

Indo-US Science & Technology Forum Connect

Newsletter of IUSSTF

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India-US S&T Partnership
Scaling New Heights

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From the Editor-in-Chief



As the world enters the New Year 2015, IUSSTF is moving towards completing 15 years in March. In the last 15 years, we have seen Indo-US science, technology and innovation ties getting stronger and stronger. The IUSSTF has been instrumental in supporting more than 300 bilateral workshops and training programs, over 40 virtual research & development networked centers and other bilateral activities taking the total number of our direct beneficiaries to more than 13,000! This reflects the true spirit of “*Chalein Saath Saath – Forward Together We Go*” – the new mantra for the Indo-US relationship endorsed by *President Obama* and *Prime*

Minister Modi during first visit of the latter to the United States. Their joint statement after the meeting recognizes the critical role of fundamental science and high technology cooperation in the strategic partnership, and they looked forward to renewing the Science and Technology Agreement in order to expand joint activities in innovative technology. Excerpts from their Joint Statement are covered in this issue of *Connect*.

The other major event in last few months was the *Third Indo-US Joint Commission Meeting (JCM) on Science and Technology Cooperation* in November 2015, co-chaired by *Dr. John P. Holdren, Director White House Office of Science and technology Policy (OSTP)* and *Science Advisor to the President* and *Mr. Y.S. Chowdary, Indian Minister of State for Science and Technology*. The JCM reviewed the Indo-US cooperation in all areas of science and technology and emphasized that through cooperation innovative solutions can be developed which are affordable and meets not only bilateral needs but would be of larger global good. This strengthens the decision taken by the US-India Science and Technology Endowment Fund (USI STEF) administered by IUSSTF for funding joint projects for commercializing S&T based innovations for societal benefit.

With time, the Indo-US cooperation in technology has considerably increased. Recognizing this trend, the United States was the partner country for the first time in the Technology Summit held in India in November 2014. This major event was attended by a large number of US and Indian companies and a number of very engaging sessions covering several subjects of mutual interest were held during the Summit. IUSSTF was an academic partner in this historic event and showcased its various Indo-US S&T cooperation activities implemented in the vast IUSSTF pavilion. The number of visitors to the IUSSTF pavilion and the demand for information brochures for various programmatic activities implemented by us was very encouraging. IUSSTF also organized two thematic roundtable discussion sessions on *Water* and *Clean Energy*, which were attended by a large number of experts and policy makers from the US and India. We hope that the readers will also find reports on these activities covered in this edition of *Connect*, informative and interesting.

In past issues, we had reported our efforts on women scientists and entrepreneurs. On the occasion of the JCM and the Technology Summit, IUSSTF also organized two workshops on *Women in STEM* and *Tech Women and Women Entrepreneurs* with support from the US Embassy, Department of Science and Technology, NSF, women entrepreneurs from Silicon Valley and other stakeholders. We are thankful to our stakeholders on the feed back on the report of these events.

As we were finalizing the content of this issue of *Connect*, Prof. Ashutosh Sharma from IIT Kanpur joined the Department of Science and Technology (DST) as its new Secretary. Prof. Sharma is a well-known scientist and has been associated with several of IUSSTF activities. The IUSSTF welcomes him as Secretary, DST and the Indian Co-Chair of IUSSTF Governing Board and looks forward to further enhancing our activities under his leadership.

Rajiv Sharma
Executive Director, IUSSTF

Excerpts from the Joint Statement

September 30, 2014



“The two leaders extolled the broad strategic and global partnership between the United States and India, which will continue to generate greater prosperity and security for their citizens and the world. Prime Minister Modi emphasized the priority India accords to its partnership with the United States, a principal partner in the realization of India’s rise as a responsible, influential world power. Given the shared values, people-to-people ties, and pluralistic traditions, President Obama recognized that India’s rise as a friend and partner is in the United States’ interest. They endorsed the first “Vision Statement for the Strategic Partnership” as a guide to strengthen and deepen cooperation in every sector for the benefit of global stability and people’s livelihoods over the next ten years. They committed to a new mantra for the relationship, “Chalein Saath Saath: Forward Together We Go.”

They also committed to a new partnership to advance the Prime Minister’s goal of improved access to clean water and sanitation for all. USAID, through the Urban India Water, Sanitation, and Hygiene (WASH) Alliance, will serve as knowledge partner to help leverage private and civil society innovation, expertise, and technology, such as with the Bill and Melinda Gates Foundation, to support the Prime Minister’s 500 Cities National Urban Development Mission and Clean India Campaign.

Agreeing on the need to foster innovation in a manner that promotes economic growth and job creation, the leaders committed to establish an annual high-level Intellectual Property (IP) Working Group with appropriate decision-making and technical-level meetings as part of the Trade Policy Forum. They recognized in particular the contribution of the Indian and U.S. Information Technology (IT) industry and the IT-enabled service



industry in strengthening India-U.S. trade and investment relations.

The two leaders committed to hold public-private discussions in early 2015 under the Commercial Dialogue on new areas of cooperation, including innovation in advanced manufacturing. In order to share best practices in manufacturing and work toward greater harmonization of standards, the National Institute of Standards and Technology's Manufacturing Extension Partnership program will start a dialogue with Indian counterparts.

The President also offered to support the Prime Minister to achieve his goal of preparing young Indians for 21st century jobs through new partnerships to share expertise and global standards for skills development in India, including by reinvigorating the Higher Education Dialogue.

The two leaders reaffirmed their commitment to implement fully the U.S.-India civil nuclear cooperation agreement. They established a Contact Group on advancing the implementation of civil nuclear energy cooperation in order to realize early their shared goal of delivering electricity from U.S.-built nuclear power plants in India.

Recognizing the critical importance of increasing energy access, reducing greenhouse gas emissions, and improving resilience in the face of climate change, President Obama and Prime Minister Modi agreed to a new and enhanced strategic partnership on energy security, clean energy, and climate change. They agreed to strengthen and expand the highly successful U.S.-India Partnership to Advance Clean Energy (PACE) through a series of priority initiatives, including a new

Excerpts from the Joint Statement

Energy Smart Cities Partnership to promote efficient urban energy infrastructure; a new program to scale-up renewable energy integration into India's power grid; cooperation to support India's efforts to upgrade its alternative energy institutes and to develop new innovation centers; an expansion of the Promoting Energy Access through Clean Energy (PEACE) program to unlock additional private sector investment and accelerate the deployment of cost-effective, super-efficient appliances; and the formation of a new Clean Energy Finance Forum to promote investment and trade in clean energy projects.

Both leaders are committed to working towards a successful outcome in Paris in 2015 of the conference of the UN Framework Convention on Climate Change (UNFCCC), including the creation of a new global agreement on climate change.

The leaders recalled previous bilateral and multilateral statements on the phase-down of hydrofluorocarbons (HFCs). They recognized the need to use the institutions and expertise of the Montreal Protocol to reduce consumption and production of HFCs, while continuing to report and account for the quantities reduced under the UNFCCC. They pledged to urgently arrange a meeting of their bilateral task force on HFCs prior to the next meeting of the Montreal Protocol to discuss issues such as safety, cost, and commercial access to new or alternative technologies to replace HFCs. The two sides would thereafter cooperate on next steps to tackle the challenge posed by HFCs to global warming.

They launched a new U.S.-India Partnership for Climate Resilience to advance capacity for climate adaptation planning, and a new program of work on air quality aimed at delivering benefits for climate change and human health. They also launched a new U.S.-India Climate Fellowship Program to build long-term capacity to address climate change-related issues in both countries. The President and Prime Minister instructed their senior officials to work through the U.S.-India Energy Dialogue, U.S.-India Joint Working Group on Combating Climate Change, and other relevant fora to advance these and other initiatives.

The leaders welcomed the conclusion of a Memorandum of Understanding between the Export-Import Bank and the Indian Renewable Energy Development Agency, which would make up to \$1 billion in financing available to bolster India's efforts to transition to a low-carbon and climate-resilient energy economy, while boosting U.S. renewable energy exports to India. The two leaders reiterated the importance of conserving India's precious biodiversity and agreed to explore opportunities for collaboration on national parks and wildlife conservation.

Fundamental science and high technology cooperation has been a critical pillar of the strategic partnership, the two leaders confirmed, and they looked forward to renewing the Science and Technology Agreement in order to expand joint activities in innovative technology. The Prime Minister welcomed the United States as a partner country, for the first time, at India's annual Technology Summit in November 2014. In addition, they committed to convene the ninth High Technology Cooperation Group (HTCG). They plan to launch new partnerships to source and scale innovation for the benefit of citizens in both countries and to harness innovation to solve global development challenges.

The President welcomed India's contribution and cooperation on high-energy physics and accelerator research and development with the U.S. Department of Energy. The President thanked the Prime Minister for his offer to have U.S. institutions partner with a new Indian Institute of Technology.

The two leaders exchanged congratulations on the successful entry into orbit of their respective Mars missions, which occurred two days apart. They welcomed the establishment and planned first meeting of the NASA-ISRO Mars Joint Working Group under the U.S.-India Civil Space Joint Working Group. The leaders also look forward to the successful conclusion of a new agreement to support the NASA-ISRO Synthetic Aperture Radar (NISAR) mission, to be launched in 2021.

The United States and India also intend to start a new dialogue on maintaining long-term security and sustainability of the outer space environment, including space situational awareness and collision avoidance in outer space.



The President and Prime Minister recognized the extensive ongoing cooperation in the health sector which they will put to use in preventing the spread of the Ebola virus. The President welcomed India's contribution to the UN Fund and donation of protective gear to the effort against Ebola, and thanked the Prime Minister for encouraging Indian-owned businesses in West Africa to contribute to the fight against Ebola. The Prime Minister also offered to deploy Indian expertise in the fight against Ebola, including by investing its resources in producing modelling of the spread of the disease, jointly producing rapid deployable diagnostics, and considering joint training of response personnel. The United States stands ready to amplify India's efforts to achieve a further reduction in preventable child and maternal deaths, including replicating India's successful approaches in other countries.

Text Courtesy:
 Ministry of External Affairs,
 Govt. of India
<http://mea.gov.in/bilateral-documents.htm?dtl/24051/Joint+Statement+during+the+visit+of+Prime+Minister+to+USA>

The leaders agreed to launch a new phase of the India-U.S. Vaccine Action Program to develop affordable vaccines for dengue, malaria, and tuberculosis, and the establishment of an adjuvant development center. They also agreed in principle to initiate cooperative activities to increase capacity in cancer research and patient care delivery, including by developing collaborative programs for and with India's upcoming AIIMS-National Cancer Institute. The President welcomed India's offer to take a leading role in the Global Health.

