



# Indo-US Science & Technology Forum

A Catalyst for Indo-US Science & Technology Cooperation



2005-2006

# annual report



# **Annual Report**

Indo-US Science & Technology Forum

April 2005 to March 2006



The Indo-U.S. Science and Technology Forum (IUSSTF), established under an agreement between the Governments of India and the United States of America on March 21, 2000, is an autonomous, not for profit society that promotes and catalyzes Indo-U.S. bilateral collaborations in science, technology, engineering and biomedical research through substantive interaction among government, academia and industry.

# Annual Report

Indo-US Science & Technology Forum  
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## FROM EXECUTIVE DIRECTOR'S DESK

Science is universal. Knowledge can be created in any part of the world and technology comes with experimentation. Scientific enterprise, on the other hand is the translation of 'mind to market' fuelled by innovation. This borderless dimension of science and technology has been intuitively recognized by India and the United States through embracing collaborations that are built upon complementary expertise and strengths, driven by economics of cost sharing and prevalent market forces.

The 'soft power' of S&T prowess is now amply recognized as an essential fabric of the Indo-American relationship. The various summit level inter-governmental declarations on strategic partnership and the umbrella Indo-US S&T Agreement signed in October 2005, is build upon the rich legacy of Indo-US scientific and technological cooperation spanning over the last five decades. The need for scientific partnership towards combating terrorism; creating measures for disaster prediction, management and mitigation; discovering civilian application of space, information and communication technologies; understanding and addressing global climatic change; developing clean and new energy technologies; assuring food safety and security through knowledge initiative in agriculture; controlling and preventing diseases; conserving wildlife; and finally building economic cooperation through high technology commerce in knowledge based industries constitutes the crux of these national declarations.

The Indo-US S&T Forum (IUSSTF) evidently has a crucial and enhanced role to play up, in bringing this scientific and technological potential upfront through innovative framework for collaboration between our two countries. The IUSSTF has been uniquely positioned to best capitalize on this scientific synergism through designing and promoting programs that can leverage each others

existing intellect, capital and investments in R&D, by working across disciplines and institutions through fostering partnership between academia, industry, laboratories and federal agencies.

The IUSSTF has utilized its operational advantage as an autonomous institution and its agility and flexibility in being able to involve industries and enterprises through the proven public-private partnership mechanisms towards generating new technological ideas and products. The IUSSTF has also adopted a 'bottoms up' approach by decisively providing a fertile platform for interaction between young and mid career scientists through the Frontiers program to develop the sense of excitement and trust which will pave the way towards scientific fraternity and leadership for the future. At the same time, we have also taken a 'top down' approach in providing valuable inputs to the envisioned Indo-American strategic partnership, outlined above.

The large canvas of activities supported by IUSSTF through three award making cycles during the year under report has created several new opportunities and dimensions in collaborations through the following programmatic portfolio:

- **Symposia, workshops, conferences** on topical and thematic areas of bilateral interest
- **Promoting contact between young scientists and engineers based on the US National Academies model**
  - Indo-US Frontiers of Science Symposium
  - Indo-US Frontiers of Engineering Symposium
- **Special initiatives on strategic partnerships** (ICT, KIA, HTCG, Clean technologies, Space cooperation, Global change, Health Science & Technology, Disaster management & mitigation)
- **Reaching out to industries** on research and technological opportunities through industry - academia linkages
- **Training programs and Advanced schools** towards human resource development
- **Public-private networked Centres** cultivating techno-preneurship in academia
- **R&D knowledge networked Centres** bridging scientific institutions across the two countries by leveraging existing strength and available national funding

- **Travel grants**
  - to undertake exploratory missions
  - for availing conferred fellowships, sabbatical and internships
  - to attend international S&T events in India
- **Visiting professorships for short courses in academia & industry**

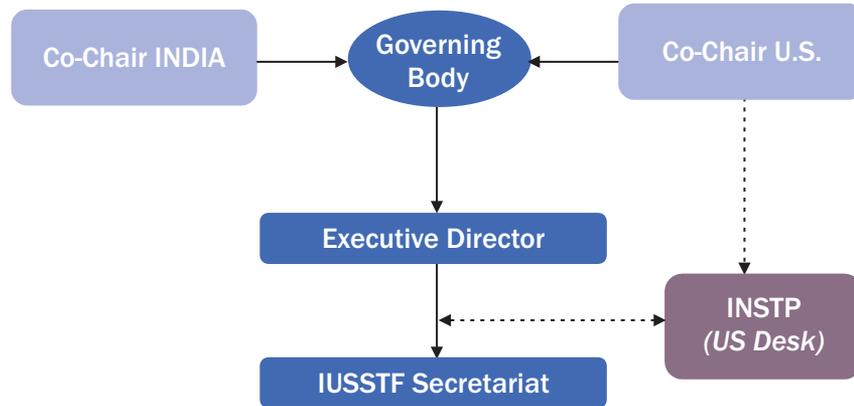
It is gratifying to note that through the above activities, we have successfully accomplished our mandated charter in being able to seed and spawn a large number of sustainable interactions and establish long term relationships, some of which are highlighted in the following pages. In particular, the signing of the University of California - India R&D initiative and US-India E-Education initiative with IUSSTF as the facilitator has opened a new vista for developing similar programs with other US universities. Similarly, looking at the encouraging response from the industry driven activities convened by IUSSTF, we plan to embark upon an exclusive program based on promoting synergistic activities with industries. We also endeavour to devise novel activities that will promote the envisioned strategic cooperation between our two countries.

IUSSTF will continue to play the crucial role of bridging the scientific enterprises through networking of institutions and effectively capitalizing on the existing resources available on both sides. IUSSTF is confident to stimulate and establish large scale collaborative efforts transcending across institutions and disciplines towards building and strengthening the Indo-US science and technology relationship. We are open to embrace new ideas and value your interactions with us.

## HISTORY OF INDO-US S&T COOPERATION

<b>1950's</b>	Green revolution facilitated with the U.S. PL 480 Rupee Funds Establishment of Land Grant Colleges
<b>1960's</b>	Establishment of IIT, Kanpur Establishment of NCERT, New Delhi Nuclear Cooperation Agreement Tarapur Power Plant
<b>1970's</b>	NASA-ISRO-SITE (Satellite Instructional Television Experiment) Indo-US S & T Sub commission
<b>1980's</b>	STI (Science & Technology Initiative) USIF (US-India Fund)
<b>1990's</b>	Indo-US Fellowships Program ICAR MoU Indo-US Vaccine Action Program DST-NSF Program NASA/NOAA-ISRO/DST MoU DBT/ICMR-NIH/CDC Health & Medical Sciences Program
<b>2000</b>	<b>Indo-US Science &amp; Technology Forum</b> Indo-US Science & Technology Agreement <ul style="list-style-type: none"><li>• Indo-US Bi-national S &amp; T Commission</li></ul> High Technology Cooperation Group (HTCG) Indo-US Strategic Partnership <ul style="list-style-type: none"><li>• Informational and Communicational Technology</li><li>• Knowledge Initiative in Agriculture</li><li>• Space Cooperation</li><li>• Energy</li><li>• Safety and Security</li><li>• Health Sciences</li></ul>

## STRUCTURE OF IUSSTF



## MANAGEMENT

The IUSSTF functions as

- Autonomous
- Bilateral
- Non-Governmental
- Not for profit society

To ensure that the activities undertaken by the IUSSTF conform to the highest standards of excellence, a joint Governing Body consisting of seven Indian and seven American eminent scientists provide leadership to IUSSTF.

The Executive Director manages the IUSSTF affairs from its headquarters at the Fulbright House, New Delhi.

## FUNDING

Annual interest earning from the endowment created by the U.S. Government with matching contribution from Government of India through the Department of Science and Technology provides regular funds to run the IUSSTF.

The IUSSTF also has the freedom to receive grants, gifts, donations or other contributions from industries, foundations and private benefactors. Contributions to IUSSTF are tax-exempted under section 80G of Indian IT Act. Towards furtherance of its objectives, the IUSSTF welcomes fund contributions both in India and U.S.A. As a 501(C)(3) entity, INSTP serves as the primary fund raising vehicle for the IUSSTF in U.S.A.

## COMPOSITION OF THE GOVERNING BODY (2005-06)

### Indian Side

**Prof. V. S. Ramamurthy**

**Co-Chair**

Secretary

Department of Science and Technology

Government of India

**Dr. Raghunath A. Mashelkar**

Director General

Council of Scientific and

Industrial Research & Secretary,

Department of Scientific and

Industrial Research

**Dr. Maharaj K. Bhan**

Secretary

Department of Biotechnology

Government of India

**Prof. Sanjay G. Dhande**

Director

Indian Institute of Technology, Kanpur

**Mr. Nandan M. Nilekani**

C.E.O, President and M.D.

Infosys Technologies Ltd

**Mr. Kiran Karnik**

President

National Association of Software and

Service Companies

**Mr. Knight P. Pandian**

Joint Secretary & Financial Adviser

Department of Science and Technology

### U. S. Side

**Dr. Norman P. Neureiter**

**Co-Chair**

Director

Center for Science,

Technology and Security Policy

American Association for the

Advancement of Science

**Prof. Michael Clegg**

Foreign Secretary

National Academy of Sciences

The National Academies

**Dr. David L. Evans**

Under Secretary for Science

Smithsonian Institution

**Dr. Joseph Jen**

Under Secretary for Research,

Education, and Economics

U.S. Department of Agriculture

**Dr. Kathie L. Olsen**

Deputy Director

National Science Foundation

**Dr. Rodney Nichols**

Former President and CEO

New York Academy of Sciences

**Mr. Benjamin H. Wu**

Assistant Secretary for Technology Policy

US Department of Commerce

## OBJECTIVES OF IUSSTF

CATALYST to facilitate, seed and promote US-India bilateral collaboration in science, technology, engineering and biomedical research through substantive interaction among academia, R&D laboratories, industry and government.

- Awareness through exchange and dissemination of information and opportunities towards promoting bilateral scientific and technological cooperation.
- Capitalizing on the scientific and technological synergy on issues of common concern leading to long term partnership based on shared values.
- Support exciting and enabling science and technology program portfolio that paves way to sustainable interactions and potential collaborations through networking.
- Explore new frontiers by nurturing contacts between young and mid career scientists to develop mutual trust, leadership and fraternity in research and development.
- Encourage public - private partnership and techno-preneurship to foster elements of innovation and enterprise through knowledge networking between academia and industry.

## SALIENT OUTCOME OF IUSSTF ACTIVITIES

*IUSSTF activities conform to the highest standards of excellence that has created new opportunities and paved the way to sustained collaborations in frontier areas leading to a new era in bilateral relationship.*

Dissemination of **information and awareness** through interaction of more than 4000 Indian and US scientists, medics and engineers from academia, R&D institutions & private sector R&D labs brought together through 60 IUSSTF supported bilateral workshops on a wide spectrum of thematic and application areas covering science, technology, engineering, mathematics, biomedical research and S&T policy issues.

IUSSTF convened events have led to **scientific collaborations** through inter-institutional agreements in diverse areas like weather and climate studies (National Center for Medium Range Weather Forecast & National Center for Atmospheric Research and India Meteorological Department & National Center for Environmental Prediction); advanced computing (Center for Development of Advanced Computing & Louisiana State University); ayurvedic research (Department of Indian Systems of Medicine and Homeopathy & National Center for Complementary and Alternative Medicine/National Institute of Health); information sciences (Mysore University & University of Pittsburgh); brain research (National Brain Research Center & National Institute for Mental Health); eco-informatics (Ashoka Trust for Research in Environment and Ecology & University of Massachusetts); technology management internship (Technology Information Forecasting Assessment Council & National Institute of Health); Sastra Ramanujan prizes (Sastra University & American Mathematical Society); biomedical engineering (Shree Chitra Institute of Medical Science and Technology & Penn State University).

The IUSSTF workshops have led to substantive impact in generating joint **Indo-US R&D projects** in frontier areas of mutual interest like agricultural biotechnology (functional genomics); traditional medicines; nano particle aerosol S&T; nano science & technology; weather & climate modeling; high performance computing; tissue engineering; advanced manufacturing; brain research; infectious diseases; epidemiology & environmental health; deep crustal studies & seismicity.

Some **major initiatives seeded** include, Indo-US civilian space cooperation; University of California-India S&T Agreement; Indo-US distance education program in engineering; five Indo-US Joint Centres on applied and knowledge R&D through academia-industry networking; India's joining the U.S. lead International Partnership in Hydrogen Economy (IPHE) and the US DOE Blue Sky Regional Carbon Sequestration Program.

Seeded the **development of educational programs** in information management sciences (Mysore University & University of Pittsburgh); green chemistry (Delhi University & Green Chemistry Institute); advanced manufacturing (IIT, Kanpur & Northwestern University) nanotechnology (SASTRA & University of Arkansas); microsurgery (All India Institute of Medical

Sciences & US Association of Microsurgery); distance education in engineering (Amrita University/ISRO & 21 US partner university and institutions); number theory (Sastra University & University of Florida) and museum science communication (National Council for Science Museums & Smithsonian Institution).

Facilitated the inclusion of **knowledge based R&D** (nano, info and biotechnology) as a part of the Indo-US High Technology Cooperation Group (HTCG) dialogue. Provided inputs to **strategic declarations** on knowledge initiatives in agriculture; information and communication technologies; health science and technology; space science applications; and nanotechnology.

**Road maps and contours of Indo-US cooperation** were chartered through IUSSTF convened events on civilian space cooperation (ISRO & NASA); microlight air vehicle development (National Aeronautical Laboratory & University of Maryland); primate national action plan (Primate Research Council & US Fish and Wildlife Service; Indo-flux program (DST); linear collider for high energy physics (DST, DAE & DOE labs); techno-preneurship in academia (CSIR/National Entrepreneurship Board & MIT/Harvard).

Initiated the **Indo-US Frontiers of Science (FOS) & Frontiers of Engineering (FOE)** symposium in partnership with the U.S., NAS & NAE. This has provided a unique platform to the best and brightest young minds from India and the US to interact and show case cutting edge scientific pursuits across disciplines through a designed symposium format. The frontier series has helped to establish trans-disciplinary research activities and build contacts between the next generation scientists.

**Industry driven activities** were initiated in areas like chemical engineering; cyber security; microwave technology; RFID & wireless sensors; design engineering; nanotechnology; rapid prototyping; cryptology; aero-elasticity; fuel cells etc. as examples of academia- industry- lab partnerships. **Academia-industry projects** have been generated on microwave technology; RFID; rapid prototyping; development of nano-structured materials; and developing cyber security standards.

Initiated Indo-US **training programs** based on complementary capacity building on topical areas like the monitoring and assessment of biodiversity; technology management; science, technology and innovation; joint WRF model development for climate studies; algorithms & cryptology (with Microsoft Research); computational aero-elasticity (with Boeing Inc.); computational materials theory; stem cell phenotype, proliferation & apoptosis etc.



## EVENTS DURING THE YEAR

### INDIA SCIENCE & TECHNOLOGY PARTNERSHIP (INSTP)

The India Science & Technology Partnership (INSTP) was incorporated as a 501 (c) (3) corporation to serve as the partner of IUSSTF in the United States. INSTP would complement the activities of IUSSTF and primarily work as an outreach and representation arm of the IUSSTF and provide linkages to the IUSSTF's operation from Delhi by:

- conducting outreach among U.S. government technical and scientific agencies
- increasing and expanding contacts with the U.S. business community, academia and professional and trade associations
- developing a closer relationship with legislative and executive branch offices interested in and supportive of closer bilateral relations with India
- representing IUSSTF at conferences, seminars, meetings and other events in the United States
- contributing to new program creation for IUSSTF and conducting follow-on efforts to IUSSTF initiatives by serving as a rapid response mechanism in the US.

In addition, INSTP will also serve as the primary fund raising vehicle for IUSSTF in the United States. It has already received financial support of the Richard F. Lounsbery Foundation and significant in-kind contributions from the Smithsonian Institution and the National Academics.

INSTP will also manage the U.S. peer review process for the IUSSTF's grant making programs and will also serve to maintain interface with U.S. members of the IUSSTF Governing Board.

## 7<sup>th</sup> GOVERNING BODY MEETING

The 7<sup>th</sup> Governing Body Meeting of the IUSSTF was held on 11 October 2005 at MIT, Cambridge. The meeting was co-chaired by Dr. Norman Neureiter and Prof. V. S. Ramamurthy. The GB expressed its satisfaction over the wide range of academic activities in contemporary areas that had been supported by the IUSSTF over the last year, resulting into expending the allocated budget for the fiscal year. It was noted that a large number of these events were now seeding substantive long-term collaborative programs.

The GB felt that the harmonics of the US-India relationship had changed substantially with the joint summit level declarations made by President Bush and Prime Minister Singh. Further, the GB recognized that the signing of the inter-governmental S&T Agreement reaffirms the strong commitments of the



two sides and would provide an altogether new vista of bilateral scientific and technological opportunities and challenges. This historic agreement would trigger newer expectations from the IUSSTF by the S&T communities of both the countries.

It was now more pertinent that IUSSTF should define a strategic role befitting this new paradigm in being more proactive by looking into some of the sectoral S&T issues of mutual concern. The IUSSTF should develop a vision to add some of the grand challenges in Indo-US S&T relationship in areas like agriculture, energy, health, rural technologies and domains that have a wider societal impact. This would help to lift the standard and imagination of the future activities and to seed joint programs particularly through active public-private participation from both the countries.

The Board endorsed the continuation of the Frontiers of Science (2006) and Frontiers of Engineering (2007) Symposium each alternating every year, as IUSSTF flagship events.

Concern was also raised about the fall in the interest rate and the consequent reduction in the IUSSTF annual income from the U.S. endowment interest and the matching grant from government of India. The GB strongly felt that at a crucial stage when the programmatic activities were rapidly growing and the IUSSTF was being increasingly approached by various S&T agencies in both countries with funding requests, the U.S. endowment should be proportionately increased so that the annual income of the IUSSTF is enhanced. The GB resolved that the co-chairs make a strong case to the US Government for enhancement of the IUSSTF endowment by transferring PL 480 Rupee funds already available with the U.S. embassy in India.

Initiatives should be mounted both in US and India to garner funds from private and philanthropic sources. To this effect, GB was amenable to the concept of an IUSSTF investiture program in recognition of the scientific and financial contributions being made by individuals and organizations in furthering the IUSSTF objectives and goals.

In conjunction with this meeting a set of ten scientific presentations on some of the prospective joint S&T programs were also presented to the Board. A special outreach program on 'Forging science partnerships between India and USA' through a panel discussion was made to a joint Harvard-MIT audience in the evening followed by a networking GB dinner at the MIT faculty club.

