



Indo-German Science and Technology Centre



Annual Report
2012-13 | 2013-14



Indo-German Science and Technology Centre

ANNUAL
REPORT

2012-13

2013-14



Federal Ministry
of Education
and Research



Department of Science & Technology
Government of India



The Indo-German Science & Technology Centre (IGSTC) has been established to facilitate Indo-German R&D networking through substantive interactions among government, academia/research systems and industry to foster innovation and application for the overall economic and societal developments of both the countries. Both Governments currently contribute up to Euro 2 million (₹ 13 crore) every year for realizing the goals.

IGSTC aims to:

- play a proactive role in facilitating participation of industry in joint R&D projects,
- provide/assist in mobilizing resources to carry out industrial R&D projects,
- promote electronic exchange and dissemination of information on opportunities in bilateral S&T cooperation. The Centre will also prepare/compile state-of-the-art reports on topics of interest with the help of highly qualified scientists and technologists, one from each country,
- provide individual advice to institutes and industries from either country, the possibilities of Indo-German cooperation and help in the identification of suitable partners,
- facilitate and promote Indo-German bilateral collaboration in basic and applied science, research and technology through substantive interaction among government, academia and industry,
- encourage public-private partnerships (PPP) to foster elements of innovation and application and cultivate a culture of cooperation between science and industry,
- nurture contacts between young and mid career scientists and technologists to develop a sense of mutual trust, leadership and entrepreneurship,
- develop cooperation through the identification of scientists and scientific institutions of the two countries,
- organize workshops, seminars, training Programs and other types of events on topics of mutual interest.

Governance

GOVERNING BODY



Arabinda Mitra

DST

Indian Co-chair



Christian Joergens

BMBF

German Co-chair



Anuradha Mitra

DST

(Served till December 2014)



Clas Neumann

Senior Vice President & Global

Head of SAP Labs Network

SAP AG



Krishnan Balasubramaniam

IIT Madras

(Served till September 2014)



Eberhard Abele

TU Darmstadt



Anjan Das

Confederation of Indian Industry



Philip Petit

German Embassy in India

(Served till May 2014)



Shailja Gupta

DBT



Gerold Heinrichs

IB-BMBF

From the **Director's** Desk

Seeking new horizons, IGSTC strives to bring together the immense scientific talent in both countries, to work together and resolve immediate and future S&T challenges.

In terms of numbers there are 15 ongoing projects in 2+2 mode involving 60 partners across academia and industry from India and Germany with investment of about 8 million euros.



Dear Readers,

Research partnership across the boundaries connecting academia and industry is the model with which Indo-German Science & Technology Centre (IGSTC) began its journey about 4 years ago. The influence of WTO, globalization of R&D and emergence of global challenges made us seriously think of a model of partnership which invokes the power of collaboration and ethos of mutuality of interest and respect.

India and Germany have been partnering in education and research for the last six decades. The 1974 Agreement on Scientific Research and Technological Development laid the foundation on which Indo-German S&T collaboration today boasts of a large number of academic and research partnership arrangements in different forms – be it student exchange, faculty exchange, joint projects, establishing large scale research facilities, launching of German satellite on Indian launchers, and, many others. It is no wonder that for India, Germany is the second most collaborative partner (after USA) in terms of globally co-authored joint research

publications as per a recent study.

IGSTC was established in December 2010, by the Government of India, and Government of Germany, as an instrument for catalyzing Indo-German strategic R&D partnership, connecting academia and industry with an aim towards translation of research results for socio-economic benefits of the two great nations. Department of Science & Technology on the Indian side, and BMBF on the German side are the anchoring agencies for IGSTC as it begins to chart its new growth path.

India and Germany: Strategic partners for Innovation with IGSTC as driving force draws its perspective from Germany's "High Tech Strategy 2014" and India's "Science, Technology and Innovation Policy (2013)".

In a small time since its inception, IGSTC has already ventured into joint research projects of industrial relevance with major academic/research institutions and industry as partners and stakeholders. The projects are addressing new developments and real challenges in areas such as advanced manufacturing;

energy & renewables; water and environment, biotech for food security & health and information technology. The projects are in true collaborative spirit with sharing of risks and rewards. In terms of numbers there are 15 ongoing projects in 2+2 mode involving 60 partners across academia and industry from India and Germany with investment of about 8 million euros.

With its all across annual growth of 25%, IGSTC has emerged as a flagship initiative of Indo- German relationship and both Governments are considering its further expansion in scope and portfolio.

The Annual Report for the years 2012-13 and 2013-14 provides a detailed overview of the progress and development of the activities of IGSTC.

The team at IGSTC continues to look forward to inputs and guidance from its various stakeholders in India and Germany to further intensify its efforts to gainfully exploit the synergy between the S&T ecosystems of the two countries.

A. Chakraborty
Director

Contents



09 | Program Activities

- 10 | Biotechnology
- 16 | Energy & Sustainability
- 22 | Material & Manufacturing
- 24 | Nanotechnology
- 28 | Information & Communication Technology

31 | Joint Workshops

- 32 | Science-based Master Planning for River Bank Filtration Water Supply in India
- 33 | Microbial Ecology and Application of Inoculants in Biocontrol
- 34 | Near real time forecasting of soil moisture for water resources management
- 35 | Strategies and Concepts of Advanced Manufacturing
- 36 | Diagnostics and Translational Genome Sequencing in Clinical and Public Health Microbiology
- 37 | Strategies for improved bone replacement Materials and orthopaedic implants: Design –Manufacturing – Technologies
- 38 | Surfactant and Amphiphilic Polymers in Nanotechnology-On the Way to Smarter Formulations
- 39 | Advances in Medical Technology Towards Current Healthcare Necessities
- 40 | Water and Wastewater Management for Sustainable Development

41 | DST-Max Planck Program

49 | Financial Statements



Program Activities

2+2 Projects

Biotechnological approaches to improve chickpea crop productivity for farming community and industry



Source : Project Archives

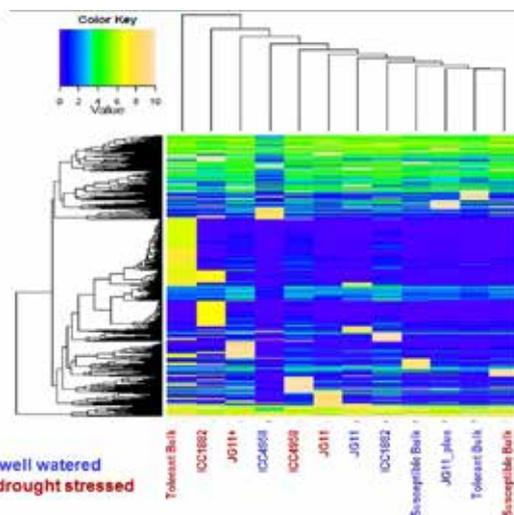
The Project

Chickpea (*Cicer arietinum* L.), an important grain legume crop of high nutritive value, is mostly grown in low-input and on residual moisture in Indian and semi-arid regions of Sub-Saharan Africa. India is the largest producer and consumer of chickpea. However India imports at least 40% of the international chickpea production. Due to insufficient rainfall in arid and semi-arid growing areas, the crop often suffers from drought. Terminal drought globally is the major constraint for chickpea production. In the past, breeding efforts to improve drought tolerance have been hindered due to its quantitative genetic basis and our poor understanding of the physiological basis of yield under water-limited conditions. Recent advances in chickpea genomics including the genome sequence, unraveled gene networks and genetic variation

controlling valuable traits in elite breeding populations. This project explored the resources developed (eg. in a different project, ICRISAT produced >400,000 ESTs from chickpea genotypes using next-generation sequencing (NGS) technologies, with the help of expertise available at University of Frankfurt/GenXPro in Germany and ICRISAT/BenchBio in India to identify candidate genes for drought tolerance in chickpea. In this context, a transcriptome assembly (ca. 60,000 contigs) was generated and 3,000 dehydration stress-responsive genes involved in major drought-stress signalling cascades were identified. Robust drought-responsive candidate genes were identified from MACE libraries and 50 qRT-PCR assays for drought-responsive candidate genes were studied. Furthermore, KASPar assays were developed for 2,005 SNPs and a high-density molecular map of chickpea comprising 1,328 loci was developed. In addition, an Integrated SNP Mining and Utilization (ISMU) pipeline, a computational tool for identifying SNPs in NGS data sets was developed. This project eventually helped to enhance breeding efficiency for developing superior chickpea varieties with higher yield under rainfed conditions.

Expected deliverables:

- ❖ Identification of candidate genes associated with drought tolerance in chickpea.
- ❖ Quantitative real time PCR (qRT-PCR) assays for candidate drought-responsive genes in chickpea.
- ❖ Perfect gene-based markers associated with drought tolerance in chickpea.
- ❖ Relevant statistical packages and bioinformatics tools for data analysis.



Project Investigators Partnering Institutions



Rajeev Varshney
ICRISAT
Hyderabad, INDIA



Günter Kahl
Goethe Universität
Frankfurt am Main, Germany



Manash Chatterjee
BenchBio Private Limited
Gujarat, India



Peter Winter
GenXPro GmbH
Frankfurt am Main, Germany

Progress Achieved

A transcriptome assembly (ca. 60,000 contigs) has been generated and 3,000 dehydration stress-responsive genes involved in major drought-stress signalling cascades were identified (GXP and ICRISAT).

Robust drought-responsive candidate genes identified from MACE libraries and 50 qRT-PCR assays for drought-responsive candidate genes designed (UF).

KASPar assays were developed for 2,005 SNPs and 384 SNP genotyping data was generated on the reference set consisting of 301 accessions. High-density molecular map of chickpea comprising 1,328 loci was developed (ICRISAT).

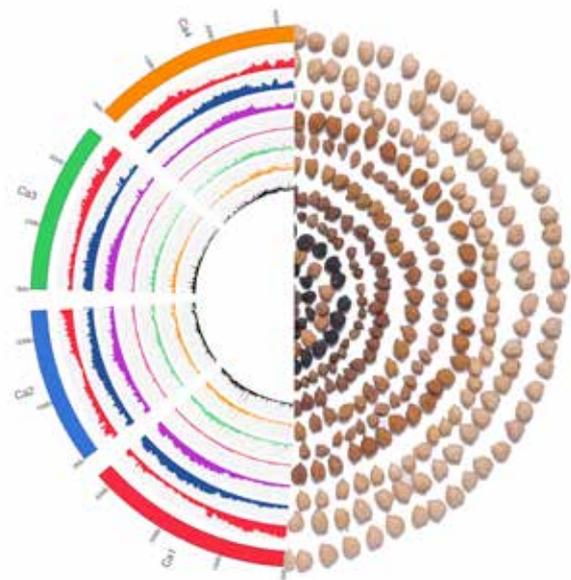
ISMU pipeline, a computational tool for identifying SNPs in Next Generation Sequencing (NGS) data sets was developed.

Joint publications:

- ❖ Azam S, Rathore A, Shah TM, Telluri M, Amindala B, Ruperao P, Katta MAVSK, Varshney RK. (2014) An Integrated SNP Mining and Utilization (ISMU) Pipeline for Next Generation Sequencing Data. PLoS ONE 9 (7): e101754.
- ❖ Afonso-Grunz F, Molina C, Hoffmeier K, Rycak Lukas, Kudapa H, Varshney RK, Drevon J, Winter P, Kahl G. (2014) Genome-based analysis of the transcriptome from mature chickpea root nodules. Frontiers in Plant Science 5: 325.
- ❖ Varshney RK, Song C, Saxena RK, Azam S, Yu S, Sharpe A, Cannon S, Baek J, Rosen BD, Tar'an B, Millan T, Zhang X, Ramsay LD, Iwata A, Wang Y, Nelson W, Farmer AD, Gaur PM, Soderlund C, Penmetsa RV, Xu C, Bharti AK, He W, Winter P, Zhao S, Hane JK, Garcia NC, Condie JA, Upadhyaya HD, Luo MC, Thudi M, Gowda CLL, Singh NP, Lichtenzweig J, Gali KK, Rubio J, Nadarajan N, Dolezel J, Bansal KC, Xu X, Edwards D, Zhang G, Kahl G, Gil J, Singh KB, Datta SK, Jackson SA, Wang J, Cook DR (2013) Draft

genome sequence of chickpea (*Cicer arietinum*) provides a resource for trait improvement. Nature Biotechnology 31:240–246.

- ❖ Kudapa H, Ramalingam A, Nayakoti S, Chen X, Zhuang W, Liang X, Kahl G, Edwards D, Varshney RK (2013) Functional genomics to study stress responses in crop legumes: Progress and prospects. Functional Plant Biology 40(12): 1221-1233.
- ❖ Hiremath PJ, Kumar A, Penmetsa RV, Farmer A, Schlueter JA, Chamarthi SK, Whaley AM, Carrasquilla-Garcia N, Gaur PM, Upadhyaya HD, Kavi Kishor PB, Shah TM, Cook DR and Varshney RK (2012). Large-scale development of cost-effective SNP marker assays for diversity assessment and genetic mapping in chickpea and comparative mapping in legumes. Plant Biotechnology Journal 10: 716–732. ●



CHICKBIO



Imparting drought stress-tolerance to crop plants by heterologous transfer of high altitude plant protection mechanisms



Source : Project Archives

The Project

On one hand a growing and more prosperous world population is expected to place a much higher demand on crop production systems in the years to come. On the other hand, productivity constraints imposed by increasing abiotic stresses, like drought and temperature changes caused by the global climate change threaten to limit the ability of crop production systems to effectively respond to increasing human needs. In order to avoid shortages of various agricultural products, breeders and plant scientists have to constantly work on developing plant varieties with higher yields, improved yield stability and stress tolerance traits. This includes identification of novel mechanisms to improve drought tolerance of crops.

In this 2+2 project, plants were modified to express stress-induced genes from plants growing at extremely high altitudes of India. Such genes have been identified by the Indian partner at CSIR-IHBT and were transformed in the model plant *Arabidopsis thaliana* (CSIR- IHBT, India) and also in plant species like rapeseed (OSR, Deutsche Saatveredelung AG, Germany) and corn (Krishidhan Research Foundation Private Limited, India). Growth of these genetically modified plants in mild drought stress conditions was analysed with state-of-the-art plant phenotyping technologies (Forschungszentrum Juelich GmbH, Germany) with image analysis methods to quantify the drought tolerance mediated by the transgene.

The purpose of the project is to achieve the combination and pyramiding of genes

increasing tolerance against drought and heat stress in spring barley and maize.

The specific objectives are :

- ❖ Establishment of controlled field comparable stress conditions.
- ❖ Identification and characterisation of stress specific promoters & genes and construction of expression constructs.
- ❖ Development of transgenic plants: Model & Crop plants.
- ❖ Phenotyping impact of high altitude plant genes on stress tolerance, growth and yield.



Project Investigators Partnering Institutions



S. Kumar
Institute of Himalayan Bioresource Technology
Palampur, India

A. Wiese - Klinkenberg
Forschungszentrum Jülich GmbH
Jülich, Germany



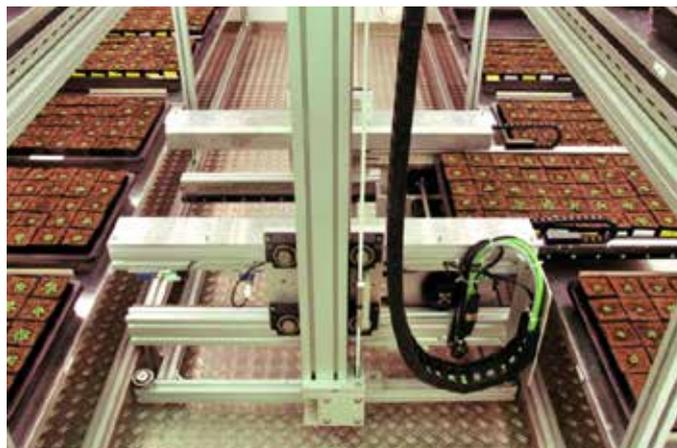
M.S. Kuruvinashetti
Krishidhan Research Foundation Pvt. Ltd
Maharashtra, India

D. Stelling
Deutsche Saatveredelung AG
Lippstadt, Germany



Progress Achieved

- ❖ Phenotyping protocol for the identification of mild drought tolerant growth established.
- ❖ Technologies for the phenotyping of extreme drought stress in Arabidopsis and OSR developed.
- ❖ High altitude plants *Caragana jubata* and *Potentilla atosanguinea* sequenced for expressed genes using SOLEXA sequencing.
- ❖ A suppression subtracted library was prepared, sequenced and analysed for *Caragana jubata* (IHBT).
- ❖ Stress induced genes of high altitude plants identified.
- ❖ Putative Promoters of stress inducible genes were cloned from *Rheum australe* (IHBT).
- ❖ Gene expression constructs for the identified stress induced genes from high altitude plants have been cloned into expression vectors for transformation in Arabidopsis and crop plants. KRFPL cloned SOD and Succinyl-CoAligase in marker free vector for transformation of maize (IHBT/KRFPL).
- ❖ Six transgenes transformed in oilseed rape and homozygous lines identified for one transgene.
- ❖ 4th OSR line genotyped and single insertion lines identified for future drought stress phenotyping.
- ❖ Nine genes or combinations in the model plant Arabidopsis thaliana were provided for phenotyping.
- ❖ Arabidopsis expressing transgenes evaluated for their performance under abiotic stresses.
- ❖ Three OSR lines were characterized for growth in drought stress conditions. 14 independent lines of transgenic.
- ❖ Arabidopsis have been phenotyped for growth in mild stress (FZJ).
- ❖ Phenotyping and quantification of the plants response to extreme stress performed to identify and quantify tolerance against extreme drought.
- ❖ Yield of transgenic OSR lines was quantified during seed production, deviation from standard yield was reinvestigated for one line, but not confirmed in second yield quantification (FZJ/DSV).
- ❖ An application for a grant for an Indian student working at FZJ to continue further crop phenotyping for lines from the project in Germany has been handed in to IGSTC. ●



Source : Project Partner

STRESS PLANT



Developing Sustainable Transgenic Crop Plants Tolerant for Drought or a Combination of Drought and Heat Stress By Manipulating ABA Signalling and Ascorbate-Glutathione Pathways.