The President thanked the Prime Minister for the gracious invitation to return to the great nation of India. In conclusion, the two leaders affirmed their long-term vision for a resilient and ambitious partnership through the first Vision Statement for the Strategic Partnership, which they will hold up as the guiding framework for their governments and people.” ●

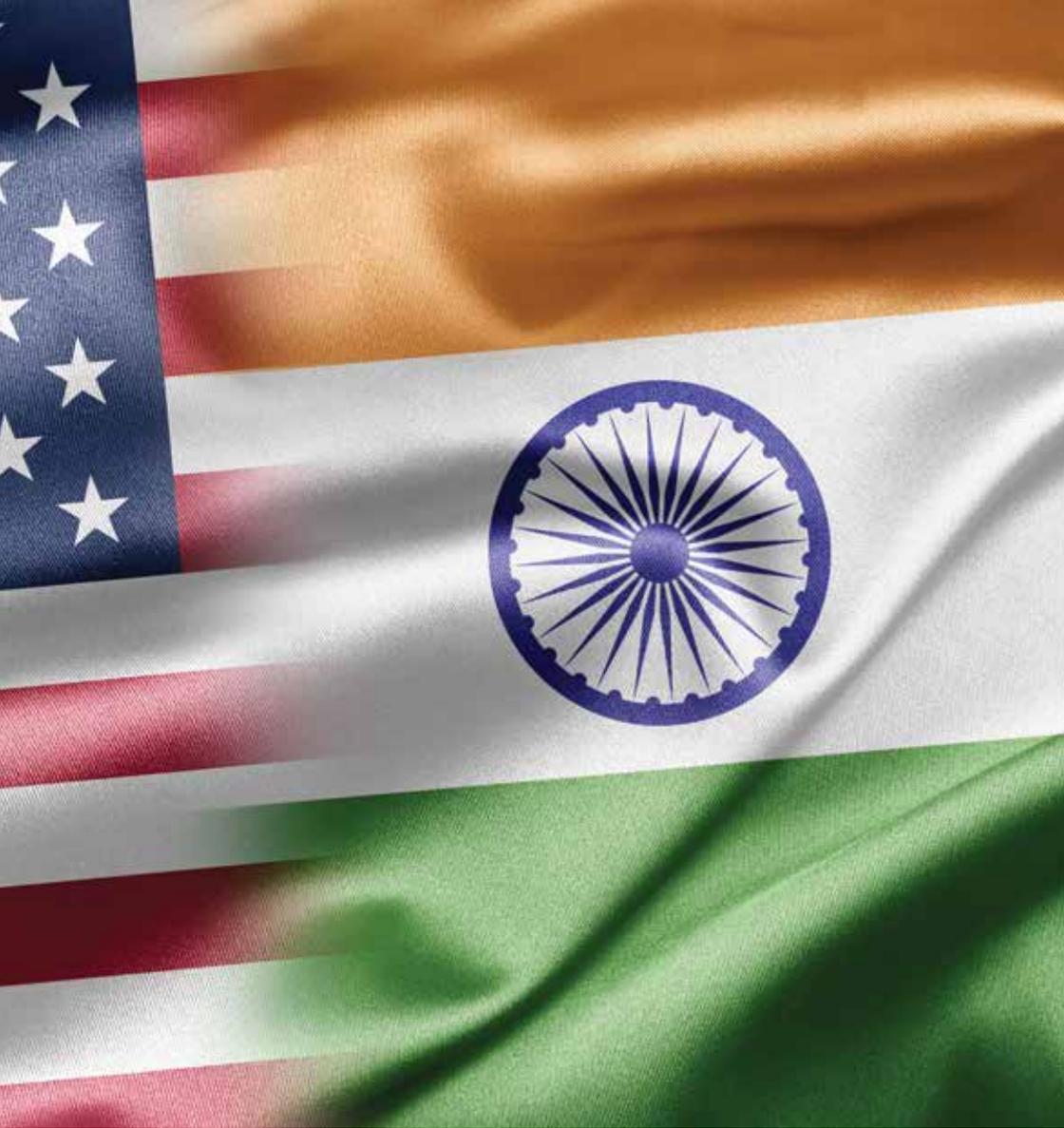
The recent visit of Prime Minister Narendra Modi to the United States of America witnessed many firsts. One of them was a joint editorial by the Indian Prime Minister and the US President in the Washington Post on 30th September, 2014. We reprint it here for our readers.



A renewed U.S.-India partnership for the 21st century

“As nations committed to democracy, liberty, diversity and enterprise, India and the United States are bound by common values and mutual interests. We have each shaped the positive trajectory of human history, and through our joint efforts, our natural and unique partnership can help shape international security and peace for years to come.

Ties between the United States and India are rooted in the shared desire of our citizens for justice and equality. When Swami Vivekananda presented Hinduism as a world religion, he did so at the 1893 World’s Parliament of Religions in Chicago. When Martin Luther King Jr. sought to end discrimination and



Our relationship involves more bilateral collaboration than ever before — not just at the federal level but also at the state and local levels, between our two militaries, private sectors and civil society. Indeed, so much has happened that, in 2000, then-Prime Minister Atal Bihari Vajpayee could declare that we are natural allies.

After many years of growing cooperation since, on any given day, our students work together on research projects, our scientists develop cutting-edge technology and senior officials consult closely on global issues. Our militaries conduct joint exercises in air, on land

and at sea, and our space programs engage in unprecedented areas of cooperation, leading us from Earth to Mars. And in this partnership, the Indian American community has been a vibrant, living bridge between us. Its success has been the truest reflection of the vitality of our people, the value of America's open society and the strength of what we can do when we join together.

Still, the true potential of our relationship has yet to be fully realized. The advent of a new government in India is a natural opportunity to

prejudice against African Americans, he was inspired by Mahatma Gandhi's nonviolent teachings. Gandhiji himself drew upon the writings of Henry David Thoreau.

As nations, we've partnered over the decades to deliver progress to our people. The people of India remember the strong foundations of our cooperation. The food production increases of the Green Revolution and the Indian Institutes of Technology are among the many products of our collaboration.

Today our partnership is robust, reliable and enduring, and it is expanding.

Ties between the United States and India are rooted in the shared desire of our citizens for justice and equality.

broaden and deepen our relationship. With a reinvigorated level of ambition and greater confidence, we can go beyond modest and conventional goals. It is time to set a new agenda, one that realizes concrete benefits for our citizens.

This will be an agenda that enables us to find mutually rewarding ways to expand our collaboration in trade, investment and technology that harmonize with India's ambitious development agenda, while sustaining the United States as the global engine of growth. When we meet today in Washington, we will discuss ways in which we can boost manufacturing and expand affordable renewable energy, while sustainably securing the future of our common environment.

We will discuss ways in which our businesses, scientists and governments can partner as India works to improve the quality, reliability and availability of basic services, especially for the poorest of citizens. In this, the United States stands ready to assist. An immediate area of concrete support is the "Clean India" campaign, where we will leverage private and civil society innovation, expertise and technology to improve sanitation and hygiene throughout India.

While our shared efforts will benefit our own people, our partnership aspires to be larger than merely the sum of its parts. As nations, as people, we aspire to a better future for all; one in which our strategic partnership also produces benefits for the world at

While our shared efforts will benefit our own people, our partnership aspires to be larger than merely the sum of its parts. As nations, as people, we aspire to a better future for all; one in which our strategic partnership also produces benefits for the world at large.

Text Courtesy:

The Washington Post,
30th September 2014
Twitter: <http://wapost/1u7n9jM> via @washingtonpost

large. While India benefits from the growth generated by U.S. investment and technical partnerships, the United States benefits from a stronger, more prosperous India. In turn, the region and the world benefit from the greater stability and security that our friendship creates. We remain committed to the larger effort to integrate South Asia and connect it with markets and people in Central and Southeast Asia.

As global partners, we are committed to enhancing our homeland security by sharing intelligence, through counterterrorism and law-enforcement cooperation, while we jointly work to maintain freedom of navigation and lawful commerce across the seas. Our health collaboration will help us tackle the toughest of challenges, whether combating the spread of Ebola, researching cancer cures or conquering diseases such as tuberculosis, malaria and dengue. And we intend to expand our recent tradition of working together to empower women, build capacity and improve food security in Afghanistan and Africa.

The exploration of space will continue to fire our imaginations and challenge us to raise our ambitions. That we both have satellites orbiting Mars tells its own story. The promise of a better tomorrow is not solely for Indians and Americans: it also beckons us to move forward together for a better world. This is the central premise of our defining partnership for the 21st century. Forward together we go — chalein saath saath.” ●



सत्यमेव जयते
Department of Science & Technology
Govt. of India



S.N. BOSE

SCHOLARS PROGRAM



To nurture future innovators and thought leaders, the Science & Engineering Board (**SERB**) Department of Science and Technology (**DST**), Govt. of India, the Indo-U.S. Science and Technology Forum (**IUSSTF**) and the University of Wisconsin-Madison (**UW**) are partnering to develop a dynamic and transformative student exchange program between premier institutions in India and the United States. The program is named in honor of **Satyendra Nath Bose** (1894 - 1974), a visionary Indian physicist best known for his work on quantum mechanics in the early 1920s. The class of particles that obey Bose-Einstein statistics, **Bosons**, was named after him.

ELIGIBILITY:

- US Citizens/Permanent Residents/
Indian Citizens
- Students pursuing a Bachelor's or Master's degree at an accredited institution of higher education in the United States
- Open to students from all disciplines of Science & Engineering

SCHOLARSHIP INCLUDES:

- Stipend (\$ Equivalent of INR 50,000)
- Airfare (upto \$1,000)
- Placement at leading Universities and Research Laboratories in India

THE MISSION OF THE PROGRAM IS TO:

- Introduce talented American students to the long-standing tradition of scientific inquiry and innovation in India;
- Encourage students to consider a career in Science and Technology;
- Foster interactions between next generation of pioneers in Science and Technology; and,
- Build long-term R&D linkages and collaborations across disciplines, cultures and geographical boundaries.

