ENSEMBLE

Volume 1 (6) | December 2013

Newsletter of the Indo-French Centre for the Promotion of Advanced Research

Indo-French S&T Initiatives

Collaborative Quests
Sustenance is the main challenge of any initiative. While publishing the sixth edition of “Ensemble” we thank you all for your sustained support during the first year of its existence. In recognition of it, last edition of the year is focused on CEFIPRA’s role as relationship builder between the S&T systems of India and France. This role was highlighted during the India-France Technology Summit held during 23-24 October, 2013 at New Delhi in our leader article this time. We thank all our esteemed visitors who graced CEFIPRA’s stall (in this edition’s cover page). The three sessions organized by CEFIPRA during the summit provided invaluable inputs for new initiatives and forward chaining the knowledge generated through CEFIPRA’s support over its 25 years of existence.

The Indo-French cooperation in the domains of Mathematics and Astronomy has been featured as the testimony of long-term knowledge relationships between the two nations. CEFIPRA is continuing its efforts in catalyzing this relationship at different levels. At the doctoral level, the ESONN-CEFIPRA young scholars have returned after successfully participating in the 10th Annual ESONN Training School in Nano-electronics and the interface between physics and biology and have shared their experiences and feedback. The initial assessment suggests that they have benefitted enormously from this experience. Based on the experience of the first year, the University Joseph Fourier, Grenoble has expressed their willingness to continue this relationship during the next annual ESONN training school. Meeting of the best minds between the two countries are being continued through the second CEFIPRA annual lecture series, delivered by Dr. R. Chidambaram, Principal Scientific Advisor to the Government of India on 2nd December, 2013 at Sacley, France.

On behalf of the CEFIPRA family, I take great pride in celebrating the “Bharat Ratna” conferred on Prof. C.N.R. Rao! We seek your guidance, feedback and partnership to go ahead with the actions initiated this year. With the Best wishes on behalf of the CEFIPRA family, I take great pride in celebrating the “Bharat Ratna” conferred on Prof. C.N.R. Rao! We seek your guidance, feedback and partnership to go ahead with the actions initiated this year. With the Best wishes.
projects supported by CEFIPRA. Several Indian and French scientists who are also Principal Investigators of CEFIPRA supported projects gave a live demo of their projects at the pavilion.

CEFIPRA’s pavilion attracted a large footfall and visitors included Hon'ble Minister of Science and Technology, Dr. Jaipal Reddy; French Ambassador to India, Mr. François Richier. This was in addition to several other senior dignitaries from Indian and French government. A large number of scientists and industry professionals also spent time in CEFIPRA's pavilion gathering information about various initiatives of CEFIPRA in support of Indo-French bilateral S&T relations.

In addition to setting up the pavilion CEFIPRA also organized three focused discussion sessions during the Summit. These sessions were on following contemporary topics:

a) Design Research | b) Aerospace Research | c) Knowledge Forward Chain

The sessions evoked an enthusiastic response and gave CEFIPRA very useful feedback and guidance which will help in shaping some of its initiatives in the future (see detailed reports on page v-vi).

SESSIONS ORGANISED BY CEFIPRA AT INDO-FRENCH TECH SUMMIT

INDO-FRENCH AEROSPACE COLLABORATION POLICIES & TECHNOLOGIES

India and France have significant strengths in the Aerospace Engineering and positioned to compliment each other's efforts for advancement in this important field. A roundtable session position “Indo-French Aerospace Collaborations: Policies & Technologies” was organised by CEFIPRA at the Indo-French Tech Summit on 24 October 2014 to discuss issues and challenges in this domain that are of interest to India and France.

Dr. Cédric Post, Deputy Director for International affairs, GIFAS (French Aerospace Industries Association) represented France while Indian SME’s were represented by Dr. Rajiv Chawla, Chairman of IamSME association of Indian SME’s. Other participants were from Indian and French Aerospace industries in private as well as the public sector (Thales, Astrium, Antrix...).

The agenda of the roundtable session was to take stock of existing collaborations between France and India in aerospace field and get a first hand account that stakeholders have had in the course of collaborative aerospace projects. The panelists also shared their insights on factors that they found to be important in determining the effectiveness of these efforts. The panelists highlighted the barriers to collaboration in Aerospace field and how these can be overcome. Each panelist answered the queries and gave valuable suggestions in the Q&A session that followed.