Source : Shutterstock

The Project

The basic objectives of the project are:

- ❖ In vitro gene pyramiding and construction of plant transformation vector with all the genes, i.e. Superoxide dismutase (SOD), Ascorbate peroxidase (Apx), Monodehydroascorbate reductase (MDHAR), Dehydroascorbate reductase (DHAR) and Glutathione reductase (GR), encoding for enzymes involved in ascorbate-glutathione pathway (at ICGEB).
- ❖ Preparation of constructs for manipulating ABA levels under drought using key genes of ABA metabolism and catabolism as well as alterations for ABA signaling to elevate hypersensitivity to ABA under drought (at IPK Germany).
- ❖ Transformation of selected maize lines through Agrobacterium-mediated transformation (at Nuziveedu Seeds (P) Ltd).
- ❖ Transformation and characterization of primary transgenic barley lines and double haploid transgenic plants and screening barley transgenic plants for terminal drought tolerance (at IPK and SURL, Germany).
- ❖ Molecular analysis of transgenic maize plants for stable integration of transgenes and their expression at both RNA and Protein levels (at both ICGEB and Nuziveedu Seeds (P) Ltd components).
- ❖ Validation of selected transgenic maize and barley events for their stress adaptation in the greenhouse under different stress conditions (at ICGEB, Nuziveedu Seeds (P) Ltd and IPK).
- ❖ The enhanced productions of Reactive Oxygen Species (ROS) in response to drought stress are effectively deactivated in multiple redox reactions by the ascorbate-glutathione pathway enzymes

expressed in transgenic maize to combat drought stress induced cellular damage (at ICGEB and Nuziveedu Seeds (P) Ltd.).

- ❖ The genetic manipulation of drought stress responsive ABA levels in transgenic plants for subsequent expression of drought stress adaptive genes through ABA mediated signaling pathway to sustained plant growth and productivity under drought stressed agro-climatic condition (at IPK, ICGEB and Nuziveedu Seeds (P) Ltd.).



Figure 1: Transgenic lines with optimized biosynthesis pathway of the plant hormone abscisic acid

Project Investigators Partnering Institutions



M. K. Reddy
International Centre for Genetic Engineering and
Biotechnology, New Delhi

N. Sreenivasulu
Institute of Plant Genetics and Crop Plant
Research (IPK)
Gatersleben



P. Sateesh Kumar
Nuziveedu Seeds (P) Ltd
Hyderabad

Jens Weyen
Saaten-Union Resistenzlabor GmbH
Leopoldshöhe, Germany



Progress Achieved

Development of drought tolerant barley and maize plants

- ❖ The objective within this project was the combination and pyramiding of genes increasing tolerance against drought and heat stress in spring barley and maize. Therefore, transgenic lines with optimized biosynthesis pathway of the plant hormone abscisic acid (ABA, Figure 1), the ABA signaling pathway and the Glutathione-Ascorbate metabolism were generated (IPK, ICGEB and Nuziveedu Seeds).
- ❖ Progress made: After initial characterization several lines were selected, grown in the greenhouse and crossed together (project partner Saatenunion). The progeny were raised as donor plants for the production of doubled haploid (DH-) lines. DH-lines were produced via in vitro tissue culture. Doubled haploid plants have the advantage of being genetically stable. They do not segregate in the further generations and are completely homozygous. That makes them ideal tools for further investigation of genes of interest. Seeds were sown under greenhouse conditions at IPK Gatersleben for further analysis under control and defined drought stress settings. Selected Lines showed a stable yield under drought stress conditions.
- ❖ The Indian component adopting Agrobacterium mediated transformation and transformed entire ascorbate-glutathione pathway encoding genes into maize plants for effective deactivation of reactive oxygen intermediate (ROI) molecules to protect the transgenic maize from the oxidative damage. In addition, modulated the expression levels of ABA, the major phytohormone and an essential messenger to trigger the expression of stress adaptive genes under drought stress by simultaneously over expressing

NCED6 and a receptor protein kinase under appropriate promoters to enhance production of ABA at the same time to prevent the leaf senescence for improved seed setting and grain filling. Elite transgenic lines were selected after field and lab level screening with basta and methyl viologen treatments respectively. In selected lines, morphological, physiological and biochemical characterization was done by doing pigment analyses, ion leakage, lipid peroxidation and enzyme assays under the induced oxidative stress condition with methyl viologen in lab and also by simulated drought stress experiments in poly house. Significant difference was observed between transgenics and control plants (Figure 2). Stable yields were observed in some lines and enhanced cob length and pigmentation were observed in others. ●

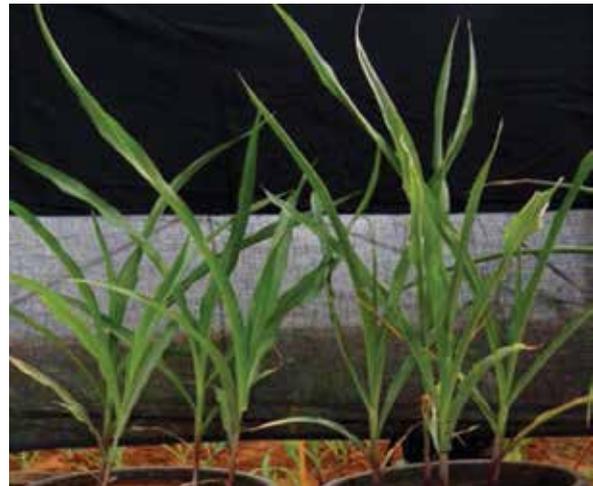


Figure -2. Tolerant green transgenic (upper) and completely dried non-transgenic (lower) maize plants under drought stress given in pot experiment.

TRANS CROP



Compact Linear Fresnel Reflector Technology for Solar Thermal Power Generation and Process Heat



Source : Getty Images

The Project

The objective of the project is to develop a low cost concentrating collector for production of medium temperature heat, designed for Indian climate, cost and production conditions. This will be a technology solution for affordable solar energy in distributed power generation which is necessary in India, and as fuel saver in feed water preheating applications of large thermal power plants mainly operated by coal. The development of such a collector is considered as an innovative solution in the field of low cost renewable energy production. It is also environmentally friendly technology as carbon dioxide emissions will be avoided by these installations.

The cooperative nature of the project combines technological know-how on the Indian and German sides on specific issues, thus aiming at a unique adapted technology solution for the Indian market.

The project seeks to develop industrial scale Linear Fresnel Reflector (ILFR) designed with high accuracy for meeting the temperature requirements between 250 – 300 Deg C. Two major applications of this range in temperature is for (a) High end industrial heating applications (60% of the industrial heating is 150 – 220 °C while 25% process heating require 220 – 300 °C) and, (b) For providing heat into the coal based thermal power plant cycle which ultimately converts this solar energy into electricity through an indirect regenerative cycle integration. Both these applications are very critical in terms of saving of fossil fuel, CO₂ reduction and the most optimum way of integrating renewable energy into the existing fossil systems.

Specifically this project envisages setting up of a 250kWth CLFR facility and integrating the same with an existing

thermal power unit. The demonstration project is being setup alongside the thermal power unit at the Heavy Water Plant (Department of Atomic Energy, Govt. of India) at Manuguru, Andhra Pradesh, India.

The scope of work includes

- Design and development of all the critical components like primary mirror system, secondary concentrator, receiver mounting, tracking system, heat exchangers, evaporators etc.
- Design and analysis of structural system.
- Fabrication of the components of the system, assembly, erection and commissioning at site.
- Testing & integration of the system in the existing Thermal power plant at Manuguru, to address all the above aspects and quantify the efficiency and cost.



Project Investigators **Partnering Institutions**



P M Mujumdar
Indian Institute of Technology-Bombay
Mumbai



Werner Platzer
Fraunhofer ISE
Freiburg



R.R. Sonde / Kiran Deshpande
Thermax Ltd.
Pune



Thomas Kuckelkorn
Schott AG
Germany

Progress Achieved

Indigenous structural design is one of the main components in the project for IITB team. The design phase includes the understanding of the system and component requirements, their functionality, working environment and evaluating the loads acting on it. The components have to be designed for taking the wind loads, gravity loads, thermal loads and the drive loads coming from the motor. The optical efficiency requirements called for an innovative structural concept having excellent rigidity with minimal deflections and deformations in the operational load cases while maintaining adequate strength in the worst case failure load conditions. Simultaneously, it also has to be light and cost effective while satisfying design for manufacture requirements and cost constraints.

The key features of this technology is downscaling of the conventional CLFR to an industrial scale LFR which can be mounted on any structure including rooftop thereby enabling deployment of this technology at many industrial and power stations where there are challenges in terms of making free land available. Such a design requires optimum sizing of the optics and the structural design that has to take care of accuracy requirements optics and the external load factors.

The second year activities at IIT Bombay were primarily focused upon the entire process of procurement of the pilot plant modules through fabrication contracts with external vendors, based on the design work carried out during Year one and converted to engineering drawings in conjunction with Thermax.

Fabrication related technical and techno-commercial activities: A procedure was established within the IIT Bombay purchase procedure framework to execute the

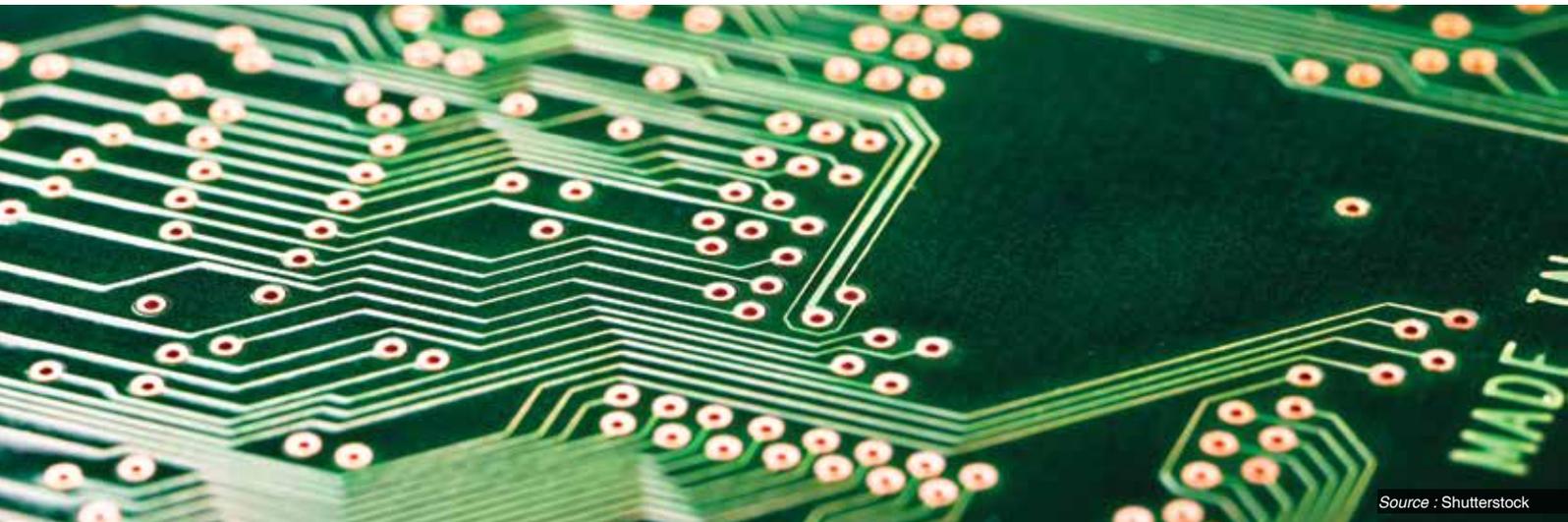
procurement of the modules. Based on the scheduled erection activities, the plant was divided into 7 different packages of different modules.

To develop the design and setting-up of proof-of- concept, the Indian partners viz. IIT-B & Thermax set-up a single array facility capturing all the salient features of the design in simulated conditions on a roof at Thermax. Various aspects and problems were faced while testing this single array including meeting accurate control requirements in the tracking system. Fraunhofer and Schott Solar were associated in discussions on a regular basis so that their expertise was continuously available in carrying out improvements. We have moved from that stage now to setting-up of 250 kW thermal ILFR facility which is now in the advanced stage of erection. The plant is likely to go on commissioning this year at a captive power plant of Heavy Water Plant (Department of Atomic Energy, Govt. of India) at Manuguru, Andhra Pradesh, India. ●

CLFR



Flexible Printed Integrated Disposable Electronics



Source : Shutterstock

The Project

Printed electronics has developed as a promising research area due to the possibilities that it provides to produce large quantities of low-cost flexible electronic devices by means of conventional mass printing technologies leading to reduced costs and new applications. Even though remarkable progress has been made in the field of printed electronic components in recent years, integration of multiple electronic components into multifunctional systems is still in need of more effort on part of researchers.

Based on a diverse variety of existing components (circuits, solar cells, low power displays etc.) new multifunctional systems can be designed to address various applications with an attractive synergistic commercial impact for the components involved. The main focus in this context is on cheap, use and throw printed paper solar cells (< 1.0 Euro/W). Future applications could be solar cell powered printed active RFID tags (< 0.2 Euro/tag) and printed electronic security seals (< 0.5 Euro/seal) to name a few.

The FLEXIPRIDE project aims at producing such multifunctional systems, which facilitate numerous novel applications. In particular, different application scenarios are to be developed on the basis of mass printing technologies: solar-based energy sources and security seals.

FLEXIPRIDE addresses the development/improvement of existing printed electronic components within the consortium and their integration into various innovative multifunctional systems. For the realisation of all these systems, the advantages of different printing technologies (screen printing, flexography, gravure, offset etc.) are combined, while keeping cost issues in mind.

FLEXIPRIDE addresses not only integration of various electronic components but also focuses on required circuit designs and simulations. Quality inspection and control of the printed electronic devices is a prerequisite in order to market the products. Therefore, optical methods will be explored and an optical device will be developed to monitor layer thickness and structural defects during printing.

Project Investigators **Partnering Institutions**



Y.N. Mohapatra
Indian Institute of Technology-Kanpur
Kanpur, India



Arved C. Huebler
TU Chemnitz
Chemnitz, Germany



Ashokka Agarwal
Anil Printers
Nasik, India



Markus Schmizlein
Chromasens GmbH
Konstanz, Germany

Progress Achieved

First half of FLEXIPRIDE project was devoted to work on printed circuitry and touch sensors. Circuitries were designed to get required current/voltage output combinations in connections for integrated devices. Different series and parallel combinations were tested on electrochromic displays. A silver ink was used for connection of display with battery. pmTUC is now capable of printing much finer lines as compared with the example circuit.

Electrochromic displays were successfully developed. They have a low powered display that can easily be powered through printed solar cells. pmTUC has worked extensively on the development of bit-wise logic for multiple connections in order to use printed circuitry in making selective switching possible for multiple devices.

In the last one year most of the time was devoted on stability of solar cells and electrochromic displays. The group has succeeded in integration of electrochromic display and solar cells together. Installation of camera

system provided by Chromasens to investigate the inline homogeneity of printed layer has also been finished.

Going forward, pmTUC will do the work on circuit technology in the future. It plans to develop a demonstrator with an extended circuit and display functionality and also take up production of the demonstrator later. FLEXIPRIDE project will now focus on improve the effectiveness of the solar cell for powering electronic devices.

Another important outcome of the project is the foundation of the company SARALON to develop electrochromic displays, circuitries and batteries by using conventional printing machines. A spin-off from the pmTUC, SARALON is part of the long term goal of producing electronics in simpler and cost-effective ways.

Publications:

- ❖ TM Moazzam Ali, Deep Prakash, Tino Zillger, Pradeep Kumar Singh, and Arved Carl Hübler:
- ❖ TM Printed Piezoelectric Energy Harvesting Device. Advanced Energy Materials (2013) ●

FLEXIPRIDE



Reduction of Earth Metals in Chalcopyrite-based Solar Cells



Source : Getty Images

The Project

Copper-indium-gallium-diselenide (CIGS) is the best performing solar film with a promise of large scale implementation. As compared to silicon-based solar film, CIGS solar film has a lower energy payback time and lower anticipated production costs. For incremental reduction of production costs, use of scarce elements such as Indium and Gallium has to be further optimized. This can be achieved by (a) replacing Indium (In) and Gallium (Ga) with Zinc and Tin that are relatively more abundant, and/or (b) improving the CIGS material itself so that thinner films deliver the same output thereby reducing consumption of In and Ga per unit area.

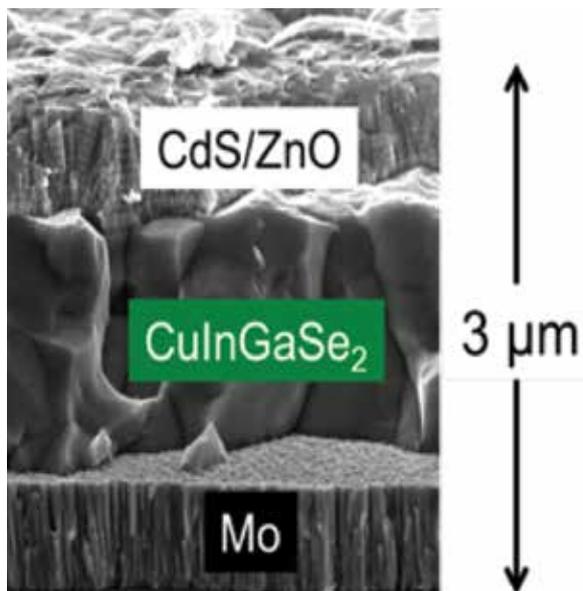


Figure 1 Electron microscopy image of a CIGS solar cell in cross-section showing

The project aims to develop a better understanding of the formation of a new material copper-zinc-tin-selenide/sulfide known as Kesterite, and, to improve the efficiency of CIGSe material itself. The efforts under the project involve the synthesis of a semiconductor thin-film through the physical vapour deposition route (thermal evaporation, or, sputter deposition). Both approaches include optimized preparation processes based on a deeper understanding of the physics and chemistry of film formation. The major deliverables are:

- ❖ Create a detailed understanding of the interrelation between growth conditions and layer properties of CIGS and Kesterite.
- ❖ Investigate the scientific potential of reducing earth metals in chalcopyrite solar cells by reducing the layer thickness and by replacing Indium and Gallium by Tin and Zinc.
- ❖ Evaluate and compare both approaches in terms of their economic potential in order to preserve competitiveness of chalcopyrite-based photovoltaics.
- ❖ Develop industrial scale model processes for both approaches in order to study the compatibility with economic boundary conditions in the interacting markets in India and Germany.
- ❖ An important contribution to the development of thin film photovoltaic systems.