## INDO-US INTER UNIVERSITY E-EDUCATION INITIATIVE ON ENGINEERING

The University of California (UC) and four other U.S. universities joined with Indian institutions, the Indian Space Research Organization (ISRO), Department of Science and Technology (DST) and Amrita University to enhance science and engineering education in India over a new satellite e-learning network through the signing of a three-year agreement on 20 July 2005, timed to coincide with the summit visit of Indian Prime Minister Manmohan Singh to the United States. The industry partners in the program are Qualcomm Inc., Microsoft Corporation, and Cadence Design Systems Inc. Subsequently, on 17 December 2005, fifteen more US universities joined this initiative with IUSSTF partnering as a facilitator for the networking.

Under the agreement, the US universities will encourage engineering faculty to spend a quarter or semester of their sabbatical at Amrita University in India. Amrita University will extend use of its e-learning center, making it possible to be beamed over EduSat, a satellite launched by the ISRO, to transmit educational programming to multiple educational institutions throughout India.

This initiative is expected to expose U.S. faculty to potential research partnerships in India, and could also help with the development and mobility of trained human capital required both in academia and partnering industries. Visiting U.S. faculty will be encouraged to explore research collaborations with participating institutions in India. The U.S. universities have also agreed in principle to make teaching materials available on a non-exclusive basis for a new digital content library being created by Amrita University for future students.

The program will focus initially on engineering and computer science, and information and communication technologies, but courses will also include materials science, biotechnology and bioinformatics, nanotechnology, medical sciences, and other emerging technological areas.



## INDO-US SCIENCE & TECHNOLOGY AGREEMENT

The United States and India signed an umbrella Science & Technology (S&T) agreement in Washington on October 17, 2005. The agreement was signed by US Secretary of State, Condoleezza Rice and Indian Minister for S&T, Kapil Sibal. The purpose of the agreement is to strengthen the science and technology capabilities of the United States and India, by expanding relations between the extensive scientific and technological communities of both countries, and to promote technological and scientific cooperation in areas of mutual benefit.

This new agreement, which for the first time established intellectual property right protocols have provisions to protect, share and ensure business confidentiality emerging out of the collaborative activities. The agreement also has other provisions necessary to conduct collaborative research, which will accelerate cooperation between Indian and U.S. scientists in government agencies, private sector, and academia in such areas as basic sciences, space, energy, nanotechnology, health and information technology that will advance scientific understanding and benefit all our peoples. As a part of this agreement, a bi-national S&T joint commission is to be created that would provide a framework for a more vigorous public-private partnership.

IUSSTF hosted a function on October 27, 2005 to celebrate the historic signing of the inter-governmental S&T agreement which was attended by about 75 invitees including the Indian Minister for S&T, Mr. Kapil Sibal and Prof. V. S. Ramamurthy, Co-Chair of IUSSTF. As a part of this function, Dr. Marco Di Capua, Science Counselor, US Embassy, New Delhi was given also given a warm farewell. Dr. Di Capua who demitted the office after completing his tenure of five years at the U.S. Embassy had played a crucial role in the formative years of IUSSTF and the signing of the bilateral agreement.

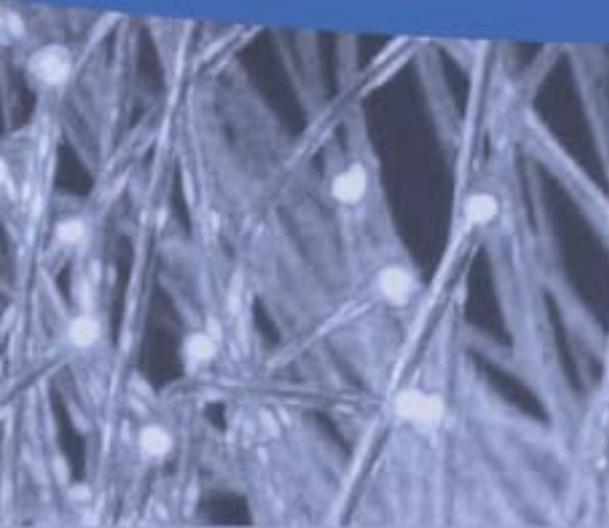






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academic activities

## FLAGSHIP PROGRAMS

### TECHNO-PRENEURSHIP IN ACADEMIA

Date & Venue: 23-25 January 2006, New Delhi, India

Principal Investigators:

H. K. Mittal, National Science & Technology Entrepreneurship Development Board (NSTEDB), New Delhi

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Recognising the fact that United States radiates vitality primarily because enterprise and innovation are the defining attributes of its R&D system, IUSSTF had put together this unique signature event with the aim to achieve a framework of innovation, efficient intellectual property management and technology transfer mechanisms required towards fostering entrepreneurship in Indian laboratories and academia through incorporating some of the successful American models from different universities and elsewhere.

The core group discussions covered IP management, venture mentoring, incubation systems, policy issues including curricula development and bilateral cooperation contours.

The recommendations that emanated from the two day event included:

- promotion of a mechanism to foster innovation development ecosystem through extending access to specialized on-hand training programs in U.S. universities.
- assist to establish a network of existing innovation centers in Indian academic institutions and linking these with leading innovation centers in U.S. universities
- execute one or two pilot initiatives in India from 'invention to start-ups' through adopting successful models in partnership with MIT.

The signature event was attended by 22 American resource persons including representatives from academia and startup companies, venture capitalists, Technology Licensing Officers from MIT, Maryland and Purdue Universities, and representatives from NSF and from the World Bank. There were nearly 110 selected Indian participants from CSIR, DST & DBT labs, academia and private R&D entities including several incubatees funded through the NEB.



## NANOTECHNOLOGY CONCLAVE

Date & Venue: 22-23 February 2006, New Delhi, India

Principal Investigator:

G. K. Moinudeen, Confederation of Indian Industries (CII), Delhi

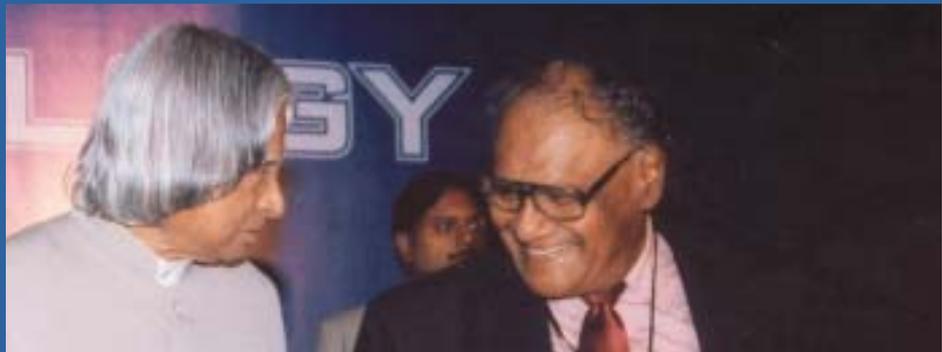
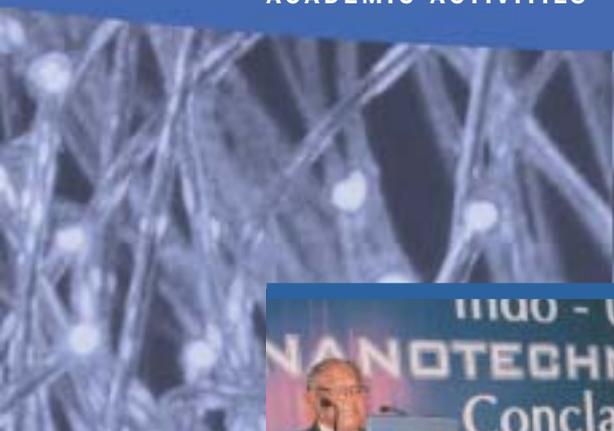
E-mail: [moinudeen@ciionline.org](mailto:moinudeen@ciionline.org)

The main objective of this conclave was drawn from the Indo-US High Technology Commerce Group (HTCG) recommendations aiming to forge linkages between US research institutes & Indian laboratories working in the area of nanotechnology, so as to identify the possible application areas and prospective nanotechnologies having potential for industry-institute collaborative development.

Through a designed technical agenda on R&D directions for nanotechnology; nanomaterials and business prospects; nano coatings; nano manufacturing: processes and tools; nano drug delivery and nano venturing, the two day industry driven conclave generated a bilateral nanotechnology roadmap process and a model for technology business and collaborations.

The President of India, Dr. A. P. J. Abdul Kalam delivered the inaugural address and enumerated the potential areas where nanotechnology can make possible societal impact through collaborative endeavors. The plenary speaker for the event was Prof. C. N. R. Rao, Chairman of the Science Advisory Council of India. The conclave was also addressed by Mr. Kapil Sibal, Indian Minister for Science & Technology and both the co-chairs of IUSSTF. There were about 20 US & 25 Indian speakers with a mix from industry & academia and the conclave had an attendance of about 150 participants from Indian industries.

It was agreed that CII & IUSSTF will facilitate data dissemination between Indian and US organizations in the interest areas that emerged out of the conclave namely on nanomaterials, nano-coatings, nano drug delivery and catalysis. A bilateral pilot project was also envisioned between two industry groups for launch at Kolkata, India.



## INDO-US FRONTIERS OF ENGINEERING SYMPOSIUM

Date & Venue: 2-4 March 2006, Agra, India

**Principal Investigators:**

**Sanjay Mittal, Indian Institute of Technology (IIT), Kanpur**

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**Subra Suresh, Massachusetts Institute of Technology (MIT), Cambridge**

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The maiden Indo-US Frontiers of Engineering (FOE) symposium, sponsored by the IUSSTF as a flagship program, brought together approximately 60 young and outstanding engineers and technologists from U.S. and Indian universities, industries, and R&D labs for a three-day meeting, where leading edge developments in four pre-selected engineering fields were discussed. The FOE was co-organised by IIT, Kanpur and the US National Academy of Engineering and was partially supported by the US Office of Naval Research. On 5 March, the FOE participants had an audience with the President of India, Dr. A.P.J. Abdul Kalam in New Delhi. The President interacted with the group, answering questions and discussing topical areas such as nanotechnology, biotechnology, and energy.

At the FOE symposium identified speakers presented their talks on contemporary research topics to colleagues outside their field with a view to both conveying and deriving cross-disciplinary information and insights through a format, which allows informed one-to-one discussions amongst the participants. The FOE was aimed to build new ties between future leaders of both nations technical and engineering enterprises. The topics covered were nanotechnology, wireless communication, natural disaster simulation and mitigation, and the interface of engineering with biology and medicine.

IUSSTF announced two awards of US \$ 50K each for the best joint proposal emerging from the FOE. Out of the 6 pre-proposals proposals received as an immediate outcome of the FOE, the two selected for award included:

*Manufacturing Robust Nanostructures: materials, methods and metrology*

Christopher Soles, National Institute of Standards & Technology, Gaithersburg, MD

Ashutosh Sharma, Indian Institute of Technology, Kanpur

*Network Tomography of Intracellular Traffic: A system – level investigation of the transport and sorting of cargo in living cells*

Muriel Medard, MIT, Cambridge, MA

Mukund Thattai, National Centre for Biological Sciences, Bangalore



## SPECIAL INITIATIVES

### UNIVERSITY OF CALIFORNIA-INDIA R&D INITIATIVE

Date & Venue: 16 March 2006, New Delhi, India

**Contact persons:**

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Gretchen Kalonji, Director of International Strategy Development, University of California, Office of the President, Oakland, CA

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A landmark research Memorandum of Understanding (MoU) in Science & Technology cooperation was signed between Indian scientific organizations and The Regents of the University of California on 16 March 2006 in New Delhi in the presence of the Indian Minister for Science & Technology, Kapil Sibal. The MoU will be facilitated through the Indo-US S&T Forum and will be coordinated by the Office of the President, University of California.

The MoU aims towards carrying out topical research in globally challenging areas of mutual interest. India's premier science and technology agencies and institutions, including the Department of Science and Technology; Department of Biotechnology; Technology Information Forecasting and Assessment Council (TIFAC), New Delhi; Amrita University, Coimbatore; IIT Kanpur; Jawaharlal Nehru Center for Advanced Scientific Research (JNCASR), Bangalore, and Society for Electronics Transaction and Security (SETS), Chennai are initial partners to this MoU.

This initiative takes the collaboration between the University of California System, with its ten campuses and four Institutes for Science and Innovation (QB3, Calit2, CITRIS, GHS) and leading Indian scientific organizations and universities, to a far deeper level in areas of science, technology, research and education. It is expected to dramatically strengthen joint research and educational collaborations, and will help build on the recent US-India collaborations in engineering education, expanding the focus to a wide range of disciplines aimed at providing solutions to grand challenges that will yield long-term benefits to the competitiveness, economies and security of both India and the U.S.

These collaborations are to be structured to provide multiple opportunities for the intellectual and professional development of students and to encourage active participation from U.S. and Indian institutions, government agencies, non profit organizations and venture capital entities. A joint steering committee will be responsible to guide and monitor the S&T programs including the educational exchanges.



## BILATERAL WORKSHOPS

### PREVENTING DIABETIC FOOT AMPUTATION IN DEVELOPING COUNTRIES

Date & Venue: 22-23 April 2005, Chennai, India

**Principal Investigators:**

Vijay Vishwanathan, Diabetic Research Centre, Chennai

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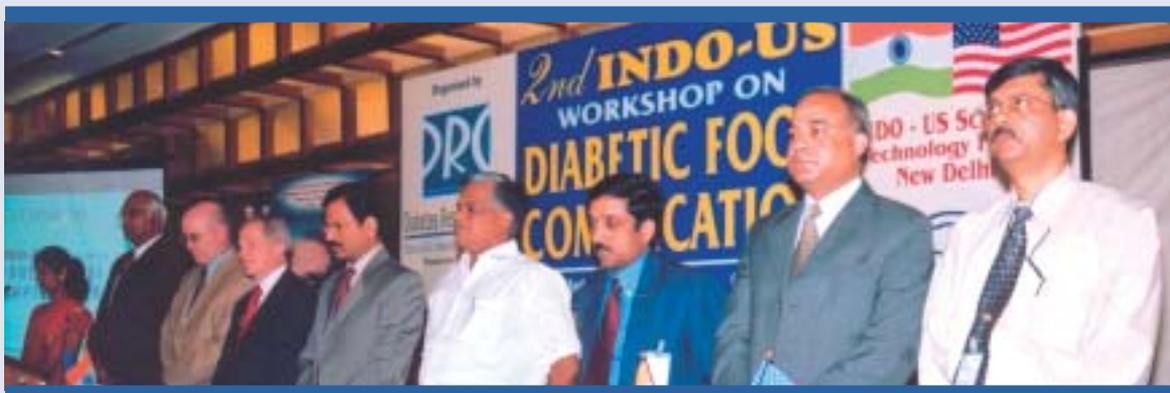
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India has the largest number of nearly 30 million of diabetic patients in the world. Of all the diabetic complications, diabetic foot is the most neglected and expensive socio-economic burden. At present there is poor knowledge about the preventive aspects of this problem both among doctors and patients, which is responsible for the high prevalence of foot infections and amputations among diabetic patients in India. In the United States, it is estimated that diabetes afflicts sixteen million people. Among them fifteen percent or two million patients are likely to develop foot complications. The annual direct and indirect cost for foot infection treatment alone exceeds US \$10 billion.

As a part of the amputation preventive initiative this tutorial workshop had an expert faculty drawn from US & India to expose the surgeons and clinicians to the latest techniques and developments in handling diabetic foot. The 15 scientific sessions and video surgical demonstrations focused on an early diagnosis of potential foot problems among diabetic patients with exchange of experiences in treating diabetic foot infections in their own regions. Recent developments in the management of Type 2 diabetes through combination therapy in foot infection were highlighted.

The dialogue between the faculty of physicians and surgeons helped in the better understanding of the complex pathogenesis of the diabetic foot problem. This also paved way for the doctors from the US to learn regarding the inexpensive and effective methods of prevention and treatment in the urban and rural setting of the Indian medicare. The doctors in India also improved their existing treatment methodology by learning the advanced techniques followed in America. The workshop had 3 US experts from Harvard Medical School and 10 invited Indian faculties and was attended by about 150 practicing surgeons and doctors from India.





## CARBON SEQUESTRATION

**Date & Venue:** 2-3 June 2005, Hyderabad, India

**Principal Investigators:**

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A workshop on carbon sequestration took a major step forward in collaboration on geological sequestration of carbon dioxide that must be developed if the world's carbon dioxide emissions, which contribute to global warming, are to be reduced. Typically this means injecting carbon dioxide into tight geological formations, such as oil and gas reservoirs, deep unmineable coal beds or deep saline formations.

Co-hosted by the National Geophysical Research Institute (NGRI) Hyderabad, India and Pacific Northwest National Laboratory (PNNL), Richland, the workshop brought together about 50 Indian and American researchers including 7 from the U.S. to exchange ideas on carbon dioxide sequestration in India and the surrounding region, including the development and demonstration of carbon dioxide capture and sequestration technologies through 18 different presentations. The various carbon storage processes and associated technologies discussed included carbon sequestration in deep geological formations; enhanced oil and coal methane recovery and gas hydrate exploitation.

The key outcome from this event was the initiation of the first pilot project in India on 'Geological CO<sub>2</sub> sequestration in basalt formations of western India' funded by the Indian Department of Science and Technology and Ministry of Power. The project is jointly coordinated by NGRI and National Thermal Power Corporation (NTPC) from India along with PNNL, as the US partner. Another significant outcome of the workshop has been the co-option of NGRI, Hyderabad as project investigator from India in the U.S. DOE led 'Big Sky Regional Sequestration Project' ([www.bigskyco2.org](http://www.bigskyco2.org)).

## HIGH PERFORMANCE COMPUTING FOR REGIONAL WEATHER AND CLIMATE

Date & Venue: 30 June - 2 July, 2005 Boulder, CO

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The workshop on High Performance Computing (HPC) for Regional Weather and Climate was held at NCAR, Boulder, Colorado, USA subsequent to the MM5/WRF Summer Workshop. Thirteen scientists representing several organizations from India and 23 scientists from the U.S. participated in this bilateral workshop.

There were 28 presentations in the workshop on various topics spanning cyber-infrastructure for HPC, additional HPC resources for regional climate studies and regional weather simulations using MM5, WRF, and other regional models. The workshop included a roundtable discussion between Indian and the University Consortium for Atmospheric Research (UCAR) scientists, during which each side presented activities with potential for mutual interaction. UCAR/NCAR projects included COSMIC, COMET, Unidata, Tropical Cyclones and Climate System Modeling.

At the conclusion of the workshop, possible areas of cooperation between UCAR and Indian institutions were agreed upon. These included the understanding and forecasting of tropical cyclones including demonstration experiments; study of regional climate changes using regional climate models; preparation of regional models using high resolution re-analysed data for Indian region; development of computational infrastructure for HPC in weather and climate studies; development of educational and training programs like the US COMET program for India.

It was also agreed to organize an advanced school in regional weather and climate modeling at IIT, Delhi for the benefit of young research scholars and towards the active involvement of the Indian research community in WRF model applications.





