Indo-US Science & Technology Forum

Connect

Newsletter of IUSSTF

September 2009

Promoting Innovation and Entrepreneurship

IUSSTF
www.indousstf.org

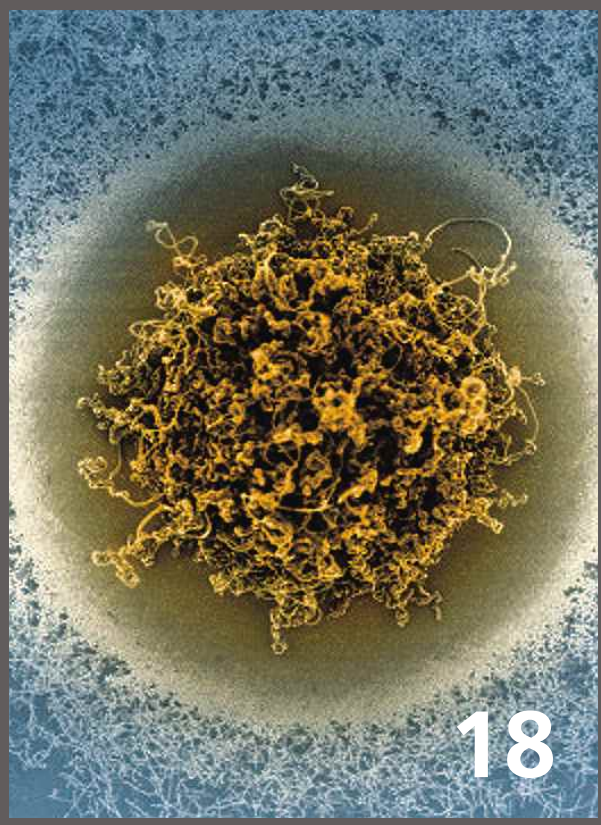
CONTENTS

cover story

feature

report

news and events



From the Editor-in-Chief

Designed, Produced and Circulated by:
Aravali Foundation for Education
Communication & Outreach Division
Aravali House, 431/D-22
Chhatarpur Hills
New Delhi-110074, India

Published and Printed by:
Nishritha Bopana on behalf of Indo-US S&T Forum from Fulbright House, 12 Hailey Road, New Delhi - 110 001.
Printed at Anand Print & Pack, 106, DSIDC, Scheme-I, Phase-II, Okhla Industrial Area, New Delhi-110020

At the bilateral level, India and the United States launched a new strategic relationship in 2005 that specifically identifies science, technology and innovation as a major focus of future relations. As India grows to become a centre of knowledge economy, new opportunities for USA and India to benefit from the complementarities of their innovation systems are fast emerging. This was recently reinforced with the signing of the historic agreement on 20 July 2009 between Minister Krishna and Secretary Clinton to establish a new endowment for joint research, innovation, entrepreneurial and commercialization activities in science and technology which is aimed to further stimulate capacity building, thus contributing to economic growth through job creation and betterment of life.

Drawing from these national perspectives, one of the cardinal program philosophies of IUSSTF has been to nurture and foster a bi-directional entrepreneurial ecosystem by adopting some of the best practices and successful models based on the concepts of 'mind to market' or 'bench to bedside' framework. The activity spectrum on innovation was seeded in January 2006 with the convening of the first *'Indo-US Initiative on Technopreneurship in Academia'* in partnership with the NEB of DST, CSIR laboratories along with MIT and Harvard University. Since then, IUSSTF has been effective in leveraging its unique position to bring together federal agencies, corporate houses, industry associations along with academia both from US and India on developing a program portfolio that identifies, nurtures and promotes the 'power of ideas' to its realization in the market space. The DST-Intel Techno Entrepreneurship Program (TEP); DBT supported Stanford-India Biodesign Program (SIB); HP Innovate Program; and DST-Lockheed Martin India Innovation Growth Program (IIGP), were launched in tandem through active partnership with IUSSTF.

In the past, the best of research schools in USA and India had been slow to engage into R&D partnerships. Based on leveraging existing scientific intellect, expertise and resource pool available in chosen disciplines, IUSSTF has been able to evolve a vibrant program by seamlessly connecting performing institutions in both our countries through the '*virtual networked R&D Centres'*. An insight into the areas of scientific strength and complementarities were brought out to the fore by the synergistic efforts of IUSSTF, leading to research alliances being forged between academia, laboratories (both public and private) though fifteen such Indo-US Knowledge R&D Centres and Public-Private R&D Centres established over the last three years. This issue highlights activities of some such networked Centres.

Both India and US have a keen mutual interest in nurturing human capital, the most critical resource in the global innovation economy. While the mobility of Indian students and researchers to USA has been in vogue, of late a surge of American student researchers to connect with Indian R&D institutions has been perceptible. IUSSTF has been able to successfully develop internship programs that would allow a reciprocal visitation program for science and engineering students to work in each others country for periods up to six months. The Research Internship in Science and Engineering (RISE) program in association with Oak Ridge Associated Universities, Visitation programs in partnership with the American Physical Society; American Society for Microbiology; Khorana Program with the University of Wisconsin-Madison; MIT-IUSSTF Internship; UC, BerkleyIIT, Kharagpur Exchange program are some such endeavours launched by IUSSTF in grooming the next generation who will shape the future of S&T cooperation between our two nations.●

Arabinda Mitra
Executive Director, IUSSTF

DST-Lockheed Martin India Innovation Growth Program

The Power of Ideas

Scientists, engineers and entrepreneurs from all over India recently gathered in New Delhi to present their innovations to an international panel of technology experts. Chemists, medical researchers, IT experts, power generation engineers, semiconductor researchers, waste recyclers and experts from a dozen other fields came together for three days to compete head-to-head. At stake was more than mere bragging rights. Participants were to be judged on the merit of their technology and its commercial potential. Winners would receive gold medals, exposure to India's national press, and the opportunity to work with business development professionals to introduce their creations to commercial markets in India and around the globe.

The Delhi competition was part of the **Department of Science and Technology-Lockheed Martin India Innovation Growth Program**. The program, the only one of its kind in India, is a nation-wide effort to stimulate and accelerate early stage Indian innovations into commercial markets in India and around the world. Originally launched in 2007 as a corporate social responsibility project by the Lockheed Martin Corporation, the program is now in its third year of operation. This year, Lockheed Martin was joined by India's Department of Science and Technology (DST) as a full partner. DST brings to the program its vast experience in technology creation, and its nationwide network of technology incubators. The program is managed by a team comprising of the Federation of Indian Chambers of Commerce and Industry (FICCI), the IC2 Institute at the University of Texas at Austin and the Indo-US Science and Technology Forum (IUSSTF).

The program provides participants with extensive training, technology assessments and professional business development assistance. The overall goal of this effort is to help innovators understand the process of getting new technologies to the marketplace; assist them in evaluating their technologies from a market perspective; and then help them to determine the best path to commercial success.

Each year, the program begins with an extensive training program led by professors from the University of Texas at Austin and the IC2 program staff. The training covers areas such as commercialization strategy and entrepreneurship. In addition, local experts such as patent attorneys and venture capitalists are brought in to share their specialized knowledge with the innovators. In April of this year, participants were invited to an intensive eight-day workshop in Goa, India. While there, they received instruction in principles of commercialization, technology marketing, venture finance and how to give the perfect "elevator pitch." There was also some free time to enjoy Goa!

The second part of the program focuses on technology assessment. Participants are systematically selected from hundreds of applications that are received. Each year, top 30 technologies are chosen for a detailed commercial analysis by professional staff at the IC2 Institute. Industry experts and market leaders in India and the US are surveyed to provide innovators with market-based perspectives on their technology. The analysis, known as the Quicklook Report, is a key tool in developing an effective commercialization strategy.

The final stage of the program is business development where innovators work closely with business development professionals from FICCI and IC2 to seek out and engage potential business partners. Using the information from Quicklook Report, the innovator and the business development professionals work together to create an effective strategy to target appropriate markets and potential partners. In just two years, the program has created as much as 40 business engagements for participating

Len Denton

Technology Commercialization Strategist IC2 Institute at the University of Texas at Austin & Program Manager India Innovation Growth Program

India's innovators are encouraged to apply.

Program details are available at www.IndiaInnovates.in

Dr. Amit Mitra, Secretary General, FICCI, opens the Delhi Awards Ceremony. Also shown are Dr. Arabinda Mitra, E.D., IUSSTF; Dr. Ray Johnson, Sr. VP, Lockheed Martin Corporation; Mr. H.K. Mittal, Head, National Entrepreneurship Board (DST) and Mr. Alop Mittal - Advisor, FICCI

DST-Lockheed Martin India Innovation Growth Program

innovators. These engagements were not just between India-based partners, but also include partnerships with entities in UK, Australia and Malaysia.

Participants in the program come from a wide range of India's technology sectors, and as one would expect, IT sector is always well-represented. However, some of the program's most successful participants have come from the fields of chemistry, banking technology and electronics manufacturing. The innovators come from a diverse range of backgrounds as well. A typical crop of innovators will include several university professors, a few students, two or three private inventors and a dozen owners or directors from small businesses. The age of the innovators also varies widely, with the youngest being a team of third year students and the oldest being an inventor well into his 70s. Such diversity of backgrounds and experience makes for an interesting and rich set of relationships. Many of the innovators establish relationships that continue even after their formal participation has ended.

Since its inception, the India Innovation Growth Program has received more than 750 technology applications. More than 200 innovators have been trained in commercialization principles and strategies for taking their technologies to the market. Ninety of these innovator's technologies have received an in-depth commercial analysis, and from this group, 40 business relationships have been established (24 in India, 16 in the US and other global markets). So far, the medals for excellence in innovation have been awarded to 44 innovators.

The program takes great pride in its innovators and their efforts to achieve commercial success. Going forward, we highlight four of the program's most noteworthy participants and their commercialization stories:

DST-LOCKHEED MARTIN INDIA INNOVATION GROWTH PROGRAM

LIST OF AWARDEES - 2009

Aroop Kumar Dutta
B. K. Soni
Gopi Kumar Bulusu
Goutam Saha
Karthikeyan Jawahar
M. Mohan
Narayanan Lakshmanan
Natarajan Rayar
Shesheer Kumar
Sondur Lakshmipathi
Sundar Manoharan
Syed Yasin
T.Raghavendra Rao
Tushar Shah

SUVARNA URJA WINDPOWER PVT. LTD., Pune

Program Medalist-2009

Suvarna Urja Windpower designs and manufactures wind-turbines and power storage systems specifically for the Indian rural power market. Since its participation in the 2009 program, this small company has already received orders to produce wind turbines and power systems for four Indian states. As the need for alternative power sources continues to grow, Suvarna Urja will work with the program team to develop new market opportunities in India, and around the world.

SANKHYA TECHNOLOGIES PVT. LTD.

Program Medalist-2008

Sankhya's award winning software technology is an embedded systems emulation tool called Teraptor. Semiconductor and systems designers can use Teraptor to simulate complex processor systems through software, allowing them to develop new designs months faster than what is possible with older methods.

Gopi Belusu, Sankhya's CEO, believes his participation in the 2008 program yielded very tangible results for his team: "As we speak" he said, "we are close to finalizing a soft loan of USD 0.5 Million. The actual process of working on the initial round of finance helped sharpen the skills of our management team's to better communicate our business plan to the finance community. The press coverage received by Teraptor resulted in additional venture capital and commercial inquiries."

SUSTAINABLE TECHNOLOGIES AND ENVIRONMENTAL PROJECTS LTD., Mumbai

Program Medalist-2007

Focused on oil industry recycling technologies, STEPS has developed the "PolyCrack" technology that converts plastic waste into diesel. The process is more efficient than competing technologies and leaves no heavy metal residues (pollutants). Since participating in the 2007 program, STEPS efforts have received world-wide media coverage. The company has sold their PolyCrack conversion system to several companies in India and Europe. Promising new opportunities in the USA and South East Asia are on the horizon and STEPS N.A., a North American subsidiary has already been established.

ZEUS NUMERIX, Mumbai

Program Medalist-2007

Zeus Numerix (ZM) has brought out a computational fluid dynamics software suite useful to the aeronautics design industry. As a result of their participation in the 2007 program, they got introduced to a number of relevant agencies of the Indian government including the Department of Scientific and Industrial Research, and the Defense Research and Development Organisation.

The program's business development team also helped ZM to join forces with Adroitec Information Systems Ltd., Bangalore in a joint marketing agreement. (Adroitec later became a 2008 program participant.)

Zeus Numerix continues to build upon its early success and is looking for new partners in the US and other parts of the world.

Gopi Belusu
CEO, Sankhya

"The extensive market research done by the IC2 team along with the Quicklook report (which I believe is a misnomer for the quite extensive report) and the close interaction with the IC2 team allowed our team to focus our marketing efforts and create marketing collateral to help better position the product."

"The credibility of our innovation has increased vastly owing to the endorsements which led to a higher success rate. For example, our European endeavor received a boost when the European companies realized that the technology is an award winner and the names behind the award are highly credible and reputed. Following the visits of several teams from Europe to our plant to witness the process, there has been a steady progress. Same story unfolded in the US as well."