Challenges in the field of Indo-French collaborations in Aerospace sector identified through this session included: Lack of formal agreements between Indian/French clusters; Lack of competitive innovation cluster in India; Poor academia-industry interactions; Lack of trained manpower..... etc. Steps identified to remove these hurdles were industrial and regional cluster formation and promoting innovation through academia industry interactions. Even as many French aerospace companies showed keenness to collaborate Indian SME’s, an MoU was signed between CEFIPRA and EADs.

INDO-FRENCH DESIGN COLLABORATION: EMERGING OPPORTUNITIES

A round table discussion on Indo-French collaboration and Emerging Opportunities was organised by CEFIPRA at Indo-French Global Summit 2013 on 24th October 2013.

The agenda of the roundtable session was to discuss cooperation and collaboration between Indian and French academic and industrial organisation cross culture areas of design and engineering for academic institution as well as industries.

Speakers from both academia and industries specific participated in the discussion and presented their views and steps need for enhancing collaboration between institutions in the two countries and way forward.
Also discussed were the modalities was CEFIPRA support to promote for joint collaboration in this important yet under emphasised area of set endeavour was discussed.

The outcome of the discussions during the sessions can be summarised as under:

- Joint collaborative projects between academia and/or industry from India and France can be submitted for support from CEFIPRA.
- Language barriers needs to be overcome. Lack of a common platform where opportunities and collaborative interests could be identified.

**KNOWLEDGE FORWARD CHAIN**

This session on Knowledge Forward Chain brought out the catalytic role of CEFIPRA in the evolutionary Indo-French S&T eco-system through selected case studies in each segment of the knowledge innovation chain.

For case studies identified for their potential to be pursued further, please see page VII.

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**MoU'S SIGNED AT INDO-FRENCH TECH SUMMIT**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Institutions</th>
<th>Purpose</th>
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<tbody>
<tr>
<td>1</td>
<td>DST INRIA</td>
<td>To launch a Joint Targeted Program in Information and Communication Science and Technology.</td>
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<tr>
<td>2</td>
<td>CNRS</td>
<td>To establish an International Associated Laboratory in the area of Systems Immunology and Genetics of Infectious Diseases.</td>
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<tr>
<td>3</td>
<td>CEFIPRA SGRl</td>
<td>For research on habitat in hot and humid climate.</td>
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<tr>
<td>4</td>
<td>CEFIPRA EADS</td>
<td>To launch &quot;The EADS-CEFIPRA Aerospace Program&quot;</td>
</tr>
<tr>
<td>5</td>
<td>INSERM</td>
<td>To set up an International Associated Laboratory on Transomics and Metabolomics for Liver Diseases.</td>
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<tr>
<td>6</td>
<td>S, INSERM</td>
<td>International Joint Laboratory on Neurosciences.</td>
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<td>7</td>
<td>GS/Safarn-Morpho</td>
<td></td>
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<td>8</td>
<td>IFCCI A3Tech Cluster, Systematic Cluster, Paris Region CUG, India Desk</td>
<td>A3Tech-Systematic India Hub</td>
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<tr>
<td>9</td>
<td>Ashoka University Sciences Po Paris</td>
<td>To set up UG/PG level student exchange program and a faculty exchange program.</td>
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<tr>
<td>10</td>
<td>DTU N+1 Engineering Network, France</td>
<td>To partner in awarding a double Master's Degree</td>
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<tr>
<td>11</td>
<td>BITS Pilani</td>
<td>To set up a student exchange program</td>
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**KNOWLEDGE FORWARD CHAIN INITIATIVES SUPPORTED BY CEFIPRA**

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Project Outcome</th>
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<tbody>
<tr>
<td>Analysis of protein flexibility in biological recognition</td>
<td>Development of Flex base software database, an open-source tool for protein recognition.</td>
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**COLLABORATORS**

- P. Chakraborti Charles Robert

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Project Outcome</th>
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<tbody>
<tr>
<td>Protein transport in Plasmodium falciparum infected erythrocytes</td>
<td>Pathway of parasite coded chaperone hsp-90 protein family discovered as novel drug target against malaria.</td>
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**COLLABORATORS**