## MICRO - LIGHT AIR VEHICLES

**Date & Venue:** 1-2 August 2005, Bangalore, India

**Principal Investigators:**

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A two-day workshop on Micro Air Vehicles (MAVs) was organized jointly by the National Aerospace Laboratories (NAL), Bangalore and the Aeronautical Development Establishment (ADE), Bangalore at NAL premises. The workshop was also supported by Aerial Research and Development Board (AR&DB), Defence Research Development Organisation (DRDO) and Council for Scientific & Industrial Research (CSIR) from India. It was conducted by a 14 member expert faculty from the US (University of Maryland, Rensselaer Polytechnic Institute, Pennsylvania State University and Stanford Research International), and India (NAL, IISc, JNCASR and MSRSAS).

The concept of a small MAV system (150-300 mm) to serve as a close range observer is gaining attention for both defence and civilian applications. Emerging operational concepts including search & rescue, perch & stare, tagging & situational awareness, sensing chemical, biological and nuclear materials etc were discussed. The workshop addressed the state-of-the-art in flight science and technology of MAVs, including topics like biological fliers, design concepts, aeromechanics, propulsion, mechanisms, multifunctional morphing and navigation & guidance and also the status of work in India.

The workshop concluded with a panel recommendation to devise a programmed structure of integrated R&D along with design development of MAV for India. A technology demonstration project on fixed winged MAVs was decided to be prepared jointly by NAL and Aeronautical Development Establishment (ADE) in consultation with US participants. The possibility of holding a US-Asian MAV/UAV demonstration event in India during 2007 was also mooted.

## CYBER SECURITY STANDARDS

Date & Venue: 5-11 September 2005, New Delhi & Mumbai, India

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A workshop on Cyber Security Standards was held in New Delhi on 3-4 September 2005 as a recommendation from the second Indo-U.S. Critical Infrastructure Protection (CIP) bilateral plenary meeting held in Washington in November 2004. Three U.S. security standards experts from National Institute of Standards and Technology (NIST) and 20 counterparts from Indian Standards, Testing and Quality Certification (STQC) Directorate/Ministry of Information Technology (MIT) conducted the 2 day event in partnership with the Confederation of Indian Industries (CII), providing 500 attendees from industry.

The event was designed to educate and receive feedback from government and industry participants, including organizations that are part of India's critical infrastructure, concerning the risk management framework and the related NIST security standards and guidelines that support the framework in the US.

Although the seminar deliberated on different aspects including the technology issues, the focal recommendations pertained to standards, certification, accreditation and assurance. The need for Information Security Assurance program in India in line with the similar practices like FISMA in the US was mooted to be taken up jointly to develop standards & guidelines for ensuring baseline security in critical information infrastructure and e-governance applications in consultation with industry.

Under the Indo-US Cyber Security Forum, WG-V on Information Security Standards & Assurance co-chaired by NIST, and STQC/MIT, besides reviewing the progress of the ongoing activities, identified new activities including refining SP 800 - 53A auditing guidelines; developing an accreditation scheme for NIST; and refining the risk management framework initially proposed by NIST.





## INDIAN PRIMATE NATIONAL ACTION PLAN

**Date & Venue:** 12-14 September 2005, Jodhpur, India

**Principal Investigators:**

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The three-day workshop on Indian Primate National Action Plan was organized jointly by the Primate Research Centre (PRC) Jodhpur and the U.S. Fish & Wildlife Service. 14 leading primatologists from the US, 25 Indian scientists and 30 young Indian primate researchers and scholars participated.

For over 40 years, one of Indian primates Rhesus macaques, and others like slender loris, hanuman langur and Bonnet Macaque were exported in millions for biomedical research. These primates failed to attract an effective conservation movement until 1994, with the initiation of an Indo-US Primate Project (IUSPP 1994-2001) to develop centers for primate field ecological studies leading to conservation strategies being taken up.

To set perspective of the deliberation presentations on countrywide current status of primates, their problems and possible direction were addressed in the light of latest field researches focusing on 5 species of south India, 4 species of North-East India in addition to rhesus and langurs of north, west, central and eastern India. Four subgroups critically evaluated human-monkey pathogens, retroviruses, DNA fingerprinting and population genetics studies and taxonomic insight for sub-speciation purposes. Conservation studies based on primate genomes, molecular biology and recombinant DNA technology were addressed.

The workshop was aimed to build upon these studies to devise an action plan incorporating policy strategies for India that are to be adopted for an in-situ protection and conservation for endangered species including maintenance of species in nature without mutilating their habitats and a plan for integrating field data with that of modern laboratory investigations. National Primate Action Plan (PAP) 2025 was drafted towards submission to the Animal Welfare Board of India and the Ecotask Force of Ministry of Defence.

## DIARRHEA AND ENTERIC PROTOZOAN PARASITES: NEW CHALLENGES IN THE ERA OF HIV/AIDS

Date & Venue: 3-5 October 2005, Kolkata, India

### Principal Investigators:

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A symposium on diarrhea and enteric protozoan parasites: new challenges in the era of HIV/AIDS was jointly organized by National Institute of Cholera & Enteric Diseases (NICED), Kolkata and Centre for Food Safety, University of Georgia. Ten American and 30 Indian scientists, including 20 young researchers attended the event.

Accompanying the HIV epidemic is the high occurrence of diarrheal diseases, especially those caused by protozoan parasites. Among these opportunistic infections, Cryptosporidiosis and Microsporidiosis contribute significantly to mortality in AIDS patients. The symposium provided a platform for scientists, doctors and students to review recent progress in this area, assess the status of research in India & the US, to introduce new diagnostic and epidemiological tools required to formulate strategies for prevention and control of opportunistic infections through identified collaborative programs.

Scientific sessions were held on parasitic opportunistic infection; epidemiology and methods for detection of different enteric protozoans; and current developments on Cyclosporiasis, Microsporidiosis and Cryptosporidiosis. A wet lab hands-on training with US faculty was given in NICED on detection of opportunistic enteric parasites like Cryptosporidium, Microsporidium, Cyclospora and Isospora. The research needs and directions for opportunistic enteric parasites in India with US collaboration were also discussed. To this end it was agreed to develop common laboratory diagnostic protocols configuration with proper QA/QC. This activity is to be taken up in India by Christian Medical College (CMC), Vellore through U.S. CDC grants.





## UTILIZATION OF SPACE BASED RESOURCES FOR ENHANCING SCIENCE EDUCATION IN INDIA

Date & Venue: 15-17 October 2005, Aurangabad, India

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As follow-on to the Indo-US Space Conference sponsored by the IUSSTF in June 2004, the bilateral workshop on Space Based Resources for Enhancing Science Education in India was co-organized by HB Center for Science Education, Mumbai and the University of Wisconsin, Madison at Aurangabad. The event was attended by 10 U.S. scientists (drawn from NASA and academia) and 15 Indian delegates from universities and laboratories (ISRO, NCERT and Ministry of Human Resources Development).

The workshop was aimed at the development of an implementation plan and delivery mechanism for the joint utilization of the space based resources for science and technology education in Indian schools. ISRO has deployed EDUSAT, a dedicated communication satellite capable of providing audio and video services to schools in India, while in recent years Education and Public Outreach Programs affiliated with US launched space missions (NASA/NOAA) have developed a substantial number of education products. The workshop looked into the ways of utilizing the US developed education materials that could be adapted for Indian EDUSAT program.

The workshop participants formed three working groups to address instructional resources; informal or non-formal science education, and teacher preparation. The groups agreed that there is a great deal of educational material already in existence in both the countries. Training for the use and adaptation of these resources and their dissemination need strengthening. Current projects such as India's Chandrayaan-1 Mission to the moon and the Phoenix mission to Mars by the U.S. offer examples of how these practices may be executed in support of two upcoming resource and exploration-related missions.

## PHYSICS WITH ENERGETIC HEAVY IONS AND RARE ISOTOPES: TOWARDS A COMMON GROUND

Date & Venue: 17-19 October 2005, Chandigarh, India

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The Indo-US workshop on Physics with Energetic Heavy Ions and Rare Isotopes, was co-organized by Punjab University and University of Notre Dame at Chandigarh. Seven American physicists attended the workshop from the US along with 45 Indian delegates from academia and various laboratories like TIFR and BARC.

Heavy ion accelerator laboratories provide a powerful set up for formation and study of exotic nuclear states. These nuclei span a range of neutron proton numbers corresponding to those that are stable or nearly stable and also more exciting ones that are involved in creating these stable nuclei through complex astrophysical processes. A host of advanced facilities requiring high investment exist or are under development in the laboratories both in the US and in India which facilitate picking up of these exotic states. The primary purpose of the workshop was to get a first hand interaction between the scientists from such laboratories to set out interesting scientific projects leading to collaborative research and development in the field of nuclear structure and dynamics.

The panel discussion at the end of the workshop identified possible collaboration in areas like complete gamma ray spectroscopy; physics of neutron rich nuclei; nuclear reaction dynamics at low and intermediate energies; physics with radioactive ion beams, in particular with Coulomb excitations and transfer reactions; the study of unstable actinide nuclei by surrogate reactions. The need for joint development of GRETA (Gamma Ray Energy Tracking Array) and a Chico-type charged particle detector was also recommended.





## ELECTRONIC STRUCTURE OF NOVEL AND COMPLEX MATERIALS

Date & Venue: 26-29 October 2005, Kolkata, India

**Principal Investigators:**

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The Indo-US workshop on Novel and Complex Materials was jointly organized by S.N. Bose Centre for Basic Sciences, Kolkata and the Oak Ridge National Laboratory and was held at Kolkata. The workshop was attended by 14 U.S. scientists from academia, laboratories and industry (Lucent Technologies) and about 50 Indian participants.

Novel materials are the key to new technologies in areas from aerospace to electronics and computer hardware. In fact, increasingly technologies are becoming materials limited, so it is essential to discover materials with enhanced properties for new industries to develop. Furthermore, green and sustainable technologies require new materials. India and the United States are world leaders in the search for novel materials, especially inorganic materials. The goals of the conference were to develop collaborations in the development of novel materials synthesis and materials specific theory, especially at the emerging interface between scientific disciplines.

The deliberations were interdisciplinary in nature looking primarily at the interface between solid-state chemistry and physics of materials. Areas covered were super conductors, magneto-resistive materials and spintronics; ferroics; phase transition; and molecular & engineering materials.

Several areas of possible collaboration in molecular materials in context with light energy, development & application of monoxides and integration of research with physics education (exchange of research students) were highlighted in the panel discussion.



## REMOTE SENSING APPLICATIONS FOR AGRICULTURAL PRODUCTIVITY

**Date & Venue:** 4-5 November 2005, New Delhi, India

**Principal Investigators:**

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Satellite based multi-spectral imagery of agricultural land can be processed using algorithms to produce multicolored spatial crop maps. These maps are powerful decision support tools for detecting factors such as nutrient deficiencies, pest infestation, crop stresses from diseases, soil color etc., that can lead to a significant loss of productivity. The economic benefit to the grower can be derived from improved application of crop inputs e.g. irrigation, fertilizer, insecticides, herbicides, soil amendments and plant growth regulators. In addition, yield maps can be produced before and after harvest, which are a valuable tool for determining timing to market as well as estimating yield.

The brainstorming was aimed to bring together key stakeholders and experts from India and the US to share knowledge in the rapidly developing field of information technologies and remote sensing applications in agriculture. The initiative was designed to fit with the recently launched Indo-US Knowledge Initiative on Agriculture (KIA) focused on application of technology to increase agricultural productivity using public-private partnership and commercial linkages. The primary outcome was designed to create the framework for moving forward with implementation of pilot projects on wheat and soya during the yield season.

The deliberations were conducted in two parts. It included the brainstorming for a day and a half wherein the mix of 15 participants from various scientific institutions and private companies in US and India shared their knowledge domain and expertise on remote sensing applications for enhancing agricultural productivity and also to develop the case for a pilot project generation with possible implementation mechanisms using a public-private partnership mode. The second part included a presentation of the recommendations to the Executive Review Panel consisting of a select group of senior government officials from India and the US. Boeing India made a contribution to support this IUSSTF convened bilateral activity.



The brainstorming was aimed to bring together key stakeholders and experts from India and the US to share knowledge in the rapidly developing field of information technologies and remote sensing applications in agriculture.

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## TECHNOLOGY PLATFORM ON EXCELLENCE IN INTEGRATED DESIGN AND MANUFACTURING SYSTEMS

Date & Venue: 9 November 2005, New Delhi, India

**Organiser:**

V. P. Topa, Federation of Indian Chambers of Commerce and Industries (FICCI), New Delhi

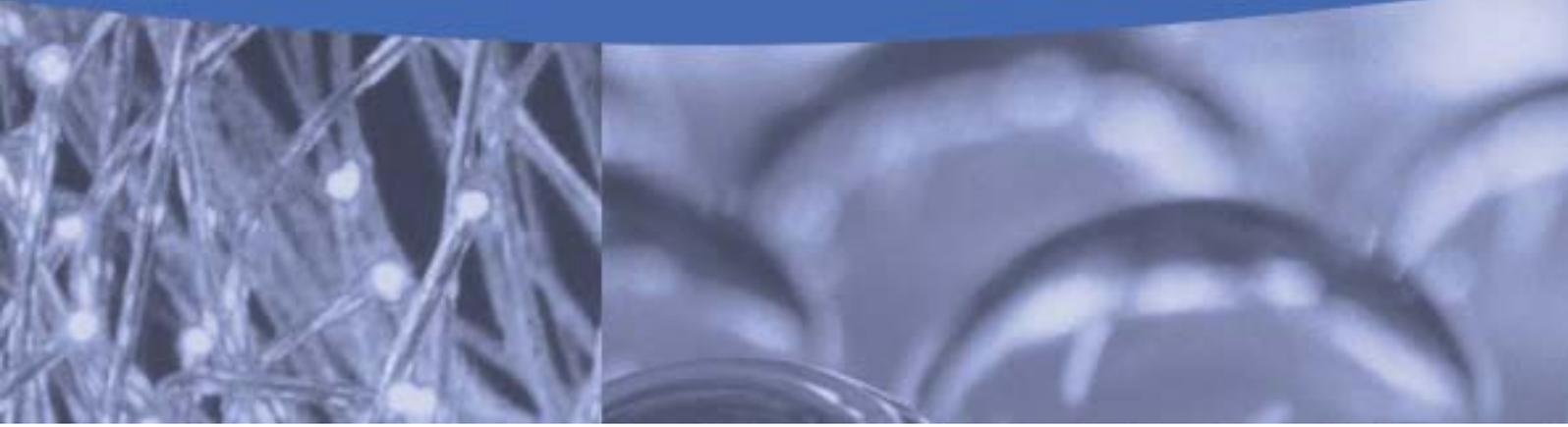
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Both design and manufacturing have undergone massive transformations through the application of microelectronics and computer sciences. The next revolution is expected to come through miniaturization of machines and devices and through an integration of life sciences with engineering sciences. Both the US and India have complementary strengths in many areas of the emerging and future technology that can be very effectively utilized.

To prepare the community of engineers and business leaders this one day event provided a platform towards showcasing prospective technologies in focused areas of advanced manufacturing and design. The industry driven event was organized by FICCI to foster interaction between academia and industries from the US and India in focused areas like:

- Photonics and opto-electronics
- Designs and systems engineering
- Transport engineering including systems intelligence
- Medical and bioengineering

The event which was inaugurated by Mr. Kapil Sibal, Indian Minister for Science and Technology and had a large business delegation from the state of Maryland, concluded with expressions of intent in the areas of advanced manufacturing (MEMS, VLSI) and medical technologies that have bioengineering applications including laser beams for surgical interventions. The idea of industry-academia joint networked centres for pre-commercial R&D was also mooted in these areas of common interest through leveraging national strengths available on both sides.



## RADIO FREQUENCY IDENTIFICATION AND WIRELESS SENSORS

Date & Venue: 11-13 November, 2005, IIT, Kanpur, India

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The areas of RFID and sensors are converging, and the two technologies combined, does provide very powerful solutions for many of our technological needs in the future. Many possible applications of this technology, such as supply chain management, animal tracking, counterfeit drug prevention, have truly global dimensions and were discussed in the workshop. The workshop aimed at exploring and defining collaborations and interactions in research, in technology application, and in manufacturing, between US and Indian organizations including industries. The workshop had 22 invited presentations, 5 panel discussion sessions, and 3 technology demonstrations, each of 30-45 minute duration. There were 9 invited speakers from the US and elsewhere including 13 from India. Besides, 37 invited delegates with a sizeable representation from industry attended the event. Multinational RFID Technology providers and Indian industries like Texas Instruments, Bangalore, General Electric Healthcare, Bangalore, Philips Electronics, New Delhi, Honeywell Corporation, Microsoft Research Laboratory, Bangalore, ST Microelectronics, Noida etc. participated.

Several issues of concern and several items for future action emerged from the workshop. It was agreed that an Auto-ID laboratory be set up in IIT, Kanpur. At present there is a network of seven Auto-ID laboratories through international linkages one each at MIT, Cambridge University, ETH, Zurich, Adelaide University, Fudan University, Keio University, Japan, and ICU, Korea. The role of the IIT, Kanpur laboratory would be to work on research projects in collaboration with the Auto-ID laboratory network and the RFID industry in India. Focused training and education could be provided through short-term workshops and elective courses, for which the RFID industry was willing to provide the RFID hardware and software for the training laboratory. As a follow up to this interaction, IIT, Kanpur has signed an agreement with Boeing Company for a collaborative project in RFID.





## DIGITAL ARCHAEOLOGY THROUGH COMPUTING AND INFORMATION TECHNOLOGY

**Date & Venue:** 11-13 November, 2005, Mussoorie, India

**Principal Investigators:**

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A symposium on Digital Archaeology: a new paradigm for visualizing the past through computing and information technology was held in Mussoorie from 11-13 Nov 2005. The event was attended by 12 American and 30 Indian archaeologists, IT and computing professionals, including 10 young researchers to highlight the advances and the state of the art in digital archaeology. IUSSTF GB member, Prof. Sanjay Dhande delivered the keynote address on the application of rapid prototyping as a new paradigm for visualizing the past.

The workshop focused into seven sessions, in which a total of 28 speakers made their presentations on the work being pursued and the areas for collaboration. The themes covered during the three day event included:

- Digital heritage libraries and archives
- Virtual reality
- Multimedia and heritage
- Digital opportunities: a perspective from Indian archaeology
- Remote sensing, GIS and CAD
- Cultural heritage and informatics
- 3D modeling and visualization

It was agreed that the institutional networking between India and the US can be further promoted so as to facilitate the exchange of technologies and knowledge in the emerging field of digital archaeology. A bilateral collaborative project on the application of virtual reality tools for '3 D reconstruction of excavated structures and monuments of Garhwal Himalaya' has emanated as an outcome of the workshop. A bilateral training program on the application of IT and computing techniques for archeological site reconstruction was also conceived by Global Heritage Foundation, USA.

## NANOPARTICLE AEROSOL SCIENCE AND TECHNOLOGY (NAST): EMERGING TRENDS

Date & Venue: 11-12 December 2005, Mumbai, India

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The workshop arose with the perceived need to develop a roadmap for NAST research and development with focus on India specific applications, an understanding of the similarities and differences with US and other nanotechnology programs, and identification of linkages between industry, academia and governmental agencies.