T. R. Rao
Director, STEPS

Abhishek Jain
Marketing Head
Zeus Numerix

"The program gave us national and international visibility. We got a good reseller in Adroitec Information Systems with a market reach of whole of India especially in education. We are able to showcase our award certificate to prove that we are an R&D company to our clients and government. This also helped us in getting recognition from DSIR as a certified R&D company."

Stanford-India Biodesign Program


All India Institute of Medical Sciences, New Delhi

Christine Kurihara
Manager, Special Projects,
Associate Director,
Stanford-India Biodesign Program

Healthy Fabrications


Stanford University, California


Indian Institute of Technology, New Delhi

The goal of Stanford-India Biodesign (SIB) is to help catalyze the growth of the Indian medical technology industry, with a focus on the needs of India's medically underserved. Started in January 2008, SIB is a collaboration between the All India Institute of Medical Sciences (AIIMS) New Delhi, Indian Institute of Technology (IIT) New Delhi, and the Stanford University, California. SIB is supported by the Department of Biotechnology, Government of India and the Indo-US Science & Technology Forum, with additional support provided by foundations, medical technology companies and venture capital firms.

SIB offers a multidisciplinary, team-based, 18-month fellowship program that trains future leaders of the Indian medical technology industry. Housed jointly at Stanford and New Delhi, the Fellowship guides engineers and physicians in identifying major healthcare needs in India and developing solutions that are cost-effective and deployable across a broad socio-economic spectrum.

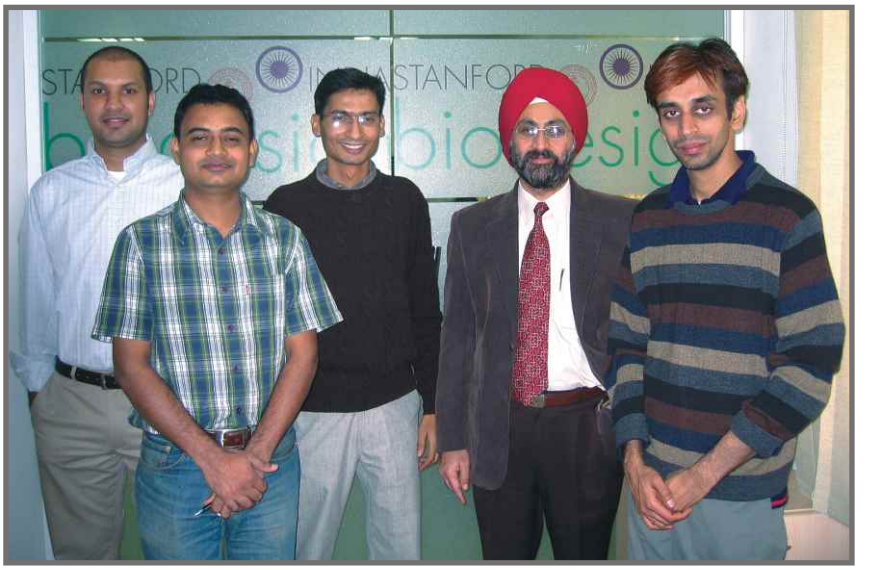
SIB Fellows commit to remain in India after the completion of the program, with an intent of returning to academia, creating entrepreneurial ventures or joining medical technology companies. Faculties from various Indian institutions participate in the Fellowship program with the goal of teaching the Biodesign process upon their return to India. Thus, the program aims to inspire and educate large number of students and faculty who are expected to fuel medical technology industry growth in India.

A distinctive feature of the program is its focus on innovation and technology transfer. SIB's methods and courses are based on methodologies developed at Stanford, but are customized to meet Indian needs. The curricula developed by SIB is freely accessible to other Indian institutions, helping to facilitate a broader medical technology educational exchange.

The Inaugural Fellowships

The SIB Fellowship program began in January 2008. During the first six months (January-June 2008) at Stanford, the inaugural Fellows received an introduction to the field of clinical medicine through lectures and immersion in clinical settings. The fellows also enrolled in a course on medical needs assessment and innovation, taught by leaders of the US industry, and learned about fundamentals of product development, legal issues and entrepreneurship. In short, the initial months spent at Stanford exposed the Fellows to the Biodesign process, a process they are utilizing and adapting now that they are back in India.

The fellows returned to New Delhi in July 2008, and now operate from the new Stanford-India Biodesign Centre at AIIMS, New Delhi. The first four months after return from the US were spent in hospitals and clinics in India engaged in the daily practice of medicine. This included observation of clinical practice in public as well as private settings, from the rural health care clinics to the tertiary urban hospitals. The Fellows' assignment during this time was to observe, understand and ultimately develop a list of *at least* 300 needs relevant to the Indian



Nish Chasmawala, Jayant Karve, Amit Sharma, Sandeep Singh and Srinivas Jaggu

Dr(s). Paul Yock, T.S. Rao, Arabinda Mitra, Manju Sharma, M.K. Bhan and Balram Bhargava at the opening of the Stanford-India Biodesign Center in December 2008

STANFORD-INDIA BIODESIGN

A CALENDAR OF ACHIEVEMENTS

DECEMBER 2007

1st Annual Indian Med Tech Summit is held at New Delhi. Hosted by Balram Bhargava (Executive Director of SIB, India) and Rajiv Doshi (Executive Director of SIB, US), the summit is attended by all SIB fellows as well as faculty from IIT- New Delhi, and AIIMS, New Delhi. The summit brings together the thought leaders of the developing medical technology industry in India to understand the current state of the industry, to identify issues facing it, and to delineate key activities that will help chart its future course.

JANUARY 2008

First set of Stanford-India Biodesign Fellows arrive at Stanford for six months of training. Four Stanford mechanical engineering students invent a very low cost novel prosthetic knee to be used in conjunction with the Jaipur foot prosthesis, in collaboration with the Bhagwan Mahaveer Viklang Sahayata Samiti (BMVSS), Jaipur. The team would visit Jaipur, India later in the year for device testing. A second student project at Stanford, sponsored by BMVSS, commenced in January 2009.

OCTOBER 2008

The Stanford-India Biodesign Internships commence at AIIMS, New Delhi. Five interns participate in this pilot program, taking some of the needs identified by the Fellows and working on needs refinement, brainstorming and concept development. These three month long internships for industry, engineers and physicians interested in medical technology innovation provide a concentrated SIB curriculum and aim to bring less complicated products to market quickly. The interns are mentored by the SIB

DECEMBER 2008

2nd Annual Indian Med Tech Summit is held at AIIMS, New Delhi. Hosted by Stanford-India Biodesign, the meeting attracts more than 100 participants, including those from industry, government and regulatory agencies. The Stanford-India Biodesign Centre is inaugurated at the AIIMS campus in New Delhi. An online forum for the medical technology industry in India www.indiabiodesign.org launched to bring together the Indian medical technology community.

JANUARY 2009

Second year of the Fellowship begins, with four new Fellows coming to Stanford for intensive training in medical technology innovation. The previous year's Fellows split into two teams of two, each dedicated to advancing one project. The team of Nish Chasmawala and Amit Sharma pursue a device to assist patients with fecal incontinence. The team of Jayant Karve and Srinivas Jaggu continue development of an intraosseous access device for providing fluids and medication to patients when intravenous access is not possible.

MARCH 2009

Applications open for the 2010 Fellowships. Four selected Fellows will arrive at Stanford in January 2010.

market that would be amenable to a medical technology solution.

During this time, the fellows also revalidated and prioritized these needs under direct guidance of Stanford Biodesign faculty, physician entrepreneurs and experienced technology innovators, both in India and the United States. The challenge was to develop a detailed understanding of the importance of these needs including clinical severity, adequacy of current treatment options and market size. The Fellows then developed the systems and criteria for ranking the listed needs and selected 8-10 most important needs for further analysis.

During the two months that followed, the team invented technology solutions to address the prioritised needs using specialized Biodesign methodologies. All Fellows pursued their top 4-5 clinical needs and were mentored through a process of brainstorming and invention. For each need, the team generated 50 or more possible solutions. The brainstorming process typically made extensive use of quick prototyping (creating rough models from paper, tape, LEGO, etc). Promising solutions were prototyped in a rapid, iterative fashion as the concepts were refined. These concepts were then filtered and further refined based on broad consideration of clinical and engineering feasibility, practicality, cost, manufacturability, distribution and patentability.

The Fellows then embarked on a "real world" process of evaluating the best pathway for developing their technology. The goal was to develop projects that could be advanced in India, both from the standpoint of further engineering/testing and ultimate business creation and clinical implementation. Mentoring from venture capitalists and industry experts from both India and the Silicon Valley was essential for making these assessments.

Currently, the Fellows are continuing the development of two devices, the first in the field of emergency medicine and the second in gastroenterology. They plan to launch their technologies either by starting a new company or by licensing their invention to an existing company. The Fellows continue to be mentored in this process by the Biodesign faculty, venture capitalists and industry leaders from the United States and India.

Nish Chasmawala (left) and S. Mahadevan during the Stanford Biodesign Innovation Fellows Graduation ceremony (June 10, 2008)

STANFORD-INDIA BIODESIGN FELLOWS

2008-09

Nish Chasmawala
(Biomedical Engineering)

Srinivas Jaggu
(Electrical Engineering)

Jayant Karve
(Design)

Amit Sharma
(Design)

2009-10

Darshan H. Nayak
(Internal Medicine)

Pulin M. Raje
(Mechanical Engineering)

Rahul Ribeiro
(Materials Science and Engineering)

Asokan Thondiyath
(Mechanical Engineering)

Stanford-India BioDesign

ENDLESS POSSIBILITIES

Balram Bhargava
Professor, Dept. of Cardiology
AIIMS, New Delhi
& Executive Director,
Stanford India Bio-designing Program

Over the course of the SIB fellowship, the first batch of fellows identified many clinical areas/problems. They have been working on some of them and developing innovative solutions for the Indian market. The five main projects that the team is currently working on are:

Managing Postpartum Hemorrhage In Women

Background

Postpartum haemorrhage (PPH) is an obstetrical emergency that can follow vaginal or caesarean delivery. Described as primary and secondary PPH, it is the loss of blood in the first 24 hours and 6 weeks respectively, after delivery. Although its incidence in the developed world is 1-5%, it has a high incidence of 10-12% and a recurrence rate of 25% in India. This makes PPH one of the major cause of maternal mortality and morbidity in India, especially in a scenario where two out of three pregnant women are anaemic and even a small loss of blood after delivery can become the cause for a medical emergency.

Currently, besides gauzes, no solutions are available in rural India to contain PPH. In rural and primary health centres, there is a limited availability of treatment options because of which under emergency conditions like PPH, the patient is required to be transferred to a higher level healthcare facility. Hence the focus is to devise a way to contain the bleeding during PPH until the patient is transferred to a facility where requisite treatment options are made available.

Innovation Summary

Understanding the existing scenario; lack of solutions for emergency obstetric care at the midwife level and solutions that contain profuse bleeding during transport, are the biggest gaps that need to be addressed.

However, considering the complexities in terms of training and clinical trials, containment will be relatively less challenging with the public healthcare system and nodal ambulatory services in place; therefore containment of PPH during transportation is a priority. To address this situation the team has come up with a tamponade solution which has the following attributes:

- It is fast, reliable and can be used by nurses and paramedics.
- Does not interfere with natural physiology.
- Does not limit transportation options.
- It is a standalone device, without any auxiliary requirements.

Providing Prolonged CPR To Patients With Cardiac Arrest

Background

Cardio-pulmonary Resuscitation (CPR) is a basic life support provided to a Sudden Cardiac Arrest (SCA) victim to maintain his/her cerebral and cardiac perfusion. One million deaths are estimated annually because of SCA in India, which is thrice as high as in the United States. More than 80% of these emergencies occur out of hospital. Unfortunately, the survival rate is abysmally low (<1%) mainly due to lack of awareness and training amongst the general population, and variation in quality of manual chest compressions during CPR. The survival of SCA patients can be improved drastically, if proper CPR is provided on time. Manual chest compressions have inherent shortcomings. Even highly trained personnel cannot perform consistent CPR for a prolonged period of time, and it also induces fatigue to the rescuer. In addition, substantial sternal and rib injuries are commonly associated with manual CPR.

Innovation Summary

There exists a clear need to improve the quality and consistency of CPR while ensuring minimum injuries in Indian settings. The team has come up with a self-powered chest compression device that smartly combines the advantages of circumferential chest compressions and augments it with sternal compressions to increase vital organ perfusion. The device has following features:

- The device helps to deliver prompt emergency care, as the deployment does not require the patient to lift.
- It provides consistent depth of chest compressions over a prolonged period
- It provides uninterrupted chest compressions while in transit.
- It is safe and non-invasive.

The device intends to be fully automatic so that its implementation in the field can be done with minimum rescuer training while at the same time minimizing the injuries.

Gaining Intraosseous Access In Emergency Patients

Background

Establishing access to the circulatory system is a critical component of resuscitation in emergency patients. Even though peripheral access (though the veins in the arm for example) is the preferred mode of vascular access, many a times it is difficult to access the veins.