- U. V. Varadaraju Bernard Raveau

<table>
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<tr>
<th>Project Title</th>
<th>Project Outcome</th>
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<tbody>
<tr>
<td>Research of new layered oxides for energy storage and conversion</td>
<td>New component of electrode materials for energy storage applicable mainly for Li ion batteries.</td>
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**COLLABORATORS**

- S. Vasudevan Florence Epron

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Project Outcome</th>
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<tbody>
<tr>
<td>Novel hydrophobically modified polymers: Synthesis, characterization and rheology</td>
<td>Development of hydrophobically modified polymers (HMPs) with superior qualities from naturally occurring renewable resource materials.</td>
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</table>

**COLLABORATORS**

- Manohar V. Badiger Dominique Hourdet

The newly designed HMPs based on PAA-g-3-PDCA showed enhanced rheological properties as compared to their unmodified precursors. The viscoelastic measurements indicated the formation of soft physical gels at moderate polymer concentrations and the soft gels exhibited strong thixotropic behaviour with an apparent yield stress. The observation of an engineering yield stress in these gels can have important implications in their use in cosmetic creams, lotions and other pharmaceutical applications. The synthesis of a new hydrophobic compound, 3-PDCA has been patented (US patent) and the synthesis and rheology of HMPs with their implications has been already published in scientific journal. This is the first attempt to modify PAA with the hydrophobic compounds, which are obtained from renewable resource materials.
Waring's Problem

Any positive integer is the sum of at most 19 biquadrates (fourth powers)
The final step to the determination of Waring's constant \( g(4) = 19 \) in 1986

### G(4) = 19

Since \( 79 = 3 \times 26 = 11 \cdot 64 = 704 \),
if an integer is the sum of at most four integers, \( E. \) Waring wrote: “Every integer is also the square of a square, or the sum of up to nineteen such; and so forth. Similar laws may be arrived at for the corresponding defined

#### Previous Estimates for G(4)

- \( g(4) \leq 53 \) (J. Liouville, 1850)
- \( g(4) \leq 47 \) (J. Rémond, 1870)
- \( g(4) \leq 45 \) (J. Lucas, 1870)
- \( g(4) \leq 41 \) (J. Lucas, 1870)
- \( g(4) \leq 40 \) (J. Fleck, 1906)
- \( g(4) \leq 38 \) (J. Landau, 1907)

#### On Waring's Problem: \( G(6) \)

- \( G(6) = 73 \)

#### E. Waring

In 1770, a few months before J.L. Lagrange solved a conjecture of Bachet (1621) and Fermat (1640) by proving that every positive integer is the sum of at most four squares of integers, \( E. \) Waring wrote: “Every integer is the sum of at most 19 biquadrates, or the sum of up to nineteen cubes; every integer is also the square of a square, or the sum of up to nineteen such; and so forth. Similar laws may be arrived at for the corresponding defined numbers of any like degree.”

### INDÒ--FRANCE COOPERATION IN APPLIED MATHEMATICS

In applied mathematics the cooperation between mathematicians from France and India is quite strong. While J.L. Lins was at the helm of INRIM (Institut National de Recherche en Informatique et Automatique) in Rocquencourt, he made efforts to develop close relations with several Indian institutions, especially the Indian Institute of Science, Bangalore, and Indian Institute of Technology-Delhi. This also included a small group of mathematicians working on partial differential equations in the Bangalore section of Tata Institute of Fundamental Research (TIFR). In September 1997 a Master of Scientific Calculus was created at the University of Pondicherry thanks to a cooperation directed by O. Pironneau (Université Pierre et Marie Curie-LJLL).

The cooperation on Scientific Calculus for Mechanics and Engineering between the laboratory of Numerical Analysis of Paris VI and INRIA, Rocquencourt and IIT Delhi, started in 1975. The agreements were renewed in 1993. This program is supported by CEFIPRA, the French Ministry of Foreign Affairs and the Pôle de recherche commun Dassault-Aviation/Université Paris VI.

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**Memorandum of Understanding**

There are several MoU between French and Indian Universities that are propelling joint efforts in mathematics research. One of them involves the University of Pondicherry in India and the universities of Paris VI and Poitiers in France. There have been many scientific exchanges under this agreement over the years supported by the French Embassy in Delhi.

Thanks to an MoU between the Chennai Mathematical Institute (CMI) and ecole Normale Supérieure (ENS), Paris, since year 2000, three students from ENS visit CMI for two months and deliver courses to the undergraduate students of CMI. Three students from CMI also visit ENS for two months each year.