The event was attended by 13 U.S. scientists 50 Indian participants including a sizeable number of students. The five technical sessions covered nanoparticle characterization and measurement techniques; computational simulation of nanoparticle behavior; nanoparticle synthesis through aerosol routes; aerosols for drug delivery and atmospheric nanoparticles. The workshop reviewed the current status of the field and identified research and development needs where nanoparticle aerosol technology can impact the Indian region and to set up a group of scientists who can collaborate on scientific activities as needed by industry and government.

Prof. S. K. Friedlander from UCLA who had initiated the NSF program on the subject was a key participant in the workshop, and had a successful model for collaboration established with Delft University. It was deliberated to use this model for the establishment of a NAST Computational Simulation Program (NAST-CSP) at IIT, Bombay. A collaborative project on delivery of nanoparticle pharmaceutical agents by inhalation with University of Maryland was also finalized.





## CEREBROVASCULAR DISORDERS

**Date & Venue:** 12-14 December 2005, Delhi, India

**Principal Investigators:**

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Cerebral stroke is the second leading cause of death in developed and developing countries. Of the 55 million deaths per year world wide, one in ten is due to stroke. The symposium laid the groundwork for further academic and clinical activities focused towards the development of cutting edge tertiary care centers and community programs targeting the population at risk for cerebrovascular disorders.

This workshop was attended by medicos and surgeons from 7 leading American medical schools and about 20 invited Indian neurologists from various medical colleges and public health hospitals with a total attendance of about 75 participants. The interactions helped to improve stroke awareness, risk factor recognition and delivery of the state of the art treatment to stroke patients.

The topics discussed included stroke epidemiology; risk factors; neuron protection; neuro-imaging for strokes; venous stroke; hemorrhagic stroke; vascular dementias were discussed. In addition, stroke intervention and therapy techniques were documented towards publishing a guideline in form of an indexed text book on stroke care. A bilateral project on stroke epidemiological studies covering risk factors, outcome and stroke burden with special emphasis on Asia Pacific region versus the West was identified between All India Institute of Medical Science (AIIMS) and University of California, San Francisco. A collaborative project on accelerated atherosclerosis in young Indians between UCSF Medical Centre and Post Graduate Institute of Medical Education & Research (PGIMER), Chandigarh was formalized for submission to Fogarty International towards funding.

## MOLECULAR INSIGHTS INTO DIGESTIVE DISORDERS

Date & Venue: 15-17 December 2005, Vellore, India

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A cast of 11 speakers from the US and 20 from India participated in the event and interacted with a large gathering of students from Christian Medical College (CMC), Vellore and other medical colleges. In addition, approximately 50 faculty members from other medical institutions across India participated. The symposium was a useful activity in drawing together basic and clinical scientists who all use molecular tools to investigate different pathologies of the digestive system. The interactions between researchers in a diverse range of research areas linked by a common organ system acted as a catalyst to stimulate ideas for inter-disciplinary collaborative research between US and Indian scientists.

The technical sessions dealt with intestine and the luminal flora; new insights into liver disease; advances in viral hepatitis; understanding cancers of the digestive tract and advances in gastrointestinal immunity. All the lectures discussed the basics of the topic and highlight recent advances in molecular understanding of cellular and microbial processes.

The strong clinical base and field experience of the participants in India was recognized, and it was felt that the large patient populations and clinical skills in India could benefit from an interactive collaboration with colleagues in the US by providing a platform for clinical research. It was decided to continue to work towards establishing a clinical trial protocol across multiple institutions treating cancer patients in India.

Selected participants visited field study areas and decided to develop a collaborative research proposal on human and bovine norovirus infections for submission under the Fogarty International Research Cooperative Agreement program. Joint work on a biomarker discovery program to develop an assay for identifying patients likely to progress to fulminant disease when infected with hepatitis E was identified for submission to the Wellcome Trust.





## NUMBER THEORY AND MATHEMATICAL PHYSICS

Date & Venue: 20-22 December 2005, Kumbakonam, India

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The conference provided an excellent opportunity for exchange of ideas between experts in the US, India, and other countries on problems at the interface between number theory and mathematical physics and on the work of the Indian mathematical genius Srinivasa Ramanujan. The 6 invited speakers from US and 5 from India presented a complete solution to an important problem of Ramanujan on universal quadratic forms by a very new method. Lectures related exciting advances in the theory of mock theta functions, a subject originated by Ramanujan. Discussions also outlined major progress in the study of partition congruence, a subject also originated by Ramanujan.

The conference also announced the award of the two SASTRA Ramanujan Prizes of US \$10,000 each to be given annually to mathematicians not exceeding the age of 32 for outstanding contributions to areas influenced by Ramanujan, who achieved so much in his brief life of 32 years. Out of an international competition, two young mathematicians from the US were recommended for these two prizes. Thus, path breaking work in both algebraic and analytic number theory was recognized through these awards.

The newly created SASTRA Ramanujan Prize has not only served as a major encouragement and recognition of research by young mathematicians, but also brought much deserved international visibility to the bilateral conference.

## RECENT ADVANCES IN MICROSTRUCTURE IN METALS

Date & Venue: 28-30 December 2005, Vishakapatnam, India

**Principal Investigators:**

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The workshop was attended by 10 American scientists including representative from the Materials Division of NSF. There were about 12 invited Indian speakers from Atomic Energy, IIT, DRDO, universities and steel plants with a total attendance of about 75 participants.

The event provided an opportunity for the scientists and engineers to interact on close packed metals such as hcp (titanium, zirconium and magnesium) and fcc (Al alloys) that find varied application in aerospace, biomedical, nuclear, automotive and defence industries. Recent advances in the characterization of the microstructures and textures of these materials along with quantitative model development of the textures and microstructures make it possible to assess the macroscopic properties leading to life prediction capabilities of materials.

Recent advances in nondestructive testing and examination techniques brought possibilities of investigating condition of materials in service from micro structural and textural perspectives. A series of sessions were held which were categorized into texture, microstructure and panel discussions. It emerged that both India and U.S. have significant interest to expand this area of mutual interest especially looking at projects related to texture analysis that could be submitted under the DST-NSF Materials Networking program.





## INTEGRATED DESIGN ENGINEERING

**Date & Venue:** 5-7 January 2006, Bangalore, India

**Principal Investigators:**

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The goals of the Indo-US Workshop on Design Engineering were to enhance awareness of research and education activities in design and to catalyze formation of networks involving different institutes and organisations in India and the US in various research areas. The workshop was attended by 75 participants including 17 from the US, with representation from nine universities (including MIT, CMU, Stanford University and the University of Texas - Austin,) and three government agencies (NAE, NSF & NIST). Several leading industries like General Electric, General Motors, Cades InfoTech, MICO, Ashok Leyland, Tata Consulting Services etc. participated in the event.

Altogether, there were thirty formal presentations from twenty-seven experts, spanning the eight technical sessions on design education; design synthesis, creativity and sustainability; product styling and ergonomics and design process, modeling and prototyping. In particular, the sessions on design education saw an all-round participation from all major design schools in India and the US. Because of a major interest in design education, three parallel breakout sessions were conducted in this area with participants distributed in these sessions.

Both Indian and US participants have identified several potential opportunities for collaboration in design and research and identified the areas of sustainable product development as a potent subject for collaboration between the two countries. A joint project on collaborative industrial design has been formulated between IIT, Madras and CMU. From the objective of catalyzing formation of networks at all levels, the event has been highly successful. Students have already formed a network, the experts from academia, industry and government organisations have had ample networking opportunities, and a “Design Seed Information Network - DeSelN” comprising the participants as its seed members is planned to be launched.

## BUILDING BRIDGES, FORGING BONDS FOR 21<sup>ST</sup> CENTURY ORGANIC CHEMISTRY AND CHEMICAL BIOLOGY

Date & Venue: 6 January 2006, Pune and 12 January 2006, Hyderabad, India

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A workshop for early-career scientists from India and the United States, partially funded by IUSSTF, “book ended” two major scientific conferences sponsored by the American Chemical Society (ACS) and India’s Council on Scientific and Industrial Research (CSIR). A three-day conference, titled Building Bridges, Forging Bonds for 21<sup>st</sup> Century Organic Chemistry and Chemical Biology (OCCB) was held at National Chemical Laboratory (NCL) in Pune from 7-9 January. A follow-on symposium, Advances in Organic Chemistry and Chemical Biology (OCCB), was held at the Indian Institute of Chemical Technology (IICT) in Hyderabad from 11-12 January 2006.

These workshops were an integral part of a new international initiative of the ACS to engage with the Indian scientific community to enhance scientific collaboration between U.S. and Indian researchers. By being able to participate in and present the results of their work at both events, workshop participants, 10 young US scientists and 12 early career Indian chemists, gained excellent exposure to the high-quality scientific research being performed in the United States and India, and were able to network extensively with their peers and other colleagues participating in the meeting.

Interactive sessions on topical areas like organic synthesis; supra-molecular chemistry; chemical biology; drug discovery; process research and organo-metallic chemistry were held. The format provided an opportunity to discuss future directions of the field and identify promising areas of investigation and exposed the US scientist to both NCL & IICT facilities. The event helped in building collaborative networks and catalyzed the development of individual research collaborations amongst young researchers.





## ORGANIC CHEMISTRY – TODAY & TOMORROW SYMPOSIUM

Date & Venue: 4-7 January 2006, Indian Institute of Science, Bangalore, India

**Principal Investigators:**

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The symposium was attended by five US chemists and many young and established chemists from India and the rest of the world. A total of 34 invited talks were presented to 230 registered participants. Additionally, young students and scientists presented 19 posters following a flash poster presentation. IUSSTF supported the participation of 3 US lead speakers.

The scientific sessions included synthetic organic chemistry, physical organic chemistry, medicinal chemistry, chemistry of materials, etc. – thus covering almost all branches of chemistry including the emerging ones. The underpinning theme was organic chemistry at the cross roads.

On January 4, a group of Indian and US chemists participated in a preparatory meeting in the Department of Organic Chemistry, Indian Institute of Science, to discuss the possibility of organizing a bilateral symposium/workshop in India towards the end of 2007/early 2008 on the general theme of “Organic chemistry – from medicine to materials”. It was felt that this was a very topical area of interest where interface between biology and chemistry towards drug development and discovery can be approached through participation of some pharma companies.

## FUTURE TRENDS IN SPECTROSCOPY: APPLICATION TO SECURITY

Date & Venue: 9-11 January 2006, Varanasi, India

**Principal Investigators:**

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The main thrust of the workshop was to review, explore and analyze cutting edge research trends in spectroscopy based technologies which are immediately applicable for the detection of explosives, illicit chemical and biological agents. The workshop was attended by 13 US and 16 Indian invited physicists with a total attendance of about 85 participants including 20 students from various universities.

The ten technical sessions of the workshop covered topics like recent trends in laser spectroscopy; optical spectroscopy; ion mobility and photo-acoustic spectroscopy; optical and MEMS fiber sensors and X-Ray for discrete detection, explosive detection, chemical and biological detection.

It was felt that the use of Laser Induced Breakdown Spectroscopy (LIBS) to home land security as well as many other spectroscopy based techniques require the strengthening of the available database. For example the intensity variation of atomic spectral line intensities with temperature (also lack of local thermodynamic equilibrium) is essential if identification of quantitative atomic percentages is to be made reliable. Again in IR or Raman based techniques the characteristic vibrations of functional groups and the variation with changes in other parts of the molecule must be known precisely before discrimination between similar chemical explosives/drugs would be reliable. All these scientific problems provide extensive basic collaborative spectroscopic research possibilities. The need for more focused interactions limited to one or two techniques, covering not only laboratory studies but also infield trials would be followed up.

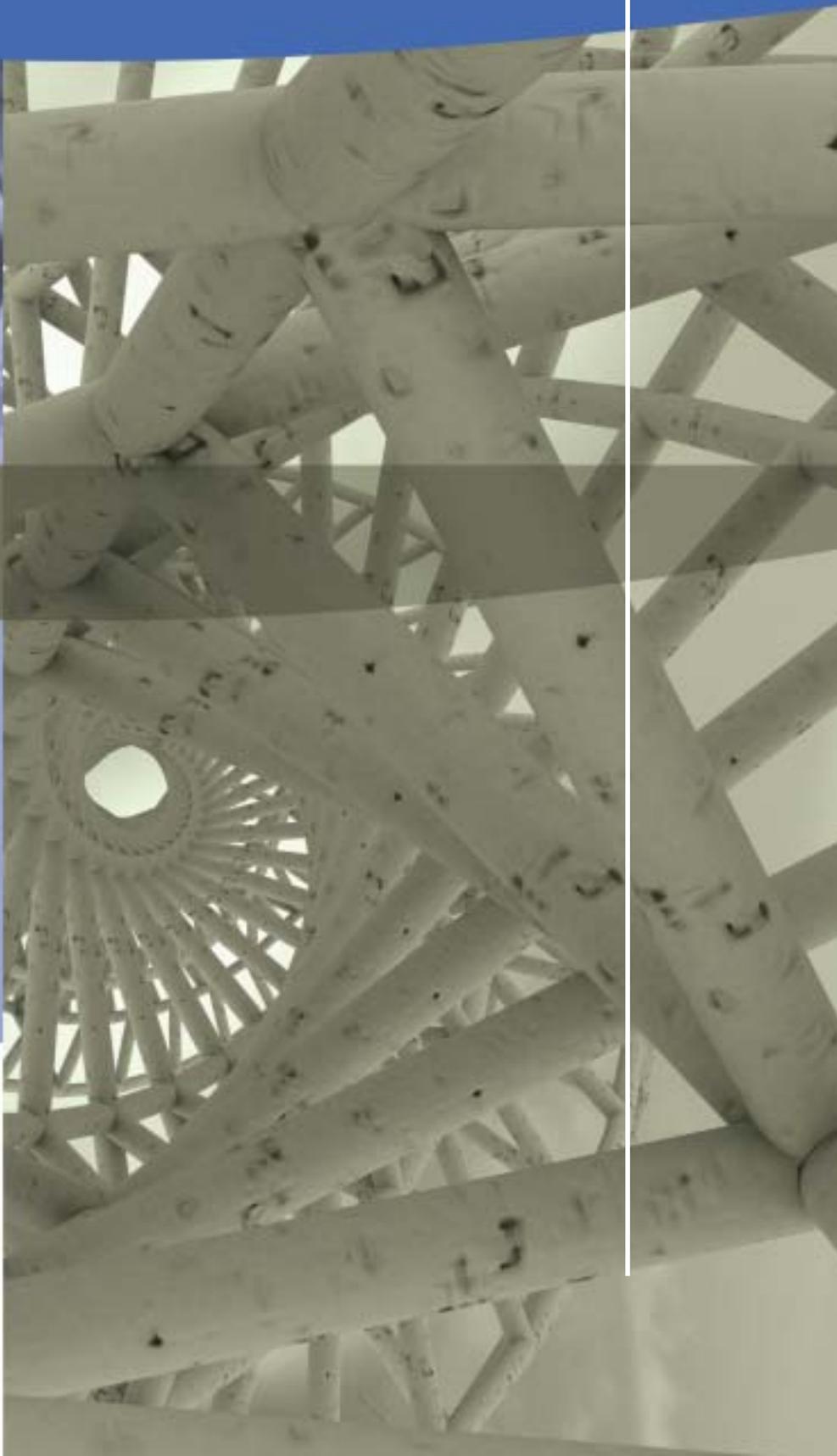
Following the workshop two students from India (BHU & IIT, Kanpur) were offered fellowships to work at MSU. Papers presented in the workshop will be published in a special issue of the Laser and Spectroscopy Society of India.





Interactive sessions on topical areas like organic synthesis; supra-molecular chemistry; chemical biology; drug discovery; process research and organo-metallic chemistry were held.

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## CULTURE OF INNOVATION IN SCIENCE AND TECHNOLOGY

Date & Venue: 19-21 January 2006, Hyderabad, India

**Principal Investigators:**

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A collaborative agreement was signed between University of Hyderabad and University of Iowa in December 2005. This symposium was the first activity under this agreement and was attended by 50 scholars including 8 US and 2 international participants drawn from varied disciplines like social sciences, natural sciences, technology, management, including representatives from several private industries & NGO's. IUSSTF Board member, Dr. M. K. Bhan participated in the inter-disciplinary panel discussion.

The symposium was conceived as an attempt to understand the plurality of cultural and social practices that promoted or hindered scientific and technological activities in the Indian context especially in the post-independence era with a special reference to the context of globalization, a socio-economic and political force that are underway. There were ten sessions devoted to historical and theoretical issues related to innovation in agricultural biotechnology, aerospace, traditional medicines, ICT, drug discovery & vaccines, besides a panel discussion supported by the Astra-Zeneca Research Foundation, Bangalore.

In the summing up session, both the theoretical aspects and the case studies aspects were highlighted to emphasize the complex nature of innovation, in general, and also specificities of innovation arising out of different scientific and technological practices. A conference volume with all case studies is under publication by Orient Longman Publishers.

As a follow up from the workshop, Hyderabad and Iowa University faculty members have initiated a study of the Technology Innovation Center (TIC), an incubator at the University of Iowa. This will be paired with a similar investigation of a university-based business incubator in Hyderabad.





## MICROWAVE TECHNOLOGY FOR MATERIALS PROCESSING: A PROMISING OPTION FOR TOMORROW

Date & Venue: 1-3 February 2006, Mumbai, India

**Principal Investigators:**

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Microwave technology, a relatively new technology, is fast emerging as a cleaner route for materials processing that is capable of meeting growing and challenging demands for better performing and cheaper products in a variety of processing industries; the process is cost-effective, energy saving and environment friendly. This processing route is gaining increasing acceptance in modern industry, ranging from mineral processing, powder metallurgy, ceramics, cutting tools, vulcanization of rubber, elastomers, polymers, chemicals & pharmaceuticals, metal melting, steel making and treating, nano-materials production, waste treatment etc.

The industry driven workshop was attended by nearly 75 participants including 13 from the US. In addition, 18 researchers and microwave engineers including four overseas speakers (from China, Canada, Japan and UK) also made presentations. The technical program was designed to cover industrial application including basics of microwave processing, microwave furnace design, international commercialization status etc. Majority participants were from leading industries like Dana Corp, Nicholas Piramal, CEM Corp., Alchem Labs, Essar Group, MS Technologies, Pradeep Metals, etc.

Visualizing the immediate need of Indian industry, a participating company agreed to establish an Industrial Microwave Research Center at Mumbai in collaboration with Penn State University. This facility will cater to the immediate needs of industry to convert their ideas in to actual business proposals and provide trained manpower on microwave technologies.