This can happen in patients with cardiac arrest, trauma, dehydration or obstetric emergencies. In such patients, blood volumes in the body are low because of hypovolemia, which leads to vein collapse. Precious time is wasted in trying to gain intravenous (IV) access during the "golden period" of patient care. This is more prominent particularly in pediatric populations due to small vessels.

Innovation Summary

The Stanford-India Biodesign Team intends to address this unmet clinical need through a novel intraosseous access device. The device has following features:

- Self- powered infusion device
- Can be used on multiple sites (tibia, iliac crest, sternum)
- Suitable for both adult and pediatric population
- Deployable in resource-constrained environments
- Affordable and easy to use

The device with its innovative features will address both local unmet Indian markets, and will extend it to the global market in a phased manner.

Improving Collection And Containment Of Fecal Output In Incontinent Patients

Background

Fecal incontinence is the loss of anal sphincter control leading to the unwanted or untimely release of feces. It is a clinical problem that is commonly encountered by colorectal surgeons and care providers across the world. Based on a community survey in the United States, the prevalence of fecal incontinence was found to be 2.3%. This figure soars to 30-40% in certain institutionalized populations such as ICU patients or nursing home residents. Although fecal incontinence is a benign condition, its social consequences are frequently devastating. Because of the embarrassing nature of the problem, many patients are reluctant to admit its presence or seek medical attention. The overall cost burden of fecal incontinence is enormous. Fecal incontinence is the second leading reason for admission of elderly patients to nursing homes, and is more common than dementia.

Innovation Summary

After a comprehensive overview of the competitive products and gap analysis, the team developed multiple concepts to effectively manage fecal incontinence. The leading concept is a collection device which has the following features:

- It is a closed system (odorless and leak proof).
- It can be easily inserted by nurses, paramedics, and even trained family members.
- It can be used either at home or in health facility.
- It can effectively be used on agitated or restless patients.

In India reports on healthcare operations suggests that 33% of all ICU patients and 50% of all patients in psychiatric wards are fecal incontinent. A fecal incontinent patient in a hospital is twenty-two times more likely to acquire bedsores; and, if there is any maceration or dermatitis ,the average length of stay gets increased by 4 to 10 days. A combination of these factors increases the mortality rate by about 7% in such patients.

Non-invasive, Rapid And Definitive Way Of Airway Management

Background

Airway management is the process of ensuring that there is an open pathway between the patient's lungs and the outside atmosphere, and the lungs are safe from aspiration. In nearly all circumstances, airway management is the highest priority in clinical care. This is because if there is no airway, there can be no breathing, hence no oxygenation of blood. Many manual manoeuvres have been developed to maintain the airway. However, as these manoeuvres require trained personnel, they can be used only for a short amount of time.

To maintain airway patency for long durations of time in clinical settings, devices are available which can be used to establish a positive pathway between the lungs and mouth/nose. Several such devices are used in healthcare facilities across India. However, placement of these devices not only requires a great deal of clinical expertise. They also have substantial morbidities associated with them. Often due to the lack of expertise among healthcare providers, a lot of time gets wasted in the "golden period" of clinical care.

Innovation Summary

Understanding the gaps present in the current market, and realising the necessity of a device that does not demand high clinical expertise and can be deployed quickly, the team has come up with an innovative device which, irrespective of placement either in trachea or esophagus can smartly ventilate the lungs. The device has the following features:

- It is simple and cost effective.
- It does not cause any trauma during insertion.
- It is rapid and does not limit the ventilation while insertion.
- It is easy to use and can be used with minimal training.

FEATURE

Indo-US Networked Joint Centers

To enable Indian and American scientists, researchers and students from academia, laboratories (both public and non-governmental) and industry to carry out joint research activities by leveraging already existing infrastructure and funding available with the partners at both sides, the Indo-US Science and Technology Forum supports linkages established through virtual networked joint centres. **The Indo-US Knowledge R & D Networked Centers** and **Public Private Networked Centers** aims to encourage joint project implementation on focal areas of thematic and applied research based on synergy of activities and harnessing complementary strengths of performing groups from the two countries. Knowledge R & D Networked Centers may also provide opportunities for integrating research with education, through both student and faculty exchanges. Public-Private Networked Centers, on the other hand, enables to foster academia-industry partnerships by promoting pre-commercial R & D activities having potential towards applied research and product development. These Centers are aimed to best capitalize on the scientific and technological innovation and entrepreneurship in translating ideas from the bench to the market place. More information on the Networked Centers can be accessed at www.indousstf.org.

We at IUSSTF are pleased to introduce the work of two such Networked Centers in this edition of "Connect". The focal areas of these Centers are Bioremediation & Phytoremediation of Chemopollutants and, Nanoparticle Aerosol Science & Technology.

Indo-US Joint R & D Networked Centre in Bioremediation and Phytoremediation of Chemopollutants

Clearing the Mess

Environmental pollution due to hazardous chemicals has been a severe problem and among the various toxic chemicals, nitro compounds form a major group. Nitro explosives are one of the main contributors of nitro compounds. Bio-remediation technologies developed using micro-organisms assume importance in solving such type of problems since micro-organisms are endowed with the property of secreting various enzyme systems required for utilization of these chemical compounds.

At the Agharkar Research Institute (ARI) Pune, technologies have been developed using microorganisms for bioremediation of industrial waste-waters containing chemo-pollutants. The Indo-US Science and Technology Forum (IUSSTF) supported ARI to set up an ***Indo-US Joint R & D Networked Centre in Bioremediation and Phytoremediation of Chemopollutants*** under the stewardship of Dr. (Mrs.) P. P. Kanekar from ARI as the Indian project co-ordinator and Prof. K. F. Reardon from Colorado State University (CSU), Fort Collins as the US project co-ordinator for a period of two years (2006-2008). Under this project, research work was carried out on bioremediation of wastewater generated during the production of a nitro explosive - High Melting Explosive (HMX), which is produced by nitration of hexamine using ammonium nitrate, nitric acid and acetic acid. The wastewater thus generated is highly acidic in nature with high concentrations of nitrate and acetate. High Energy Materials Research Laboratory (HEMRL), Pune provided HMX wastewater samples and all the necessary related information.

Two soil isolates of yeast namely *Williopsis* sp. and *Pichia* sp. were able to tolerate high concentrations of nitrate and acetate, and were used for bioremediation of HMX waste water using Horizontal Packed Bed Bioreactor (HPBBR) and Sequential Batch Reactor (SBR). *Williopsis* sp. reduced nitrate and acetate to an extent of 73% and 82% at the initial concentration of ~ 35,000 mg/L and 23,000 mg/L respectively within 8 days at ambient temperature in the HPBBR, operated in batch mode. *Pichia* sp. showed around 50%, 49% and 72% removal in HMX, nitrate and acetate content of the wastewater at the initial concentration of ~ 254 mg/L, 35,000 mg/L and 23,000 mg/L respectively in a HPBBR run in both batch and continuous mode. In the SBR operated with agitation of 100 rpm and aeration of 1.0 L/min respectively, *Pichia* sp. Could remove 77% HMX, 76% nitrate and 68% acetate from the HMX wastewater at the initial concentration of about 520 mg/L, 8,600 mg/L and 2,500 mg/L respectively within 96 h with alternate aerobic and anaerobic cycles of 24 hr duration at 30°C.

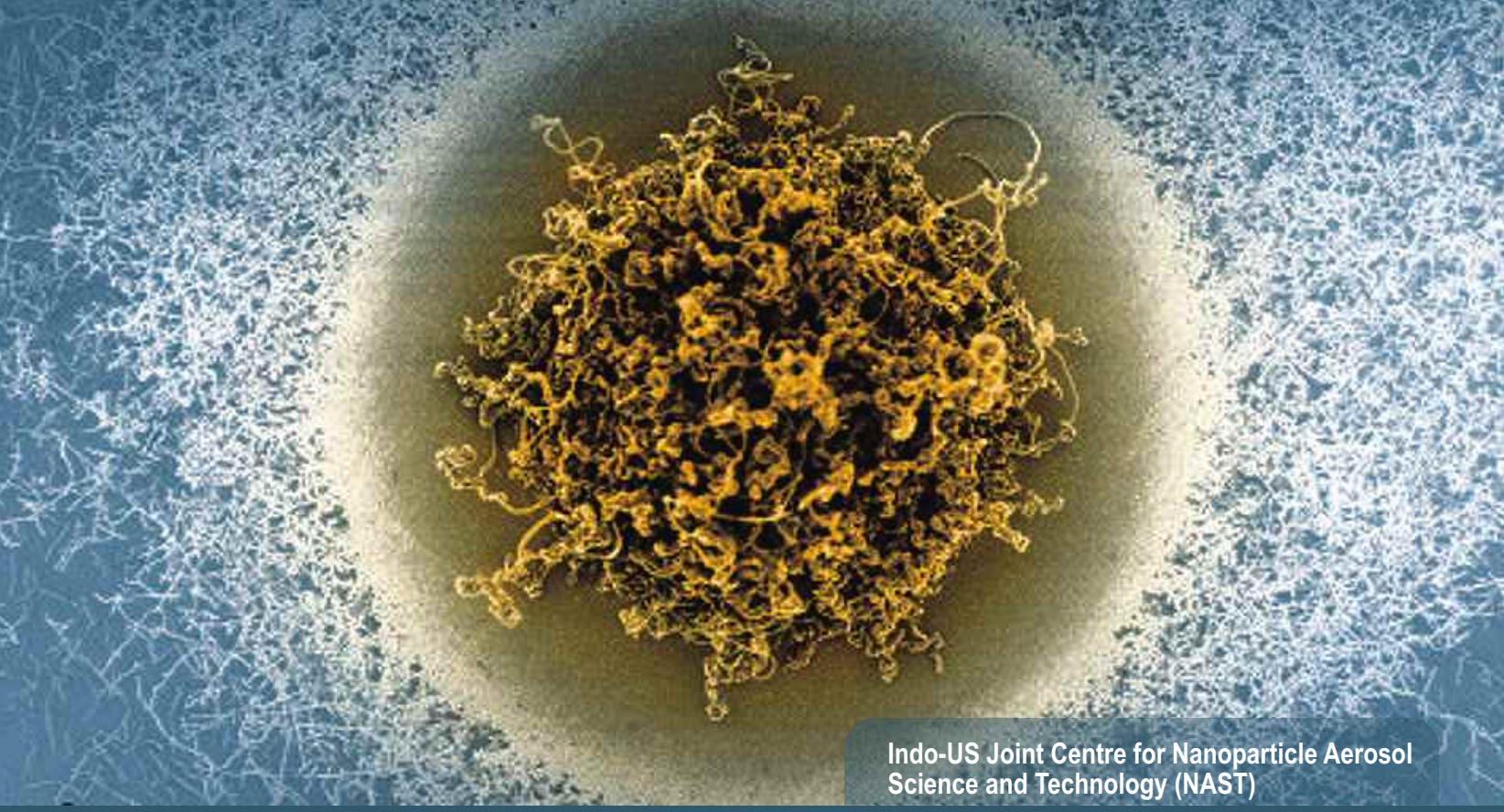
The phytoremediation studies carried out using Hydroponics systems showed *Hydrilla verticillata* to be more efficient in removing nitrate from the suitably diluted HMX waste water (having a concentration of nitrate as 8,000 mg/L), followed by *Ceratophyllum demersum*, *Salvinea molesta*, and *Vallisneria* sp. All the four plants displayed around 50% removal and uptake of nitrate from the HMX waste-water. All the plants exhibited nitrate reductase activity, however the maximum activity was

(Contd. page on 23)

P. P. Kanekar
Director (Acting),
Agharkar Research Institute, Pune

Kenneth Reardon
Associate Department Head and Director of Undergraduate Studies,
Colorado State University

Hydroponics experimental setup showing *Brassica juncea* for removal of nitrate from wastewater



Indo-US Joint Centre for Nanoparticle Aerosol Science and Technology (NAST)

Nanoparticle Technology

New Directions

Nanoparticle Aerosol Science and Technology (NAST) is a new sub-discipline of aerosol science and technology and covers basic principles that underlie the formation, measurement and modeling of systems of particles smaller than 100 nanometers (0.1 micrometers), present individually or as aggregates, in a gaseous suspension. Nanoparticles in aerosols have unusual optical, biochemical and catalytic properties that make them of special interest.

NAST has applications in fields that include microelectronics, medicine and pharmaceutics, space exploration, environment, energy and several others.

An Indo-US Joint Centre for Nanoparticle Aerosol Science and Technology (NAST) supported by the Indo-US Science and Technology Forum was initiated in February 2008 with a collaborative research focus in two areas:

a) Nanoparticle synthesis through aerosol routes to support inorganic nanomaterial powder manufacturing and nanobiotechnology applications in the pharmaceutical industry; and

b) Computational simulations of atmospheric aerosols and nanoparticles on multiple spatial scales toward understanding their climate and health effects.