Project Investigators Partnering Institutions



Sarang Ingole
Indian Institute of Technology -Kanpur
Kanpur, India



Roland Scheer
Martin-Luther-University
Halle, Germany



Nagesh Kini
THERMAX
Pune, India



Ralf Sorgenfrei
Manz CIGS Technology GmbH
Schwäbisch Hall, Germany

Progress Achieved

Both approaches, (a) Kesterite thin films and (b) thinner CIGSe films are being pursued under the project that involves synthesis of the semiconductor thin-film through the physical vapor deposition route (either via thermal evaporation, or, via sputter deposition). Both approaches include optimized preparation processes based on deeper understanding of physics and chemistry of film formation.

In-situ characterization of layer growth is a corner stone of the project REM Solar. The resulting thin film is characterized for its structural, electrical and optical properties – all in relation with thin-film synthesis parameters. Ultimately this thin-film is made an absorber in a photovoltaic device and studied for the correlation between its properties and the characteristics of the resulting PV device. Process variants for maximum efficiency and minimum In, Ga usage are identified. For both approaches, industrial scale model processes shall be realized, which will allow a study of issues relevant for fabrication. Process variants have been tested in large-scale module deposition. The results are being used to evaluate and benchmark both approaches. Finally, different conceptual solutions are being assessed in an exploitation study. As of now the project has:

- ❖ Identified the major loss quantity of thinned CIGS solar cells which is the short circuit current density

determined the experimental conditions for in-situ characterisation of CIGS and growth based on results from model experiments (see Figure 3).

- ❖ Presented a world record device efficiency with 200 nm CIGS thickness and 9.2% efficiency (internal measurement).
- ❖ Initiated the transfer of laboratory results on CIGS thickness reduction to large-scale experiments with an optimizes process.
- ❖ Commenced the vacuum deposition of CZTS films and conducted first in situ experiments. ●

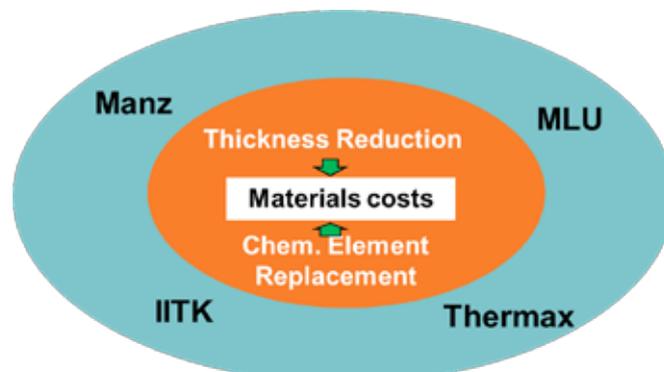


Figure 2 Project scheme showing the 2 approaches for earth metal reduction and finally material cost reduction: (1) Reduction of CIGS film thickness and (2) Chemical replacement of In,Ga by Zn+Sn. All partners are contributing to both approaches with major responsibility of Manz/MLU for (1) and with major responsibility of IITK/Thermax for (2).

REMSOLAR



Visualization of automated multi-sensor NDT assessment of concrete structures



Source : Project Archives

The Project

Regular inspection of concrete structures is necessary to assess their condition and get data to serve as a basis for planning maintenance and repair schedules.

In concrete structures, inspection for structure (damages) and material properties (deterioration) is not possible with a single method approach. Effects of deterioration processes and structural changes are non-uniform in nature and must be addressed by a multi-method approach

Robots and scanning technologies have made it possible to collect high quality multi-sensory data. Nevertheless, individual sensor data is often independently analyzed and compared against the data from other sensors at the decision level. Thus, the potential of multi-sensory information is typically not fully realized. Fusing multi-sensory data can close this gap and pave the way for automated evaluation of multimodal data sets.

Honeycombing defects (Honeycombs are porous volumes of coarse grain aggregates bonded together by cement) occur when fresh concrete ingredients segregate due to poor workmanship. Detection and characterization of honeycomb defects is a challenging task for inspectors due to their strong variability in size, shape, position, orientation and density. Moreover, unlike voids of a comparable size, honeycombs introduce a gradual and volumetrically distributed change in material properties.

The significance of this project is the use of statistical data fusion techniques for data processing and visualization. The automated scanner system provides multi-sensor overlapping data suitable for data fusion. Complementary data sets are combined using the statistical information available on each sensor while taking into account the

physical principles behind each method. The uncertainty in each data set can be taken into account to deal with conflicting and complimentary data. This approach leads to an enhanced evaluation and results of higher significance. The fused results can then be visualized using specially developed software tools.

The main goals of the project were:

- ❖ To develop and implement automated scanner system for data collection using multi-sensor (Ground Penetrating Radar(GPR), Ultrasonic Pulse Echo (UPE), and Impact Echo (IE)).
- ❖ Development of software tool for visualization of data using data fusion technique by combining radar, ultrasonic pulse echo and impact echo.
- ❖ Validation of the data fusion software tool for evaluation of thickness, identification of reinforcement and defects such as honeycombs at laboratory level.

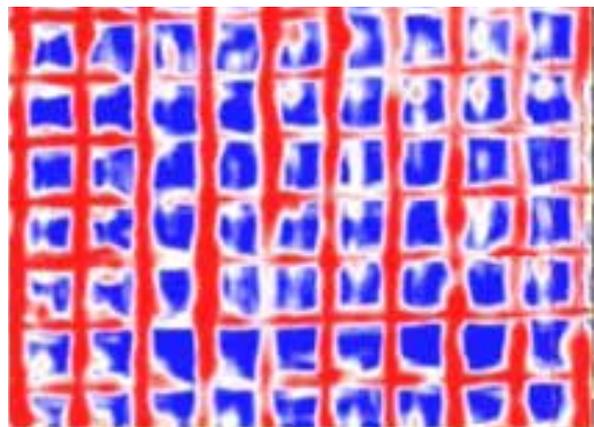


Fig. 1 Top reinforcements obtained with radar

Project Investigators Partnering Institutions



P. Srinivasan
CSIR-Structural Engineering Research Centre,
Chennai, India



Thomas Kind
Bundesanstalt für Materialforschung und
-prüfung (BAM), Berlin



Krishna Mohan Reddy
Lucid Software Limited
Chennai, India



Andre Molkenstein
Specht, Kalleja + Partner GmbH
Berlin, Germany

Progress Achieved

A systematic approach for fusion of multi-sensory nondestructive testing (NDT) data was developed to improve the detectability of honeycombs by fusing the information from three different sensors.

A prototype (demonstrator) was developed at BAM (GER) was delivered to CSIR-SERC (IND) to carry out laboratory and preliminary field tests and collect data on a number of large scale concrete specimens containing distinct built-in honeycombing defects and varying thickness.

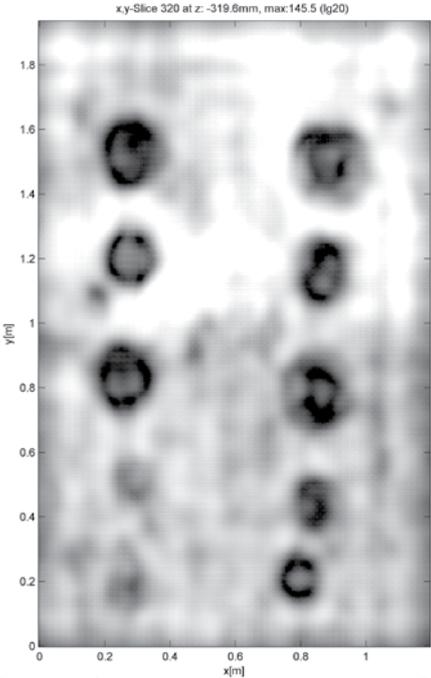
The description of the concept for software integration and outline of the visualization concept has just begun. A description of the technology, which enables the scanner to move in its foreseen grid and schedule has already been made. The system is able to acquire data from commercially available sensors. Data Processing (filtering, noise removal etc.) has been implemented for UPE and GPR data.

Field tests under consideration of typical practical problems were performed in diaphragm walls and parking garages. The diaphragm wall thickness of 1.0 m was evaluated from one side using IE and UPE. The same was confirmed with concrete cores extracted from the wall. In addition, the reinforcements and the variation in cover thickness were evaluated using GPR. The evaluation of the performance of the approach will be conducted as soon as the experimental results are analysed.

The automated scanner was erected on the vertical face of a concrete wall in the laboratory using suction feet and trial runs performed. Measurements are being planned on a large-scale I-girder beam of 20 m span as part of the field study. Investigations for nondestructive testing of pitting corrosion have also been initiated. The schedule for this experiment includes multi sensor reference measurements in the beginning. Afterwards chloride is induced into concrete and pitting corrosion is initiated at pre-defined locations.

Afterwards new features indicating pitting corrosion are to be found. Corrosion data in field has already been collected and shall be evaluated after laboratory investigations have been completed.

Part of the work has been presented in a few scientific meetings (DGZFP – Annual Meeting 2014), conferences, and recently accepted for publication in NDT&E, a prestigious journal in the field of NDT. Another article dealing with more sophisticated fusion algorithms for honeycomb data has just been submitted to NDT&E. ●

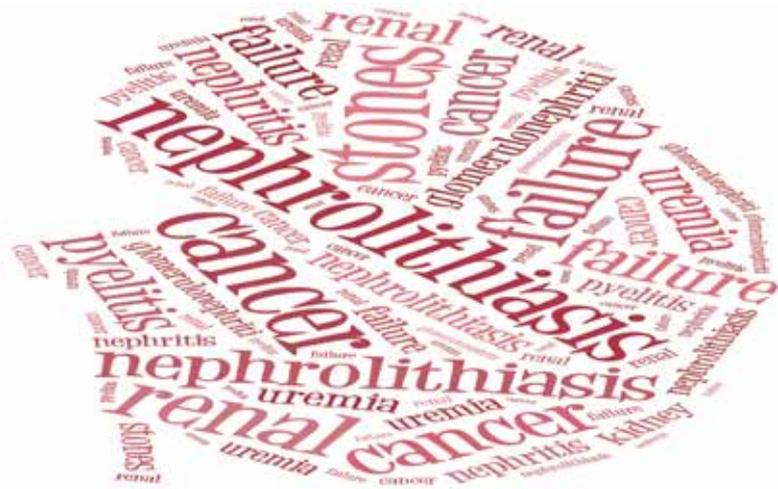


Detection of Honeycombs in concrete slab using UPE

NDT FUSION



Development, characterisation and validation of nano-porous particles for the adsorption of hydrophobic uremic toxins in renal failure patients



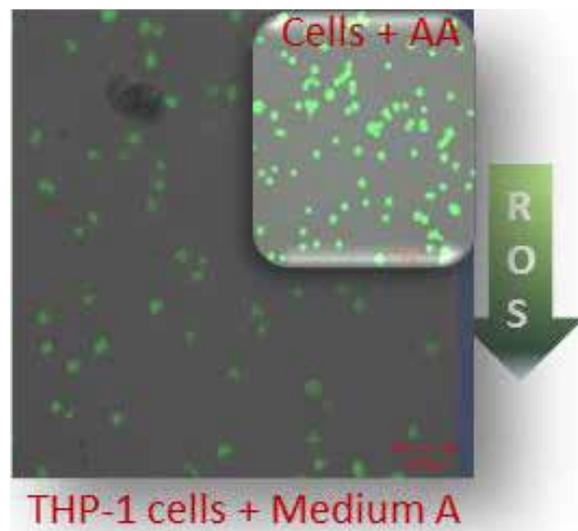
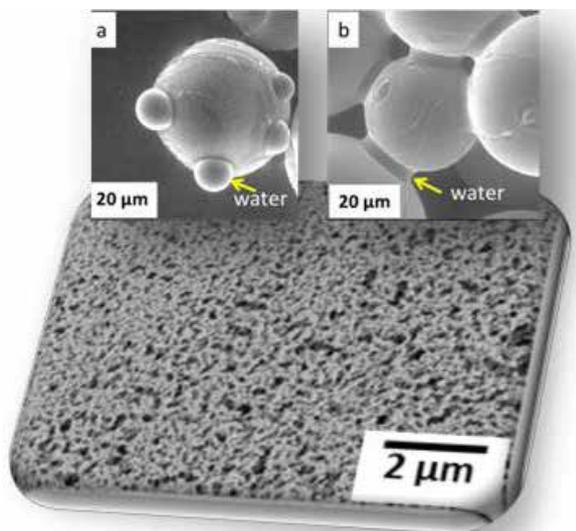
Source : Shutterstock

The Project

Kidneys are the organs that help filter waste products from the blood. They are also involved in regulating blood pressure, electrolyte balance, and red blood cell production in the body. Kidneys of individuals suffering from chronic renal failure are unable to perform these tasks. Dialysis helps in alleviation of this condition. However, dialysis techniques available to manage kidney complications suffer from a major drawback in terms of poor elimination of protein-bound hydrophobic low molecular uremic toxins. This situation is strongly associated with cardiovascular disease in end-stage renal failure patients. So far, there are no available methods to eliminate these hydrophobic substances. The goal of this project is the development/modification, characterisation and validation of nano-porous particles for adsorption of

hydrophobic uremic toxins from serum of renal failure patients.

Patients with chronic kidney disease (CKD) and also those on dialysis (CKD-5D) show an increased cardiovascular mortality and morbidity due to several risk factors including diabetes, hypertension, and uremic retention solutes toxicity. Accumulated uremic toxins in CKD patients contribute substantially to the progression of cardiovascular disease. Hydrophilic toxins can be removed by conventional dialysis methods. However, hydrophobic uremic toxins, due to their protein-binding, are poorly cleared during conventional hemodialysis or even hemodiafiltration. The project aims at the development, characterisation and validation of adsorbent particles for the removal of hydrophobic uremic toxins from plasma of chronic renal failure patients.



Project Investigators Partnering Institutions



S. D. Tetali
University of Hyderabad
Hyderabad, India

J. Jankowski
Uniklinik RWTH Aachen
Aachen, Germany



H.-D. Lemke
Excorlab
Oberburg, Germany

K. Kratz
Helmholtz Zentrum Geesthacht
Teltow, Germany



Progress Achieved

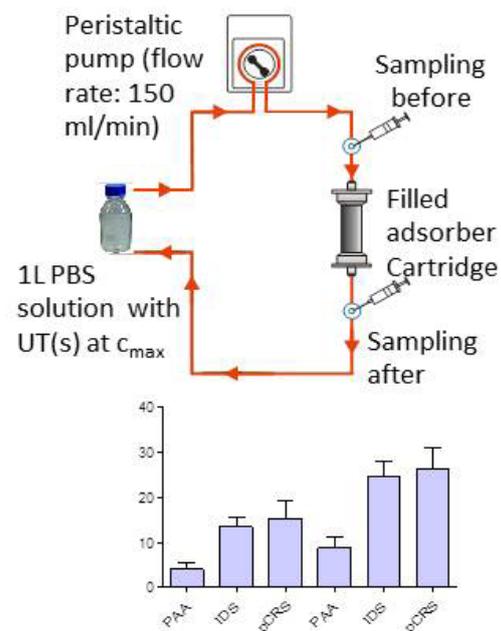
- ❖ Optimisation of adsorbant nano-porous particles for efficient binding of uremic toxins.
- ❖ Determination of capacity of modified nano-porous particles in terms of binding to various hydrophobic uremic toxins such as phenylacetic acid, indoxyl sulfate and p-cresylsulfate.
- ❖ A better understanding of biocompatibility of nanoporous particles and feasibility of their sterilization.
- ❖ Determination of biosafety of particles in terms of toxic side effects using human cell culture models, particles did not cause oxidative stress.

Following the spraying and coagulation process, a well-established synthesis method, sophisticated delivery poly etherimide (PEI) microparticles were successfully engineered. Modified poly etherimide (PEI) particles exhibit a hydrophilic outer surface and a hydrophobic core evidenced by various analytical tool employed in the NPORE study. Non and modified PEI particles are gamma and steam sterilized and tested regarding their biocompatibility. Different factors such as TAT (thrombin/anti-thrombin-complex) and C5a monitored the blood coagulation. In the first case of modified PEI particles, C5a was strongly activated, whereas the sterilized particles showed lower C5a concentration values than those in the presence of non-functionalized particles, passing the maximum acceptable level.