Submission Deadline: 15 February 2015

For program information contact:

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For application guidelines, please visit <http://www.indousstf.org/bose/scholars.htm>



Inauguration of the Technology Summit by Dr. Harsh Vardhan, Minister for Science & Technology & Earth Sciences, Govt. of India; Dr. John P. Holdren, Assistant to the President for Science and Technology, Director of the White House Office of Science and Technology Policy and Co-Chair of the President's Council of Advisors on Science and Technology; Ambassador Kathleen Stephens, Charge d'affaires, Embassy of the United States of America; and, Prof. K. VijayRaghavan, Secretary, Department of Biotechnology and Department of Science & Technology, Govt. of India

India - US Technology Summit Partnership for Progress

The robust partnership between India and the United States in science, technology, and innovation has benefited both countries immensely. Our collaboration has been vital in achieving shared goals, including creating economic growth and jobs, helping people live longer and healthier lives, finding solutions to challenges affecting both societies and with global benefits. In November 2014, the Confederation of Indian Industry, the Indian Department of Science & Technology and the U.S. Department of State partnered with the Indo-U.S. Science and Technology Forum and the U.S.-India Business Council to organize the 20th Technology Summit and Technology Platform.



▲
Dr. Ray O. Johnson, Chief Technology Officer, Lockheed Martin Corporation visiting the IUSSTF Booth at the Technology Expo

The objectives of India-U.S. Technology Summit were to provide a platform for industries, institutions, and government agencies from India and the United States to exchange ideas and showcase their expertise; forge new partnerships to increase trade and investment in the knowledge sector; and bring together leaders from all sectors – government, industry, research, and academia – for high level policy discussions.

The Summit was inaugurated by **Dr. Harsh Vardhan**, Minister for Science & Technology & Earth Sciences, Govt. of India; **Dr. John P. Holdren**, Assistant to the President for Science and Technology, Director of the White House Office of Science and Technology Policy and Co-Chair of the President’s Council of Advisors on Science and Technology; **Ambassador Kathleen Stephens**, Charge d’affaires, Embassy of the United States of America; and, **Prof. K. VijayRaghavan**, Secretary, Department of Biotechnology and Department of Science & Technology, Govt. of India.

The focus areas of the Summit included Manufacturing, Pharmaceuticals, Biotechnology, Healthcare, Clean & Renewable Energy, Sustainable Cities, Earth Sciences, IT Hardware & Software, Embedded Systems, Internal Security, Cyber Security, Agriculture, Water & Sanitation, Robotics & Automation, Science & Technology, Research and Development, Higher Education, Intellectual Property Rights, Design, Innovation & Entrepreneurship. A large number of stakeholders from industry, government, and

▲
Participants at the IUSSTF Roundtable on Collaborative R&D in Clean Energy



India-U.S. Technology Summit



Speakers at the Indo-U.S. Tech Women & Women Entrepreneurs Workshop

research participated at this event as exhibitors, speakers, and delegates. Events included policy dialogues, business presentations, roundtable discussions, networking opportunities, and exhibitions of technology products and services.

IUSSTF organized the following three events under the aegis of the Technology Summit:

Indo-U.S. Tech Women & Women Entrepreneurs Workshop: The Indo-U.S. Tech

Women & Women Entrepreneurs Workshop was organized by the Indo-U.S. Science and Technology Forum (IUSSTF) during the Technology Summit on 18 November. Ambassador Kathleen Stephens, Charge d'affaires, U.S. Embassy; Dr. Jonathan Margolis, Deputy Assistant Secretary, Bureau of Oceans and International Environmental and Scientific Affairs, U.S. Department of State; Dr. Renu Swarup, Senior Advisor, Department of Biotechnology; Mr. H.K. Mittal, and Dr. Anita Gupta, NSTEDB, Department of Science & Technology, Govt. of India gave a special address at the Inaugural session. The workshop had engaging panel discussions on “Nothing really can stop women from being successful tech leaders”; “Tech women leaders as mentors – how to get there?” and “Networking women tech professionals and women entrepreneurs” moderated by successful tech women leaders and women entrepreneurs from and India and USA. The workshop also focussed on sharing of success stories, and creating mentoring and networking opportunities for women in science & technology. The workshop was a huge success as it brought together leading Indian and U.S. women tech entrepreneurs and leaders on one common platform to address aspiring women professionals on building successful careers in S&T.

IUSSTF Roundtable on Collaborative R&D in Clean Energy: Keeping in mind the fact that science and technology have since long been an important cornerstone of cooperation between India and the United States; both nations recognize the fact that further collaboration can and would enhance our shared understanding of the planet’s climate by expanding efforts to develop new programs to meet environmental and climate challenges. The Roundtable

Participants at the IUSSTF Roundtable on Collaborative R&D in Clean Energy





Dr. Ellen Stofan, NASA Chief Scientist visiting the IUSSTF Booth

discussion on Collaborative R&D in Clean Energy was built on the successful Indo-U.S. Joint Clean Energy Research and Development Center (JCERDC) as a starting point. The activities of the JCERDC would contribute greatly to the sustainability and prosperity of not only our two countries but the world at large by helping diversify energy supply and accelerate the transition to a low-carbon economy. The session began with invited speakers from India and the United States sharing their views on the importance of collaboration and identifying key areas of mutual benefit. This was followed by the principal investigators of the three JCERDC Projects – Solar Energy, Second Generation Biofuels and Energy Efficiency of Buildings – sharing their experiences about the program and their respective projects. After this the session moderator, Dr. Satish Kumar (Energy Efficiency Ambassador - Vice President, Schneider Electric, Global Operations, and, Chairman, Alliance for Energy Efficient

Economy) opened the floor for discussion. The roundtable participants deliberated upon several issues that included the vision to continue research collaboration under current JCERDC beyond its tenure; additional priority areas in clean energy for bilateral engagement; mechanisms to strengthen engagement with various stakeholders including industry; success of JCERDC model (multi-institutional network projects using a public-private partnership model of funding); ways to economically incentivize technology transfer; means to improve technology leapfrog capability;

Mr. Charles H. Rivkin, Assistant Secretary of State for Economic and Business Affairs visiting the IUSSTF Booth at the Technology Expo



India-U.S. Technology Summit



▲ Participants at the IUSSTF Roundtable on Water Challenges

financing options; and, policies and programs for faster deployment of technologies.

IUSSTF Roundtable on Water Challenges:

Recognizing that water is of fundamental importance for human development, the environment and the economy and therefore needs to feature prominently in the development agenda of both India and the United States; cooperation between our countries is critical in tackling water-related issues. This discussion was aimed to deliberate on various issues related to water quality and water management as well as explore new avenues for India-U.S. collaboration in these critical areas.

The session began with invited speakers sharing their views on water availability; water purification; water recycling, and, water productivity. Subsequent to that the moderator Dr. Pushpito Ghosh (Former Director, CSIR-Central Salt & Marine Chemicals Research Institute) opened the session for discussion about the importance of collaboration and identifying key areas of mutual benefit;

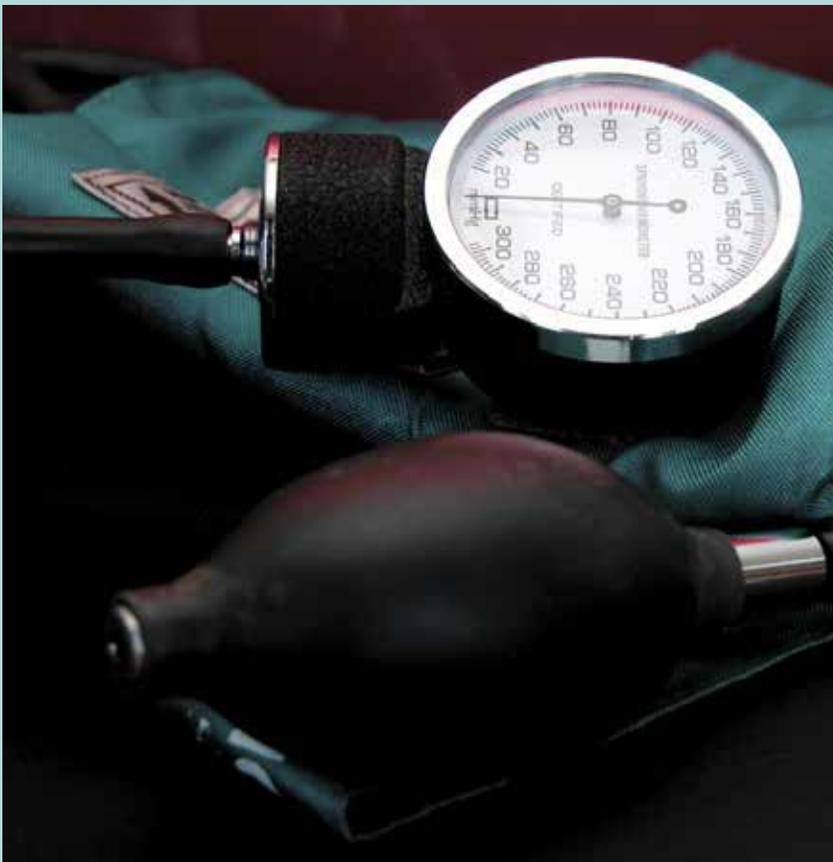
identifying priority areas for bilateral engagement; ways to strengthen engagement with various stakeholders including industry; and, the possibility of multi-institutional network projects using a public-private partnership model of funding.

The **Indo-U.S. Science and Technology Forum** also showcased its wide program manifesto that helps create linkages between India and the United States through the exchange and dissemination of information and opportunities in promoting bilateral scientific and technological cooperation. The IUSSTF booth was well appreciated by both delegates and dignitaries. Visitors to the booth included Dr. Harsh Vardhan, Minister for Science & Technology & Earth Sciences, Govt. of India; Dr. John P. Holdren, Assistant to the President for Science and Technology, Director of the White House Office of Science and Technology Policy and Co-Chair of the President's Council of Advisors on Science and Technology; Prof. K. VijayRaghavan, Secretary, Department of Biotechnology, Govt. of India; Dr. Ellen Stofan, NASA Chief Scientist; Mr. Charles H. Rivkin, Assistant Secretary of State for Economic and Business Affairs; Dr. Ray O. Johnson, Chief Technology Officer, Lockheed Martin Corporation; and, Dr. Jonathan Margolis, Deputy Assistant Secretary, Bureau of Oceans and International Environmental and Scientific Affairs, U.S. Department of State. ●

Dr. Harsh Vardhan, Minister for Science & Technology & Earth Sciences, Govt. of India, and Prof. K. VijayRaghavan, Secretary, Department of Biotechnology and Department of Science & Technology, Govt. of India visiting the IUSSTF Booth at the Technology Expo



Affordable Blood Pressure Measurement Technologies for Low- Resource Settings in India and the U.S.



Hypertension diagnosis and management is a critical healthcare issue. However, the basic underlying approach for the measurement of Blood Pressure has essentially remained the same for the past several decades making it ripe for disruptive technological innovation.