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**Feature**

By Peter Cade

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**Legacy and Achievements**

The influence of French mathematicians on the development of mathematics in India has played a leading role in at least two topics: algebraic geometry in the 1960’s and theoretical partial differential equations in the 1970’s.

J-L. Verdier was responsible of a Programme International de Coopération Scientifique (PICS Inde) of the Centre National de la Recherche Scientifique (CNRS) from 1986 to 1989. A report on this cooperation was published in the Gazette des Mathématiciens of the Société Mathématique de France (n° 49, juin 1991, pp. 59–63).

A second report dealing with the activities from 1986 and 1995 was also published in the same Gazette des Mathématiciens (n° 71, 1997, pp. 62–65).

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**feature**

By Peter Cade

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The relations between mathematicians from France and from India are indeed very old. The first links were established by A. Weil in 1930, and shortly after that, Father Racine played a major role in the development of mathematical research in India.

**ANDRÉ WEIL**
In 1929, Syed Ross Masood, Vice-Chancellor of Aligarh Muslim University, proposed a Chair of French civilization to André Weil, who was recommended to him by Sylvain Levi, a specialist of Indology. A few months later this order was converted into a Chair of Mathematics. Weil reached India in early 1930 and stayed on for more than two years.

Weil wrote two reports on the situation of the universities in India in 1931 and 1936. In his first report he suggested actions for the improvement of Indian mathematics. The conclusion of the second report dealt with the potential of India as a country and the possibility for it to take a leading place in the international mathematical community.

**FATHER RACINE**
Father Racine (1897–1976) reached India in 1937 as a Jesuit missionary after having taken his Doctorate in Mathematics in 1934 under Élie Cartan. He taught mathematics first at St. Joseph’s College in Tiruchirapalli (Tamil Nadu) and from 1939 onwards at Loyola College (Madras). He had connections with many important French mathematicians of that time like J. Hadamard, J. Leray, A. Weil, H. Cartan. His erudition was clear from his lectures; his courses were research oriented in contrast with the traditional way of teaching, which aimed just at leading the largest number of students to success in their exams.

Father Racine taught his students to read recent books, like the one of L. Schwartz on distributions. Father Racine encouraged his best students to join the newly founded Tata Institute of Fundamental Research (TIFR) in Bombay with K. Chandrasekharan and K.G. Ramanathan. This explains why so many mathematicians from that generation who were the leaders in TIFR came from Tamil Nadu.

### THE TATA INSTITUTE OF FUNDAMENTAL RESEARCH (TIFR)
Right after the creation of the TIFR in Bombay, many influential French mathematicians visited the Tata Institute of Bombay and gave courses. In the 50’s, L. Schwartz visited it several times, followed by H. Cartan, F. Bruhat, J.L. Koszul, P. Samuel, B. Malgrange, J. Dieudonné, P. Gabriel, M. Demazure, A. Duda and many others, invited by the Director of that time, K. Chandrasekharan. Later, at the end of the 60’s, A. Weil and A. Grothendieck visited TIFR.

Another MoU was signed in 2009 between the University of Paris VI Pierre et Marie Curie and two Indian institutes namely the CMI and the Institute of Mathematical Sciences(IMSc). Under this MoU and as per the recommendations of the Committee for Developing Countries (COPED) of the French Academy of Sciences one mathematician from Paris VI gives contributes one full teaching duty each year in Chennai. In practice, two professors from Paris 6 go to CMI each year to teach a graduate program for one term each.

### INDO–FRENCH CONFERENCE IN MATHEMATICS
A joint Indo–French Conference in Mathematics took place from 15–19 December, 2008, at IMSc-Chennai. Of the 10 plenary lectures and 30 lectures in parallel sessions, half were by Indian mathematicians and the other half by French mathematicians. In fact H. Cartan passed away a few days before this meeting (at the age of 104), two special lectures (by J. Oesterlé and C.S. Seshadri) were devoted to him the last day.