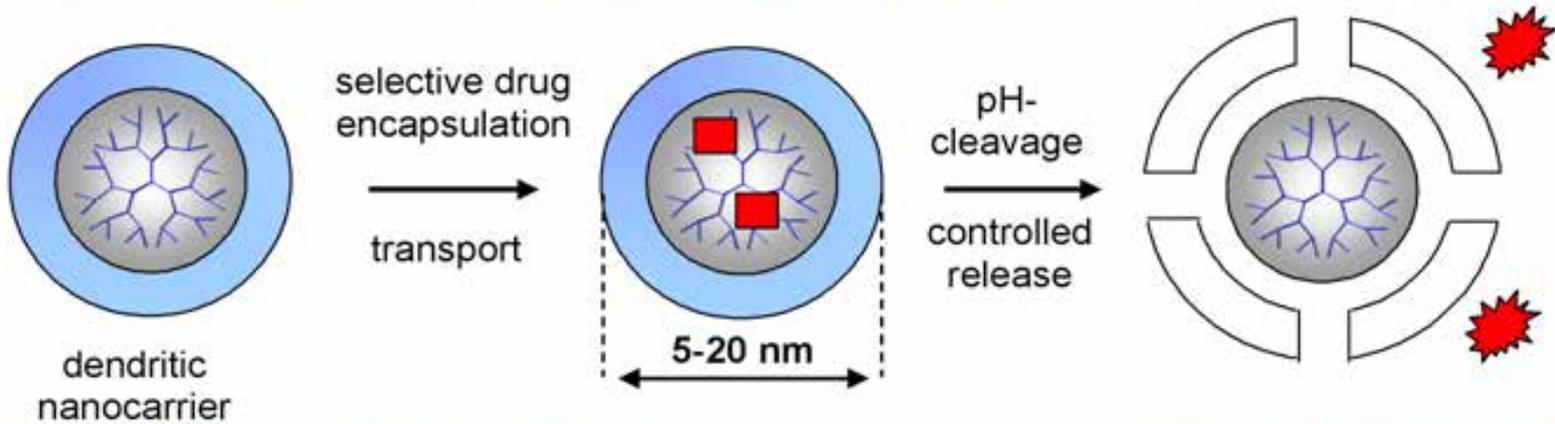
Steam sterilized samples seem to be more biocompatible than gamma sterilized samples/non sterile samples, but nevertheless lead to a strong activation of the coagulation system. Binding capacity of three toxins PAA, IDS and p-CRS, respectively was investigated by reverse phase chromatography and estimated both in human plasma

and blood. In plasma, PAA showed a concentration value of one order of magnitude higher than those for IDS and p-CRS, while IDS has similar value to that of p-CRS. Binding capacity of UT(s) in blood was approximately two-fold lower than the same detected in the blood. PEI particles were tested for their inflammatory and apoptotic effects.

Microscopic data suggested that PEI particles did not cause cell death, neither under tested conditions nor oxidative stress and differentiation to macrophages. PEI particles did not up regulate gene expression of any of the tested proinflammatory markers in human monocytic (THP-1) and aortic endothelial cells (HAECs). ●



Chemoenzymatic synthesis and development of biodegradable, structurally persistent core-shell nano-architectures for drug delivery applications



Source : Project Archives

The Project

Healthcare has seen major advances over the past 100 years with new drugs and technologies making it possible to successfully treat a large variety of potentially serious medical conditions. However, several challenges still continue to provoke. One of this is to ensure that right quantity of drug reaches the target in the human body to have the required therapeutic effect. Human metabolism and immune system begin to impact the drug soon after it is administered and degrade it substantially even before it reaches the targeted tissue. Higher drug doses often have to be administered only to have side effects due to the drug interacting with parts of the body that are not the target of the drug. To optimize dosage related systemic complications it is necessary to design drug delivery systems that ensure directly and continuously drug delivery to the target tissue without degradation enroute.

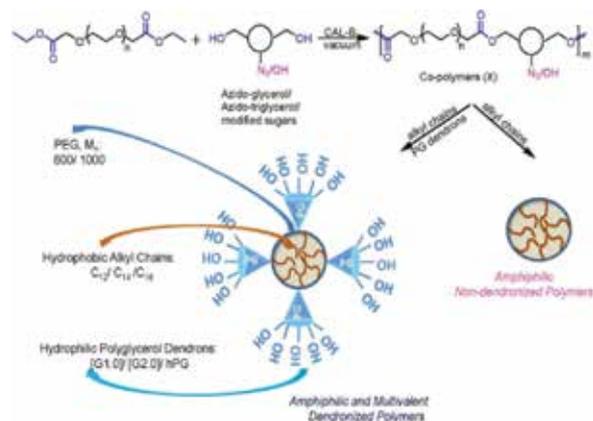
Polymeric micelles have been used as a potential carrier for a wide variety of drugs, due to their solubilization, low toxicity, long circulation, targeting and nano-size. We are working to design and develop novel nanomaterials based on a combination of linear and dendritic architectures and to study the entrapment of the drug molecules in the nanoparticles and their biological response.

Deliverables

- ❖ To design and develop novel environmentally benign bio-catalytic routes to synthesize nanomaterials based upon amphiphilic copolymers.
- ❖ To study the entrapment mechanisms of the drug molecules in the nanoparticles and their release inside the cell.
- ❖ To study the structural properties of nanomaterials using state of art electron microscopy facilities to eventually standardize the method and allow control of the size and distribution of the particles entrapping biomolecules.

- ❖ To analyze bio-distribution and pharmacokinetics in a mice model system.
- ❖ To realize efficient delivery of drug and phenotypic expression in a mice model system.
- ❖ To enhance the aqueous solubility and to study the pharmacokinetics (PK) and the pharmacodynamics (PD) of our 'new chemical entities' (NCEs) and other molecules of interest.

As per the proposal, a bio-catalytic method has been developed to synthesize novel polymeric systems using Novozym 435 catalyzed polymerization of glycerol/ azido glycerol/modified sugars and poly[ethylene glycol bis(carboxymethyl) ether] diesters. The resulting base copolymers were post functionalized with different hydrophobic and hydrophilic moieties and their physico-chemical characterization carried by various techniques to evaluate their size and aggregation behavior in the aqueous solution. Furthermore, the stability of supramolecular architectures and their transport potential was also compared.



Project Investigators Partnering Institutions



Sunil K. Sharma
Department of Chemistry
University of Delhi, Delhi

Rainer Haag
Institute of Chemistry & Biochemistry
Freie Universität Berlin, Berlin



Ashok K. Prasad
Department of Chemistry
University of Delhi, Delhi

Christoph Böttcher
Research Center of Electron Microscopy
Freie Universität, Berlin



Progress Achieved

We have selected one of the most promising polymer for carrying out pharmacokinetic and pharmacodynamic studies which are under progress.

Besides these, some of the hyperbranched polyesters based on PEG and polyglycerol have also been synthesized by "Nanopartica GmbH" and have been explored for their encapsulation potential for Nile red and Pyrene. The enzyme and pH mediated release profile of resulting polyesters was also studied.

Explored PEG (Mn: 600/1000 diethyl ester) and azido glycerol/triglycerol/modified sugar based dendronized/non-dendronized polymers grafted with hydrophobic chains of varying lengths and hydrophilic polyglycerol based regular and hyperbranched dendrons for their transport potential using Pyrene, Nile red, ICG, Dexamethasone, Curcumin and also studied for their cyto-toxicity profile.

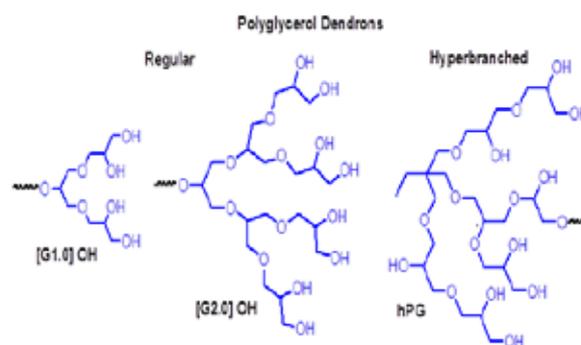
The dendronized polymers grafted with longer hydrophobic chains and [G2.0] generation regular and hyperbranched polyglycerol dendrons have shown superior encapsulation for Nile red and also found to have better biocompatibility even up to the concentration of 500 $\mu\text{g/mL}$ till 72 hr.

The polyglycerol based dendrons were found to increase the biocompatibility of the polymers. The dendronized polymeric systems were observed to exhibit superior transport potential as compared to the respective lower molecular weight amphiphile.

The degree of polymerization (DOP) was increased from 9 to 20 (approx) for base co-polymer for the modified PEG diesters and azido glycerol as compared to the unmodified ones.

Joint Publications Emerged from this Project:

- ❖ S. Gupta, R. Tyagi, V. S. Parmar, S. K. Sharma, and R. Haag. *Polymer* 2012, 53, 3053-3078.
- ❖ S. Gupta, B. Schade, S. Kumar, C. Böttcher, SK. Sharma and R. Haag. *Small* 2013, 9 (6), 894-904.
- ❖ M. Kumari, A. K. Singh, S. Kumar, K. Achazi, S. Gupta, R. Haag, S. K. Sharma. *Polymer Adv. Tech.* 2014, 25, 1208-1215. TM M. Kumari, S. Gupta, K. Achazi, C Böttcher, S. Stefani, J Khandare, R. Haag, S. K. Sharma. *Macromol. Rapid Commun.* 2015, 36, 254-261.
- ❖ M. Kumari, M. Billamboz, E. Leonard, C. Len, C Böttcher, A.K. Prasad, R. Haag, S. K. Sharma. *RSC Advances* 2015, 5, 48301-310
- ❖ S Kumar, K Achazi, C. Böttcher, K Licha, R Haag, S K Sharma. Encapsulation and cellular internalization of cyanine dye using amphiphilic dendronized polymers. *Eur. Polymer Journal* 2015, 69, 416-428. ●



Architecture-aware Timing Analysis and Optimization of Safety-Critical Automotive Software



Source : Getty Images

The Project

Modern cars contain an enormous amount of electronics and software that implement a range of functions from those that are safety critical, to those that are related to driver assistance and passenger comfort. Automotive software development is concerned with careful translation of mathematically proven control laws into concurrent communicating software tasks running on complex networks of processors. With 50-100 computing nodes, numerous sensors and actuators and more than 100 million lines of code, automotive software is one of the most complex cyber-physical systems in existence. The project AUTOSAFE takes up the challenge of capturing their functional and temporal behavior and formally verifying safe operation. This project brings

together valuable expertise in automotive engineering from Germany with software development and verification expertise from India, towards a common goal, namely to come up with a methodology and tool flow for establishing timing convergence in automotive cyber-physical control. The primary achievements include a tool flow offering for automotive system developers that combine three important developments stitching together existing tools from TRDDC and INCHRON. Code generated out of Matlab Simulink/SF is mapped into a symbolic model of the platform using the INCHRON tool flow. INCHRON tools chronSIM and chronVAL, along with AutoGen from TRDDC identifies the actual timing behaviour of the control task on the chosen platform.



The first AUTOSAFE workshop was held at TRDDC, Pune during April 1-3, 2013. From left to right: Samarjit Chakraborty (TUM), Ravi Metta (TRDDC), Pallab Dasgupta (IITKGP), R Venkatesh (TRDDC), P P Chakrabarti (IITKGP), Dip Goswami (TUM), Kajori Banerjee (IITKGP), Karsten Albers (INCHRON), Michael Balszun (TUM), Martin Becker (TUM)

Project Investigators Partnering Institutions



Partha P Chakrabarti
Indian Institute of Technology-Kharagpur
Kharagpur, India



Samarjit Chakraborty
Technical University
Munich, Germany



Arun Bahulkar
Tata Research Development and Design Centre
Pune, India



Karsten Albers
INCHRON GmbH
Potsdam, Germany

Progress Achieved

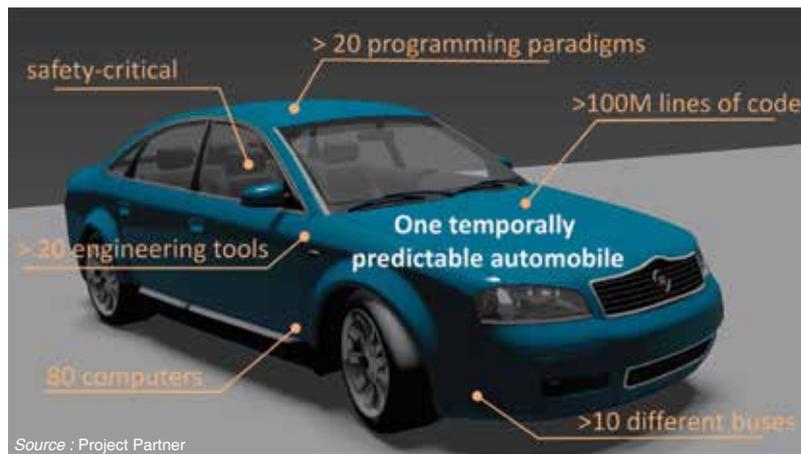
Specific achievements include:

- Development of new timing analysis techniques. The German side has developed new timing analysis techniques for automotive software and scheduling methods for both computation and communication resources in an automotive architecture. The Indian side has developed methods for formal analysis of software (WCET analysis) and timed platform architectures (timed automata).
- New methods for random stimulus generation from Real Time Calculus specifications. The work from IIT Kharagpur on extracting the simulations patterns from RTC-curves addressed an important and for INCHRON long open question within the tool-suite. Starting from the solution provided by IIT Kharagpur a concept was developed and implemented efficiently with a simple variant of the original approach.
- New methods for scheduling and multi-mode sampling for computationally efficient control. The German partners have developed new scheduling techniques that allow electronics and software upgrades in future models of cars, without altering previous designs. Indian partners have a new approach which defines multiple sampling modes targeting computational gains, and synthesizes a control strategy for switching between these sampling modes.

- New methods for platform aware design and validation of control software. This is one of the main objectives of the AUTOSAFE project. It includes research on incorporating platform timing in control design by TUM, and research on reliability aware control design by IIT Kharagpur.

The research has been disseminated through 4 papers in reputed journals and 19 papers in well-known international conferences. A tutorial covering the new approach towards designing safe automotive control systems was delivered by the AUTOSAE team members at the Embedded Systems Week (ESWEEK) 2014, which is the premier event covering all aspects of embedded systems and software. Forthcoming activities include the release of the integrated tool flow and several publications on the joint methodology.

AUTOSAFE



Integration of Non-Destructive Evaluation Based Ultrasonic Simulation

Project Investigators Partnering Institutions



D. Roy Mahapatra
Indian Institute of Science
Bangalore



Ing. Christian Boller
Universität des Saarlandes



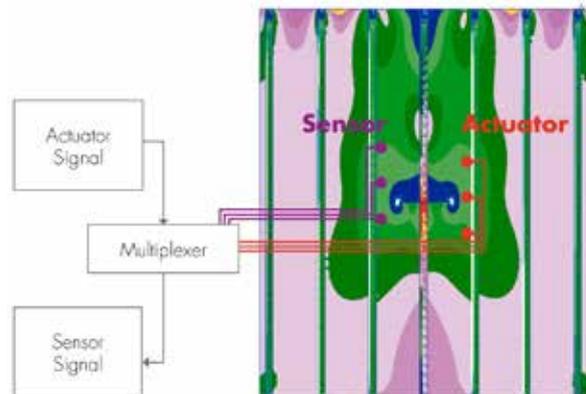
Srinivasan Ramaprasad
Mahindra Satyam Pvt. Ltd.
Bangalore



Rainer Franke
Materialforschung und
Anwendungstechnik GmbH, Dresden

The Project

Many of the infrastructure assets today are ageing and require increased care through monitoring. Aeronautical structures are one of the most sophisticated in terms of design since they allow for damage to exist as long as this damage does not become critical. To avoid damage criticality loads monitoring, fatigue life evaluation and defined inspection are key elements of consideration. New coating and printing technologies in materials science, micro-electro-mechanical systems, enhanced computation power, lower sensing cost and much more has allowed Non-Destructive Evaluation (NDE) to become an integral part of structural components leading towards Structural Health Monitoring (SHM) systems, that will automate a structure's inspection process without compromising safety and reliability. To establish a simulation platform for the design of optimized SHM-systems in terms of SHM verification and validation. ●



IN-DEUS





Joint Workshops

Platform for Research Networking

Science-based Master Planning for River Bank Filtration Water Supply in India

Dresden, Germany
08-10 April 2014



Workshop Coordinators



Dr. N. C. Ghosh
National Institute of Hydrology, Roorkee



Prof. Dr.-Ing. T. Grischek
Dresden University of Applied Sciences
(HTW Dresden)

Background

Bank filtration (BF) systems play a vital role as an ecosystem service for human health in some locations in India by naturally removing chemical contaminants and microbiological pathogens from raw water for drinking. But despite the large potential in India, only a small fraction (<1%) of the raw water for drinking was provided by BF up to 2014. The main aim of the workshop was to develop a science-based master plan on the identification of potential BF sites and their further development to full-scale sites in India.

Agenda, Participation and Deliberations

38 Indian and German researchers, academics and engineers from universities, R & D institutes, water supply and management organizations and from the industry, participated in the three-day workshop. Aspects on design and operation of BF systems, water quality parameters and monitoring, and world-wide case studies on BF were presented during the 2 day-long technical sessions. Potential BF sites across India were presented and specific investigation techniques were discussed. Aspects relevant for increasing awareness on BF in India were presented. Consequently the contents of the master plan for BF were derived and measures to implement the plan were discussed. A field-visit was organized on the third day to the Hosterwitz Waterworks operated by the Dresden public utility company (DREWAG). Current best-

practices in operating drinking water production systems with different abstraction schemes combining managed aquifer recharge and BF followed by post-treatment using aeration, activated carbon filtration and disinfection were demonstrated. Subsequently the laboratory of the Institute for Water Chemistry at the Technische Universität Dresden and the hydraulic engineering laboratory of the HTW Dresden were visited.

Conclusions and Recommendations

There is a consensus that BF can potentially improve the local/regional drinking water supply in India. Microbiological contamination and turbidity are considered to be the two main problems with surface water as a raw water source for drinking. BF offers advantages in both of these respects along with a high attenuation capacity for many other pollutants. As a result of the workshop, a set of recommendations were formulated that included the assessment of potential BF sites, measures for the popularization of BF and future research needs on BF in India. The workshop conclusively established that the successful implementation of a master plan for BF requires not only science-based technical procedures but a much more effective and proactive information (marketing) and education campaign for which respective activities have been proposed in the recommendations. Suggestions for the sustainable implementation of BF in India were also identified.