The Indo-US Grand Challenge Initiative has been set up by the Science & Engineering Research Board (SERB), Government of India and the National Institute of Biomedical Imaging and Bioengineering (NIBIB), NIH, USA. It encourages collaborative research within and between both countries to propose new approaches to the measurement of Blood Pressure that are unobtrusive, passive, low cost and can automatically provide frequent data recording and reporting to healthcare workers as well as feedback to the patients.

It is expected that this partnership will leverage knowledge and material resources to develop new technologies which are relevant for low resource settings not only in their respective political domains but in other similar settings all over the world.

In this edition of *Connect* we profile the three proposals selected in response to the first call for proposals.

Principal Investigator



Santosh Noronha
Indian Institute of Technology-
Bombay, Mumbai

LOW COST ARTERIAL TONOMOMETRY BASED BLOOD PRESSURE MONITORING DEVICE

Hypertension is a leading risk factor for cardiovascular disease and a significant cause of morbidity and mortality in both India and US. A rural healthcare camp in India gets close to a 1000 patients on an average basis. It takes a clinician 3-5 minutes to measure blood pressure (BP) measurement of an individual patient using a sphygmomanometer. This leads to clinicians spending more time diagnosing reducing the number of patients that can be treated in a given period of time.

The diastolic pressure is the second reading at which the pulsation finally stops; the pressure in the arteries when the heart relaxes between the beats is indicated by this reading.

The sphygmomanometer was introduced more than hundred years ago and has not evolved much over the years. Sphygmomanometers need routine calibration checks and regular preventive maintenance which makes them less user-friendly. There is also a risk of these devices losing their calibration in case they are dropped or bumped during usage.

BP is currently measured using a device called a sphygmomanometer. It is measured using the unit - millimetres of mercury (mmHg). The pressure is then expressed by two values that are correlated to two different readings from the device. In the first stage, an inflatable cuff is wrapped around the patient's upper arm over the brachial artery. The cuff is then pumped with air so that it blocks the blood flow. The point at which the blood flow stops, the air pressure in the cuff is let out slowly while the clinician listens to the artery with a stethoscope. The moment the clinician hears the first pulsing of the artery as the blood flow initiates again, a reading is taken from the device and this reading is known as the systolic pressure. This measure indicates the pressure in the patient's arteries as the blood is squeezed out.

This team is attempting to build a next generation blood pressure monitoring device which can help ease difficulties faced by clinicians as well as personal users. The best way to measure 'absolute' peripheral BP is by using an invasive probe. Alternately, a cuff can be used to occlude the brachial artery (or radial artery) for oscillometric measurement. Arterial tonometry is another competing technique for BP measurement. Arterial tonometry is best suited for beat to beat measurement of BP. On the other hand, tonometry provides a 'relative BP' measurement with some amplification factor that depends on the specific sensor and applied pressure distribution. The objective is to build a low cost arterial tonometry based blood pressure monitoring device.

Co-Investigator



C. S. Pramesh
Tata Memorial Centre
Mumbai

Principal Investigator



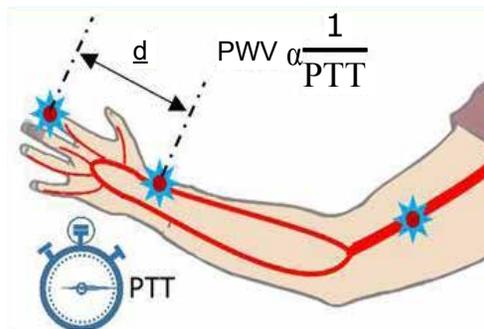
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Engineering Research Institute
(CSIR-CEERI), Pilani

RAPID REAL TIME BLOOD PRESSURE MEASUREMENT AND HYPERTENSIVE PREDISPOSITION DIAGNOSTICS

Blood Pressure (BP), with heart rate, respiratory rate and body temperature is one of the four major vital signs. BP values higher than 140/90 mmHg indicate high blood pressure or hypertension. Hypertension is a "silent killer" because it has no visible symptoms, but if left untreated, can cause stroke, kidney damage,

impaired vision, congestive heart failure, heart attack, vascular dementia, peripheral blood vessel disease and aortic aneurisms. WHO has predicted an increase in hypertension patients in India from 140 million in 2008 to more than 215 million by 2030 (14% of the projected population).

When the heart pumps, the pressure wave travels along the arterial tree. The pulse can be detected at various points along the tree at different parts of the body. In the figure two points at the wrist and the finger and another point at the upper arm are shown. The pulse at these points can be detected using a method called **Photoplethysmography (PPG)**.



In this method, light is shone into a region of the body and the volume of blood in that region is determined using the amount of light reflected back or transmitted through. This gives a waveform that represents the pulse. By detecting the peaks of this waveform at the points shown, the time taken for the pulse waveform to travel between those points (i.e., the Pulse Transit Time or PTT) can be found. From the PTT the Pulse Wave Velocity (PWV) can be calculated.

Co-Investigators



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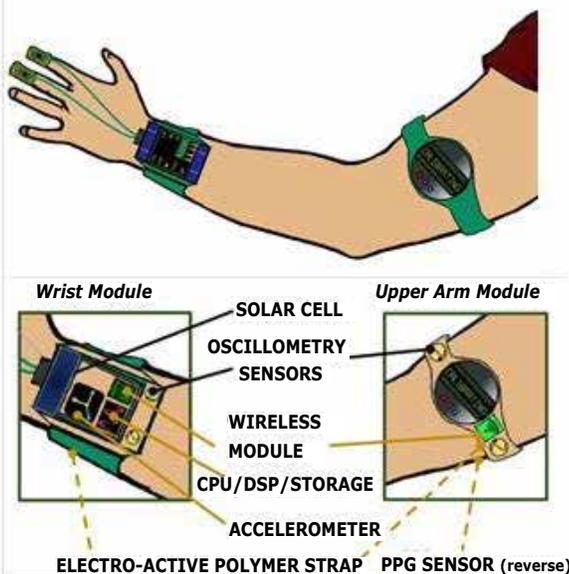
Hypertension is typically detected in hospitals, (the sphygmomanometer and invasive arterial measurement are considered the “gold standard” techniques) often too late. Also, “masked hypertension”, is difficult to detect. Since it is being recognized that

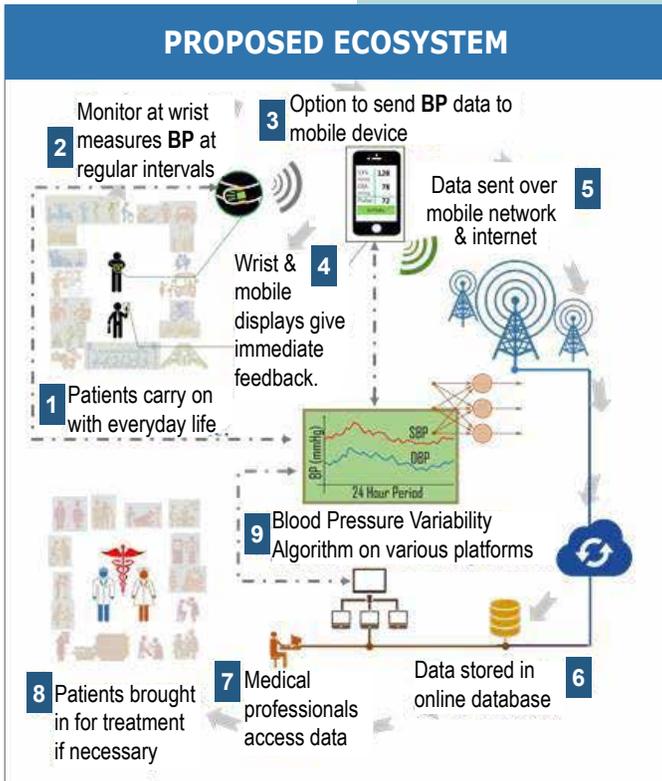
such occasional measurements are not truly reflective of the highly dynamic blood pressure changes, home BP monitors and wearable monitors are becoming increasingly common for monitoring BP outside the hospital.

Almost all of these, apart from those using invasive techniques, are based on the oscillometric method of BP monitoring which requires an inflatable cuff on the upper arm or wrist. This is not very comfortable and does not give beat-to-beat blood pressure values. Other devices such as those based on the Penaz Principle measure blood pressure continuously, but these are expensive. Hence, there is a clear need for a wearable device that is easy to operate, inexpensive, non-invasive, comfortable, and can measure beat-to-beat BP with high accuracy.

Many techniques are being explored to tackle this challenge. One promising technique is to measure BP using Pulse Transit Time (PTT)/ Pulse Wave Velocity (PWV). There is sufficient prior research to show

PROPOSED PROTOTYPES





that PWV is correlated to the beat-to-beat BP and hence a device which can track PWV/PTT accurately can be used to quantify the BP trends.

However, this idea has yet to be successfully commercialized as a wearable device for low-resource settings. Also, the research in PTT has not yet taken into account the challenges faced in the Indian context such as the

wide variation in skin tones, which makes it difficult for light to penetrate the finger/wrist/upper arm effectively. There are also problems specific to wearable devices. The device needs to be as comfortable as possible. Constant recalibration is needed to ensure accuracy. Most current calibration setups use a cumbersome inflatable cuff oscillometry setup.

Finally, power management and movement artifacts are common obstacles for wearable devices. The current project aims to address these issues. The proposed device will have a wrist-watch form factor with unobtrusive finger sensors. For the arm-band oscillometry calibration module, electro-active polymers are being explored to avoid the need for bulky inflatable pneumatic cuff systems. In addition, the classical method used to calculate PTT employs Photoplethysmography (PPG) at a finger and ECG signal measured at the heart which

makes the device bulky and cumbersome to wear.

Here, we aim to develop a complete PPG based solution, where the PPG sensors at the finger-tip, wrist, and arm are used. In addition, multiple wavelengths are being explored to find the optimum source that ensures best light penetration for skin tones of Indian subjects. In future versions, Electrocardiogram (ECG) signals can also be picked up at the three points using skin-contact electrodes, which will make this a multi-parameter device capable of correlating various physiological signals to improve the accuracy. Solar cells incorporated into the watch will alleviate the power management problems, and an accelerometer will enable compensation for motion artifacts. The ecosystem within which this device will be used is explained in the info graphic above. To realize the project goals effectively, we have a distinguished inter-disciplinary team of scientists with experience in embedded systems, data analytics from various institutes, medical doctors and industrial expert from the medical electronics industry.