### CENTRE INTERNATIONAL DE MATHÉMATIQUES PURES ET APPLIQUÉES (CIMPA)
CIMPA is a non-profit international organization established in Nice (France) since 1978, whose aim is to promote international cooperation in higher education and research in mathematics and related subjects, particularly computer science, for the benefit of developing countries, organized several research schools in India. (See Box on page xx for Details)

### CIMPA–SMF–SMAI WIKI PROJECT
A joint initiative of CIMPA, Société Mathématique de France and Société de Mathématiques Appliquées et Industrielles gave rise to a wiki–style website concerning mathematics in the world, with an emphasis on cooperations involving French mathematicians and mathematicians from developing countries.

Understanding formation and evolution of baryonic structures in the universe, the galaxies and the intergalactic medium, is one of the main topics of present day physical cosmology.

In order to address the issue, one needs to answer questions such as how star-formation proceeds, what is the resultant metal production and how it is related to the UV radiation field pervading the universe and what is the molecular content of the gas in the disk of galaxies. In particular, it is important to understand the role played by processes such as infall and outflow of gas into or out of galaxies and mergers of galaxies in exchanging gas between the intergalactic medium and galaxies and vice versa.

As light propagates with finite speed, looking at a far away universe is equivalent to looking back at the universe in its youth. In the framework of standard Big-Bang cosmology a distant object can be identified based on the shift seen in the wavelengths of absorption or emission lines in their spectra. Therefore Big-Bang model provides the framework in which the evolution of the universe can in principle be described by studying the most distant objects.
Any distant QSO (a compact object smaller than a size of our solar system and emitting as much energy as a typical galaxy) can be used as a beacon in the very distant Universe to probe the intervening material. Interstellar clouds of molecular gas in galaxies and diffuse atomic gas in the intergalactic medium between galaxies, located between the QSOs and us along the same line of sight, absorb parts of the light emitted by the QSOs. The resulting spectrum consequently presents dark ‘valleys’ that can be attributed to well-known elements and possibly molecules. These absorption lines can be used as a unique tool to tackle the above mentioned problems. Besides, analysis of specific absorption lines can be used as a probe for studying the time evolution of cosmic microwave background radiation and dimensionless fundamental physical constants. For the past 15 years we (An INDO-FRENCH team lead by Raghunathn Srianand (IUCCA, Pune) and Patrick Petitjean (IAP, Paris) are addressing some of the issues listed above using QSO spectra obtained with the world’s largest optical and radio telescopes. Below we summarize some of the main results obtained by our team.

Detecting molecular gas and cold neutral hydrogen and measuring its properties in the most remote parts of the Universe is important to understand the physical conditions and to determine the rate of star formation in the early Universe. We have been conducting systematic surveys of molecular hydrogen and Carbon monoxide (CO) in remote galaxies using the Very Large Telescope (VLT) from the European Southern Observatory (ESO) in Chile. These surveys have resulted in the first ever detection of Carbon-monoxide (CO) in addition to the detection of molecular hydrogen (H2) and deuterated molecular hydrogen (HD) in the remote universe. We also used the Giant Meterwave Radio Telescope (GMRT) in India to search for cold neutral hydrogen (through 21-cm absorption) in the remote universe. These surveys have more than doubled the number of such absorbers known to date. Using these observations we are able to (i) understand the physical conditions in the disk of protogalaxies, (ii) constrain the thermal evolution of cold gas as a function of time, (iii) study the nature of dust in the galactic disk, (iv) investigate out-flows and rotational velocity of proto-galaxies at high redshift, (v) constrain the baryon density of the Universe, (vi) constrain the time and space variation of the electron-to-proton mass ratio and (vi) confirm the time evolution of cosmic-microwave background as predicted by the Big-bang model. Below we describe some of these in a pedagogical way.

One of the fundamental predictions of the hot Big-Bang theory is the existence of the Cosmic Microwave Background Radiation (CMBR). This relic radiation of the primeval fireball was discovered in 1964 by means of radio observations by American physicists Arno A. Penzias and Robert W. Wilson, who were rewarded with the Nobel Prize in 1978. Precision measurements by the COBE satellite later showed that this ancient radiation fills the Universe, with a present day temperature of slightly less than 3 degrees above absolute zero (2.725 Kelvin, or ~270.4 degree Celsius). A particular prediction of the Big Bang theory is that the Universe cools when expanding, the temperature scaling with the dilution factor of the Universe. Thanks to the power of the VLT in Chile and a very careful selection of the targets - selected among about ten thousands quasars – we were able to discover the presence of normal and deuterated molecular hydrogen (H2, HD) and carbon monoxide (CO) molecules in the interstellar medium of seven remote galaxies. Using these observations we have demonstrated that CO can be used as a cosmic-thermometer to measure the temperature of the CMBR in the remote Universe. Our precise measurements rendered a most important confirmation of the Big-bang cosmological model. They also placed stringent constraints on the allowed energy densities from decaying non-standard particles and dark-energy.