Microbial Ecology and Application of Inoculants in Biocontrol

New Delhi
07-10 April 2014



Workshop Coordinators



Dr. K. Annapurna
Indian Agricultural Research Institute
New Delhi



Dr. Kornelia Smalla
Federal Research Centre for
Cultivated Plants, Braunschweig, Germany

Background

The Indo-German Bilateral Workshop “Microbial Ecology and Application of Inoculants in Bio-control” held at NASC Complex, New Delhi, was organized by the two coordinators, Dr. K. Annapurna from India and Dr. Kornelia Smalla from Germany. Dr. H.S. Gupta, Director, Indian Agricultural Research Institute, New Delhi inaugurated the workshop. Eleven delegates from Germany and two from Austria along with several Indian delegates participated in the workshop.

Agenda, Participation and Deliberations

Two plenary talks were presented by distinguished scientists, Dr. T P Rajendran from India and Prof. Kornelia Smalla from Germany on the same day. Both the talks focused on the role of PGPR in the management of crop diseases and the key factors influencing their performance and their impact on indigenous microbial communities.

The workshop had three technical sessions. Session I focused on “Microbial Ecology and Disease

Suppressiveness” and deliberated on the aspects of plant rhizosphere, plant endophytes, and their role in disease suppressiveness. Session II focused on “Biocontrol and plant growth promotion” including research advances and impact in nematode control by using molecular techniques, Session III was on “Biocontrol research, Adoption and Industrial application”. New developments presented at the workshop (a) Use of molecular tools which target the uncultivable microbes in the soil and the importance of their study to understand the total microbiome and its influence on the target microbe for plant growth promotion. and (b) Homogenous products with defined content of active ingredients needed for storable products.

Conclusions and Recommendations

The workshop concluded with a promise to develop collaborative programs, and exchange visits among the participating delegates and after a formal vote of thanks by Dr. K. Annapurna certificates of participation was distributed among all the delegates.

Near real time forecasting of soil moisture for water resources management

Bangalore, India
24-28 March 2014



Workshop Coordinators



Prof. M. Sekhar
Indian Institute of Science, Bangalore



Prof. H. Vereecken
Forschungszentrum Juelich

Background to the Workshop

Optimal management of irrigated agricultural systems requires daily information on the soil and crop water status in the field plots. Development of a methodology for real-time optimization of irrigation using soil moisture measurements directly in the field as well as indirectly from a satellite combined with hydrological prediction models is required for improved efficiency. So far, no forecasting systems for soil moisture with a special focus on water resources management and practical applicability exist. The development of such a system as well as its application in cooperation with local water authorities and farmers is the overall aim of this cooperation.

Agenda, Participation and Deliberations

34 participants from Germany (11), India (17) and Research scholars (6) took part in intense deliberation. Ministerial Dirigent M Metzger from BMBF, Germany and Director, IGSTC joined the event. German experts from Forschungszentrum Juelich, Vista Remote Sensing, Max Planck Insititue for Meterology, LMU Munich, University of Bonn and University of Cologne took part in the workshop. The workshop helped to bring the ongoing activities in Germany towards developing soil moisture products at different scales and methods to calibrate/validate the products through the TERENO long

term observatories. The resource persons had series of deliberations and identified synergy between German and Indian know how and discussed plans for intensification and extension of their joint cooperation for the future for mapping soil moisture towards applications of agriculture, floods, droughts etc. The scientific issues to reach this aim were discussed during the workshop, the local conditions were peered through a two day excursion visit to the AMBHAS observatory of the Indian Institute of Science.

Conclusions and Recommendations

One of the specific outcomes was that algorithms of soil moisture retrieval developed both in India and Germany by the resource persons participating in the workshop would be shared and will be applied in both the countries. Work towards developing a super site in India with control experiments for soil moisture, crop with remote sensing in semi-arid climatic environments. Work towards developing a broad umbrella program involving for operational retrieval of soil moisture from satellite remote sensing. Work towards a joint call between DST and DFG on this important theme for both countries. It was planned for visits of one or two research students to TERENO observatory network in Germany. In addition future visits of some of the German researchers to India for working on soil moisture for crop and water resources applications.

Strategies and Concepts of Advanced Manufacturing

New Delhi, India
23-24 Jan. 2014



Workshop Coordinators



Dr Baldev Raj
President, INAE &
PSG Institutions, Coimbatore



Prof Otthein Herzog
ACATECH, Germany

Background

The Indian National Academy of Engineering (INAE) and the National Academy of Science and Engineering (Acatech), Germany in association with Indo – German Science & Technology Centre (IGSTC) jointly organized a Workshop on “Strategies and Concepts for Advanced Manufacturing” on Jan 23-24, 2014 at New Delhi. The objective of the workshop was to build a road map for Indo - German joint initiatives in the area of Advanced Manufacturing.

Agenda, Participation and Deliberations

On January 23-24, 2014, the 2-day Indo-German Science and Technology Centre (IGSTC) workshop on “Strategies and Concepts for Advanced Manufacturing” took place at India International Centre in New Delhi. The workshop was co-organized by the Indian National Academy of Engineering (INAE) and the German National Academy of Science & Engineering (Acatech).

The workshop was divided into five technical sessions (Smart Factory, Human Factors, Framework and Infrastructure Conditions, Business Environment of the Smart Factory and Technologies for Advanced Manufacturing) all of which left ample room for extended discussions between

the Indian and German academicians, researchers and representatives of industry. The presidential address was delivered by Dr. R Chidambaram, the Principal Scientific Advisor to the Government of India, who emphasized that cooperation between Germany and India will go a long way in helping India emerge as a global leader in science, engineering, technology management and innovation.

Conclusions and Recommendations

The discussions at the Workshop identified a range of opportunities for India-Germany collaboration. The paradigm change has taken place in the field of Manufacturing in the two Academies. This will strive to promote and steer collaboration between India and Germany in the field of manufacturing and help prepare for the transition to Smart/Advanced Manufacturing.

The major recommendations deliberated during the workshop were to use best efforts to promote, facilitate and evaluate a range of activities identified during the discussions. It was also recommended to encourage and support national and bilateral agencies such as IGSTC to adopt these areas as priorities for funding; encourage partnerships through workshops, collaborative research and pilot projects and review progress on the collaborative activities mentioned above.

Diagnostics and Translational Genome Sequencing in Clinical and Public Health Microbiology

Chennai, India
17-21 March 2014



Workshop Coordinators



Dr G Balakrish Nair
THSTI, Gurgaon



Prof Trinad Chakraborty
Justus-Liebig University, Giessen

Background

Clinical and public health microbiology and epidemiology are on the threshold of a major transformation driven by high-throughput genome sequencing, for use either as an adjunct or even as an alternative to traditional diagnostic approaches. The pace of technological development in sequencing is stupendous with sequencing capacity currently doubling every six months. The introduction of metagenome-based patient management in clinical practice now appears possible. Against this background, it was proposed to organise an Indo-German Workshop on this technology and clinical applications to facilitate development of research collaborations, synergies based on expertise of the different groups and provide a forum to discuss the emerging tools with clinical practitioners of both countries.

Agenda, Participation and Deliberations

The Workshop was held at Madras Medical Mission, Chennai and Dr. Anusha Rohit was the Organising Secretary. 17 scientists from different parts of India and 11 scientists from Germany attended the workshop and the German delegation was led by Prof Dr. Trinad Chakraborty from University of Giessen. Dr. Chakraborty from Germany presented the future applications of next generation sequencing and outlined the steps that need to be taken by researchers and clinicians to bring the application to the level at which the patients in hospitals

would be directly benefitted. Dr. Hasnain from India described the developments that have taken place in tuberculosis research due to the application of NGS. Dr. Kronke provided an overview of the research in the German Center for Infection Research (DZIF) and outlined the international outreach Programs of the Center. There were five thematic sessions covering NGS applications in public health and clinical microbiology; platform technologies such as biobanks and bioinformatics; NGS in understanding pathogen biology; metagenomics in health and disease; environment and public health implications.

Conclusions and Recommendations

New developments presented at the event include various bioinformatics tools that are used for analysis of NGS data in Germany and India, comparative advantages and limitations of the tools available, the outcome of genomic epidemiological studies on outbreaks of foodborne pathogens and hospital based infections, use of NGS platforms for study of resistomes, identification of novel antibiotic resistance genes, use of NGS for understanding host response to infections and metabolic profiles of the host, use of NGS for study of microbial diversity in environmental samples and identification novel genes that may be involved in virulence, antibiotic resistance or environmental fitness. Both the groups have identified important scientific gaps that can be addressed through collaborative research and taking advantage of complementary expertise in the two groups.

Strategies for improved bone replacement Materials and orthopaedic implants: Design – Manufacturing – Technologies

Dresden Germany
19-21 Feb. 2014



Workshop Coordinators



Dr. Bikramjit Basu
Indian Institute of Science
Bangalore



Dr. Michael Gelinsky
Technische Universität Dresden

Background

Among the human health problems, the cases of patients suffering from musculoskeletal disorders are rapidly increasing, even in the middle aged populations. Under such diseased conditions, an appropriately designed and fabricated biomaterial is necessary for the restoration of injured tissue. Rapid prototyping (RP) techniques are being applied extensively for the fabrication of porous three dimensional scaffolds for tissue engineering. These techniques aid in the design of patient-specific implants based on the CAM/CAD datasets of the defect region generated from computed tomography (CT) of the patient. The combination of such 3D scaffolds and autologous cells from the patients form the crux of tissue engineering to repair and replace failed tissues/ organs.

Agenda, Participation and Deliberations

In the above perspective, the Indo-German symposium “Strategies for improved bone replacement materials and orthopaedic implants: design – manufacturing – technologies”, held in Dresden, Germany between 19th – 21st Feb., 2014 laid a unique platform for the exchange of scientific ideas among a select group of active researchers from the biomaterials, tissue engineering and medical field. The objective of the symposium was to bring to light, some on the state-of-the-art manufacturing technologies based on rapid prototyping for the design and fabrication

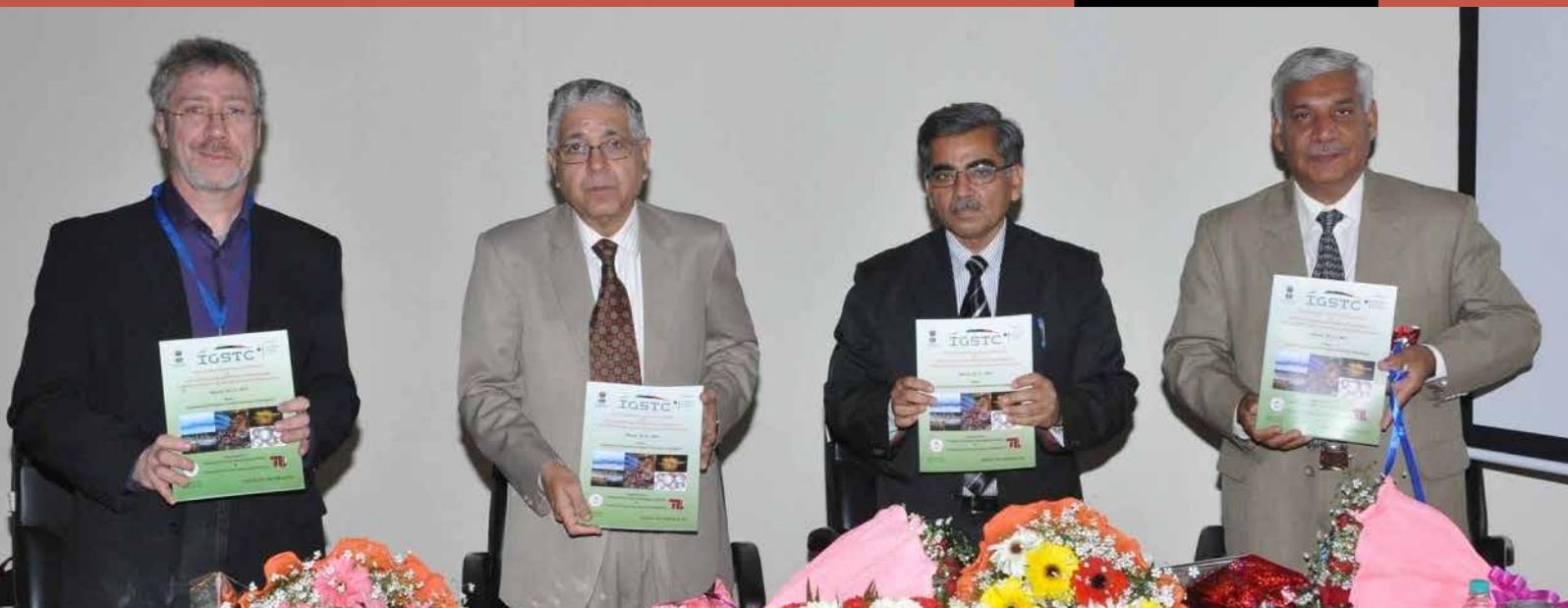
of advanced biomaterials and implants. The symposium proceedings were distributed over 2 days and categorized under 8 technical sessions, each of which consisted of 4-6 speakers. Among the 33 presentations, 15 were made by Indian participants, while the rest were from the German contingent and a couple from Latvia and Lithuania. On day one, the talks were focused on 3D plotting and 3D printing techniques, porous metallic foams, alginate-based matrices for bone tissue vascularization, additive manufacturing methods for bio-inspired blood vessels and drug releasing calcium phosphates. The sessions on day two deliberated on the mechanical and tribological behavior of metals and ceramics in hip prosthesis, the diagnosis of endo-prostheses loosening, medical risks during spine fixations and the application of shape memory alloys for protection against active loosening of implant structures. In the concluding session, the young researchers were given an opportunity to showcase their findings.

Conclusions and Recommendations

In summary, the symposium facilitated the exchange of ideas between researchers from the two nations. It also paved the way for Indo-German collaborative research projects, exchange programs, lab visits and more, some of which have resulted in joint research publications. An annual workshop for the gathering of researchers from the two countries will strengthen scientific ties, especially in the area of biomedical science and engineering.

Surfactant and Amphiphilic Polymers in Nanotechnology-On the Way to Smarter Formulations

Chandigarh, India
20-22 March 2014



Workshop Coordinators



S. K. Mehta
Punjab University, Punjab



Michael Gradzielski
Technical University, Berlin

Background

To strengthen scientific ties between India and Germany, Punjab University hosted a three day workshop on "**Surfactants and amphiphilic polymers in nanotechnology - On the way to smarter formulations**". The main focus of the workshop was on recent developments in use of synergistic effects of surfactant / polymer mixtures for developing novel and smart formulations for the preparation of nanoparticles and nanostructure matrices.

Agenda, Participation and Deliberations

Inaugurating the workshop Vice Chancellor of Punjab University, Prof A.K. Grover emphasized the importance of such events for enhancing the scientific temper in young generation and bussing scientists. The deliberations with 21 invited lectures and more than 50 poster presentations laid a sound basis for identifying common interests and challenges that could be tackled in the future jointly by the eminent scientists of the two countries.

The workshop involved enriching invited lectures from a plethora of scientists. The opening lecture delivered by Prof. Gradzielski highlighted the use of time resolved experiments to gain a deeper understanding of the self assembled systems. Prof. P. Pramanik from IIT. Kharagpur

highlighted the immense potential of nanoparticles in the field of diagnostics such as the separation of biological molecules like DNA, RNA, cancer and degenerative diseases. Keeping in mind the toxicity and biocompatibility of colloidal and nanostructured materials, Prof. Reinhard Schomacker, TU Berlin formulated the solution for the catalyst recycling problem. Dr. Cristina Giordano from Max Plank Institute, Golm gave an insight into the role of macromolecules as in-situ template/ functionalization agents for nanomaterials. Prof. Andreas Walther, Aachen highlighted static and dynamic self assemblies to produce bio inspired materials. The concluding lecture by Prof. Mehta rightfully emphasized the role of surfactants to prepare nanocomposite materials in accordance with the theme of the workshop.

Conclusions and Recommendations

A panel discussion with Prof. Michael Gradzielski, Prof. S.K. Mehta, Prof. P. Pramanik, Prof. Heinz Rehage and Prof. Reinhard Schoemacker dwelt upon the outcomes and evaluated the potential for future developments. Options to generate joint projects were evaluated for a long-lasting and productive Indo-German cooperation to address fundamental colloid science and to encourage the mutual exchange of students and young faculty between the two countries.

Advances in Medical Technology Towards Current Healthcare Necessities

Manipal, India
05-07 March 2014



Workshop Coordinators



Ramesh R. Galigekere
Manipal University, Manipal



Arved Huebler
Chemnitz University of Technology
Chemnitz, Germany

Background

Medical Technology represents the application-facet of biomedical engineering. The Indian population is huge with low average income. However, healthcare necessities are growing and are becoming more and more complex. This is partly to a significant change in lifestyles as the economy evolves. This makes quality-engineering solutions and cost-cutting in the healthcare sector quite essential. This can be achieved better with strong partners having complementary skills.

In this context, the workshop was quite relevant and timely given the expertise of Indians in theory, software and experimentation, and that of the Germans in the field of hardware technology and sensors.

Agenda, Participation and Deliberations

Speaking in inaugural session, the Chief Guest at the function, Dr. Valiathan, National Research Professor, Govt. of India highlighted the current health care necessities in India, the role of technology in addressing the same, and the advantages of collaboration between the scientists and engineers from Germany and India.

The Workshop program was divided into four sessions. The topics of various lectures/presentations included Printed Electronics and its possible applications; Functional materials and novel & better contrast agents; Lab-on-chip platform towards advanced medical technology; New possibilities in endovascular therapy, Infection-control in hospitals based on sensor clouds and the Indian scenario on laboratory-diagnosis of TB; anthropomorphic aspects, gait-analysis and functional electric stimulation in improving gait; medical imaging, signal and image processing techniques reflecting new advances and overall cost-reduction in healthcare; therapeutic ultrasound; Live cell monitoring, and diagnosis based on molecular markers – towards personalized medicine, and next generation sequencing in clinical applications; zebrafish as a model organism in developmental biology; applications of micro-Raman spectroscopy study in biomedical applications.

