendra Prasad

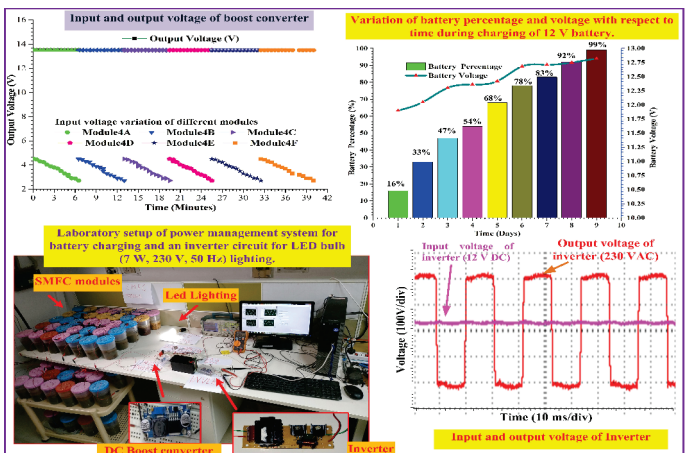
Sediment Microbial Fuel Cell as a Renewable Power Source in Remote Area

Jeetendra Prasad
Motilal Nehru National Institute of Technology, Allahabad

Guide:
Prof. Ramesh Kumar Tripathi

To overcome the harmful effects of traditional energy sources, there is a need to focus on natural resources to generate electricity without pollution. An alternative to clean and renewable electrical energy is sediment microbial fuel cells (SMFCs). SMFC is a bio - electrochemical device that generates direct current by microbes present in the soil. The laboratory-scale SMFCs have been assembled using a 10 cm diameter of the cylindrical plastic bottle having a total volume of around 1L. Sediment and water were collected from the Ganga River (Prayagraj, India). An SMFC produces a maximum voltage of 1.16 V using copper and zinc electrodes, which is too low to power an electronic device. In order to increase the voltage, eight individual SMFCs were connected together in series- parallel combinations to power an LED light. An energy harvesting power management system (PMS) was also developed to increase the voltage of a single SMFC from 1.16 V to 3.0 V. In addition, another power management system (PMS) was developed for series-parallel connected SMFC (7 parallel × 5 series-connected SMFC), which increased the voltage up to 13.50 V for charging a battery (12 V, 7.5 Ah). After 100% charging the battery, an astable multivibrator-based inverter circuit was used to convert the DC power of battery into AC for LED bulb lighting (7 W, 230 V, 50 Hz). Typically, telemetry systems and chemical sensors are powered by batteries, but in some applications, replacing batteries on a regular basis can be time-consuming, costly and impractical. One possible solution to this problem is to use a self-renewable power supply such as SMFC, which can work for a longer time using local resources. This innovative research can provide a power source to electronic devices in the future.





SMFCs - Prototype

Minds on the margin
are not marginal minds

-Prof. Anil Gupta

SITARE - GYTI 2020 APPRECIATION

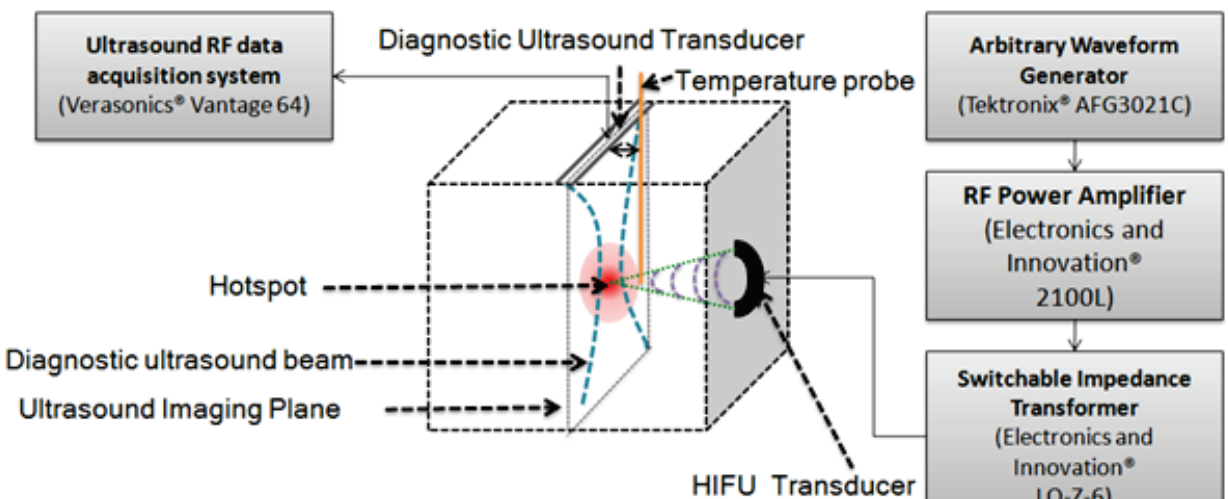
Aliarshad Kothawala

Real-time Ultrasound-Based Acoustic Parameter Imaging to Track Spatio-temporal Evolution of Hotspot in High Intensity Focused Ultrasound and Microwave Hyperthermia

Aliarshad Kothawala
Indian Institute of Technology, Madras

Guide:
Prof. Arun K. Thittai

High intensity focused ultrasound (HIFU) is one of the most promising non-invasive techniques to treat deep-seated benign and cancerous tumors. The principle of HIFU is based on the conversion of focused acoustic energy into heat. This is accomplished by focusing the ultrasound waves on a very small region using the HIFU transducer. The current challenge in the HIFU is the lack of image-guided feedback for monitoring and control. Real-time feedback about the distribution of heat in the 2-D space and its changes with time can provide useful information. The ultrasound imaging has high frame rate, low-cost, portability and non-ionizing nature. The acoustic parameters and statistical distribution of scatterers are affected by changes in temperature. This phenomenon can be harnessed to reconstruct a map depicting their spatio-temporal evolution. The method involves the use of two ultrasound transducers, HIFU for delivering heat and common diagnostic ultrasound transducer to acquire ultrasound RF data. The acquired RF data is processed using the developed methods, namely, RLSD, RNI and RKI. These algorithms have shown promise in estimating the location and extent of the hotspot. Also, the preliminary results obtained on the ex-vivo liver samples demonstrates that the entire formation of the lesion can be tracked using this image-guided technique. The current limitation is that the information obtained is still qualitative and calibration needs to be done to have a quantitative temperature map. Also, parallelization of the algorithm and its implementation on the GPUs will ensure faster computation making information real-time. The same technique has also been tested on microwave hyperthermia monitoring to track the hotspot in real-time and thus, it can be used in this case also along-with chemotherapy and radiotherapy.



Experimental Setup

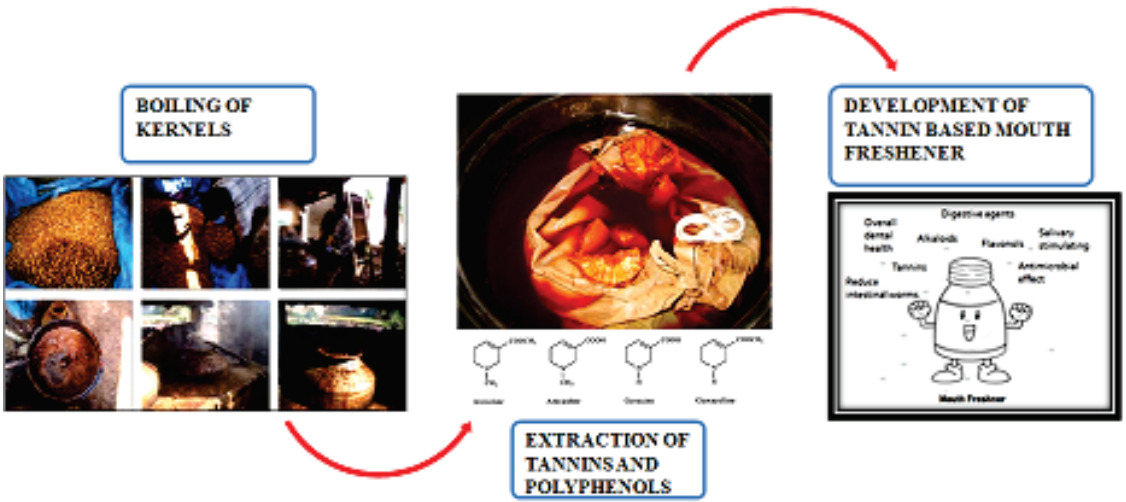
Sonali Naik

Tannins-Based Mouth Freshener

Sonali Naik
National Chemical Laboratory, Pune

Guide:
Dr. Kiran S

Mouth washes are the simplest and most comfortable means to maintain oral hygiene, especially in the case of medically compromised patients and the elderly for whom maintaining dental hygiene can be a cause of concern. Chemicals such as chlorhexidine and alcohol form primary ingredients of any commercially available mouthwash. These chemicals can have various side-effects ranging from taste disturbance to allergic contact stomatitis. A better alternative, therefore, is to use a herbal mouthwash, packed with natural ingredients and devoid of any special additives. The Areca nut or betel nut, a commercial cash crop widely found in the Asian and African countries, is rich in rich polyphenol content such as tannins, widely used as a chewing agent or in the processed form to protect teeth from dental problems. Since tannins are well-known for their antioxidant and antimicrobial properties, incorporating them in mouth fresheners can help to prevent oral malodor; increase oxygen supply by eliminating volatile sulfide compounds; and decrease bacteria activity. Tannins and the essential oils in the Areca nut are relatively easy to extract, and so are ideal for use in a mouthwash. This work aims to develop a mouthwash using natural ingredients obtained from betel nut, having inherent antimicrobial and anti-inflammatory activity. Furthermore, the use of these natural compounds in mouth fresheners will help to maintain dental hygiene while avoiding the side-effects commonly associated with the alcohol-based mouthwashes available in the market.


BOILING OF KERNELS
EXTRACTION OF TANNINS AND POLYPHENOLS
DEVELOPMENT OF TANNIN BASED MOUTH FRESHENER
Digestive agents
Overall dental health
Alkaloids
Salivary stimulating
Flavonols
Tannins
Antimicrobial effect
Reduce intestinal worms
Mouth Freshner

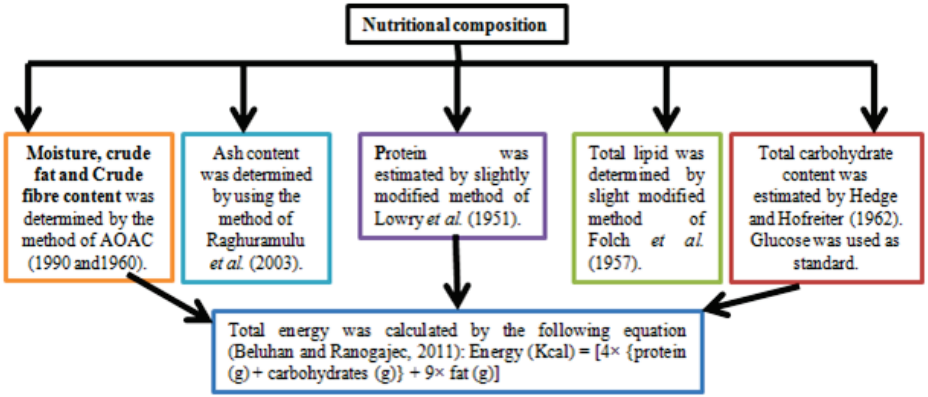
Sanjit Debnath

Development of Protocol of Commercial Cultivation of Nobel Wild Edible Mushrooms of Tripura, Northeast India and Evaluation of their Biological Properties

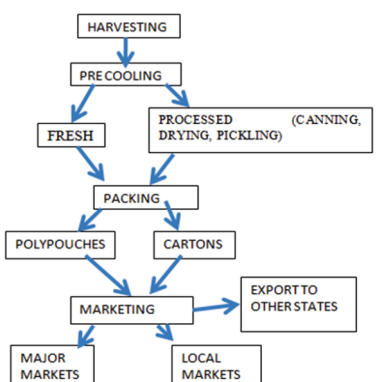
Sanjit Debnath
Tripura University, Tripura

Guide:
Prof. Ajay Krishna Saha

Mushroom is a novel food item known for its flavor, texture and nutraceutical value. Mushroom production in India has gone up to 1,55,000 tones in the last few years. Reports of mushroom food poisoning among the rural tribal people are common given their inability to identify toxic mushrooms from the edible ones. Traditional tribal disease healers use mushrooms to cure various diseases. Given their various bioactivities, it is important to commercially cultivate specific varieties of mushrooms. Eco-friendly commercial production of wild edible mushrooms on organic waste will also improve the socio-economic status of the tribal people in Tripura. However, there is a need to develop appropriate infrastructure and train people for commercial cultivation of the crop. Such an approach will help to push new mushrooms as a dietary item. Successfully trained beneficiaries can also seek funds for commercial cultivation from the government, either individually or as a self-help group. The high nutraceutical properties of mushrooms put them in the summit of all available food materials in the world.



Methods for estimation of nutritional values of cultivated mushrooms.



A flow chart of proposed extension programme of mushroom harvesting to marketing

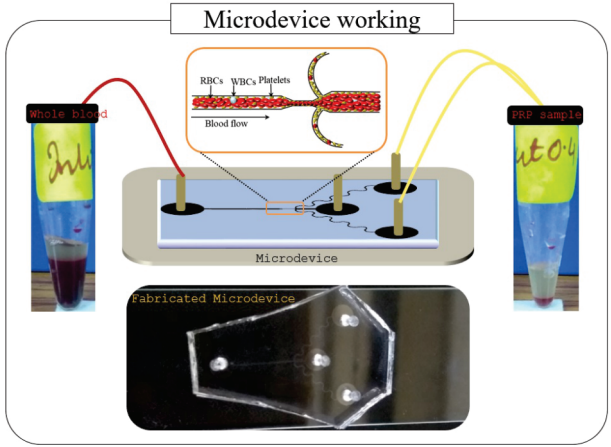
Vijai Laxmi

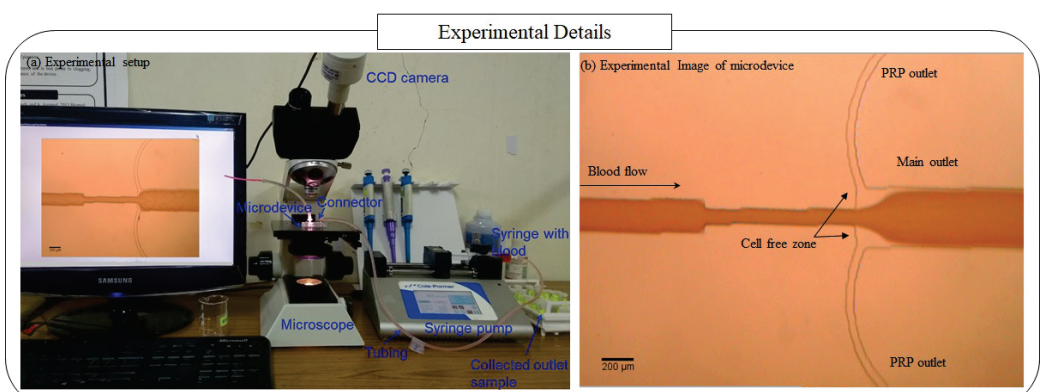
A Low Cost Passive Microdevice for Platelet Rich Plasma PRP Separation from Human Blood

Vijay Laxmi
Indian Institute of Technology, Bombay

Guides:
Prof. Amit Agrawal, Prof. Suhas S. Joshi

The aim of our work is to develop a passive micro device that can separate platelet-rich plasma (PRP) from blood. PRP finds wide applications in blood transfusion for patients undergoing treatment for dengue, dental surgery, sports injury; and in the field of dermatology. The extraction of PRP, therefore, has a wide social impact. Globally, approximately 390 million people per year (World Health Organization, 2017) get infected by dengue and needs platelet transfusion for the treatment. Clinical methods of PRP separation are of centrifugation-based, involving several drawbacks, for instance, they require large setup, are time and power-consuming, need skilled personnel, involve manual steps, and have an adverse effect on the quality of the sample (activation of ~50% of extracted platelets occurs during the separation process). Our micro device overcomes these drawbacks and comes with the following unique features: It is easy to fabricate and operate, is compact in size, low in cost and easy to operate; It does not require external power supply, sheath fluid and additional pumping power to operate; It utilizes a unique principle for separating PRP, which is the combined effect of hydrodynamics forces, biophysical laws, and geometrical effects of separation; It separates PRP with 14.55+1.81(n=3) fold enrichment from the entire blood, which is better than all the reported passive (and even active) micro devices ever built; It provides clog-free (and therefore) operation over a long duration; It also works as a platelets-poor plasma (PPP) separation device by altering the inlet blood samples and providing PPP with 94.7% purity; The biological characterization of the samples obtained from the micro device have no adverse effect on the quality of the sample; The design is unique in that it allows to prepare PRP and PPP on a single micro device; It has great potential to detect the severity of COVID-19 and cardiovascular diseases.


Microdevice working
RBCs
WBCs
Platelets
Blood flow
Whole blood
PRP sample
Microdevice
Fabricated Microdevice


Experimental Details
(a) Experimental setup
CCD camera
Microdevice
Connector
Syringe with blood
Microscope
Syringe pump
Tubing
Collected outlet sample
(b) Experimental Image of microdevice
PRP outlet
Blood flow
Main outlet
Cell free zone
200 µm
PRP outlet

Aswathy Nair

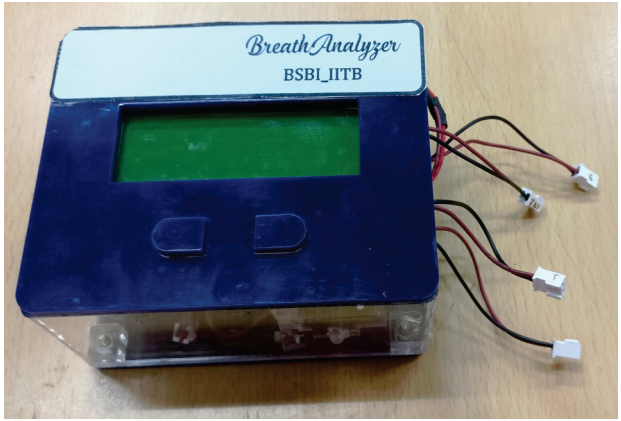
Breath Volatile Organic Compound Detection Using Conducting Polymer Coated Chemiresistive Filter Paper Sensors

Aswathy Nair
Indian Institute of Technology, Bombay

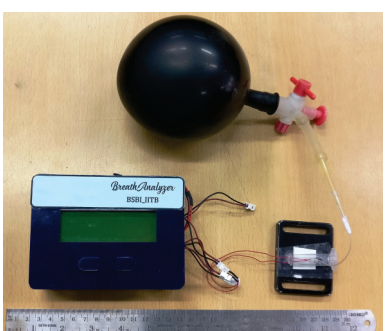
Guide:
Prof. Soumyo Mukherji

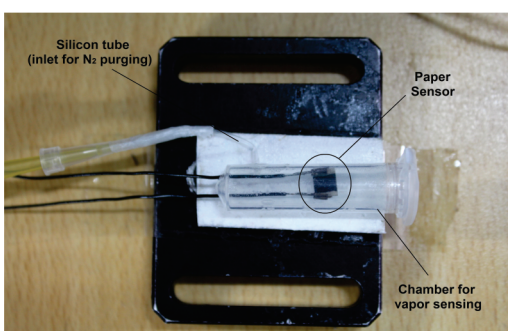
Breath analysis is a sensitive and non-invasive screening platform that can be used to predict various metabolic, biochemical and pathological conditions in the body. In this work, we have developed a multi-analyze breath monitoring system that consists of: (i) four filter paper sensors coated with doped and de-doped combinations of polypyrrole and polyaniline, (ii) miniaturized inert chamber to pack the sensors along with vapor source, and (iii) multi-channel, low cost, ohmmeter to measure the resistance change from the sensors. Three volatile organic compounds (VOCs), i.e., acetone, ethanol and methanol were detected in breath till a concentration as low as ~ 80 – 140 ppb. The sensor DC resistance changes were due to the conductivity changes of the coated polyaniline or polypyrrole matrixes as a result of either their swelling or disordering effects or hydrogen bonding in the presence of VOCs. For the preliminary experiments, a customized chamber was designed using 2 mL microcentrifuge tube to house the sensors to avoid the use of bulky and expensive gas chambers. To ensure uniform gas flow towards the sensor, a simple balloon and valve arrangement was used instead of mass flow controllers. The percentage change in resistance was calculated to quantify different vapors, as different substrates showed different initial resistance. Further, a time frame of 2 minutes was chosen due to the faster sensor response. The sensors showed good reversibility and subsequent purging with nitrogen gas helped to re-establish the baseline. Principal component analysis (PCA) based classification algorithm, temperature, and humidity compensation features were added to overcome the sensor non-specificity and to improve stability. The developed system can be effectively used for diabetes management (acetone), drunk drive identification (ethanol) and toxicity screening (methanol).

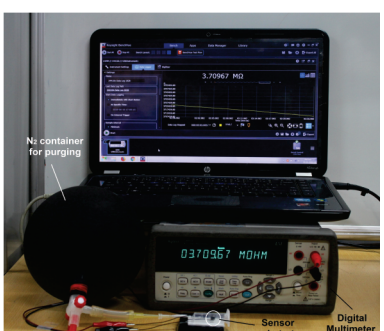
Other Contributors:
Debasmit Mondal, Sourabh Agrawal



Breath monitoring system - Images







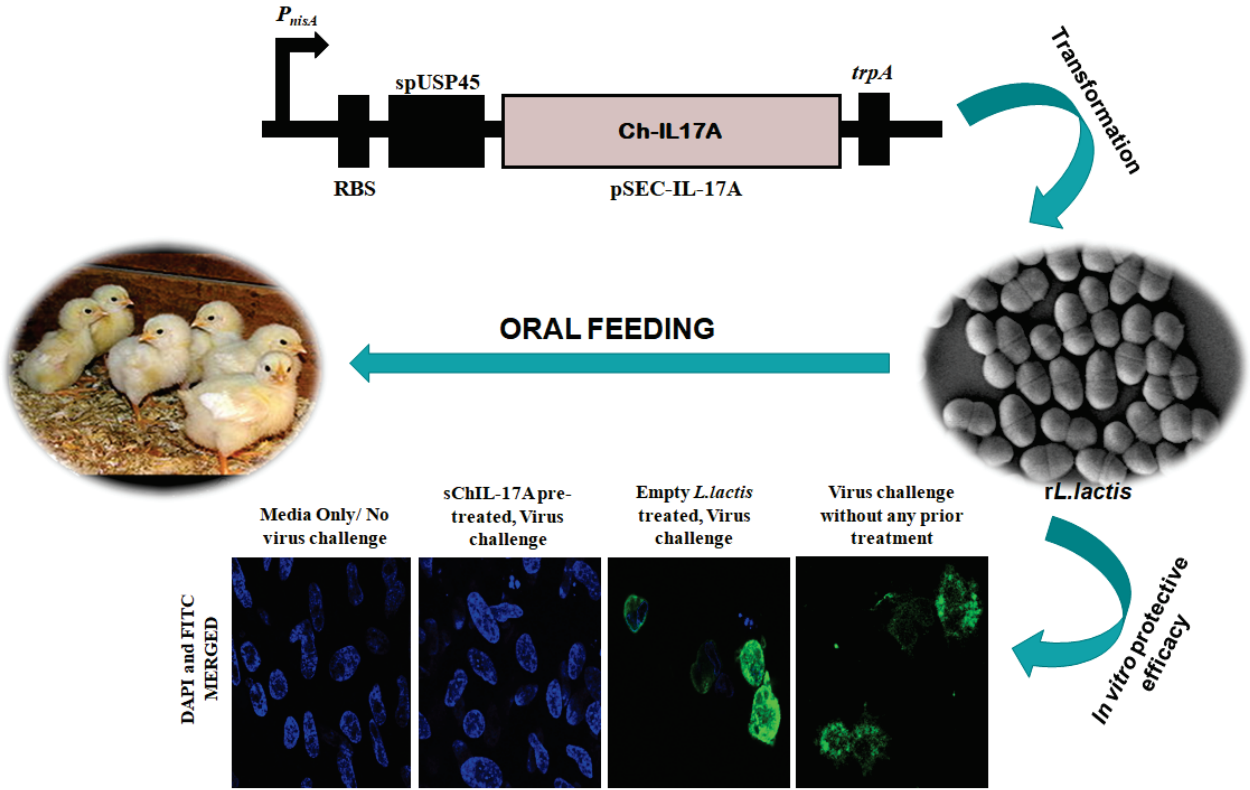
Aritraa Lahiri

Production of Bioactive Chicken IL-17A by Genetically Engineered Food Grade Lactic Acid Bacteria Lab: From Gene to Biomedical Application in Poultry

Aritraa Lahiri
Indian Institute of Science Education and Research, Kolkata

Guide:
Prof. Amirul Islam Mallick

The recent advances in our understanding of the host factors that orchestrate qualitatively different immune responses against avian influenza virus (AIV) infection have changed the notion of conventional approaches toward designing prophylactic components. Providing that the infection-induced pathogen city largely depends on the resulting host immune responses, application of cytokines to modulate host defense against AIV infections remains a major focus around the globe. However, direct application of cytokines against AIV is often challenging due to the associated risk of 'cytokine storm' leading to exacerbated responses, thus, warranting careful selection of cytokine class, dosage and application regimen. In line with the other inflammatory cytokines, Interleukin-17A (IL-17A) has often been described as a 'double-edged sword' in case of viral infections indicating its paradoxical role in exacerbated as well as protective host responses. Intrigued by significant researches that have pointed toward an indirect but beneficial role of the cytokine in host-protection, we explored the translational significance of recombinant chicken IL-17A based immune-modulation. In view of its recognition as GRAS category robotic bacteria, we specifically chose to use bio-engineered food grade Lactococcus lactis (rL.lactis) to produce recombinant chicken IL-17A in secretory form. We anticipate that the ability of engineered LAB vectors in secreting recombinant IL-17A in its functional form in a tightly regulated manner may represent a promising strategy to overcome the risk of exacerbated and unregulated effects often associated with conventional mode of cytokine use.


P_{nisA}
spUSP45
Ch-IL17A
trpA
RBS
pSEC-IL-17A
Transformation
ORAL FEEDING
rL.lactis
Media Only/ No virus challenge
sChIL-17A pre-treated, Virus challenge
Empty L.lactis treated, Virus challenge
Virus challenge without any prior treatment
DAPI and FITC MERGED
In vitro protective efficacy

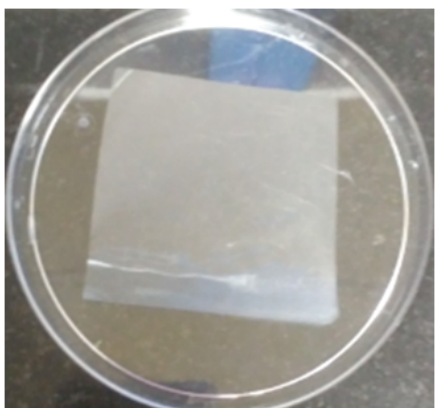
Puja Kumari

Development of Sustainable Antimicrobial Wrapping Material from Biopolymers

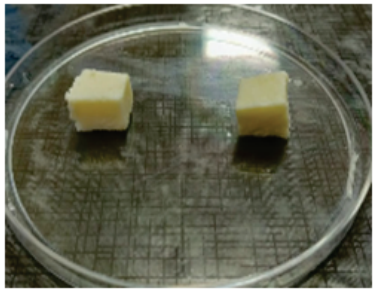
Puja Kumari
Indian Institute of Technology, Madras

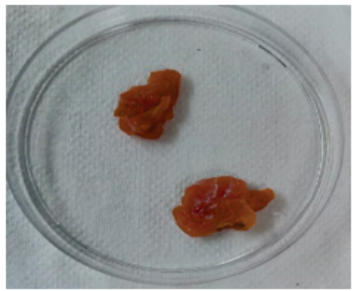
Guide:
Prof. Mukesh Doble

The aim of this innovation is to develop a biodegradable wrapping material containing antibacterial activity. Currently, disposal of plastic wrapper is a major concern due to its impact on global warming and increasing the level of solid waste. This product, completely developed using an agreed approach, can be a better alternative to combat these problems as it is bio-degradable. Upon degradation, the components improve the nutrient quality of the disposal site. This wrapping material has inbuilt antibacterial activity as it incorporates a FDA-approved, natural, nontoxic phytochemical. Moreover, the approach to synthesizing the material is completely green and does not involve any toxic solvents. The materials used for preparing the film are biocompatible and non-toxic. This antibacterial wrapper will also increase the shelf life of products and will reduce food-borne contamination. The efficacy and degradability aspects of this product have been tested in controlled conditions in the lab with three different food samples. The observations showed promising results in improving the shelf life of the stored food samples and reducing the bacterial contamination. The degradation results showed a degradability rate up to 97% within 30 days of disposal in various disposal sites. This innovation will go a long way in addressing issues of solid wastes accumulation, plastics non-degradation and food spoilage that occurs during packaging as a result of microbial contamination. The future use of this environment-friendly innovation at large scale can help to reduce food spoilage and toxic effluents generated from packaging industries.