## PLANT MOLECULAR VIROLOGY

Date & Venue: 11-13 February 2006, New Delhi, India

**Principal Investigators:**

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The purpose of the workshop was to establish a dialogue between Indian and American virologists to review the state of the art in virus diagnostic, virus control and gene mining for new opportunities. The genesis of the meeting was in response to the spurt in virus disease problems in various cropping systems in India and the vast experience of the US participants in tackling such problems in the U.S. The workshop was partially supported by the Indian Department of Biotechnology (DBT) and USAID and was attended by 9 US and 30 invited Indian researchers.

Sessions were devoted for discussions and interactions on molecular virology, emerging viral diseases, molecular diagnosis and transgenic approaches for the management of viral diseases of plants. These interactive sessions clearly identified the need for developing collaborative programs related to begomoviruses, ilarviruses, tospoviruses and some other economically important viruses, which are a cause of great constraint in improving crop production in India.

To address specific problems of the identified viruses, the participants were grouped according to the viruses of their interest. Major recommendations focused on the need to (a) generate basic information on the identified viruses (b) develop sensitive and fast molecular diagnostic systems for applied and basic research applications (c) undertake research on virus vectors, as very limited information is available on insect vectors of plant viruses in India (d) understanding the science of 'gene silencing' for use in developing plants for resistance to viruses (e) development of transgenic plants for virus resistance and (f) development of dynamic database and culture collection of plant viruses in India.

Several areas of mutual research interest have emanated and are expected to be taken up as joint R&D activity through support from DBT and USAID.





## NEONATAL & FETAL SURGICAL ANOMALIES AND ROLE OF STEM CELL TRANSPLANTATION

**Date & Venue:** 13-15 February 2006, Varanasi, India

**Principal Investigators:**

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The workshop was on a very focused and emerging surgical area on congenial and fetal malformation, stem cell applications, and neonatal surgery. The speakers included 3 US and 8 Indian specialists from medical fraternity and about 20 other participants.

Fetal surgery is in a nymph stage, and this symposium offered a great opportunity to the participants to learn about the burden of the surgical anomalies in the fetal and neonatal stages and various cutting edge diagnostic and therapeutic options available in both countries. Prevention of congenital anomalies is the most important tool for which national policy planning strategy of implementation of micronutrients particularly addition of folic acid to wheat flour was recommended.

For the early detection of the gross non correctable anomalies Nuchal Translucency Screening test in early fetal life can be considered as an important tool. Fetal Surgery also holds a good promise of better results in some selected group of congenital anomalies. The regenerative power of the stem cell can be gainfully utilized for hither too incurable diseases as preliminary works carried out by scientist in India and abroad have shown liver & pancreas regeneration, neural cell regeneration in brain and spinal cord etc.

BHU along with inter departmental collaboration will make an attempt to develop a stem cell line and evaluates it's clinical application for rectification of gross congenital anomalies specially in cases of myelo meningocele in collaboration with the US counterparts. Participants from University of California, San Francisco and BHU agreed towards initiating training and research program in the field of fetal surgery and stem cell transplantation for the correction of otherwise hopeless gross congenital anomalies.

## APPLICATION OF GENOMICS TO CHICKPEA, PIGEON PEA AND PEANUT IMPROVEMENT

Date & Venue: 6-9 March 2006, Hyderabad, India

**Principal Investigators:**

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The workshop was held at ICRISAT, Hyderabad and was attended by 12 US and 23 invited Indian researchers representing thirteen distinct institutions, 7 in India and 6 in the US, spanning the breadth of expertise from plant breeding to molecular biology and biotechnology. The purpose of the workshop was to discuss the application of Genomics technology to the improvement of legume species of importance on the Indian subcontinent and in the US.

Among the three legume species, chickpea and pigeon pea account for 60% of the pulse production in India, while peanut is among the most important oil seed crops. In both India and the US, each of these crops face serious challenges from biotic and abiotic stress and in each case crop improvement is limited by narrow genetic diversity in cultivated germplasm. With the explicit aim of identifying research priorities in each species, the participants divided into 3 subgroups to discuss and prioritize research needs on (i) agronomic issues (ii) technology platforms and access (iii) data, data types, access and analysis (iv) genetic and genomic resources and (v) factors limiting progress in breeding of improved varieties.

Since the time of this meeting, several key developments have occurred that allowed many of the meeting participants to initiative collaborative activities on a large scale. Among these developments were (i) the inception of Knowledge Initiative in Agriculture (KIA) led by the Indian Council for Agricultural Research and USDA-Foreign Agricultural Service (ii) a new project on legume genomics and evolution funded by the NSF and (iii) a Generation Challenge Program initiative that will use genomics to address issues of crop improvement in legumes. Together these 3 initiatives, as well as others are expected to bring significant resources to bear on the three species that were the focus of this meeting, namely chickpea, pigeonpea and ground nut, and also cowpea, common bean and lupin.





## QUANTUM COMPUTING: DEVELOPING NEW APPROACHES TO MOLECULAR STRUCTURAL STUDIES

**Date & Venue:** 6-10 March 2006, Kanpur, India

**Principal Investigators:**

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The core focus in this workshop was to explore a partnership on aspects of coherent control approaches to quantum computing that included issues on the application of ideas from quantum computing in doing science like new approaches to molecular structural studies and metrology. The speakers included 10 from the US and 12 from India and 8 international participants from Europe & Asia with a total attendance of 70 persons. There were also eight poster presentations from students and young researchers.

A specific focus of the workshop was to investigate optical communication on a molecular scale of nanoscopic information devices, and molecular quantum computing via femtosecond laser spectroscopy and coherent control. Discussions and research presentations covered the latest achievement in scalable approaches to quantum computation in addition to the algorithmic and theoretical developments. Some of the near future applications including imaging with entangled photons, critical point phenomena, cryptography, quantum authentication, and information teleportation were discussed.

American Institute of Physics (AIP) has agreed to publish a refereed proceeding of the conference (in press). Most of the researchers who participated strongly felt the need for an Indo-US consortium to be built-up on such practical issues of quantum computation. Consultative process have been initiated between groups working together to develop joint programs on femto-second pulse shaping, coherent control issues etc. Exchange of undergraduate students between Indian and US labs have taken place as a follow up to this workshop.

## JOINT CENTRES

### CENTRE FOR DEVELOPMENT OF NANO-STRUCTURED MATERIALS

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The formal establishment of a virtual joint centre on nano-structured materials took place during the visit of the Indian S&T Minister, Mr. Kapil Sibal to Rutgers University on 13 June 2005. The Center is an example of public-private partnership establishing linkages between ARCI, India, Centre for Nanomaterials Research, Rutgers University, USA and NEI Corp, USA with the intent of drawing upon the significant complementary expertise, resources and infrastructure available with the partners to pursue and co-develop new nanomaterials related technologies of pre-commercial relevance. The joint centre activities seeks to immediately undertake specific programs in three identified areas of common interest to showcase leapfrogging capabilities that will be made possible by synergistically integrating individual strengths of partners.

Consistent with the above objectives, the Centre will undertake research activities for two years in areas of mutual interest towards development of i) nanostructured hardmetals ii) nanostructured protective coatings by thermal spraying and iii) nanostructured powders using thermal spraying.

The expected outcome of the various activities under the Centre includes synthesis of nanostructured WC/Co hardmetals which are promising for numerous applications in coatings, machine tools, drill bits and wear parts. Assessment of feasibility of using nanostructured powders for detonation spraying and cold gas dynamic spraying applications to enhance the quality of deposited coatings and comparison of coatings obtained with conventional powder feedstock. Finally, evaluation of feasibility of detonation sprays processing of nanopowders and comparison with powders produced by shrouded plasma and arc spray will be carried out.





## CENTRE FOR ADVANCED AND FUTURISTIC MANUFACTURING

### Principal Investigators:

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The advancements in physical, engineering and computational sciences have provided the scientific community an unprecedented amount of capability for simulation and material manipulation at the nano and molecular levels. This has opened up horizons for conceiving new processes for shaping of objects and devices which are fundamentally different from the traditional “top-down” approaches of manufacturing.

The suitability of India and the US working together for the development of the “new era” processes was seeded during the IUSSTF sponsored workshop on Advanced & Futuristic Manufacturing held at IIT Kanpur in March 2004. The joint Centre for Advanced and Futuristic Manufacturing is aimed to bring complimentary strengths of the five partnering institutions through expertise sharing for the following three groups of project activities on (i) manufacturing based on generative processes (ii) manufacturing of microdevices and microfactory concepts and (iii) manufacturing based on self assembly of materials.

The expected deliverables through this networked centre can be both new processes and products like sensors, actuators, microtools etc. from the specific projects under the networking. These would cover (i) microfabrication including micro machining, generative manufacturing at macro and micro scales – to develop nano device integrated micro factory test bed (ii) design and fabrication of micro parts using lithography, FIB, RIE etc. (iii) shaping and patterning through coded and uncoded self assembly - soft material fabrication through self assembly at molecular and macro levels, DNA assisted self assembly.

## TRAINING PROGRAMS

### MONITORING AND ASSESSMENT OF BIODIVERSITY

Date & Venue: 10 November 2005, Front Royal, VA

Principal Coordinator:

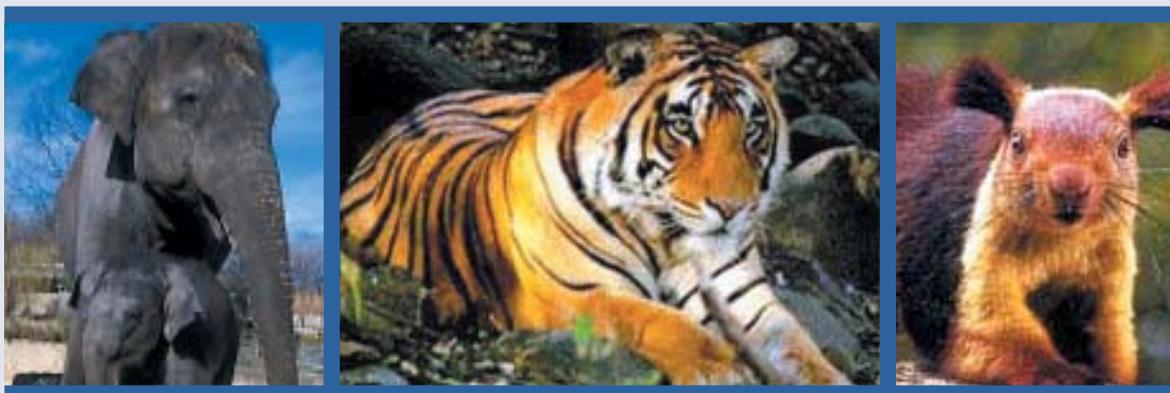
Jennifer Sevin, Smithsonian Institution, Washington, D.C.

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The Monitoring and Assessment of Biodiversity Program (MAB) of the National Zoological Park conducted by the Smithsonian Institution (SI), is an in-depth training program which integrates a variety of learning methods including content presentations on a number of subjects, field work, laboratory analysis, report preparations, group work and case studies. The course is taught in eight modules like framework, vegetation, arthropods, aquatic/marine systems, amphibians, birds, mammals and integrations.

The 5-week Biodiversity Assessment and Monitoring course involves 40 internationally recognized instructors and speakers to teach the latest methodology and approaches to biodiversity assessment and monitoring. The techniques used for modeling and sustainable development towards ecological monitoring and assessment are also imparted. Learning is hands-on through lectures, fieldwork, laboratory analyses and report preparation. Case studies from Peru, Canada, Southeast Asia and Africa were highlighted as real-world applications of the tools taught.

The 2005 MAB Course was held at the Conservation and Research Center in Front Royal, Virginia. IUSSTF supported the participation of 4 early career Indian scientists who undertook specific course topics on vegetation, mammals, arthropods, biological indices, introduction to project planning, GIS and statistics. This course not only provided needed information to participants, but allowed them the opportunity to network with international leaders in their field. The participants through the 2 week environmental leadership course were provided tools to help them to set goals and communicate more effectively on future projects.





## SCIENCE, TECHNOLOGY AND INNOVATION PROGRAM

**Date & Venue:** 27 November 2005, Cambridge, MA

**Principal Coordinators:**

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IUSSTF facilitated the participation of eight scientists drawn from various Indian organizations (CSIR, DRDO, ISRO, DST, etc) for the Executive Training program on Science, Technology, Innovation Policy (STIP) at the Kennedy School of Government, Harvard University from 27 November - 2 December 2005. This was an extramural program funded by the Indian Department of Science and Technology (DST) to help provide S&T decision makers from government, laboratories, academia with a unique opportunity to integrate science and technology into a national development policy with an international perspective.

The executive program offered by Harvard's Kennedy School of Government focuses on how science, technology and innovation works to help developing countries meet human needs, participate in the global economy and make the transition to sustainability. The interactive course with case studies covered areas like, technology and development trends; innovation systems; business and development; technology and sustainability; science and technology advice; emerging technologies; intellectual property; technology and foreign direct investment.

The STIP allowed the selected Indian participants an exposure to a range of STI related issues thereby integrating them with contemporary practice and pursuits in the United States. The interactions also helped the other international participants and the faculty gain an enhanced understanding and perspective of the Indian S&T system. Considering the utility to Indian scientific enterprises looking at techno-preneurship models, site visits to several startup companies in Boston area were also organized in the week following the course. This helped the participants to understand and appreciate the entire eco-system required for translation of ideas from laboratory to the market place.

## WET LAB TRAINING ON STEM CELLS - FLOW CYTOMETRY

Date & Venue: 5-12 February 2006, Trivandrum, India

**Principal Coordinators:**

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Stem cells because of their unique capacity to regenerate functional tissue for the lifetime of an organism are attractive “raw material” for multiple biotechnological applications. Advancements in stem cell biology have made the prospect of tissue regeneration a potential clinical reality based on a series of new exciting breakthrough discoveries in developmental biology. Various analytical techniques have been developed for rapid identification and characterization of stem cells. Methods based on use of specific antibodies and fluorochromes, which can identify the stem cells in peripheral blood, bone marrow, tumors and other tissues, have been developed.

The increasing need to increase the number of skilled researchers by providing a dedicated training environment and programs to enhance skills and techniques in working with various stem cell types needed for various purposes prompted to hold a wet lab training cum workshop on ‘monitoring of stem cell phenotype, proliferation and apoptosis’ at the SCTIMST, Trivandrum. The training program included experts in standardization of protocols for identification and enumeration of stem cells with lectures as well as laboratory demonstrations of the different methods and protocols. Fifty trainees from India and the US attended the workshop with 8 US and 6 Indian faculties as trainers. Special instruments required for the training were specifically arranged for use at the workshop by four major manufacturers for demonstration purposes.

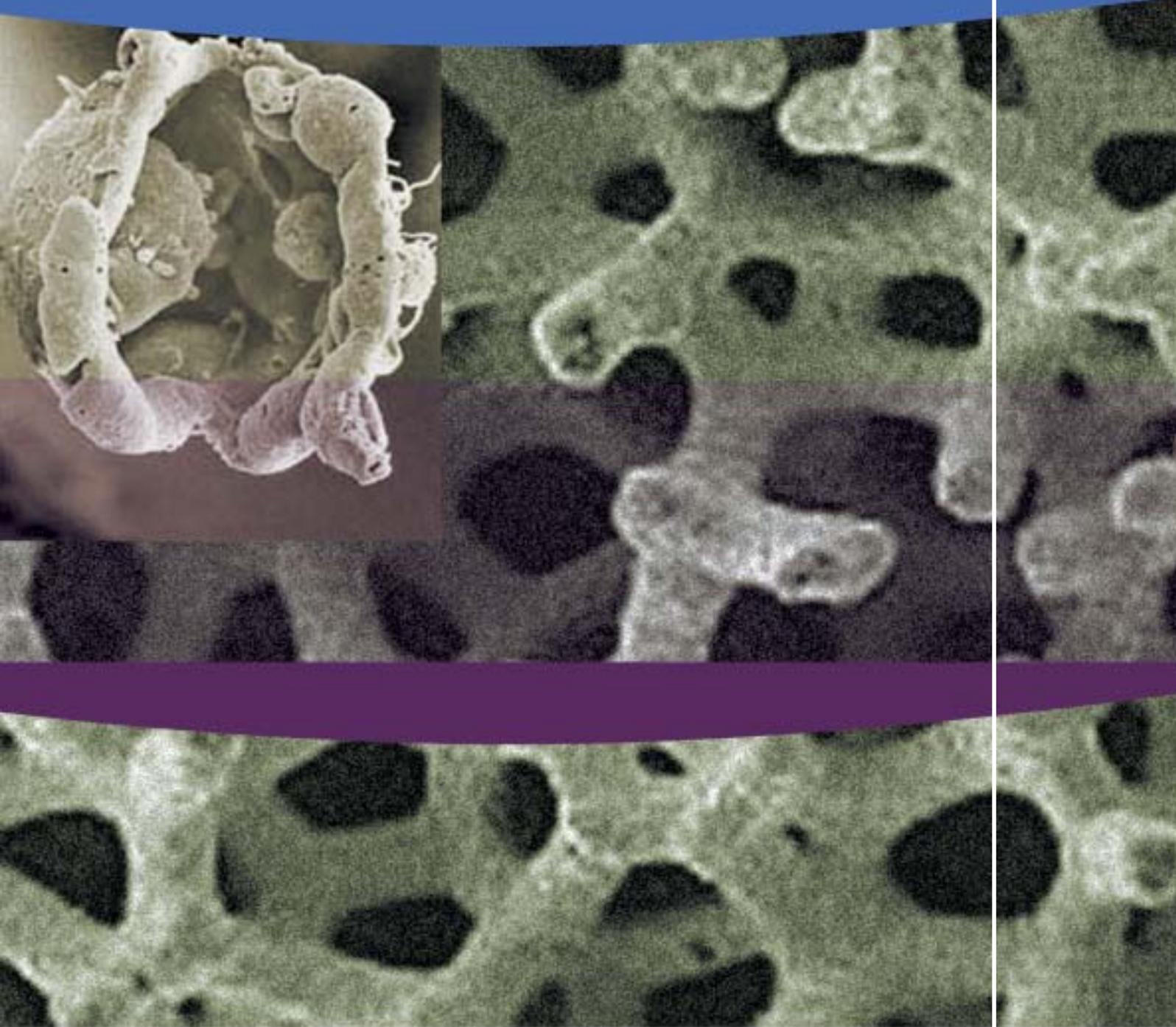
The course contents covered aspects like basics of cytomics; cell proliferation and apoptosis; cell growth and signal transduction; phenotype analysis; tumor immunology; drug transport and resistance; stem cells in hematopoiesis and solid tumors; stem cells in heart and endothelium; analytical methods for the detection of stem cells and standards and validation of stem cell data for bone marrow engraftment. In addition, panel discussions and tutorials were held to discuss common pitfalls in identification of stem cells and in multiparametric data acquisition and analysis.





Advancements in stem cell biology have made the prospect of tissue regeneration a potential clinical reality based on a series of new exciting breakthrough discoveries in developmental biology. Various analytical techniques have been developed for rapid identification and characterization of stem cells.

