COVER STORY

04 Indo-U.S. Center for Building Energy Research & Development
Smart Buildings

FEATURE

08 Sustainable Access to Arsenic-safe water
A Sip for a Healthy Tomorrow

12 Handheld Forced Oscillation Device for Improved Detection and Monitoring of Airway Diseases
Breathing Easy

REPORT

14 Excerpts from the Joint Statement
Second India-U.S. Strategic and Commercial Dialogue

19 DST-Intel Launch a Research Initiative for Real-Time River Water and Air Quality Monitoring

20 U.S. - India S&T Joint Commission Meeting

21 World’s first foot-operated resuscitation system launched

STUDENT SPEAK

22 Giving Wings to Talent

26 EVENTS DIARY
As we enter the New Year, it is with a sense of immense pride that I look back upon the achievements of IUSSTF in 2016! IUSSTF has continued to play its pivotal role in catalyzing the strategic science, technology and innovation partnership between India and the United States. In the past year, we have continued to provide a platform to thousands of Indian and American scientists, engineers, entrepreneurs and students to benefit through our manifold programs and accelerate the development of all those great ideas into broadly accessible technology solutions. To quote the Joint Statement released after the Second India-U.S. Strategic and Commercial Dialogue held in August 2016 – “Considering that the bi-national Indo-U.S. Science and Technology Forum (IUSSTF) has played a successful role in catalyzing and supporting the current level of the multifaceted S&T relationship, both Sides resolved to continue scaling effective technologies locally and globally through various mechanisms and to seek to augment funding of the IUSSTF in order to scale up its activities”. The achievements of IUSSTF also figured prominently on the agenda and the subsequent discussions of the U.S.-India S&T Joint Commission Meeting held in Washington in September 2016.

Building on the success of the first phase of the Indo-U.S. Joint Clean Energy Research and Development Center (JCERDC), a second phase to this program was announced with a new funding opportunity in two areas critical to improving the reliability, flexibility, and efficiency of the electricity delivery system - Smart Grid and Energy Storage. Also, for the Seventh Call for Proposals under the U.S.-India Science and Technology Endowment Fund (USISTEF) Program, IUSSTF attempted to reach out to approximately 20,000 individuals virtually and through personal contact. As a result of this extensive, yet targeted outreach, the Secretariat received an unprecedented response for the Seventh Call of the USISTEF Program with 366 applications!

I am also happy to let you know that in partnership with the Department of Science & Technology, Govt. of India (DST) and Intel®, we have launched a new research program titled Research Initiative for Real-time River Water and Air Quality Monitoring. The intent is to develop tools and constituent blocks that will enable end-to-end water and air quality monitoring systems on smart, networked, low cost, low power sensor nodes with large-scale cloud based data analysis.

On behalf of IUSSTF, I wish all our stakeholders a very productive and invigorating New Year! I am confident that IUSSTF will continue to play an increasingly important role in catalyzing bilateral interactions that benefit not only our people, but the world at large!

Rajiv Kumar Tayal
Executive Director, IUSSTF
The **Indo-U.S. Center for Building Energy Research and Development (CBERD)** is working on the integration of digital technology with building technology. Penetration of digital technology for design, construction and operation of buildings is still in a nascent stage compared to its permeation in sectors such as finance, transport and governance. Under the aegis of the **Indo-U.S. Joint Clean Energy Research and Development Center (JCERDC)** supported by the Ministry of Science and Technology, Govt. of India and the U.S. Department of Energy; since October 2012, the CBERD team is working to provide next-generation solutions to enhance energy efficiency in buildings.
CBERD is a consortium of 11 R&D partners consisting of Universities and National Laboratories, 23 Industry cost share partners encompassing software giants to material manufacturing Start-Up Companies and eight Industry Associations from India and the United States. This consortium is led by CEPT University in India and Lawrence Berkeley National Laboratory (LBNL) in the U.S.

In the initial stages, CBERD focused on fine-tuning research questions and defining outcomes. The CBERD team believes in striking a good balance between the natures of outcomes. On one side, it believes in academically important activities such as publication of research papers - a number of international conference papers have helped the team to discuss its work with peers in person; while journal papers have provided opportunities to disseminate its knowledge with a wider audience. On the other side, CBERD has developed key software and hardware in collaboration with partner industries. Some of the deployable outcomes fall under the broad categories of tools, methods, materials and technologies; and the CBERD team is working with stakeholders to deploy various CBERD outcomes.

Design tools such as eDOT and COMFEN India are expected to assist architects in the early design stage of buildings. COMFEN India is a tool to predict daylight inside building spaces. eDOT provides design assistance to understand the complexity of operational end-use energy. Non-CoPlaner Shading Calculator and Cool Roof Calculator will assist in building energy code implementation. Grid Responsive Building Web Tool will assist in technology evaluation. Early building design phase offers high design flexibility, less cost and high energy saving potential. eDOT is an easy to use tool for early design phase and does not require the user to have whole building energy simulation expertise. The user can give a range of parameters such as building orientation, floor-space aspect ratio, window-to-wall ratio, glass and...
frame type, and many others. eDOT generates thousands of possible simulation models and uses Energy Plus to simulate them in parallel and has been supported by interactive visualization interface. The solar gain through windows in buildings is characterized by the Solar Heat Gain Coefficient (SHGC). This research develops calculation of a SHGC-modifier that indicates how much the SHGC of a window changes by adding a specific exterior shading feature such as a fin or overhang. Non-Coplaner Shading Calculator uses EnergyPlus for the calculation of incident diffuse and direct solar radiation on a window given a specific site, orientation, climate and external shading features. The result of this incident solar radiation data is then used as an input for the WINDOW tool. Cool Roof Calculator helps a user understand the impact of cool-roof material on energy and comfort in the Indian context. Grid Responsive Building Web Tool analyses implications of (i) static technology adoption and implication in buildings (including CBERD technologies) and, (ii) Integration of distributed power generation, demand response, time of day pricing, simulation of micro-grid for GRBs and cost benefit analysis under alternate scenarios.

Methods developed at CBERD will assist Government and Industry in managing a portfolio of buildings for their energy demand in an improved manner. The Building energy benchmarking method is aimed to assist the Central Government in developing scalable and affordable benchmarking programs at the national level. Research related to ‘Energy Information System (EIS)’ has provided technical requirements for scalable and cost effective EIS packages suitable for specific sectors and sub-sectors. Based on an extensive study of electrical distribution diagrams of existing and new buildings and equipment installed in the offices, hotels and hospitals; energy use pattern at space level and EIS for these specific sectors have been developed and tested in a few buildings.