The NAST joint centre has multi-institutional participation, with the Indian Institute of Technology, Bombay serving as the nodal host institution; Washington University in St. Louis as the principal partner; and three other partnering institutions, the Centre for Development of Advanced Computing, India; University of Iowa, USA; and University of Maryland, USA. Significant multi-institutional exchange has been facilitated through co-advising of five post-graduate students from IIT Bombay on four specific research problems defined by teams of advisors from among the seven Indian and four US faculty and professionals participating in the Centre.

A unique feature of the NAST centre is the commitment of the US partners to provide matching support for exchange visits of post graduate students to enable intensive training for a period of six months. Exchange visits by students and their advisors from both sides have resulted in substantial progress in furthering common scientific objectives. Outcomes include the successful establishment of flame and furnace aerosol reactors for inorganic nanomaterial synthesis at IIT Bombay (in collaboration with Washington University) being used for composition controlled composites of ceria and titania for photocatalysis applications. Techniques for the study of aerosol delivery of nanometer-size liposomal drug-matrices, developed in collaboration with University of Maryland, are being used to understand their properties, for applications in vaccine and drug delivery. An ongoing exchange with Washington University in St. Louis is aimed at capacity building in electrospray technology for monodisperse aerosol generation of liposomal suspensions. The ongoing exchange with University of Iowa, aimed at climate change studies, has brought the University of Iowa Regional Atmospheric Model (STEM) to C-DAC and IIT Bombay. The STEM model is being used for a sectoral analysis of the effects of black carbon aerosols on climate, with IIT Bombay emissions databases. Future grid-computing applications are planned using this modeling platform.

The NAST centre has resulted in a significant cross fertilization of ideas, the training of students and capacity building in nanoparticle aerosol research at IIT Bombay. Joint research papers have been published and several are expected from jointly advised doctoral research. The Indian partners have leveraged two projects supported by the DST and one through the DIT that have supplemented the efforts of the joint centre. Future plans include exploring industry and government sponsorship and participation in both India and the US to translate scientific understanding into outcomes of commercial and societal interest.●

Chandra Venkataraman
Dept. of Chemical Engineering
Indian Institute of Technology
Mumbai, India

Pratim Biswas
Washington State University
in St. Louis,
Missouri, USA

REPORT

UC Berkeley and IIT Kharagpur Collaboration in BioEnergy and Emerging & Neglected Diseases

Connecting the Future

Satyahari Dey
Professor of Biotechnology Department and Principal Investigator for the collaboration at IIT Kharagpur.

Shail Kumar
Senior Director, External Relations in the College of Letters & Science at UC Berkeley.

The world is facing significant challenges in energy and healthcare. Unlike some other challenges that can be solved by researchers in one location, these challenges are unique in that they require researchers in different parts of the world to collaborate in developing effective solutions that can meet local and global needs. Within this context, UC Berkeley and IIT Kharagpur, two premier research and education institutions in the US and India respectively, launched a collaboration in May 2008 in bioenergy and emerging & neglected diseases.

Within this context, UC Berkeley and IIT Kharagpur, two premier research and education institutions in the US and India respectively, launched a collaboration in May 2008 in bioenergy and emerging and neglected diseases. The partnership also includes Lawrence Berkeley National Laboratories (LBL) (bioenergy and healthcare) and University of Illinois, Urbana Champaign (UIUC) (bioenergy). Mark Richards, the Executive Dean of the College of Letters and Science, UC Berkeley along with Geoff Owen, then the Dean of the College's Biological Sciences Division, at UC Berkeley laid the groundwork for the collaboration during a trip to India in November 2007.

What sets this program apart from others is the way it was conceived. Spearheading this initiative are not faculty members but a group of students who will act as ambassadors for the program.

Background

The UC Berkeley IIT Kharagpur collaboration is intended to accelerate the societal impact of research discoveries. We are planning to develop and scale the program in two phases. Phase 1 is planned to foster relationships amongst students, researchers and faculty and increase the pool of highly talented and capable participants. In Phase 1, initiated in summer 2008, we brought eleven IIT Kharagpur students for an 8-week summer research internship at UC Berkeley and LBL. Starting 2009, most of the selected students were mentored by their respective IIT Kharagpur thesis advisor in advance of their summer research in Berkeley. The students will be expected to submit a summer research report to faculty of both institutes. Thereafter, the students will be expected to continue their research at IIT Kharagpur under the supervision of their IIT thesis adviser. We expect the IIT Kharagpur student and faculty, and UC Berkeley faculty to collaborate on student's final year research project, as appropriate. As a result of these faculty-student interactions on a research project of mutual interest, we expect to develop enduring faculty-faculty collaborations between IIT and Berkeley. These relationships

> "UC Berkeley-IIT Kharagpur collaboration has catalyzed an alumnus to provide seed financial support to set up a BioEnergy Centre at IIT Kharagpur-a compelling example of the "Butterfly Effect" in action!"
>
> Shail Kumar

First batch of IIT Kharagpur students at UC Berkeley, May 2008

Associate Dean Deb Nolan and Shail Kumar with Prof. S. Dey and Dr. A. K. Das

Right: Mark Richards, Executive Dean, College of Letters & Science, and Dean, Physical and Mathematical Sciences, welcoming the students, May 2008

Left: Susmita Thomas, Consul General of India, San Francisco speaking at the May 2009 reception

Below: Some of the IIT Kharagpur students with UC Berkeley Faculty

would be further facilitated by faculty visits to each other's labs and UC Berkeley students visiting IIT Kharagpur. Additionally, we would encourage IIT Kharagpur students to pursue doctoral studies either at IIT Kharagpur or UC Berkeley. As we develop momentum on the student summer research program and faculty visits, we plan to then organize a joint research symposium to take the collaboration to the next level, i.e. Phase 2.

Phase 2 will focus on conducting joint research and expediting the translation of scientific discoveries to local markets. In Phase 2 the plan is to include all the program elements of Phase 1 and additional program elements such as longer stay visits, including faculty sabbaticals. This is expected to further strengthen the student-faculty relationships and also provide a platform for increased and sustainable research collaboration in selected areas. The increased pool of expertise will address the greater R&D challenges and opportunities in relation to Bio-innovation and Biotech Park, evolving sustainable industry-university bonds, and catalyzing much-needed solutions in the healthcare and bioenergy fields.

Current Status UC Berkeley IIT Kharagpur Collaboration

The results of the UC Berkeley IIT Kharagpur collaboration have thus far exceeded expectations in several important ways:

1. Eleven IIT Kharagpur students completed an 8-week summer research program at UC Berkeley and LBL in summer 2008. They found the research and educational experience transformative.

   a) One student from the 2008 program will be joining UC Berkeley's graduate program and will work with Prof. Norm Miller on BioEnergy research.

   b) Prof. Norm Miller is a co-PI for the joint-research symposium at IIT Kharagpur, planned for Jan. 2010.

2. The UC Berkeley faculty members were impressed by students' quality, motivation and dedication. One of the faculty members mentioned that his student was "…as good as or better than the best UC Berkeley undergraduates that I have worked with..." As a result of the positive interactions, the faculty members are also interested in enhanced interactions with IIT

Kharagpur faculty and students, including visiting IIT Kharagpur and submitting joint grant proposals. Eighteen IIT Kharagpur students are currently at UC Berkeley for the 2009 summer research program.

3. We have facilitated a number of visits of IIT Kharagpur faculty members to UC Berkeley. As a result of these faculty-faculty interactions and the summer research program:

   a) Several IIT Kharagpur faculty members have indicated interest in working with the students and assisting them in continuing their summer research project at IIT.

   b) The Henry Wheeler Center for Emerging and Neglected Diseases (CEND) faculty member led proposal, with one IIT Kharagpur faculty member as co-PI, was awarded a training grant. This two-year funding will support two UC Berkeley students to visit IIT Kharagpur for summer program starting 2010.

   c) A joint-research workshop in bioenergy and healthcare is being planned for Jan. 2010.

4. The collaboration acted as a catalyst for IIT Kharagpur alumnus to provide seed funding to create a BioEnergy Center at IIT Kharagpur. This initiative is expected to further enhance IIT Kharagpur's capacity, capability and unique positioning in this area. Energy Biosciences Institute (EBI) is advising with the centre set-up.

The collaboration has thus far been sponsored by EBI, CEND, IIT Foundation, Sunil and Sujata Gaitonde, Headstrong, PfP LLC, Vasan and Neerja Raman, Prabha Sinha, several UC Berkeley Labs, and the Indo-US Science & Technology Forum (IUSSTF). IUSSTF's support has enabled several IIT Kharagpur students and faculty to visit UC Berkeley. This has been instrumental in enabling the collaboration.

A lot has been achieved in the last year and a half. We believe that continued financial support from current sponsors and new funding from corporations, foundations and government agencies will further accelerate benefits from the collaboration. And, make a difference for a healthier and sustainable planet.●

> "We decided to grow the program in an unusual way. We thought the most straightforward way to make this happen is directly through the students. They will explore research opportunities here with the understanding that these projects will continue when they return and in the process grow faculty bonds."
>
> 
>
> **Mark Richards**
> Executive Dean of the College of Letters and Science, UC Berkeley

Clearing the Mess

(Contd. From page 17)

observed in *Hydrilla verticillata*. *Hydrilla* plants used in constructed wetland systems, showed around 61% removal of nitrate content from the waste water with 63% uptake of nitrate by the leaves.

Attempts were made to develop an integrated process using bioremediation and phytoremediation techniques for removal of nitrate from HMX waste water using Silver oak plants. The results showed good nitrate removal and uptake from both the microbially treated as well as untreated waste water at 7,000 mg/L concentration of nitrate. The plants showed ~ 95 % removal of nitrate from waste water with ~75% uptake of nitrate by leaves.

The studies carried out at CSU by an Indian researcher entailed electrochemical reduction of simulated waste-water containing 2 g % sodium acetate (20,000 mg/L) and 4 g % ammonium nitrate (40,000 mg/L) using coupled-cell and divided-cell assemblies. The results indicated the feasibility of an electrochemical reduction process and divided-cell assembly with Nefion semi permeable membrane, as being more suitable than a coupled-cell assembly with graphite felt as cathode material for the purpose. The phytoremediation studies using *Brassica juncea* showed ability to accumulate nitrate ions in the leaf tissue and thus removed nitrate from the simulated waste water to which the plants were exposed.

The collaborative work of the Joint Centre resulted in the development of a remediation process involving bioremediation, phytoremediation and electrochemical reduction for high nitrate containing waste-water like that generated during the production of High Melting Explosive. The work has concluded after fulfilling of the objectives of the Joint Centre. As an added outcome of the Joint Center, one paper has been published, while the remainder data are being communicated for publication.●

The Khorana Exchange Program

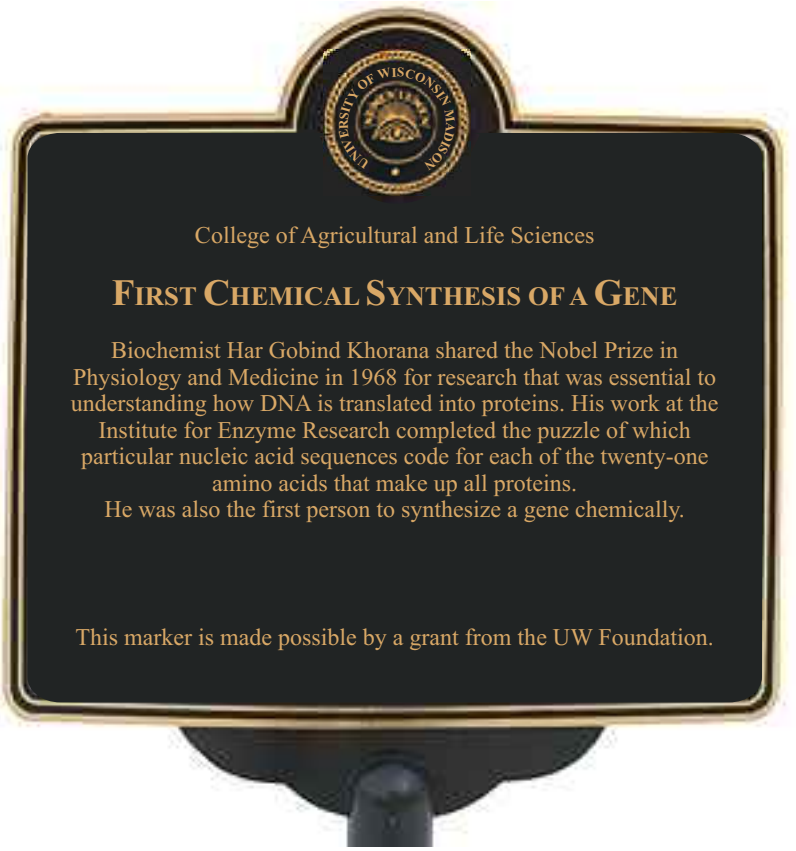
Catch Them Young!

Aseem Z. Ansari
Associate Professor, Department of Biochemistry, University of Wisconsin-Madison, Madison, WI

"Dear Sir/Madam, I have read about your very exciting research on the website and am seeking the privilege of working in your esteemed laboratory, under your esteemed guidance…." or so went the request from a faceless, eager, and potentially capable young applicant from India. "Dear Sir/Madam!" had this person really visited my website and failed to unambiguously tell my gender from my mugshot? Even if this were true, coming from India, they should have guessed my gender from my first name.