An interesting review on low-cost innovation, and a discussion on risk management for medical software were also a part of the workshop.

Water and Wastewater Management for Sustainable Development

Delhi, India
30-31 Jan. 2014



Workshop Coordinators



Ashok K. Keshari
Indian Institute of Technology Delhi, India



Wilhelm J. F. Urban
Technical University of Darmstadt

Background

Supplying safe drinking water is becoming one of major challenges due to growing water demand, shrinking freshwater resources, increasing complexity of water pollution problems, inadequate pollution prevention and control measures and lack of sustainable technologies to tackle increasing complex real life problems. The water and wastewater management issues are demanding greater attention and interest in view of growing water scarcity and water pollution problems varying in complexity, dimension, nature and severity that have cropped up in many parts of world due to various anthropogenic activities.

The main objective of this workshop cum round table discussion was to deliberate the real crux of the problems encountered in the area of water and wastewater management, to share the scientific knowledge and experiences, and to identify the current needs and challenges faced in the various areas which can be tackled jointly through mutual cooperation and collaborative projects.

Agenda, Participation and Deliberations

The topics deliberated the six technical sessions, namely,

“Groundwater Recharge and Rainwater Harvesting”, “Integrated Water Resources Management”, “Water and Wastewater Treatment”, “Wastewater Management”, “Improving Water Supply and Irrigation Systems”, and “Specific Industry Problems”. A round table discussion was held for the collaborative project formulation, which was well attended by academic and industrial experts from India and Germany. More than 75 experts and young researchers participated in this joint scientific workshop. There were 42 research papers and 35 papers were presented under various technical sessions.

Conclusions and Recommendations

The event provided a unique platform for interaction and sharing technical know-how, views and experiences and necessary feedback to formulate collaborative projects and field scale pilot implementation of sustainable technologies. It will also help shape mutual cooperation to develop innovative improved scientific methods and sustainable technologies for water and wastewater management that can be translated on the ground to achieve the desirable and tangible outcomes along with its sustainability in real life scenario.



DST-Max Planck **Program**

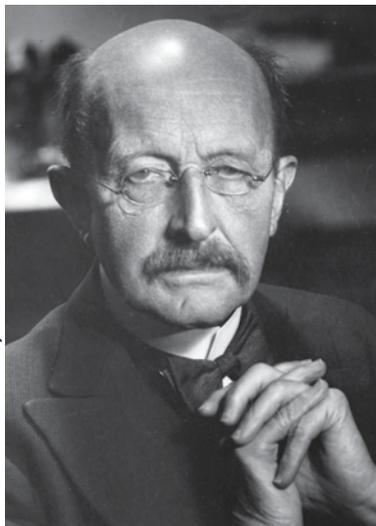
Connecting Excellence



DST–Max Planck Society Program

Connecting Excellence

Source : Max Planck Society



The Department of Science & Technology (DST), Govt. of India and Max Planck Society (MPG), Germany have collaborated, through an agreement signed in 2004, to constitute and operationalise DST–Max Planck Society Program.

Running since year 2004, the DST-Max Planck Society Program has two flagship initiatives under its umbrella aimed at creating opportunities for collaboration and sustained interactions with S&T research priorities.

IGSTC has been entrusted with the responsibility of implementing the DST/MPG Program from Indian side.

Science cannot solve the ultimate mystery of nature. And that is because, in the last analysis, we ourselves are part of nature and therefore part of the mystery that we are trying to solve.'

Max Planck

Max Planck Partner Groups at Indian Institutes

The “Partner Group” is an instrument created by the Max Planck Society (MPG) for the purpose of strengthening the ties between Max Planck Institutes and research institutes from other countries. Partner Group is a mechanism to intensify cooperation between individual scientists through jointly conceptualized and implemented S&T research projects.

The “Max Planck Partner Group at Indian Partner Institute” has been developed as an instrument for supporting collaborative research in target areas prioritized on the basis of their relevance to immediate problems and interests of institutions involved from both sides.

Partner Groups are headed by Indian scientists who return to India after completing their extended research residency at a Max Planck Institute. Partner Groups allow the involved scientists to lead appropriately equipped research groups in order to continue their research activities in close co-operation with their former German hosts.

Each Partner Group is supported to the tune of €20000 per year by MPG with a matching contribution of equivalent ₹ amount by the DST. Grants are expected to be utilized, as far as possible, for the purpose of creating MPI like facilities at the respective Indian host institutions.

GRAVITATIONAL WAVE PHYSICS



Dr Archana Pai
Indian Institute of Science
Education and Research
Thiruvananthapuram

PARTNER GROUPS



Prof Bernard Schutz
MPI for Gravitational Physics
Potsdam

Project Abstract

Gravitational waves (GW) are ripples in the curvature of spacetime which propagate as a wave, travelling outward from the source. The Partner Group will work on generating analytical waveform and gravitational wave data analysis to focus on solving the equation of motion through detection and parameter estimation of GW.

COSMOLOGY & GRAVITY



Dr S. Shankaranarayanan
Indian Institute of Science
Education and Research
Thiruvananthapuram

PARTNER GROUP



Prof Herman Nicolai
MPI for Gravitational Physics
Potsdam

Project Abstract

The partner group shall focus on the top-down approach to quantum gravity as opposed to the traditional bottom-up approaches like the string theory or loop quantum gravity. The main aim will be to use observations to build reliable models of quantum gravity and look for broad features with robust experimental signatures.

GENETIC DIVERSITY STUDIES



Dr Madhusudan R. Nandineni
Centre for DNA Fingerprinting and
Diagnostics, Hyderabad

PARTNER GROUP



Prof Mark Stoneking
MPI for Evolutionary Anthropology
Leipzig

Project Abstract

The partner group aims at discovering new bacterial species which can affect the residing salivary microbiome in the human population of India from various regions having differing food habits and cultural backdrops. The group seeks to determine whether the Indian population have a basic core microbiome for saliva.

GLYCONANO - TECHNOLOGY



Dr Raghavendra Kikkeri
Indian Institute of Science
Education and Research, Pune

PARTNER GROUP



Peter H Seeberger
MPI for Colloids and Interfaces
(19.12.2011 – 18.12. 14)

Project Abstract

The Partner Group will focus on engineering of multifunctional nanoparticles that can exploit biological processes to guide the carbohydrate mediated targeting, self-assembly, and remote actuation of nanoparticles to treat tumors in mouse models of cancer. The longterm goal of this project is to amplify carbohydrate mediated tumor targeting to enhance diagnostic and therapeutic capabilities.

CHEMICAL ECOLOGY (PLANTS-INSECT INTERACTION)



Dr Shree Prakash Pandey
Indian Institute of Science
Education and Research
Kolkata

PARTNER GROUP



Prof Ian T. Baldwin
MPI for Chemical Ecology
Jena

Project Abstract

The Partner Group plans to undertake detailed study to understand the role of small-regulatory RNAs (SmRNAs) in plant defense mechanisms against herbivores. The main hypothesis being tested as part of the project is the post-transcriptional regulation by small RNAs and the insect defense pathways.

STRUCTURAL BIOLOGY OF VESICULAR TRAFFICKING



Dr Sunando Datta
Indian Institute of Science
Education and Research
Bhopal

PARTNER GROUP



Prof Marino Zeria
MPI for Molecular Cell Biology and
Genetics
Dresden

Project Abstract

The partner group is focussing on Screening of putative Rab5 GAPs for their role in Rab5 to Rab7 conversion with Structural elucidation of P5 protein complex: towards understanding the structure-function relationship in a highly conserved endocytic protein machinery.

ATMOSPHERIC CHEMISTRY & COMPOSITION



Dr Vinayak Sinha
Indian Institute of Science
Education and Research, Mohali

PARTNER GROUP



Prof Jos Ielieveld
MPI for Chemistry Mainz
(19.12.2011 – 18.12. 15)

Project Abstract

OH radical is key to understanding the chemistry of the atmosphere. It also fuels ozone and secondary organic aerosol formation. The partner group aims at initiating a measurement program in India for understanding atmospheric oxidation capacity driven by OH radical and reactive VOC emissions, and their climate and air quality ramifications.

DATA MANAGEMENT & MINING



Dr Srikanta Bedathur
Indraprastha Institute of
Information Technology, Delhi

PARTNER GROUP



Prof Gerhard Weikum
MPI for Informatics
Saarbrucken

Project Abstract

Working on various facets of large-scale graph mining and searching, the focus of the group is on developing scalable algorithms which can be integrated into modern graph data management systems with three components: (i) navigation problems on large graphs, (ii) visual exploration of graphs and (iii) modelling and mining of dynamic graphs.

POLYMER SYNTHESIS AND APPLICATION



Dr Parameswar K. Iyer
Indian Institute of Technology
Guwahati

PARTNER GROUP



Prof Klaus Muellen
MPI for Polymer Research
Mainz

Project Abstract

The Partner Group aims to develop new conjugated co-polymers with enhanced optical, electrical and thermal properties that can be used as material for efficiently harvesting light and electric charge in devices such as photovoltaic cells and light emitting diodes.

NEW AMINOCATALYTIC ASYMMETRIC TRANSFORMATIONS



Dr Subhas C Pan
Indian Institute of Technology Guwahati

PARTNER GROUP



Prof Benjamin List
MPI for Kohlenforschung Muelheim

Project Abstract

Organocatalytic asymmetric cyclization reaction is one of the powerful ways to make chiral cyclic compound. The goal of the partner group is to develop highly enantioselective kinetic resolution reaction involving different 2,2-disubstituted cyclohexanones and 2-substituted cyclohexanones as substrates.

CHARACTERISING THE PROPERTIES OF BIOLOGICAL AEROSOL PARTICLES UNDER DIFFERENT ENVIRONMENTAL AND SEASONAL CONDITIONS OVER THE INDIAN TROPICAL REGION



Dr Sachin S Gunthe
Indian Institute of Technology Madras

PARTNER GROUP



Prof Ulrich Pöschl
MPI for Chemistry
Mainz

Project Abstract

Assessment for possible climatic and health impacts: The objective is to perform intensive field and long term measurements and analysis of biological aerosols to characterize the number size distribution on local and regional scale under different environmental and seasonal conditions over the continental and marine Indian region.

REGULATION OF RNA SPLICING BY A NOVEL UBIQUITIN RELATED PROTEIN



Dr Shravan Kumar Mishra
IISER Mohali

PARTNER GROUP



Prof Stefan Jentsch
MPI for Biochemistry
Martinsried

Project Abstract

Ubiquitin-related Sde2 protein is poised to play a major regulatory role during RNA splicing. This project proposes a novel mechanism of alternative RNA splicing mediated by the ubiquitin-like protein Hub1. The study would help to understand how the spliceosome is regulated, it would also add to the understandings of the ubiquitin field.

MULTIFUNCTIONAL HYBRID NANOSTRUCTURES FOR ALTERNATIVE ENERGY SYSTEMS



Dr Amreesh Chandra
IIT Kharagpur

PARTNER GROUP



Prof Katharina Landfester
MPI for Polymer Research Mainz

Project Abstract

This Partner Group aims to focus research on novel polymer/inorganic hybrid nanostructures for application in renewable energy devices and associated processes. It is expected that these new hybrid nanostructures would be able to enhance the characteristics of Biological Fuel Cells.

ROLE OF CELLULAR MEMBRANES IN STRESS SIGNALLING AND PROTEIN HOMEOSTASIS MAINTENANCE



Dr Swasti Raychaudhuri
CSIR- CCMB, Hyderabad

PARTNER GROUP



Prof F Ulrich Hartl
MPI for Biochemistry
Martinsried

Project Abstract

Membrane proteins are required for specific passage of selected substances, many of which participate in signalling. The major aims of the project are characterization of candidate membrane proteins involved in stress-signalling, cell membrane dynamics during stress and aging and nuclear membrane dynamics during stress and aging.

COUPLING AND DYNAMICS OF SOLAR ATMOSPHERE



Dr Durgesh Tripathi
Inter-Univ Centre for Astronomy and
Astrophysics, Pune

PARTNER GROUP



Prof Sami K Solanki
MPI for Solar System
Research, Lindau

Project Abstract

The two main goals of the project are to study (a) the heating of the upper solar atmosphere with the emphasis on the heating of active regions and (b) the magnetic configuration in source regions of CMEs and the early phase evolution of CMEs. The research will provide a better understanding on the coupling of the solar atmosphere.

Max Planck - India Fellowship/Mobility Grant

Max Planck-India Visiting Fellowship is a distinction for highly qualified and talented scientists. The Fellowship is awarded to scientifically outstanding, promising young Indian scientists.

Individuals selected for the award get the opportunity to work with Scientists at the Max Planck Institute (MPI) relevant to their area of expertise for up to 2 months a year for four consecutive years.

Fellowship holders receive from MPG a sum of €3,000 per year, for up to four years, with Indian side providing travel support for each research stay.

	Fellow	MPI Counterpart	Field of Research / Title
CALL 2011			
1	S. Krishnamurthi Institute of Microbial Technology, Chandigarh	Bremen R. Amann MPI for Marine Microbiology	Polyphasic taxonomic characterization of marine bacteria and analyses of the microbial diversity in Indian marine waters using culture-independent approaches
2	Suneel Kateria Delhi University	Wolfgang Gaertner MPI for Bioinorganic Chemistry, Mülheim	Deciphering the role of the flanking N- and C- terminal regions in the modulation of photocycle kinetics of a LOV domain of a marine algal phototropin
3	Sandeep Kaur Delhi University	Matthias Stein MPI for dynamics of complex technical systems, Magdeburg	Transition metal dithiolato complexes as functional models for hydrogenases
CALL 2012			
1	Koushik Dutta IISER, Bhopal	Georg G Raffelt MPI for Physics, München	Inflationary cosmology and its connection to particle physics
2	Naveen C. Bisht NIPGR, New Delhi	Jonathan Gershenzon MPI for Chemical Ecology Jena	Investigation the role of glucosinolate content towards plant fitness in <i>Brassica Juncea</i>
3	S. Chidambaram Vision Research Foundation, Chennai	Reinhard Jahn MPI for Biophysical Chemistry Goettingen	Dissecting the regulatory role of adiponectin signaling in human retinal synaptic vesicle trafficking under physiological and pathological conditions
CALL 2013			
1	P Anil Kumar IMT, Chandigarh	Friedrich Widdel MPI for Marine Microbiology, Bremen	Physiology of mixotrophic planktonic bacteria
2	Satya Pal Nehra Deenbandhu Chhotu Ram Univ of Sci & Tech, Murthal	Dwayne Miller MPI for Dynamics and Structure of Matters Hamburg	Preparation and Characterization of semiconductor Photocatalysts for Surface Reaction Dynamics Study and their Applications
3	Richa Rai BHU, Varanasi	Jonathan Gershenzon MPI for Chemical Ecology, Jena	Application of metabolite, transcript and flux measurements to investigate the effect of elevated ozone and carbon dioxide on yield and pest protection of C3 and C4 crops
4	Kamal P Singh IISER, Mohali	J M Rost MPI for Physik Komplexer Systeme, Dresden	Sub-fs control of photo-dynamics in atoms/molecules using shaped XUV pulses



Financial Statements



Audit Report 2012-13

SSAS & ASSOCIATES

CHARTERED ACCOUNTANTS

Branch- D/147, Pushpanjali Enclave; Pitampura, Delhi-110034

Tel: 91.11.27010841; 91.9868144009, email- sansaxonline@gmail.com

Auditors' Report

To the Members ,Governing Body of the Indo -German Science and Technology Centre, New Delhi.

We have audited attached Balance sheet of **the Indo German Science and Technology Centre , New Delhi**("the Society") registered under Societies Registration Act , 1860 as at 31st March 2013 and the Income and Expenditure account and Receipt and Payment Account of the Society for the year ended, annexed thereto. These financial statements are the responsibility of the Society Management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with auditing standards generally accepted in India. Those Standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining ,evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis of our opinion.

We report that :

- a. we have obtained all the information and explanations which, to the best of our knowledge and belief were necessary for the purpose of our audit;
- b. (b) in our opinion, proper books of accounts have been kept by the Society so far as appears from our examination of those books;
- c. (c) the balance sheet, income and expenditure and receipt and payment account dealt with by this report are in agreement with the books of accounts;
- d. (d) as there are presently no authoritatively established accounting principles for the specialised aspects related to societies not having any commercial activity, these statements have been prepared on the basis of accounting policies referred to in the Note `G` of the financial statements. On this basis, in our opinion and to the best of our information, and according to the explanations given to us, the said accounts give a true and fair view:
 - (i) in the case of the balance sheet, of the state of affairs of the Society as at 31st March 2013; and
 - (ii) in the case of the Receipt and Payment Account together with Income and expenditure Accounts, of the Surplus of income over expenditure for the accounting year ending 31st March 2013.

for **SSAS and Associates,**
Chartered Accountants
Firm Registration No. : 08550N

Sd/-

(ALPANA SAXENA)
Partner
Membership No. 095837
Place : New Delhi
Date :

SCHEDULE ANNEXED TO AND FORMING PART OF THE BALANCE SHEET, INCOME & EXPENDITURE ACCOUNT AND RECEIPT & PAYMENT ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2013.

SCHEDULE- 'H'

ACCOUNTING POLICIES AND NOTES ON ACCOUNTS

Objective of the Organisation

The Indo German Science and Technology Centre(Society) established in India by the Governments of India and Germany, to facilitate and promote the interaction, in India and Germany of government, academia and industry in science and technology. It is to build and improve research and technology synergies between countries, focusing primarily on natural, life, and engineering sciences. The centre was registered in India on 14th June 2010 under Societies Registration Act, 1860.