To explain the Universe and to represent it mathematically, scientists rely on so-called fundamental constants or fixed dimensionless numbers. Contemporary theories of fundamental interactions, such as the Grand Unification Theory or super-string theories that treat gravity and quantum mechanics in a consistent way, not only predict a dependence of fundamental physical constants with energy - particle physics experiments have shown the fine structure constant, that describes how electromagnetic forces holds atoms together, to grow at high collision energies - but allow for their cosmological time and space variations. A time dependence of the fundamental constants could arise if, besides the three space dimensions, more hidden dimensions exist.

By studying very remote objects it becomes possible to test the values of the physical constants when the Universe had only 25% of its present age, that is, about 10,000 million years ago. One of these constants is the so-called fine-structure constant and the way light interacts with atoms. If the fine-structure constant happens to change over the duration of the light’s journey, the energy levels in the atoms would be affected and the wavelengths of the absorption lines seen in the QSO spectrum would be shifted by different amounts. By comparing the relative gaps between the valleys with laboratory values, it is possible to estimate the variation of the fine structure constant as a function of the distance from us, that is, as a function of the age of the Universe. Our team has placed strong constraints on the variation of the fine-structure constant using optical data collected at the VLT and HI-absorption spectra obtained with the GMRT in India. Similarly, in the case of molecular hydrogen, the wavelengths of absorption lines will depend on the value of the electron-to-proton mass ratio. Using the molecular hydrogen detected in our survey, we also placed stringent constraints on the variations of electron-to-proton mass ratio in the remote universe.

Most of the listed projects were part of two CEFIPRA projects (3004-3 & 4304-2). These long term projects have established a very long-standing relationship between researchers in IUCCA (Pune) and IAP (Paris). We have made use of all available observational and computational resources in India and France. Through these projects eight PhD thesis were completed in India and France. Four post-doctoral fellows who have worked in these projects are now employed as permanent faculties in research institutes in India and France. A couple of years back our team also gathered an international team to propose a large survey of neutral gas using the upcoming Square Kilometer Array (SKA) path-finder experiment “MeerKAT” in South-Africa. This project has been selected as one of 8 large survey projects by an international review panel. This survey (amounting to 4000 hrs of telescope time) will result in the detection of 600 cold neutral hydrogen absorbers (i.e. more than 20 time what we know today) in the remote universe. This will allow one to systematically study the evolution of neutral gas over a major part of the cosmic time. The sample resulting from this survey will be a laboratory for astronomers all over the world to explore various scientific questions related to the cold gas in the remote universe and its relation to galaxy formation and evolution.
INDO-FRENCH DESIGN SEMINAR

CEFIPRA partnered with the National Institute of Design (NID), Ahmedabad to organise an inter-disciplinary conclave involving design and engineering professionals from various institutions in India and France. It was unique in the sense that for the first time design communities (industry and academia) from both the countries were brought together on a common platform.

The goal of the conclave was to explore the possibility of Indo-French collaborations in the interface zone of engineering and design disciplines through a variety of mechanisms including:

- Scientific research
- Design and Technology collaborative research
- Student mobility
- Industrial collaboration (especially SMEs)

The deliberations during the seminar emphasized upon research and product development in areas of common interest like community health care, mobility, automotive design, medical devices, design pedagogy, UX design, building design and sustainability.

Most participants expressed an earnest wish to link-up with CEFIPRA by way of joint projects. They also felt that CEFIPRA’s support for mobility will be very useful to foster more interactions that are a must for identifying research priorities and for developing joint R&D proposals for funding support.

During the seminar a common form was distributed to all the participants for outlining and submitting their research interests, desired areas for collaboration and contact details for further action. A website (http://ifc.iidj.net) has since been created by Andreas SCHNEIDER to enable participants of the seminar to submit such details online. Other suggestions that came through during the course of deliberation for improving collaborative R&D were:

- Development of common directory of design professionals in India and France
- Conduct of a joint workshop to identify priorities and potential partners.
- Focused training sessions to dilute cultural and language barriers.