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## TECHNOLOGY MANAGEMENT TRAINING PROGRAM - INTELLECTUAL PROPERTY RIGHT (IPR)

Date & Venue: 8-10 February 2006 Bangalore & 13-17 February 2006, Manesar, India

**Principal Coordinators:**

R. Saha, Technology Information, Forecasting & Assessment Council (TIFAC), Delhi

E-mail: raghav@nic.in

Luis Salicrup, National Institute of Health (NIH), Rockville, MD

E-mail: salicrul@mail.nih.gov

Indo-US Technology Management Program (IUTMP) of NIH & TIFAC creates linkages between Indian and American technology management experts to highlight the benefits of public-private partnerships and intellectual property protection for India so as to stimulate local biotechnology research and innovation in public health, agricultural and environmental needs. This program also helps to sensitize American technology managers and research administrators to Indian capabilities and needs.

As a part of IUTMP, a tailor made training program on 'Managing Intellectual Property in Public-Private Partnerships' was organized with faculty drawn from U.S. NIH and India and was imparted at two locations in India (Bangalore & Manesar) with nearly 70 technology managers, scientists, lawyers, and policy officers from IITs, government departments, industry, CSIR labs, several universities and other leading institutes participating in the workshops shared their experience of IP handling and technology transfer in their respective institutes.

The training was aimed to share best practices experience of successes and failures both in the US and India; overview of NIH & international tech transfer; NIH research tools policy and guidelines and Material Transfer Agreements; taxation issues in IP licensing in India; management of confidential information at NIH and its role in IP licensing; valuation of IPR; technology transfer capacity building in emerging economies; US and Indian patent laws - an integrated picture etc. Discussions were focused to stimulate establishment of new offices of Technology Management in India using US expertise and lessons to help increase process of licensing from publicly-funded laboratories to the private sector.





## WEATHER RESEARCH AND FORECASTING (WRF) TRAINING

**Date & Venue:** 15-21 February 2006, New Delhi, India

**Principal Coordinators:**

**U. C. Mohanty, Indian Institute of Technology, Delhi**

**E-mail:** mohanty@cas.iitd.ernet.in

**G. Holland, National Centre for Atmospheric Research (NCAR) Boulder**

**E-mail:** gholland@ucar.edu

Advanced Training Program and Tutorial on WRF model system, and Joint WRF Development was organized by IIT, Delhi and National Centre for Atmospheric Research (NCAR), Boulder from 15-21 February 2006 at Delhi. Six NCAR scientists who have developed the WRF (Weather Research & Forecasting) model and have experience in mesoscale modeling were invited as the core speakers and resource persons in the training program imparted to 30 young researchers drawn from 18 institutions in India. The participants were already working in the field of mesoscale modeling in particular using MM5 model and showing interest in WRF modeling system were trained under this program.

The main objective of the training program was to enhance the growing expertise in mesoscale modeling in India and also to make aware and acquaint operational forecasters about recent developments in mesoscale modeling including familiarization to the basics of mesoscale modeling; tutorial on WRF modeling and analysis system by NCAR scientists; assignment for each group to simulate the recent heavy rainfall event over Mumbai using WRF modeling system with each group presenting their results for evaluation by experts.

The successful completion of the advanced training program has led to the introduction of the mesoscale modeling systems in India that will help to boost bilateral cooperation in the field of weather and climate modeling for through hands-on practice in running various components of WRF modeling system in India. This in turn is expected to foster more effective and fruitful bilateral research and development (R&D) work on weather and climate prediction of mutual interest.

## VISITING PROFESSORSHIP

### INDO-US MICROBIOLOGY PROFESSORSHIPS

**Principal Coordinator:**

**Marion Granigan, American Society of Microbiology, Washington, D.C.**

**E-mail: [mgranigan@asm.usa.org](mailto:mgranigan@asm.usa.org)**

Under an arrangement between the Indo-U.S. Science and Technology Forum and the American Society for Microbiology (ASM), Indo-US Professorship Awards in Microbiology, were instituted with the aim of fostering scientific cooperation, education and training, and building of capacity at individual and institution levels. The awards are given to selected scientists from US and India to deliver pedagogical short courses or conduct research in the microbiological disciplines in each others institutions. The award is administered parallel with the ASM International Professorship Program.

Teaching Professorships consist of one to two-week courses delivered at Indian or U.S. institutions by scientists from the other country. Courses serve a minimum of 20 students and faculty. Research Professorships enable microbiologists in India to participate in an interactive short course on a topic in any of the microbiological disciplines, or conduct a research project in partnership with colleague in a research facility in the U.S. Such visits are customarily of 5-6 weeks duration.

The four awards for the period of report included:

#### 2005

- Dr. Krishna Sundari of the Jaypee Institute of Information Technology visited the University of Florida in Gainesville. Course: Short Course on Mycorrhizal Fungi.
- Dr. Honorine Ward of Tufts New England Medical Center visited the Christian Medical College in Vellore. Course: Molecular Methods for Detection, Speciation and Genotyping of Opportunistic Intestinal Protozoal Infections and Evaluation of Immune Responses.

#### 2006

- Dr. Paul T. Magee of the University of Minnesota selected to visit the Jawaharlal Nehru University in New Delhi. Course: The genomes and mating behavior of *Candida albicans* and other *Candida* species.
- Dr. Lee W. Riley of the University of California at Berkeley selected to visit the Mahatma Gandhi Institute of Medical Sciences in Sevagram. Course: National Workshop on Applied Infectious Diseases Epidemiology.

**Indo-US Workshop  
on  
Micro Air Vehicles**



August 1-3, 2009  
NATIONAL AERONAUTICS LABORATORIES  
BANGALORE

Sponsored by: India, USA, AIR FORCE  
100, 2009

Proceedings of the  
**2<sup>nd</sup>**  
INDO-US WORKSHOP ON  
**DIABETIC FOOT  
COMPLICATION**



Theme:  
Promoting Global Innovation  
in Technology Transfer

**ICCP  
2009**

INDIAN INSTITUTE OF TECHNOLOGY KANPUR  
Book of Extended Abstracts  
International Workshop  
on  
**SSD and Window Structures**  
4-11 December 2009



**The Spinal Colloquium  
and  
Flying Squirrel Colloquium**



Abstracts

INDO-US JOINT WORKSHOP ON  
"Signal Technology & Test Problems For Challenging  
Fuel Storage Containers and Alternative Fuels"



INDO-US WORKSHOP  
ON  
RECENT ADVANCES IN HIGH-TEMPERATURE TUBES AND  
FUELED BURNERS IN LONG PULSED MOTORS  
20-22 DECEMBER 2009



**Information  
Systems  
Security**

10th International Conference, ICSI 2009  
Bangalore, India, December 2009  
Proceedings

Springer

**International  
Symposium  
on  
Insect Genetics  
and Genomics**



Centre for DNA Fingerprinting and Diagnostics  
Hyderabad, India 9-11 January 2008

Abstracts

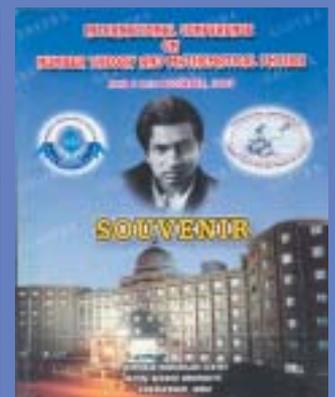
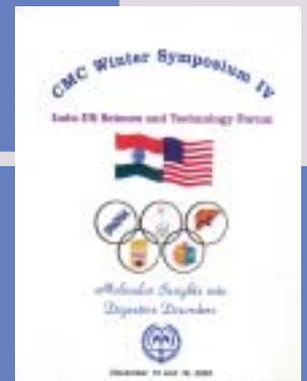
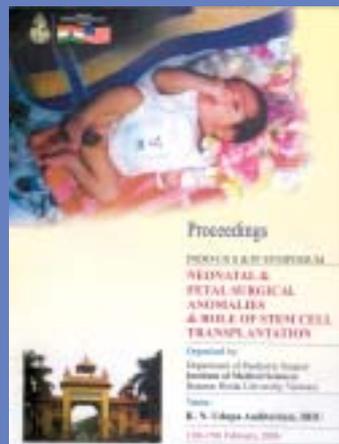
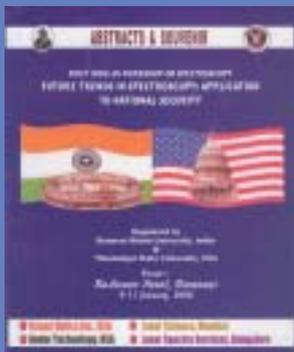
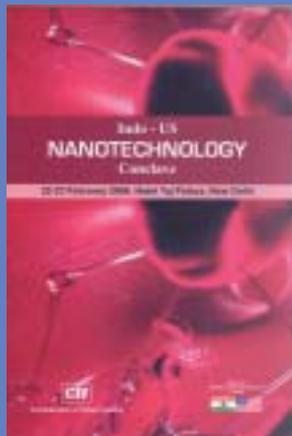
INDO-US Workshop  
on  
Microwave Technology For  
Material Processing

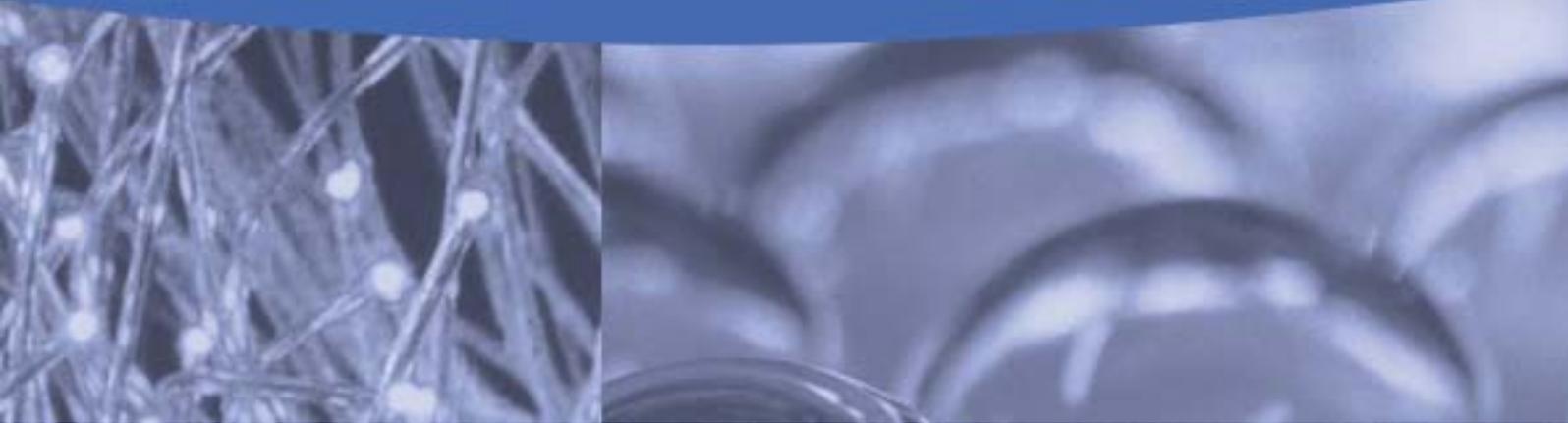
February 1-3, 2009  
Mumbai, India

**"A PROMISING OPTION  
FOR TOMORROW"**

ORGANIZED BY  
THE INTERNATIONAL ISM GROUP  
SPONSORED BY  
INDO-US ACQUISITION & TECHNOLOGY FORUM







## TRAVEL SUPPORT EXTENDED TO INTERNATIONAL EVENTS

### FRONTIERS ON MEDICAL IMAGING

**Date & Venue:** 9 & 15 July 2005, Indian Institute of Technology, Bombay, India

**Principal Investigator:**

**Ajit Gopaldas, US-India Forum, Washington, D.C.**

**E-mail:** [agop@myprimus.com](mailto:agop@myprimus.com)

This interactive event was aimed towards exposing participants to exciting new areas in medical imaging that have a positive impact on patient care. New developments in medical imaging such as digital radiography, PET-CT scanners and Functional MR systems are changing the face of medical care and positively influencing patient care. This workshop helped to appreciate these developments and the potential applications areas in the Indian context. The topics discussed included advanced digital radiography including mammography; advances in CT scanning and PET-CT fusion; advances in MRI systems and advanced applications such as image guided surgery, virtual colonoscopy

IUSSTF supported the travel for the primary U.S. speaker from Eastman Kodak Company at Rochester, New York.



## WORLD VIEW ON PHYSICS EDUCATION IN 2005

Date & Venue: 21-26 August 2005, Delhi, India

Principal Investigator:

Pratibha Jolly, Miranda House, University of Delhi

E-mail: [pjolly@vsnl.com](mailto:pjolly@vsnl.com)

As the part of the International Year of Physics, this international conference focusing on new paradigms was organized with the objective to build collaboration in the field of physics education research at the tertiary level. The conference brought together physicists, physics educators, physics education researchers, curriculum developers from across the world to focus on four broad themes (i) changes in the ways of teaching-learning of physics; (ii) changes in the understanding of the teaching-learning process; (iii) changes in the content of physics as a discipline; and (iv) changes in the context of physics teaching.

The conference brought about 350 participants from 30 countries including 19 US participants of which 12 were supported by IUSSTF including Nobel laureate, Prof. Horst Strommer from Columbia University. The event was inaugurated by the President of India, Dr. A. P. J. Abdul Kalam.

## TRANSCRIPTION ASSEMBLY

**Date & Venue:** 17-19 September 2005, Hyderabad, India

**Principal Investigator:**

**Purnima Bhargava, Centre for Cellular and Molecular Biology (CCMB), Hyderabad**

**E-mail:** [purnima@ccmb.res.in](mailto:purnima@ccmb.res.in)

Transcription is one of the key processes in gene expression and regulation. Ramifications of the process are far reaching and its connections to every life process in a cell are deep rooted. Organization of the genetic material into chromosomes makes the transcription intimately associated with the chromatin structure such that today no research in transcription is complete without addressing its chromatin connections. The ninth annual meeting of the Indian transcription group focused on the aspects of regulation and mechanism of gene expression.

IUSSTF sponsored the visit of US Nobel laureate Prof. Roger Kornberg from Stanford University who delivered the keynote address on the “Discovery of nucleosome: fundamental particle of the chromosome”. This gave an opportunity to the common man to hear the story of a seminal discovery in this field by the discoverer himself.

## ANNUAL CHP & DE CONFERENCE

**Date & Venue:** 25-27 October 2005, New York, USA

**Principal Investigator:**

**Jeff Bell, World Alliance for Decentralized Energy (WADE)**

**E-mail:** [jeff.bell@localpower.org](mailto:jeff.bell@localpower.org)

This was the sixth in the series of international cogeneration on combined Cooling, Heating and Power (CHP) and Distributed Energy (DE) related conferences that have previously taken place in Washington, Amsterdam, Delhi, Rio de Janeiro and Beijing. The event was co-organised by WADE and the US CHPA and was held in New York. The sessions covered best practice CHP projects; urban CHP success stories; and US CHP Roadmap.

IUSSTF supported the participation of an invited Indian speaker on the topic “CHP in industrial and agricultural sector in India”.

## ENDOCRINOLOGY CONFERENCE

**Date & Venue:** 11-13 November 2005, New Delhi, India

**Principal Investigator:**

**Nikhil Tandon, All India Institute of Medical Sciences (AIIMS), New Delhi**

**E-mail:** [nikhil\\_tandon@hotmail.com](mailto:nikhil_tandon@hotmail.com)

Endocrinology involves the study of ductless glands, which produce hormones. The areas of diabetes, thyroid disorders, male and female sex hormone disturbances, and adrenal disorders are important sub-disciplines of the field of Endocrinology. The conference organized by the Endocrine Society of India was held under the aegis of AIIMS & Apollo Hospital, Delhi and addressed issues on continuing medical education program targeting trainees in medicine and endocrinology. The scientific program covered the entire breadth of endocrinology with emphasis on the recent advances and best clinical practice recommendations.

A total of 14 international experts including 11 from USA participated in this meeting out of which 4 were supported by IUSSTF.

## PLANTS AND ENVIRONMENTAL POLLUTION (ICPEP-3)

**Date & Venue:** 29 November - 02 December 2005, Lucknow, India

**Principal Investigator:**

**R. D. Tripathi, National Botanical Research Institute (NBRI), Lucknow**

**E-mail:** [tripathi\\_rd@rediffmail.com](mailto:tripathi_rd@rediffmail.com)

This conference was aimed to provide an international platform for discussions on the critical issues of the impacts of environmental pollution on climate, plant biodiversity, agriculture, food security, natural resources and human health along with the need for pollution indication, remediation, environmental conservation and sustainable development. The third international event in the series was jointly organized by the International Society of Environmental Botanists and the National Botanical Research Institute, Lucknow.

IUSSTF supported the participation of 5 eminent scientists from US to this event which had a total of 10 US participants out of 45 international attendees.

## ATOMIC, MOLECULAR AND OPTICAL PHYSICS

**Date & Venue:** 13-15 December 2005, Kolkata, India

**Principal Investigator:**

**Chandana Sinha, Indian Association for the Cultivation of Science, Kolkata**

**E-mail:** [tpcs@iacs.res.in](mailto:tpcs@iacs.res.in)

The understanding of the interaction of atoms and molecules between themselves and with external fields is a very rapidly growing field of science. Trapping of single atoms and ions and the concomitant development of atom optics, development of sub femto second lasers, successful implementation of BEC, fundamental breakthroughs in experimental realization of quantum computation have all contributed to this revolution. An enormous increase in the number of application of these newly developed fields and the number of scientifically spectacular results expected from them is now well insight. Keeping this as the backdrop, the conference covered areas like collisions and structures in atomic and molecular physics; atomic and molecular properties under external environments; quantum entanglements and quantum computation; and Bose - Einstein condensation and atom optics. IUSSTF supported the participation of 2 key US speakers.

## UPSTREAM AND DOWN STREAM OF HOX GENES

**Date & Venue:** 14-17 December 2005, Hyderabad, India

**Principal Investigator:**

**Rakesh K. Mishra, Centre for Cellular and Molecular Biology (CCMB), Hyderabad**

**E-mail:** [mishra@ccmb.res.in](mailto:mishra@ccmb.res.in)

One of the most fascinating aspects of all living creatures is the variety in forms and behavior in the background of underlying commonalities. The organization and regulation of Hox complexes that determine the anterior posterior body axis in all bilaterians is one such area. Both, the upstream event that regulate the setting of expression pattern of Hox genes and the downstream targets generating complex patterns that eventually lead to formation of body structures along the body axis are currently studied with great interest. With the emergence of new genomics approaches, the complex puzzle of regulatory events upstream and downstream of Hox complexes is at an extremely exciting stage.

Experts from India, Europe and the US could assemble to discuss the current state and future directions of this important unsolved problem of modern biology. Out of a total of 16 US speakers who attended the event, 4 were supported by IUSSTF.