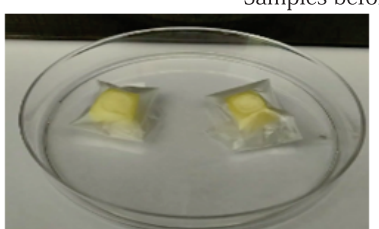


Lab prototype of the antibacterial and biodegradable wrapping material

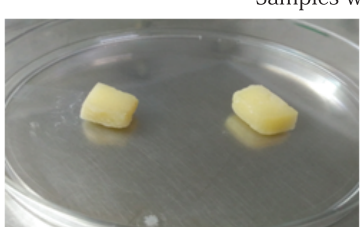


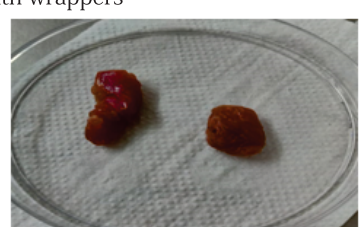


Samples before wrapping



Samples with wrappers





Samples after incubation period of 10 days

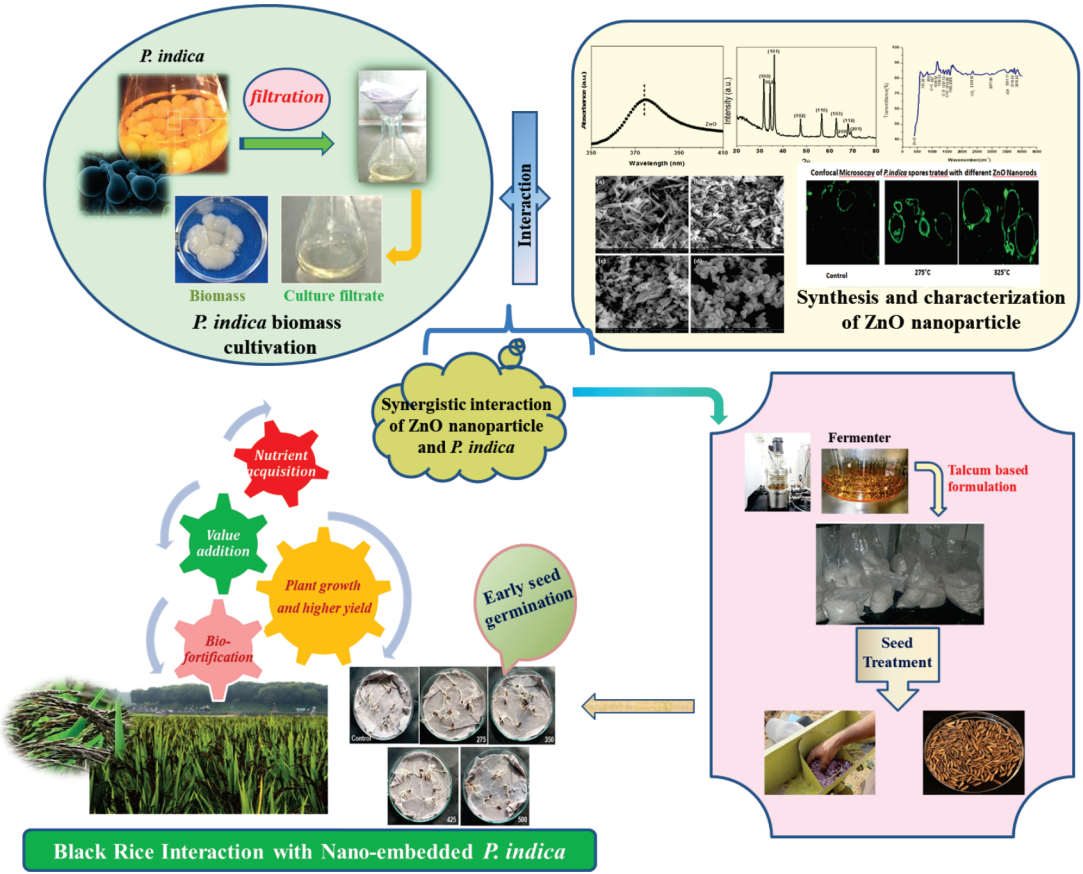
Shubhangi Mahajan

Crop Productivity and Related Value Addition to Black Rice by Co-inoculation with Nanoembedded Mycorrhizal Fungus Piriformospora indica Serendipita

Shubhangi Mahajan
Amity University, Noida

Guide:
Prof. Ajit Varma

The biotechnology based on zinc nanoparticles and Piriformospora indica (ZnO embedded P. indica) holds great potential for the agricultural sector. The P. indica is a well-known novel endophyte which promotes nutrient uptake, allows plants to survive in biotic and a biotic stress, and confers systemic resistance to toxins, heavy metal ions, insects and pathogenic organisms. It has also been shown to stimulate production of biomass, early flowering, seed production and a potential microorganism impacting biological hardening to tissue culture-raised plants. Black rice is a rare range of glutinous rice types of the species Oryza sativa L., having higher amounts of amylopectin. It offers some benefits when taken in a balanced amount. Black rice, despite its low yield, is consumed for its medicinal value and is high in demand. Here, we have tried to increase the yield of black rice and enhance its value by using a combination of nanotechnology and microbial inoculants P. indica. It is believed that black rice fortified with zinc would not only ameliorate the health of the marginalized sections of the Indian populace but also pave the way to improve the agriculture yield, thereby sustainably improving the carrying capacity of the arable land. Our research revealed that the synergetic association of zinc nanoparticles with P. indica called,"Nanoembedded P. indica", enhanced fungal biomass, and spore count; and led to thick hyphae, and less vacuoles. Nanoembedded P. indica has emerged as a novel nano-tool with potential to overcome existing agricultural challenges, including low productivity and ecosystem imbalance, through its potential use as plant growth promoter, biofertilizer, and protector against biotic and a biotic stress.


P. indica
filtration
Biomass
Culture filtrate
P. indica biomass cultivation
Interaction
Synthesis and characterization of ZnO nanoparticle
Synergistic interaction of ZnO nanoparticle and P. indica
Nutrient acquisition
Value addition
Plant growth and higher yield
Bio-fortification
Early seed germination
Fermenter
Talcum based formulation
Seed Treatment
Black Rice Interaction with Nano-embedded P. indica

Tathagata Pal

Colorimetric Yes/No Type Swab Based Detection of Pesticides on Agricultural Produce

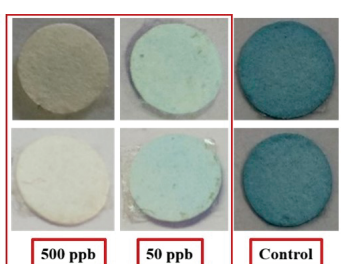
Tathagata Pal
Indian Institute of Technology, Bombay

Guide:
Prof. Soumyo Mukherji

Pesticides play an unavoidable role in storing and maintaining crops. However, their uncontrolled use over the decades has led to a gradual accumulation of chemicals in the human body through the food chain, leading to several kinds of health issues. While the government has passed laws and regulations to control the use of these pesticides, they are rarely implemented. Added to this, India has also been facing the highest number of border rejections of its agriculture products by foreign countries mainly because the crops have a high presence of such hazardous chemicals, more than the maximum permissible limit (MRL). This, in turn, has dealt a huge blow to the grassroots economy. The present method of detection of these chemicals consists of a gold standardized chromatography coupled with mass spectrometry. But this detection technique needs trained personnel, is time-consuming and overall very costly for the routine monitoring of the quantity of pesticides. Besides, it is only available in high-funded research labs and is not portable enough or available for field use. To specifically address the India-centric issue, we have developed a swab-based Yes/No-type colorimetric sensor to detect organophosphate and carbamate pesticides. The sensor has a circular and a square paper part. The surface under investigation has to be swabbed at the circular part using a swabbing solution. Next, the activation buffer has to be added to the square side. After 5 minutes, you have to observe the color that is generated. The sensor can screen all organophosphate and carbamate pesticide loads present on the surface of agricultural produce below/over the MRL based on the change of color from blue to white.

Colorimetric Paper Sensor

Swabbing apple surface
with circular paper side



Apple: MRL of Chlorpyrifos pesticide is
500 ppb (EU) and 1000 ppb (CODEX);
Tomato: 100 ppb (both agency)

Sukanya Patra

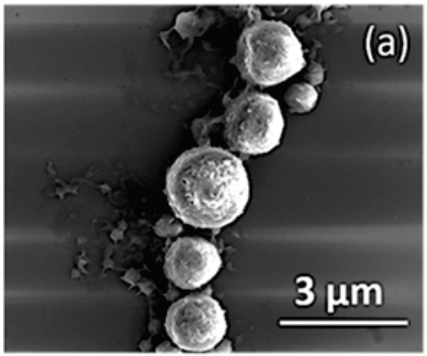
Development of Polymer Based Nano Medicine for the Treatment of Cerebral Malaria

Sukanya Patra
Indian Institute of Technology,
Banaras Hindu University, Varanasi

Guide:
Dr. Pradip Paik

According to WHO, a child dies of malaria every 2 minutes. Each year, more than 200 million new cases of the disease are reported. Although many countries have efficiently reduced the total number of malaria cases and deaths, the current year shows a reverse in trend with increasing numbers. Among all the five Plasmodium parasites, P. falciparum is the one responsible for human cerebral malaria. To overcome resistant due to first line anti-malarial drugs, a new treatment approach like free drugs can be precisely administered by encapsulating in a novel temperature responsive polymeric Nano capsules to achieve better stability, biodegradability and effectiveness against P . falciparum infection to the RBCs depending upon periodic change in body temperature. It also helps to avoid toxic side-effects due to overdose. A polymer with appropriate LCST (Low Critical Solution Temperature) can be used as a nano carrier with a specific dose of antimalarial drugs, either individually or with a combination for better efficacy. We have designed nanomedicine of temperature-sensitive hollow and mesoporous polymer nanocapsule (hmNC) which can be used to decide the dose of medicine with a periodic increase in the body temperature by the P. falciparum infection and to reduce the side effects by ensuring a controlled delivery of drugs. Thus, this novel nanomedicine uses hmNC with thermos-responsive nature loaded with individual or combination of drugs to treat cerebral malaria with minimum side-effects. Currently, we have invented this nanomedicine for the treatment of malaria. Further, this work will be extended for in- vivo study using the standard mouse model used for cerebral malaria, having potential to delineate the underlying mechanism, immunologically and physiologically.

Other Contributors:
Himadri Medhi, Somedutta Maity



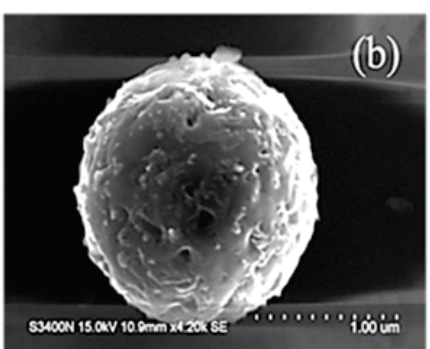


Fig. 1 (a) and (b) FESEM micrograph of ihmPCL capsules with higher and lower magnifications, respectively.

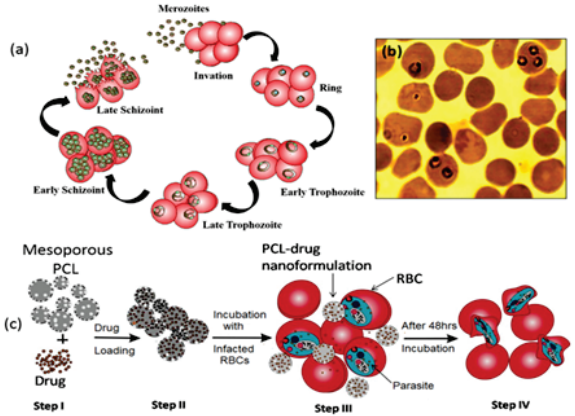


Fig. 2 (a) Life-cycle of P. falciparum, (b) early Trophozoite stage of P. falciparum at which stage ihmPCL-DHA/ihmPCL-CQDP nano-formulations added for treatment and (c) schematic of different steps of making nano-formulations and treatment.

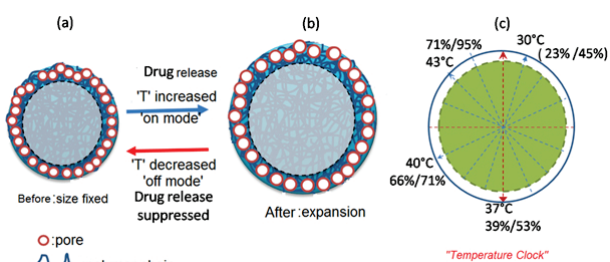


Fig. 3 (a) and (b) representative schematic showing with change in body temperature how the DHA/CQDP release happened with 'on' and 'off' mode from the ihmPCL-DHA and ihmPCL-CQDP nano-formulations, and (c) a proposed 'temperature clock' showing different extent of release with temperature.

Krishna Sivanand

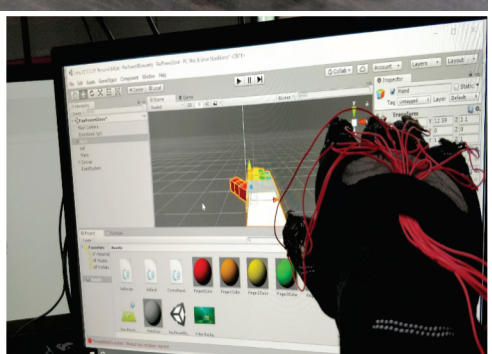
Smart Gloves for Assisted Physiotherapy

Krishna Sivanand
Kumaraguru College of Technology, Coimbatore, Tamil Nadu

Guide:
Dr. B.L.Lakshmi Meera

In India, around 1.8 million people suffer from stroke every year, among them 66 have high chances of developing motor impairment. Approximately, 96 of the affected patients are recommended by doctors to undergo physiotherapy treatment to ensure complete recovery. In the majority of the cases, 62% of the patients undergoing physiotherapy treatment require assistance devices and regular treatment from trained professionals to be able to gain full recovery. Home-based treatment becomes unaffordable for low-income patients as the costs keep accumulating for a 60 to 100 session treatment (about 60-100 over a 6 month period). Besides, there are additional fees to consider for instance doctor visitation, because of which such patients eventually give up on the treatment early in the cycle. It requires measurement and analysis of various parameters such as angle, pressure, axis to track the progress of the patient. This is however, a time-consuming and tedious process and eats into the time required for actual treatment. The proposed solution is a digital monitoring kit for limb physiotherapy rehabilitation that will help patients with limb movement and at the same time, also measure the improvement in their motor skills. The physiotherapy will be gasified such that users will have to move their limbs after wearing a wearable sensing unit in the form of gloves, rings, etc. The sensors will detect the movement of the limbs, digits, and other muscles and help the patients measure their progress in real-time. With the data, the system can map the areas where the patients are performing well and those that need improvement.

Other Contributor:
Deepika Gunasekaran



Smart Gloves - Prototype & Demonstration

Great dreams of great dreamers are always transcended

- Dr APJ Abdul Kalam

SRISTI - GYTI 2020 APPRECIATION

Kuldeep Mahato

BuddhadevPurohit

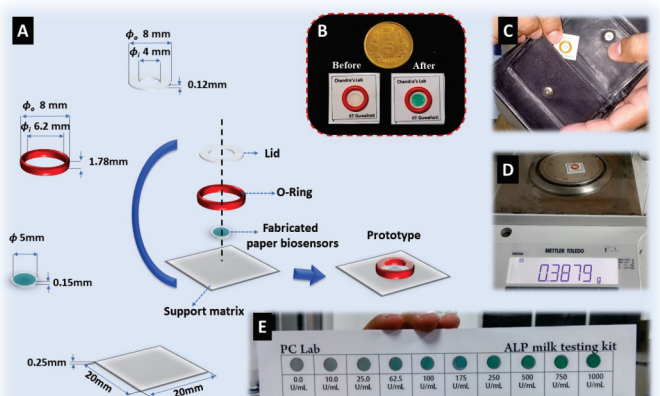
Ashutosh Kumar

Disposable Onsite kit for Discriminating Raw/Synthetic/Pasteurized Milk Based on Alkaline Phosphatase Indicator

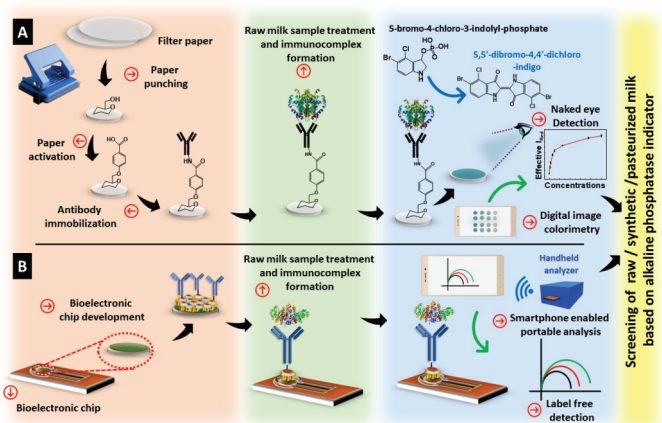
Kuldeep Mahato, Buddhadev Purohit, Ashutosh Kumar
Indian Institute of Technology, Guwahati

Guide:
Dr. Pranjal Chandra

Milk has the richness of almost all essential nutrients viz. carbohydrates, vitamins, proteins, fats, minerals, and calcium. Due to its immense nutritional value, its commercialization has attained a very rapid growth across the globe. However, the presence of various nutrients also makes it prone to certain microbial invasions, which could harbor the potential causative agents of milk-borne infections. Thus, the milk is sterilized by heating and rapid instant cooling (pasteurization process) to check the microbial invasions for safer consumption. For ensuring this pasteurization process, alkaline phosphatase (ALP) content has been reported as an indicator molecule. Several methods have been reported for ALP determination in milk, however, their requirements of dedicated infrastructure, instruments, trained personnel, and time-taking process limit their utility for onsite detection, which eventually costs to the huge wastage of the raw milk due to unwanted contamination by mixing of non-fresh milk. In our innovation, we developed a set of biosensor prototypes to detect ALP in milk samples and screen it comprehensively, which includes a paper-based and bioelectronic chip-based module. The paper-based module can detect ALP in a couple of minutes to screen the raw milk. Assisted by smartphone, the quantification of ALP has also been achieved, where higher concentration infers the milk is from diseased/udder-infected cow. The consumption of such milk may facilitate the cross-species transfer of the disease-causing agents making it unsafe for consumption. In the second module, we introduced a sensitive bio-electronic chip-based platform for efficient discrimination of raw and pasteurized milk from synthetic milk,which is inherently devoid of functional proteins / ALP molecules due to the presence of detergents, urea, and nitrogenous salts. According to our preliminary results, we obtained a detectable range of ALP in between 10000 and 1000000 U/L with the detection limit of 870 U/L, using smartphone coupled paper-based kit; whereas the bioelectronic chip-based module can detect the ALP in the range of 10-1000 U/L with the detection limit in a few milliunits.



Details of the developed paper-based prototype: (A) The dimensions of various components of paper-based biosensor prototype. **(B)** Images of the developed prototype before and after the detection.(Adopted from Mahato et al. Biosens. Bioelectron., (2019) 128, 9-16., copyright Elsevier Inc.) **(C)** Shows a milk-consumer taking out the prototype from wallet for onsite milk quality checkup, inferring its wallet-fit portability. **(D)** Ultralight weight of the prototype. **(E)** The color chart prepared for consumers to quantify the content of indicator (ALP) in milk sample at point of collection.



Scheme showing the development and milk analysis using the prototypes: (A) Developed paper-based module and **(B)** Proposed bioelectronic-chip based module

Syed Muntazir Andrabi

A Ready-to-use Haemostatic Bandage for Military and Civilian Trauma Care

Syed Muntazir Andrabi
Indian Institute of Technology, Kanpur

Guide:
Prof. Ashok Kumar

The project addresses uncontrolled and excessive bleeding and its associated complications in battlefields and trauma cases. Excessive bleeding is one of the key elements in both defense and civilian deaths. Currently, in India, 1 death in every 3 minutes occurs due to trauma-related injuries. The currently available haemostatic dressings (materials that prevent blood loss) require technological advancements to provide an affordable and efficient dressing for quick blood clotting and stopping microbial infection. Therefore, we developed an advanced low-cost haemostatic bandage having efficient and rapid blood clotting ability. The comprehensive polymeric matrix involves all the three groups i.e. factor concentrators, mucoadhesive agents and procoagulant supplements that work synergistically as a single system to maintain efficient haemostasis by accelerating a stable blood clot formation. Furthermore, the experimental study proved that the novel combination of polymeric matrix incorporated with desired haemostatic agents had integrated the advantages of both materials, providing fast and high fluid absorption leading to efficient and rapid blood control. In brief, the low-cost and availability (bulk manufacturing), high haemostatic and adsorption capacity of the developed product will ensure its high value for common people. The developed bandage accelerates blood coagulation and avoids the use of multiple dressing at the injured site, thus preventing life-threatening conditions due to excessive bleeding and bacterial infections. The developed novel bandage is ready-to-use, easily removable and does not require any operational deployment. Thus, the aim is an economical and affordable material with promising potential to fulfill the much-required healthcare needs of the emerging global market. The major potential applications of the developed product are: (1) Defense use. Where severe bleeding leading to death occurs during battlefields, bullet injuries, explosions etc. (2) Trauma care. In patients with major traumatic injuries due to accidents, stabbing wounds, sports

injuries, gunshot wounds etc. (3) First-aid tool kit. In educational institutes, medical device and automobile industries. The developed material will have further advantages of 'made in India', fabrication, design and commercialize a ready-to-use Haemostat for Trauma Care to reduce the mortality due to traumatic bleeding.

Figure 1: Digital image of the developed haemostatic bandage in different formats (A) and tentative design (B) of the developed product (*Cryo-HaemoClot*).

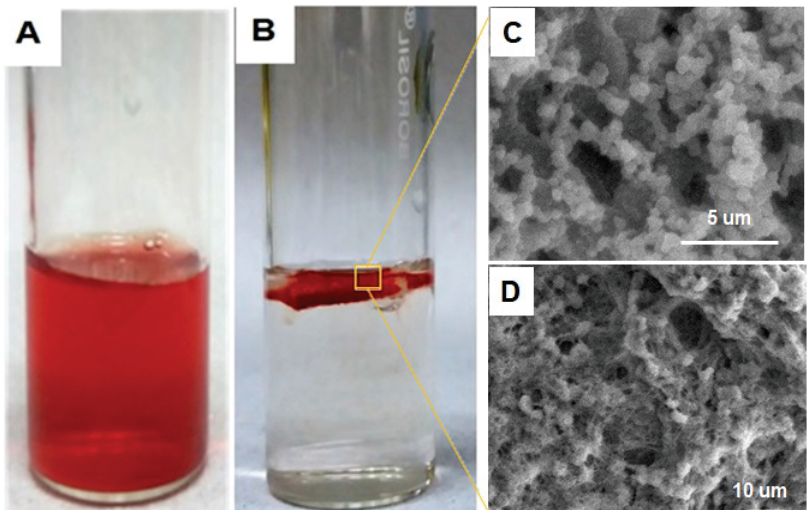


Figure 2: Evaluation of the bandage for blood clotting assay and material interaction. Digital image showing complete blood clotting within 30s by the developed haemostatic bandage (B); no clot formation was observed in control group (A). SEM images showing the cell-material interaction and aggregation on the haemostatic bandage (C) platelets and (D) red blood cells.

Bukke Vani

Design of an Indigenous Atmospheric Water Generator for Economical Production of Drinking Water in the Water Scarce HILLY, Arid and Coastal Regions

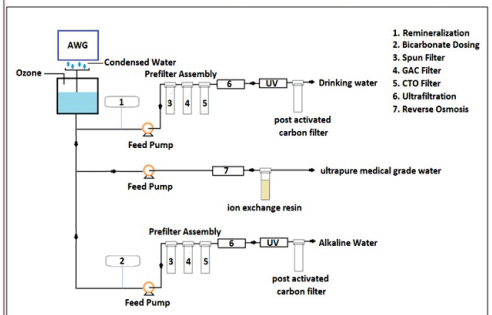
Bukke Vani
Indian Institute of Chemical Technology (CSIR-IICT), Hyderabad

Guide:
Dr. S. Sridhar, Dr. Nivedita Sahu,
Dr. Sugali Chandra Sekhar, Mr. M. Ramakrishna

Millions of fatalities occur every year from water-borne diseases, leading to economic losses for healthcare amounting to billions of dollars. The acute problem of water shortage is mainly faced by countries with long coastlines, hilly terrains and islands, which do not have adequate freshwater sources like rivers and ponds. As a result, most of these countries meet their water demands by desalination of seawater, which is an expensive option. Sometimes, these desalination plants may fail to operate, causing acute water shortage. The aim of the project was to create a portable device that could be used to meet the drinking water requirements of people living in water-scarce regions. CSIR-IICT and Mathri Aquatech Pvt. Ltd. together developed an indigenous atmospheric water generator (AWG), which harvests moisture from the atmosphere to generate potable water. The device is very useful for production of drinking water at locations where no raw water is available for treatment. It takes advantage of relative humidity (25%) and temperature (15°C) to produce drinking water in remote villages, coastal and hilly regions, border and areas, Indian Army, Navy and Coastguard. Post-treatment of water by indigenously developed ultrafiltration membrane with UV-ozonation produced clean and safe water. IICT introduced a novel online remineralization technology in the AWG for the production of potable water enriched with essential minerals but free from turbidity and pathogens. Medical grade water for dialysis, biochemistry, automobile batteries and college laboratories can be produced from the AWG using membranes in post-treatment. Healthy alkaline water for therapeutic purposes is feasible by dosing of a proprietary salt mixture or through the ionization technique.

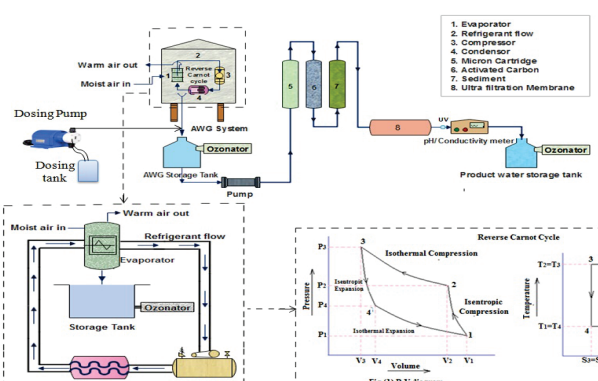
Other Contributors:
Mr. Sajja. S. Chandrasekhar,
Mr. Dileep Kumar Fothedar, M. Madhumala,
Karishma Mishra, Shiva Prasad Nandala,
Mr. B. Govardhan

Indigenous an atmospheric water generator (AWG) System



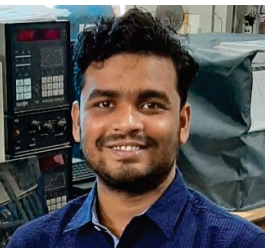
a) Schematic and b) Actual photograph of AWG for the production of potable water, alkaline water, and medical grade water.