A. SIGNIFICANT ACCOUNTING POLICIES

1. Accounting Period:

Financials are reported from 01st April of a year to 31st March of the following year.

2. Reporting currency:

The accounting currency of the Society is Indian Rupee.

3. Basis of preparation :

The financial statements are prepared under the historical cost convention and on cash basis. In the absence of any authoritatively established accounting principles for the specialised aspects related to societies not having any commercial activity, these statements have been prepared in accordance with the significant policies as described below.

4. Any surplus of Income over Expenditure carried forward to next year for utilization as per Objectives of the IGSTC.
5. **Method of Accounting:** Accounts are maintained on cash basis
6. Grants released for various research projects have been shown under the head "Scientific Expenses" in the "Income & Expenditure Account" on the basis of disbursements made by the Centre. First year releases are made only on the basis of the approved Budget. However, subsequent releases are made on the basis of approved budget and the statement of expenditure of the previous years furnished by the institutions.
7. Loans granted to Industrial partners of the awardees are treated as utilization of fund of the Society. The overhead charges on the loans become due from the date of release of funds. However the overhead charges accrued during the implementation period get amortised and recovered in maximum ten instalments. The recovery of overhead charges shall be accounted for as income during the year of receipt.

8. All the assets acquired for research projects remain with the institution where the research work is carried on. The Centre has however retained the right to transfer these assets to other institutions, if so required, on completion of the projects for which these assets were purchased. The expenditure on these assets has been accounted for in the Income and Expenditure Account under the head "Scientific Expenses". Hence, these assets have not been taken in the Balance Sheet of the Centre.

9. Foreign Currency Transactions :

Transactions : Foreign exchange transactions are recorded at the rate prevailing on the date of transaction.

Translation to Euro: Indian currency assets and liabilities at the year end are stated at the rate of foreign exchange (euro) at the closing of financial year (31.03.2013).

10. Grants Awarded - Recognition:

Grants to an awardee are recognised as commitments based on recommendation of the Scientific Council and final approval of the Governing Body. Based on the commitments made to awardees in a year, aggregate grants are recognised as expenditure to the extent of payment made to each awardee during the year.

11. Income Recognition:

Grants: Grants from the two governments are recognised in the Income & expenditure statements as Grant in Aid only on receipt of the funds from either side.

Interest: Interest income on deposits shall be accounted at the maturity of the term.

12. Fixed Assets:

Fixed assets are stated at cost of acquisition less accumulated depreciation. The cost of an asset comprises of its purchase price and directly attributable costs of bringing the asset to working condition for its intended use.

13. All expenditure and grant payment figures from the German Government side are reported on the basis of statement of expenses received.

14. All direct grant awards towards scientific projects by the German Government are neither recorded as receipt nor expenditure of IGSTC, since the same are not received/ paid in India.

B. NOTES TO ACCOUNTS:

1. Both governments have considered the allocation of equivalent amount of funds up to 10 million euros each to meet the objectives of the Centre and its running expenditure for an initial five years. The annual expenditure may be enlarged by mutual agreement. Out of the said contribution :

a) The Capital and running expenditure of the **Centre** and expenses on account of workshops, seminars, symposiums, preparatory visits, exploratory missions, etc shall be shared equally by **the two Governments**.

b) Expenditure for joint research projects shall be shared by **the two Governments** according to the distribution of costs for the respective parts of the project in each country.

2. During the period under reporting, the total expenditure till the reporting date are as under:

S. No.	Nature of Expenditure	Amount (INR)	Amount (INR)
i).	Shareable:		
	• Capital Expenditure		3,15,840
	• Operational Expenditure		
	(i) By IGSTC, Gurgaon	1,78,71,086	1,85,16,254
	(ii) By IB/BMBF, Germany*	6,45,168	
	Total shareable Expenditure		1,88,32,094
ii).	Research Projects:		
	• Paid by Indian Side to Indian Awardees		1,55,57,750
	Total Indian Side Expenditure (a)		3,43,89,844
	• Paid by German Side to German Awardees* directly (b)		4,08,16,786
	Total Expenditure (a+b)		7,52,06,630

(*)As reported through IB/BMBF.

3. Statement of Distribution of Shareable Expenses:

Amount in Rupees

S. No.	Expenditure	Total	Allocable to Indian Side	Allocable to German Side
1	Shareable expenditure	1,88,32,094	94,16,047	94,16,047
2	Carried Forward Shareable Expenses of the year 2011-12		NIL	44,16,603
3	Total Shareable Expense as on 31 st Mar 2013.		97,16,047	1,38,32,650
4	Contribution Received during 2012-13 including operative expenditure incurred by IB-BMBF directly during the year 2012-13 in Germany		97,16,047	1,90,82,613
5.	Balance of Contribution as on 31 st Mar 2013		NIL	52,49,963

4. Status of Current Award Liabilities:

Amount in Rupees				
<i>Awarded in 2+2mode</i>	<i>Number of awards committed during the year</i>	<i>Amount committed</i>	<i>Amount released up to 31.3.2013</i>	<i>Outstanding future commitments</i>
Indian Side	10	12,50,68,160	6,89,59,520 (*)	5,61,08,640
German Side	10	26,62,36,033	7,46,45,894	19,15,90,139
	Total	39,13,04,193	14,36,05,414	24,76,98,779

(*) includes Rs. 63,79,500/- as loans given to industrial partners as per the terms of the agreement.

5. **Income Tax:** The Society's application for registration u/s 12A of the income tax act 1961 is under process with IT Department. The Management and Tax consultant is of the opinion that objectives of the society are charitable in nature and qualify for exemption u/s 12A of the income tax act, 1961.

6. All expenditure and grant payment figures from the German Government side are reported in the Indian Currency at the exchange rates as per Reserve Bank of India as on the date of close of the financial year i.e. on 31st March, 2013 at Indian rupee at Euro 1 = Rupee 69.5438.

7. All German expenditure reflected in the report are based on the figure provided by IB-BMBF through IGSTC.

8. Related parties Disclosures :

During the year no trust funds were utilized for the benefits of the settlers or the trustees other than reimbursement of expenses incurred by them.

9. An Extra Mural Program under India-German (DST-MPG) Science & Technology Cooperation Program by IGSTC under an agreement with Department of Science and Technology is being administered and managed from Indian side as per the approved activities under DST-MPG MOU signed by the governments of India and Germany. A separate bank account and utilization reports are prepared for the project and annexed to the IGSTC reports.

10. Previous years' figures are regrouped wherever necessary.

Balance Sheet as at 31st March, 2013

			Rupee Version Amount in INR		Rupee Version Amount in INR
	Schedule		Amount as at March 31, 2013		Amount as at March 31, 2012
SOURCE OF FUNDS					
Capital Fund					
Opening Balance		12,446,969			
Add : Surplus/(Deficit)		65,755,244	78,202,214	12,446,969	12,446,969
Current Liabilities					
TDS Payable	H		417		
TOTAL			78,202,631		12,446,969
APPLICATION OF FUNDS					
Fixed Assets					
Gross Block	A	966,927		1,274,097	
Less: Depreciation to date		327,588	639,339	623,010	
Net Block					651,087
Other Deposits					
Staff Advance					20,000
Cash and Bank Balances					
Cash in hand		4,490		378	
Balance with Bank		77,558,802	77,563,292	11,775,504	11,775,882
TOTAL			78,202,631		12,446,969
Accounting policies and notes on accounts As per our report of even date.	G				

For SSAS & ASSOCIATES
Firm Registration No. 08550N
Chartered Accountants

Sd/-
Alpana Saxena
Partner
Membership No. 095837

Sd/-
S. S. SENGUPTA
MANAGER ACCOUNTS &
ADMIN.

Sd/-
A. CHAKRABORTY
DIRECTOR

Place : New Delhi
Date: 21 st August, 2012

Receipt And Payment Account

for the year ended on 31 March, 2013

Schedule	Rupee Version Amount in INR		Rupee Version Amount in INR	
	Amount for the year ended March 31, 2013		Amount for the year ended March 31, 2012	
A. Opening balance				
Other deposits	20,000		-	
Cash in hand	378		-	
Balance with Bank	11,775,504	11,795,882	-	-
B. Receipts				
Grant-in-aid				
Contribution from Dept. of Science and Technology, Govt. of India	80,000,000		75,000,000	
Contribution from Government of Germany	19,082,613	99,082,613	-	75,000,000
Interest from Bank Accounts		1,074,224		746,371
Amount deducted Tax Deducted at Source		929,931		557,368
Amount recovered on behalf of CSIR, Delhi		363,180		302,650
Total		113,245,830		76,606,389
C. Payments				
Scientific project expenses of the Centre	B	15,557,750	53,401,770	
Scientific Workshop / Conference	C	3,594,228	-	
Governing Body/ Scientific Council Expenses	C	2,778,672	2,502,870	
Travelling Expenses	E	953,664	551,719	
Office Expenses - Shareable	F	7,175,584	4,232,241	
Salaries	G	4,014,106	1,987,792	
Purchase of Office Equipment		1,42,762	171,125	
Purchase of Furniture & Fixtures		138,334	77,312	
Purchase of Computer/Printer		34,744	1,025,660	63,950,489
D. Other Payments				
Advance- Staff		-	20,000	
TDS Payments		929,514	557,368	
Amount recovered on behalf of CSIR, Delhi		363,180	302,650	880,018
E. Closing Balance				
Cash in hand		4,490	378	
Bank Balances		77,558,802	11,775,504	11,775,882
		113,245,830		76,606,389
Accounting policies and notes on accounts	H			

As per our report of even date.

For SSAS & ASSOCIATES
Firm Registration No. 08550N
Chartered Accountants

Sd/-
Alpana Saxena
Partner
Membership No. 095837

Sd/-
S. S. SENGUPTA
MANAGER ACCOUNTS & ADMIN.

Sd/-
A. CHAKRABORTY
DIRECTOR

Place : New Delhi
Date:

Income and Expenditure Account

for the year ended 31 March, 2013

Schedule	Rupee Version Amount In INR	
	Amount For The Year Ended March 31, 2013	Amount For The Year Ended March 31, 2012
Income		
Grant-In-Aid		
Contribution From Department Of Science And Technology, Govt. Of India	80,000,000	75,000,000
Contribution From Govt. Of Germany	19,082,613	1,645,297
Interest From Bank Accounts Banks In India	1,074,224	746,371
Total	100,156,837	77,391,668
Expenditure		
Scientific Expenses Of The Centre	15,557,750	53,401,770
Governing Body/ Scientific Council Expenses	27,786,72	2,502,870
Scientific Workshop / Conference	35,942,28	-
Travelling Expenses	953,664	551,719
Office Expenses	7,175,584	5,877,538
Salaries	4,014,106	1,987,792
Depreciation On Fixed Assets A	327,589	623,010
Total	34,401,593	64,944,699
Surplus/(Deficit) Of Income Over Expenditure Carried Over To Balance Sheet	65,755,244	12,446,969
Accounting Policies And Notes On Accounts		

As per our report of even date.

For SSAS & Associates
Firm Registration No. 08550N
Chartered Accountants

Sd/-
Alpana Saxena
Partner
Membership No. 095837

Sd/-
S. S. SENGUPTA
MANAGER ACCOUNTS &
ADMIN.

Sd/-
A. CHAKRABORTY
DIRECTOR

Place : New Delhi
Date:

Schedules Forming Part Of The Income & Expenditure Account And The Receipt & Payment Account

for the year ended on 31 March 2013

Schedule ' A ' Fixed Assets

Rupee Version
Amount in INR

S. No.	Particulars	Rate of Depn.	GROSS BLOCK				DEPRECIATION For the Year	NET BLOCK
			Balance as on 01.04.2012	Additions during the Year upto 30.09.2012	after 30.09.2012	Sold during the year		
1	Computer	60%	430,049.00	5800	28944		270193	194600
2	Office Equipment	15%	147592	122624	20138		42043	248311
3	Furniture & Fixtures	10%	73,446.00	21840	116494		15353	196427
	Total		651,087	150,264	165,576	-	327,589	639,338
	Pervious Year			1,102,355	171,742		623,010	651,087

Schedules Forming Part Of The Income & Expenditure Account And The Receipt & Payment Account

for the year ended on 31 March 2013

Schedule	Rupee Version Amount in INR Amount for the year ended March 31, 2013	Rupee Version Amount in INR Amount for the year ended March 31, 2012
<u>Schedule 'B'</u>		
Scientific Expenses of the centre (India Side)		
Research Projects - Grant	11,282,000	51,298,020
Loan Given to industrial partners for Scientific Projects	4,275,750	2,103,750
	15,557,750	53,401,770
<u>Schedule 'C'</u>		
Governing Body/ Scientific Council Expense		
Governing Body/Other Meetings	2,778,672	1,561,618
Scientific Council	-	941,252
Scientific Workshop/Exhibition	3,594,228	-
	6,372,900	2,502,870
<u>Schedule 'D'</u>		
Travelling Expenses	953,664	551,719
Travel in India and abroad	953,664	551,719
<u>Schedule 'E'</u>		
Office Expense		
Advertisement Expense	20,000	88,762
Transportation Expense	502,458	377,621
Office Equipments	0	93,125
Telephone & Internet Expenses	231,524	215,790
Printing & Stationery	82,279	106,757
Postage and Courier Expenses	2,963	7,375
Office Rent	3,960,700	2,500,000
Inauguration Expenses	0	199,799
Staff Welfare Expense	17,548	39,820
Electricity, Water & Other Maintenance charges	730,340	500,000
Miscellaneous Office Expenses	982,604	103,192
Operational Expenses by IB-BMBF	645,168	1,645,297
	7,175,584	5,877,538
<u>Schedule 'F'</u>		
Salaries	4,014,106	1,987,792
	4,014,106	1,987,792
<u>Schedule 'H'</u>		
Current Liabilities		
TDS Payable	417.00	0.00
	417.00	0.00

Audit Report 2013-14

SSAS & ASSOCIATES

CHARTERED ACCOUNTANTS

Branch- D/147, Pushpanjali Enclave; Pitampura, Delhi-110034

Tel: 91.11.27010841; 91.9868144009, email- sansaxonline@gmail.com

Auditors' Report

To the Members , Governing Body of the Indo -German Science and Technology Centre ,New Delhi.

We have audited attached Balance sheet of **the Indo German Science and Technology Centre , New Delhi**("the Society") registered under Societies Registration Act , 1860 as at 31st March 2014 and the Income and Expenditure account and Receipt and Payment Account of the Society for the year ended, annexed thereto. These financial statements are the responsibility of the Society Management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with auditing standards generally accepted in India. Those Standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining ,evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis of our opinion.

We report that :

- (a) we have obtained all the information and explanations which, to the best of our knowledge and belief were necessary for the purpose of our audit;
- (b) in our opinion, proper books of accounts have been kept by the Society so far as appears from our examination of those books;
- (c) the balance sheet, income and expenditure and receipt and payment account dealt with by this report are in agreement with the books of accounts;
- (d) as there are presently no authoritatively established accounting principles for the specialised aspects related to societies not having any commercial activity, these statements have been prepared on the basis of accounting policies referred to in the Note `G` of the financial statements. On this basis, in our opinion and to the best of our information, and according to the explanations given to us, the said accounts give a true and fair view:
 - (i) in the case of the balance sheet, of the state of affairs of the Society as at 31st March 2014; and
 - (ii) in the case of the Receipt and Payment Account together with Income and expenditure Accounts, of the Surplus of income over expenditure for the accounting year ending 31st March 2014.

for **SSAS and Associates**,
Chartered Accountants
Firm Registration No. : 08550N

Sd/-

(ALPANA SAXENA)
Partner
Membership No. 095837
Place : New Delhi
Date : 5 September 2014

SCHEDULE ANNEXED TO AND FORMING PART OF THE BALANCE SHEET, INCOME & EXPENDITURE ACCOUNT AND RECEIPT & PAYMENT ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2014.

SCHEDULE- 'G'

ACCOUNTING POLICIES AND NOTES ON ACCOUNTS

Objective of the Organisation

The Indo German Science and Technology Centre(Society)) established in India by the Governments of India and Germany, to facilitate and promote the interaction, in India and Germany of government, academia and industry in science and technology. It is to build and improve research and technology synergies between countries, focusing primarily on natural, life, and engineering sciences. The centre was registered in India on 14th June 2010 under Societies Registration Act, 1860.

A. SIGNIFICANT ACCOUNTING POLICIES

1. Accounting Period:

Financials are reported from 01st April of a year to 31st March of the following year.

2. Reporting currency:

The accounting currency of the Society is Indian Rupee.

3. Basis of preparation :

The financial statements are prepared under the historical cost convention and on cash basis. In the absence of any authoritatively established accounting principles for the specialised aspects related to societies not having any commercial activity, these statements have been prepared in accordance with the significant policies as described below.

4. Any surplus of Income over Expenditure carried forward to next year for utilization as per Objectives of the IGSTC.
5. **Method of Accounting:** Accounts are maintained on cash basis
6. Grants released for various research projects have been shown under the head "Scientific Expenses" in the "Income & Expenditure Account" on the basis of disbursements made by the Centre. First year releases are made only on the basis of the approved Budget. However, subsequent releases are made on the basis of approved budget and the statement of expenditure of the previous years furnished by the institutions.
7. Loans granted to Industrial partners of the awardees are treated as utilization of fund of the Society. The overhead charges on the loans become due from the date of release of funds. However the overhead charges accrued during the implementation period get amortised and recovered in maximum ten installments. The recovery of overhead charges shall be accounted for as income during the year of receipt.
8. All the assets acquired for research projects remain with the institution where the research work is carried on. The Centre has however retained the right to transfer these assets to other institutions, if so required, on completion of the projects for which these assets were purchased. The expenditure on these assets has been accounted for in the Income and Expenditure Account under the head "Scientific Expenses". Hence, these assets have not been taken in the Balance Sheet of the Centre.

9. Foreign Currency Transactions :

Transactions: Foreign exchange transactions are recorded at the rate prevailing on the date of transaction.