My annoyance faded as I recalled a similar request that I had sent 20 years earlier to a preeminent scientist, Professor Obaid Siddiqi, at one of the best research institutes in India. I had laid bare my soul and waxed on about how this experience would truly permit me to decide whether I should pursue a career in science or, like my mother, become a member of the Indian Navy. I expected an immediate and equally long response by return mail. And so when just a 10-word reply arrived, I was crushed even though the message was "I welcome you to join my laboratory for the summer."

The experience changed the trajectory of my life. I realized that what was needed was a high quality "match making" program that identified qualified students and placed them in highly charged labs where they would be nurtured and given the opportunity to engage in solving exciting problems at the frontiers of science, medicine and technology.



In the fall of 2005, these thoughts crystallized one evening at an annual gathering on campus for the A*star students from Singapore. The government of Singapore identifies a handful of outstanding "A*star" students who they then fund from college all the way through their final degree (for example, a PhD). The students have the freedom to choose any institution and roughly any area of study. The students are exceptional and an absolute joy to mentor.

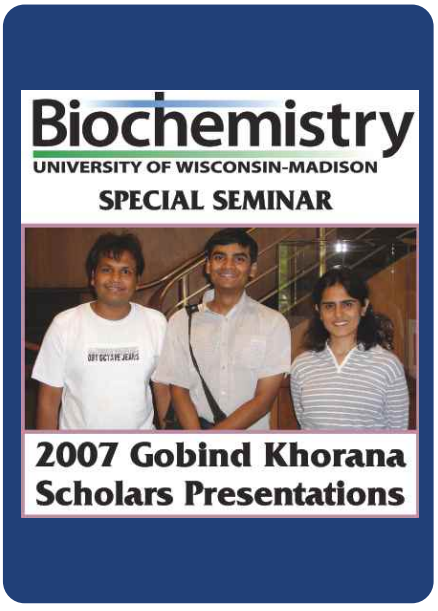
At the end of the reception, I was standing around awkwardly chatting with Chancellor John Wiley when I pointed out that we were missing the boat by not establishing a similar program with India. He smiled and walked me over to Ken Shapiro (Associate Dean of CALS) and Kim Santiago (Asia outreach coordinator, who had organized the A*star evening). "Ken," he said, "Aseem here is volunteering to build an Indian A*star program." I had done no such thing, but Ken, a charming, mild-mannered, but very action-oriented Dean for International Programs was not about to let that get in his way. He chatted with me quietly about Indian institutions, post 9/11 visa complications, UW policy on foreign students, and his interest in connecting UW to as many countries as was possible. Kim would interject whenever we digressed, expressing enormous enthusiasm for engaging India and linking the many UW alumni who hailed from that subcontinent.

In January of 2006, at a joint Indo-US conference I heard Arabinda Mitra, Executive Director of the Indo-US Science and Technology Forum (IUSSTF) extolling the virtues of joint research and exchange of scientists. "Tired maxims," I thought, but Mitra jolted me out of my cynical state with the magic phrase: "Money is at times not a problems if the idea is good. We are always looking for interesting ideas to fund." The IUSSTF had contributed to the joint meeting that had brought 40 scientists to India. Mitra offered to seriously consider anything consistent with the IUSSTF mission to foster productive and long-term interactions between India and the US. Could we get support from the IUSSTF to develop an exchange program with India? The answer may take the form of a substantial number of travel awards for students and scholars from both nations.

Nucleation: Khorana and Adler

Ken Shapiro was unrelenting in his mission to ensure that the program took form. We had several meetings over 2006. Ken would pull out his little leather bound black book and take copious notes and then, abruptly, nearly a year after the A*star gathering, he put down his pencil and in a soft but firm way he said, "enough talk, lets just do it."

But do what exactly, and how? Shaped by incessant grant writing, my instinct was that



approaching IUSSTF without "preliminary data" was premature. Moreover, the college (CALS) had just told us that they had no money for a non-essential program. "So start a pilot project that I will fund from my tin can under my pillow," Ken countered. Walking back from that meeting I nearly ran head-on into a no-nonsense metal marker that honored the work of Har Gobind Khorana at UW. The marker declared that Khorana won the Nobel prize at UW in 1968 for his work in deciphering the genetic code. He went on to make synthetic genes. No scientist from India is complete if they don't know these factoids from the moment when they are anointed as "science majors" in their late teens. They may not know what the *genetic code* is or what a *synthetic gene* may be or how this led to the birth of modern molecular and chemical biology, but by God, we know of Khorana's greatness and that he did transcendental things at MIT.

Har Gobind Khorana with Julius and David Adler

So why was this unyielding marker claiming that he had cracked the code at UW? I re-read it a couple of times to make sure I hadn't misunderstood. Julius Adler caught me in the act and explained that, in fact, Gobind had been a faculty member in our department (and the Enzyme Institute) for nearly a decade. "He did it all here, in that building." Why then is there no endowed chair in his name in the department? Julius shrugged and then in his wonderful way went on to recount some of the memorable times he had with Gobind. "But you know, he is unwell these days." It took less than a second to suggest that we name the coalescing student program the "Khorana Scholars." Julius followed through with an email to Gobind to let him know about this nascent plan. A few days later he informed me that Gobind seemed pleased by the suggestion. The "Khorana Scholars Program" was born!

The pilot project

I asked my colleagues to send me the "Dear Sir/Madam" letters that they had bothered to read and found interesting but inscrutable in terms of academic rankings/quality of institutions and such. I pruned a list to 50 very talented candidates, got transcripts and letters, and narrowed it to about 10 candidates; phone interviews cut it to 5 finalists. In the end we matched five students with five colleagues. To my horror, one colleague erupted, "But this student was ranked a thousandth in the entrance exam!" I rushed to explain that nearly 400,000 students prepare for nearly two years to take the grueling IIT-JEE (Indian Institutes of Technology - Joint Entrance Exam) and only the top 1-2% get into these elite institutions. The Infosys chairman famously quipped "IIT rejects" win top honors at Caltech and Harvard, so a rank of 1000+ from the best IIT was actually quite respectable. In the end, Ken could fund only three students. To help the program take its first tentative steps, the department chairperson Elizabeth Craig generously offered a supplement of $1000 per student. An amount that made an enormous difference in the students' ability to buy food.

The pilot project was on!

Transformation

Graduate students from the host labs at UW made the visitors feel welcome. Jackie Reading warmly introduced them at the departmental retreat and Jeet Kalia, a former IIT graduate, took them under his wing. We took pains to place them in nurturing and exciting labs at UW. Arpita Mandan worked on RNA-protein molecular recognition (in Marv Wickens' lab), Ishan Chaturvedi spanned a couple of labs working on nanofabrication with Franco Cerrina in engineering and Robert Blick in physics, and Mukul Garg worked on bioinformatics and microbial genomics (in Bob Landick's lab). At the end of their 10 weeks they were fighting tooth and nail with the IIT administrators to stay on another week and another day and another hour… Finally, they could stay no more and they gave their presentations to the department. The subsequent windup meeting with Dean Shapiro was especially touching. Each student had been transformed.

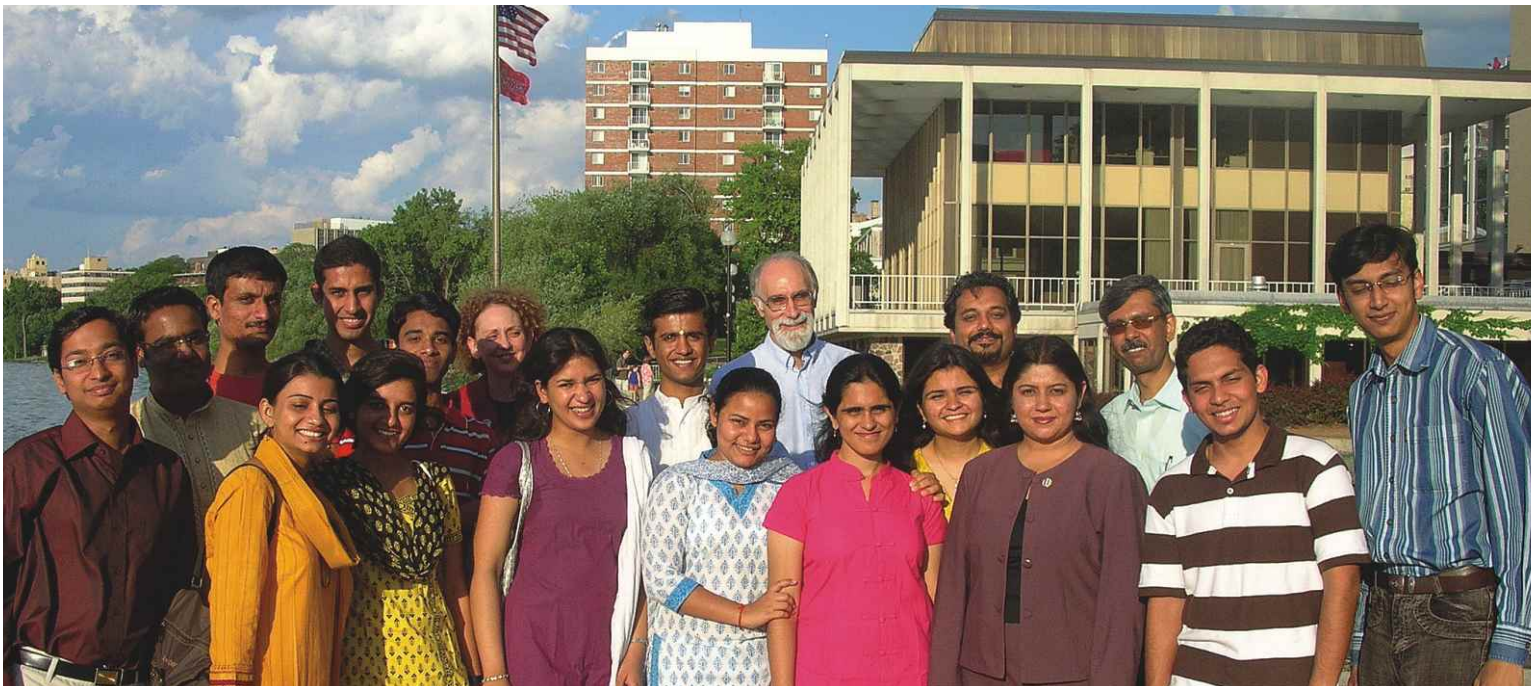
Exchange

An amazing and quite different program soon came to my attention. My office neighbor, Professor James Ntambi, had created an exchange program with Uganda. James' remarkable program takes a group of students to Uganda and intimately introduces them to various health and nutritional issues facing the populace. Students take a class in the fall semester and then over the winter break, under James' tutelage, attend workshops and work in camps in Uganda. Many students find it a transforming experience. Some have in fact gone on to start their own non-governmental organizations to continue work on the projects that they encountered during their trip. Ken Shapiro too had gone to Uganda with James and was tremendously moved by the work. Greatly impressed, I asked if the Khorana program should not also seek to incorporate a similar "exchange" component? The program thereafter was rebaptized the "Khorana Exchange Program."

A whirlwind through India

At the end of summer 2007, with the pioneering Khorana fellows back in India and my tenure process in full swing, Ken gracefully stopped asking me to more meetings. As soon as a positive departmental vote on my tenure came through at the end of October, Ken suddenly reemerged from the shadows with the request that we visit India. The goals were indeed ambitious. We wanted to identify partner institutions in India, gauge the interest of the institutions in a scientific exchange program, learn about areas of relevance to Indian scientists, engage the Indian government and lay the ground work to formally launch the program in the fall of 2008. All this in time for the 40th anniversary of Professor Khorana's Nobel Prize award.

Kenneth Shapiro



First batch of Khorana scholars with Dr. Arabinda Mitra, Dr. Smriti Trikha, Prof. Kenneth Shapiro and Dr. Aseem Ansari

At this stage we reconnected with Kim Santiago, who arrived with a list of alumni going back to when India was still part of the British Raj, and Mahatma Gandhi had not yet returned from South Africa to spur on the Indian freedom movement. In looking at the alumni list, Sankar Adhya's name jumped out at me. A prominent molecular geneticist at the National Cancer Institute in Bethesda and member of the prestigious National Academy of Sciences, I had known him from the start of graduate career. I asked him for advice and he suggested we contact Dr. R. A. Mashelkar, (a visionary head of the Council for Scientific and Industrial Research (CSIR) and Dr. P. Balaram, another leading scientist and the director of the Indian Institute of Science (IISc) in Bangalore. The latter institution seemed like a natural home for UW students, because of its scientific excellence, academic breadth, setting in the former royal botanical gardens in the lovely city of Bangalore, and the sheer volume of the UW alumni on its faculty.