Working Principle of AWG



❖ AWG system works on the basic principle of Reverse Carnot Cycle

Prashant Ram Jadhao



Ramdayal Panda

Snigdha Mishra

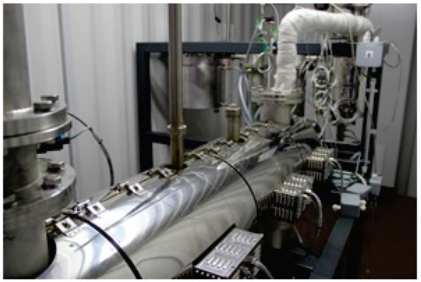
Self-Sustainable E-waste Recycling: Generating Wealth from Waste via Zero Discharge Technology

Prashant Ram Jadhao, Ramdayal Panda, Snigdha Mishra
Indian Institute of Technology, Delhi

Guide:
Prof. K. K. Pant, Prof. K. D. P. Nigam, Prof. Ejaz Ahmad

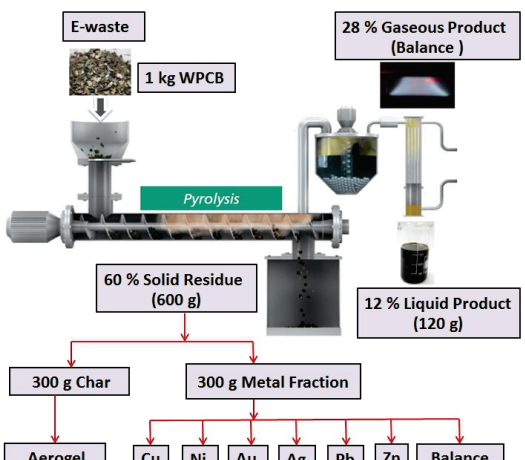
Electronic waste (e-waste) generation is inevitable, which, if not addressed now, will lead to mountains of solid waste. E-waste contains various toxic materials and therefore, unregulated accumulation or inappropriate recycling causes a severe threat to human health and the environment. Therefore, we developed a sustainable technology to tackle the e-waste problem under "Smart Cities" and "Swachh Bharat Abhiyan" via (i) e-waste pyrolysis followed by (ii) metal fraction separation and (iii) individual metals recovery. Initially, e- waste was shredded and pyrolyzed to convert e-waste plastic into liquid and gaseous fuels, along with residual solid, under optimum operating conditions at 400°C temperature in 20 minutes. The liquid and gaseous products have a heating value of 32 MJ/Kg and 28 MJ/Kg and can be used for energy production whereas the residual solid consists of metals and char. Thus, the residual solid was treated using a novel ultrasonication process to yield 90% to 95% concentrated metal fraction and charry leftover residue. Post-this, the leftover residue was used to synthesize light weight aerogels for application in oil spillage control and dye removal. Whereas, the concentrated metal mixture was further treated using a low- temperature roasting technique in the presence of NH_4Cl at 275°C in 3h to yield up to 90% recovery of metals, such as Cu, Ni, Pb, Zn, Ag and Au under optimum operating conditions. During the whole process, no new waste was generated,thus, the innovation claims to be a zero-waste and 100% eco-friendly process for the recovery of metals from e-waste and simultaneous products of energy as well as value-added products. Eventually, a 10 kg/h pilot wa designed and installed at IIT Delhi based on experimental results to demonstrate the technology-readiness level at the pilot scale.

Hopper



Screw reactor

Stirred Reactor



Overall Mass Balance of Process

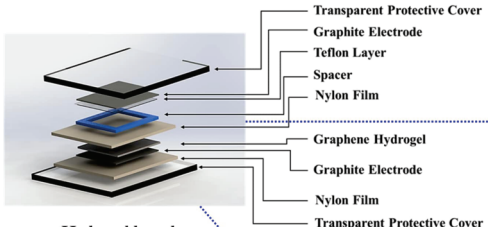
Sri Ganesh Subramanian

Smart, Flexible, and Multi-Functional Thermal and Energy Management Systems for Next-Generation Electronic Devices

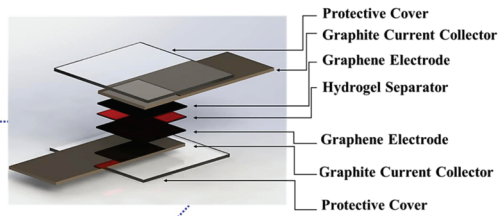
Sri Ganesh Subramanian
Indian Institute of Technology, Kharagpur

Guide:
Prof. Sunando Das Gupta, Prof. Justin A Weibel

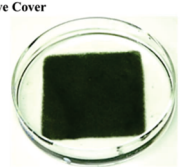
The need and ability to develop devices capable of augmented computational power, has led to the proliferation of several electronic appliances with very high-power densities. Thermal management is, therefore, critical for the proper functioning of these devices. Furthermore, several of these appliances have embedded miniaturized sensors for the real-time monitoring of diverse attributes. However, these sensors need an external power source for charging and operation. Therefore, it would be highly beneficial, if the biomechanical energy of the user could be used to drive these devices. Additionally, the global trend in electronic systems is moving towards flexible and wearable gadgets to augment the usability and integratibility of the devices with the end-user. Hence, the thermal and energy management strategies of the future should not only be smart and flexible but also highly multi-functional. Herein, we address the problem of harvesting the biomechanical energy and storing the generated energy in a sustainable manner, while simultaneously providing an elegant solution for thermal management, in a flexible and wearable electronics paradigm. This was accomplished by leveraging the unique properties of smart materials, viz. hydrogel infused with graphene. Our hydrogel-based devices have demonstrated their capability in converting mechanical movements to electricity, while also being able to store the generated energy. Furthermore, the hydrogel also functioned as a promising wick-structure for the development of a flexible and multifunctional thermal management device. We postulate that our project, which comprises of three individual devices (hydrogel-based Triboelectric Nanogenerator, hydrogel-based Supercapacitor, and hydrogel-based Thermal Management device), can reduce the dependency of several electronic gadgets on an external power source while improving the service-life and operability of these appliances by effectively cooling the components in a highly sustainable manner.



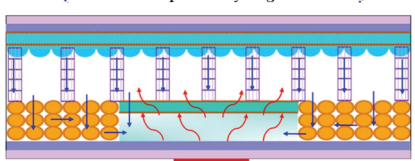
Hydrogel based
Triboelectric Nanogenerator-
HTENG
(for energy
harvesting/generation)



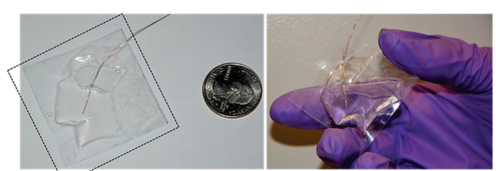
Hydrogel based
Supercapacitor - HSuperCap
(for energy storage)



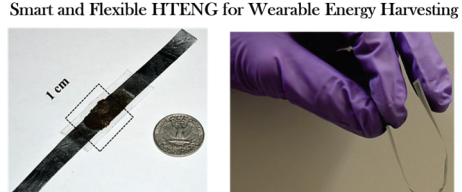
Graphene-Hydrogel



Hydrogel based Thermal Management
System - HCool
(for cooling for electronic devices)



Smart and Flexible HTENG for Wearable Energy Harvesting



Flexible HSuperCap for Efficient and On-demand Energy Storage

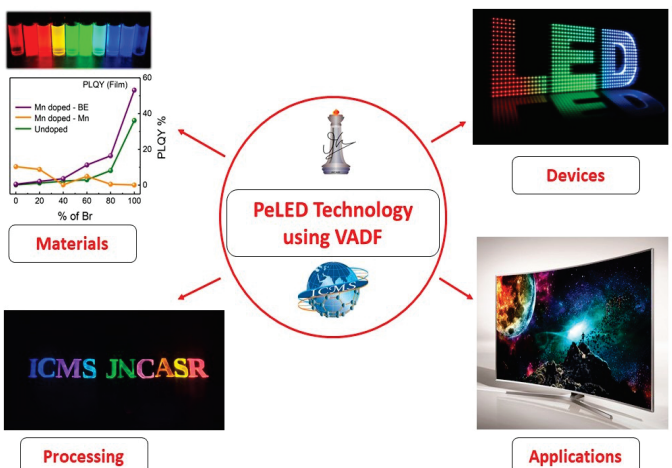
Pradeep K.R.

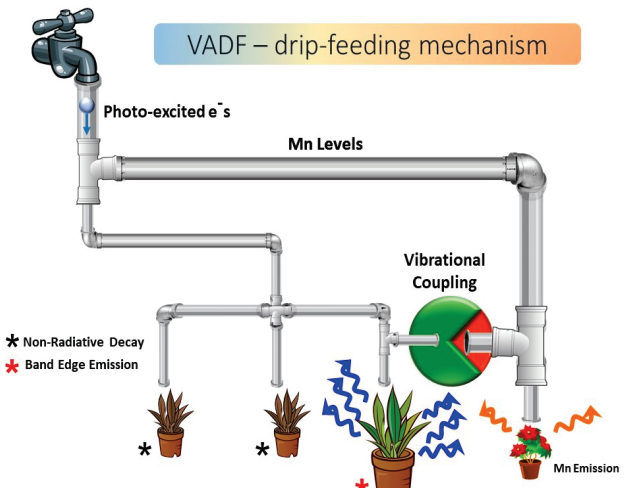
Harvesting Delayed Fluorescence in Mn-doped Perovskite Quantum Dots Using Vibrationally Assisted Delayed Fluorescene (VADF)

Pradeep K.R.
Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore

Guide:
Prof. Ranjani Viswanatha

Perovskite quantum dots have been investigated extensively for energy-based applications like lighting and photovoltaics. In an era that is driven by the quest for energy efficiency, useful harvesting of any kind of losses is extremely important. In this context, it is important to note that one of the key drivers in this quest is innovative material design and chemistry. In this work, we have addressed one such aspect, that is, reducing non-radiative losses by using an impurity-driven state to create an electron storehouse within the solid. Selective alteration of the quantum-mechanical conditions of vibrational coupling ensures that the transitions from excited to the deexcited states do not generate heat instead of light. Specifically, we have used Mn doping in energy-matched perovskite materials to trap the excited electrons followed by a selective de-trapping of electron through the vibrational assistance to the radiative states of the host named as Viberationally Assisted Delayed Flourescence (VADF). Electron detrapping from Mn 2+ to the host conduction band through VADF is observed for the first time in a prototypical example of Mn-doped CsPbX 3 (X = Cl, Br) NCs. This has given rise to about 100% increase in the energy efficiency, proving the need for these pathways. While this pathway has been enunciated using Mn as a dopant, this mechanism can be extended to all unsatisfied spin dopants like Ni, Co, Cu among many other materials with varying lifetimes and, thus,can create a new class of materials. Electron drip-feed leading to delayed excitonic emission adds an additional handle to increase and maintain a high QY with low losses. The immediate fallout of this is the reduction of over-potential losses and/or non-radiative loss leading to more efficient devices with Mn doping.


PLQY (Film)
Mn doped - BE
Mn doped - Mn
Undoped
PLQY %
% of Br
Materials
PeLED Technology using VADF
Devices
Processing
Applications
ICMS JNCASR


VADF – drip-feeding mechanism
Photo-excited e⁻s
Mn Levels
Vibrational Coupling
Non-Radiative Decay
Band Edge Emission
Mn Emission

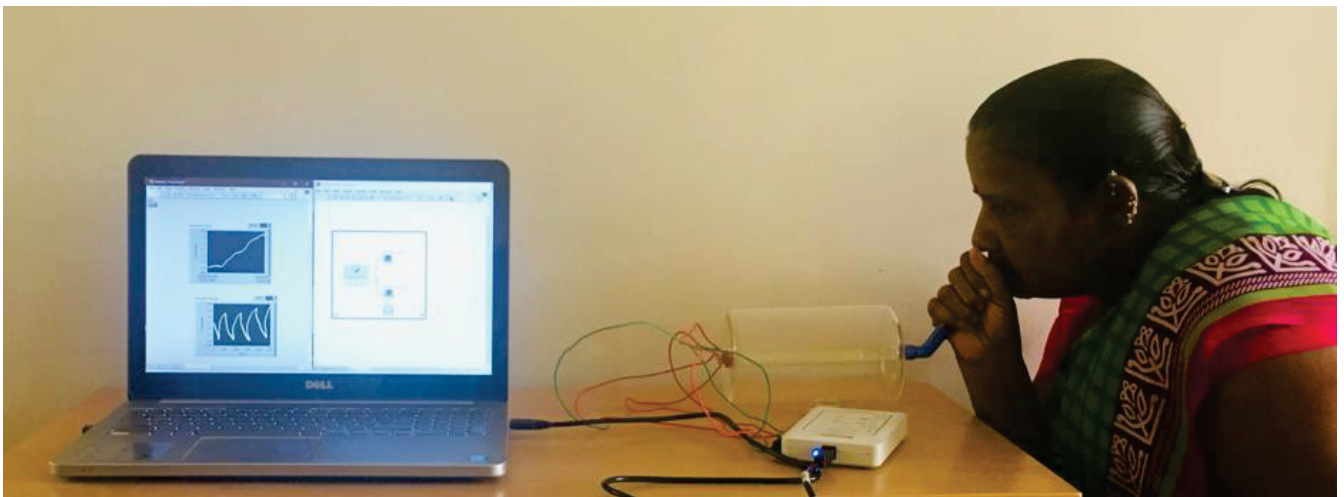
Ramji Kalidoss

Design of Acetone Breath Gas Analyzer in the Evaluation of Diabetes Mellitus

Ramji Kalidoss
SRM University, Chengalpattu

Guide:
Dr. U. Snekhalatha

Breath gas analysis is fast emerging as an important diagnostic tool to evaluate Diabetes Mellitus (DM) because it is non-invasive and inexpensive. Human breath acetone provides useful information about the internal metabolism of glucose and indicates the presence of Diabetes Mellitus. Instead of pricking their fingers multiple times a day to monitor their blood sugar levels, diabetic patients can use a breathalyzer to diagnose their sugar level by simply checking their breath. Graphene-based nanocomposite sensors with exposed crystal facets of (101) and (110) were exploited to selectively detect acetone due to the interaction of high dipole moment vapor and the uncoordinated oxygen vacancies crystal orientation. The validation of the fabricated sensors with known concentrations of acetone and other biomarkers showed excellent performances with high selectivity and sensitivity to acetone within the concentration range between 0.25 ppm – 30 ppm, well below the threshold acetone concentration (1.8 ppm) for diabetic subjects. The performance declines for 30days and at different humidity levels compelled to replace the sensor at least once in 2 weeks and use calcium chloride desiccants during breath sampling. These validated sensors were then used to develop a portable prototype using a simple voltage divider circuit. The Outcome of the breathalyzer exhibited a positive correlation (r=0.88) between biochemically measured and non-invasively estimated HbA1c with the derived empirical formula of significant sensor indices. The mean saturation voltage was 10% higher for diabetic subjects when compared to healthy subjects, yielding an accuracy of 65%.



Acetone Breath Gas Analyzer - Mechanism

Ashish Kumar Sahu

Harish Kumar

HardikArvindbhai Patel

Jitin Malhotra

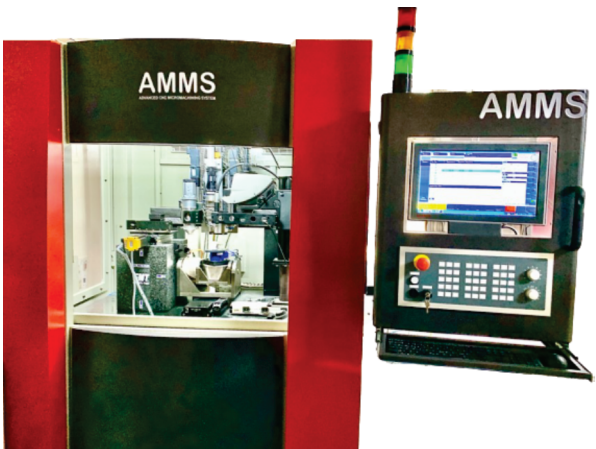
Design and Development of Advanced CNC Micro-machining System

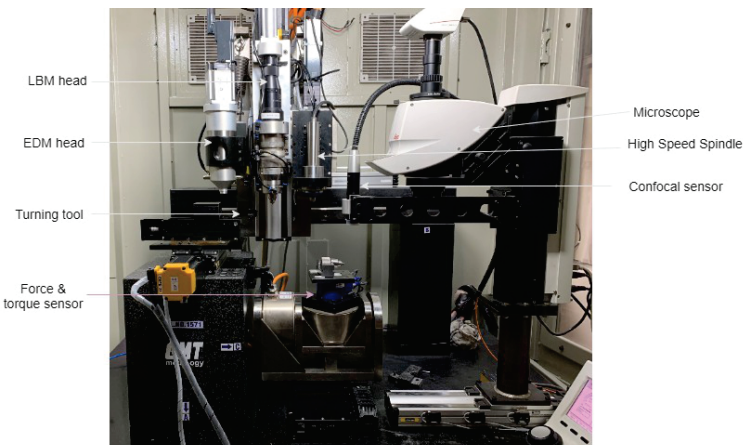
Ashish Kumar Sahu, Harish Kumar
Hardik Arvindbhai Patel, Jitin Malhotra
Indian Institute of Technology, Delhi

Guide:
Prof. Sunil Jha

The project is technology-driven and innovation-focused, and caters to the needs of emerging miniaturization technologies related to part size (few microns to 1 mm), complex feature definitions, accuracy and precision-oriented product requirements. It relates to design and development of a fully automated 5-axes Advanced CNC Micro-Machining System (AMMS) from a conceptual idea to an industry-ready machining center. AMMS can produce highly precise and accurate micro-components like micro-pillars, micro-channels, nozzles, high aspect ratio micro-holes, and stents, which have huge demand in industries, namely, automotive, electro-optics, aerospace, biotechnology, information technology, healthcare, and MEMS. This project conceptualized the idea of designing a multi-process fully automated CNC micro-machining center with in-situ metrology, which is industry-4.0 ready. After conducting feasibility analysis, an AMMS consisting of four conventional mechanical tool-based micromachining processes viz. µ-milling, µ-drilling, µ-turning, µ-grinding and two conventional µ-EDM, µ-LBM processes with in-situ metrology,was developed. AMMS is also capable of engaging different tool-heads sequentially for producing highly complex parts and overcoming the limitations of individual processes. The device has an indigenously developed unique control system software for controlling micromachining processes with 5-axes CNC motions. It further provides in-situ metrology facilities through on-machine microscope and roughness measurement with non-contact confocal sensor. Unique gantry structure design assures a vibration-free and stable operation of linear axes with an accuracy of 1µm. This machining center has a plethora of sensors for power measurement, micro-tool length measurement, vibration measurement, touch

probe-based tool and workpiece referencing. AMMS is an all-in-one cost-efficient, indigenously developed, micromachining center which can be used to manufacture micro-components, perform metrology, and provide all the data in a user-friendly HMI.





CNC Micro-machining System - Prototype

Sri Navya Kondaveeti

Not-IS: A Currency Identification Aid for the Visually Impaired in India

Sri Navya Kondaveeti
Indian Institute of Technology, Bombay

Guide:
Prof. Swatai Pal

The use of money is an inevitable process in our everyday lives. The recent demonetization, has, however, made money handling a challenge for the visually-impaired, making it difficult for them to recognize and handle new currency. Besides, a large section of people still do not have access to smartphone technology and apps, while there are others who are not tech-savvy and so at a disadvantage with digital transactions. The solution, therefore, is a manual aid to help with physical monetary transactions. In this context, we devised two types of wallet-sized, affordable currency identification aids for the visually impaired people in India. The first is a foldable template with tactile markers and patterns on its surface to help identify the denominational value of the currency notes. These markers are designed to be independent of users' braille awareness, making the device a universal aid that can be used independently by the visually impaired. It can be manufactured using 1 mm Polypropylene sheets with laser cutting and embossing. While it can be a standalone product, it also has the option to integrate with wallets and pouches for ease of handling money. The second device is DIY templates that can be upcycled from Tetra Pak's to reach users at the grassroots-level in all corners of India. These templates are made with upcyclable materials like tetra packs, laminated book covers, etc. These substances are durable and can be easily replaced in households. The services of NGOs and local SGGs can be used to expand the reach of these templates to the remote regions of the country. This will help to generate local learning avenues and make the aid accessible to all the urban and rural corners of the country.

Not-IS Device

Singh Rahulkumar Sunil

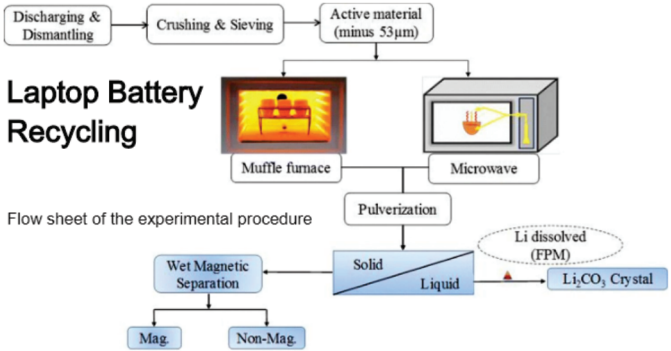
Recovery of Lithium Cobalt and Manganese Values from Discarded Lithium-ion Batteries

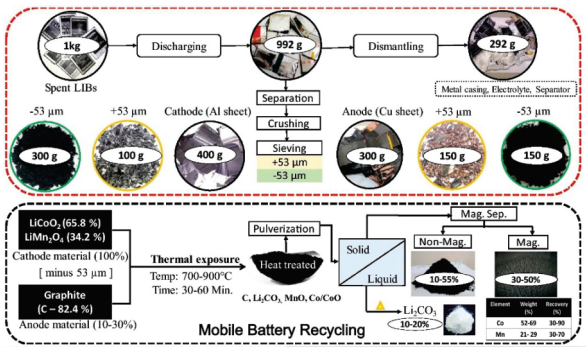
Singh Rahulkumar Sunil
Indian Institute of Technology, Roorkee

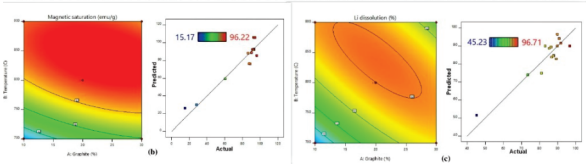
Guide:
Dr. Nikhil Dhawan

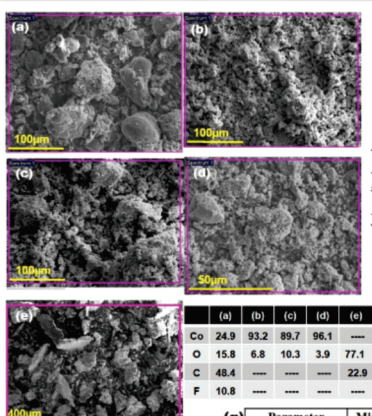
This innovation is an eco-friendly, and robust process, which can be a promising step to recover various precious and critical metals like Co, Li, and Mn from spent Li-ion batteries. A simple process of indigenous reduction using graphite-magnetic separation followed by water leaching provided magnetic-fraction-contained cobalt and manganese values, whereas graphite and lithium carbonate were found in the nonmagnetic fraction and dried solution.

Laptop Battery Recycling: (https://link.springer.com/article/10.1007/s11837-019-03540-6) The heat treatment was carried out in a muffle furnace (600–1100°C for 30-60 minutes) microwave (5–30 minutes at 900 W). The reduction kinetics was studied in a muffle furnace using different models, which yielded activation energy of 31.46 kJ/mol. The magnetic fraction contained ~99% cobalt values in the muffle furnace. The muffle furnace process was observed to be better than the microwave in terms of product purity and process yield. Mobile Battery Recycling: (https://link.springer.com/article/10.1007/s12666-019-01769-y). The statistical Box–Behnken design approach was pursued to optimize the conditions for maximizing the recovery of Co, Mn, and Li values using the muffle furnace. A weight loss of ~14 to 33%, Li dissolution of ~45 to 97% and the corresponding magnetic saturation of ~15 to 97 emu/g were obtained. The overall yield was 74.08%, and the final product composition was Co (64.2 %) and MnO (35.8%), respectively. Further, the product was processed using planetary ball milling for 10 min followed by magnetic separation cleaning to increase the recovery up to 83% Co values. Finally, it can be concluded that the adopted can recover 96.7%, 81.67%, and 67.38% of lithium, cobalt, and manganese values in the form of Co-rich or Co-Mn mixture from Li-ion batteries.