Three pulse watch prototypes have been built as a part of this research. Two of them have Bluetooth connectivity to an Android smart phone to display the pulse waveform and body temperature. One of these also has an accelerometer that gives data about hand movement. The third device displays the pulse on a built-in screen. Using these devices, PTT is calculated for various subjects. Currently, PPG data is being collected from a large pool of subjects using high speed data acquisition systems to construct a mathematical model using machine learning and pattern recognition techniques that predicts BP from the PWV. Preliminary results on test subject with and without fatigue show a correlation between PWV and BP. Future targets of the proposed research are creating a proof of concept system, and then alpha and beta prototypes to be used in field trials to be conducted at various hospitals and at eHealth Centres run by CSIR, so that a large number of patients can be monitored. It is

envisioned that the proposed device will enable early stage diagnosis of various cardiovascular diseases. The large amount of data collected will enable the creation of health profiles of large sections of the population across the country. It is anticipated that in future, large scale deployment of these devices will enable

predisposition diagnostics. In addition, the wearable devices and their paired smartphones can be equipped with user interfaces to enable biofeedback mechanisms so that the users can take measures to stabilize their vital parameters and thus create a positive impact upon their health.

ARTERIAL COMPLIANCE PROBE FOR CUFF-LESS BLOOD PRESSURE MEASUREMENT

Non-invasive measurement of Blood Pressure (NIBP) has well established utility in screening, clinical diagnosis and patient follow-up for a variety of disease conditions. Traditional methods of NIBP, such as auscultation and oscillometry, use a cuff and require expert medical personnel and hence not very amenable in field or home settings. Majority of state of art technology in cuff-less BP monitoring are based on tonometry, Pulse Contour Analysis (PCA) and Pulse Transit Time (PTT) principles. Reliable measurements using tonometry require expertise, whereas PTT based techniques suffer from both subject specific and population specific calibration issues and are hence limited to home or well-being applications and yet to attain wide spread acceptance.

HTIC is developing a novel method and device for blood pressure evaluation, based on real time measurements of vessel wall properties using a vascular compliance probe that can be used to quickly obtain accurate readings in minimally obtrusive manner. The technique utilizes ultrasound transducers and plethysmograph sensors to quickly perform cuff-less, non-invasive blood pressure measurement. The technique is based on fundamental principles of arterial pressure-flow thereby creating a method that is independent of patient or population specific calibration constants. The project aims to deliver a field validated technology for calibration free, cuff-less evaluation of blood pressure amenable for use in resource constrained settings.

The project will be executed in three phases. Phase 1 would involve proof of principle and demonstration of the concept in controlled settings and limited field trials. Phase 2 would involve development of a device prototype (desktop form factor) for validating the concept in clinical settings. The R&D of measurement principle, probe design, algorithms for real time signal processing and computation, techniques for BP evaluation, investigation on sensor fusion methods will be conducted in these first two phases of the project. Following iterative improvements in the measurement concept, probe design and usability issues in phase 2, the development of a portable/hand held device would be done in Phase 3. Field studies using this prototype device would be accompanied by advocacy efforts to create visibility to this new methodology. Besides clinical settings, the portable device would be tested extensively in resource constrained settings such as screening camps, rural clinics etc through clinical and public health collaborators.

HTIC had earlier developed an image-free ultrasound system for automated measurement of vessel wall properties. This ARTSENS system was validated on more than 500 subjects at different clinical settings. This current project will leverage the existing technical know-how, expertise and practical knowledge of ARTSENS and other sensing modalities to develop the cuff-less BP technology. ●

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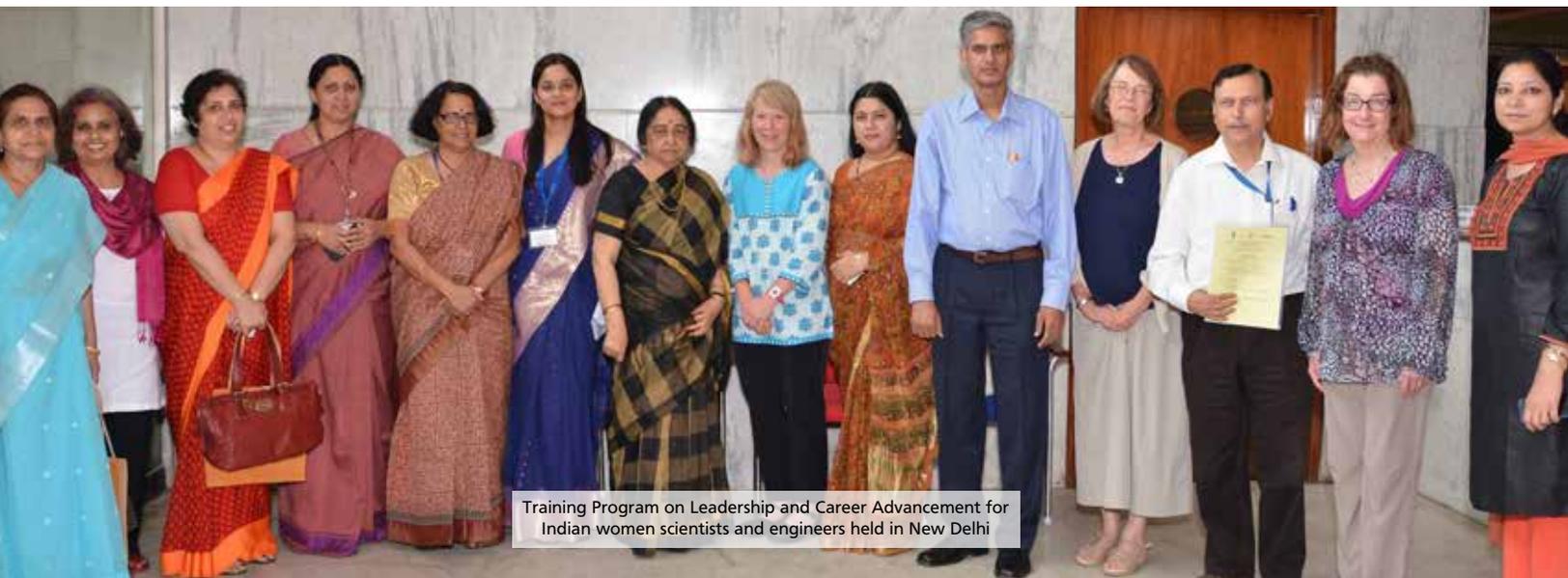
Empowering Women Scientists and Entrepreneurs

“Women in Science” is one of the priority areas for engagement between the United States and India. Both countries share a common goal of promoting, enabling and retaining women in science, and increasing access to science and technology for women. The Governments of India and USA are committed to collaborate on issues of leadership, mentoring and networking of women scientists in both countries.



Over the years, the Indo-US Science and Technology Forum (IUSSTF) has been actively engaged in promoting Women in Science. Since 2009, IUSSTF partnered with the U.S. Embassy and the Department of Science and Technology (DST), Government of India to organize four annual workshops and several roundtables on women in science.

With the objective to study and codevelop programs to promote and facilitate Women in Science, Entrepreneurship and Research (WISER), an Indian delegation comprising of senior government officials, scientists and industry representatives, who have been promoting women in science, entrepreneurship and research in India visited USA from 14-



Training Program on Leadership and Career Advancement for Indian women scientists and engineers held in New Delhi



Participants at the Training Program in Leadership and Career Advancement for Indian women scientists and engineers

18 July, 2014. IUSSTF organized the visit with the goal to facilitate research and educational partnerships between women scientists in the U.S. and those in India. The visit also provided an opportunity to discuss common research interests and develop plans for future research collaborations, exchange of students and research personnel. The delegation had very successful engagements at the National Science Foundation, US State Department, Lockheed Martin, Intel, TiE Silicon Valley, Anita Borg Institute and University of California, Berkeley.

As a part of the continued efforts to promote Women in Science, the Indo-US Science and Technology Forum (IUSSTF) in partnership with the Department of Science and

Technology, Government of India and COACH International organized the Training Program in Leadership and Career Advancement for Indian women scientists and engineers. Two Training Programs were successfully organized on September 1-5, 2014, Delhi and September 8-12, 2014, Bangalore.

Prof. Geraldine Richmond, President Elect, American Association for the Advancement of Science, Presidential Chair and Professor, Department of Chemistry and Biochemistry, University of Oregon, USA; Founder and Chair of COACH International and her team organized these training programs. For each of these training programs the participants were drawn from the mid carrier Indian women scientists

Indo-U.S. Tech Women & Women Entrepreneur Workshop



Women in Science



Indian WISER (Women in Science, Entrepreneurship and Research) delegates at the U.S. National Science Foundation

and trainers. Over 100 Indian women scientists across universities, R & D institutions were trained during these two training programs.

The women scientists were trained on topics such as effective negotiation skills, successful leadership methods, communicating science effectively, working in a team environment, consensus building, establishing a strong in-person and internet presence, publishing in respected journals, grant writing, and the job search.

IUSSTF organized Indo-US Workshop for Advancing Women Faculty in STEM, 15 November, in partnership with the National Science Foundation (NSF) and DST. The objective of the Round table was to share best

practices and to identify and codevelop joint programs to promote leadership and build research to research collaborations amongst women scientists and researchers from both countries.

IUSSTF also organized the Indo-U.S. Tech Women & Women Entrepreneur Workshop, 18 November, Greater NOIDA. Leading Indian and U.S. women tech entrepreneurs and leaders addressed aspiring women professionals on building careers in science & technology and reaching to the top. There were focused sessions on sharing of success stories, and creating mentoring and networking opportunities for women in science & technology and also develop plans for future collaborations. The

Indo-U.S. Tech Women & Women Entrepreneur Workshop





Indo-U.S. Tech Women & Women Entrepreneur Workshop

workshop was organized during the Indo-US Technology Summit. The workshop had an excellent line up of speakers from the industry. There was a tremendous amount of interest from the industry to partner on Women in Science initiatives.

In the 15th IUSSTF Governing Body meeting held in April 2014, IUSSTF Board resolved that the IUSSTF should play a crucial role in promoting joint initiatives in Women in Science. IUSSTF worked with key stakeholders from the government, academia and industry in India and US to initiate new joint programs for women in Science and for women entrepreneurs that were announced during the 3rd US-India Joint

Commission Meeting (JCM), 17 November 2014.

Indo-US Women in Science Fellowship Program

IUSSTF partnered with the Department of Science and Technology, Government of India to announce the Indo-US Women in Science Fellowship program. The program will be funded through DST and administered by the Indo-US Science and Technology Forum. This program will provide opportunity for Indian Women Scientists under the age of 50 years to undertake research in any lab university in the United States.