Other technology developments in the project include a smart power strip, low-energy wireless motion sensor and personal environmental control system for demand response. Integrated Workstation Control Hub and Low Power Wireless Motion Sensors are examples of deployable outcomes from research focused on electronic sensors and controls technologies. Integrated Workstation Control Hub is a personalized hub, which provides control over task lighting on personal air motion device. It also helps monitor environmental parameters such as CO$_2$, Lux, Temperature, Relative Humidity along with energy consumption and occupant motion. It also includes inductive charging, large battery storage. An interactive
control panel supports this smart control hub. Identifying lacuna in existing systems of motion sensors, a Low Power Wireless Motion Sensor with very small form has been developed at CBERD. This sensor uses extremely low power and such multiple devices can be installed to cover even minor motions.

For physical systems like the air-conditioning units, three new technologies have been developed that have the potential of saving considerable amount of energy. These developments include a Dedicated Outdoor Air System (DOAS) and a Micro-Channel Heat Exchanger (MCHX_E) for evaporator in unitary air-conditioning systems. Envisaging India’s space cooling demands of the future and its impact on energy generation; CBERD has successfully developed and tested these two technologies.

Development of Dedicated Outdoor Air Systems can reduce the complexity, size, cost of conventional non-compressor DOAS while increasing energy recovery. The research has culminated in the development of three different types of non-compressor DOAS technologies and these modular units can be used in the building air conditioning systems. These are Indirect Evaporative Water Cooler, Air-to-Air recovery and Solution Heat Exchanger. Another research is focused on Micro Channel Heat Exchanger (MCHX_E) for Evaporator. MCHX_E can reduce size, cost and refrigerant inventory compared to conventional fin tube evaporator in small unitary Split AC up to 2 TR capacity while improving their performance.

A number of deployable and marketable technologies have been developed in the CBERD project to reduce energy consumption in buildings, mainly in the commercial sector. However, scalable models are possible for integrating the same into residential buildings as well. The CBERD team has worked on performance evaluation of Laser Cut Panels (LCP) to improve its performance and deployment. Relying on optical characterization technologies, CBERD has worked on improved LCP to bring daylight deep inside the building to save electricity for lighting during daytime. Development of building material containing Phase Change Material Tiles (PCM) has also been accomplished that can be applied to a building to provide increased comfort for longer periods of time without air conditioning. Integration of the Phase Change Material within the building envelop will provide a higher possibility to operate buildings in mixed operation mode, which could be a combination of natural ventilation mode and air conditioned mode. The CBERD team developed three deployable outcomes based on research pertaining to PCM that can be directly used in the buildings - PCM ceiling tiles, encapsulated PCM for inside plaster finish and non-load bearing masonry unit with encapsulated PCM.

A number of other CBERD deployable outcomes are in an advanced laboratory prototype stage. Some prototypes have been tested in the field as well with the help of CBERD Industry Partners. If deployed in a building each of these outcomes has the potential to save 7% to 28% energy. The CBERD team is currently refining these along with field testing. Majority of the tools are designed to remain in public domain, available free of cost. A number of industry partners are also working extensively on technologies and material based outcomes in order to turn them into commercially viable products.
Presence of arsenic in ground water is a serious problem affecting a large chunk of the population in India. Chronic consumption of arsenic contaminated water leads to serious health complications in adults and children alike. Technological solutions to tackle this concern will go a long way in reducing morbidity and mortality.

High levels of naturally occurring arsenic poison the drinking water of 200 million people worldwide. Arsenic contaminated groundwater was first detected in India in West Bengal in 1983. Since then, arsenic contamination has been discovered in groundwater sources in Punjab, Jharkhand, Bihar, Uttar Pradesh, Assam, Manipur, and Chhattisgarh. Chronic ingestion of arsenic causes skin lesions, gangrene, multiple types of cancer, cardiovascular diseases, reduced IQ in children, neuropathy and premature death. Since the initial detection, millions of liters of contaminated groundwater have been withdrawn and consumed; several million persons have been poisoned slowly, one gulp at a time; several thousands have been affected by arsenic-induced illnesses; and several hundred, at least, have lost their lives. The U.S. Environmental Protection Agency’s 2010 assessment found that lifetime consumption of water with 250 ppb arsenic—common in these parts of India—results in 18 excess internal cancers per 100 individuals, an unacceptable risk.

Tackling the arsenic contamination problem in India requires the invention of a new robust, effective technology, coupled with a successful social business model and local manufacturing that takes into consideration the cultural needs of the community. Economics Professor Joyashree Roy from Jadavpur University, Kolkata and Environmental Engineering Professor Ashok Gadgil from UC Berkeley, USA have dedicated the past 15 plus years to developing such a holistic solution. Their current collaborative work funded by the U.S.-India Science and Technology Endowment Fund (USISTEF) has led to the implementation of their concepts and ideas in a successful arsenic remediation plant at a high school in West Bengal.

Beginning in 2000, Joyashree Roy and her team at Jadavpur University have been trying to understand societal and economic welfare impacts of consuming arsenic contaminated water.
water. Their work has been published extensively in English and Bengali. The purpose of their papers is to help everyday people make sense of the crisis and guide decision makers as they search to find a sustainable and effective solution. The team has documented numerous case studies showing the sufferings accompanied with arsenic exposures and failed technology deployment strategies implemented in the past.

Between the years 2005 and 2008 Ashok Gadgil and his team from the University of California, Berkeley, and Lawrence Berkeley National Laboratory, USA invented, developed, and demonstrated a robust, highly effective, affordable arsenic-removal technology known as Electro-Chemical Arsenic Remediation (ECAR).

ECAR works by applying a small voltage (<10 V) to iron plates (aka electrodes) suspended in arsenic contaminated water. The voltage causes continuous dissolution of the negatively charged iron electrode leading to the formation of a particular kind of rust in the water. Arsenic binds to these newly generated rust particles forming an easily removable sludge that settles as a solid.

To our knowledge, ECAR remains technologically superior to other remediation approaches in its (1) effectiveness (2) affordability (3) rapid scalability and (4) capacity to operate in remote areas with intermittent grid electricity and/or solar PV.