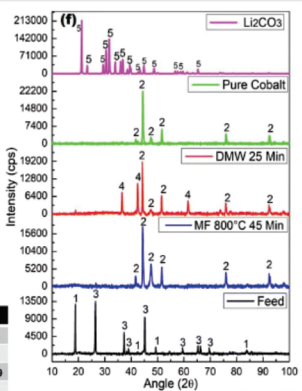








	(a)	(b)	(c)	(d)	(e)
Co	24.9	93.2	89.7	96.1	----
O	15.8	6.8	10.3	3.9	77.1
C	48.4	----	----	----	22.9
F	10.8	----	----	----	----



SEM-EDS results of (a) feed, (b) muffle optimum, (c) microwave optimum, (d) pure cobalt, (e) Li2CO3 crystals, (f) XRD spectrum and (g) comparison between routes

(g)

Parameter	Microwave (25 min)	Muffle Furnace (800°C, 45 min)
Wt. loss (%)	28.8	24.8
Li dissolved (%)	63.8	89.8
Co grade (%)	89.7	94.1
Sat. Mag. (emu/g)	75.2	128.1
Yield (%)	23.2	36.8

Sankha Subhra Das

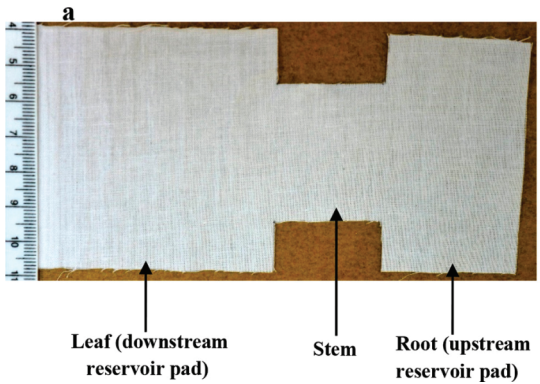
Vinay Manaswi Pedireddi

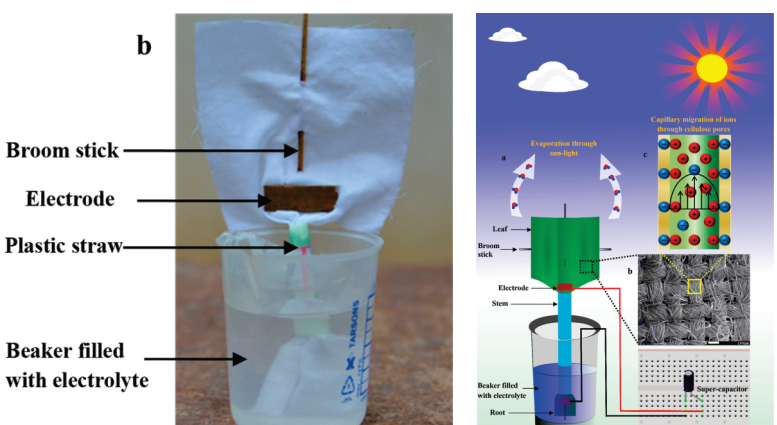
Electrical Power Generation from Wet Textile

Sankha Subhra Das, Vinay Manaswi Pedireddi
Indian Institute of Technology, Kharagpur

Guide:
Prof. Suman Chakraborty, Prof. Partha Saha, Prof. Aditya Bandopadhyay

We have demonstrated that water evaporation from a centimeter-sized piece of wet cloth containing frugally-cut fabric channels having micro and nanopores can generate electrical power capable of enlightening a white LED for more than an hour. As compared to the previously reported methods of energy harvesting from complex resources, the electricity generation occurs in natural ambience, directly converting the abundantly available thermal energy into electrical power. Further, in contrast to classical streaming potential generated by an externally applied pressure gradient, here, the intrinsic surface energy of the fabric is used to drive the ionic current. Most importantly, our method paves the way of deploying regular fabric pieces as the sources of energy, with no special topographical manipulation of the cloth surface being demanded. Thus, the device does not necessitate any extensive fabrication protocol, unlike some recently reported evaporation-driven energy harvesting devices. Finally, in a hot and dry environment, the natural evaporative transport gets spontaneously enhanced, so that the flow-induced voltage can be maximized. Thus, the device may be extremely effective in geographically warm and dry regions of the earth. Our results reveal that a single fabric channel can stably deliver a potential of ~700 mV in ambient conditions, while the same can be amplified by ~17 times upon series connection of 40 identical units. The combined series-parallel connection of 50 array channels can consistently charge a super-capacitor of ~0.1 F up to ~3.5 V in ~1 day. This is further up-scaled massively by systematically drying a set of wearable garments under the sunlight. This eventually culminates into a utilitarian paradigm of low-cost power harvesting in extreme rural settings.


a
Leaf (downstream reservoir pad)
Stem
Root (upstream reservoir pad)


b
Broom stick
Electrode
Plastic straw
Beaker filled with electrolyte
Evaporation through sun-light
Capillary migration of ions through cellulose pores
Leaf
Broom stick
Electrode
Stem
Beaker filled with electrolyte
Root
Super-capacitor

Parth Joshi

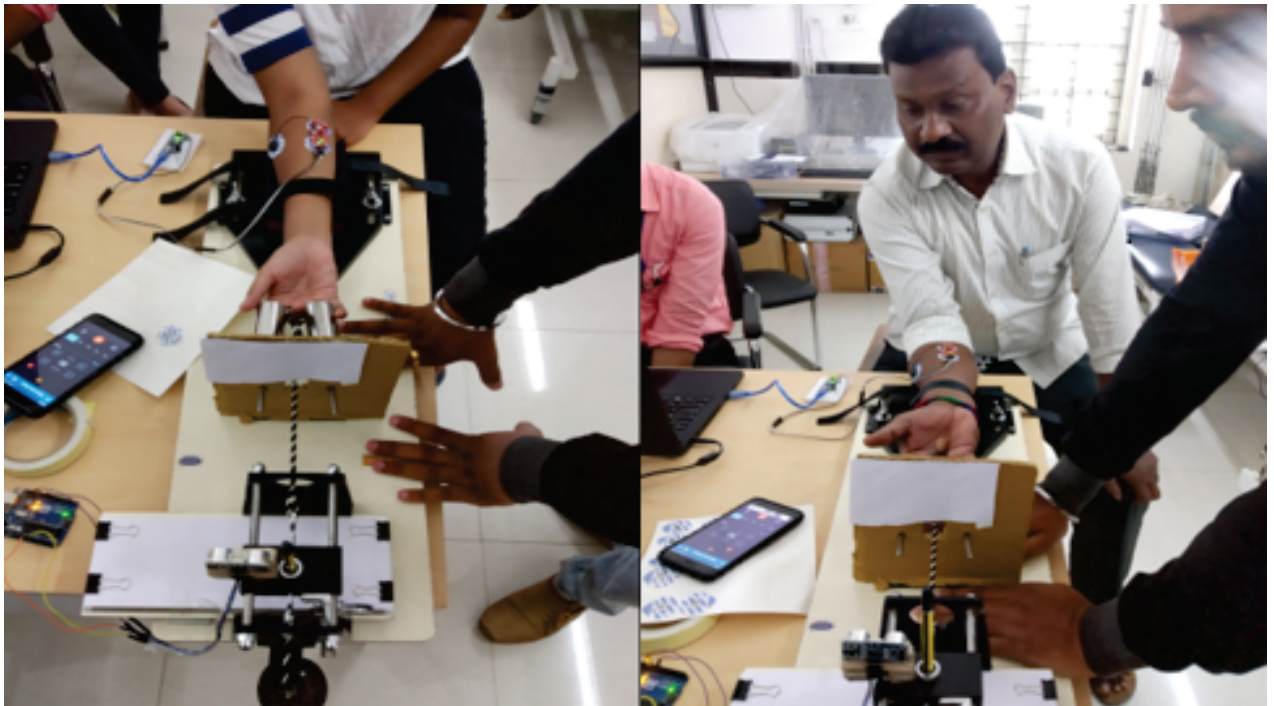
Poojan Gajjar

Development of New Electro-mechanical Muscle Fatigue Measurement Device

Parth Joshi, Poojan Gajjar
Indian Institute of Technology, Jodhpur

Guide:
Dr. Kaushal A. Desai

Muscle fatigue is an essential physiological characteristic used for a variety of purposes such as rehabilitation treatments, monitoring of muscle strength, monitoring physiological changes, e.g.,lack of food, sleep, forced marches, mental fatigue; the effect of substances such as coffee or sugar; and emotional effects. The process of determining muscle fatigue is termed as ergography. Mosso-ergograph is one of the devices used to study and analyze muscle fatigue, using ergography. The device has a mechanical design consisting of multiple moving parts without any sophistication.The bulky device requires skilled persons to operate and collect manual data output using a pen-tracer mechanism. Therefore, it is limited to academic or demonstration purposes, with little practical application. The present work aims to develop an electro-mechanical device in the wearable form to expand its scope of application. The design employs an Electromyography (EMG) sensor to generate digital data and a completely new wearable design to achieve the goals. A mathematical framework has been developed to calibrate the output of the EMG sensor with the muscle fatigue index obtained using a conventional mechanism. The preliminary testing of the device was carried out on multiple test subjects after obtaining ethics committee approval from AIIMS, Nagpur. The study further aims to expand the scope of the present work to evaluate other clinical parameters of relevance to medical professionals.



Electro-mechanical Muscle Fatigue Measurement Device- Prototype

Suresh Nuthalapati

Vijay Shirhatti

Vaishakh Kadambari moodle

Highly Sensitive, Scalable Reduced Graphene Oxide with Palladium Nano-composite as Strain Sensor

Suresh Nuthalapati, Vijay Shirhatti, Vaishakh Kadambari Moodle
Indian Institute of Science, Bangalore

Guide:
Prof. K. Rajanna, Prof. M. M. Nayak

Despite the low-cost and high sensitivities, most of the traditional strain sensors (metal and semiconductor type) can measure a strain in a specific direction. They have a low strain resolution at the nanoscale and cannot be embedded into a structural material. Semiconductor type strain gauges have high sensitivity, but they are fragile compared to foil gauges, highly sensitive to temperature changes, and exhibit non-linear response at larger strains (1%). But, human health monitoring applications like wrist-bending, knee-bending, arm movements, and finger-bending, etc., cause a strain of more than 5%. Hence, there is a demand for highly sensitive sensors with a flexible and biocompatible substrate like polydimethylsiloxane (PDMS) to meet the needs to remotely monitor human health.We have proposed highly sensitive, low-cost strain sensors fabricated with reduced graphene oxide (rGO) with metal nanocomposite materials. These sensors can overcome the drawbacks of the traditional sensors and possess high strain resolution at the nanoscale and can be embedded into structural materials, giving them the latitude to operate as both multidirectional and multifunctional sensors. These sensors are tested preliminary for human health-monitoring applications like pulse measurement, wrist/finger bending, finger tapping, etc., and they are proven to be best and suitable for these applications at low-cost. The function of this system is to measure few biological parameters of the patient's body like heartbeat, blood pressure, ECG, finger/arm/wrist bending movements by using this These sensors will sense the listed parameters and send the values to the microcontroller through ADC (Analog to Digital Converter). The data collected in the micro-controller will be sent to the IoT Cloud platform using Internet connectivity through the wireless communication module. All information about patient health will be stored on the cloud. Doctors

can access this data remotely using a mobile or web application. Stored data in the cloud can be analyzed in the cloud. Doctors can visualize data for monitoring purposes. The innovation enables doctors to use their smartphones to monitor the health of their patients.

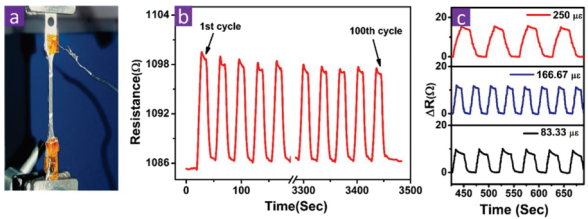


Figure 4. (a) Tested strain sensor, (b) the response of the sensor for load of 166.67 micro strain (c) sensor's response comparison for different loads.

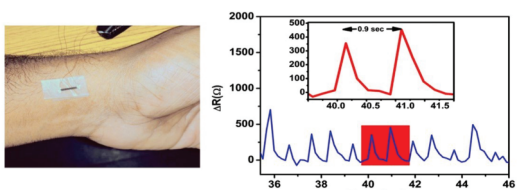


Figure.5 Pulse monitoring experiment

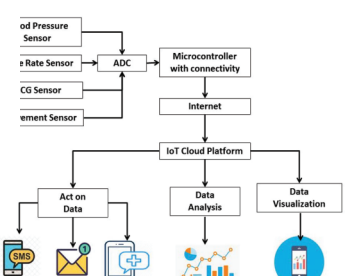


Figure1. Block diagram of sensor interface with IoT cloud platform.

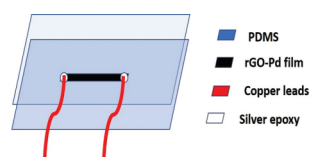


Figure2. Schematic diagram of flexible sensor.

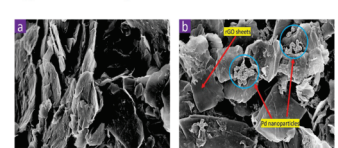


Figure.3. FE-SEM images for a) rGO and b) rGO-Pd nano-composite.

Nagender Singh

Development of Sustainable Mosquito- repellent- cum Multifunctional Textile using Microencapsulation of Essential oils

Nagender Singh
Indian Institute of Technology, Delhi

Guide:
Prof. Javed N. Sheikh

Textile materials are a barrier layer between the human body and the environment. They can also serve as a protective layer against the spread of microbial contaminations and the deadly mosquito-borne diseases. Thus, there is a need to develop efficient textile protective systems to guard against these biological agencies. This is achieved by the functionalization of textile materials. A well-known and traditional practice followed by the industry is to use essential oils known for imparting various functionalities to textiles fibres; however, their tropical application on the fabricis limited due to the durability of their functional properties. Further, the finishing of the textile fabric with microcapsules is conventionally known. An important application field of microcapsules in textile processing is the market of easy-care articles made of natural or regenerated cellulose fibres. Further, microcapsules impart functionalities based on the components utilized in the microcapsule and overcome the usual disadvantage of conventional finishing. In this innovation, thyme oil-embedded functional microcapsules were prepared using functional biopolymer, i.e. chitosan and functional additive, i.e. DAP. The microcapsules were prepared using spray drying techniques using specific process parameters and then applied on the fabric via a pad-dry method. The microcapsules and finished fabric were characterized using FTIR, EDX, TGA and SEM analysis. The IR graph revealed the presence of functional groups of chitosan, thyme oil and phosphorus on the finished fabric. The TGA results suggest that the finished fabric exhibited more thermal stability as compared to the controlled fabric. The finished linen showed excellent antimicrobial properties (>93%), antioxidant activities (96%), flame retardancy (LOI >28%), mosquito repellency (100%) along with the fragrance till at least 20 washes.

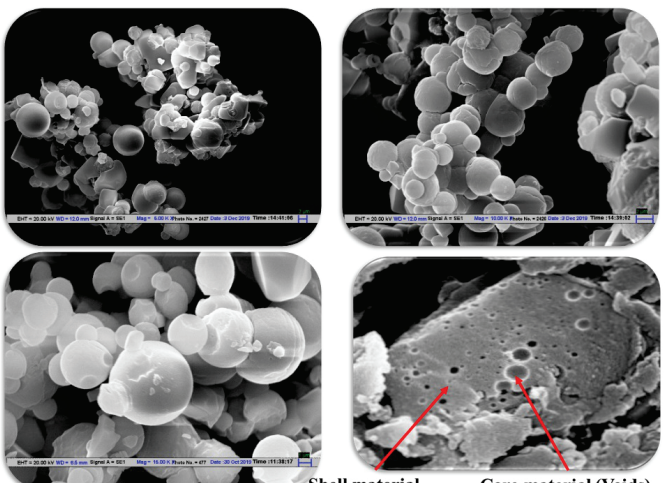


Figure 1 - Microcapsules

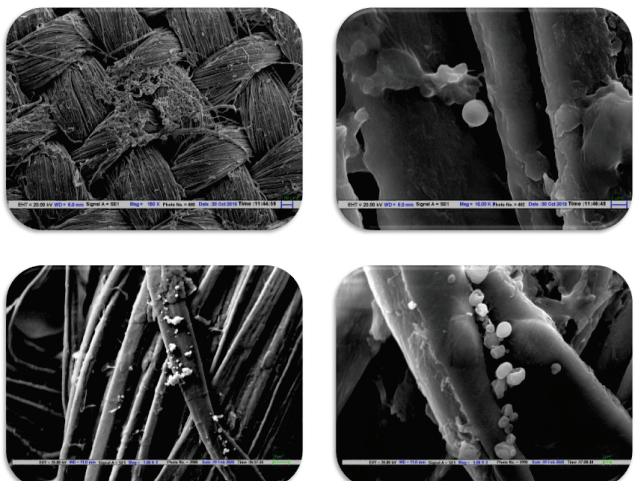


Figure 2 - Fabric finished with Microcapsules

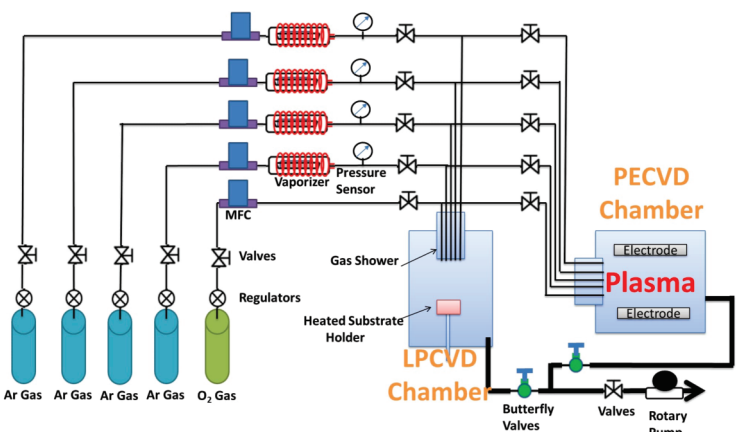
Vivek Singh

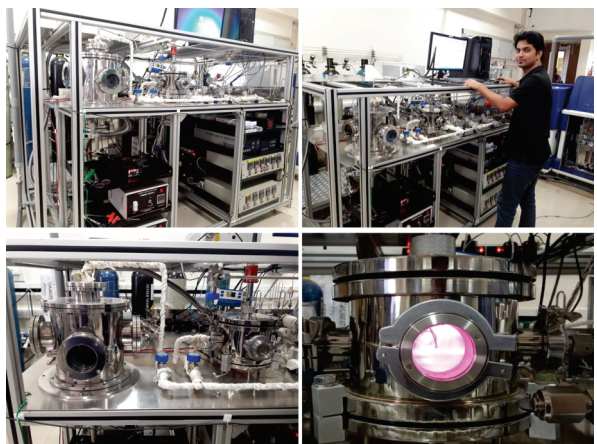
Deposition Reactor Designed for Low cost Low-temperature Deposition of High-quality Oxides Films for Next Generation Electronics

Vivek Singh
Indian Institute of Science, Bangalore

Guide:
Prof. Sushobhan Avasthi

Nanostructured semiconducting metal-oxide thin-films have very interesting applications for low-cost emerging electronics industries. CVD reactor is a state-of-art, known to deposit a defect-free high-quality high-performance thin-film with precise control. One of the reasons is that existing thin films deposition techniques are neither scalable nor atomically precise, hence, lead to poor quality; more over they are very expensive. In this project, we have built a novel, indigenously designed, and fully-functional CVD reactor that is capable of depositing device-quality thin films. This reactor can be used in research and development to deposit high quality thin film for semiconductors, such as solar cells, smart device, LEDs, MEMS, and other applications, such as LCD panels, transparent electronic device and foldable mobile phone, which are only concepts till now. The work is novel not only because the system has some unique capabilities, but also because a fully- functional oxide CVD system deposition was designed, built and commissioned in just 1 year with an investment of ~30 lakhs. In comparison, the market price for a comparable system will be more than 2 Cr. In our system, a closed-loop temperature control and throttle valve were commissioned for maintaining accurate pressure and temperature to achieve reproducible films. The deposition temperature can be set between RT-700^{0}C with an accuracy of +/- 5^{0}C. The CVD system has a base pressure of 30mTorr. Deposition pressure can be maintained from50 mTorr to 10 Torr. For safety, the reaction by-products must be removed by a “scrubber”. This makes the CVD environmentally safe. The low-cost and indigenous design of the reactor is itself an innovation. It will encourage research in oxide-semiconductor and possibly seed an equipment manufacturing industry in India.





Deposition Reactor - Prototype

Ravinder

Hargun Singh Grover

Suresh

A Machine Learning Package to Design Novel Functional Glasses

Ravinder, Hargun Singh Grover, Suresh, Sourabh Singh
Indian Institute of Technology, Delhi

Guide:
Prof. N. M. Anoop Krishnan

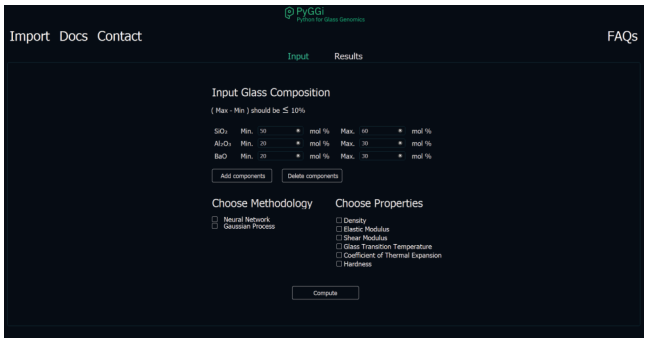
Glasses (especially) are one of the earliest known and most used materials. They are one of the most studied material due to their use in a wide range of applications (from simple window glass to nuclear waste immobilization). However their composition-property relationship has remained poorly understood. Most of it depends on physics based empirical modelling or trial and error approach. This results into inefficient design of novel functional glasses. Here, our product leverage the potential of data driven approach namely machine learning (ML). Following are some of the key areas which will be positively impacted by the current work. Accelerated design of functional glasses: The traditional approach exercised by most glass manufacturing firms are based on trial and error. In this approach, glasses with new compositions are made using prior knowledge and then it is tested for desired property. If glass passes the testing criteria, it is used as a product otherwise it is stored in knowledge base of the firm and a new composition is tried. This process of trial and error is time consuming as well as it costs resources. However, trained machine learning models can be used to suggest the new composition for desired properties. Using trained ML models, glass compositions can be screened without actually making a glass and testing it. The screened glass compositions will provide an accurate prediction for the desired properties. Hence, the ML approach will reduce the time and cost associated to the design cycle of functional glasses.

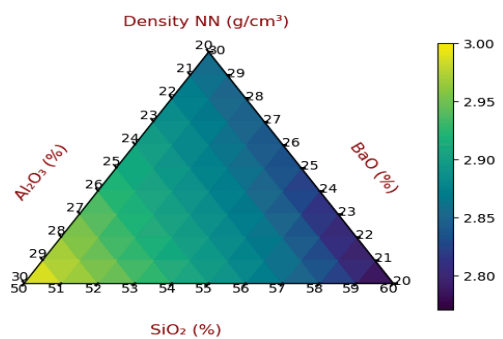
Sourabh Singh

Glass selection charts: A glass selection chart is a plot with property A vs property B. The specific use of glass defines the desired property for the application for e.g. flexible glasses (tellurite) used in fibre optic cables. Here, two competing desired properties are refractive index and stiffness. Using trained ML models, we can build glass selection chart for these

properties which will lead to efficient selection of desired glass. These charts can be used as a guide to design more complex functional glasses with competing multiple desired properties. Understanding underlying physics: Glass properties are directly dependent on its composition. Understanding the physics behind such dependence has its fundamental importance. Each component of glass contribute to its behaviour at atomic level (such as network formers and network modifiers).

The trained ML model will give us relationship between glass components and its properties which can be used to further gain insights to underlying physics of the phenomenon.





Honey Bee Network

The Honey Bee Network (HBN) is a social movement supported by a large number of volunteers. The network which had pioneered the open innovation culture much before the term became popular. For the past 33 years, it has been the vanguard of protecting knowledge, resources and rights of the knowledge rich, economically poor people. It aims at i) cross-pollination of ideas, promoting lateral learning among creative individuals and communities, ii) overcoming anonymity of the grassroots innovators and other knowledge holders iii) ensuring that whatever is done with their knowledge is shared with them in local language, and iv) if any profit or income is generated using their knowledge, a fair and just share should go back to the people. It has been promoting creativity and green grassroots genius in several countries. It has facilitated documentation of over 45000 ideas, innovations and traditional practices besides student projects through volunteers. Honey Bee Network has incubated a series of institutions to support green grassroots innovators and others. It has given birth to Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI), Grassroots Innovation Augmentation Network (GIAN), National Innovation Foundation (NIF) and inspired many national and international innovation policies. It is a global platform where like-minded individuals, innovators, farmers, academicians, policymakers, entrepreneurs and non-governmental organizations (NGOs) come together to respect, recognize and reward grassroots innovations. Various volunteers associated with the network help in scouting innovators, supporting them, mentoring them and provide help in disseminating the innovations as well.

The key areas of engagement:

- Scouting, spawning, and supporting innovations and outstanding traditional knowledge at grassroots. It links formal and informal science, tries to validate and add value in sustainable innovative technologies, promotes creativity among children and also pursues learning from grandparents, particularly centenarians, about viable and green traditional knowledge.
- Promoting innovations and creativity among grassroots farm and non-farm workers, communities and women's groups engaged with culture, folk art, school and college technical education, institutions (particularly common properties or community managed) for conservation of biodiversity and natural resources.
- Mentoring individual innovators in various sectors and linking them with each other and informal sector innovators. Lobbying for policy and institutional changes in support of grassroots creativity and innovations at regional, national and international levels.

- Supporting knowledge and intellectual property rights (IPR) of economically poor people, young inventors and encouraging them to share their knowledge with other self-employed people, as a part of Technology Commons. The transfer of people's knowledge to firms is facilitated on fair and just licensing terms with benefit-sharing.
- Linking innovators with formal research and development (R&D) institutions, market and communication institutions & networks, media etc., so that more and more people are inspired to find solutions to problems of our society. SRISTI (www.sristi.org) and GIAN (www.gian.org)provide institutional support to the Network, along with other volunteers.

Linking technology students with small industry, entrepreneurs and informal sector through techpedia.in and facilitating Gandhian Young Technological Innovation [GYTI] Awards by SRISTI. Creating world's largest open-source pool of sustainable solutions developed by people without outside help, accessible to communities worldwide. Bringing out Honey Bee quarterly newsletter, a unique voice of creative and innovative people at grassroots in different languages. Motivating commercial organizations and public systems to become more empathetic in providing extremely affordable services and products to common people.

SRISTI (www.sristi.org)

INTRODUCTION:

SRISTI, which means creation in Sanskrit, was born in 1993, to support the activities of the Honey Bee Network (1987-88) to recognize, respect and reward creativity at the grassroots level.

SRISTI, as a developmental voluntary organization strengthens the spirit of creativity and innovations by knowledge-rich, economically poor individuals and communities. It builds bridges between informal and formal science, protects intellectual property rights of grassroots innovators and helps in conserving and augmenting biodiversity and associated knowledge systems.
It supports eco-friendly solutions to local problems being scouted, spawned and spread by the Honey Bee Network volunteers for the last 27 years. It also nurtures ecopreneurs engaged in conserving biodiversity, common property resources, cultural diversity and educational innovations. There are five pillars of Honey Bee Network which SRISTI is committed to backstop:

[1] Educational innovations by school and college students, teachers, and other stakeholders; [2] Institutional innovations at community and other levels in managing natural and other resources, [3] Cultural creativity so that curiosity, collaboration, and compassion grow through art, literature and crafts; [4] Technological innovations and traditional knowledge dealing with human, animal, plant and ecosystem health, and [5] Policy reforms to generate frugal innovations for sustainable development at all levels, with specific reference to youth, children, women and elderly.
Essentially, it aims at improving access of knowledge-rich, economically poor people to various informal and formal institutional resources to trigger self-reliant development process as per the Gandhian ethics and principles.

OBJECTIVES:

Systematic documentation and dissemination of and value addition in green grassroots innovations and supporting biotechnological innovations by communities, technology students and others for a sustainable future.

BIODIVERSITY

- Providing intellectual property rights protection and risk capital support.
- Extending necessary support for in-situ and ex-situ conservation of local biodiversity and associated knowledge system.

- Empowering the knowledge-rich, economically poor people by adding value to their innovations, traditional knowledge and associated biological diversity including microbial diversity.
- Linking formal and informal science to enrich both the knowledge systems, build databases of innovations by farmers, artisans, mechanics, technology students, teachers and other social innovators.
- Providing early stage risk capital and mentoring support to grassroots innovators, students and other mavericks to scale up their products and services which are based on grassroots innovations through commercial or non-commercial channels. Embedding the insights learnt from grassroots innovations in the formal educational, policy and institutional systems in order to expand the conceptual, cognitive, institutional and policy space available to these innovations.

INITIATIVES:

BIRAC's BioNEST

Sanctuary of Innovation, Incubation and Entrepreneurship

(SIIE), SRISTI-BioNEST is an innovation and grassroots distinctive traditional knowledge based business incubator, an entity funded by BIRAC (Biotechnology Industry Research Assistance Council, Department of Biotechnology, Govt. of India). Innovations based on 'out-of-the-box' thinking, traditional knowledge, grassroots level knowledge systems, ideas of university students and even children are supported for successful product development and commercialization. Innovations from both formal and informal sectors are supported. The incubator caters to sectors like biotechnology, biological sciences, environmental sciences, food technology, medical science and technology, nanotechnology, pharmacy, rural development and other allied areas. Currently there are 28 incubatees incubated at SIIE-SRISTI BioNEST.

CHILDREN'S CREATIVITY:

The Children's Creativity and Co-creation Workshops aims to empower children to not only identify and articulate their own problems but also identify an try to solve problems of socially disadvantaged segments, individually and/or collectively. This workshop aims to involve children in solving the social challenges faced by community and thus help us mobilize the creative potential of children around the world. The aim is to overcome persistent social inertia in emerging and sometimes even in advanced geographical regions. It is hoped that many of these children will grow into empathetic, creative, and compassionate leaders in future and will try to work towards making an inclusive and sustainable society.

INSHODH - "TEACHERS AS TRANSFORMERS"

Teachers as Transformers is the initiative of Educational Innovations Bank (EI Bank), which is partnered with SRISTI and Honey Bee Network and based at the Ravi J. Matthai Centre for Educational Innovation, Indian Institute of Management Ahmedabad (RJMCEI-IIMA). EI Bank is a clearing house for effective educational innovations developed and implemented by elementary school teachers working in the public system. Teachers in the public system continue to play an important role in

ensuring education for the marginalized sections of our society. In spite of the increase in the share of private sector enrolment, the precariously placed socio-economic strata will continue to depend on this system in the foreseeable future. However, the quality and other educational outcomes of the public system have often been criticized for their less than desirable levels. The EI Bank assumes that top-down reform is necessary but not sufficient: learning from those who have performed in spite of constraints that are common to many teachers, valorizing and supplementing their work and converting this work into a resource, will expose teachers to a solution-augmenting approach to local educational reform, and motivate them.

SHODHSANKAL

The concept of Shodh Sankal (a chain of experimenting farmers) to generate a lateral learning environment among grassroots innovators was started by SRISTI in 1996. The idea was to bring together experimenting farmers and discuss the results of trials that farmers have taken up on their own to solve various local problems. The discussion also enhances the esteem for local knowledge systems apart from speeding up the process of technological change in regions where formal technology generation system has not been very successful - such as dry regions, mountainous regions and other disadvantaged areas.