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Indo-U.S. Tech Women & Women Entrepreneur Workshop



Giving **Wings** to Talent

To address the need for human resource development and capacity building in science and technology, the Indo-U.S. Science and Technology Forum (IUSSTF) is committed to nurture contacts between students of science and technology from India and the United States. It has been unambiguously demonstrated that providing students and young scientists with an exposure to cutting-edge scientific research experiences at a formative stage not only broadens their intellectual horizons but also leads to increased engagements in scientific and technological research careers. In this section of Connect, we share with you the experiences of some of our bright, young fellows and interns in their own words!

Bhaskara Advanced Solar Energy Fellowship Program

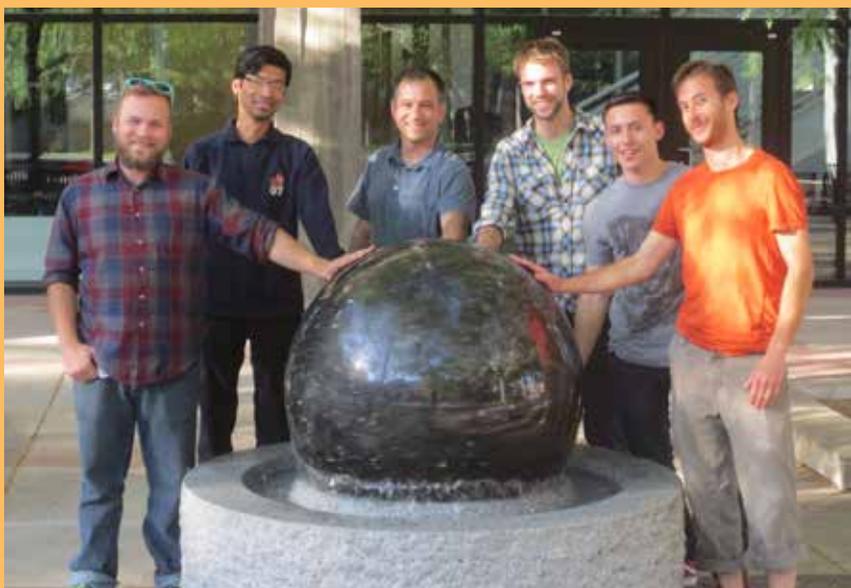
One cold morning in January, I got a mail in my mailbox that said “Congratulation! You have been selected for the BASE fellowship”. My dream of working with a leading scientist in the field of organic photovoltaic had come true! Prof. Sean Shaheen of University of Colorado Boulder is a renowned scientist in the field of organic and hybrid solar cells as he was associated with part of the development of the field particularly during his tenures as the scientist of NREL and the research

associate of JK University, Austria. Working in an advanced laboratory and regularly participating in Thursday discussions gave me a different perspective to work on my research topic. After coming here, I am focusing more on the study of charge transport and recombination dynamics in high efficiency organic and hybrid solar cells. Moreover, the collaboration with NREL helps me to visit their lab and participate

in the relevant discussions with the scientists. Overall, it is a wonderful experience for me as a research scholar. I would like to thank IUSSTF and DST, Govt. of India for giving me this wonderful opportunity during my Doctoral tenure. I would also like to acknowledge the IUSSTF staff for helping me in easing out all the procedures for the visa application and other issues related to the internship!



Santanu Pradhan
Indian Institute of Technology-
Kharagpur





Aparajita Mandal

Indian Association for the Cultivation of Science-Kolkata

During my internship as a BASE fellow at the University of Delaware, I worked under Prof. Juejun Hu in the Department of Material Science and Engineering. During the 4 months of my internship, I studied the low-symmetry grating structures for light trapping enhancement beyond Lambertian limit in thin crystalline Si and CIGS (CuInGaSe₂) solar cells. I performed direct imprint/molding of grating geometries on glass material in the back-side of the solar cells. This process does

not require any additional pattern transfer step, therefore minimizes the processing cost and surface damage to the PV cells. Reflecting on my experiences, I truly learnt a lot from this research visit. It was a great opportunity and it gave me a feel of the graduate culture in U.S. laboratories. With a new passion for research, this internship has greatly motivated me for pursuing advanced research in the field of Photovoltaics.



My foremost gratitude to IUSSTF for giving me this wonderful opportunity to work at the National Renewable Energy Laboratory (NREL), Colorado (NREL Host: Dr. David Ginley). I worked at NREL from mid-May till end-July 2014. Since this was a national lab, I had to undergo an orientation of the whole laboratory and had to learn and clear the lab training exams for each instrument used. I was chosen to work on novel material (photo anode - n-type semiconductor) that uses solar light to split water (photoelectrolysis). Previous DFT-

based calculations at NREL predicted Mn_xZn_{1-x}O alloy ($x \approx 0.5$) of Wurzite crystal structure to act as a suitable photoanode for water splitting. I mainly carried out the experimental part by depositing thin films of various Mn_xZn_{1-x}O alloy compositions of different thicknesses on glass and FTO substrates using pulsed laser deposition; characterized their crystal structure and thicknesses using XRD and ellipsometry and finally studied their carrier densities and water splitting capabilities through Mott-Schottky and photoelectrochemical experiments.



Suhash Ranjan Dey

Indian Institute of Technology-Hyderabad

For more information on the Bhaskara Advanced Solar Energy Fellowship Program:

Webpage: <http://www.iusstf.org/story/53-59-Bhaskara-Advanced-Solar-Energy-Fellowship-Program.html>

E-mail: jcerdc@indousstf.org

Viterbi-India Program

The Viterbi-India Program was the best thing that happened to my academic career until now! It not only boosted my confidence towards taking up research as a career but also provided me the opportunity to showcase my true talents as a researcher. The internship was spectacular in the fact that the possibilities were limitless. Even though I was just an undergraduate student staying at USC for only 2 months, I received much attention and care from my advisors (my ideas were met with enthusiasm

and encouragement). This environment surely brought out the best in me and provided me the opportunity to conduct original, creative research. On a non-academic note, I had the best time of my life at Los-Angeles! I made new friends, visited new places and soaked up the true nature of life in the US. Being a student who aspires to study more, this internship is golden and I sincerely thank IUSSTF for offering me this opportunity.



Goutham Ezhilarasu

College of Engineering-Guindy

Student-Speak

I interned at the University of Southern California in the summer of 2014. Looking back, I must say those two months were one of the most enriching parts of my academic life.

I was naturally overawed and overjoyed when I got the mail from IUSSTF confirming my selection. When I finally arrived in Los Angeles in mid-May, the first thing that struck me was the climate - it was so pleasant! A few days later, I met my mentor, Prof. Hossein Hashemi and he briefed me about the topic that I would work on for the next two months. Though it was a short meeting, Prof. Hashemi was so articulate throughout the interaction, that I had a clear idea and road map upon which to follow on. I was also very fortunate to have Ankush as my guide for the whole assignment. My research topic was based on designing a full-Duplex antenna - a technique which is getting immense attention for its usage in modern day 4G communication. I attended a few group meetings all of which were lively and objective. All of us prepared a poster to be presented on the final day. Overall, the intensity of research and the atmosphere for it was such that it only strengthened my desire for pursuing a career in research.

Apart from my research, I got to do a lot of other stuff...oh yes, it is California!! We went to San Francisco, Hollywood, Disneyland, Venice beach, Downtown LA and lots of interesting places. Then, USC itself has its own sports museum, soccer stadium, a natural history museum and science centre by its side, and its buildings are a perfect blend of modern and ancient architecture. All the members of Prof Hashemi's research group along with Prof. Hashemi himself were very supportive. Many a times, we used to meet up for dinner or lunch where we would have all sorts of discussions ranging from science to life to politics. I must also thank our program coordinator, Tracy Charles who worked tediously for organizing the whole program. She would also suggest us about newer trip destinations and also took us to a baseball game. I also had the pleasure to interact with Prof. Raghavendra who is not only a great academician; but also a wonderful human being. I want to thank all the people administering this program - Nishritha Bopana and Monika Madan - for organizing this program and making it an once-in-a-lifetime experience for me!



Sudipta Biswas
Indian Institute of Technology-
Kharagpur

For more information on the Viterbi-India Program:

Webpage: <http://www.iusstf.org/story/53-51-Viterbi-India-Program.html> E-mail: : viterbi-india@indousstf.org

Empowering Women Scientists and Entrepreneurs

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Women Entrepreneurs Quest Program

The Indo-US Science and Technology Forum (IUSSTF) partnered with the National Science & Technology Entrepreneurship Development Board (NSTEDB), Department of Science and Technology (DST), Government of India and Anita Borg Institute (ABI), Palo Alto for its Women Entrepreneurship Quest (WEQ) Program. The Joint program aims to nurture and create an entrepreneurial ecosystem for women entrepreneur in India through a Business Plan competition. The objective of the partnership is to provide a platform to the women entrepreneurs to expose them to some of the best practices in India and

United States. WEQ aims to reach out and identify talented technical women in the founding or leadership team of early stage start-ups who have applied technology in innovative ways to solve meaningful business problems. The winners of the competition will receive cash awards. Top 6 women entrepreneurs will receive an all-expenses paid-trip to Silicon Valley for a week for an experiential learning.

IUSSTF is committed to promote women in science and women entrepreneurs and aims to codevelop sustainable programs in partnership with the government, academia and industry to co create an ecosystem to enable and empower Women in science and entrepreneurship. ●

U.S.-India Joint Commission Meeting on Science and Technology Cooperation

17 November 2014, New Delhi



Shri Y. S. Chowdary
Minister of State
Science & Technology,
Government of India

The third Science and Technology Joint Commission Meeting (JCM) between India and the United States was held on November 17, 2014 in New Delhi. The JCM was Co-Chaired by Shri Y. S. Chowdary, Minister of State for Science & Technology, Government of India, and Dr. John Holdren, Director, White House Office of Science & Technology Policy and the Science Adviser to the U.S. President.

Both sides recognized the value of the science and technology cooperation in being one of the pillars and integral component of overall bilateral relationship. Shri Chowdary highlighted the importance which the present government underlines to the promotion and support to science with a human face which will underpin the development of technology required to support the knowledge economy of this century. Dr. John Holdren emphasized the need to use and apply science to address some of the impending challenges which India and USA need to meet for its food, water and energy security. It was decided that through cooperation innovative solutions can be developed which are affordable and meets not only bilateral needs but would be of larger global good.

Four Working Groups on Basic and Applied Sciences; Health and Medical Sciences; Earth, Environment and Climate Sciences; and Emerging Materials and Advanced Manufacturing had very fruitful discussions in not only

evaluating the progress but also identifying new areas of future cooperation. Both sides have agreed to establish a new Working Group on plant biotechnology and agricultural research which is vital for addressing food security in context to food-water-climate nexus.