For over a decade ECAR was tested in a range of synthetic and real groundwaters with arsenic concentrations reaching 800 ppb in Bangladesh, West Bengal, and Cambodia. In
all cases ECAR was able to reduce arsenic concentration to <10 ppb (the World Health Organizations recommended limit) and in most cases to <5 ppb. The engineering science is robust and extremely effective, and considerable innovation has also gone into ensuring that its design and implementation are responsive to local skills, regulations, social, economic, and cultural norms and needs of poor rural communities.

Knowing that inventing a technology is not sufficient for solving a problem, in 2009 Profs. Roy and Gadgil engaged in a joint collaboration to further the successful social integration and application of ECAR in India. Their diverse backgrounds, in emerging areas of environmental economics and environmental engineering respectively, fostered an interdisciplinary approach that incorporated both the technical and social science necessary for successful technology deployment. They had two main goals (1) scale ECAR so it can operate sustainably and affordably at the community level through cost sharing and (2) increase public awareness about the health effects associated with arsenic consumption and need for an effective and socially acceptable technology to reduce risk to individual well-being.

With the generous support of USISTEF, Prof. Roy and Prof. Gadgil partnered with Livpure Private Limited company from New Delhi to bring ECAR to commercial scale. With Dr. Gadgil leading the technology team, Dr. Roy overseeing the social and economic analyses, and Livpure providing the necessary industrial support the team successfully designed, built, commissioned, and continues to operate a pilot plant with a throughput capacity of 10,000 L/day. Located on a school premise in the rural outskirts of Kolkata, West Bengal, this plant is capable of serving 5,000 students and their families.
Since April 11, 2016 analysis of weekly water samples performed by UC Berkeley and two independent Nationally Accredited Board Laboratories in India confirm that the pilot plant’s product water meets all relevant drinking water standards (IS 10500:2012). While raw water has arsenic at ~250 ppb, ECAR-treated water is well below 10 ppb. In October 2016 this water became available for the first time to the students, teachers, and staff of Dhapdhapi High School. The school headmaster wrote to the team that he was ‘very pleased with the plant,’ and emphasized the importance that “this water remains available and if possible expand to neighboring communities.”

Though the pilot plant at Dhapdhapi High School currently serves only 5,000 people, it is the first arsenic remediation plant of its size and serves as an example of what ECAR is capable of. In particular the pilot plant is proof of convergence of (1) a novel highly effective technology to remove arsenic, (2) application of rules for successful social placement of such technology in a community, and (3) a successful test of a business case for the private sector to partner with the public sector for greater social benefit. The hope for the future is that the lessons and successes learned here will help in the global scaling of ECAR and other similar technologies.

In order to support the future dissemination and use of ECAR, Prof Gadgil and his team have provided meticulous hands-on training to Indian manufacturing companies to build, install and manage plants successfully. Over the past few years UC Berkeley engineers have visited West Bengal for many months at a time and trained Indian graduate students, post-doctoral researchers, and local technicians on the ECAR process. By making ECAR locally affordable, adaptable and operable, and securing investments from both the private and public sector, this technology has the potential to spread across India, providing access to clean, safe drinking water to all arsenic affected communities, and eventually putting an end to this entirely preventable mass poisoning.
Lung diseases are amongst the top three threats to public health globally (see http://www.thelancet.com/themed/global-burden-of-disease). One of the main challenges in assessing lung health is lack of affordable, simple and sensitive diagnostic tests. Together these form an apparent trilemma, a situation in which at most two of three desirables are obtainable. Peak flow tests measure the maximal airflow during a forced exhalation after a maximum inhalation. They are affordable and simple but lack sensitivity. Forced Oscillation Technique (FOT) devices apply sound waves to lungs during normal breathing and are simple and highly sensitive, but are expensive and bulky. The USISTEF supported project aims to combine all desirable attributes into a single portable battery operated device based on FOT principles to reduce costs, size and power consumption.

Lung diseases are a very significant source of morbidity and mortality globally. Assessing lung health is hampered by lack of affordable and simple diagnostic tests that are also highly sensitive. Forced Oscillation Technique (FOT) devices, though simple and highly sensitive, are very expensive and bulky. The USISTEF supported project aims to combine all desirable attributes into a single portable battery operated device based on FOT principles to reduce costs, size and power consumption.

The current United States-India Science and Technology Endowment Fund (USISTEF)-supported project ambitiously aims to combine all the desirable attributes together into a single portable battery operated device based on FOT principles for easy measurement during quiet breathing, using state of art algorithms for highest sensitivity, and innovative engineering to reduce cost, size and power consumption. The project was selected for funding in 2015 under the fifth call and the work has progressed well. The key development is that Cognita Labs has developed a highly accurate ultrasonic transducer for measurement of airflow. The successful development of a suitable ultrasonic platform is significant as it simultaneously achieves both high accuracy and low cost. The key breakthrough was...
in co-designing the hardware and signal processing algorithms for accurate flow design, combined with accounting for the unique features of human breathing. The sensor design consists of several aspects, which include the optimal placement of the sensors, accurate calculation of sensor dimensions, mechanical design enclosure, electronics to capture the flow data and then signal processing algorithms to convert raw sensor values into accurate flow readings. A practical implication of an ultrasonic transducer based design is that the instrument has an open tube without wire mesh and will be easy to clean and disinfect. The importance of such small details in countries like India with high prevalence of tuberculosis cannot be overstated. The new ultrasonic sensor and industrial design is the basis for the provisional patent filed by Cognita Labs in February 2016. The provisional patent titled “Method and Apparatus for Portable Forced Oscillometry Technique-based Lung Function Testing” protects Cognita Labs special design of ultrasonic flow sensing.

The first fully functional industrial design was completed and demonstrated at multiple events. The prototype was first demonstrated at the ICONIC conference in Feb 2016 and subsequently at the TIECON start-up meet at Silicon Valley and also the American Thoracic Meeting at San Francisco in May 2016. The key elements of the new design were ease of use along with mechanical stability. The team has recently completed a version 2.1 of the prototype that increases accuracy and test reproducibility, by making changes to the flow dynamics of the design and reducing mechanical resistance of the device. The key new feature is the identification of the shape dynamic of human breathing and leveraging it to improve the performance of the device even further. A simplified and intuitive tablet based mobile software has been developed that controls the device and calculates output parameters in real-time. The near-final version is now being further tested at CSIR-IGIB. Meanwhile, physicians in India have been introduced to this class of technology and have provided excellent feedback regarding the possibility of incorporation into their practice. A marketable version of the device is expected by 2018.
Excerpts from the Joint Statement
Second India-U.S. Strategic and Commercial Dialogue
August 31, 2016
India and the United States held the second India-U.S. Strategic and Commercial Dialogue in New Delhi today. External Affairs Minister of India Sushma Swaraj and Minister of State for Commerce and Industry of India Nirmala Sitharaman co-chaired the dialogue with U.S. Secretary of State John F. Kerry and U.S. Secretary of Commerce Penny Pritzker.