SOCIAL INNOVATION FUND

The main objective of Social Innovation Fund (SIF) is to provide mentoring-, financial-, fabrication-, validation- support, and value addition facilities in labs, fields, and R&D Institutions for nurturing creativity in culture, education, technology, and governance.

SRISTI INNOVATIONS

A sec 8 company was set up with the objective of strengthening the capacity of grassroots inventors, innovators and ecopreneurs in the area of conserving biodiversity and developing eco-friendly solution to local problems and is engaged inter alia in the areas of documentation, experimentation, search, development and diffusion of sustainable technologies and institutions. It now hosts the BioNEST incubator besides publishing HBN newsletters and other books in Hindi, Gujarati and English languages. It also develops commercialization products ensuring a fair share of benefits going back to knowledge providing communities.

Gandhian Young Technological Innovation (GYTI) Awards celebrates the spirit of students' innovation in engineering, biotechnology, agriculture, pharmacy, material science, design and other applied technological domains through extremely affordable/frugal solutions or the ones pushing the technological edge. It is SRISTI initiative to foster youth-driven tech innovations. Gandhian Young Technological Innovation Awards 2019 were given by the Vice President of India, Shri M. Venkaiah Naidu at Rashtrapati Bhavan, New Delhi on July 06, 2019.

Other Activities:

SATTVIK FOOD FESTIVAL:

SATTVIK is the festival to celebrate traditional nutritious food and associated knowledge systems. It was started fourteen years ago at IIMA to provide market based incentives for conserving agro-biodiversity and creation of demand for rarely or less cultivated nutritionally rich crops and varieties to stimulate their cultivation. In the regions with low rainfall, minerals inside of the soil don't

leach much and hence crops which are grown there- like millets, sorghum, and pulses- are rich in nutritional value. The paradox of development is that the food that rich eat is often poor while food that poor grow (in poorer regions) is rich in nutritional value. This festival aspires to put the lesser known but nutrient-rich food from various states on the plate of urban communities, helping them to adopt healthier food habits and lifestyle. The festival also hopes to encourage farmers to grow more nutrition-rich crops and thus help them in augmenting their incomes. http://sattvik.sristi.org/

SHODHYATRA

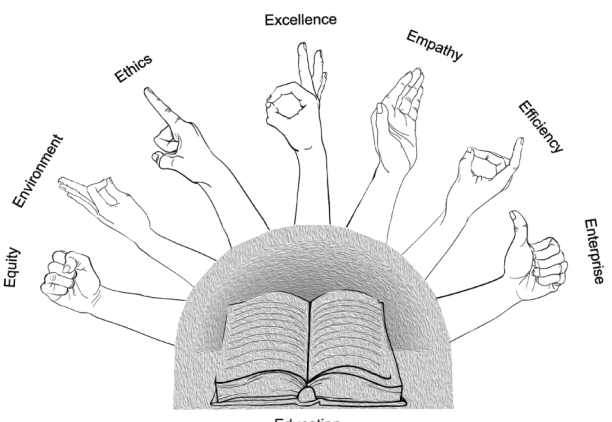
Shodhyatra is a journey in some of the remotest areas of the country to search for knowledge, creativity, and innovations at the grassroots. It is an attempt on the part of SRISTI with a firm belief that the hardships and challenges of natural surroundings are prime motivators of creativity and innovations. It aims at unearthing such traditional knowledge and grassroots innovations. It is also a journey of mutual exchange and sharing of knowledge. Whatever knowledge and practices that are pooled in over various Shodhyatras are also shared back with the villagers during subsequent Shodhyatras, along with sharing of the various databases of the Honey Bee Network. During Shodhyatras also include women and children to display their ecological knowledge through recipe and children competitions respectively. Over the past 21 years, 45 Shodhyatras have been organised covering all the states of the country. https://www.sristi.org/shodhyatra/

SRISTI LAB:

SRISTI believes that adding value to indigenous knowledge will help local communities co-exist with biodiversity by reducing primary extraction and generating long term benefits. Such an approach will lead to augmenting sustainable resource use and livelihood support systems. it converts local knowledge and resources into value added products with simultaneous development of processing facilities in rural region where natural resources exist but not enough in situ value addition takes place.more at http://www.sristi.org/sristi-lab/

AASTIIK

Academy for Augmenting Sustainable Technological Inventions, Innovations, and Traditional Knowledge (AASTIIK) began as an independent programme in 2005. It aims at creating a virtual and real knowledge community of professionals and experts in the field of invention, innovation and traditional knowledge.



TECHPEDIA(www.techpedia.in)

Techpedia, an initiative of SRISTI, aims at putting the problems of micro, small and medium enterprises (MSMEs), informal sector, grassroots innovators and other social sectors on the agenda of young technology students across the country. For the past sixty years, India has not utilised much of the technological outputs of millions of students. But, this apathy will continue no more. Can a knowledge society really afford to ignore the huge talent, distributed in thousands of polytechnics, diploma and degree colleges of engineering, pharmacy, medical science, agriculture etc.? SRISTI is providing a platform for the industry and academic institutions to collaborate, co create and foster distributed and horizontal frugal innovations.

Goals of Techpedia:

Promotion of originality among technology students by making it impossible for them to repeat what has already been done before. This will be possible only when they can find out what has been done before. Techpedia has 204,000 technology projects done by about 600,000 students from more than 600 colleges in India.

- Connecting the technical students with the problems of informal unorganised sectors and grassroots innovators.
- To harness collaborative potential of students across disciplines and colleges to solve persistent problems of our country in formal and informal sectors.
- Explore kho kho model (relay) of product development; the idea is that if one student group has brought the solution of a particular problem to a specific stage, the next group of the same/other department should be able to build upon it and take it forward.
- To pose challenges for students to address unsolved problems of our society. Gandhiji had announced an award of 7,700 pounds (Rs 100,000) to redesign charkha (spinning wheel). Today, the value of this prize will be more than Rs 10 crore. Industry association, government and others can offer attractive prizes for solving those problems which have remained unsolved for so long.
- Developing high-tech capabilities through network platforms so that India becomes a hub for high-tech outsourcing for the world in future and does not serve only the low-tech needs.
- Promoting both IPR protected and open-source technology and eventually develop techpedia.in into an online virtual sanctuary of innovations and not just an incubator.
- Creating real-time online National Mentoring Network (NMN) to harness skills, insights and experiences of senior tech experts, for mentoring young students. Also, remote reverse mentoring by young start-ups and students.
- Encourage some of the innovations through SRISTI Social Innovation Fund, set up recently to promote frugal and extremely affordable socially useful ideas.
- Leverage policy and institutional changes to make innovation ecosystem more responsive to societal needs and aspirations of young talent.
- Organize summer schools to address specific social challenges so that young students can try to overcome institutional inertia by coming out with new prototypes for removing child labour, enhance women safety or supporting autonomy of physically-challenged people etc.

- Build global linkages so that collaborative open-innovation models, pioneered by the Honey Bee Network, are further diffused among student communities worldwide.

Summer School on Inclusive Innovations

SRISTI has been engaging with children for tapping their creativity to address unmet social needs for over 30 years. World over, children are often treated as a sink of sermons rather as a source of ideas.

The children creativity workshops are organized see the societal inertia through the children eyes. They are empowered to do research and identify the unmet social needs, and suggest solution. Later, the engineering and other students take some of these ideas besides others for fabricating solutions for addressing these problems.Purpose is to generate extremely affordable solutions over next three weeks which improve the quality of life of poor children, women, workers and other disadvantaged social segments. It is possible that solutions developed during summer school may not be fully finished. We will give opportunity to some of the participants or external designer to finish these in coming months in partnership with the potential users.

Even if some of the problems remain unsolved, there will be better appreciation of the pathways that will not resolve these problems. SRISTI (Society for Research and Initiatives for Sustainable Technologies and Institutions) has organized this Summer School on Inclusive Innovation through open, reciprocal and responsible frame work guided by the Honey Bee Network Philosophy. It is hoped that young students will learn not to be patient with inertia. They may be sharpen their perceptions to learn the transition from samvedana to srijansheelta (empathetic way of creative problem solving).

A palm leaf broom maker has to beat the leaves on a wooden plank mounted with nails to tear a leaf into fine fibres. The drudgery involved in this act drains much of the energy of women who generally do this task.

Similarly, hundreds of thousands of tribals have to crack mahua nut to get the seed out for oil extraction. The construction workers carry brick on their heads straining their necks and spines.

Women in Saurashtra and many other regions get hurt while harvesting the fruits from cactus like opuntia growing on the field bunds. Amla harvesting in the forest often involves cutting branches rather than just harvesting the fruits.

These and many other problems have been mobilized by the Honey Bee Network to challenge the young people to design solution to get over the indifference or inertia of formal design and technology institutions.

Every institution in the country will have to take the responsibility of mapping the unmet social needs in their hinterland and address them through student projects and summer and winter schools. Like every initiative that Honey Bee Network has taken, it may take years before policy and institutional reforms follow. The structure of governance in any society cannot remain indifferent to the persistent problems of the disadvantaged people for too long.
Email: summerschool@sristi.org Web: ss.sristi.org

IGNITED MIND

In the memory of Dr. A.P.J. Abdul Kalam, the Honey Bee Network, SRISTI, and GIAN have jointly organized an annual competition of innovative ideas by students. Dr. A.P.J. Abdul Kalam Children Ignited Mind Creativity and Innovation Award competition accepts entries from students up to class 12 and also from school dropouts. This award aims to develop a culture of the "Samvedna" among children to find solutions to the local problems addressing unmet social needs. The idea is to make children aware of the problems and hardships which are faced by common people in their day-to-day life, problems with which many of us have learned to adjust and adopt. It is believed that if children start becoming impatient with social inertia at an early age, it is likely that they will bring about more creative and compassionate changes in the society as they grow up.

SITARE BIIS: Opportunity for technology students to work on grassroots innovations

SRISTI (Society for Research and Initiatives for Sustainable Technologies and Institutions) in collaboration with BIRAC (Biotechnology Industry Research Assistance Council, Department of Biotechnology, Govt. of India) has been organizing a three-week SITARE BIIS (Students Innovations for Translation & Advancement of Research Explorations-Biotech Innovation Ignition School) for validating, value-adding and product development around grassroots innovations since 2017. The BIIS tries to develop solutions for grassroots applications for humans, animals, and agricultural applications including herbal technologies, medical devices, and microbial applications.

Due to COVID-19 pandemic, we have conducted BIIS (BIIS-5: June 8-June 27, 2020, BIIS-6: September 22- October 12, 2020, BIIS-7: December 1- December 21, 2020 and BIIS-8: January 25 – February 14, 2021) course as a webinar, where the prime focus has been to build the capacity of primarily undergraduate students to develop skills in the field of phytochemistry, pharmacognosy, extraction, separation of compounds, microbial diversity screening, pest control, development of extremely affordable solutions for farmers, livestock keepers, pastoralists, human applications, besides patent, biostatistics and ethical guidelines for work on grassroots knowledge and innovations.

The topics for the online course BIIS are designed based on the following fields and as a part of webinar we will assign some projects to the students primarily in five action-research areas drawing upon the Honey Bee Network Database:

- Pharmacognosy/Phytochemistry - SRISTI's Grassroots database contains many traditional knowledge practices as well as contemporary innovations from across the country. These projects would involve validation/ value addition to these practices. A few of these practices are presented here- http://www.sristi.org/ hbnew/honeybee_database.php

- Soil Microbiology-SRISTI has a Microbial diversity bank containing 8000+ organisms (bacteria, fungi, and actinomycetes) isolated from the soil samples collected during ShodhYatras (learning walks for scouting and sharing innovations and local practices) in different parts of the country (http://www.sristi.org/cms/shodhyatra). An extensive study of screening these isolated microbes for novel human, animal, and agricultural applications would be conducted.
- Veterinary Medicine- Validation of traditional practices for the

improvement of livestock health, nutrition, and productivity.

- Agriculture- Validation of grassroots practices by conducting trials in the lab, on the station, and in the field for product development/improvement.
- Medical devices- Value addition/product development of any of the open-source projects listed on our summer school website (http://summerschool.sristi.org/) or medical devices for human and animal health care or meeting any other unmet social needs.

Eligibility to apply:

Students pursuing bachelors programs in life sciences can apply. The student should have a valid ID issued by the Institution/University. A few seats are reserved for post graduates too. In exceptional cases, even school children with interesting ideas may be considered.

The reading material for each subject will be shared with the selected students in advance. The participants would be expected to do literature review before joining the School. These students will be having expert lecture of various life science fields like, microbiology, agriculture, medical devices, biostatistics, phytochemical extraction procedures, live experiments and demonstration of various lab equipment (AAS, HPTLC, HPLC, ELISA, PCR, BSL-I & II etc.) during the webinar. They are likely to develop a project proposal as well as work plan. These students would receive an expert feedback on their proposals from the reviewers.

The assignment, quiz and work done by students during the BIIS webinar will be assessed on the last day of the school. The outstanding studies (up to 10 per BIIS) may be identified for further support of INR 1 lakh each as SITARE-Appreciation Award Grant. The grantees are expected to conduct further research on the topic given either at home institution or at SRISTI lab.

Above all, students would get an invaluable opportunity to interact with both national and international experts as well as grassroots practitioners/innovators in their respective fields. It is hoped that each participant becomes a volunteer of the Honey Bee Network which has helped in scouting and disseminating rural creativity and innovation over the last three decades. All the output will be credited to the grassroots knowledge providers and can be published thereafter with prior written concurrence of the BIIS team and knowledge providers.

Highest ethical code of biotech research is expected to be followed. Team spirit and willingness to develop open source solutions will be highly encouraged. Peer learning will be strongly encouraged. The findings will be shared with knowledge providers in local language with the help of SRISTI and Honey Bee Network team.

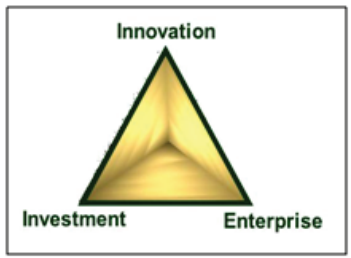
Undergraduate student from life sciences can apply through the link https//birac.nic.in/ gyti_registration.php?scheme_type=23

Grassroots Innovation Augmentation Network [GIAN]

One of the major reasons why grassroots innovations are not able to scale up in many regions and sectors is lack of handholding support for reducing their transaction cost in leveraging linkages with investors and entrepreneurs. The grassroots innovators cannot often make or present a business plan, nor can they construct scenarios under different assumptions of demand subject to availability of varying capacity for fabrication, manufacturing or development of other products and services. GIAN was set up in 1997 as a follow up of ICCIG (International Conference on Creativity and Innovations at Grassroots) held at IIMA in collaboration with Society for Research and Initiatives for Sustainable Technologies and Institutions [SRISTI] and Honey Bee Network.

The golden triangle for rewarding creativity thus became the purpose of GIAN. The reduction in ex-ante and ex-post transaction cost of innovators, investors and entrepreneurs was to be achieved by several operating principles: Never to ask innovators to come to office, instead provide them support at their doorstep; and organize financial, intellectual property, product and business development and dissemination support.

With a small team and limited funds, GIAN has achieved an admirable track record. So much so that it shared the best incubator award with IIT Madras at the hands of the then President, Dr. A.P.J.AbdulKalam by Department of Science and Technology, 2003. GIAN worked in close collaboration with SRISTI which scouted various innovations for incubation purposes. In fact, the model of GIAN was scaled up in 2000 in the form of National Innovation Foundation [NIF].



GIAN has an independent board and a small team of professionals trying to experiment with new models of incubation, innovation and inculcation of experimental ethic at different levels in society.

Genesis

Being a pioneer is not easy. One has much higher expectations from pioneers. There is no template to copy from and much of learning takes place by doing.

The GIAN was set up in collaboration with Gujarat Government, IIMA and SRISTI besides volunteers of Honey Bee Network as a follow up of ICCIG (International Conference on Creativity and Innovations at Grassroots) held at IIMA. Its only assets were: the commitment of state government to support grassroots innovations from the state to become entrepreneur, access to SRISTI's Honey Bee Network Database of innovations by common people and guidance and support by faculty and support of students from IIMA.

Having got the best Incubator award in 2002? At the hands of then President, Dr A P J Abdul Kalam, jointly with IIT Madras, it made a point. India's first grassroots innovation incubator was a viable pathway to reduce transaction cost of innovators, investors and entrepreneurs. The golden triangle (see fig one) for rewarding creativity, now well known, summarizes the purpose of GIAN, handholding a grassroots innovator in her journey to become a social and/or economic entrepreneur. With passage of time, GIAN has expanded its scope work. It now works with women's groups, tribal communities, students of ITIs and polytechnics particularly women polytechnics besides farmers.

t works in all sectors of human survival and adds value to people's knowledge ín collaboration with other HBN institutions such as SRISTI and NIF. It has an independent board having three additional chief secretaries of agriculture, Industry and rural development departments, independent industry reprsentatives, faculty, IIMA, Director, EDI and Director, IIMA and NID are permanent invitees.

Mission

GIAN aims at sustaining the spirit of innovation, encouraging experimentation and nurturing creativity at grassroots level of knowledge rich economically poor people, students, mechanics, workers, young start-ups by contributing to the creation of a knowledge network. This Network empowers the innovators, stems the erosion of traditional knowledge systems, recognises and augments contemporary innovations, and facilitates diffusion of grassroots green innovations through commercial as well as non-commercial public, private and voluntary channels

Objectives

- To identify socially, economically and ecologically viable innovations from Honey Bee data base which are amenable for scaling up, prototype development, diffusion with or without further value addition.
- To participate in the process of value addition being done by other research organizations in grassroots innovation so that eventual scaling up can be achieved effectively.
- To mobilize resources from regional, national and international private, public and other organizations and high net-worth individuals to strengthen the ecosystem of grassroots innovations.
- To undertake market research, project development, provide design, IP related and entrepreneurial support and help in protection of their intellectual property protection.
- To influence policy at micro and macro level to make it more responsive to the needs and expectations of green innovators so that society becomes more inventive and accommodative of local knowledge systems, innovations and practices.
- To publicize innovations and products through exhibitions, Shodhyatras, media and workshops.
- To organize entrepreneurial development workshops in collaboration with expert institutions for the innovators
- To trigger a rural development process that provides an alternative model of poverty alleviation in a fair, just and dignified manner through local resources, knowledge or otherwise

What does it do?

GIAN provides product development, business planning, innovation augmentation through design and development, dissemination and entrepreneurship support. It supports farmers and artisans, primarily in the informal sector in Gujarat, Maharashtra and Goa. However, it can mobilize innovation from any other regions for application in these states. Likewise, it can disseminate innovations from this region in other parts. It has recently started work with the students of ITI and polytechnic, besides school children. It has set up community innovation labs in one of the government primary schools in Ahmedabad. It has also experimented with community food and nutrition lab so that poor people [but also others] can get more nutrition out of available food materials for healthier future. It is well known that despite economic growth, many regions in our country suffer from high anaemia among women and malnutrition among children.

How can you support GIAN?

Besides CSR and other kinds of funding support, GIAN will appreciate professionals on short term sabbatical, internship, apprenticeship with innovators or incubators; remote mentoring support, exposure for its staff, infrastructural support, mobile food and nutrition labs for women, community innovation lab, sponsorship for summer and winter schools for inclusive innovation to address the unmet social needs, shodhyatas, etc. GIAN also wishes to join hands with SRISTI in online courses in different languages on how to invent and innovate. GIAN wishes to organize mobile exhibition, also build a stationary centre for inclusive innovations; public books, collaborate in bringing out Honey Bee newsletter started 28 years ago, in different languages.

Trust, transparency and accountability

GIAN is committed to uphold highest standards of ethical responsibility in managing resources and other non-material contributions. GIAN welcomes opportunities for social audit where the people with whom it works evaluate its working and various contributions.

Honey Bee Network Innovation Club

Search

Unless young students go out into the field, villages, urban workshops, slums and other MSME clusters to find out innovations by common people as well as others, they would not know the creative potential that already exists in our country. They can mobilize ideas from school children, college students, roadside mechanics, farmers, artisans, homemakers and others for solving various problems or improving the quality of life through incremental innovations. Every time a hidden innovation is brought to surface, many more people feel encouraged and may start trying to solve problems through their own genius. If every college and university starts mapping creativity in its hinterland, the whole society will bristle with positive energy and unleash tremendous dynamism in the economy. The innovations in different fields such as technology, education, institutions, public services, private enterprises, cultural creativity, governance at different levels, etc., will be documented first in a synoptic way and then detailed documentation will be taken up of the more significant ideas. In different courses, these ideas and documentation can be incorporated as a part of curriculum. The social, cultural, ecological, industrial and institutional connect are extremely important for overcoming possible alienation of people in certain areas.

Spread

Diffusion of existing innovations whether sourced from Honey Bee Network and National Innovation foundation [NIF] or other depositories have to be shared with the local communities in a systematic manner through various creative pedagogies and performances. In fact, searching innovations without sharing may neither appear very credible nor even ethical. In the process of sharing, the students and faculty will themselves become aware of how creative our country is and how limited is the support extended to these people/communities by the formal sector including academia. Such a realization will do more to trigger introspection and generate empathetic culture for blending ideas from formal and informal sector. The students can organize exhibitions, have street theatre performances or follow other means of creating awareness about innovations in the nearby villages, schools, communities, clusters of industry, government departments, etc.

Sense

There are a lot of problems in our society which have remained unsolved for long. Unless we benchmark the persistent problems and try to address them within the means available, we may develop an attitude of living with them indefinitely. Such an attitude will never let our society progress in the long term. Idea here is that students from different discipline should benchmark unsolved problems or challenges in different sectors, at various scales affecting numerous social groups. In technology institutions, third year students can go to both MSME clusters and units and informal rural and urban sector and benchmark the problems to be addressed. They can be given credit for identifying the problem and writing a synopsis on it. In the final year, they can take up projects to address these problems in one or two terms. Accordingly, they can get credit for that too. Practical examples of such a process are given at www.techpedia.in. The innovative solution can be given prizes at university level and also at national level through competition like Gandhian Young Technological Innovation

Awards. In social sciences, one can identify gender and other cultural problems and address them likewise through action research approach. Language related students can help improve the linguistics skill of school children and develop innovative pedagogies. If every student develop one lesson for any one topic and for any class, a huge repository of open source local language lesson for school children can be developed to overcome the asymmetry in access to basic education. Different challenges can be sensed and responded.

Celebrate

During the interactions with different social and institutional segment, a lot of outstanding achievers. Will be identified in the hinterland. There may be an outstanding doctor who may have contributed in big way for making the communities almost disease free or a teacher who has created a very rich learning environment in a school or an innovator who has solved a problem or a public or private functionary who has created public goods for larger social development. There may also be outstanding artists, writers or other change agents who need to be invited in the universities to inspire students and create and insatiable desire to excel and serve society.

Honey Bee Network Innovation Clubs can be coordinated by the students under the oversight of empathetic faculty members. Students should have as much flexibility and freedom as possible. They should organize interaction with innovators in different fields and try to add value where possible, help in diffusion, create markets, provide linkage with other innovators and stakeholders and forge a knowledge network around innovations. They should not remain restricted only with local innovations. They should also mobilize ideas from outside for local development and vice versa. If a few session can be organized in different course to rigorously analyze the heuristics, triggers, motivations, outcomes and ecosystem characteristics, more and more student feel encouraged to take risk and try new ideas.

HBN will support the value chain development in the case of innovations from informal sector and by school children. The mandate of HBN is restricted to support ideas, innovations and outstanding traditional knowledge practices from the unorganized sector by individuals or communities who have not received any professional training or support. The educational, cultural, institutional and other governance related innovations will be pooled by Society for Research and Initiatives for Technologies and Institutions [sristi.org] and linked to various other programmes. In due course, support may be mobilized to give traction to these ideas. At present, the major contribution will be to give voice and visibility to the innovative ideas in various sectors. Volunteers from among faculty, staff and students will hopefully join hands with the innovators at different levels and in different sectors to ensure widest application for creative and compassionate ideas. Collaborative culture is likely to emerge when learning across formal and informal boundaries get reinforced. During the visit of the Hon'ble President, such clubs can be inaugurated and the team of volunteers can be blessed by the President so as to motivate them to excel in search, spread, sense and celebrate the creativity and innovation in our country.