A very crucial area of Global Health Security has been jointly addressed for cooperation towards emergency preparedness and response; anti-microbial resistance; emerging infections like Ebola. Similarly the aspects of environmental health have also been covered especially with respect to water, air pollution, sanitation and hygiene. India and the United States also agreed to take forward collaboration in ground water studies, monsoon modeling, tropical cyclones and severe weather systems. The future areas of collaboration in marine services, deep drilling in the ocean, satellite observation and assimilation and wave modeling were jointly identified. It was agreed that the Department of Science & Technology and U.S. NSF will strengthen cooperation in the area of women in science, technology, engineering, and mathematics. ●



Dr. John Holdren
Director
White House Office of Science
& Technology Policy and the
Science Adviser to the
U.S. President

Text Courtesy: Press Information Bureau, Government of India, Ministry of Science & Technology, 19-November-2014
<http://pib.nic.in/newsite/PrintRelease.aspx?relid=111552>

Graduate Research Opportunities Worldwide (GROW) Program



GROW in India

The Graduate Research Opportunities Worldwide (GROW) program is a partnership between the Science and Engineering Research Board (SERB), Govt. of India and the National Science Foundation (NSF) to provide NSF Graduate Research Fellows with opportunities to enhance their professional development through research collaborations at top-caliber science and engineering research sites in India.

The program seeks to promote research and capacity building in frontline S&T areas and pave way for the next generation scientists and technologists from the United States to interact with their Indian peers.

Meet our very first GROW-India Fellow – *Joanna Yang* from Mayo Graduate School in the United States.



Joanna Yang
Mayo Graduate School
Rochester

“When I first received the email notifying me that India was a new National Science Foundation Graduate Research Opportunities Worldwide (NSF GROW) partner, I remember contacting my Ph.D. mentors with excitement. I had been to India once before, and the opportunity to return for collaborative research efforts was a dream come true. The morning I received my funding approval from the Science and Engineering Research Board (SERB)

of India and the NSF Division of Graduate Education was the beginning of an opportunity of a lifetime.

My time in India has passed altogether too quickly, but I have enjoyed my research at the *Council of Scientific and Industrial Research, Institute of Genomics and Integrative Biology (CSIR-IGIB)*. Thanks to the patient guidance of my host PI, Dr. Sridhar Sivasubbu, and of

Project Scientist Dr. Adita Joshi, I was able to undertake research and partnership-building activities under the umbrella of a CSIR-Mayo Clinic collaborative program called Integrated Science Education Outreach (InSciEd Out). Our collaboration aimed: 1) to advance InSciEd Out hub strengthening, and 2) to lay the foundation for a school-based, curricular intervention in mental health and addiction. The project thus encompassed two separate, yet interrelated topics of furthering science education, which is in need of evidence-based change, and of addressing the burden of mental illness, which is a heavily under-recognized and over-stigmatized source of global burden of disease. Our work eventually aims to decrease the burden of mental illness in adolescents, moving beyond awareness and even stigma reduction to actual behavioral change.

To these ends, I enjoyed my interactions with partner schools and institutions, learning from them both scientifically and culturally. My experiences interviewing mental health professionals additionally opened my eyes to the state of mental healthcare in India and provided me with new perspectives for my thesis work concerning adolescent outcomes in mental health. Out of all my research activities, my favorite part of this journey has been adapting, pre-testing, and administering a battery of mental health surveys to grades 6 to 11 students. Interacting with school children is always an eye-opening experience, and the voices of India's youth are truly awe-inspiring.

Scientific lessons aside, India's rich culture and history never fail to amaze me. Even after

“I enjoyed my interactions with partner schools and institutions, learning from them both scientifically and culturally.”



driving around the Delhi/NCR region every day for my research, I am still in awe of the myriad historical sites, ruins, and pockets of green space tucked in between modern cityscape. I was also fortunate enough to visit Vrindavan and Bhubaneswar, as well as to celebrate Durga Pooja, Dussehra and Diwali during my stay. These experiences have been cultural highlights. As my four-month stay in

“Interacting with school children is always an eye-opening experience, and the voices of India's youth are truly awe-inspiring.”

India draws to a close, I thank IUSSTF for its tremendous role in making both my research and this experience possible. I will take much more than data back with me to the US, as the life lessons and skills I have learned here transcend time and place. My best wishes to the IUSSTF-GROW program moving forward; it is my honor to be an Indo-US scholar.” ●

For more details on the GROW Program, please visit:
http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504876 and
<http://www.iusstf.org/story/53-58-Graduate-Research-Opportunities-Worldwide--GROW--Program.html>



IUSSTF Governing Board Meeting



Governing Board of IUSSTF

The Extraordinary Meeting of the Governing Body (GB) of the Indo-U.S. Science and Technology Forum was held at IUSSTF under the Co-Chairmanship of Dr. VijayRaghavan, Secretary, Department of Science & Technology, Govt. of India (Indian Co-Chair) and Dr. Jonathan Margolis, Deputy Assistant Secretary, Bureau of Oceans and International Environmental and Scientific Affairs, U.S. Department of State (U.S. Co-Chair), on 15 November 2014.





meets at New Delhi

In the GB business meeting, the Executive Director, IUSSTF highlighted the ongoing and several new programs implemented and launched during the year, most of which were in partnership with government agencies, professional societies, industry and academia. The Governing Body expressed its unanimous appreciation of the role that has been played by IUSSTF to forge and catalyze a wide variety of bilateral S&T collaborations since its inception in 2000. ●





A Long Flight to Mars

Mars Orbiter Spacecraft Successfully Inserted into Mars Orbit

September 24, 2014

India's Mars Orbiter Spacecraft successfully entered into an orbit around planet Mars today morning (September 24, 2014) by firing its 440 Newton Liquid Apogee Motor (LAM) along with eight smaller liquid engines. This Liquid Engines firing operation which began at 07:17:32 Hrs IST lasted for 1388.67 seconds which changed the velocity of the spacecraft by 1099 metre/sec. With this operation, the spacecraft entered into an elliptical orbit around Mars. Honourable Prime Minister of India, Mr. Narendra Modi, was present at ISRO's Telemetry, Tracking and Command Network (ISTRAC) in Bangalore to witness this important event.

The events related to Mars Orbit Insertion progressed satisfactorily and the spacecraft performance was normal. The Spacecraft is now circling Mars in an orbit whose nearest point to Mars (periapsis) is at 421.7 km and

farthest point (apoapsis) at 76,993.6 km. The inclination of orbit with respect to the equatorial plane of Mars is 150 degree, as intended. In this orbit, the spacecraft takes 72 hours 51 minutes 51 seconds to go round the Mars once.

Mars Orbiter Spacecraft was launched on-board India's workhorse launch vehicle PSLV on November 05, 2013 into a parking orbit around the Earth. On December 01, 2013, following Trans Mars Injection (TMI) manoeuvre, the spacecraft escaped from orbiting the earth and followed a path that would allow it to encounter Mars on September 24, 2014.

With today's successful Mars Orbit Insertion operation, ISRO has become the fourth space agency to successfully send a spacecraft to Mars orbit. In the coming weeks, the spacecraft will be thoroughly tested in the Mars orbit and the systematic observation of that planet using its five scientific instruments would begin. ●

Text courtesy:
Indian Space Research Organization
http://www.isro.org/pressrelease/scripts/pressreleasein.aspx?Sep24_2014

October - 2014

EPIDEMIOLOGY AND PREVENTION OF CANCER

07-09 October 2014,
Chennai, INDIA

Systematic cancer registration has long been practiced in India through the National Cancer Registry Program. Over the last 20-30 years, there has been a progressive increase in the incidence of cancer within India although rates are generally lesser than in the US. Geographical variation in the incidence of cancer is well known. India and the US have people of diverse genetic backgrounds and large populations. Such large and genetically diverse populations are an important asset for epidemiological studies aimed at identifying the etiological factors of a complex, multi-factorial disease like cancer. The Indo-US workshop on *Epidemiology and prevention of cancer* organized by **T.S. Ganesan** (Cancer Institute, Chennai) and **Ernest Hawk** (The University of Texas MD Anderson Cancer Center, Houston), facilitated a useful exchange of valuable

information in these areas of research, examining the feasibility of implementing them and allowing the framing of questions and outlining potential future research in these areas for the mutual benefit of both countries. The expertise that US investigators brought to the workshop would enhance and support the level of research that is possible in a diverse country like India. Similarly, the expertise of Indian investigators working to advance public education, cancer screening, and cancer prevention in India (i.e., a lower-resource setting) would assist and inform American efforts to tailor effective programs which might better meet the needs of poor and underserved sectors of the American population. Thus, the conference helped facilitate bi-directional learning to benefit all participants, and more importantly, the health of the populations they serve. ●

RECENT ADVANCES IN STRUCTURE BIOLOGY AND DRUG DISCOVERY

09-11 October 2014
Roorkee, INDIA

Structural biology has witnessed rapid advancements in the past few decades. X-rays have played crucial roles in some of the most important scientific breakthroughs since their discovery by Roentgen in 1895. Modern advancements in the three major structure determination techniques - X-ray crystallography, nuclear magnetic resonance (NMR) spectroscopy and cryo-electron microscopy have made it possible to obtain three-dimensional structural information on various biological processes and systems with much less effort than in the past. Lately, the field of drug discovery has seen a paradigm shift with structure-based drug design making a comeback while traditional high-throughput

screening methods have persistently produced disappointing results. An Indo-US workshop on *Recent advances in structure biology and drug discovery* was organized by **Pravindra Kumar** (Indian Institute of Technology-Roorkee), **Richard J. Kuhn** (Purdue Discovery Park), **Shailly Tomar** (Indian Institute of Technology-Roorkee), **Carol B. Post** (Purdue University) and **Jeffrey T. Bolin** (Purdue University) to provide a common platform for interaction between scientific and technical representatives from both nations in the context of projects that focus on problems of mutual interest in the area of structure based drug designing, virus crystallography and bioremediation. ●

BEST PRACTICES AND ECO-RESTORATION TECHNOLOGIES FOR ENHANCING FUNCTIONAL QUALITY OF URBAN LANDSCAPES

03-05 November 2014
Bengaluru, INDIA



The rapid growth of cities in India and the United States has focused attention on the role of ecological services, the ways that natural resources and habitats in cities help improve environmental and human health. New science-based solutions for improving urban conditions can help augment air and water quality, liveability, and sustainable biodiversity for our burgeoning urban populations. **S. Natesh** (National Institute of Immunology, New Delhi) and **Steven N. Handel** (Rutgers University, New Brunswick) organized an Indo-US Workshop on *Ecorestoration technologies and best practices for enhancing functional quality of urban landscapes* at Bangalore. This workshop was an integral part of the International Congress on Green Urban Futures which was organised by Center for Urban Green Spaces, New Delhi and co-hosted by Government of Karnataka and Ministry of Urban Development, Govt. of India.