The Sides expressed deep satisfaction at the expanded and strengthened course of bilateral engagement in recent times and reiterated their shared commitment to advance mutual prosperity, global peace, and stability. The Sides noted that the deepening strategic partnership between the United States and India is rooted in shared values of freedom, democracy, universal human rights, tolerance and pluralism, equal opportunities for all citizens, and rule of law.

**Strategic, Defense and Security**

Recognizing the growing threats and challenges in cyberspace and the serious risks to national security from malicious cyber activity, both Sides reaffirmed working together to promote cyber security, combat cyber-crime, advance norms of responsible state behavior in cyberspace, improve cooperation among technical and law enforcement agencies, and promote cyber R&D and capacity building. In this context, they welcomed the signing of the Framework for the India-U.S. Cyber Relationship.

**Regional Consultations and Global Issues**

Reflecting on progress already made towards enhanced triangular cooperation, the Sides reaffirmed their commitment to work together and leverage their combined capacities to assist other developing countries, and address global development challenges for the benefit of the wider region and the world. This includes expanded collaboration in the areas of health, energy, agriculture, and women’s empowerment. The Sides lauded the recent launch of the second phase of the Feed the Future India Triangular Training Program by the Ministry of Agriculture and Farmers’ Welfare of India and the United States Agency for International Development (USAID) that brings specialized agriculture training to 1,500 agricultural professionals from countries across Africa and Asia. The Sides look forward to the next round of bilateral consultations on Africa later this year.

Reflecting the shared commitment to promoting economic growth and development in South Asia, the Sides look forward to strengthen cooperation in the area of regional integration and connectivity in South Asia, including through possible collaboration with the U.S. Millennium Challenge Corporation.

**Climate, Energy and Environment**

In light of the commitment to strengthen and expand the highly successful U.S.-India Partnership to Advance Clean Energy Deployment (PACE-D), and underscoring the vital importance of expanding access to public and private financing for clean energy development in order to enhance energy access and sustainable development, the Sides welcomed the progress on clean energy initiatives announced during the recent Summit. The Sides recognized their collective efforts to advance the U.S.-India Clean Energy Finance (USICEF) initiative, the U.S.-India Clean Energy Hub, the expansion of USAID programme for Utility-level support and the U.S.-India Catalytic Solar Finance Program, which will collectively mobilize public and private capital towards clean energy solutions.

Recognizing the advanced progress of the U.S.-India Joint Clean Energy Finance Task Force (Task Force), the Sides announced their intent to expand the Task Force’s work to include new clean energy finance initiatives for joint collaboration.

Recognizing the U.S.-India Joint Clean Energy R&D Center initiatives for technological innovation in clean energy, the two sides appreciated the expansion of the Partnership to Advance Clean Energy Research (PACE-R) through a fourth track on smart grid and energy storage technologies. The Sides noted the progress under the “Greening the Grid” initiative and collaboration for training of Indian professionals in the area of large scale integration of renewable energy into the Indian grid. Both governments reiterated their commitment to doubling their Clean Energy R&D Investment towards fulfillment of the objectives of Mission Innovation, resolved to increased
cooperation between national labs, and announced the creation of the PACE Fellowship.

The United States affirmed its support for pursuing its membership of the International Solar Alliance (ISA), recognizing the critical role it can play in the development and deployment of solar power.

The sides also recognized the continued significance of efficient power generation technologies to address the challenges of climate change.

The Sides resolved to work towards the early finalization of the MOU between Directorate General of Hydrocarbons (DGH) of India and Bureau of Oceans Energy Management (BOEM) of the United States for cooperation in the field of unconventional hydrocarbon research. They resolved to work for early finalization of the proposed MOU between NTPC Ltd. of India and National Energy Technology Laboratory of the United States for cooperation in the field of Fossil Energy Technologies.

The Sides reaffirmed their commitment to combat climate change and its effects. They reiterated their resolve to work together and with others to promote full implementation of the Paris Agreement to address the urgent threats posed by climate change. India and the United States recognize the urgency of climate change and share the goal of enabling entry into force of the Paris Agreement as early as possible. The United States re-stated that it will join the Paris Agreement as soon as possible this year. India has similarly begun its processes to work towards this shared objective. The United States reiterated its commitment to pursue low greenhouse gas emission development strategies in the pre-2020 period and to develop long-term low greenhouse gas emission development strategies. The United States also remains committed, with other developed countries, to the goal of jointly mobilizing $100 billion per year by 2020 to address the needs of developing countries in the context of meaningful mitigation and adaptation action.

In addition, the two countries resolved to continue to work together to adopt a hydrofluorocarbon (HFC) amendment in 2016 with increased financial support from donor countries to the Multilateral Fund to help developing countries with implementation, and an ambitious phasedown schedule, under the Montreal Protocol pursuant to the Dubai Pathway.

The Sides recognised the progress achieved through the first three years of the Joint Working Group on Combating Climate Change. The Sides noted progress and opportunities in the bilateral cooperation on resilience, air quality, forestry and science and technology fellowships under the Joint Working Group.

Recognizing the need to play a leadership role to protect the iconic elephant from extinction due to rampant poaching and ivory trafficking, the Sides expressed joint support for a resolution that calls on Parties to implement domestic bans on the trade in elephant ivory at the September Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Conference of Parties. The Sides also expressed joint support for increased CITES protections of pangolin species ranging from Africa to Asia, whose populations have been decimated due to wildlife trafficking, and reiterated their joint commitment to protect India’s tiger population.

Commerce, Economy, and Growth

The Sides noted that the strong commercial ties have defined the growing partnership between India and the United States. In an otherwise sluggish global economy, bilateral trade between India and the United States has held steady, and bilateral investment flows have grown over the last two years. The Sides noted the significantly increased Government-to-Government engagement on economic and commercial topics undertaken in the past year under the S&CD. They noted the value of engagement in building mutual confidence and the capability to address problems and pursue opportunities constructively for mutual benefit. They resolved to continue to institutionalize and use the S&CD to elevate their ambitions and accomplishments in mutual trade and investment.