Working non-stop for two and half months, Ken, Kim and I lined up 50 meetings that we would have in 7 cities across India over a span of 14 days! We met with Directors/Chancellors, Deans, Department chairs, and students from over 12 academic institutions - and even explored experimental farms. As we crisscrossed India, ministers, governors, academicians, industrial giants, alumni - nearly everyone - added to our objectives. The breadth of excellence across UW allowed us to flesh them all out.

Finally, in support of the widespread enthusiasm for the program, the Indian government's Minister Kapil Sibal and UW government's Chancellor Wiley, both known for fiscal prudence, offered to bank roll the program *completely unsolicited*.

A new and ambitious identity

From our discussions with friends and potential partners, three major objectives emerged:

- Provide Indian and American students with a transformative experience.
- Increase interaction between academia and the private sector in both nations.
- Engage in Indian rural development.

The third objective illustrates how the objectives of the program were shaped by suggestions of the people we met.

The Khorana program, we anticipate, will provide a life-changing experience for students from both nations, build bridges between scientists/institutions and lead to virtual and seamless scientific communities across the world. If it continues along its current trajectory, and if it garners further support from friends and alumni, the program will grow beyond undergraduates, beyond summer exchanges, beyond chemical biology, beyond the current boundaries and would make UW the focus of a much broader program between US and India. The scope may match that of the Fullbright program but with an emphasis on Science, Medicine and Technology. The challenge now will be to make the Khorana program self-sustaining and retain its nimbleness to adapt to new and unanticipated areas of interest and more important, to maintain its excellence.●

Second batch of Khorana Scholars with Dr. Nishritha Bopana

THE UNIVERSITY of WISCONSIN MADISON

Department of Biotechnology
Govt. of India

IUSSTF
Indo-US Science and Technology Forum

KHORANA Program for SCHOLARS

University of Wisconsin-Madison (UW), the Department of Biotechnology (DBT), Govt. of India and Indo- US Science and Technology Forum (IUSSTF) are partnering to launch the prestigious Khorana Program for Scholars named in honor of Dr. Har Gobind Khorana, who won the Nobel Prize in 1968 for his work at the interface of Chemistry and Biology while a member of the UW faculty. The Khorana Program will provide opportunities to Indian students to undertake research at University of Wisconsin-Madison (UW) in Summer 2010 for a period of 10 weeks.

The Khorana Program is envisaged to:

- Provide encouragement to young scholars
- Stimulate creativity amongst students
- Transform research into societal benefits and
- Build a seamless scientific community between India and the United States

Eligibility:

B.Tech, M.Tech and M.Sc. students currently enrolled in a recognized institution of higher education in India in the areas of biotechnology including agricultural, health and biomedical sciences.

Scholarship includes:

• Stipend • Accommodation • Airfare

For application guidelines refer to:

www.biochem.wisc.edu/faculty/ansari/khorana_program

www.indousstf.org

For program information contact:

Dr. Nishritha Bopana

Indo-US Science and Technology Forum (IUSSTF)

12 Hailey Road, Fulbright House,
New Delhi- 110 001
E-mail: scholar@indousstf.org
or write to khoranaprogram@cals.wisc.edu

Application Deadline : 30 NOVEMBER 2009

Quest for Excellence

Science and Engineering Research Council (SERC) of the Department of Science and Technology (Govt. of India) and the Indo-US Science & Technology Forum (IUSSTF) are committed to the common goal of promoting science and technology through devised programs, and nurturing contacts between scientists and technologists at an early career stage. With this objective, the Indo-US Research Fellowship Program for Indian Researchers was launched jointly by SERC and IUSSTF. The aim of the program is to introduce scientists and engineers at the thresh hold of their careers to international collaborative research opportunities, thereby furthering their research capacity and global perspective and forging long-term relationships with scientists, technologists and engineers in USA.

The awards provide an excellent opportunity to young Indian scientists and technologists of all disciplines, under the age of 40 to interact with the American scientific community to get first hand information of the developments taking place at the international level, and also acquaint themselves with new scientific research methods. It enables young Indian researchers to carry out a clearly defined research project at a place of their choice in the US upto a period of 12 months.

In this article, three past recipients of this prestigious fellowship, Dr. Vijaya Kumar, Dr. Suaib Luqman and Dr. Kalyan Mitra recollect their experiences as IUSSTF Research Fellows.

Heave Ahoy! Hawaii

Suaib Luqman
Genetic Resources and Biotechnology Division
Central Institute of Medicinal and Aromatic Plants
Lucknow, India

I have been awarded the Indo-US Research Fellowship to conduct advance research in the area of Life Sciences at the University of Hawaii Hilo (UHH), USA for a period of twelve months with Professor John M Pezzuto, Dean, College of Pharmacy. I reached Hawaii on November 11, 2008 and moved to my new place of work, the College of Pharmacy, Hilo. Elizabeth Ryan (Research & Special Projects Coordinator) arranged a nice accommodation just 5-minutes from the Institute of Pacific Island Forestry, where my laboratory was located. Being in the US for the first time, I was very excited. Along with research, I was also interested in learning about various aspects of running a lab, planning and execution of laboratory protocols, writing research grants and proposals, as done in a leading institution. The College of Pharmacy, a new college founded by none other than my advisor at UHH, would be the largest pharmacy community in the state with a mission to improve health care in Hawaii and throughout the Pacific.

I underwent laboratory/biological safety training related to procurement, storage, use and disposal of chemicals, biological organisms and hazardous materials. Thereafter, I began work on 'Natural Products in Drug Discovery' with special emphasis on cancer chemo-prevention. During my stay in the US, I got several opportunities to present my work at various conferences and symposia including the 26th Annual Miami Breast Cancer Conference; 50th Anniversary Meeting of the American Society of Pharmacognosy and, the 238th Meeting of the American Chemical Society (ACS).

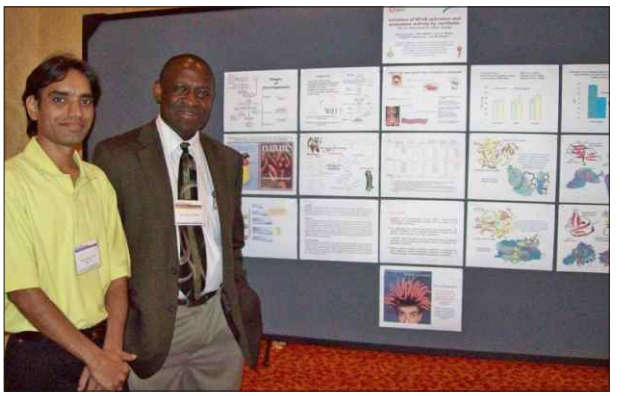
In addition to pursuing my specific research interests, I have also focused on how US institutions manage teaching, research, and facility creation in a seamless manner. I got an opportunity to interact with a set of very committed individuals at the College of Pharmacy like Prof. Bob Borris (Associate Dean), Dr. Daniela Guendisch (Research Scientist) and Dr. Tamara Kondratyuk (Laboratory Manager).

Some of my professional achievements after I received the Indo-US Research Fellowship are :

- Young Researcher Scholarship from International Multidisciplinary Research Congress and European Organization for Research and Treatment of Cancer, Turkey
- Young Researcher Member of the Biochemical Society, United Kingdom
- Elected as Active Member of The European Association for Cancer Research (EACR)
- Young Scientist Award from Council of Science and Technology, Government of Uttar Pradesh

To sum up, I must say that for me, it has been a remarkable and fantastic experience at UHH both personally and professionally. And I will return to India with several new research ideas and a dream to begin chemoprevention studies with natural products. I am very grateful to the entire team of IUSSTF and CIMAP (CSIR) for giving me such an excellent opportunity!

Certificate presentation at the 26th Annual Breast Cancer Conference at Miami



Suaib with Prof. Alex Adjei, Vice President Roswell Park Cancer Institute, Buffalo, New York

K. Vijaya Kumar
Department of Geological
and Environmental Sciences,
Stanford University,
Stanford, CA 94305, USA

Scintillating Stanford

My excitement began right away when I received the consent letter from renowned Earth Scientist Prof. W. Gary Ernst of Stanford University. This was even before I was selected for the prestigious IUSSTF Research Fellowship! Prof. Gary Ernst is a legend in himself - a Guru's Guru!. This IUSSTF fellowship provided me with a great opportunity to live my childhood dream of being a practitioner at "The Farm". Spread across 8,180 acres, Stanford University has the largest contiguous university campus in the world. It is awe-inspiring - but, naturally!. Twenty seven Nobel Laureates (including the two-time winner Linus Pauling) have passed through the portals of Stanford. Stanford's current community of scholars includes 16 Nobel laureates, four Pulitzer Prize winners, 23 MacArthur Fellows and 20 recipients of the National Medal of Science. The founders and/or the present/past CEOs of several corporations were Stanford alumni. Google got its start at Stanford when Sergey Brin and Larry Page developed the page-rank algorithm while they were computer science graduate students. "Sun" in Sun Microsystems originally stood for "Stanford University Network. Stanford has been represented in every summer Olympics since 1908, and since 1912, Stanford athletes have won at least one gold medal.

Cantor Center for Visual Arts at Stanford University

My research at Stanford deals with understanding the growth of the continental crust along the eastern margin of India using geochemical and geochronological studies. This involves U-Pb dating of zircons on the Sensitive High Resolution Ion Microprobe (SHRIMP). It is amazing to see how the tiny zircon grains unfold billions of years of the history of the Earth, about both its formation and destruction. Another aspect I am working on is delineating the composition of minerals formed at different physico-chemical environments on the Electron Probe Micro Analyzer (EPMA). During the course of my studies, I have explored snow-topped dormant volcanoes of Mount St. Helena and Mount Shasta to collect a few samples of ancient oceanic crust preserved along continental margins.

The Green Earth Sciences Building

A weekly presentation of ongoing research under the banner "Chain Gang" (obviously started by Gary) keeps researchers on their toes! I had the privilege of delivering a couple of lectures to the Chain Gang members. During my sojourn, I came across some fabulous humans, who are not only dedicated scientists in their respective fields but friendly, affable and humorous individuals. Liou, Ruth Zhang, Bob Jones, Owe Martins, Joe Wooden and Marty Grove have infact become life-time friends.

Nostalgia is a rare phenomenon for an Indian living in the Bay area of California. You are greeted with *Shukria* in a Subway and you get *Chai* in a Starbucks coffee shop! With Udipi hotels to Punjabi dhabas, Lord Venkateswara to Shirdi Sai temples, Kanchi sarees to Kashmir shawls, around you, life is beautiful! My diary will not be complete without thanking my loving hosts Rama, Renil and Trisha who made my stay at Stanford a memorable experience.

"Jai Ho" to IUSSTF for providing me with this wonderful opportunity and to Gary for making it a happy learning experience!

Pursuits at Purdue

Kalyan Mitra
Central Drug Research Institute (CSIR),
Lucknow, India

Having joined Purdue in July 2008 as an IUSSTF Research Fellow for year, I had the pleasure of working in the laboratory of Prof. Michael G. Rossmann at the Markey Center for Structural Biology, Purdue University, Indiana, USA. My research work involved studying structural aspects of the largest known virus, a new strain of mimivirus (putative human pneumonia agent) and an alphavirus (which includes viruses pathogenic to animals and humans e.g. Chikungunya virus).

During my first few days, while I was settling down and registering for various utilities and services, the most notable thing that struck me was the efficiency of the system. People were very cooperative, positive in their outlook, courteous and helpful. Things did not take time to get done and one did not have to chase the person concerned to get the work done. In our weekly lab meetings, I cannot recall a single incident of anyone coming late. Being a quiet person myself, I enjoyed the work culture of the lab.

My research relied heavily on Cryo-electron microscopy and single particle analysis for three-dimensional reconstruction of viruses. At a university course I attended on three dimensional image reconstruction, meant for graduate students, I was surprised to find that there were only two students in the class who would be graded for this advanced course! It was also interesting to note that Professors were also graded by students. I also attended a workshop on Single Particle Reconstruction, Map interpretation and Visualization at NCMI, Houston, Texas. I had the opportunity to closely interact with the participants and speakers who are leaders in their areas of research. I met Andres Sali, Klaus Schulten, Wah Chiu, Steve Ludtke, Sriram Subramaniam among many others and it was a privilege to discuss and take suggestions from them. I also made new friends here and we talked on different subjects late into the night. I also had the opportunity to hear invited speakers like Prof. Wolfgang Baumeister and Dagmar Ringe at seminars organized by Purdue University throughout the year.

The Rossmann Lab Group photo

The lab and the University were well represented by students from all over the world giving it a multi-cultural flavor. I had the opportunity to closely interact with many of them. Indian and Chinese students account for a significant proportion of students. Purdue University campus is huge and almost everyone in the city of West Lafayette either studies or is employed at the University. Unlike big American cities, West Lafayette is a very quiet place with greenery all around and Wabash River flowing through it.

A snowstorm outside the lab

The past year at Purdue has been very eventful. The IUSSTF fellowship has helped me immensely to broaden my horizons and I hope to implement the newly acquired techniques and ideas in my research work here. I am extremely grateful to IUSSTF for providing me with this excellent opportunity.

INDO-US 3.0

Clicking On The "Science and Technology" Tab

Debapriya Dutta
Counselor (S&T), Embassy of India, Washington D.C.