The objective of the workshop was to join research and results

from case studies in both countries' urban centers into a new framework for improving cities' ecological conditions, and identify specific research areas needing more attention and focus. Key issues discussed included urban waterways, urban agricultural zones, the value of small urban habitat parcels, biotechnological approaches in urban restoration, and the increased understanding of

urban forestry for improving human conditions in our cities.

More than 180 participants attended the workshop including scientists, foresters, officials of urban local bodies from across the country, pollution control professionals, senior officers from various departments associated with urban sanitation & water supply and civil society professionals.

The deliberations during the workshop pointed at the need for a multi-agency framework to identify and restore landscapes with clear outcomes at the initiation stage itself. Several case studies of eco-restoration projects in India, US and other countries were presented during the meeting and prompted focused discussions. It was decided to develop a few pilot projects in India in collaboration with state pollution control boards, R&D organisations and civil society groups. Center for Urban Green Spaces, New Delhi and Rutgers University agreed to collaborate to develop a long term program on eco-restoration demonstration projects in various parts of India. ●

MOLECULAR MODELING AND INFORMATICS IN DRUG DESIGN

03-06 November 2014
Mohali, INDIA

The discovery of new medicines is a cumbersome process – hugely expensive in terms of time, money, efforts and human resources. With the advent of cutting-edge science

and technologies for solving the problems related to biology and chemistry, the process of discovery has been hastened manifold, and now allows scientists to rationally design



drugs by understanding their targets at an atomistic level and tailored them to specific diseases. This facilitates the development of drug molecule with better efficacy and less side effects/toxicity as their properties and possible interactions are better understood at the earlier stages. The use of computational techniques and validated software in

drug discovery are gaining popularity, and are routinely being implemented to complement experimental studies. Hence, the future of drug discovery shall strongly depend on the integration of informatics and pharmaceutical sciences. An Indo-US workshop on **Molecular modeling and informatics in drug design** was organized by **Prasad V. Bharatam** (National Institute of Pharmaceutical Education and Research, Mohali) and **Alexander Tropsha** (University of North

Carolina at Chapel Hill) with an aim to provide a platform for group-to-group coordination, with a focus on strengthening graduate education in the interdisciplinary area of informatics and drug discovery in India and the United States. ●

GENOMIC INSIGHTS INTO HUMAN MORPHOGENESIS: PRENATAL, POSTNATAL AND MOLECULAR DYSMORPHOLOGY

07-09 November 2014
Hyderabad, INDIA



The relative contribution of congenital malformations to neonatal mortality and morbidity is being increasingly recognized in India following improvements in immunization programs and perinatal care. Hence, the need for the care of malformed children and genetic counselling for such families is gaining attention. Further, the recent availability of advanced molecular techniques like micro array and next-generation sequencing have made it possible to identify the causative gene/mutation in a number of malformation syndromes. However, we still do not have information regarding genetic etiology of a number of

malformation syndromes and a lot of research interest is being diverted to this aspect. Proper clinical delineation, genetic counselling, prenatal diagnosis and research aimed towards identification of genes will go a long way to decrease disease burden in society due to these conditions. Towards this end, the Indo-US workshop on **Genomic insights into human morphogenesis: prenatal, postnatal and molecular dysmorphology** organized by **Ashwin Dalal** (Centre for DNA Fingerprinting and Diagnostics, Hyderabad), **John C. Carey** (University of Utah, Salt Lake City), **Shubha R. Phadke**

(Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow) and **Prajnya Ranganath** (Nizam's Institute of Medical Genetics, Punjagutta, Hyderabad), brought together eminent clinicians and scientists from India and the US to deliberate on various aspects of normal and abnormal human morphogenesis: developmental genetics, clinical evaluation

and prenatal imaging for malformations/ malformation syndromes, diagnostic testing, pathophysiology, treatment, supportive care, genetic counselling, prevention and prenatal diagnosis, use of advanced techniques like micro array, next generation sequencing for elucidation of genetic etiology etc. ●

PROTEOMICS FOR TRANSLATIONAL RESEARCH

06 December 2014
Mumbai, INDIA

Due to the rapid advancement in state-of-the art proteomics technologies, continuous expansion of our scientific understanding, and challenges associated with translational research, it has become necessary to keep up with current trends and advances in proteomics research. In spite of versatile global proteomics research endeavours, there is a serious bottleneck between promising laboratory findings and their successful translation into real clinical applications. Additionally, analysis and management of large datasets obtained from the high-throughput proteomics research is also a formidable challenge.

An Indo-US workshop on *Proteomics for translational*

research was organized by **Sanjeeva Srivastava** (Indian Institute of Technology-Bombay) and **Philip Andrews** (University of Michigan, Ann Arbor) to bring together the top proteomics researchers of the US and India to discuss many of the existing technological limitations for translational proteomics research and make recommendations for future collaborative research projects to overcome such limitations. Specifically, the objectives were to build long-term bilateral collaborative research work and provide recommendations for joint proteomics projects for translational research; and, to develop joint proteomics courses and exchange programs for students and scientists from India and the US. ●

RECENT TRENDS IN THERMOELECTRIC MATERIALS: FUNDAMENTALS TO APPLICATIONS

13-15 December 2014
New Delhi, INDIA

Thermoelectricity involves the conversion of a thermal gradient into electricity and vice versa. Although it is of great interest to develop conventional renewable and carbon neutral energy sources, such as, wind, solar, and biomass; there is a potentially large source of energy in the form of heat, which can also similarly be used to generate electricity. Owing to its green technology, there has been a renewed interest in thermoelectric-based waste heat recovery systems for energy generation; however, currently the main impediment in this direction is their limited thermoelectric efficiency. An Indo-US workshop on *Recent trends in thermoelectric materials:*

fundamentals to applications was organized by **Ramesh C. Budhani** (CSIR-National Physical Laboratory, New Delhi) and **Donald T. Morelli** (Michigan State University, East Lansing) to focus on fundamentals and applied research in the area of thermoelectric materials and devices thereof. Effective solutions to the major challenges, currently inhibiting the use of thermoelectric devices for energy generation, which includes enhancement of the thermoelectric conversion efficiency (figure of merit) and the use of cost-effective and non-toxic materials was deliberated upon at the workshop. ●

NANO-ENGINEERING IN MEDICINE

17-19 December 2014
New Delhi, INDIA

An Indo-US workshop on *Nano-engineering in medicine* was organized by **Amit Kumar Dinda** (All India Institute of Medical Sciences, New Delhi), **Rupak Banerjee** (University

of Cincinnati), **Ashok Kumar Ganguli** (Institute of Nano Science & Technology, Mohali) and **Kunal Mitra** (Florida Institute of Technology) with the objective of bringing

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researchers from the leading institutions of the two countries on a common forum to facilitate discussions on successful application of nano-engineering in medicine. The hypothesis was that such workshop would be an effective platform for

efficient exchange of research ideas between diverse institutions involving complex topics, such as transport of nano-particles in biological systems. This would help in determining the unmet needs and central challenges while identifying synergies between the two nations in this field. ●



Prof. Ashutosh Sharma is appointed Secretary, Department of Science and Technology, Govt. of India

Prof. Ashutosh Sharma (Institute Chair Professor & C.V. Seshadri Chair Professor, Coordinator, DST Unit on Nanoscience & Center for Environmental Science and Engineering, IIT-Kanpur) has been appointed as Secretary, Department of Science and Technology, Govt. of India. Prof. Sharma got his B.Tech. degree in Chemical Engineering from IIT Kanpur in 1982. He graduated with a master's degree from Pennsylvania State University in 1984 and three years later obtained his Ph.D. in Chemical Engineering from Buffalo State University. Prof. Sharma is an elected fellow of prestigious societies such as the Academy of Sciences for the Developing World, Indian National Science Academy, Indian National Academy of Engineering, Indian Academy of Sciences and the National Academy of Sciences, India.

In 2002, he received the Shanti Swarup Bhatnagar award in engineering sciences for his "original pioneering contribution to the understanding of the behaviour of thin films and other highly confined nanoscale systems". The next year he was awarded Herdillia Award by the Indian Institute of Chemical Engineers. In 2007, he was awarded the Distinguished Alumnus Award from the Indian Institute of Technology in Kanpur. In 2010, the Infosys Science Foundation awarded him with the Infosys Prize in Engineering and Computer Science for his "scholarly scientific contributions in the broad areas of nanoscale surface pattern evolution, instability, and the dynamics of thin liquid and solid films and soft matter." IUSSTF wishes Prof. Ashutosh Sharma every success in his new assignment!



Indo-US Science & Technology Forum

Who we are

The Indo-US Science and Technology Forum (IUSSTF), established under an agreement between the Governments of India and the United States of America, is an autonomous, not for profit society in India, co-funded and co-governed by both the governments. IUSSTF promotes and catalyzes Indo-US collaborations in science, technology, engineering, biomedical research and innovation through substantive interaction among government, academia and industry.

What we do

- Foster** excellence by capitalizing on the scientific and technological synergy
- Disseminate** information and create awareness through scientific exchanges
- Build** linkages through networking between academia and industry
- Explore** new frontiers by nurturing contact between young and mid-career scientists
- Pave** way to sustainable interactions and establish long term relationships
- Encourage** public-private partnership to inculcate elements of innovation and entrepreneurship

We support

Exciting and innovative collaborative programs cutting across disciplines and institutions

- Academia-Industry Connect Programs
- Advance Schools & Training Programs
- Bilateral Workshops & Symposia
- Flagship Events
- Knowledge R&D Networked Joint Centers
- Programs on Innovation and Entrepreneurship
- Public-Private Networked R&D Joint Centres
- Research Fellowships for Faculty
- Special Initiatives for Strategic Partnerships
- Student Internships & Visiting Professorships

We invite

Proposals which are peer reviewed both in India and USA for awards

Bilateral Indo-US Workshop/Symposia & Indo-US Training/Advanced Schools

Submission Deadlines	Award Announcements
01 March	31 July
31 August	31 January

Indo-US Public-Private Networked Centres & Indo-US Knowledge R&D Networked Centres

Submission Deadline	Award Announcement
31 August	31 January

How to contact us?

For program details visit:
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Catalysing Indo-US Science & Technology Cooperation for 15 years!