## INFORMATION SYSTEMS SECURITY

**Date & Venue:** 18-21 December 2005, Kolkata, India

**Principal Investigators:**

**Chandan Majumdar, Jadavpur University, Kolkata**

**E-mail:** chandan.mazumdar@gmail.com

**Sushil Jajodia, Center for Secure Information Systems, George Mason University, Fairfax, VA**

**E-mail:** jajodia@gmu.edu

Outsourcing has become a global industry. While this practice may be acceptable to commercial enterprises, it poses a serious security threat, especially if the new software is destined for a major critical infrastructure. There are two potential problems: software may contain code that has malicious intent (called malware) or suffer from poor coding practices that leave software vulnerable to exploitation.

This conference was aimed is to increase awareness of the security-related issues required to strengthen the R&D and standardization of unclassified cyber security research results required for improvement in multinational trade, outsourcing and academics. IUSSTF supported the participation of 5 American experts. The proceedings of this conference have been published by Springer Verlag as lecture notes in Computer Sciences. The conference also provided valuable inputs to the Indo-US working group on 'R&D in Cyber Security'.

## PEDICON-2006

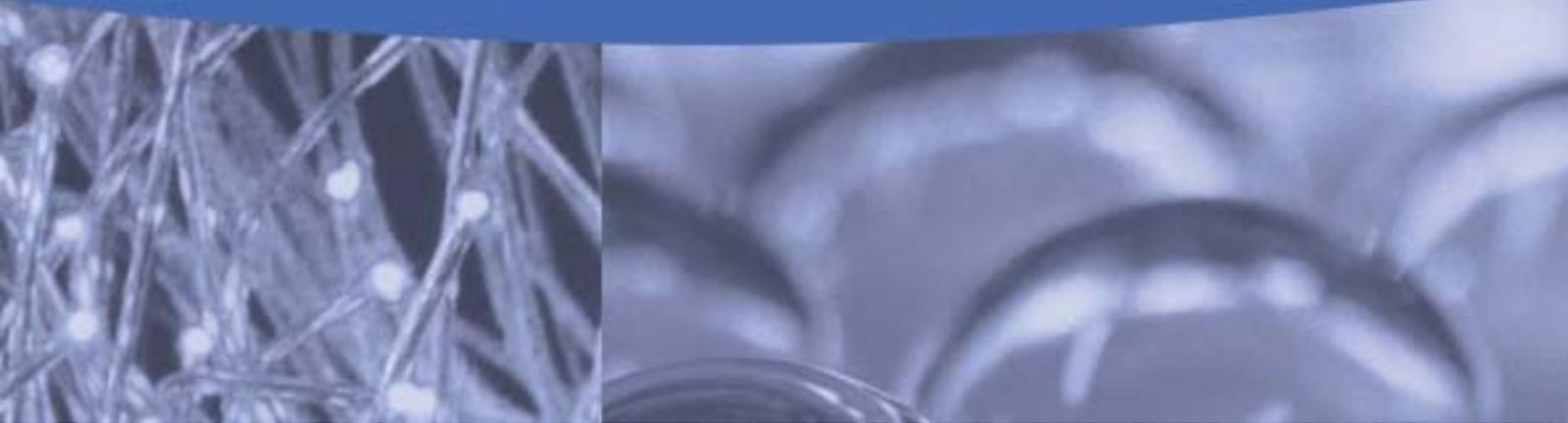
**Date & Venue:** 5-8 January 2006, New Delhi, India

**Principal Investigator:**

**Ashok K. Dutta, Lady Hardinge Medical College, New Delhi**

**E-mail:** drdutta@gmail.com

The Conference of Indian Academy of Pediatrics (IAP) was attended by 10 leading US pediatricians out of whom 4 were supported by IUSSTF travel grants. The purpose of this conference was to update its members in recent advances in various fields of medical science related to health of children. This is the main conference of IAP through which medical advances reach to a majority of the children in India. The entire spectrum of prevalent child diseases was covered including aspects of diagnostics, prevention, intervention and treatment. Three books of 500 page each on 'Selected topics in pediatrics' were published as a part of the event that was attended by 200 Indian faculty members.



## GENETICS AND GENOMIC OF SILK MOTH AND OTHER INSECTS

**Date & Venue:** 9-11 January 2006, Hyderabad, India

**Principal Investigator:**

**J. Nagaraju, Centre for DNA Fingerprinting and Diagnostics, Hyderabad**

**E-mail:** [jnagaraju@cdfd.org.in](mailto:jnagaraju@cdfd.org.in)

By virtue of long history of breeding due to its economic importance and the genetic resources available for research, the silkworm has emerged as a key model in Lepidoptera. The current efforts of several laboratories contributing to the silkworm genome project focus on the generation of high-density linkage map, identification of Lepidoptera-specific genes, development of transgenic tools and generation of clone-based physical map that will allow virtually immediate access to any defined region of the euchromatin.

As many genes of silkworm have homologues in the lepidopteran pests, the in-depth analysis of silkworm genome and its comparative genomics with the well-studied insect like *Drosophila* and Mosquito was the main objective of this conference. The deliberations helped to open up new avenues for the basic understanding of syntenic relation of chromosomes, sex-determination mechanisms, development pattern, and provide understanding for the control of wide range of pests. IUSSTF supported the participation of 3 US scientists in this international meet.

## HUMAN GENOMICS

**Date & Venue:** 27 February - 1 March 2006, New Delhi, India

**Principal Investigator:**

**R. N. K. Bamezai, Jawaharlal Nehru University, New Delhi**

**E-mail:** bamezai@hotmail.com

This international symposium was organized by the Indian Society of Human Genetics and was held at the National Centre of Applied Human Genetics, Jawaharlal Nehru University. In the background of the information generated through human genome project and the HapMap to understand human diversity and the etiology of diseases there is an increased focus on the potential role of the distribution of human genome sequence variations in the populations across the globe and their role in contributing to observed differences in disease status among population groups. The meeting discussed issues related to human genomics and public health with an international expertise.

The scientific program included plenary lectures by 15 foreign scientists including 6 from USA (2 supported by IUSSTF) and Europe and 16 scientists from India; 9 young scientist award lectures, a panel discussion on the theme of the conference and poster sessions where 240 posters were displayed over three consecutive days.

## ATOMIC AND OPTICAL PHYSICS

**Date & Venue:** 22-23 March 2006, New Delhi, India

**Principal Investigator:**

**Manmohan, Department of Physics and Astrophysics, University of Delhi, Delhi**

**E-mail:** sneh@del2.vsnl.net.in

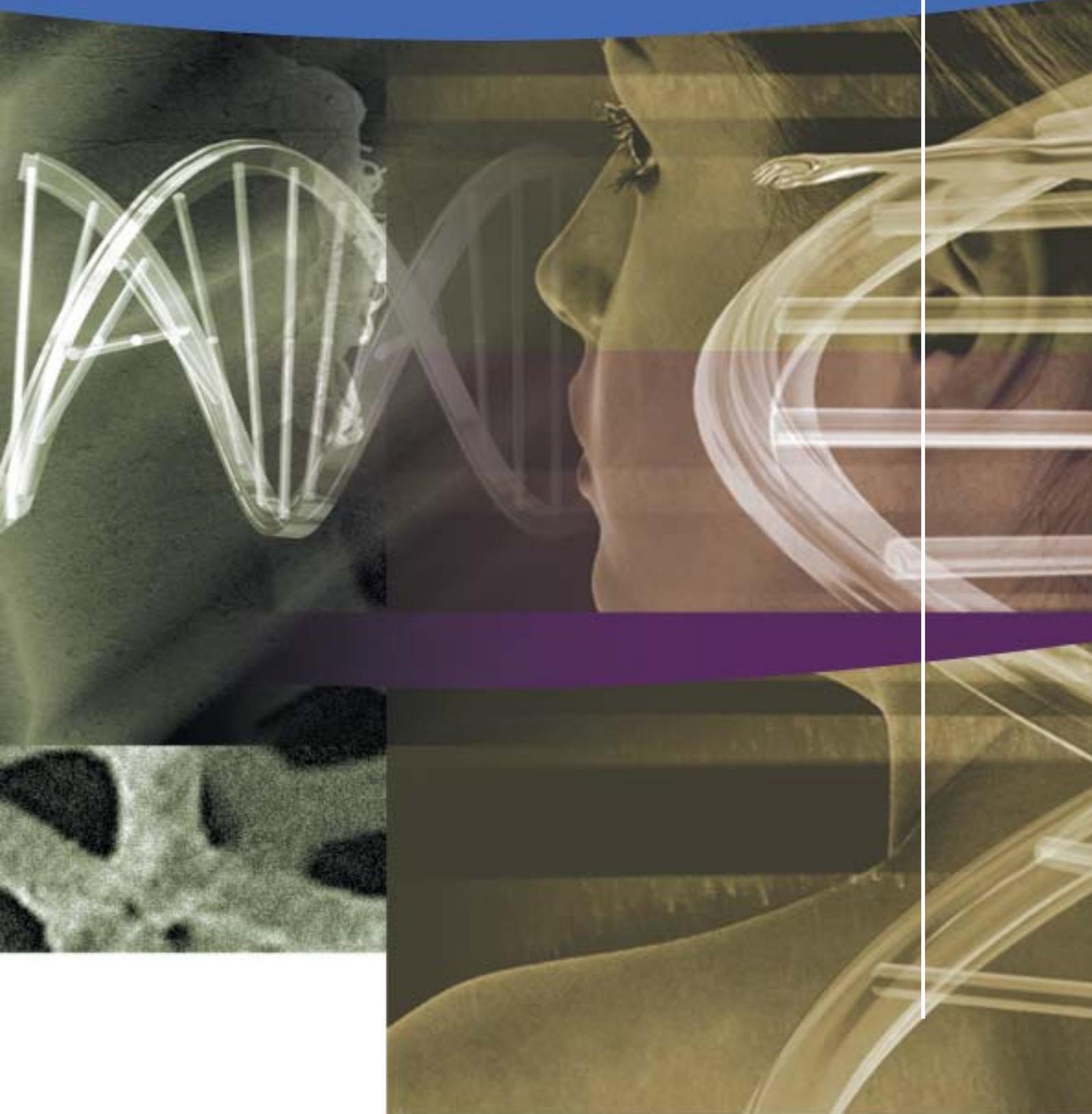
The 2<sup>nd</sup> international conference on 'Current developments in atomic, molecular and optical physics', was aimed at experimental and theoretical research with applications of the fundamental properties of atoms, ions and molecules and the interactions between electrons, photons and ions in collisions with atoms, molecules and surfaces. IUSSTF supported the participation of 4 plenary speakers from the US.

Topics covered in the conference included atoms and molecules in intense electromagnetic fields; laser cooling; trapping and Bose-Einstein condensation; high precision and ultra-cold phenomena; atom optics and its application in lithography; coherent processes in highly excited atoms; high harmonic generation and applications; coherent optical phenomena; attosecond and ultrashort pulses and their applications; reaction dynamics using ultrafast techniques; surface interactions with atomic particles and its applications to mesoscopic systems; photonic crystals; and advanced spectroscopies with new light sources.



In the background of the information generated through human genome project and the HapMap to understand human diversity and the etiology of diseases there is an increased focus on the potential role of the distribution of human genome sequence variations in the populations across the globe and their role in contributing to observed differences in disease status among population groups.

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## FLYING SQUIRREL COLLOQUIUM

**Date & Venue:** 22-29 March 2006, Periyar, India

**Principal Investigator:**

**Nandini R., National Institute of Advanced Studies (NIAS), Bangalore**

**E-mail:** [nandinirajamani@yahoo.co.in](mailto:nandinirajamani@yahoo.co.in)

The fourth international colloquium on flying squirrels was held at the Periyar Tiger Reserve in Kerala to appreciate flying squirrels as model systems for evolutionary and ecological studies. The event was also followed by a workshop on conservation priorities for the small mammal community, attended by biologists, wildlife managers and field researchers. It also included a session on methods to survey and study the squirrels through a two day field survey in the forest area. A total of 100 delegates including delegates from 16 countries attended the event co-hosted by IUCN. The IUSSTF supported 5 plenary speakers from USA for the colloquium. A manual on survey methodology for flying squirrels and other nocturnal mammals have been generated from this international event.

**Annual Report**

Indo-US Science & Technology Forum  
April 2005 to March 2006

# Financial Statements



## AUDITORS' REPORT

The Members,  
Governing Body,  
Indo-US Science and Technology Forum  
New Delhi

We have audited the attached Balance Sheet of **INDO-US SCIENCE AND TECHNOLOGY FORUM**, New Delhi as at 31<sup>st</sup> March, 2006, the Income and Expenditure Account and Receipts and Payments Account for the year ended on that date and report that:

1. We have obtained all the information and explanations which to the best of our knowledge and belief, were necessary for the purpose of the audit;
2. The Forum has maintained proper books of accounts so far appears from the examination of such books;
3. The Balance Sheet, Receipts and Payments Account and Income and Expenditure Account are in agreement with the books of account;
4. In our opinion and to the best of our information and according to the explanations given to us, the said accounts read with the attached notes thereto, give a true and fair view;
  - a) In the case of the Balance Sheet, of the state of affairs of the above named Forum as at 31<sup>st</sup> March, 2006.
  - b) In the case of the Receipts and Payments Account together with Income and Expenditure Account, of the deficit for the year ending 31<sup>st</sup> March, 2006.

For RAJEEV NEELAM & ASSOCIATES  
CHARTERED ACCOUNTANTS

**RAJEEV K. GUPTA**  
PROPRIETOR  
Membership No. 87128

Place: New Delhi  
Date : 20<sup>th</sup> September, 2006

## INDO-US SCIENCE AND TECHNOLOGY FORUM

BALANCE SHEET AS AT 31<sup>ST</sup> MARCH, 2006

Schedules		As at 31 <sup>st</sup> March 2006 Amount Rs.	As at 31 <sup>st</sup> March 2005 Amount Rs.
<b>LIABILITIES</b>			
US Endowment Fund		319,800,000	319,800,000
Opening Balance		208,589,993	178,832,278
Add : Surplus (Deficit) of Income Over Expenditure		<u>(10,023,311)</u>	<u>29,757,715</u>
<b>Total</b>		<b><u>518,366,682</u></b>	<b><u>528,389,993</u></b>
<b>ASSETS</b>			
<b>Fixed Assets:</b>			
Gross Block	A	3,457,000	2,871,358
Less: Depreciation to date		<u>2,115,413</u>	<u>864,497</u>
<b>Net Block</b>		1,341,587	2,006,861
<b>Cash and Bank Balances:</b>			
<b>a) Term Deposit with Banks-</b>			
Bank of America - FDR (Endowment)		-	319,800,000
Union Bank of India - FDR (Endowment)		319,800,000	-
Bank of America - Short Term Deposits		65,000,000	72,500,000
UTI Bank - Short Term Deposits		20,032,452	-
Union Bank of India - Short Term Deposits		<u>100,000,000</u>	<u>108,201,369</u>
		504,832,452	500,501,369
<b>b) Balance with Banks:</b>			
Bank of America - Saving A/c		2,563,463	3,025,691
UTI Bank - Saving A/c		2,230,815	16,923,796
Union Bank of India - Saving A/c		<u>1,754,095</u>	<u>4,209,728</u>
		6,548,373	24,159,215
<b>c) Cash In Hand</b>			
		1,305	117
<b>d) Advances For Scientific &amp; Other Expenses</b>			
	B	5,239,465	1,312,800

Schedules	As at 31 <sup>st</sup> March 2006 Amount Rs.		As at 31 <sup>st</sup> March 2005 Amount Rs.	
<hr/>				
<b>e) Sundry Deposits</b>				
Rent Security	390,000		390,000	
Telephone Security	12,000		12,000	
Cell Phone Security	1,500	403,500	7,631	409,631
<b>Total</b>		<b>518,366,682</b>		<b>528,389,993</b>
Accounting Policies and Notes to Accounts	<b>F</b>			

Subject to our Report of even date

For RAJEEV NEELAM & ASSOCIATES  
CHARTERED ACCOUNTANTS

RAJEEV K. GUPTA  
PROPRIETOR  
Membership No. 87128

ARABINDA MITRA  
EXECUTIVE DIRECTOR

R. VARADARAJAN  
CONTROLLER

Place : New Delhi

Date : 20th September, 2006

## INDO-US SCIENCE AND TECHNOLOGY FORUM

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED  
31<sup>ST</sup> MARCH, 2006

Schedules	For the Year Ended 31 <sup>st</sup> March 2006 Amount Rs.	For the Year Ended 31 <sup>st</sup> March 2005 Amount Rs.
<b>INCOME</b>		
Contribution from Department of Science and Technology - Government of India	27,013,900	33,670,997
<b>Bank Interest Received on:</b>		
US Endowment FDR	27,013,900	33,670,997
Short Term Deposits with Bank of America	2,983,229	2,514,342
Short Term Deposits with Union Bank of India	5,052,928	4,854,080
Short Term Deposits with UTI Bank	1,024,379	-
Savings Bank Accounts	315,164	283,865
	<u>36,389,600</u>	<u>41,323,284</u>
Unspent Grants Refunded from Workshops	475,675	1,274,368
Contribution for Application of Remote Sensing in Agricultural Productivity Workshop	1,320,000	-
Contribution for Sponsoring Indo-US Frontiers of Engineering Symposium	1,091,000	-
Grant from D.S.T. for Training of Scientists	4,088,719	-
<b>Total</b>	<b><u>70,378,894</u></b>	<b><u>76,268,649</u></b>
<b>EXPENDITURE</b>		
<b>Scientific Expenses</b>	<b>D</b>	<b>37,775,978</b>
<b>Establishment &amp; Office Expenses</b>	<b>E</b>	<b>5,421,183</b>
<b>Governing Body Expenses</b>		
Governing Body Meeting Expenses	3,859,027	2,344,155
<b>US Desk Outreach Activities</b>	<b>2,183,000</b>	<b>-</b>
<b>Peer Review Process in US</b>	<b>545,500</b>	<b>548,750</b>

	Schedules	For the Year Ended 31 <sup>st</sup> March 2006 Amount Rs.	For the Year Ended 31 <sup>st</sup> March 2005 Amount Rs.
Depreciation on Fixed Assets	A	1,250,916	420,868
	<b>Total</b>	<u><b>80,402,205</b></u>	<u><b>46,510,934</b></u>
Surplus (Deficit) of Income Over Expenditure Carried over to the Balance Sheet		<u><b>(10,023,311)</b></u>	<u><b>29,757,715</b></u>