Genesis

Post cold war, India-US relations started taking a new shape in the new millennium, when US President Bill Clinton made a historic visit to India in 2000 delivering a clear message that the US wanted to forge a new partnership. This led to the establishment of the ***Indo-US Science and Technology Forum*** - an autonomous, not-for-profit society, mandated to promote and catalyse Indo-US bilateral collaborations in science, technology, engineering and biomedical research. President George W. Bush continued to build on this foundation, enhancing ties in new areas of mutual interest. The bilateral *Science & Technology Agreement* was signed on October 17, 2005, to promote technological and scientific cooperation in areas such as information technology, nano-technology, biotechnology and defence. The relationship further reached a new height with the signing of a historic agreement for peaceful use of nuclear energy between the two countries on October 10, 2008.

The present US Government conveyed its intention for invigorating Indo-US ties, when the US Undersecretary of State William Burns handed over a personal letter from President Obama to the Indian Prime Minster in June 2009, stating that India is "an absolutely critical country". US Secretary of State Hillary Rodham Clinton termed this phase of our relationship as "Indo-US 3.0" at the US-India Business Council's 34th Anniversary "Synergies Summit" on June 17, 2009 in Washington D.C.

U.S. Secretary of State Hillary Rodham Clinton and Indian Minister of External Affairs S.M. Krishna sign a U.S.-India bilateral science and technology endowment agreement in New Delhi, India July 20, 2009.

The Pillars

During the recently concluded visit of the US Secretary of State to India from July 17-20, 2009, the pillars (let us say tabs in computer terms) of Indo-US 3.0 were defined as (i) Energy and Climate Change; (ii) Education and Development; (iii) Economics, Trade and Agriculture; (iv) Common security and Defence interests; and (v) Science and

Technology, Health and Innovation. Based on the above framework, External Affairs Minister S.M. Krishna and Secretary Clinton have decided to meet once annually in alternate capitals to chair an "India-US Strategic Dialogue" for delivering concrete results.

Science and Technology Tab

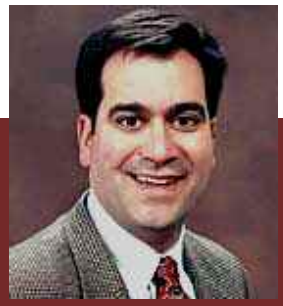
Drawing on the historic Indo-US S&T cooperation and the new found political and economic camaraderie, India and US concluded three agreements on July 20, 2009. Incidentally all of these are linked to the "Science and Technology" tab and, coincidentally on the day of the 40th anniversary of man's landing on the moon! The two sides signed a ***Science and Technology Endowment Agreement***, creating a $30 million endowment to fund joint research and development, innovation, entrepreneurial, and commercialization activities in science and technology beneficial for both nations. The ***Technology Safeguards Agreement*** on space cooperation will permit the launch of civil or non-commercial satellites containing U.S. components on Indian space launch vehicles. The third agreement was on crucial ***End-use Monitoring Arrangements*** for Indian procurements of US defence equipment and technology.

Both the nations agreed to expand the original focus of the bilateral ***High Technology Cooperation Group*** (HTCG) beyond IT, biotechnology, nanotechnology and defense technology to new areas of common interest in civil nuclear technology, civil aviation and licensing issues in defence, strategic and civil nuclear trade. Minister Krishna and Secretary Clinton also vowed to step up collaboration on climate change and energy security. Put together, all these arrangements will provide an all together new paradigm in our bilateral relationship, with S&T playing a pivotal role in our future cooperation that envisions to build a global knowledge economy.●

For a Material World

An Indo-US Centre of Research Excellence in Science and Engineering (CRESE) on ***Advanced Materials Research*** has been established through a joint funding from IUSSTF and Northwestern University with Jawaharlal Nehru Centre for Advanced Scientific Research (Bangalore), Northwestern University (Evanston, IL), Argonne National Laboratory (IL) and Indian Institute of Science (Bangalore) as the partnering institutions.

The CRESE on Advanced Materials Research, funded for a three-year duration, will allow a synergistic *quantum* materials research partnership anchored by the respective institutions leadership in materials research, leveraged by established grass-root collaborations and cross-institutional bridge-building initiatives (through long and short term student and faculty exchanges), as well as out-of-the-box *cyber*-enabled global educational, training and outreach programs between US and Indian institutions. The areas of R&D collaboration will cover broad emerging materials critical for advancing next generation information technology, and include nano-materials; soft matter; molecular electronics; structure-property relationships; and computational modelling.



Chad Mirkin
International Institute of Nanotechnology,
Northwestern University, Illinois.

Dr. Chad Mirkin has been recently awarded the prestigious Lemelson-MIT Prize in recognition of his inventions that use nanotechnology for the early diagnosis of diseases.

A serial innovator in nano-technology, Dr. Chad Mirkin will be one of the US investigators in this bilateral joint center of research excellence.

Infant and Young Child Feeding and Development

April 6-10, 2009
National Institute of Nutrition
Hyderabad

Members of the Indian & US teams

Under-nutrition remains a major problem in India *even today*, and interventions to reduce it are of a high priority. Malnutrition restricts the ability of children to develop their full cognitive and socio-emotional potential.

An investigative workshop followed by a conference on *New approaches to infant and young child feeding and development* was held from 6-9 April, 2009 at the National Institute of Nutrition (NIN), Hyderabad. The workshop was based on the results of the ongoing Indo-US collaborative study on "The efficacy of integrated feeding and care intervention among 3 to 15 months old rural children in Andhra Pradesh, India".

The event, jointly organized by **Dr. Shahnaz Vazir** of National Institute of Nutrition and **Dr. Patrice Engle** of Poly State University, California was attended by 85 participants, including 5 resource persons each from USA and India.

The workshop served as a base to analyze and draw conclusions from the efficacy trials conducted under the Indo-US collaborative project. The academic highlights included deliberations regarding various models for interpreting data, use of more sophisticated statistical models for analysis like multi-level modeling, appropriate indicators etc. The workshop provided an opportunity to finalize the initial conclusions of the trial for dietary intake, growth, responsive feeding and child development.

The recommendations of the workshop included:

a) highlighting the necessity for interpersonal communication methods that involve participatory discussions, behavioral experiences that could be used to improve children's nutrient intake and,

b) interventions with young children that would incorporate improvements in responsive feeding and play/communication. ●

Quaternary Climate Studies with Emphasis on Dendrochronology and Palynology

May 12-18, 2009
Birbal Sahni Institute of Palaeobotany
Lucknow and Srinagar (Garhwal)

Issues such as global warming, land-use changes, pollution and other climate related and anthropogenic ecological changes are of great concern to policy makers and planners around the globe. Paleoecological data, such as those provided by palynological (pollen) and dendrochronological (tree-ring) studies, are crucial to provide long-term perspectives on climate and ecological processes.

A workshop on Concepts in Quaternary Climate Studies with Emphasis on Dendrochronology and Palynology was organized by **Dr. Amalava Bhattacharya** of the Birbal Sahni Institute of Palaeobotany, Lucknow, from 12-18 May 2009. The training program attended by twenty Indian and one US participant included a two-day lecture series at the Birbal Sahni Institute of Palaeobotany, followed by a five-day field

Dr. Amalava Bhattacharya explaining tree ring features

trip to the Garhwal Himalayas (Department of Forestry, HNB Garhwal Central University) for hands-on application of field and laboratory methods.

The keynote lecture, "Reconstructing Paleoclimates and Paleoecology with Tree-Ring Data", was presented by **Dr. Peter M. Brown** (Colorado State University). The keynote was designed to set the basic themes of the workshop, both the importance of and need for understanding longer-term ecological and climatological processes using paleo-proxy data, and how tree-ring data are applied in environmental, cultural, and climatic studies.

The principle goal of the training was to provide participants with the knowledge needed to develop and apply multidisciplinary approaches to study longer-term ecological and climatological variability. The new developments presented at the event included:

a) analysis of isotopic ratio of C-14 and C-12 in the annual bands of trees from the Indian region for pollution assessment;

b) carbon and oxygen isotopic analysis from tree-rings of trees growing in different geographical regions in India for an analyses of various aspects of climatic change;

c) analyses of multi-proxy data towards high resolution climate reconstruction through collection of subsurface sediments from centers of lakes;

d) statistical applications in pollen analysis with development of revised formula and contemporary software techniques for quantification of reconstructed climatic information; and,

e) dating of fire scar in tree-ring sequences to build the forest fire history in a Chir pine forest of the Himalayas.

The participants recommended the launch of a coordinated multi-disciplinary research in areas having the potential of providing high resolution long-term palaeo-climatic and palaeoecological records.

Metrology, Standards, and Conformity Assessment and their use in Support of Technical Regulations

June 1-4, 2009
NIST, Gaithersburg,
Maryland, USA

Metrology, standards and conformity assessment procedures are used by societies to help develop technical regulations that address optimization of production, health, consumer protection, environment, security and quality, as well as to manage risk and intervene in cases of market failure. Sound development and effective implementation of these procedures and regulations enable sustainable development, build welfare and facilitate trade.

An Indo-US workshop on Metrology, Standards, and Conformity Assessment and their use in Support of Technical Regulations was organized at Gaithersburg, Maryland, from 1-4 June 2009. The Principal Investigators were **Dr. Vikram Kumar** (Director, National Physical Laboratory, New Delhi) and **Dr. Claire M. Saundry** (National Institute of Standards and Technology, Gaithersburg). The scope of the meeting was to provide detailed overviews of the measurement system and the standards system in the two countries. It dealt with the

Workshop participants under the Apple Tree at the National Institute of Standards and Technology. This tree is genetically transferred from the original famous Apple tree under which Newton made his epoch making discoveries.

standards (both documentary and measurement), conformity assessment and metrology systems and their applications to support technical regulations in the United States and India. The workshop also examined the role that these system components play in enhancing global trade and spurring innovation; and to explore opportunities for future collaboration. The laboratory tours to specific NIST laboratories (nano, chemical, bio, manufacturing, engineering etc.) were also organized. The workshop was attended by representatives of the government, academic institutions, regulatory bodies, industries and other allied organizations from both countries.

Delegates resolved to formulate a matrix where the major objective would be to create a network of scientists, technologists and entrepreneurs who can work together to promote joint research and enable development of projects that would help to foster mutually beneficial innovation.

Permian-Triassic Boundary Event in Spiti Valley, Himachal Pradesh

June 11-20, 2009
Chandigarh University, Chandigarh

Workshop participants collecting geological samples in Spiti Valley

The Permian-Triassic (P/T) bio-stratigraphic break is coincident with the greatest mass extinction event in the history of life that took place ~251 million years ago. This extinction event is believed to be accompanied by the demise of 96% of all marine species and 70% of terrestrial vertebrates. Although the pattern of this mass extinction is still being debated, the proposed mechanisms for the extinction include wide-ranging catastrophic environmental change caused by rapid flood basalt eruptions, bolide impacts, sudden release of methane gas hydrate from the sea-floor, sea-level changes, marine anoxia, and changes in the oceanic circulation caused by climate change.

In order to examine, investigate, and collect close-spaced geological samples from this P/T boundary section, an Indo-US bilateral workshop and field conference on the Permian-Triassic Boundary Event in Spiti Valley, Himachal Pradesh was organized at Chandigarh University from 11-20 June 2009. The Principal Investigators of the event were **Prof. Arun D. Ahluwalia** (Centre of Advanced Studies in Geology, Panjab University) and **Prof. Asish R. Basu** (Department of Earth and Environmental Sciences, University of Rochester).

The event attracted nine US and eleven Indian participants. The lectures covered the general nature of the world-wide (P/T) boundary event, and, the geology of the (P/T) rocks of the Himalayas, in particular, the Spiti Valley. Field work was organized around Atargoo near Lalung, Guling, and Muth to examine and collect samples from the Upper Permian to the Lower Triassic including the boundary layers. Participants were exposed to the unique geological field experience of observations on a rare geological boundary in the Himalayas that is generally inaccessible for most geoscientists.

Advanced Summer School on Systems and Networks

June 18 - July 18, 2009
University of California San Diego
USA

IUSSTF and California Institute of Telecommunications and Information Technology (CalIT2), University of California San Diego (UCSD) sponsored an Indo-US Advanced Summer School on Systems and Networks from 18 June-18 July 2009 at UCSD. The Principal Investigators were Dr. Dharmaraja (Indian Institute of Technology, Delhi) and **Dr.**

B. S. Manoj (UCSD-CalIT2). The event successfully brought together researchers, students, and faculty members from both India and the US to work together on two important areas of communication research - systems and networking.

Several eminent researchers in the area of communication systems and networks presented their work at the event. These included **Prof. Geoff Voelker** (Department of Computer Science and Engineering, UCSD), **Prof. Rajesh Gupta** (Department of Computer Science and Engineering, UCSD), **Dr. Dilip Krishnaswamy** (Qualcomm Research Center), **Dr. Navid Ehsan** (Mushroom Networks), **Dr. Ping Zhou** (Qualcomm R&D), and **Dr. Kalyan Vaidyanathan** (Sun Micro Systems).