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The indian dream should not be about ‘some Indians’ doing well, but ‘India’ doing well

- Dr. R A Mashelkar

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Prof. Imran Ali	Science Publisher, Department of Chemistry, Jamia Millia Islamia
Dr. Jayanta Haldar	Associate Professor, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore
Dr. J Savitha	Professor, Dept. of Microbiology, Bangalore University
Dr. Joy Kumar Roy	Scientist-F, National Agri-Food Biotechnology Institute (NABI)
Dr. Jayati Ray Dutta	Department of Biological Sciences, Birla Institute of Technology & Science, Pilani, Hyderabad Campus
Prof. Jayanta Kumar Ghosh	Associate Professor, Department of Civil Engineering, Indian Institute of Technology, Delhi
Prof. Jay Dhariwal	Assistant Professor, Department of Design, Indian Institute of Technology, Delhi
Prof. J N Chakraborty	Professor, Department of Textile Technology, National Institute of Technology, Jalandhar
Prof. Jagadeesh Kumar Varadaraja	Professor, Department of Electrical Engineering, Indian Institute of Technology, Madras
Prof. Jyotsnendu Giri	Associate Professor, Department of Biomedical Engineering, Indian Institute of Technology, Hyderabad
Prof. Jayakrishnan. A	Former Vice Chancellor, University of Kerala and Cochin University of Science and Technology
Prof. Jaspreet kaur Randhawa	Assistant Professor, School of Engineering, Indian Institute of Technology, Mandi
Prof. Jaichander Swaminathan	Professor, Department of Mechanical Engineering, Indian Institute of Technology, Gandhinagar
Dr. Koel Chaudhury	Professor, School of Medical Science & Technology (SMST), Indian Institute of Technology, Kharagpur
Dr. Kanmani Subbu S.	Assistant Professor, Department of Mechanical Engineering, Indian Institute of Technology, Palakkad
Prof. K. K. Pant	Professor & HOD, Department of Chemical Engineering Department , Indian Institute of Technology, Delhi
Prof. KSMS Raghavarao	Chief Scientist, Department of Food Engineering, CSIR-Central Food Technological Research Institute, Mysore
Prof. Kaushik Mukherjee	Assistant Professor, Department of Mechanical Engineering, Indian Institute of Technology, Delhi
Prof. Keshab C. Monda	Professor, Department of Microbiology, Vidyasagar University
Prof. K B Ramachandran	Emeritus Professor (Retired), Department of Biotechnology, Indian Institute of Technology, Madras
Prof. Krishna Prasad Miyapuram	Associate Professor, Centre for Cognitive and Brain Sciences, Indian Institute of Technology, Gandhinagar
Professor K. P. Sinhamahapatra	Chair Professor, Aerospace Engineering, Indian Institute of Technology, Kharagpur
Prof. Krishna Sesha Giri	Assistant Professor, Department of Mechanical Engineering, Indian Institute of Technology, Palakkad

Name	Designation
Prof. Kantesh Balani	Professor, Dept. of Materials Science & Engg., Indian Institute of Technology, Kanpur
Dr. Monali C. Rahalkar	Scientist 'D', Bioenergy Group, Agharkar Research Institute, Pune
Dr. Meher Wan	Scientist, CSIR- National Institute of Science Communication and Information Resources
Dr. Mihir Kumar Purkait	Head, Centre for the Environment; Professor, Department of Chemical Engineering, Indian Institute of Technology, Guwahati
Dr. Manasi Mishra	DST-INSPIRE Faculty, Department of Life Sciences, School of Natural Sciences, Shiv Nadar University
Dr. Munesh Singh	Assistant Professor, Department of Computer Science & Engg, Indian Institute of Information Technology, Design and Manufacturing, Kancheepuram
Dr. Md. Sikandar Azam	Assistant Professor, Department of Mechanical Engineering, Indian Institute of Technology, Dhanbad
Prof. M T Chabaria	Principal, L. M. College of Pharmacy, Ahmedabad
Prof. Makarand Ghangrekar	Professor, Department of Civil Engineering, Indian Institute of Technology, Kharagpur
Prof. Madhulika Dixit	Professor, Department of Biotechnology, Indian Institute of Technology, Madras
Prof. M. Maran	Professor, Department of Mechanical Engineering, Velammal College of Engineering and Technology, Madurai
Prof. M. K. Reddy	Group Leader, Crop Improvement Group, International Centre for Genetic Engineering and Biotechnology, New Delhi
Prof. Manoj Dinesh Oak	Scientist, Department of Genetics and Plant Breeding, Agharkar Research Institute
Prof. Marco Mandolini	Assistant Professor, Design Tools and Methods Group, Department of Industrial Engineering and Mathematical Sciences Universita' Politecnica delle Marche
Prof. Mukesh Doble	Professor, Chemical engineering, Indian Institute of Technology, Madras
Prof. Manoj Kumar Tiwari	Assistant Professor, Indian Institute of Technology, Kharagpur
Dr. Niramal Sahay	Vice President, works and R & D Super Crop Safe Ltd, Advisor, SRISTI
Dr. N. K. Srivastava	Associate Professor, Department of Chemical Engineering, National Institute of Technology, Jalandhar
Dr. Niket Kaisare	Professor, Indian Institute of Technology, Madras
Dr. Navin Kumar	Associate Professor, Department of Mechanical Engineering, Indian Institute of Technology, Ropar
Dr. Nirmal Mazumder	Assistant Professor, Department of Biophysics, Manipal Academy of Higher Education, Manipal
Prof. N M Anoop Krishnan	Assistant Professor, Indian Institute of Technology, Delhi
Prof. Neetu Singh	Associate Professor, Centre for Biomedical Engineering, Indian Institute of Technology, Delhi

Name	Designation
Prof. N. B. Ballal	Professor, Metallurgical Engineering & Materials Science, Indian Institute of Technology, Bombay
Prof. N Vinod Kumar	Assistant Professor, School of Chemical and Biotechnology
Prof. Nihar Ranjan Jana	Professor, School of Bio Science, Indian Institute of Technology, Kharagpur
Prof. Om Prakash Singh	Associate Professor, Department of Mechanical Engineering,Indian Institute of Technology (BHU), Varanasi
Dr. Prakamya Gupta	Division of Innovation & Translational Research, Indian Council of Medical Research, New Delhi
Dr. P. Gopinath	Associate Professor, Department of Biotechnology, Indian Institute of Technology, Roorkee
Dr. Prasanta Kumar Das	Professor, Department of Mechanical Engineering, Indian Institute of Technology, Kharagpur
Dr. Prakamya Gupta	Scientist C, Indian Council of Medical Research, New Delhi
Dr. Pinky Agarwal	Scientist IV, National Institute of Plant Genome Research, New Delhi
Dr. Padmaparna Chaudhuri	Principal Scientist, Mitra Biotech
Dr. Pijus Kumar Sasmal	Assistant Professor, School of Physical Sciences, Jawaharlal Nehru University,New Delhi
Dr. Prabhat Singh	Professor, Department of Biological Sciences, Indian Institute of Science Education and Research, Berhampur
Dr. Praveena Gangadharan	Assistant Professor, Department of Civil Engineering, Indian Institute of Technology, Palakkad
Prof. P V M Rao	Head, Department of Design, Indian Institute of Technology, Delhi
Prof. Prdeep T	Professor, Department of Chemistry, Indian Institute of Technology, Madras
Prof. Pallab Bhattacharya	Associate Professor, National Institute of Pharmaceutical Education and Research, Ahmedabad
Prof. Padma V. Devarajan	Professor, Department of Pharmaceutical Sciences and Technology, Institute of Chemical Technology, Mumbai
Prof. Premnath Venugopal	Head, NCL Innovations, Director, Venture Center
Prof. P. P. Mujumdar	Professor, Department of Civil Engineering Chairman, Interdisciplinary Centre for Water Research, ndian Institute of Science, Bengalore
Prof. Pradip Paik	School of Biomedical Engineering, Indian Institute of Technology (BHU), Varanasi
Prof. Pitam Chandra	Former Professor, Food Engineering, NIFTEM and Former Director, ICAR-CIAE, Bhopal
Prof. Prasenjit Mondal	Professor, Department of Chemistry, Indian Institute of Technology, Roorkee
Prof. Pramod Kumar Prabhakar	Assistant Professor, National Institute of Food Technology Entrepreneurship and Management (NIFTEM)
Prof. Pradeep Singh Negi	Sr. Principal Scientist, CSIR - CFTRI

Name	Designation
Prof. Piyush Sonkar	Assistant Professor, Department of Chemistry, Indian Institute of Technology (BHU), Varanasi
Prof. Pankaj Tiwari	Associate Professor, Department of Chemical Engineering, Indian Institute of Technology, Guwahati
Prof. Pramod Kumar Prabhakar	Assistant Professor, Department of Food Science and Technology, National Institute of Food Technology Entrepreneurship & Management
Prof. Praphulla Chandra Shukla	Assistant Professor, School of Medical Science and Technology, Indian Institute of Technology, Kharagpur
Prof. Paramjit Khurana	Department of Plant Molecular Biology, University of Delhi, South Campus
Prof. Pinaki Sengupta	Assistant Professor, National Institute of Pharmaceutical Education and Research, Ahmedabad
Prof. P. K. Panigrahi	Department of Mechanical Engineering, Center for Lasers and Photonics,Indian Institute of Technology, Kanpur
Prof. Preeti Bansal	Professor, Jamia Millia Islamia, Delhi
Prof. Pooja Singh	School of Biological Sciences, Symbiosis
Prof. Pranab Kumar Dutta	Professor and Head, Electrical Engineering, Indian Institute of Technology, Kharagpur
Prof. Priti Maheshwari	Associate professor, Department of Civil Eng, Indian Institute of Technology, Roorkee
Prof. Pitam Chandra	Professor (Food Engineering), NIFTEM & Former Director, ICAR-CIAE, Bhopal
Dr. R. Tamilselvi	Professor, National Institute of Technology, Tiruchirapalli
Dr. Raghu V Prakash	Professor, Department of Mechanical Engineering , Indian Institute of Technology, Madras
Dr. Rahul Bahulikar	Senior Scientist, Central Research Station BAIF Development Research Foundation, Pune
Dr. Ranadeep Gogoi	Assistant Professor & Head, Department of Biotechnology, National Institute of Pharmaceutical Education and Research, Guwahati
Dr. R. Kapila	Principal Scientist, Animal Biochemistry Division, National Dairy Research Institute, Karnal
Dr. Rituparna Sinha Roy	Associate Professor, former Ramalingaswami Fellow, Department of Biological Sciences, Indian Institute of Science Education and Research, Kolkata, Mohanpur
Dr. Rahul Thakur	Assistant professor, Department of Computer Science and Engineering, Indian Institute of Technology, Roorkee
Prof. Ravi Krishnan Elangovan	Associate Professor, Biochemical Engineering and Biotechnology, Indian Institute of Technology, Delhi
Prof. Rakesh K Sharma	Associate Professor, Department of Chemistry, Indian Institute of Technology, Jodhpur

Name	Designation
Prof. Rakesh Mishra	CSIR- Centre for Cellular and Molecular Biology, Hyderabad
Prof. Rajendra Machavaram	Assistant Professor, Department of Agricultural & Food Engineering, Indian Institute of Technology, Kharagpur
Prof. Ravi P Shah	Associate Professor, NIPER, SAS Nagar, Mohali
Prof. Rakesh Tekede	Assistant Professor, Department of Materials Engineering, Indian Institute of Technology, Jammu
Prof. Rashmi Kumari	Research Scholar, Genome Biology Lab, JMI
Prof. Randip Kumar Das	Professor, Indian Institute of Technology (ISM), Dhanbad
Prof. Rudra Prasad Chatterjee	Scientist, Centre of Excellance for Farm Machinery, CSIR - Central Mechanical Engineering Research Institute
Prof. R. V. Ravikrishna	Chair Professor, Department of Mechanical Engineering, Indian Institute of Science, Bangalore
Prof. Rajinder Ambardar	Professor, Discipline of Material Engineering, Indian Institute of Technology, Jammu
Dr Subir Kumar Maulik	Professor, All India Institute Of Medical Sciences, New Delhi
Dr. Subham Banerjee	Assistant Professor, National Institute of Pharmaceutical Education and Research, Guwahati
Dr. Sunil Jacob	Director, SCMS Centre for Robotics, Professor, Electronics and Communication Engineering Department, SCMS School of Engineering & Technology, Karukutty, Cochin, Kerala
Dr. Shalini Gupta	Assistant Professor, Indian Institute of Technology, Delhi
Dr. Shivani Pandya	Head of Department & Assistant Professor, Parul Institute of Applied Sciences, Parul University, Vadodara
Dr. Shubham Atal	Assistant Professor, Department of Pharmacology, All India Institute of Medical Sciences, Bhopal
Dr. Shantimoy Karv	Research Assistant, Bio-medical Engineering, University of Glasgow
Dr. Santosh Sridhar Mysore	Associate Professor, Center for Incubation, Innovation, Research and Consultancy (CIIRC), Jyothy Institute of Technology, Bangalore
Dr. Soma Mondal Ghorai	Associate Professor, Department of Zoology, Hindu College, University of Delhi
Dr. Shirish Sonawane	Professor, Depatment of Chemical Engineering, National Institute of Technology, Warangal
Dr. Swapnajit Pattnaik	Assistant Professor, Department of Electrical Engg., National Institute of Technology, Raipur
Prof. Subir Kumar Saha	Professor, Department of Mechanical Engineering , Indian Institute of Technology, Delhi
Prof. Sarita Ahlawat	BIRAC_BIG Innovator, TBIU , Indian Institute of Technology, Delhi, Head- Living Science Group
Prof. Smita Srivastava	Associate Professor, Department of Biotechnology, Indian Institute of Technology, Madras

Name	Designation
Prof. Sathyanarayana N Gummadi	Department of Biotechnology, BJM School of Biosciences, Indian Institute of Technology, Madras
Prof. Shivi Jain	Associate Professor, Department of Radiodiagnosis & Imaging Institute of Medical Sciences, Banaras Hindu University
Prof. Sai Siva Gorthi	Associate Professor, Optics & Microfluidics Instrumentation, Dept. of Instrumentation and Applied Physics, Indian Institute of Science, Bangalore
Prof. Soumen Das	Professor, School of Medical Science and Technology, Indian Institute of Technology, Kharagpur
Prof. Shrad Gupta	Associate Professor, Department of Biological Engineering , Indian Institute of Technology, Gandhinagar
Prof. Subha Narayan Rath	Associate Professor, Biomedical Engineering, Indian Institute of Technology,Hyderabad
Prof. S. Aravindan	Professor, Mechanical Engineering, Indian Institute of Technology, Delhi
Prof. Shiv Govind Singh	Professor, Department of Electrical Engineering, Indian Institute of Technology, Hyderabad
Prof. Santanu Chattopadhyay	Professor & Head, Rubber Technology Centre, Indian Institute of Technology, Kharagpur
Prof. Shubhajit Roy Chowdhury	School of Computing and Electrical Engineering, Indian Institute of Technology, Mandi
Prof. Suman David S	Professor, Department of Electronics & Communication Engineering, National Institute of Technology, Karnataka
Prof. Siddhartha Sen	Professor-in-Charge, Counselling Centre, Indian Institute of Technology, Kharagpur
Prof. Sanket Goel	Head and Associate Professor, Department of Electrical and Electronics Engineering BITS, Pilani, Hyderabad Campus
Prof. Sanjeev Kumar Mahto	Senior Scientist, Biomedical Instrumentation Unit, Assistant Professor, Academy of Scientific and Innovative Research CSIR-Central Scientific Instruments Organisation Chandigrah
Prof. Sunil Kumar Khare	Dean (R&D) and Institute Chair Professor of Biochemistry, Enzyme and Microbial Biochemistry Lab, Department of Chemistry, Indian Institute of Technology, Delhi
Prof. Shalini Rajkumar	Professor, Institute of Science, Nirma University, Ahmedabad
Prof. Shri Ram Yadav	Associate Professor, Department of Biotechnology, Indian Institute of Technology, Roorkee
Prof. Subhankar Maity	Assistant Professor, Department of Textile Technology,Textile Technology Institute, Uttar Pradesh
Prof. Somnath Maji	Professor, Department of Chemistry, Indian Institute of Technology ,Hyderabad
Prof. Sudip Nag	Assistant Professor, IEEE, Department of Electronics and Electrical Communication Engineering, Indian Institute of Technology, Kharagpur

Name	Designation
Prof. Suma Divakar	Professor, Kerala Agricultural University
Prof. Santosh K. Misra	Assistant Professor, Dept of Biological Sciences and Bioengineering, Indian Institute of Technology, Kanpur
Prof. Santosh Kumar	Professor, Department of Mechanical Engineering, Indian Institute of Technology (BHU), Varanasi
Prof. Sanil George	Scientist E-II, Chemical and Environmental Biology Group, Rajiv Gandhi Center for Biotechnology, Thiruvananthapuram
Prof. S V Kulkarni	Professor, Department of Electrical Engineering, Indian Institute of Technology, Bombay
Prof. Srinivas Seethamraju	Professor, Department of Energy Science and Engineering, Indian Institute of Technology, Bombay
Prof. Sachin Kumar Srivastava	Assistant professor, Physics, Indian Institute of Technology, Roorkee
Prof. Saakshi Dhanekar	Assistant Professor, Electrical Engineering, Indian Institute of Technology, Jodhpur
Prof. Santanu Chattopadhyay	Professor & Head, Rubber Technology Centre, Indian Institute of Technology, Kharagpur
Prof. Soumya Gangopadhyay	Associate Professor, Department of Mechanical Engineering, Indian Institute of Technology, Bhilai
Prof. Satish Chandra	Scientist, CSIR - National Aerospace Laboratories
Prof. Tapan Kumar Gandhi	Associate Professor, Department of Electrical Engineering, Indian Institute of Technology, Delhi
Prof. Tapas K. Maiti	Professor, Department of Biotechnology, Indian Institute of Technology, Kharagpur
Dr. Upendra Kumar	Scientist, ICAR- National Rice Research Institute, Cuttack
Dr. Usharani D	Principal Scientist, FS & AQCL, Central Food Technological Research Institute, Council of Scientific and Industrial Research, Mysore
Dr. Ulka Malode	Assistant Professor, Depatment of Microbiology, Jankidevi Bajaj Collge of Science
Prof. Uday S. Racherla	Professor, Department of Industrial and Management Engineering, Indian Institute of Technology, Kanpur
Dr. V. V. Raghavendra Sai	Associate Professor, Biomedical Engineering, Indian Institute of Technology, Madras
Dr. Virendra Yadav	Assistant Professor, Department of Microbiology, School of Life Sciences, Jaipur National University, SIILAS Campus
Dr. Vandana Ghormade	Nanobioscience Group, Agharkar Research Institute, Pune
Dr. Vinod Singh Yadav	Assistant Professor, Dept. of Mechanical Engineering, National Institute of Technology, Uttarakhand
Prof. Vandana B. Patravale	Professor, Pharmaceutical Sciences and Technology, Institute of Chemical Technology, Mumbai
Prof. Vipin Laddha	Officer Incharge Centre for Information Management & Computer Applications, Swami Keshwanand Rajasthan Agricultural University, Bikaner, Rajasthan

Name	Designation
Prof. Vivekanandan Perumal	Associate Professor, Kusuma School of Biological Sciences, Indian Institute of Technology, Delhi
Prof. Venkatesh V	Assistant Professor, Department of Chemistry, Indian Institute of Technology, Roorkee
Prof. V. Prakash	Department of Mechanical Engineering, Indian Institute of Technology, Madras
Prof. Vinay M. Bhandari	Senior Principal Scientist, National Chemical Laboratory, Pune
Prof. Viswanath Chinthapenta	Assistant Professor, Department of Mechanical & Aerospace Engineering Indian Institute of Technology, Hyderabad
Prof. Vinay Kumar Tyagi	Professor, Department of Civil Engineering, Indian Institute of Technology, Roorkee
Prof. Vijay Kothari	Professor, Institute of Science, Nirma University
Prof. Veena Koul	Professor, Centre for Biomedical Engineering, Indian Institute of Technology, Delhi
Prof. Vinod A Prasad	Professor, Department of Electrical Engineering, Indian Institute of Technology, Palakkad
Prof. V. Arul Mozhi Selvan	Professor, Department of Mechanical Engineering, National Institute of Technology, Tiruchirappalli
Dr. Yogendra Shastri	Associate Professor, Chemical Engineering, Indian Institute of Technology, Bombay

Gandhiji strongly advocated finding local solutions to local problems. This thought was inherent in his idea of Gram Swaraj. It is a matter of immense satisfaction that this Festival sees participation from several grassroots innovators who have been inspired to find effective solutions to problems that they experienced in their communities. I congratulate all the award winners. I hope they will continue to be an inspiration for society. The creativity and efforts they have put in to conceive practical solutions to everyday problems is commendable.

-Ram Nath Kovind
Honorable president of india

LIST OF GYTI AWARDEES (2012-2019)

List of GYTI Awardees (2012- 2019)

GYTI Award 2012

Sr. N	Title	Student Name	Institute Name	Supervisor Name
1	Tiles Measurement and Grade Classifying Equipment	Deep M. Bhimani	Government Engineering College, Rajkot	Dr. C. H. Vithalani
2	Multi Desire Wheelchair	Pratik Gandhi, Chintak Dholakia	L.D. College of Engineering	Prof. B. H. Parmar
3	Incense Stick Maker	Keshav G	Indian Institute of Technology, Gandhinagar	Dr. Murali Damodaran
4	LPG Based Refrigerator	Chintan Patel, Mayank D Patel, Mayank Patel and Biren Patel	Laljibhai Chaturbhai Institute of Technology, Mehsana	Prof. Y. L. Raol, Prof. A. B. Patel
5	Domestic Refrigerator with Water Heater	Dhruv Patel	Gandhinagar Institute of Technology, Gandhinagar	
6	LPG Based Refrigerator	Jainil Bhatt, Dhruvin Kagdi, Tirth Jani, Kunjal Jadav	LDRP-ITR College	Prof. Tushar Patel
7	Jeevan Dhara Hand Pump with Integrated Filtering System	Kirti Ranjan	Indian Institute of Technology, Kharagpur	
8	Automobile Air Conditioning using Engine Exhaust	Harish Umashankar Tiwari	Pimpri Chinchwad College of Engineering, Nigdi, Pune	Prof. G. V. Parishwad
9	Design, Synthesis & Evaluation of Novel Steroidal Aromatase Inhibitors in Breast Cancer	Dr. Prafulla M. Sabale	Parul Institute of Pharmacy, Vadodara	
10	Image, Speech Recognition and Speech Synthesis for Physically Disabled	Saurabh Saket	Bhutta College of Engineering	Inderdeep Singh Grewal
11	Smart Grid Forecasting Technique	V S K Murthy, Balije Palli	Indian Institute of Technology, Bombay	

12	Ultra Sensitive, Low Cost Hand Held Explosive Detector System	Neena Avinash Gilda	Indian Institute of Technology, Bombay	Prof. V. Ramgopal Rao, Prof. Dinesh K. Sharma, Prof. Maryam S. Baghini
13	A Tsunami Warning System Using Ionospheric Measurements	Jhonny Jha	Indian Institute of Technology, Bombay	Prof. Krishna Sudhakar
14	Vardaan: Stair Climbing Wheelchair	Shanu Sharma	Indian Institute of Technology, Kanpur	Dr. J. Ramkumar, Prof. Shatrupa Thakruta Roy, Dr. Satyaki Roy
GYTI Award 2013				
1	Electronic Support System for Physically Disabled (Deaf & Dumb)	Margie Ashok Joshi	C.K. Pithawalla College of Engineering and Technology	Prof. Dipti Patel
2	Saral Parikshan - an Advancement in Cutting Edge Technology for Rural Area to Detect Vitamin B12 for Pernicious Anemia	L. Sagaya Selvakumar	Council of Scientific & Industrial Research-Central Food Technological Research Institute	Prof. M. S. Thakur
3	E-Diagnoser: an Advanced Low Cost Patient Monitoring Watch	Libin Varghese, Pillai Sareesh, Shibin Joseph, Adarsh.S, Chithira Jacob, Nithya Merin, Anoop.P	Amal Jyothi College of Engineering	Prof. Reshmi V
4	Hydro-Operated Square-Bottom Paper and Jute Bag Making Machine	Anirudh Thakur	Llriet Moga	
5	Nano Finishing of Freeform Surfaces of Prosthesis Knee Joint Implants	Sidpara Ajay Muljibhai	Indian Institute of Technology Kanpur	Prof. V. K. Jain, Prof. V. K. Suri, Prof. R. Balasubramanian
6	Digital Pen	Kalpesh Wani	Visvesvaraya National Institute of Technology, Nagpur	

7	Multifunctional Nano-in-micro Alginate Microspheres for Biosensing, Drug Delivery and MRI	Rashmi Dilip Chaudhari	Indian Institute of Technology, Bombay	Prof. Rohit Srivastava
8	Highly Gas Impermeable Elastomeric Rubber-Rubber Blend Nano Composites	Ajesh K Zachariah	Mar Thoma College	Prof. Sabu Thomas
9	A Portable and Efficient Electronic Filter for Sub-Micron Particles from Fluids	Aswathi R Nair	Indian Institute of Science	Prof. Sanjiv Sambandan
10	Laser Ignited Internal Combustion Engine	Kewal Dharamshi	Indian Institute of Technology, Kanpur	Prof. Avinash K. Agarwal
11	Novel Stand-Alone 1-Phase AC Generator for Rural Electrification using Renewable Energy	Sandeep Vuddanti	Indian Institute of Technology, Delhi	Prof. S. S. Murthy, Prof. Bhim Singh
12	Ultra Low Cost Tunable Nano Scale Patterns	Nandinibhandaru	Indian Institute of Technology, Kharagpur	Dr. Rabibrata Mukherjee
13	Vision for the Blind Using Ultrasonic Sensors	Santosh Kumar Bhandari	SRM, Kattankulathur	
14	Spectral Eye	Sai Vijay Gole, Saket Choudhary, Yashesh Gaur	IIT Madras, IIT Bombay, DA-IICT	
15	Automatic Fish Scaling Machine	M. Rajesh Kanna	Velammal College of Engineering and Technology, Madurai	Dr. P. Rajesh Kanna
16	Chetna - Celebrate Your Pregnancy	Keyur Sorathia	Indian Institute of Technology, Guwahati	Keyur Sorathia
17	VAJRA (Vessel Desk)	Raghunath P Lohar	Ganesh Institute of Engineering	
18	SHE- Society Harnessing Equipment	Manisha Mohan	SRM University, Chennai	
19	Clubfoot Orthosis	Kanwaljit Singh	Indian Institute of Technology, Delhi	Dr. P. M. Pandey

20	The Third Eye	Naveen Kumar Rai	Indian Institute of Technology, Guwahati	Dr. Amit Sethi
21	Reactor & Catalyst Development for Oxygen Evolving Step in Sulfur-Iodine Cycle for Hydrogen Production	Kishore Kondamudi	Indian Institute of Technology, Delhi	Dr. Sreedevi Upadhyayula
22	Apparatus for Making Silk Fiber Based Lamellar Biomaterials to Solve Problem of Lower Back Pain	Maumita Bhattacharjee	Indian Institute of Technology, Delhi	Dr. Sourabh Ghosh, Prof. Alok R Ray
GYTI Appreciation 2013				
23	Ambulatory Health Network App	Jayesh Vrujlal Khasatiya	Narnarayan Shastri Institute of Technology, Jetalpur	Prof. Ankita Shah
24	Re-Arranging Unused Contacts in Mobile Phones for Quick Access	Bala Vishnu R	Kongu Engineering College	Prof. P. Natesan
25	Development Bamboo-Epoxy Nano Composites for Manufacturing of Helmets and Other Structural Applications	Vivek Kumar	Indian Institute of Technology, Delhi	Dr. Sanat Mohanty
26	Mosquitocidal Endotoxin from Vellore Poultry Farm Wastes	Bishwambhar Mishra	VIT University, Vellore	Dr. Suneetha Vuppu
27	Sancharak: A Cell-Phone for Blind People	Rohit Bharatkumar Singh	Padmabhushan Vasantdada Patil Pratishthan College of Engineering	Dr. K. T. V. Reddy
28	Target Oriented Niosome Based Delivery of an Antitubercular Drug, Development and Characterization	Gyanendra Singh	Indian Institute of Technology, Banaras Hindu University, Varanasi	Prof. Shubhini Saraf
29	Semi-Automatic Rubber Tapping Machine	G. R. Malarmannan	Velammal College of Engineering and Technology, Madurai	Dr. P. Rajeshkanna

30	Cow Dung Based Microbial Fuel Cells (CDFCS) to Light Up Indian Villages	Vishnu Jayaprakash	University of California, Berkeley	Prof. T. S. Natarajan
31	Development of a Geo-hazard Warning Communication System	Devanjan Bhattacharya	Indian Institute of Technology, Roorkee	Dr. Jayanta Kumar Ghosh, Dr. Narendra Kumar Samadhiya
32	Prognosis of Pre-diabetes and Type 2 Diabetes Based on the Non-Invasive Estimation of Blood Glucose Using Infrared Thermography Against the Bio-Marker	Sivanandam S	SRM University	Dr. M. Anburajan
33	Saree Cutting Machine for Mat Making Handlooms	Alapkshirsagar	Indian Institute of Technology, Bombay	Prof.Suhas Joshi
34	Hybrid Classifier for Marine Vessel Based on Propulsion	Piyush Aggarwal	Jaypee Institute of Information Technology University, Noida	Prof. Mukta Goyal
35	Design of A Smart Automotive Ventilation System for Parked Vehicles	Gaurav Kumar Jaiswal	Vellore Institute of Technology, Vellore	Dr. Vasudevan R.
36	Snippets-Memory Aid for People With Disability	Devender Goyal	Indian Institute of Technology, Hyderabad	Kshitij Marwah
37	Graphics Model for Power Systems in CIM Framework and Design of Online Web-Based Network Visualizations and Integration of Control Center Applications	Gelli Ravi Kumar	Indian Institute of Technology, Bombay	Prof. S. A. Khaparde
38	Cross Linked Antibaterial Hydrogel	Mr. Chakavala Soyeb Rafikbhai	Anand Pharmacy College	Dr. Nirav V Patel, Dr. Tejal R. Gandhi
39	Robotic Dredger	Amit Dinanath Maurya	Indian Institute of Technology, Bombay	C. Amarnath
40	Comprehensive Protection from Electrocution	RAMDAS M U	Vidya Academy of Science and Technology, Thrissur	Dr. Sudha Balagopalan, Prof. Mary P Varghese

41	High Performance Cooking Stove	Mayur Rastogi	Indian Institute of Technology, Kharagpur	Prof. S Ray
42	Self-Cleaning Functional Molecular Material	M. B. Avinash	JNCASR	T. Govindaraju
GYTI Award 2014				
1	Performance Enhancement of Microthruster Using Nano-Engineered MEMS Structure for Long Term Space Mission	Pijus Kundu	Indian Institute of Technology, Kharagpur	Prof. T. K. Bhattacharyya, Prof. Soumen Das
2	Parichaya - A Low-Cost Medical Device to Increase Adherence Among Tuberculosis Patients in Rural Assam	Himanshu Seth	Indian Institute of Technology, Guwahati	Prof. Keyur Sorathia
3	A Simple and Cost Effective Retrofitting to Improve the Thermal and Combustion Performance of Traditional Cook Stoves	Vijay Hanmant Honkalaskar	Indian Institute of Technology, Bombay	Prof. Upendra Bhandarkar
4	Bio Mimicked Polymer Surfaces Exhibiting Super Hydrophobic and Anti-Reflective Properties	Srinadh Mattaparthi	Indian Institute of Technology, Hyderabad	Prof. Chandra Shekhar Sharma
5	A Low Cost Cardiovascular Diagnostic Instrument for Rural Healthcare	Sushanth Poojary	Indian Institute of Technology, Bombay	Prof. Santosh Noronha
6	Low-Cost Diagnosis of Pneumonia	Abhishek Khanolkar	Indian Institute of Technology, Madras	Vikram Shete
7	Development and Pilot Testing of Nano-Sized Tio2 Based Photocatalytic Oxidation Technology for Controlling Vocs	Indramani Dhada	Indian Institute of Technology, Kanpur	Prof. Mukesh Sharma
8	Microfluidic Immunosensor	Ramchander Chepyala	Indian Institute of Technology, Kanpur	Prof. Siddhartha Panda
9	Laser Light Based Fully Computerized Automated Breast Cancer and Muscle Screening System Development	Samir Kumar Biswas	Indian Institute of Science, Bangalore	Prof. K. Rajan