Translation to Euro: Indian currency assets and liabilities at the year-end are stated at the rate of foreign exchange (euro) at the closing of financial year (31.03.2014).

10. Grants Awarded - Recognition:

Grants to an awardee are recognised as commitments based on recommendation of the Scientific Council and final approval of the Governing Body. Based on the commitments made to awardees in a year, aggregate grants are recognised as expenditure to the extent of payment made to each awardee during the year.

11. Income Recognition:

Grants: Grants from the two governments are recognised in the Income & expenditure statements as Grant in Aid only on receipt of the funds from either side.

Interest: Interest income on deposits shall be accounted at the maturity of the term.

12. Fixed Assets:

Fixed assets are stated at cost of acquisition less accumulated depreciation. The cost of an asset comprises of its purchase price and directly attributable costs of bringing the asset to working condition for its intended use.

13. All expenditure and grant payment figures from the German Government side are reported on the basis of statement of expenses received from Government of Germany.

14. All direct grant awards towards scientific projects by the German Government are neither recorded as receipt nor expenditure of IGSTC, since the same are not received/ paid in India. However the same is included in the "Notes to Accounts" on the basis of Statement received from Government of Germany.

B. NOTES TO ACCOUNTS:

1. Both governments have considered the allocation of equivalent amount of funds up to 10 million euros each to meet the objectives of the Centre and its running expenditure for an initial five years. The annual expenditure may be enlarged by mutual agreement. Out of the said contribution :

- a) The Capital and Operating expenditure of the **Centre** and expenses on account of workshops, seminars, symposiums, preparatory visits, exploratory missions, etc shall be shared equally by **the two Governments**.
- b) Expenditure for joint research projects shall be shared by **the two Governments** according to the distribution of costs for the respective parts of the project in each country.

2. During the period under reporting, the total expenditure till the reporting date are as under:

S. No.	Nature of Expenditure	Amount (INR)	Amount (INR)
i	Establishment expenditure (Shareable)		1,91,51,048
	1) Capital Expenditure	26,574	
	2) Operational Expenditure	1,91,24,474	
	i) By IGSTC, Gurgaon	1,48,04,081	
	ii) By IB-BMBF	43,20,393 *	
ii	Scientific Workshop expenditure (Shareable)		1,84,60,449
	1) By IGSTC, Gurgaon	1,84,60,449	
	2) By IB-BMBF		
iii	Research Projects (Non-shareable)		10,57,46,472
	1) Paid by Indian Side to Indian Awardees	1,67,84,398	
	2) Paid by German Side to German Awardees	8,89,62,074 *	
	Total Expenditure (i + ii +iii)		14,33,31,395

(*)As reported through IB/BMBF.

3. Statement of Distribution of Shareable Expenses:

Amount in Rupees				
S. No.	Expenditure	Total	Allocable to Indian Side	Allocable to German Side
1	Shareable expenditure	3,76,11,497	1,88,05,749	1,88,05,748
2	Carried forward of balance of contribution as on 1.4.2013		Nil	52,49,963
	Net shareable expenditure		1,87,92,461	1,35,55,785
3	Contribution received from IB-BMBF during 2013-14			2,19,39,015
4	Operative expenditure incurred by IB-BMBF during the year 2013-14 in Germany		Nil	43,20,393
	Balance of Contribution as on 31 st March, 2014		Nil	1,27,03,623

4. Status of Current Award Liabilities :

Amount in Rupees

Awarded in 2+2 mode	Number of awards committed during the year	Amount committed	Amount released up to 31.3.2014	Outstanding future commitments
Indian Side	11	14,17,68,160	8,57,43,919 (**)	5,60,24,241
German Side	11	26,62,36,033	16,36,07,968	10,26,28,065
	Total	40,80,04,193	24,93,51,887	15,86,52,306

(**) includes Rs. 91,08,250 /- as loans given to industrial partners as per the terms of the agreement.

5. Income Tax: The Society's application for registration u/s 12A of the income tax act 1961 is under process with IT Department. The Management and Tax consultant is of the opinion that objectives of the society are charitable in nature and qualify for exemption u/s 12A of the income tax act, 1961.

6. All expenditure and grant payment figures from the German Government side are reported in the Indian Currency at the exchange rates as per Reserve Bank of India as on the date of close of the financial year i.e. on 31st March, 2014 at Indian rupee at Euro 1 = Rupee 82.57.

7. All German expenditure reflected in the report are based on the figure provided by IB-BMBF through IGSTC.

8. Related parties Disclosures :

During the year no trust funds were utilized for the benefits of the settlers or the trustees other than reimbursement of expenses incurred by them.

9. An Extra Mural Program under India-German (DST-MPG) Science & Technology Cooperation Program by IGSTC under an agreement with Department of Science and Technology is being administered and managed from Indian side as per the approved activities under DST-MPG MOU signed by the governments of India and Germany. A separate bank account and utilization reports are prepared for the project and annexed to the IGSTC reports.

10. Previous years' figures are regrouped wherever necessary.

Balance Sheet as on 31 March 2014

	Schedule	Amount in INR Amount as at March 31, 2014		Amount in INR Amount as at March 31, 2013	
SOURCE OF FUNDS					
Capital Fund					
Opening Balance		78,202,214		12,446,969	
Add : Surplus/(Deficit)		6,237,853	84,440,067	65,755,244	78,202,214
Current Liabilities					
TDS Payable					417
Amount meant for DST-MPG A/c, wrongly received in Main Account	J		75,000		-
TOTAL			84,515,067		78,202,631
APPLICATION OF FUNDS					
Fixed Assets	A				
Gross Block		665,912		966,927	
Less: Depreciation		178,634	487,278	327,589	639,338
Net Block					
Cash and Bank Balances					
Cash in hand		2,512		4,490	
Balance with Bank	K	84,025,277	84,027,789	77,558,802	77,563,292
TOTAL			84,515,067		78,202,631
Accounting policies and notes on accounts	G				

As per our report of even date.

For SSAS & ASSOCIATES
Firm Registration No. 08550N
Chartered Accountants

Sd/-
Alpana Saxena
Partner
Membership No. 095837

Sd/-
S. S. SENGUPTA
MANAGER ACCOUNTS &
ADMIN.

Sd/-
A. CHAKRABORTY
DIRECTOR

Place : New Delhi
Date: 4 September 2014

Receipt And Payment Account

for the year ended on 31 March, 2014

	Amount in INR Amount for the year ended March 31, 2014		Amount in INR Amount for the year ended March 31, 2013	
A. Opening balance				
Other deposits	-		20,000	
Cash in hand	4,490		378	
Cash at Bank	77,558,802	77,563,292	11,775,504	11,795,882
B. Receipts				
Grant-in-aid : Contribution from Dept. of Science and Technology, Govt. of India	30,000,000		80,000,000	
Contribution from Government of Germany	21,939,015	51,939,015	19,082,613	99,082,613
Interest from Bank Accounts		4,331,062		1,074,224
Amount of Tax Deducted at Source (TDS)		1,029,909		929,931
Amount recovered on behalf of CSIR, Delhi		363,180		363,180
Amount wrongly received in Main A/c		75,000		-
Disposal of old newspaper		230		-
Unspent amount received from University of Hyderabad for ICME , Pune workshop		195,109		-
TOTAL		135,496,797		113,245,830
Payments				
Scientific project expenses of the Centre	16,784,398		15,557,750	
Scientific Workshop	18,460,449		3,594,228	
Other Meetings / Conference	1,368,344		-	
Governing Body/ Scientific Council Expenses	1,865,895		2,778,672	-
Travelling Expenses (National & International)	1,045,722		953,664	-
Office Expenses	6,075,119		7,175,584	
Salaries	4,449,001		4,014,106	
Purchase of Office Equipment	21,375		142,762	
Purchase of Furniture & Fixtures	-		138,334	
Purchase of Computer/Printer	5,199	50,075,502	34,744	34,389,844
Other Payments				
TDS Payments	1,029,909		929,514	
Amount recovered on behalf of CSIR, Delhi	363,180		363,180	
Pervious year's TDS liability liquidated	417	1,393,506	-	1,292,694
Closing Balance				
Cash in hand	2,512		4,490	
Bank Balances	84,025,277	84,027,789	77,558,802	77,563,292
TOTAL		135,496,797		113,245,830
Accounting policies and notes on accounts				

As per our report of even date.

For SSAS & ASSOCIATES
Firm Registration No. 08550N
Chartered Accountants

Sd/-
Alpana Saxena
Partner
Membership No. 095837

Sd/-
S. S. SENGUPTA
MANAGER ACCOUNTS &
ADMIN.

Sd/-
A. CHAKRABORTY
DIRECTOR

Place : New Delhi
Date: 4 September 2014

Income And Expenditure Account

for the year ended on 31 March 2014

Schedule	Amount in INR		Amount in INR	
	Amount as at Ended March 31, 2013		Amount as at Ended March 31, 2013	
INCOME				
Grant-in-aid : Contribution from Department of Science and Technology, Govt. of India	30,000,000		80,000,000	
Contribution from Govt. of Germany (Euro 263892)	21,939,015	51,939,015	19,082,613	99,082,613
Contribution (through expendiutre intimated by BMBF) from Govt. of Germany (Euro 52,324)		4,320,393		-
Interest from Bank Accounts Banks in India		4,331,062		1,074,224
Disposal of old newspaper		230		-
Unspent amount received from University of Hyderabad for ICME , Pune workshop		195,109		-
TOTAL		60,785,808		100,156,837
EXPENDITURE				
Scientific Project Expenses of the Centre	B	16,784,398	15,557,750	
Governing Body/ Scientific Council Expenses	C	1,865,895	6,372,900	
Travelling Expenses (National & International)	D	1,045,722	953,664	
Office Expenses	E	10,395,512	7,175,584	
Salaries	F	4,449,001	4,014,106	
Scientific Workshop Expenses of the Centre	H	18,460,449	-	
Other Meetings / Conference	I	1,368,344	-	
Depreciation on Fixed Assets	A	178,634	327,589	34,401,593
TOTAL		54,547,955		34,401,593
Surplus/(Deficit) of Income over expenditure carried over to Balance Sheet		6,237,853		65,755,244
Accounting policies and notes on accounts	G			

As per our report of even date.

For SSAS & ASSOCIATES
Firm Registration No. 08550N
Chartered Accountants

Sd/-
Alpana Saxena
Partner
Membership No. 095837

Sd/-
S. S. SENGUPTA
MANAGER ACCOUNTS &
ADMIN.

Sd/-
A. CHAKRABORTY
DIRECTOR

Place : New Delhi
Date:

Schedules Forming Part Of The Income & Expenditure Account And The Receipt & Payment Account

for the year ended on 31 March 2014

Schedule ' A ' Fixed Assets

S.No	Particulars	Rate Of Depreciation	Balance As On 1-4-2013	Addition During The Year		Sold During The Year	Total	Depreciation For The Year	Net Block Balance As On 31-3-2014
				Upto 30-09-13	After 30-09-13				
1	Computer And Peripherals	60%	194,600	5,199	-	-	199,799	119,879	79,920
2	Office Equip-ment	15%	248,311	3,500	17,875	-	269,686	39,112	230,574
3	Furniture & Fixture	10%	196,427	-	-	-	196,427	19,643	176,784
	Total		639,338	8,699	17,875	-	665,912	178,634	487,278
	Previous Year		651,087	150,264	165,576	-	966,927	327,589	639,338

Schedule 'B'
Scientific Expenses of the centre (India Side)

Schedules	Amount For The Year Ended March 31, 2014		Amount For The Year Ended March 31, 2013
Research Projects - Grant			11,282,000
1 Chemoenzymatic synthesis and development of biodegradable structurally persistent core -shell nano-architectures for drug delivery applications (NANOTRANS)	2,366,368		
2 Compact Linear Fresnel Reflector (CLFR) for Solar Thermal Power and Process Heat	2,995,507		
3 Development , characterisation and validation of nanoparticles for the adsorption of hydrophobic uremic toxins in renal failure patients (NPORE)	3,092,381		
4 Imparting Stress-Resistance to Crop Plants by Heterologous Transfer of High Altitude Protectin Mechanism (IHBT,Palampur)	878,535		
5 Biotechnological approaches to improve chickpea crop productivity for farming community and industry(ICRISAT)	1,795,000		
6 Developing Sustainable Transgenic Crop Plants tolerant for Drought or a Combination of Drought and heat Stress by Manipulating ABA signaling and Ascorbate-Glutathione Pathways" (ICGEB)	1,489,305		
7 Visualization of automated multi-sensor NDT assessment of concrete structures (NDT DATA FUSION)	1,438,552	14,055,648	
Loan Given to industrial partners for Scientific Projects			4,275,750
1 Imparting Stress-Resistance to Crop Plants by Heterologous Transfer of High Altitude Protectin Mechanism - Krishidhan (IHBT,Palampur)	728,750		
2 Compact Liner Fresnel Reflector (CLFR)Compact Linear Fresnel Reflector (CLFR) for Solar Thermal Power and Process Heat" - Thermax Ltd.	2,000,000	2,728,750	
	16,784,398		15,557,750

Schedule 'C'	Amount For The Year Ended March 31, 2014		Amount For The Year Ended March 31, 2013	
Governing Body/ Scientific Council Expense				
Governing Body (05th GB in Goa. after adusting refund)	890,579		2,778,672	
Scientific Council Meeting (in Germany)	975,316	1,865,895	3,594,228	6,372,900
		1,865,895		6,372,900

Schedule ' D '	Amount For The Year Ended March 31, 2014		Amount For The Year Ended March 31, 2013
Traveling Expenses			
Travel with in India	145,419		953,664
Travel Abroad	900,303	1,045,722	
		1,045,722	953,664

Schedule ' E'	Amount For The Year Ended March 31, 2014		Amount For The Year Ended March 31, 2013	
Office Expense				
Advertisement Expense	16,500		20,000	
Transportation Expense	462,633		502,458	
Telephone & Internet Expenses	218,452		231,524	
Printing & Stationery	95,065		82,279	
Postage and Courier Expenses	9,010		2,963	
Office Rent	3,932,600		3,960,700	
Staff Welfare Expense	17,679		17,548	
Electricity, Water & Other Maintenance charges	724,721		730,340	
Miscellaneous Office Expenses	598,460		982,604	
Operational Expenses by IB-BMBF	4,320,393	10,395,512	645,168	7,175,584
		10,395,512		7,175,584

Schedule ' F '	Amount For The Year Ended March 31, 2014		Amount For The Year Ended March 31, 2013	
Salaries				
Salary including Leave salary and Pension contribution	4,360,968			4,014,106
Medical	88,033	4,449,001		
		4,449,001		4,014,106

Schedule 'H'	Amount For The Year Ended March 31, 2014	
Scientific Workshop		
Indo German Joint Workshop		
1 Strategies for improved bone replacement materials and orthopaedic implants (BioEngg-TUD) (€ 31420)		2,744,671
2 Microbial ecology and application of inoculants in bio-control (Ecology IARI)		1,820,000
3 Advances in medical technology towards current healthcare necessities (Health - Manipal)		1,520,000
4 Diagnostics and translational Genome sequencing in clinical and public health microbiology (Health - THSTI)		2,040,000
5 Strategies and Concepts for Advanced Manufacturing (INAE, Delhi)		1,688,000
6 Surfactants and amphiphilic polymers in nanotechnology-On the way smarter formulations (Poly - PU)		1,736,000
7 Science -based master planning for bank filtration water supply in India (Riverbank)		2,179,229
8 Near real time forecasting of soil moisture for water resources management (Soil – IISc) (to IISc = INR 8,88,000 & to Germany = € 12600 eqv of INR 10,88,522)		1,976,522
9 Water and Wastewater Management for Sustainable (Water -IITD) (to IITD = INR 8,40,000 & to Germany = ₹ 12600 eqv of INR 991666.14		1,831,666
10 Logistic Workshop in Berlin		728,218
11 Brainstorming Energy Worskshop DST/FZJ		174,282
12 ICME Workshop in Pune		21,861
		18,460,449

Schedule ' I '		Amount as on March 31, 2014
Other Meetings / Conference		
1	Project Monitoring Meeting on CLFR, Pune (on going project)	85,068
2	Review Committee Meeting in Germany	872,718
3	Review Committee Meeting in India	161,251
4	IHBT, Palampur project inspection	30,932
5	IGSTC on going Project Review Meeting, India	30,078
6	Due Diligence Meeting Call-2012	188,297
		1,368,344

Schedule ' J '	Amount as on March 31, 2014
Amount meant for DST-MPG A/c, wrongly received in Main Account	75,000.00
	75,000.00

Schedule 'K		Amount as on March 31, 2014
1	Axis Bank	32,612,506
		300,000
2	Axis Bank	32,912,506
3	Union Bank of India	29,053,360
		22,059,411
		84,025,277

Contact Points



A Chakraborty
Director
IGSTC
Gurgaon, India
Ph. : +91 124 4929400
email : director@igstc.org



Martin Goller
Head-IGSTC Germany Office,
International Büro of BMBF,
PT-DLR, Bonn, (Germany),
Ph. : 0228-38211407
email : martin.goller@dlr.de



P V Lalitha
Senior Scientific Officer
IGSTC
Gurgaon, India
Ph. : +91 124 4929400
email : lalitha@igstc.org



Sara Sabzian
International Büro of BMBF,
PT-DLR, Bonn, (Germany),
Ph. : 0049-228-38211420
email : sara.sabzian@dlr.de

IGSTC Over the Years Through the Lens





India Office

Indo-German Science and Technology Centre
Plot No. 102, Institutional Area
Sector 44, Gurgaon – 122003 (India)
Ph : +91 (0) 124 4929400
Fax : +91 (0) 124 4929411
Email: info@igstc.org

German Project Office

German Aerospace Centre
Project Management Agency
Heinrich-Konen-Str. 1
53227 Bonn
Phone; + 49 (0)228 3821 1407

www.igstc.org