Accounting Policies and Notes to Accounts F

Subject to our Report of even date

For RAJEEV NEELAM & ASSOCIATES  
CHARTERED ACCOUNTANTS

RAJEEV K. GUPTA  
PROPRIETOR  
Membership No. 87128

ARABINDA MITRA  
EXECUTIVE DIRECTOR

R. VARADARAJAN  
CONTROLLER

Place : New Delhi

Date : 20th September, 2006

## INDO-US SCIENCE AND TECHNOLOGY FORUM

RECEIPT AND PAYMENT ACCOUNT FOR THE YEAR ENDED  
31<sup>ST</sup> MARCH, 2006

Schedules	For the Year Ended 31 <sup>st</sup> March 2006 Amount Rs.		For the Year Ended 31 <sup>st</sup> March 2005 Amount Rs.	
<b>RECEIPTS</b>				
<b>Balances Brought Forward</b>				
<b>a) Terms Deposits With Banks</b>				
Bank of America - FDR (US Endowment Fund)	319,800,000		319,800,000	
Bank of America - Short Term Deposits	72,500,000		62,500,000	
Union Bank Of India - Short Term Deposits	<u>108,201,369</u>	500,501,369	<u>92,800,000</u>	475,100,000
<b>b) Balance With Banks</b>				
Bank of America - Saving A/c	3,025,691		10,100,556	
UTI Bank - Saving A/c	16,923,796			
Union Bank Of India - Saving A/c	<u>4,209,728</u>	24,159,215	<u>1,458,472</u>	11,559,028
<b>c) Cash In Hand</b>				
		117		1,356
<b>d) Advance For Scientific Expenses</b>				
		<u>1,312,800</u>		<u>11,269,428</u>
	<b>Subtotal</b>	<b>525,973,501</b>		<b>497,929,812</b>
<b>Endowment/ Grant-in-Aid Received</b>				
Contribution From Department of Science and Technology (Government of India)		27,013,900		33,670,997
<b>Bank Interest Received on</b>				
US Endowment FDR	27,013,900		33,670,997	
Short Term Deposits with Bank of America	2,983,229		2,514,342	
Short Term Deposits with Union Bank of India	5,052,928		4,854,080	
Short Term Deposits with UTI Bank	1,024,379			
Savings Bank Account	<u>315,164</u>	36,389,600	<u>283,865</u>	41,323,284
<b>Unspent Grants Refunded</b>				
Refund Received From Workshops	<b>C</b>	475,675		1,274,368
<b>Other Receipts</b>				
Security Refund		6,131		1,369
Contribution for Application of Remote Sensing in Agricultural Productivity Workshop		1,320,000		-
Contribution for Sponsoring Indo-US Frontiers of Engineering Symposium		1,091,000		-

Schedules		For the Year Ended 31 <sup>st</sup> March 2006 Amount Rs.	For the Year Ended 31 <sup>st</sup> March 2005 Amount Rs.	
Grant from D.S.T. for Training of Scientists		4,088,719	-	
<b>Total</b>		<b>596,358,526</b>	<b>574,199,830</b>	
<b>PAYMENTS</b>				
Scientific Expenses	<b>D</b>	66,023,699	37,775,978	
Establishment and Office Expenses	<b>E</b>	6,540,063	5,421,183	
Fixed Assets Purchases	<b>A</b>	585,642	2,046,263	
Governing Body Meeting Expenses :		3,859,027	2,344,155	
US Desk Outreach Activities		2,183,000		
Peer Review Process in US		545,500	548,750	
<b>Sundry Advances</b>				
Rent Security		-	90,000	
<b>Sub Total</b>		<b>79,736,931</b>	<b>48,226,329</b>	
<b>Balances Carried Forward</b>				
<b>a) Term Deposits with Banks</b>				
Bank of America - FDR (Endowment Fund)		-	319,800,000	
Union Bank of India - FDR (Endowment Fund)		319,800,000	-	
Bank of America - Short Term Deposits		65,000,000	72,500,000	
UTI Bank - Short Term Deposits		20,032,452	-	
Union Bank of India - Short Term Deposits		100,000,000	504,832,452	108,201,369
<b>b) Balance with Banks</b>				
Bank Of America - Saving A/c		2,563,463	3,025,691	
UTI Bank - Saving A/c		2,230,815	16,923,796	
Union Bank Of India - Saving A/c		1,754,095	4,209,728	24,159,215
<b>c) Cash In Hand</b>				
		1,305		117
<b>d) Advances For Scientific and Other Expenses</b>				
	<b>B</b>	5,239,465	1,312,800	
<b>Total</b>		<b>596,358,526</b>	<b>574,199,830</b>	
Accounting Policies and Notes to Accounts		<b>F</b>		

Subject to our Report of even date

For RAJEEV NEELAM & ASSOCIATES  
CHARTERED ACCOUNTANTS

RAJEEV K. GUPTA  
PROPRIETOR  
Membership No. 87128

ARABINDA MITRA  
EXECUTIVE DIRECTOR

R. VARADARAJAN  
CONTROLLER

Place : New Delhi  
Date : 20th September, 2006

**SCHEDULE - 'A'**  
**FIXED ASSETS:**

Sl. No.	Particulars	GROSS BLOCK			DEPRECIATION			NET BLOCK	
		Balance as on 01.04.2005	Additions during the Year	Total	Upto 31.03.2005	For the Year	Total	Balance as on 31.03.2006	Balance as on 31.03.2005
1	Air Conditioner	470,125	46,000	516,125	205,680	75,119	280,799	235,326	264,445
2	Computers	1,717,933	474,242	2,192,175	608,369	1,078,801	1,687,170	505,005	1,109,564
3	Furniture	235,060	23,250	258,310	3,472	24,332	27,804	230,506	231,588
4	<b>Office Equipments:</b>								
	Mobile	34,945	6,400	41,345	12648	6,122	18,770	22,575	22,297
	Fax Machine	36,995	-	36,995	3083	5,549	8,632	28,363	33,912
	EPABX System	232,710	-	232,710	19393	34,907	54,300	178,410	213,317
	Fire Extinguisher	9,990	-	9,990	833	1,499	2,332	7,658	9,157
	Photo Copier	128,100	-	128,100	10,675	19,215	29,890	98,210	117,425
	Room Heater	5,500	-	5,500	344	825	1,169	4,331	5,156
	Pedestal Fan	-	8,000	8,000	-	1,000	1,000	7,000	-
	Invertor & Battery	-	21,500	21,500	-	2,688	2,688	18,812	-
	Refrigerator	-	6,250	6,250	-	859	859	5,391	-
	<b>Total</b>	<b>2,871,358</b>	<b>585,642</b>	<b>3,457,000</b>	<b>864,497</b>	<b>1,250,916</b>	<b>2,115,413</b>	<b>1,341,587</b>	<b>2,006,861</b>
	Previous Year	825,095	2,046,263	2,871,358	443,629	420,868	864,497	2,006,861	

## SCHEDULE - 'B'

### ADVANCES FOR SCIENTIFIC & OTHER EXPENSES

	As At 31 <sup>st</sup> March, 2006 Amount Rs.	As At 31 <sup>st</sup> March, 2005 Amount Rs.
Advanced Manufacturing Center	1,898,594	-
Cerebrovascular Disorder	90,000	-
Diabetic Foot Complications	-	325,050
IPR Training	1,100,000	-
MAB Training Program	-	987,750
Development of Nano Structured Materials Center	2,131,500	-
Travelling Advance	19,371	-
<b>Total</b>	<b><u>5,239,465</u></b>	<b><u>1,312,800</u></b>

## SCHEDULES TO RECEIPT & PAYMENT / INCOME & EXPENDITURE

### ACCOUNT FOR THE YEAR ENDED 31<sup>ST</sup> MARCH, 2006

	For the Year Ended 31 <sup>st</sup> March 2006 Amount Rs.	For the Year Ended 31 <sup>st</sup> March 2005 Amount Rs.
<b>SCHEDULE - 'C'</b>		
<b>REFUND FROM WORKSHOPS</b>		
Child Neurologist	78,103	-
Futuristic Manufacturing	190,694	-
Infectious Diseases	-	311,539
Mathematical Society Meetings	-	192,982
Molecular Toxicology & Environmental Health	-	25,943
NMR Drug Design & Informatics	-	34,067
Online Science Education	117,500	160,485
Seismicity & Geodynamics	-	316,832
Symposium on Hepatitis E - Virus	89,378	-
Traditional Medicine	-	84,983
Transport of Air Pollutants	-	104,159
Women in Science Work	-	43,378
	<b><u>475,675</u></b>	<b><u>1,274,368</u></b>

	For the Year Ended 31 <sup>st</sup> March 2006 Amount Rs.	For the Year Ended 31 <sup>st</sup> March 2005 Amount Rs.
<b>SCHEDULE - 'D'</b>		
<b>SCIENTIFIC EXPENSES</b>		
<b>1. Workshops &amp; Symposiums</b>		
Application of Remote Sensing in Agricultural Productivity	701,021	-
Atomic, Molecular and Optical Physics Applications	269,728	-
Autism Spectrum Disorders	-	1,000,310
Carbon Sequestration	466,592	-
Ceramic Composites	-	766,657
Cerebrovascular Disorders	1,084,195	-
Chemical Engineering in Global Environment	-	2,201,301
Child Neurology	-	516,719
Culture of Innovation in S&T in India	1,201,130	-
Current Developments in Atomic, Molecular and Optical Physics	258,332	-
Design Engineering	2,827,847	-
Diabetic Foot Complications	325,050	-
Diarrhea And Enteric Protozoan Parasites	2,084,080	-
Digital Archaeology	1,796,412	-
e - Education Initiative	514,624	-
Endocrine Society of India	270,000	-
Energy R & D	-	1,959,075
Flying Tree Squirrel	545,000	-
Functional Genomics	-	268,669
Future Trends in Spectroscopy and Application to National Security	1,836,722	-
Futuristic Manufacturing	-	1,125,197
Green Chemistry	-	31,400
Heat, Power& Distributed Energy	62,935	-
High Performance Computing for Weather & Climate	2,710,700	-
Human Genomics and Public Health	144,937	-
INAE Nano Technology 2003	-	38,540
Indian Primate National Action Plan	2,412,981	-
Infectious Disease	-	-
Innovation and Radical Innovation	19,635	2,436,259
<b>Sub Total c/d</b>	<b>19,531,921</b>	<b>10,344,127</b>

	For the Year Ended 31 <sup>st</sup> March 2006 Amount Rs.	For the Year Ended 31 <sup>st</sup> March 2005 Amount Rs.
<b>Sub Total b/d</b>	<b>19,531,921</b>	<b>10,344,127</b>
Insect Genetics and Genomics	345,000	-
Intelligent Processing of Metallic Materials	-	813,400
International Conference On Physics Education	1,125,732	-
International Conference on Statistical Physics	-	163,560
Legume Genomics	35,247	-
Material Design And Development	667,500	-
Micro Light Air Vehicles	1,186,967	-
Micro Structure Property Relations in Closed Packed Metals	1,805,197	-
Microwave Technology for Material Processing	1,738,947	-
Minimal Access Surgery	-	175,000
Molecular Insights into Digestive Disorders	781,695	-
Nano Particle Aerosol	1,129,221	-
Nano Scale Materials from S & T	-	2,506,713
Nano Technology and Health Care	362,604	-
Neonatal and Fetal Surgical Anomalies and Role of Stem Cell Transplantation	739,245	-
Novel and Complex Materials	1,706,768	-
Number Theory and Fourier Techniques	533,050	300,000
Organic Chemistry - Today and Tomorrow	350,000	-
Organic Chemistry and Chemical Biology	947,288	-
Pedicon -2006	350,000	-
Physics with Heavy Ions & Rare Isotopes	1,740,622	-
Plant Virus	1,256,881	-
Plants And Environmental Pollution	513,393	-
Promoting the Romance of Science and Engineering and Medical Imaging Systems	300,000	-
Quantum Computing Applications	696,268	-
Radio Frequency Identification & Wireless Sensors (RFID)	743,361	-
S & T Policy and Globalisation	-	216,000
S & T and Mathematics Education	-	81,881
Snow Monitoring & Avalanches	-	751,168
Solid State Hydrogen Storage	-	208,540
Space Based Resources for Enhancing Science Education in India	1,705,691	-
Symposium on Hepatitis-E Virus	-	1,385,734
Three Dimensional Structure of Carbohydrate	52,500	-
Transcriptional Assembly	106,960	-
Upstream and Downstream of Hox Genes	361,330	-
	40,813,388	16,946,123

	For the Year Ended 31 <sup>st</sup> March 2006 Amount Rs.		For the Year Ended 31 <sup>st</sup> March 2005 Amount Rs.	
<b>2. Projects/ Networked R &amp; D Centre</b>				
Eco-Informatics Center	-	-	1,138,500	1,138,500
<b>3. Preparatory Meetings / Exploratory Visits</b>				
American Physical Society Meeting	74,431		-	
Biochemical Monitoring Network Study (Indo -Flux)	261,601		-	
Climate Change Science	-		2,245,057	
Frontiers of Engineering	-		3,952	
Molecular Genetics	71,383		-	
Monsoon Research Project	87,951	495,366	-	2,249,009
<b>Sub Total</b>		<b>41,308,754</b>		<b>20,333,632</b>
<b>4. Visiting Professorships</b>				
Microbiology Professorship		-		1,104,208
<b>5. Flagship S &amp; T Programs/ Special Initiatives</b>				
INDO-US Technology Summit- Excellence in Integrated Design & Manufacturing Systems	1,869,222		-	
Frontiers Of Engineering Symposium	8,299,222		-	
Frontiers of Science Symposium	2,690,289		6,449,388	
Nano Technology Conclave	1,517,918		-	
Techno Entrepreneurship in Academia	2,090,516		-	
University of California - India S & T Initiative	77,012		-	
Space Science Conference	-	16,544,179	9,888,750	16,338,138
<b>6. Training Programs</b>				
Computational Methods in Aero Elasticity	350,000		-	
IPR Training and Technology Management	302,487		-	
Monitoring and Assessment of Bio-Diversity	1,380,543		-	
Enrichment of Science Communication in Museums	608,472		-	
WRF Modelling Systems for Weather & Climate Studies in Tropics	979,006		-	
Wet lab Training and Monitoring Of Stem Cell Phenotype Proliferation	994,850		-	
Science, Technology Innovation Policy Training at Harvard University	3,555,408	8,170,766	-	-
<b>Total</b>		<b>66,023,699</b>		<b>37,775,978</b>

	For the Year Ended 31 <sup>st</sup> March 2006 Amount Rs.	For the Year Ended 31 <sup>st</sup> March 2005 Amount Rs.
<b>SCHEDULE - 'E'</b>		
<b>ESTABLISHMENT &amp; OFFICE EXPENSES</b>		
Advertising Expenses	144,151	63,518
Audit Fees	18,734	16,530
Bank Charges	1,694	25
Conveyance Charges	5,286	3,324
Communication Expenses	452,214	292,834
Staff Selection Expenses	43,668	537,255
Establishment Expenses	24,000	19,000
Foundation Day Expenses	-	306,371
Honorarium	15,000	-
Office Repairs & Maintenance	886,745	1,010,769
Office Expense	183,941	17,417
Office and Other Rentals	1,457,800	1,231,913
Printing & Stationery	454,166	600,241
Postage & Courier	47,765	21,651
Professional Fees	-	40,000
Salaries	1,440,646	212,429
Subscription	142,321	21,838
Travelling Expenses	795,891	424,196
Vehicle Hire Charges	399,411	267,922
Web Development/ Maintenance Charges	26,630	333,950
<b>Total</b>	<b><u>6,540,063</u></b>	<b><u>5,421,183</u></b>

## SCHEDULE - 'F'

### ACCOUNTING POLICIES AND NOTES TO ACCOUNTS

(Attached to and forming part of the Balance Sheet and Income and Expenditure Statement for the year ended 31<sup>st</sup> March, 2006)

#### 1. ACCOUNTING POLICIES:

- a. The Forum has adopted cash system of accounting.
- b. Any surplus of Receipts over Payments is carried forward to next year for utilization as per Objectives of the Forum.
- c. All receipts of interest against Time Deposits with the bank are accounted for on actual receipt/ credit in the bank account of the Forum.
- d. Fixed Assets are stated at their original cost less accumulated depreciation but including freight, duties, taxes and other incidental expenses relating to acquisition and installation.
- e. Depreciation on fixed assets has been provided on written down value method on a pro-rata basis at the rates as prescribed under the Income-tax Rules.
- f. All the assets acquired for research projects remain with the institution where the research work is carried on. The Forum however retains the right to transfer those assets to other institution if so required, on completion of the projects for which the assets are purchased. The expenditure on those assets are accounted for in the Income & Expenditure Account under the head "Scientific Expenditure" or such similar account and hence such assets are not taken in the Balance Sheet of the Forum.
- g. Funds released for various research projects are shown as Scientific Expenditure in the Income & Expenditure Account on the basis of disbursements made by the Forum and not on the basis of the expenditure on the projects by receiving institutions out of the disbursements.
- h. Transactions in foreign currencies are recorded at the exchange rates prevailing on the date of the transactions. Current assets and liabilities in foreign currency at the year-end are translated at the year-end exchange rates, and the resulting exchange difference is recognized in the Income and Expenditure Account.
- i. Contingent Liabilities in respect of any ongoing or projected activities are not provided for as expenses.
- j. Additional disbursements made for workshops/ seminars/ projects etc. undertaken during the year, but paid for in the subsequent year, or any unspent amounts received back out of current year disbursements, but received in subsequent year, are accounted for in the year of payment/ receipt.
- k. Payment/ disbursements for Seminars/ Projects or such events not performed during the year, are carried forward as advance and accounted as expenditure in the year in which the seminar/ project etc. is held.

**2. NOTES TO ACCOUNTS:**

- a. The Forum has been registered during the current year under section 12A of the Income-tax Act, 1962. The Forum has also been approved U/s 10(23C)(iv) of the Income-tax Act for the period ended 31.3.2006. The approvals allow the Forum to avail exemption from tax under the Income-tax Act, 1962.
- b. The Forum has been granted approval under U/s 80G of the Income-tax Act, 1962 for the period from 20<sup>th</sup> January, 2006 to 30<sup>th</sup> June, 2008 which entitles the donors to claim deduction of their contributions.
- c. The Forum has been recognized as a Scientific and Industrial Research Organisation (SIRO) by the Department of Scientific and Industrial Research (DSIR) for the period from 01.04.2003 to 31.3.2006.
- d. Total interest received on FDR-US Endowment Fund and matching contribution from the Department of Science and Technology, Government of India, upto 31<sup>st</sup> March, 2006:

	Upto Financial Year 2004-05 (Rs.)	For the Financial Year 2005-06 (Rs.)	Total upto 31.03.2006 (Rs.)
Interest on US Endowment FDR with Bank of America/Union Bank of India	15,13,35,493	2,70,13,900	17,83,49,393
Matching contribution from Department of Science & Technology, Government of India	15,13,35,493	2,70,13,900	17,83,49,393

- e. The previous year figures have been regrouped wherever necessary to conform to current year's classification.

Subject to our Report of even date

**For RAJEEV NEELAM & ASSOCIATES  
CHARTERED ACCOUNTANTS**

**RAJEEV K. GUPTA**  
PROPRIETOR  
Membership No. 87128

**ARABINDA MITRA**  
EXECUTIVE DIRECTOR

**R. VARADARAJAN**  
CONTROLLER

Place : New Delhi  
Date : 20th September, 2006

## CONTACT POINTS

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