10	Injectable Silk Fibroin Hydrogel for Tissue Engineering and Drug Delivery	Surojeet Das	Indian Institute of Technology, Guwahati	Dr. Biman B. Mandal
11	Fabrication of Stable Liquid Crystal Based Biosensor	Arun Prakash Upadhyay	Indian Institute of Technology, Kanpur	Dr. Sri Sivakumar
12	Paper-Pencil Based Self-Pumping and Self-Breathing Fuel Cell	Ravi Kumar Arun	CSIR-Central Mechanical Engineering Research Institute, Durgapur	Prof. Suman Chakraborty
13	Development and Evaluation of Women Friendly Vaginal in *Situ* Hydrogel for Sperm Immobilisation.	Dr. Vaishali Thakkar	Anand Pharmacy College, Anand	Dr. Tejal R. Gandhi
GYTI Appreciation 2014				
14	Voice Activated Safety App	Mithila Harish	Vellore Institute of Technology, Vellore	Prof. Monica Subashini M
15	Integrated Circuit (IC) - Based Flexible Electronic Devices and Displays (ICFEDD)	Prakash Kodali	Indian Institute of Science, Bangalore	Sanjiv Sambandan
16	Android Application for Women Safety	Akhil Aggarwal, Shubham Jindal, Siddharth Garg, Rajan Nagpal	Indian Institute of Technology, Delhi	Dr. Rajesh Prasad
17	Microwave Coplanar Sensor System for Detecting Contamination in Food Products	Makkattary Shaji	Indian Institute of Technology, Kanpur	Dr. M. J. Akhtar
18	Amsler Grid Test	Jagjeet Singh	Indian Institute of Technology, Guwahati	Anthony Vipin Das
19	Inhalable Multiparticulate Carrier Systems for Sustained and Targeted Delivery of Isoniazid	Dr. Sanjay Tiwari	Indian Institute of Technology, Varanasi	Dr. B. Mishra
20	Wireless Communication and Security System Embedded Safety Helmet	M. Sivagurunathapandian	Easwari Engineering College, Chennai	Dr. N. S. Bhuvaneswari
21	Cost Effective Vegetable Chiller for Rural Small Farmers	Vishnu Padmanaban	Amrita School of Engineering, Coimbatore	Dr. M. Elangovan

22	Jaivik Prakash: A Simple Tool for Detection of Hazardous Materials and Sanitary Condition At Rural Level	Rajeev Ranjan	CSIR-Central Food Technological Research Institute, Mysore	Prof. M. S. Thakur
23	Concept of Breaker Dipeptides and Its Application in Alzheimer's Amyloid Disruption	Nadimpally Krishna Chaitanya	Indian Institute of Technology, Guwahati	Dr. Bhubaneswar Mandal
24	3D Model Generation from 2D X-Ray Images	Vikas Dhruwdas Karade	Indian Institute of Technology, Bombay	Prof. B. Ravi
25	Identification of Safest Path Using Crime Records	Puneet Singh	Indian Institute of Technology, Kanpur	Prof. Bhiksha Raj, Prof. Rita Singh
26	Laser Technology Detects Hidden Materials: Applications to Security and Medicine	Sanchita Sil	Indian Institute of Science, Bangalore	Prof. Siva Umapathy
27	Open Source E-Mailing System for the Visually Impaired	Aakash Anuj	Indian Institute of Technology, Kharagpur	Prof. Anupam Basu
28	Development of Microbial Fuel Cells With Improved Performance	Jayesh Manohar Sonawane	Indian Institute of Technology, Bombay	Prof. Prakash Chandra Ghosh
29	Fabrication of Organic Thin Film Transistor using Single Drop of Organic or Hybrid Insulator, Conductor and Semiconductor Materials	Gunda Manideep	Indian Institute of Technology, Kanpur	Dr. Monica Katiyar
30	Adsorptive Removal of Phenolic Compounds using Mixed Matrix Membrane of Cellulose Acetate Phthalate and Alumina Nanoparticle	Raka Mukherjee	Indian Institute of Technology, Kharagpur	Prof. Sirshendu De
31	Ultra-High Actuationi a Carbon Nanotube Actuator	Prarthana Gowda	Indian Institute of Science, Bangalore	Prof Abha Mishra

32	A Transceiver for Satellite Based Communication during Emergency using TV White Spaces	Rajan Kapoor	Indian Institute of Technology, Patna	Dr. Preetam Kumar
33	Macrophage-Specific Targeting of Mannose-Functionalized Biodegradable Polymeric Nano Particles of Some Anti-Leishmanial Drugs- Development, Optimization and Efficacy Evaluation	Pramila Chaubey	Indian Institute of Technology (BHU), Varanasi	Prof. Brahmeshwar Mishra
34	Stampede Control using Image Analysis Technology	S. Vidya Sagar	Kongu Engineering College, Erode	Prof. D.Leela
35	Synthesis and Design of Indigenous Polycentric Knee for Transfemoral Prosthesis	Anand T.S.	Indian Institute of Technology, Madras	Dr. Sujatha Sreenivasan
36	Highly Stable Metallic Nano Particle-Semiconductor Hetero Structures via Click Chemistry for Photoelectro/ Photocatalytic Applications	Arun Prakash Upadhyay	Indian Institute of Technology, Kanpur	Dr. Sri Sivakumar
37	Novel Algal Bioreactor for Wastewater Treatment and Bio Fuel (Lipid) Production	Durga Madhab Mahapatra	Indian Institute of Science, Bangalore	Dr. T V Ramachandra, Dr. H N Chanakya
38	Care Mother-Mobile Pregnancy Care	Shantanu Pathak	INHS Asvini, Mumbai	Prof. Vaibhav Tidke
39	Paper and Pencil Micro Fluidic Device for Point-of-care Diagnostics	Ranabir Dey	Indian Institute of Technology, Kharagpur	Prof. Suman Chakraborty

40	Touchpad for Malignant Tumour (Epithelial) Detection and Imaging	Sritam Parashar Rout	Indian Institute of Technology (BHU), Varanasi	Prof. Anoop Jayaram
BIRAC GYTI Award 2015				
1	RIGHTBIOTIC: the Fastest Antibiotic Finder	Shivani Gupta	BITS, Pilani	Dr. Suman Kapur
2	Redefined Spoon for Parkinson's Patient	Dhyey Mayank Kumar Shah, Eepsit Tiwari, Rajesh Patidar	Indian Institute of Technology, Gandhinagar	Prof. Bhaskar Bhatt, Prof. Harish P. M.
3	Development of a Powerful New Antibiotic That Kills All Drug-Resistant Bacteria	Venkateswarlu Yarlagadda, Padma Akkapeddi, Goutham B Manjunath	Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR)	Prof. Jayanta Haldar
4	Real Time Wound Management System Wound Segmentation & Analysis using Image Processing on Mobile Platform (Android).	Abhiraj Gupta	Manipal Institute of Technology	
GYTI Award 2015				
5	Sway: the Rhythm Within	Janhavi Joshi	MIT Institute of Design, Pune	Prof. Sanjay Jain
6	Double Disk Ultrasonic Assisted Magnetic Abrasive Polishing Device	Prateek Kala	Indian Institute of Technology, Delhi	Dr. Pulak Mohan Pandey
7	Development of Shape Controlled Palladium Structures as Electrocatalysts for Fuel Cell Applications	Kranthi Kumar Maniam	Indian Institute of Technology, Madras	Dr. Raghuram Chetty
8	Reduced Converters and Brushless Generators Based Standalone Microgrid for Rural Electrification	Krishan Kant	Indian Institute of Technology, Delhi	Prof. Bhim Singh
9	Novel Nanozyme Technology for Combating Oxidative Stress Related Disorders	Amit Ashok Vernekar	Indian Institute of Science, Bengalore	Prof. G. Mugesh

10	FLEXICAST: A Breathable, Washable and Customized Cast for Immobilization of Fractured Limb	Jamdade Nikhil Kailas, Pankaj Kumar K. Chhatrala, Devanshi Saksena	Indian Institute of Science, Kanpur	
11	Novel Technique for Energy Generation Coupled With Treatment of Wastewater and Resource Recovery using E-Waste as Electrode Material in Microbial Fuel Cell	Praveena Gangadharan, Jaganathan Senthil Nathan	Indian Institute of Technology, Madras	Dr. Indumathi M Nambi
12	Evaluation of Blood Pressure and Arterial Compliance by the Radial Arterial Pulse Pressure Waveform Obtained using Fiber Bragg Grating Pulse Recorder	Sharath Umesh	Indian Institute of Science, Bangalore	Prof. Sundarrajan Asokan
13	Targeting Lymphatics to Treat HIV using Lipid Based Formulations	Rashmi Jain, Vivek Makwana, Komal Patel	B. V. Patel PERD Centre	Prof. Amita Joshi
14	TAPARCH: A Visually Challenged People Footwear	Krishna Sai	Gitam University	
15	Valproic Acid Prevents Progression of the Diabetic Nephropathy: Elucidation of Molecular Mechanisms and Proof of Concept for Promising Therapeutic Usefulness	Sabbir Khan	National Institute of Pharmaceutical Education and Research (NIPER), S.A.S. Nagar	Dr. Gopabandhu Jena
16	Gift of New Abilities	Shiva Kumar H R	Indian Institute of Science	Prof. A. G. Ramakrishnan
GYTI Appreciation 2015				
17	Recyclable Porous Sheets for Low-Cost Water Filter	Abhishek Gandhi	Indian Institute of Technology, Delhi	Prof. Naresh Bhatnagar
18	TEDKIT- an Audio Tactile Storybook for Visually Impaired Children	Ankita Gulati	Indian Institute of Technology, Delhi	Prof. M. Balakrishnan
19	Food Vending Machine for Schools	Subrahmanya Shridhar Shetty	NMAM Institute of Technology	Prof. Pradeep Kanchan

20	Nano Emulsions as a Vehicle for Delivery of Omega-3 Fatty Acids for Serum and Tissue Lipids	D. Sugasini	CSIR-Central Food Technological Research Institute	Dr. B. R. Lokesh
21	Rapid Non-Invasive Diagnostics Kits for Diabetics Patients to Check Glucose Level Thrice a day	Yadav Vijay Dukhran	Institute of Chemical Technology, Mumbai	Dr. Prajakta Dandekar Jain
22	Injection Mouldable Polymeric Composite Based Passive Polycentric Knee Joint	S. Arun	Indian Institute of Technology, Guwahati	Dr. S. Kanagaraj
23	A Novel Process to Commoditize Carbon Dioxide Gas into Fuels and High Value Nutraceuticals at Commercially Viable Scale	Dilip Singh, Preeti Mehta, Ravi P. Gupta	DBT-IOC Centre for Advance Bio Energy Research	Dr. D. K. Tuli
24	Development of X-Ray Visible Polymers via in *Situ* Iodination-Crosslinking for Non-Invasive Real Time Imaging	Paulomi Ghosh, Arun Prabhu Rameshbabu	Indian Institute of Technology, Kharagpur	Dr. Santanu Dhara
25	Affordable Power-Assist for Wheelchair	Sri Priya Kalidoss, Karthikeyan S D, Viveksarda	Indian Institute of Technology, Madras	Dr. Sujatha Srinivasan
26	Utilization of Marine Algae as Substrate and Methanogen Inhibitor in Microbial Fuel Cell	Rajesh P P	Indian Institute of Technology, Kharagpur	Prof. M. M. Ghangrekar
27	Prashamana - A Smart Hospital Bed	Toshib Bagde, Jamdade Nikhil Kailas	Indian Institute of Technology, Kanpur	Dr. Ramkumar Janakarajan
28	Linearly Polarised Planar Inverted F-Antenna for Global Positioning System and Worldwide Interoperability for Microwave Access Applications	Mayank Agarwal	Indian Institute of Technology (BHU), Varanasi	Dr. Manoj K. Meshram
29	Use of High Nutrient, Low Cost Natural Materials for Preparation of Well-Engineered Emulsions for Variety of Applications	Lad Virang Kumar Nanubhai	Sardar Vallabhbhai National Institute of Technology, Surat	Prof. Z. V. P. Murthy

30	Club foot Deformity Measuring Device	Kanwaljit Singh Khas	Indian Institute of Technology, Delhi	Dr. P. M. Pandey, Prof. Alok. R.Ray
31	Virtual Reality Based Minimally Invasive Surgical Simulator with Haptics Feedback	M.S. Raghu Prasad, Abhijit Biswas	Indian Institute of Technology, Madras	Manivannan M
32	Electrospun Cellulose Acetate Nanofibers for Female Hygiene Applications	Shital Yadav, Illa Mani Pujitha, Tulika Rastogi	Indian Institute of Technology, Hyderabad	Dr. Chandra Shekhar Sharma
33	One Drug to Cure Them All	Chandradhish Ghosh	Jawaharlal Nehru Centre for Advanced Scientific Research	Dr. Jayanta Haldar
34	Fabrication of Nano Object Imaging Probe Using Simple & Fast Hydro - Mechanical Etching Technique	Fazle Kibria	University College of Science & Technology	Rajib Chakraborty
35	Agriculture	Abitha R	Indian Institute of Science, Bangalore	Dr. H. N. Chanakya
36	Rapid Diagnosis of Brain Injury- a Novel Approach Using Citrate-Capped Gold Nano Particles	Srishti Agarwal	Indian Institute of Technology, Hyderabad	Dr. Anindya Roy
37	Biodegradable Liposau Nanoparticles for Photothermal Ablation of Cancer	Aravind Kumar Rengan, Amirali B. Bukhari	Indian Institute of Technology, Bombay	Rohit Srivastava
38	Biomechanical Investigation of Extracorporeal Irradiation and Reimplantation Therapy in Malignant Bone Tumours	Sakshi Chauhan	Indian Institute of Technology, Delhi	Dr. Anamika Prasad, Dr. Shah Allam Khan
39	Suchi - Ahvana	Pratik Raj, Deepak Nagar, Kewal Chand Swami	Indian Institute of Information Technology, Jabalpur	Pandit Dwarka Prasad Mishra

40	Development of Membrane Technology for Industrial Progress, Societal Benefit and Environmental Safety	Siddhartha Moulik, Dr. Sundergopal Sridhar, Y. V. L. Ravikumar, M. Madhumala, Dasari Manjunath	CSIR-Indian Institute of Chemical Technology	Dr. S. Sridhar
41	Methane Sensing Module: from Concept to Prototype	Anwesha Mukherjee, Pavan Kumar R, Goutam Prasannakar, Sanjay Rao A, Vaibhav V Rao	Indian Institute of Science, Bangalore	Dr. Abha Misra
42	Energy Efficient Robust Controller for Autonomous Underwater Vehicle	Meenakshi Sarkar	CSIR - Central Mechanical Engineering Research Institute	Dr. Sambhunath Nandy
43	Inch Worm Mechanism for Solar Panel Cleaning Robot	Bhivraj Suthar	Indian Institute of Technology, Delhi	Prof. Sudipto Mukherjee
BIRAC GYTI Award 2016				
1	Simple Low-Cost Bioactive Titanium Foam via Novel Route for Skeletal Tissue reunion	Kausik Kapat	Indian Institute of Technology, Kharagpur	Prof. Santanu Dhara
2	Flexible Biodegradable Anti-microbial New Advanced form of Intra Uterine Contraceptive device (IUCD)	Bhuvaneshwaran Subramanian, Selvakumar M Dibyendu Gouri	Indian Institute of Technology, Kharagpur	Dr. Sujoy K Guha
3	Automated Opto-Fluidic Microscope for Cellular Diagnostic Testing	Veerendra Kalyan Jagannadh, Jayesh V. Adhikari, Albina L. Nirupa, Rashmi S, Bindu Bhat	Indian Institute of Science, Bangalore, Karnataka	Dr. Sai Siva Gorthi

4	3D Printed Hydroxyapatite Tray for Segmental Mandibular Bone Reconstruction by Stem Cell Delivery for Oral Cancer Patients	Sanskrita Das, Dr. Praveshmehra	Indian Institute of Technology, Delhi	Dr. Sourabh Ghosh
5	Nstomoz – Vascular Anastomosis Assist Device	Anand Parikh	Indian Institute of Technology, Madras	Prof. Venkatesh Balasubr Amanian, Dr. V B Narayanamurthy
6	Wearable Drug Delivery Device Based on Microneedles for Efficient Management of Chemotherapy Induced Nausea and Vomiting (CINV) and Nausea and Vomiting in Pregnancy(NVP)	Bhushan N Kharbikar	Indian Institute of Technology, Bombay	Prof. Rohit Srivastava
7	Automatic Urine and Fecal Disposal System	Neenu Jose, Athul K.Raj, Athira K.R, Neenu P	Sahrdaya College of Engineering and Technology	Prof. Jinu Sebastian
8	Device for Intrapartum Materno-Fetalcare	Vichal P M	BMS College of Engineering, Visvesvaraya	Prof. Appaji M Abhishek
9	Rapid Endotoxin Entrapment and Detection on Surface- Engineered Glass Substrates	Sachin Kumar, Prasanta Kalita, Ruchika Sharma, Nitish Goel	Indian Institute of Technology, Delhi	Dr. Shalini Gupta
10	Near Infra-Red Light Activable Iron(III) Complex as a Remarkable and Organelle-Targeted Anti - Cancer Agent for the Photodynamic Therapy Application	Aditya Garai	Indian Institute of Science, Bangalore	Prof. A. R. Chakravarty

11	Energy Efficient Combined Process of Microbial Fuel Cell (MFC) and Membrane Bioreactor (MBR) for High Efficiency and Reliable Treatment of Organic Waste Water	Sreemoyee Ghosh Ray, Gourav Dhar Bhowmick	Indian Institute of Technology, Kharagpur	Prof. M. M. Ghangrekar
12	A Novel Compound Restores Obsolete Antibiotics to NDM-1Superbugs	Divakara SS Murthy, Uppu, Goutham B Manjunath, Padma Akkapeddi	Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR)	Prof. Jayanta Haldar
13	Development of a Novel, Non- Biological Pyrogen/Micro Cellular Components Detection Technique for Purification and Dehydrogenation of Water.	Yadav Vijay Dukhran, Rohan Chhabra, Nikhil Kalane, Anomitra Dey, Tejal Pant, Ratnesh Jain	Institute of Chemical Technology, Mumbai	Dr. Prajakta Dandekar Jain
14	A Compact Microwave Sensor for Characterization of Radomes and Dielectric Signature Detection of Materials in 3G and 4G GSM Bands	Abhishek Kumar Jha	Indian Institute of Technology, Kanpur	Dr. M. J. Akhtar
15	Development of Portable Device Based on Polarized Fluorescence for Detection of Cervical Pre- Cancer	Bharat Lal Meena, Seema Devi, Asima Pradhan, Kiran Pandey, Asha Agrawal	India Institute of Technology, Kanpur	Prof. Asima Prdhan
GYTI Awards 2016				
16	X-Niff: Microcantilever Based Electronic-Nose Platform for Airborne Chemical Vapor Sensing	Gaurav Gupta, Vijay Shrinivas Palaparthy,Shambhulingayya Ningayya Doddapujar, Pallabi Das	Indian Institute of Technology, Bombay	Prof. Valipe Ramgopal Rao
17	Design of an Innovative Retrofitted Tricycle for a Disabled Person	Pushkaraj Sonawane	Maharashtra Institute of Technology, Pune	Prof. Pushkaraj D. Sonawane, Prof. Sandip T. Chavan

18	Soya Nuggets - A Novel Drug Delivery Vehicle	Utkarsh Bhutani	Indian Institute of Technology, Hyderabad	Dr. Saptarshi Majumdar
Hari Om Ashram Prerit Dr. Amulya K.N. Reddy GYTI Award 2016				
19	Air - Assisted Electrostatic Sprayer (AAESS)	Manoj Kumar Patel	Academy of Scientific and Innovative Research (Acsir-CSIO), Chandigarh	Prof. C. Ghanshyam
20	High Altitude Wind Energy using Kite - a Revolution in Renewable Energy	Roystan Vijay Castelino	Srinivas Institute of Technology, Merlapadavu, Mangaluru	Prof. Lokesh B
21	Low Cost Sanitary Napkin Disposal Machine	Aiswarya Paramadathil	Adi Shankara Institute of Engineering and Technology	
22	Design and Development of Semi-Automatic Flower Knotting Device	C. Cornelius Durai, S. Lakshmana Raja, S. Sriram	Velammal College of Engineering and Technology	Dr. G. Senthil Kumar
23	Automatic Sugarcane Juicer	Nilkantha Dashrath Gadakh	K. K. Wagh Institute of Engineering Education and Research, Nashik	
GYTI Appreciation 2016				
24	An Indigenous Oxygen Dosing Device to Conserve Oxygen using Patient Monitoring system	Srividhya Sakthi	Sri Ramakrishna Engineering College	
25	Neuronal Cells Produced from Non-Neuronal Cell Line using Walnut Oil	Dr. Varsha Singh	Chitkara University	
26	Cost Effective Self-Stabilizing Smart Hand Held Platform (Spoon/Pen) for Elderly or Parkinson's Disease Patients	Debjyoti Chowdhury	Heritage Institute of Technology	Dr. Madhurima Chatto Padhyay
27	Paper Microfluidic Chip	Avisekbarla Sameer Sharma	Indian Institute of Technology Madras	

28	Multimechanist Ic Polymer Based Novel Drug elutingstent coating	Dr. Govindakapusetti, Ms. Shiva Kalyaniadepu	National Institute of Pharmaceutical Education and Research, Ahmedabad	Prof. Kiran Kalia
29	Harnessing Micro Air Jets for Spraying Viscous Non- Newtonian Fuels	Manisha B. Padwal, Prof. D. P. Mishra	Indian Institute of Technology, Kanpur	Prof. D. P. Mishra
30	Paper Based Resistive Touch- Pad for Electronic Applications	Mitradip Bhattacharjee	Indian Institute of Technology, Guwahati	Dr. Dipankar Bandyopa Dhyay
31	Nano Material Based Flexible Aqueous Power Cell for Energy Conversion and Storage(Self-Charging and Flexible Aqueous Power- cell)	Vinay Gangaraju	Visvesvaraya Technological University	Prof. Dinesh Rangappa, Dr. D. S. Prasanna
32	Handicap Support Device	Vishrut Bhatt, Sumanth Mudaliar, Joshi Ashay, Dave Kaushal	L J Polytechnic	Prof. Harshul Bhrambhatt
33	Biobased Adhesive Formulation for Construction Applications	Neelima Tripathi	Indian Institute of Technology, Guwahati	Dr. Vimal Katiyar
34	Checkit – a Low Cost Mobile OMR System	Rahul Patel	Institute of Engineering & Technology	Prof. Mehul Raval, Prof. Dhruv Gupta
35	Green Flexible Conducting Paper from Edible Bacteria Derived 3D Nanocellulose Matrixand Polyaniline	Divya Anand	Indian Institute of Technology, Hyderabad	Dr. Mudrika Khandelwal
36	Latex (Natural Rubber) Carry Backpack	Ajin Omanakuttan	Amal Jyothi College of Engineering, Kanjirappally	Prof. Abi Varghese
37	Bio-Inspired Flapping Near Surface Underwater Vehicle	Mannam Naga Praveen Babu	Indian Institute of Technology, Madras	Prof. Krishnankutty. P
38	E-Droid Meter	Bitu C. Ghoniya, Shruti B. Patel, Jigisha M. Karangiya, Jinal N. Modi	Sarvajanik College of Engineering & Technology	Urmi Desai

39	Design and Development of Multipurpose Electric Cycle	Patel Krunal, Brijesh Patel, Prashant Solanki, Jigar Parmar	Shri Satasangi Saketdham	Sandip Godse
40	Cost Effective Mechanical Testing Equipment for Characterising Creep Behaviour of Materials under Combined Tension-Torsion Loading	Vineesh K P	Indian Institute of Technology, Kharagpur	Prof. Vikranth Racherla
41	Application of Nano Material to Analyze the Strength of Concrete	Dhrafani Ishita Mayurkumar	College of Engineering, Rajkot	Prof. Hitesh Rameshchandra Ashani
42	Msleep - Measure Your Sleep	Shuchita Gupta, Yashovardhan Sharma	Indraprastha Institute of Information Technology, Delhi	Dr. Vinayak Naik
43	Straut AERO : Solar Industrial Hot Air Generator	Sharad Parekh	Universal College of Engineering & Technology	Dr. Nilesh Bhatt
BIRAC GYTI Award 2017				
1	White Light Emission from Vegetable Extracts	Dr. Vikram Singh	Indian Institutes of Technology, Madras	Prof. Ashok Kumar Mishra
2	Rotary Ultrasonic Bone Drilling	Dr. Vishal Gupta	Indian Institutes of Technology, Delhi	Dr. Pulak M. Pandey
3	A Novel Hybrid System for Textile Dye Waste Water Treatment.	Bhaskar Bethi	National Institute of Technology, Warangal	Dr. Shirish Hari Sonawane
4	Revealed: Dual Functional Characteristics of Escherichia Coli Outer Membrane Protein Wzi and Its Implications in the Design of Novel Antibiotics	Shivangi Sachdeva, Narendar Kolimi	Indian Institutes of Technology, Hyderabad	Dr. Thenmalarchelvi Rathinavelan

5	Targeted Theranostic Nanomedicines for Brain Cancer Therapy	Sonali, Rahul Pratap Singh, Poornima Agrawal	Banaras Hindu University, Varanasi	Dr. M.S. Muthu, Prof. B. L. Pandey
6	Blood Quality Assessment using Digital Holographic Microscopy	Mandeep Singh, Azhar Muneer	Indian Institutes of Technology, Delhi	Dr. Kedar Khare, Dr. Sarita Ahlawat
7	STERI-FREEZ: Flash Freeze Sterilization	Saugandha Das, Archit Devarajan	Institute of Chemical Technology, Mumbai & Ramnivas Ruia Junior College, Mumbai	Prof. Padma V. Devarajan, Prof. Vasihali Kavishwar
8	Prophylactic Transdermal Patch Against Neurotoxin Poisoning in Biological Warfare Situations.	Subham Banerjee	Defence Research Laboratory, Tezpur & Birla Institute of Technology, Mesra.	Prof. Pronobesh Chattopadhyay, Prof. Animesh Ghosh
9	Low Cost and Field-Portable Smartphone Platform Water Testing Kit for Detection and Analysis of Contaminants in Drinking Water	Iftak Hussain, Kamal Uddin Ahamad	Tezpur University, Assam	Dr. Pabitra Nath
10	Near Infrared Fluorescence Probes for Diagnosis of Alzheimer's Disease	K Rajasekhar, Kavita Shah	Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore	Prof. T. Govindaraju
11	Low Cost Automated Handheld Melamine Detection Device (For Testing Melamine in Milk)	Dhiraj Indana, S.C.G. Kiruba Daniel, Varun S., Prateek Katare	Indian Institute of Science, Bangalore	Dr. Sai Siva Gorthi
12	Neurobuds - brain Wave Mapping Smart Earphones	Nitin Vasanth	Cochin University of Science & Technology, Kochi	Prof. Unni A M
13	Affordable and Rapid Paper-based Test Kits for Antimicrobial Susceptibility Assays	Shantimoy Kar, Tarun Agarwal, Shubhanath Behera, Varun Varma	Indian Institutes of Technology, Kharagpur	Prof. Suman Chakraborty, Prof. Tapas K. Maiti