The Sides noted the recommendations of the U.S.-India CEO Forum held earlier today and acknowledged the crucial role of the Forum in strengthening our partnership on commercial and trade related issues. They acknowledged the value of closely integrating the CEO Forum with the Commercial track of the S&CD. They appreciated the follow-up action by various Government
departments and agencies on the recommendations made by the CEO Forum in 2015. In line with the CEO Forum recommendations, a number of concrete measures have been undertaken. The new Defence Procurement Procedure of the Government of India enhances the ability of the private sector to tap into the opportunities for defence production in India. Already, joint collaboration on two new defence projects on digital helmet mounted displays and the joint biological tactical detection system has been undertaken. The Sides noted the establishment of a National Infrastructure and Investment Fund (NIIF) by the Government of India. The Sides acknowledged the productive U.S.-India CEO Forum-led Digital Infrastructure Best Practices Exchange Workshops, and encouraged participation by all stakeholders in the regional Global Connect Conference to be held on September 15, 2016.

Recognizing the importance of small and medium enterprises (SMEs) to spur growth and create jobs, the Sides committed to creating a platform for sharing of best practices and technology, in addition to access to finance to promote integration of these SMEs in global value chains.

Recognizing the important contributions of Indian companies to the U.S. economy, the United States welcomed nearly 80 Indian delegates to the 2016 Select USA Investment Summit in Washington, D.C. The United States announced a Select USA Road show to India in March 2017. Similarly, Invest India, India’s investment promotion and facilitation agency, which facilitates U.S. companies investing in India, will also be organising Investor Road shows in the United States.

Innovation and Entrepreneurship

The Sides expressed satisfaction at the progress made by the work stream on Innovation and Entrepreneurship. The Sides noted that India’s ranking moved up 15 places this year in the Global Innovation Index. They noted the private sector led Innovation Forum held on August 29, 2016, and believe that it will actively engage with stakeholders from both sides to support the eco-system of innovation across sectors. The Sides resolved to facilitate engagement between innovation hubs in sectors like life sciences, while strengthening ties with academic institutions. They resolved to facilitate linkages between innovation hubs in India and the United States, with the private sector also playing a leading role.

Taking note of the Government of India’s “Startup India” initiative launched in 2016 to foster greater entrepreneurship and innovation, the Sides committed to further collaboration between Indian and U.S. startups, venture capitalists and other stakeholders. The Sides also look forward to co-hosting the 2017 Global Entrepreneurship Summit in India, which will bring together entrepreneurs, investors, educators, government officials and business representatives from around the world, creating new opportunities for investments, partnerships and collaborations. To move forward on this engagement, the Sides signed a Statement of Intent to Co-Host GES 2017.

The Government of India plans to launch an initiative which deploys leading Indian entrepreneurs to advance Startup India and inspire the next generation of successful innovators. The Sides also noted President Obama’s U.S. Presidential Ambassadors for Global Entrepreneurship Initiative, about which the U.S. side intends to share information.

Smart Cities Cooperation

The Sides appreciated the ongoing cooperation on Smart Cities between Indian and U.S. Government agencies. Recognizing the success of the ongoing smart city collaboration in Visakhapatnam, the Sides resolved to launch a follow-on phase that will deliver an integrated master plan. The Sides resolved to continue reverse trade missions from the MOU partner cities (Ajmer, Allahabad and Vishakhapatnam) to look at smart solutions for their respective cities. The Sides looked forward to working on the Plan of Action developed for mutual technical cooperation for issuance of municipal bonds by Pune.

Science and Technology

The Sides emphasized the importance of science and technology and innovation for economic development and wellbeing of people in both countries. Considering
that the bi-national **Indo-U.S. Science and Technology Forum (IUSSTF)** has played a successful role in catalysing and supporting the current level of the **multifaceted S&T relationship**, both Sides resolved to continue scaling effective technologies locally and globally through various USAID mechanisms and to seek to augment funding of the IUSSTF in order to scale up its activities, including through external fundraising such as from Corporate Social Responsibility. The Sides also announced the convening of the India-U.S. Joint Committee Meeting on Science and Technology in Washington, DC later this year to review progress made and advance cooperation in the fields of science, technology and innovation, and empowering women to pursue careers in STEM fields.

The Sides recognized the successful collaborations in high energy physics that led to advances in accelerator technology. They decided to expand the cooperative activities in other frontier areas of science.

They noted with satisfaction that the charter for the Joint Oversight Group (JOG) for the Laser Interferometer Gravitational-Wave Observatory (LIGO) project in India has been signed and the final site for establishing the LIGO project in India identified. Further, the Sides appreciated that vacuum systems designs are mature and the prototyping work of the vacuum and optical components of the detector system will soon commence in India.

The Sides looked forward to participating in the Our Ocean Conference in September 2016 and to the inaugural Oceans Dialogue to promote sustainable development of the ocean economy.

The United States welcomed India’s decision to participate in the first ever White House Arctic Science Ministerial to be held in September 2016. The Sides proposed to initiate collaborations in areas of Arctic science and research.

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**Health, Education, and People-to-People Contacts**

Noting the ongoing active dialogue between the Sides in the field of traditional medicine and acknowledging the successful organization of India-U.S. Workshop on Traditional Medicine in March 2016, the Sides welcomed progress toward an MOU between the Department of Health and Human Services (HHS) and Ministry of AYUSH.

As an affirmation of the commitment to build enhanced partnerships in education and research, the Sides decided to explore the continuation of Indo-U.S. 21st Century Knowledge Initiative. The Sides appreciated the progress made towards an MOU in the field of Higher Education to increase cooperation in all higher education areas including student and faculty exchange and mobility, institutional collaborations, vocational training, technical and professional education, and philanthropy in higher education.

The Sides looked forward to organizing and scheduling a Higher Education Dialogue to be held in Washington, DC.

The leaders asked officials on both sides to continue to remain in touch and strive to further strengthen the bilateral partnership. Secretary of State John Kerry and Secretary of Commerce Penny Pritzker thanked the Indian delegation for hosting the second Strategic and Commercial Dialogue and for the warm hospitality. They decided to convene the next round in the United States in 2017.”