This event paved the way for scientific cooperation between young Indian and American researchers and scientists who could work jointly towards the eradication of the digital divide. The exposure that the doctoral students gained in the Indo-US advanced summer school helped them to develop new theories, solutions, and methods for advancing the science of systems and networks. The meeting between India- and US-side faculty members also resulted in the drafting of a number of successful future collaboration plans.●

Prof. Ramesh Rao explains UCSD facilities to the visiting faculty. L-R: Prof. Ramesh Rao, Director, UCSD-CalIT2, Prof. S. N. Merchant, IIT Bombay, Prof. Krishna Sivalingam, IIT Madras, and Dr. B. S. Manoj, UCSD

Chemical Biology

July 2-7, 2009
Indian Institute of Science, Bangalore

Prof. Judith Klinman (UC, Berkeley) delivering a lecture

Chemical biology, an area that encompasses the application of diverse chemical concepts and tools to understand biological processes, has become a new frontline discipline in research. Understanding of protein structure-function dynamics using chemical tools has made an enormous progress over the last few decades due to the coordinated efforts of experimentalists and theoreticians. On the experimental side, novel new developments in the areas of single molecule spectroscopy and protein dynamics coupled with remarkable growth in the reach of structural biology have fueled unprecedented understanding of macromolecular function. On the theoretical side, energy landscape paradigms have been developed to understand protein folding, protein-DNA interaction and protein association. Computer simulations are playing an important role in bridging the gap between theory and experiments.

In India, research interest in chemical biology has seen a rapid growth in recent years. Young scientists and students, in particular, need to be exposed to the best in this area. With this aim, an Indo-US workshop on Chemical Biology was organized at the Indian Institute of Science, Bangalore from 2-7 July, 2009. The Principal Investigators of the event were **Prof. Biman Bagchi** (IISc, Bangalore) and **Prof. Shankar Subramaniam** (University of California San Diego). Seven US and 49 Indian delegates participated in the event.

There are now several groups within India that are working on protein folding, single molecule spectroscopy, enzymology and biodynamics. The workshop served to bring together scientists and students with different areas of expertise under one umbrella.●

Spatial Data Analysis in Ecology and Conservation

July 22-23, 2009
National Centre for Biological Sciences, Bangalore

Scientists from the National Centre for Biological Sciences (NCBS), Bangalore, the Nature Conservation Foundation (NCF), Mysore and the GeoDa Center for Geospatial Analysis and Computation, Arizona State University (ASU) participated in a training workshop on Spatial Data Analysis in Ecology and Conservation from 22-23 July 2009**.** The Principal Investigators were **Dr. T. R. Shankar Raman (NCF), Dr. Suhel Quader (NCBS), Dr. Julia Koschinsky (ASU)** and **Dr. Daniel Arribas-Bel (ASU)**.

The purpose of the training workshop was to contribute to closing a gap in ecology and conservation research in India related to spatial analysis techniques for vector data. Such data, frequently encountered in ecology and conservation research, comprises points (e.g., occurrences of individuals or events in space), lines (e.g., routes of animal movement, seed dispersal, hydrologic flows), and areas or polygons (e.g., fragments of habitat, resource patches, landscape element boundaries).

Mapping, measuring, and spatially exploring and analysing vector data is an essential component of research in the fields of landscape ecology, biodiversity conservation, forest ecology, and wildlife biology including the study of animal movement and human-wildlife conflicts in modern landscapes. Despite substantial recent theoretical and technical developments in spatial ecology and econometrics, including the availability of free and open source software for data analysis, few of these have been widely disseminated in India unlike techniques for data such as remote-sensing imagery, which are more widely used.

The event was used to develop a research project that advances spatial ecology and conservation research in India through spatial analysis methods and tools developed in the US. The workshop aimed to develop the ability to gather, use, and analyze spatial vector data among students and scientists in the field of ecology and conservation in India.

Training Indian Leaders in Human Dimensions of Wildlife Conservation

July 20-30, 2009
National Centre for Biological Sciences, Bangalore

Conservation of endangered species such as tigers and Asian elephants demands that we balance wildlife and human needs. To achieve this balance, each generation of wildlife conservation workers must understand ecological as well as socio-political and economic factors. Therefore, interdisciplinary training is required for the next generation of conservation leaders.

In order to combine classroom instruction, small-team advising, field practicum, and collaborative research, an Indo-US program on Training Indian Leaders in Human Dimensions of Wildlife Conservation was organized from 20-31 July 2009 at Bangalore.

The Principal Investigators of the event were **Dr. Ajith Kumar** (National Centre for Biological Sciences, Bangalore)

Workshop participants during the field trip to the Bannerghatta National Park

and **Dr. Adrian Treves** (Nelson Institute for Environmental Studies, University of Wisconsin-Madison).

The Master of Science (M.Sc.) degree in Wildlife Biology and Conservation is collaboration between the Tata Institute of Fundamental Research (TIFR), NCBS and the Centre for Wildlife Studies (CWS). Thus far it has been predominantly focused on the natural sciences and mathematics as they pertain to biological aspects of conservation. With a growing awareness of the demand for conservationists trained in human dimensions (human behavior, perceptions, attitudes, economics, and politics), the advisory board and instructional staff of the M.Sc. program invited Dr. Treves to help teach a new module in the human dimensions of wildlife conservation.

The event armed students with the translational and design skills needed to integrate human dimensions in wildlife conservation. It helped to deliver state-of-the-art training in the human dimensions of wildlife conservation; to collaborate in the design and conduct of social survey field research; to share curricular materials and pedagogical skills with Indian colleagues; and, to advance a long-term, multi-disciplinary Indo-US collaboration.●

Designing Sustainable Products, Services and Manufacturing Systems

August 18-20, 2009
Indian Institute of Science
Bangalore

The Indo-US workshop on *Designing Sustainable Products, Services and Manufacturing Systems* was organized from 18-20 August 2009 at Bangalore. The primary objective of workshop was to bring together domain experts from India and the US to discuss the social, economic, environmental, and technological aspects of designing sustainable systems, especially manufacturing systems.

The Principal Investigators were **Prof. Amaresh Chakrabarti** (Indian Institute of Science, Bangalore) and **Dr. Sudarsan Rachuri** (National Institute of Standards and Technology, USA) Sustainable systems are essential for ensuring quality of life for future generations by taking into account environmental, societal and economical impacts of activities or products that the systems control.

The essential goal of systems is to significantly reduce the consumption of resources and minimize the effects on the environment to an enduringly affordable level, while maintaining, if not enhancing, economic output and social structure.

The workshop consisted of technical sessions, breakout discussions, and industrial showcases that addressed important issues necessary for the production of sustainable systems. The topics for the technical sessions included:

A) design of sustainable products, services, and manufacturing systems (integrating environmental aspects into product design and development, design for sustainability, product lifecycle management and lifecycle analysis, material science, advanced manufacturing technologies, nano-manufacturing, energy efficiency, conservation for production and use of products, reduce, reuse, and recycling, information infrastructure including advanced models and semantics for product and process);

B) preparing engineering designers and managers for the 21st century (engineering curricula to include sustainability principles, national and international standards, multi-disciplinary approach to engineering education); c)

policies, standards and industry best practices for sustainable systems (standards landscape for product, process representation, national and international standards for sustainability, risk analysis of policies and regulations) and

D) showcases of sustainable technology (Indian and US case studies and business models).●

IBM -IUSSTF
Visiting Fellowships in Nanotechnology

Indo-US Science and Technology Forum (IUSSTF) in partnership with IBM announces the IBM-IUSSTF Visiting Fellowships. The IBM-IUSSTF Visiting Fellowships are envisaged to provide research opportunities for Indian researchers in the field of nanotechnology to undertake research at IBM's Thomas J. Watson Research Laboratory in Yorktown Heights, New York. The fellowship is intended to provide a platform for vibrant interaction between Indian and IBM researchers, thus fostering excellence and building long-term networks. The individual availing this Fellowship would be called an IBM-IUSSTF Fellow.

Eligibility

Researchers and faculty members, holding a regular position in recognized Indian academic institution or R&D laboratory. PhD in Sciences or Technology or equivalent. Outstanding record of scholarly achievement and significant contribution to research and development in the field of nanotechnology.

Areas of Nanoscience and Nanotechnology covered under the Fellowship

- **Spintronics**
- **Nanoelectronics**
- **Nanophotonics**
- **Materials and devices for energy conversion**
- **Materials for memory devices**

Promising applications in areas other than the above areas may also be considered.

Fellowship includes

- **Monthly stipend: $6,000 to $10,000 depending on technical area and experience**
- **Return Airfare**
- **Assistance with moving expenses**

Fellowship duration: Three months for one researcher in 2009.

The nominated candidate will undergo a final selection process at IBM. On selection, the Fellow will be required to sign an IBM Employee Confidentiality and Intellectual Property Agreement.

Submission Deadline : 02 October 2009
Award Announcement : 15 October 2009

For proposal guideline and format, refer to: www.indousstf.org

For immediate answers to your queries, please contact:
Dr. Smriti Trikha
Indo-US Science and Technology Forum
12 Hailey Road, Fulbright House, New Delhi-110 001
Phone: 011-42691700, Fax: 011-23321552 E-mail: fellowship@indousstf.org

IUSSTF
Indo-US Science and Technology Forum

Department of
Science and Technology
Govt. of India

Indo-US Research Fellowships for Indian Researchers

In an effort to augment scientific excellence in emerging areas of science and technology, the Indo-US Science and Technology Forum (IUSSTF) in association with Science and Engineering Research Council (SERC) of Department of Science and Technology (DST), announces the Indo-US Research Fellowships. The objective of the fellowship is to enable young researchers from India to carry out research in frontier areas of science and technology at a premier institution in USA. The fellowship will enable early and mid career Indian researchers to acquaint themselves with new scientific research methods and at the same time build strong collaborative linkages between the scientific communities of US and India.

Eligibility/ Application Requirements

Academic Qualifications
Master's Degree in Engineering, Technology or equivalent or Ph.D. in Science or Technology or equivalent or M.D. Degree in Medicine or equivalent
Applicants must provide proof of independent research work in internationally recognized academic journals

Age
Upto 40 years as on 31 December 2009

Employment
A permanent position in a recognized S&T institution/university/college in India

Areas covered under the Fellowship
- Atmospheric and Earth Sciences
- Chemical Sciences
- Engineering Sciences
- Life Sciences
- Medical Sciences
- Mathematical and Computational Sciences
- Physical Sciences

Promising applications in areas other than the above areas may also be considered

Place of work
The applicant should have letter of acceptance from reputed US scientific/technological institution where the applicant will be undertaking the research work under the Fellowship

Fellowship includes
- Monthly stipend
- Return airfare
- Preparatory allowances
- Conference allowances

Fellowship Duration
Minimum 3 months and upto 12 months

Proposal Guidelines and Format
Refer to www.indousstf.org

Application Deadline
31 December 2009

For immediate answers to your queries, please contact:
Dr. Smriti Trikha
Indo-US Science and Technology Forum
12 Hailey Road, Fulbright House, New Delhi-110 001
Phone: 011-42691700, Fax: 011-23321552
Email: fellowship@indousstf.org

Indo-U.S.
Science & Technology Forum

Who we are

The Indo- U.S. 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 that promotes and catalyzes Indo- U.S. collaborations in science, technology, engineering and biomedical research 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
- Industry Driven Programs
- Knowledge R&D Networked Joint Centers
- Programs on Innovation
- Public-Private Networked Joint Centers
- Special Initiatives for strategic Partnerships
- Student Internships
- Travel Grants
- Visiting Professorships

We invite

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

Submission Deadlines	Award Announcements
February	May
June	September
October	January

Further information available at **http://www.indousstf.org**

We value your interactions with us towards promoting Indo-U.S. Science and Technology collaborations

Our contacts

Arabinda Mitra, *Executive Director*
Indo-U.S. Science and Technology Forum (IUSSTF)
Fulbright House,12 Hailey Road
New Delhi 110 001, India
E-mail: amitra@indousstf.org
Phone: 91-11-42691700
Fax: 91-11-23321552

Michael Cheetham, *Director*
India Science and Technology Partnership (INSTP)
Smithsonian Institution
1100 Jefferson Drive SW, Washington DC 20013-7012, U.S.A.
E-mail: mcheetham@si.edu
Phone: 1-202-633-4784
Fax: 1-202-786-2557

IUSSTF
Indo-US Science and Technology Forum

Indo-U.S. Science and Technology Forum: A Catalyst for Indo-U.S. Science & Technology Cooperation

IUSSTF
Indo-US Science and Technology Forum

Indo-US S&T Forum: New Logo

Identical forms have been oriented and placed in such a manner that they can be read as "I" and "S" in positive and U in a countered form to create the image of "IUS". The counter form is also played in such a way that it gives a feel of an extended hexagon in the form of a beaker, moving in a dynamic upward direction. The symbol uses typographic element in an unusual manner adhering to the principle of minimalism. This simplicity lends it a modern, progressive and futuristic connotation. The colours Orange and Blue complement each other and enhance the importance of the joint activity.