14	Portable Biosensing Platform Based on Conducting Polymer Decorated Optical Fiber for Bacteria as well as Heavy Metal Sensing in Tap Water	Sutapa Chandra, Arvind Dhawangale, Rosna Binish	Indian Institutes of Technology, Bombay	Prof. Soumyo Mukherji
15	Affordable Kit for Cervical Cancer Detection.	Appidi Tejaswini, Syed Baseeruddin Alvi, Anurag Meena	Indian Institutes of Technology, Hyderabad and Indian Institutes of Technology, Bombay	Dr. Aravind Kumar Rengan, Dr.Rohit Srivastava
16	Non-Invasive, Point-of-care Diagnostic System for Early Detection of Oral Cancer using Digital Infrared Thermal Imaging	Manashi Chakraborty, Santanu Patsa, Nishat Anjum	Indian Institutes of Technology, Kharagpur	Dr. Sudipta Mukhopadhyay, Prof. Swapna Banerjee, Dr. Sourav Mukhopadhyay, Prof. Jay Gopal Ray
GYTI Award 2017				
16	A Virtual Reality (VR)-Based Immersive Simulator for Endoscopy Training	Shanthanu Chakravarthy	Indian Institute of Science, Bangalore	Prof. G. K. Ananthasuresh
17	Navyo-The Smart Glove	Madhav Aggarwal, Mohd. Suhail, Bhavesh Pachnanda	Delhi Technological University, Delhi	Prof.Vikas Rastogi
18	A Novel Bio-Engineering Approach to Generate an Eminent Surface Functionalized Template for the Selective Detection of Female Sex Pheromone of Certain Agriculturally Hazardous Pests	Parikshit Moitra, Deepa Bhagat, Rudra Pratap	Indian Institute of Science, Bangalore & Indian Association for the Cultivation of Science, Kolkata	Prof. Santanu Bhattacharya
19	Anubhav-An Efficient Writing Tool for Visually Impaird	Sachin N P, Vimal C	Indian Institutes of Technology, Kanpur	Prof. Shantanu Bhattacharya

20	Swayam - Passively Stabilized Communication Satellite	COEP Satellite Initiative	College of Engineering, Pune	Dr. M.Y. Khaladkar, Dr. B.B. Ahuja
21	Indigenous Technology of Soft Body Armour for Defence Applications using 3D Woven Aramid Fabrics	Animesh Laha	Indian Institutes of Technology, Delhi	Prof. Abhijit Majumdar
GYTI Appreciation 2017				
22	Affordable Paper Microfluidic Device for Blood Glucose and Cholesterol Detection	Avisek Barla,Abrar Ali Khan, Sameer Sharma, Vijay Anand, Nitish Kumar Singh	Indian Institutes of Technology, Madras	Dr. Vignesh Muthuvijayan
23	Never Ending Learning of Sound	Ankit Parag Shah, Rohan Badlani, Benjamin Elizalde, Anurag Kumar	National Institute of Technology, Surathkal	Prof. Bhiksha Raj Ramakrishnan
24	OCR++: A Robust Framework for Information Extraction from Scholarly Articles	Mayank Singh, Barnopriyo Barua, Priyank Palod, Manvi Garg, Sidhartha Satapathy, Samuel Bushi, Kumar Ayush, Krishna Sai Rohith, Tulasi Gamidi	Indian Institutes of Technology, Kharagpur	Dr. Pawan Goyal, Dr. Animesh Mukherjee
25	Paper-Based Device for Rapid Detection of Dengue	Sanjay Kumar, Pulak Bhushan	Indian Institute of Technology, Kanpur	Prof. Shantanu Bhattacharya
26	Trolley Straw Baler by Ram Compressing Mechanism with Traction Force	Ramalingam.Pl, M. Prakash, M. Prabhu, C. Logesh, Jayaprakash.P.S	Panimalar Institute of Technology, Anna University, Chennai	Prof. R.Vigithra

27	Enhancement of Distribution System Performance using HVAC Boost Converter and Fuzzy Controller	Anusha Vadde	M S Ramaiah University of Applied Sciences, Bangalore	Prof. V.S.N Sitaram Gupta .V
28	Design of A Mechanical Device (Nanorobot) for Diagnosis and Removal of Plaque from Human Heart Artery System	Mallikarjunachari G	Indian Institute of Technology, Madras	Dr. Pijush Ghosh
29	"Electrolithography"- A Novel Nano Patterning Technique using Electric Field Induced Material Transport	Santanu Talukder	Indian Institute of Science, Bangalore	Prof. Rudra Pratap, Dr. Praveen Kumar
30	Cost Effective Inspection System for Automated Large Scale Cocoon Quality Assessment	Prasobh Kumar P. P.	Indian Institute of Science, Bangalore	Dr. Sai Siva Gorthi, Prof. C. R. Francis
31	Industrial Production of Poly (Lactic Acid) Based Biodegradable Films with Highly Improved Gas Barrier Properties for Food Packaging Application: A Potential Candidate to Replace Conventional Synthetic Polymers	Akhilesh Kumar Pal	Indian Institutes of Technology, Guwahati	Dr. Vimal Katiyar
32	Fish Inspired Propulsion for Remotely Operated Surface Ships and Underwater Vehicles	Mannam Naga Praveen Babu	Indian Institutes of Technology, Madras	Prof. P. Krishnankutty
33	Development and Characterization of Smart Nanocarriers for Oral Insulin Delivery	Ashish Kumar Agrawal	National Institute of Pharmaceutical Education and Research, Mohali	Prof. Sanyog Jain
34	Design & Development of Automated Five Axis CNC Ball End Magnetorheological Finishing Machine	Dilshad Ahmad Khan, Faiz Iqbal, Zafar Alam	Indian Institutes of Technology, Delhi	Dr. Sunil Jha
35	Grid Interactive Solar PV Based Water Pumping using BLDC Motor Drive	Rajan Kumar	Indian Institutes of Technology, Delhi	Prof. Bhim Singh

36	A Mechanism for Toilet Seat Sanitation	Arvind Pujari, D V S S Skushal Kumar Reddy, Shashwat Jain, Subham Kumar Sahana, Tanay Garg	Indian Institutes of Technology, Madras	Dr. Anil Prabhakar
37	Design of Highly Efficient and Inexpensive Membrane Equipment as Import Substitutes for Demineralized Water Production and Hemodialysis	Harsha Nagar, Shaik Nazia, M. Madhumala, Y.V.L. Ravi Kumar	CSIR-Indian Institute of Chemical Technology, Hyderabad	Dr. S. Sridhar
38	Portable Geo-Specific Water Filtration Bottle	Ramesh Kumar, Anupam Chandra	Indian Institutes of Technology, Madras	Prof. Thalappil Pradeep
BIRAC GYTI Award 2018				
1	Point of Care Nano Diagnostic Kit for Brucellosis	Rohit Shivaji Pawar	Institute of Chemical Technology	Prof. Vandana B. Patravale
2	Miniaturized Fluorescence Adapter for Fluorescence Sputum Smear Microscopy using Bright - Field Microscope	Vikas Pandey	Indian Institutes of Technology Delhi	Dr. Ravikrishnan Elangovan
3	A Multipurpose Low Cost Biological Air Purifier	Mrs. Neeta Ganesh Wagle	Dr. D.Y. Patil Vidyapeeth	Prof. Neelu N. Nawani
4	Nano Spermviricide: A Dual Acting Aid for Prevention of Unintended Pregnancy and Unprotected Sexual Intercourse Associated HIV	Amit Mirani	Institute of Chemical Technology	Prof. Vandana B. Patravale
5	A Low-Cost Disposable Microfluidic Biochip for Malaria Diagnosis	Brince Paul K	Indian Institutes of Technology Hyderabad	Dr. Shiv Govind Singh
6	Smartphone-Based Impedimetric Disposable Biosensor for Detection of Cardiac Biomarkers	Debasmita Mondal, Sourabh Agrawal	Indian Institutes of Technology, Bombay	Prof. Soumyo Mukherji

7	Decellularized Corneal Matrix (DCM) Based Injectable Hydrogel for Strengthening Cornea Matrix in Severe Corneal Keratoconus	Shibu Chameettachal	Indian Institutes of Technology, Hyderabad	Dr. Falguni Pati
8	Super Resolution Ultrasonic Imaging (SUI)	Kiran Kumar Amireddy	Indian Institutes of Technology, Madras	Dr. Krishnan Balasubramanian, Dr. Prabhu Rajagopal
9	Understanding the Design Principles of Protein Nanosensor to Combat Multidrug Resistant Enterobacteriaceae	Abhishek Narayan	Indian Institutes of Technology, Madras	Dr. Athi Narayanan N
10	A Novel Strategy to Block Malaria Transmission	Divya Beri	Indian Institute of Science	Prof. Utpal Tatu
11	Design and Development of Phase Change Material (PCM) Based Milking Cum Cooling Pail	Ravi Prakash	National Dairy Research Institute	Dr. Menon Rekha Ravindra, Dr. M. Manjunatha
12	An Alternative Technology to Produce Biomass-Based Food Grade Flavors, Fuels and Value Added Chemicals	Shelaka Gupta	Indian Institutes of Technology, Delhi	Dr. M. Ali Haider
13	Nano Based Soil Conditioner for Agricultural Application	Pallabi Das, Kasturi Sarmah	Tezpur University	Dr. Sanjay Pratihar, Dr. Satya Sundar Bhattacharya
14	SNAP - A RAW Images' Based Setup that can Calculate Nutrient Concentration in Leaves	Ekdeep Singh Lubana	Indian Institutes of Technology, Bombay	Dr. Maryam Shojaei Baghini
15	Rolling Water Purifier - Roll Pure	Ramesh Kumar	Indian Institutes of Technology, Madras	Prof. T. Pradeep
GYTI Award 2018				
16	Battery-less Iot Sensing Nodes	Anandarup Mukherjee	Indian Institutes of Technology, Kharagpur	Dr. Sudip Misra

17	Road Accident Detection using Perceptual Attributes of Video	Sinnu Susan Thomas	Indian Institutes of Technology, Kanpur	Prof. Sumana Gupta, Prof. Venkatesh K. S.
18	Feasibility Study of Wireless Power Transfer using Metamaterial	Amit Kumar Baghel	Indian Institutes of Technology, Guwahati	Sisir Kumar Nayak
19	Design of Low Cost Infrared Vein Detector	Trivikram Annamalai	Institute of Chemical Technology	Prof. Purba Joshi, Prof. B. K. Chakravarthy
20	Window Solar Cooker	Avinash Prabhune	Indian Institutes of Technology, Hydrabad	Prof. B. K. Chakravarthy
21	Magnetic Tool for Nano Finishing the Holes, Vertical and Horizontal Surfaces	Girish Verma	Indian Institutes of Technology, Delhi	Prof. Pulak Mohan Pandey
22	Origgon - A Social Search Engine	Abhik Saha, Harshit Jain	Indian Institutes of Technology, Hydrabad	
23	A Novel Low Cost Polyvinyl Alcohol-Nafion-Borosilicate Membrane Separator for Microbial Fuel Cell Treating Distillery Wastewater	Bikash Ranjan Tiwari		Prof. M. M. Ghangrekar
GYTI Appreciation 2018				
24	3D Bioprinted Skin Scar Model for Drug and Cosmetic Testing	Shikha Chawla	Indian Institutes of Technology, Delhi	Dr. Sourabh Ghosh
25	A Non-Contact Optical Device for Online Multiplexed Monitoring of Diseases of Military Importance in Fragile and Conflict-Affected Settings	Probir Kumar Sarkar	Indian Institutes of Technology, Delhi	Prof. Samir Kumar Pal
26	Performance Evaluation and Process Optimization for Production of Ready-to-eat Therapeutic Food Paste in Pilot Scale Unit	Rakesh Kumar Raigar	Indian Institutes of Technology, Kharagpur	Prof. H N Mishra

27	3D-Nus: A Web Server for Automated Modeling and Visualization of Non-Canonical 3-Dimensional Nucleic Acid Structures	L Ponoop Prasad Patro	Indian Institutes of Technology, Hyderabad	Dr. Thenmalarchelvi Rathinavelan
28	Eco-Friendly Water Retention Natural Polymer	Narayan Lal Gurjar	Maharana Pratap University of Agriculture & Technology	Prof. S. M. Mathur
29	New Generation Periscope Fruit Picking Device	Tania Dutta	Birla Institute of Technology &Science	
30	Nano-Biosensor and Methods for Detecting Potassium Ion Concentration	Jaymin Kanubhai Jadav	Junagarh Agricultural University	Dr. B. A. Golakiya
31	Development of Graphene Coated Conductive Fabrics Based Smart Wearable Body Warmers for Defense and Medical Applications	Nagarjuna Neella	Indian Institute of Science, Bangalore	Prof. K. Rajanna
32	Buzzing Band	Saka Naveena	Jawaharlal Nehru Technological University	Ravuri Viswanadhan
33	Brain Wave Nerve Excitation for Physically Disabled	Sarath S, Shilpa M Biju, Nanda Kiran, Hridhya Jolly K, Shilpa P Prasad, Midhun Raj, Sachin Suresh	A.P.J. Abdul Kalam Technological University	Dr. Sunil Jacob
34	A Computational Alternative to Analyze and Understand Ebola Virus Pathogenesis in Human	Abantika Pal	Indian Institutes of Technology, Kharagpur	Dr. Pralay Mitra
35	Open Source Augmented Reality Wearable Smart Assist Device for Blind	Sarang Nerkar		Prof. Steve Mann
36	White Cane - A Virtual Assistant for the Visually Impaired	Barnopriyo Barua	Indian Institutes of Technology, Kharagpur	
37	Rapid Cervical Cancer Detection Using Neuromorphic Hardware	Narayani Bhatia	Indian Institutes of Technology, Delhi	Dr. Manan Suri

38	Design and Development of Intelligent and Robust Grid Integrated Solar PV System With Improved Power Quality for Roof Top Applications Especially for Abnormal Indian Distribution Feeder	Amresh Kumar Singh	Indian Institutes of Technology, Delhi	Prof. Bhim Singh
39	Cerium Impregnated Activated Carbon Composite As A Filtering Material for Fluoride Removal from Groundwater	Mahipal	Indian Institutes of Technology, Patna	Dr. Trishikhi Ray Choudhury
40	Loco-Pilot Vision Enhancement System: TRINETRA (Third Eye) for Indian Railways	Anand Kumar K.S.	Indian Institutes of Technology (BHU), Varanasi	Dr. R. K. Saket, Dr. R. Rajendran
41	Katha	Ritika Singh		Koumudi Patil
42	Aadharv - A Multi Utility Assistive Device for Elders and People With Mobility Impairment	Vimal C	Indian Institutes of Technology, Kanpur	Dr. J. Ramkumar
43	Augmentative Rehabilitation of SCI and Stroke Patients	Kashif Sherwani		Dr. Neelesh Kumar
44	Detection of Hydrocarbons by Laser Assisted Paper Spray Ionization Mass Spectrometry (LAPSIMS)	Pallab Basuri	Indian Institutes of Technology, Madras	Prof. T. Pradeep
45	An Indigenous Technology for Development of Cost-Effective and Energy-Efficient Engine Intake Air Filters	Ajay Kumar Maddineni	Indian Institutes of Technology, Delhi	Prof. Dipayan Das
46	Smartphone Based Portable Low-Cost Continuous Wave Doppler Ultrasound System	Biswabandhu Jana	Indian Institutes of Technology, Kharagpur	Prof. Swapna Banerjee, Prof. Goutam Saha
47	SIT: Smell Your Health	P. Sri Lekha	Jawaharlal Nehru Technological University	Dr. Pushpa Kotipalli
48	On Board Diagnostic Data Analysis System (OBDAS)	Archit Agarwal	University of Petroleum and Energy Studies	Dr. Rajesh Singh

49	NOWAH (No Waste At Household) Technology - A Novel, Sustainable, Smart and Complete Treatment Technology for Both Faecal Sludge and Organic Waste Management	Anu Rachel Thomas	Indian Institutes of Technology, Madras	Prof. Ligy Philip
50	Bioelectric Toilet: A Novel Approach for Treatment of Human Waste and Generating Onsite Electricity for Lighting Toilets	Indrasis Das	Indian Institutes of Technology, Kharagpur	Prof. M. M. Ghangrekar
SITARE Award 2019				
1	Novel Hybrid Technology for Bioseparation	Jayeshkumar Sevantilal Mevada	Institute of Chemical Technology, Mumbai	Prof. Aniruddha B. Pandit
2	Development of Engineered E.coli for High-Throughput Drug Screening Against Malaria and Kala-azar	Preeti Yadav	Jawaharlal Nehru University, Delhi	Dr.Shailja Singh, Dr. Swati Garg, Dr.Soumyapati
3	Anti-Pesticide Dermal Gel	Ketan Thorat, Subhashini Pandey	Institute for Stem Cell Biology and Regenerative Medicine, Bangalore	Dr. Praveen Kumar Vemula, Dr. Sandeep Chandrashekharappa
4	Yog-I - an Affordable Insulin Pump for Type-1 Diabetic Patients in Resource Constrained Settings	Deval Karia, Rohit S. Nambiar	Indian Institute of Science, Bangalore	Dr. Manish Arora
5	Magnetic-Field Actuated Hybrid Nanofiber Scaffold and Apparatus for 4D Tissue Engineering	Uday Kumar Sukumar, Vinay Kumar	Indian Institute of Technology, Roorkee	Dr. P. Gopinath
6	Modernization of Traditional Anti-Malarial Drug Artesunate via Nanomedicine Approach.	Deepika Kannan, Nisha Yadav	Shiv Nadar University, Uttar Pradesh	Dr. Shailja Singh, Dr. Bimlesh Lochab, Dr. Soumya Pati

7	Revelation of G-Quadruplex Formation as a Molecular Basis of Fragile X Tremor/Ataxia Syndrome (FXTAS) Leads to a New Direction in the Drug Discovery	Yogeeshwar Ajjugal, Narendar Kolimi	Indian Institute of Technology, Hyderabad	Dr. Thenmalarchelvi Rathinavelan
8	Low-Cost, Easy-To-Use, In-house Developed Electric Cell Impedance Sensing (ECIS) System for Studying the Dynamic Behaviour of the Biological Cell	Uvanesh K Asiviswanathan	Indian Institute of Technology (Banaras Hindu University), Varanasi	Prof. Neeraj Sharma, Dr. Sanjeev Kumar Mahto
9	Growth Factor Free Strategy for Therapeutic Neo-Vascularization	Shivam Chandel, Abel Arul Nathan S	Indian Institute of Technology, Madras	Dr. Madhulika Dixit
10	Real Time Surrogate Visual Tracking of Lung Tumours for Effective Radiotherapy	Priya Singh, Darshan Ramesh Shet	Indian Institute of Technology, Kanpur	Prof. Venkatesh K Subramanian
11	Patient-Specific Spheroid-on-chip for Cancer Treatment: Combinatory Drug Screening	Sharanya Sankar, Viraj Mehta	Indian Institute of Technology, Hyderabad	Dr. Subha Narayan Rath
12	Pneumatic Damping Prosthetic Leg for Above-Knee Amputees	Muhammed Janish U, Abhijitnath A	MES College of Engineering, Kuttippuram	Prof. Padmakumar K
13	Actin Mimetic ATP Driven Controlled Supra molecular Polymerization	Ananya Mishra	Jawaharlal Nehru Centre for Advanced Scientific Research, Banglore	Prof. Subi J. George
14	Image Analyzing Drying Patterns of Blood and Plasma Droplets for the Rapid Detection of Thalassaemia Carriers	Manikuntala Mukhopadhyay, Rudra Ray	Indian Institute of Technology, Kharagpur	Prof. Sunando Das Gupta, Prof. Maitreyee Bhattacharya
15	Development of Rapid and Non-Destructive Method for Detection of Insect Infestation in Stored Cereal Grains	Gayatri Mishra, Ranjana Rani	Indian Institute of Technology, Kharagpur	Dr. H N Mishra, Prof. Shubhangi Srivastava

GYTI Award 2019				
16	Utilisation of Real-World Waste Plastic for the Production of Fuel Range Liquid Hydrocarbons using Two-step Approach	Uma Dwivedi	Indian Institute of Technology, Delhi	Prof. K. K. Pant, Prof. S. K. Naik
17	Non- Catalytic Deep Desulfurization Process using Hydrodynamic Cavitation	Nalinee B. Suryawanshi	CSIR-National Chemical Laboratory, Pune (CSIR-NCL)	Dr. Vinay M. Bhandari
18	Dual Action of SPIONS in Effective Removal of Heavy Metals and Mosquito Larvae from Water.	Roshini S. M, Karthika M, Lavanya Agnes Angalene J.	Sathyabama Institute of Science and Technology, Chennai	Dr. Antony V Samrot
19	Formic Acid-powered Ferrobots for Clean Energy Technology	Amit Kumar Singh, Saptak Rarotra, Viswanath Pasumarthi	Indian Institute of Technology, Guwahati	Prof. Dipankar Bandyopadhyay, Prof. Tapas Kumar Mandal
20	Early Diagnosis of Osteoporosis using Metacarpal Radiogrammetry and Texture Analysis	Anu Shaju Areeckal	National Institute of Technology, Surathkal	Prof. Suman David S
21	Novel and Eco-friendly Light Weight Thermal Insulating Ceramics from Thermal Power Plant Waste	Yogesh D. Urunkar, Chandrakant S. Bhogle	Institute of Chemical Technology, Mumbai	Prof. Aniruddha B. Pandit, Prof. J.B. Joshi
GYTI Appreciation 2019				
22	Artificial Biomarkers of Knee Osteoarthritis	Nikhil Gupta	Indian Institute of Technology, Delhi	Prof. Tapan Kumar Ghandhi, Dr. Alok Prasad
23	Developing Labscale Magneto-Mechanical Experimental Setup to Predict the Plaque Growth of Human Heart Coronary Arterial Layer System	Mallikarjunareddy Reddy Boreddy	Madanapalle Institute of Technology and Science, Andhra Pradesh	Dr. Mallikarjunachari G

24	Development of Low Grain Arsenic Rice by the Fungal Arsenic Methyltransferase Via Bio-Volatilization	Shikha Verma, Pankaj Kumar Verma	CSIR - National Botanical Research Institute, Lucknow	Dr. Debasis Chakrabarty
25	Towards Application of Helical Nanorobots for Biomedical Applications.	Malay Pal, Debayan Dasgupta, Arijit Ghosh, Neha Somalwar	Indian Institute of Science, Bangalore	Prof. Ambarish Ghosh, Dr. Deepak K Saini, Prof.Ramray Bhatt
26	Development of Improved Biocatalysts for D-allulose Production Utilizing the Low-Cost Agro-Industrial Residues	Satya Narayan Patel	Center of Innovative and Applied Bioprocessing, Punjab	Dr. Sudhir P. Singh
27	Design and Development of Interlock Mechanism Based Bio-compatible, User-Friendly and Cost-effective Elbow Disarticulation Prosthesis	Mrutyunjay Maharana, Bhabani Shankar Nayak	Indian Institute of Technology Guwahati & All India Institute of Physical Medicine and Rehabilitation(AIIPMR), Mumbai	Dr. Sisir Kumar Nayak, Prof. Deepak P. Prabhu
28	Production of Effective and Low Cost Dapsone-Phytochemical Hybrid Candidate for use in Multidrug Therapy Against Mycobacterium Leprae	Shasank Sekhar Swain	Institute of Medical Sciences and Sum Hospital (IMS and Sum Hospital), Bhubaneswar	Prof. Rabindra Nath Padhy, Prof. P. Sudhir Kumar
29	Proteasome Activation: A Potential Drug Target for Treatment of Parkinson's Disease.	Mohd Ahsan, P Chinmai	Indian Institutes of Technology, Madras	Prof. Sanjib Senapati
30	A More Accurate Detection and Intrinsic Subtype Classification of Breast Cancer using Machine Learning.	Bikash Ranjan Samal	Indian Institute of Technology, Kharagpur	Dr. Ranjit Prasad Bahadur
31	Fighting Resistance in Cancer Cells Due to Bacterial Infections with Modular Drug Platforms: an Idea Towards Personalized Medicine	Rohini Singh	Indian Institute of Technology, Delhi	Prof. Shalini Gupta

32	Economical Paper-strip for Early Stage Mastitis Disease Detection in Cow	Harika Chappa, Avisek Barla, Navin V Narayanan, Sudip Chakraborthy, Ahila Yegappan	Sri Venkateswara Veterinary University, Tirupati	Prof. Y. Hari Babu
33	Anemia Meter	Jeethu Raveendran	Amrita Vishwa Vidyapeetham University, Coimbatore	Dr. T. G. Satheesh Babu
34	Understanding Sequence-Disorder-Function Relationship of an Intrinsically Disordered Protein to Design Soil Salinity Sensor	Sneha Munshi	Indian Institute of Technology, Madras	Dr. Athi Narayanan N
35	A Simple, Non-Invasive, Low Cost, Point of Care, Colorimetric Method, Using Reactive Oxygen Species Induced Lipid Peroxidative Changes in Saliva, to Assess the Risk of Oral Pre-cancerous Lesions and Oral Squamous Cell Carcinoma in Chronic Smokers	Nikhiya Shamsher	Greenwood High International School, Bangalore	Prof. Aloysius D'Mello
36	Multifunctional Granulator (MFG) - A Multi Functional Device to Prepare Dried Spherical Granules	Rajendra Prasad Moturu	Andhra University College of Pharmaceutica Sciences, Zisakhapatnam	Prof. K.V. Ramana Murthy
37	Audience Response Device for Deaf and Mute Classroom	Manasi Mishra	Indira Gandhi Delhi Technical University for Women	Prof. S. R N Reddy
38	Development of Process Technology for Manufacture of RTD Carbonated Grain Beverage	Anjali Thakur, Pooja Pandey	Indian Institute of Technology, Kharagpur	Dr. H N Mishra
39	Manufacture of Micronutrient Fortified Rice Kernels Through Extrusion Technology	Dalbhagat Chandrakant Genu, Jayshree Majumdar	Indian Institute of Technology, Kharagpur	Dr. H N Mishra
40	An Automated Panipuri Vending Machine	Abhijit Nath, Saurav Jyoti Sarma, Chandeep S. Gogoi	Tezpur University, Assam	Prof. Polash Pratim Dutta
41	Fibonacci Series Based Rectangular Microstrip Patch Antenna	Deven G. Patanvariya, Kalyan Sundar Kola	National Institute of Technology, Goa	Dr.Anirban Chatterjee

42	Smart Signalling and Interlocking System	S. Karthikeyan, S. Umasankar, Karthikeyan S.	M. Kumarasamy College of Engineering, Tamil Nadu	Dr. C. Ramesh
43	Bhu-Goal : Predicting Moods of India	Kartik Vij, Rahul Kinra, Rouble Gupta, Debarshi Ghosh	Chitkara University, Punjab	Dr. Nitin K. Saluja
44	Pyrophosphate and Metaphosphate as Next-generation Cathode Material for Energy Storage Devices	Ritambhara Gond, Krishnakanth Sada, Anshuman Chaupatnaik	Indian Institute of Science, Bangalore	Prof.Prabeer Barpanda

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LOW-COST ORCHARD/SANITIZER SPRAYER
INNOVATOR: DEEPAKBHAI PATEL
GRASSROOTS
.....INNOVATIONS
USED FOR SPRAYING PESTICIDES IN THE FARM BUT USED FOR SPRAYING SANITIZER DURING THE CORONA TIMES....

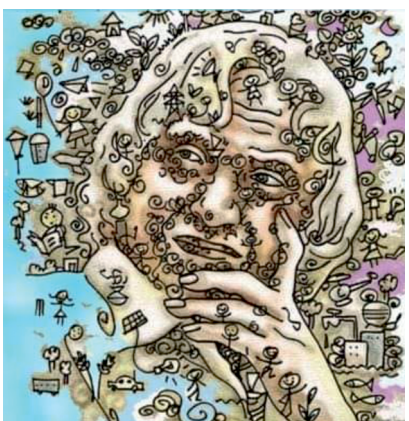
NOTES

Honey Bee Network

Dr A P J Abdul Kalam Ignited Mind Children Creativity and Innovation Awards 2021

Students are there not just to teach to, but they should be seen as a crucible of creativity in themselves.

If you have ever thought of a solution to any common, day-to-day life problems and have devised or thought of any method to solve them, and if you are a student from class 1st to 12th, then send us your innovative ideas on below address or email ID, or simply fill out the Google form given below to participate in the competition.



- A student can send more than one entry.-
- You can send a sketch or drawing of your idea/innovation with your submission, though it's not compulsory.
- If a teacher is involved with a student in devising any idea, s/he will also be awarded.
- Kindly ensure that you send your original ideas only unaided by anyone in generating the ideas. Teacher's/parent's involvement would be accepted only at the application/ designing/ prototyping stage.

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