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**Text Courtesy:** Ministry of External Affairs, Govt. of India

Recognizing the importance of developing the online River Water and Air Quality Monitoring (WAQM) systems, Department of Science and Technology (DST), Government of India and Intel are collaborating to jointly initiate the **DST-Intel Research Initiative for Real-Time River Water and Air Quality Monitoring** soliciting proposals from Academic/Research Institutions and providing grant-in-aid support to the selected project(s). Speaking on the occasion of launch of the collaboration, Minister of State for Science & Technology and Earth Sciences Shri. Y.S. Chowdary said that this programme is very critical for the restoration, conservation and preservation of the environment. Elaborating on the DST-Intel collaboration, Shri Chowdary added that “Global experience will come in handy to tackle local challenges.”

The aim of this initiative is to develop key technologies for sensing, communication and analysis of large-scale data collected from autonomous networks of perpetual/long-lived sensor nodes, followed by integration and deployment for water and air quality monitoring in real-time. The program will be administered by the binational Indo-U.S. Science and Technology Forum (IUSSTF). The development of such an end-to-end solution comprising of several individual research elements can also potentially impact environmental quality monitoring systems in diverse contexts such as urban, domestic and industrial settings.”

Text Courtesy: Press Information Bureau, Government of India
Complete text can be accessed at http://pib.nic.in/newsite/PrintRelease.aspx?relid=155133
Dr. Harsh Vardhan, Minister of Science and Technology and Earth Sciences, Govt. of India and Dr. John Holdren, White House Office of Science and Technology Policy Director, co-led the U.S.-India S&T Joint Commission Meeting in Washington on September 30. In the week leading up to the JCM, five joint working groups convened to discuss progress in bilateral S&T cooperation in the following areas: Basic and Applied Science; Atmospheric, Environment and Earth Sciences; Health and Medical Science; Emerging Materials and Manufacturing Science; and, Agriculture. The fourth JCM featured thematic discussions on areas of science and technology (S&T) policy priorities that included promotion of women in science and technology; innovation and technology commercialization; achievements of the Indo-U.S. S&T Forum, and the upcoming renegotiation of the bilateral S&T Agreement. Both sides committed to develop a JCM action plan to help guide implementation of joint activities over the next two years.
World’s first foot-operated resuscitation system launched

The commercial launch of NeoBreathe™ - the world’s first foot-operated resuscitation system, was done on December 3, 2016 during the X Indian Medtech Summit which is the annual flagship event of the School of International Biodesign (SIB). The product was launched in the presence of Prof. K. VijayRaghavan (Secretary, Department of Biotechnology, Govt. of India), Prof. M.K. Bhan (National Professor IIT-D), Mr. Amitabh Kant (CEO, Niti Aayog), Dr. Arabinda Mitra (Department of Science and Technology, Govt. of India), Dr. Rajiv Tayal (Executive Director, Indo-U.S. Science and Technology Forum) and Prof. Balram Bhargava (Executive Director, School of International Biodesign). Neobreathe™ was developed with funding support from the U.S.-India Science and Technology Endowment Fund (USISTEF) and is an advanced, integrated yet easy-to-use solution that enables caregivers at all levels to resuscitate effectively with convenience, control and confidence. NeoBreathe™ is easy to use for nurses and other para-medical staff, while it offers exceptional convenience and premium features like built-in suction, pressure monitoring, and oxygen regulation for the sophisticated caregiver.
Giving Wings to Talent

To address the need for human resource development and capacity building in science and technology, the Indo-US Science and Technology Forum (IUSSTF) is committed to nurture contacts between scientists and students 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 interns in their own words!

Water Advanced Research and Innovation (WARI) Fellowship Program

I am a Doctoral Researcher, working on ‘Engineered Nanoparticles for Sustainable Environmental Application’. As a part and expansion of my research work, I am studying the interaction of nanoparticles with actual environmental systems. I had seen the announcement of WARI Program and applied by opting for Dr. Yusong Li as my Mentor, who has the leading group in the field of fate and transport of nanoparticles. When I received a mail stating that I have been selected as an Intern for the WARI Program with Dr. Yusong Li as my mentor, I was ecstatic! This program offered me a wonderful opportunity to share, interact, analyze and interpret the individual potential outcome of unique test methodologies and facilities from different high-quality specialists from various countries. Also, this program gave me an opportunity to interact with people at Lincoln, and gain a broader perspective of research and lifestyle in the US. I am hopeful that the exposure derived from attending this internship will not only be of tremendous help in my current research, but is also beneficial in furthering career and life prospects.

Ambika Selvaraj
Indian Institute of Technology, Madras
I am a Ph.D. student at IIT Roorkee with a research interest in the water sector where I work on micropolllutants in water and wastewater. The WARI internship opened new opportunities in my research career and gave me the opportunity to work in an USDA/NSF project. Professionally, this internship experience inculcated confidence in my research skills, and helped me develop research and laboratory ethics. In my daily life, I learnt to manage by myself - for everything from housing to ironing my clothes! After returning to IIT Roorkee, I am looking forward to develop a similar micropolllutants laboratory after discussion with my laboratory coordinators so that my fellow students can carry on the related research here. Thanks to IUSSTF, DST, UNL and DWFI for this wonderful opportunity!

For more information on the Water Advanced Research and Innovation (WARI) Fellowship Program:
E-mail: water.fellowship@indousstf.org

A new country, a new city, a new culture and a new university - the anxiety and hype created by this word ‘new’ on my selection for the Viterbi-India Summer Internship Program 2016 has all faded away and USC now feels like second home. An opportunity of doing a research internship under Prof. Clifford Neuman, at the Information Sciences Institute at USC has transformed my outlook towards academics and research. My project aimed to develop containment architecture for virtual distributed systems to address the issue of cyber-attacks caused due to vulnerable isolation boundaries. The constant guidance and encouragement provided by my mentor helped me recognize that small ideas when subjected to cutting-edge research facilities can create new technologies and bring about innovation.

The atmosphere in USC was incredibly welcoming! The people were as beautiful as the city itself. Walking down the streets, the smiles and greetings of the passers-by could cheer you up at any time of the day. Here lies the true beauty and spirit of Los Angeles!
When I first saw a beautifully worded email perched in my inbox saying that I was selected for the Viterbi India Program 2016, I could not believe it! Me, spending my summer in Los Angeles? I had not imagined that even in my wildest dreams! I was elated. Slowly as days went by, the feeling then descended into fear - I realized that I would be away from home for the first time in my life, that too in a foreign country with different people, different food and different lifestyle. But I could not be happier with my decision to get rid of the anxiety and take a leap into what is turning out to be the best summer of my life! The Viterbi-India Program has helped me both personally as well as professionally. Living alone, learning to cook food for myself and handling all responsibilities shaped the timid girl in me into a strong, independent person. This program, more than anything, helped me come out of the cozy, comfortable cocoon I was in for so many years and enter the real world. It exposed me to brilliant people, introduced me to research and world-class facilities and helped nurture the talent in me. Every day I was surrounded by people who were at the top of their fields. The meetings and intellectual discussions with professors and the team made me realize how privileged I was to get the opportunity to interact and work with the best minds. It really motivated me and pushed me to improve my knowledge and skills. Not only did I learn a lot about graph analytics – the field of my research, but I also got to know what kind of research was being conducted in the world, new techniques, concepts and ideas. This helped me learn about various fields and opportunities, which gave direction to my career.

The summer was not all about research though. We had lots of fun visiting exciting places in and around LA and these memories will remain etched in our minds forever! I was inspired by the values, manners and etiquettes the people here have. The exposure to US culture and ethics will certainly help me when I come here for further studies. Thank you IUSSTF for laying the foundation of an unwavering life ahead!
Professionally speaking, the kind of programs that USC offers to students is so vast and varied that it is surely a very fulfilling experience to be a student here. As interns, the access provided to us for different facilities is more than enough to get an overall idea of the research going on and actually be able to contribute to it. My guide, Prof. Michelle Povinelli and her students are extremely friendly and ever willing to help out. I was included in the weekly group meetings from the very first day even though my work had not been sorted out and I have to say, it has been just great to be able to learn something different everyday from then on. Also, the various lab safety trainings provided were very helpful and informative and helped me realize the meticulous structure behind every single undertaking. This internship has given me the necessary impetus to prepare for my graduate studies which I am keenly looking forward to.

On a personal note, interning in LA is one of the best possible and exciting opportunities that I could think of and I am indeed very happy that I was fortunate enough to get it. LA has so much life and culture to offer that there is not a single mundane moment when one steps into the city. The beautiful historical and art museums and to say nothing of Hollywood, Universal studios and Disneyland and especially the old town feel in some parts of the city, which takes one into an almost different era, is a very refreshing change to experience and I am very glad to have got a chance to do that. And most importantly, I am part of a very fun and loving gang of the other 19 interns and I could not have asked for anything better.

I am just really thankful to Dr. Nishritha Bopana and Prof. Raghavendra for giving us all this amazing opportunity to intern at USC and of course to Prof. Povinelli for guiding me so well and making every single topic really fun to learn. Also, a special thanks to Ms. Monika Madan, the IUSSTF Travel Desk and Ms. Tracy Charles for helping us all with the administrative arrangements before and after arriving at USC.

For more information on the Viterbi-India Program:

E-mail: viterbi-india@indousstf.org
ASSESSMENTS OF REGIONAL HYDROLOGY USING SPACE-BORNE GRAVITY OBSERVATIONS

Spaceborne gravity measurements have been demonstrated to be a valuable tool for studying regional water cycle variability, estimating soil moisture, assessing ground water variability and extractions, monitoring drought, and predicting flood vulnerability.

An Indo-U.S workshop on Assessments of Regional Hydrology using Space-borne Gravity Observations was organized by Virendra M. Tiwari (Ministry of Earth Sciences, Government of India, Thiruvananthapuram), Matthew Rodell (NASA Goddard Space Flight Center, Greenbelt) and Srinivas V. Bettadpur (Centre for Space Research, University of Texas at Austin) at Hyderabad, India.

The aim of the was to bring together scientists and engineers from the U.S. and India who are interested in the evaluation of Indian water resources using satellite gravimetry, to assess the potential for scientific collaboration within this theme and to discuss possible mechanisms and opportunities for growing collaborative research.

THALASSEMIA AND SICKLE CELL DISEASE: TIME FOR A NEW OPTIMISM

Sickle cell disease (SCD) and beta thalassemia are autosomal recessive inherited diseases caused by the failure to synthesize normal haemoglobin. India has the largest population in the world affected with serious inherited blood disorders. The majority of patients become sick soon after birth and many die during childhood due to inadequate treatment. The resources required to provide care - blood transfusions and expensive drugs - are an enormous burden on the health system. In the United States, sickle cell disease is a public health and national research priority area.

In order to develop collaborations between clinicians and scientists from the United States and India, which will serve to accelerate the development of breakthrough therapies for thalassemia and sickle cell disease; Reena Das (Postgraduate Institute of Medical Education and Research, Chandigarh) and Ashutosh Lal (University
of California San Francisco Benioff Children’s Hospital Oakland) organized an Indo-U.S. workshop titled Thalassemia and Sickle Cell Disease: Time for a New Optimism.

**SCHOOL ON SPACE SCIENCE**

Space Weather is an essential component of development for satellite communications and navigation systems. It links the Sun, the Earth, and the space in between in a branching chain of consequences. Weather systems on the Sun can spawn interplanetary storms of colossal size and energy that envelop the whole planet in electrical hurricanes. Such storms attack high-tech, complex, and expensive technological systems that provide much of the infrastructure that allows modern society to function.

The School on Space Science organized by Nat Gopalswamy (NASA/GSFC, Greenbelt), P. K. 07-17 Nov. 2016, Sangli, INDIA
Manoharan (Tata Institute of Fundamental Research, Pune), Dipankar Banerjee (Indian Institute of Astrophysics, Bangalore) and Dadaso J. Shetti (Smt. KasturbaiWalchand College, Sangli) was intended to give students a comprehensive understanding on the subject of space weather - what it is, what it does, and what can be done about it. Students had the opportunity to attend lectures and interact with top space scientists and experts.

**PROTEIN FOLDING AND DYNAMICS**

The protein-folding problem - of understanding how a polypeptide chain folds to form a functional structure - continues to remain a major problem in modern science. Computational simulations can now describe folding events on time scales accessible to experimentalists, but suffer from the poor current understanding of the physicochemical forces that stabilize protein structures and sub-structures. In order to bring together researchers working in experimental and computational/theoretical approaches; an Indo-U.S. workshop on Protein Folding and Dynamics was organized by Jayant B. Udgaonkar (National Centre for Biological Sciences, Bangalore) and C. Robert Matthews (University of Massachusetts, Worcester).

**BILATERAL RESEARCH OPPORTUNITIES FOR AIR POLLUTION AND HEALTH ISSUES**

The publication of the World Health Organization’s urban air quality database in May 2014 indicated that 13 of the world’s 25 most polluted cities (as measured by ambient air quality) are located within India. An Indo-U.S. workshop to explore Bilateral Research Opportunities for Air Pollution and Health Issues was organized by Sundeep Salvi (Chest Research Foundation, Pune) and Terry Gordon (New York University, Tuxedo) to bring together American and Indian scientists in the fields of air pollution exposure assessment, epidemiology, toxicology, clinicians, health care providers and health care policy makers to bridge knowledge gaps in air pollution and public health. Researchers and policy makers also got an opportunity to identify new directions for translational research and policy change(s).
Infections of the Central Nervous System (CNS) have consequences ranging from asymptomatic infection to death with severe neurological sequelae in survivors. Many of these severe infections are caused by viruses, some of which are zoonotic in origin and recent emergents in human populations. Some of these viruses cause widespread outbreaks or epidemics, emphasizing their importance to human health. Many aspects of the pathogenesis and epidemiology of these diseases is poorly understood. The primary goal of the Indo-U.S. Symposium on Central Nervous System Virus Infection and its Therapy organized by Jayasri Das Sarma (Indian Institute of Science Education and Research, Kolkata), Sunit K. Singh (Banaras Hindu University, Varanasi), Stanley Perlman (University of Iowa) and Susan Weiss (University of Pennsylvania, Philadelphia), was to bring together investigators in this field from both countries on a common platform to discuss their research as well as to explore avenues for potential collaboration. The meeting involved 80-100 basic researchers, clinical scientists and trainees working in the areas of neurology, virology, neuropathology neuroimmunology, neurochemistry, and molecular virology.

There is solid experimental evidence for yet-undiscovered physics, from the origin of neutrino masses to the huge amounts of dark matter and the nature of dark energy, but the kind of physics responsible for this dark sector is currently completely unclear. A bilateral workshop on Understanding the Origin of the Invisible Sector: From Neutrinos to Dark Matter and Dark Energy was organized by Rukmani Mohanta (University of Hyderabad) and Rafael Lang (Purdue University, Indiana) to bring together young scientists from both countries and both areas of theoretical and experimental particle physics, in order to inform future directions.
and establish lasting ties to tackle what is perhaps the most pressing question in physics today. This meeting addressed the synergy between the planned experiments and their phenomenological aspects.

**BIG DATA ANALYSIS FOR TRANSPORTATION ENGINEERING SYSTEMS**

05-06 Dec. 2016, Chennai, INDIA

Increased monitoring of transportation networks via traditional and non-traditional techniques would be fruitful if a timely analysis can be conducted for accurate assessment of traffic conditions. The rate of collection of such data is poised to increase, with more closed circuit cameras, community based sensing such as Waze, instrumentation of taxis and bus systems, and vehicle-to-infrastructure communications. Rigorous mining of such data can lead to several insights that might be buried in enormous data logs. The purpose of the Indo-U.S. workshop on *Big Data Analysis for Transportation Engineering Systems* organized by Lelitha Devi Vanajakshi (Indian Institute of Technology Madras) and Anuj Sharma (Iowa State University, Ames) was to bring together professionals from universities, public and private sector, in the area of big data analysis for transportation, for knowledge dissemination on current big data technologies and challenges, as well as to identify research areas that would be fruitful for collaborations.

**FRONTIERS IN FUNCTIONAL PROTEOMICS AND TRANSLATIONAL RESEARCH IN FOOD AND HEALTH**

12-13 Dec. 2016, New Delhi, INDIA

Despite significant advances in our understanding of the molecular basis of diseases, gaps remain in terms of disease pathogenesis as well as diagnosis and treatment. On the other hand, impending changes in the global climate coupled with a rapidly growing population have resulted in challenges related to food nutrition and crop productivity. Food processing and safety are also very important and essential disciplines. With the aim of addressing these concerns, an Indo-U.S. workshop titled *Frontiers in Functional Proteomics and Translational Research in Food and Health* was organized by Subhra Chakraborty (National Institute of Plant Genome Research, New Delhi), Sixue Chen (University of Florida, Gainesville) and Robert L. Moritz (Institute for Systems Biology, Seattle). The aim of this event was to focus on the recent technological advancement in proteomics/metabolomics/transcriptomics and application of proteomics techniques to different aspects of life sciences, bringing together the proteomics community to encourage transdisciplinary exchange of ideas, increase collaborations and enhance innovations at the national and international level.
Research Initiative for
Real Time River Water and Air Quality Monitoring

Access to clean water and air is indispensable to human life. Yet, managing this access in an efficient and effective manner is an immensely complex challenge. With this background, the Department of Science and Technology, Govt. of India (DST) and Intel® have collaborated to initiate a research program titled “Research Initiative for Real-time River Water and Air Quality Monitoring”. The program will be administered by the binational Indo-U.S. Science and Technology Forum (IUSSTF).

Objective
To develop key technologies for sensing, communication and analysis of large-scale data collected from autonomous networks of perpetual/long-lived sensor nodes, followed by integration and deployment for water and air quality monitoring in real-time.

Program Structure
DST and Intel expect to award Research, Development and Demonstration Projects addressing multiple Research Vectors, integrated in a manner to develop complete technological solution(s) that can be demonstrated first through test-bed in controlled conditions, and subsequently in real-time deployment. Both these milestones have to be completed during the tenure of the project. Such projects would normally be supported for a maximum duration of 5 years and at a total cost ceiling of about INR 15 Crore.

Two fully integrated projects with interdisciplinary teams - one for river water and another for air quality monitoring, are intended to be supported.

Eligibility
National Laboratories, Academic Institutions and autonomous Research Organizations in India are eligible to apply for the Grant-in-aid. The participation of at least one U.S. entity is mandatory. Partnership of users and other stakeholders is desirable.

For program information, please visit www.iusstf.org or email us at WAQM@indousstf.org

Submission Deadline: 10 March 2017
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.

**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

**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**

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

<table>
<thead>
<tr>
<th>Bilateral Indo-US Workshop/Symposia &amp; Indo-US Training/Advanced Schools</th>
<th>Award Announcements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submission Deadlines</td>
<td>Award Announcements</td>
</tr>
<tr>
<td>1 March</td>
<td>31 July</td>
</tr>
<tr>
<td>31 August</td>
<td>31 January</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indo-US Public-Private Networked Centres &amp; Indo-US Knowledge R&amp;D Networked Centres</th>
<th>Award Announcement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submission Deadline</td>
<td>Award Announcement</td>
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<tr>
<td>31 August</td>
<td>31 January</td>
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For program details visit: [www.iusstf.org](http://www.iusstf.org)