A brainstorming seminar on Atmospheric Sciences was organised jointly by Ministry of Earth Sciences (MoES), Govt. of India and CEFIPRA, Indian and French scientists as participants for the session. The agenda was discuss the Monsoon Mission initiated by the Govt. of India and scope for Indo-French collaboration in the same. The Indian participants were drawn from research groups involved in gathering data and developing models and carrying out atmospheric studies in this domain in India. The French side included representative from institutions like Institut Pierre Simon Lapalce (IPSL), Le Laboratoire de Météorologie Dynamique (LMD) and Meteo-France. The program comprised of a plenary session, eight technical sessions and a panel discussion at conclusion. Technical sessions which formed the core of the program covered five broad areas:

- Monsoon and Tropical Modelling
- Ocean and Monsoon/Tropical Climate/atmospheric ocean coupling
- Multi-scale Monsoon Modelling
- Modelling and Model Initialisation
- Parameterization of physical Processes, Initialisation and Modelling.

Speakers in this inaugural session emphasised on the need for comprehensive and wider Indo-French collaborations in the area of weather forecasting and modelling. This is in view of the significance it has for the economy of both the countries. During the course of the deliberation MoES underlined its commitment to support academic institutions/universities pursuing research in this field. In this context, observation, modelling, simulation, model development were identified as key result areas. In the plenary session, the Director, IPSL gave an overview of IPSL, which is a federation of six laboratories. Prof J Srinivasan of IISc explained the challenges in understanding and predicting the Monsoons.

As many as 30 speakers representing diverse institutions of India and France presented their insights on the challenges in atmospheric sciences that confront India and France. Challenge areas identified included:

(a) Climate modelling;
(b) Prediction of Monsoon;
(c) Poor Intraseasonal and interannual predictions;
(d) Decadal predictions;
(e) Climate Change predictions;
(f) Seasonal forecast at smaller spatial scales;
(g) Fine-scale physical processes in the ocean and atmosphere boundary layers, and their role in basin-scale air-sea interactions;
(h) Monsoon variability and coupled model;
(i) Satellite data assimilation;
(j) Automation technique for monitoring thunderstorm and cyclones;
(k) Teleconnections for Indian monsoon prediction and Design of future modelling systems.

Speakers also underlined the areas in which they are looking for collaborations from French/ Indian Institutions. Seminar concluded with a panel discussion moderated by Prof. Herve Le Treut and Prof. J. Srinivasan.

Four major technical areas of Indo-French collaborations in the field of Atmospheric science were identified:

- Modelling
- Data Assimilation and understanding
- Aerosols
- Atmospheric coupling
FIRST MEETING OF REGION-TO-REGION COOPERATION
KARNATAKA, INDIA AND AQUITaine, FRANCE

Indo-French Science and Technology Cooperation has evolved continuously over the last four decades. With an increasing global emphasis on promoting innovation and the desire of the respective Governments to utilize this for the development of society and industry, India and France are striving to upscale their ST & I collaboration at an ecosystem level.

Recognizing the scope and benefits of regional synergy between India & France across the knowledge-innovation chain, CEFIPRA has launched a regional cooperation program including the State of Karnataka, India and Region of Aquitaine, France. Both the regions have relatively better developed ST &I ecosystems by presence and performance of their knowledge institutions and innovative enterprises in various domains. The program has two distinct but closely linked pathways:

a) Knowledge cooperation aimed to link the knowledge institutions of both the regions through various activities.
b) Business Cooperation aimed to connect small and medium enterprises from both the regions in the areas of Aerospace and Biotechnology to develop a B-2-B collaboration through various mechanisms.

As part of this initiative, CEFIPRA took a delegation representing Government, Industry and Academia from the State of Karnataka to Aquitaine Region.

First day was denoted to discussion on Knowledge Cooperation opportunities between Karnataka and Aquitaine. The dialogue sessions on knowledge and economic eco-system of the regions including their R & D strengths as well as possibilities of knowledge cooperation allowed the Indian and French delegates to share their views focused on the knowledge pathway. This was followed by a visit to Optical Institute Graduate Polytechnic Institute. Key recommendations for the session are as under:

Administrative Steps:
1. Invitation to President of the Aquitaine Regional Council to Karnataka from the Chief Minister of Karnataka.
2. MoU between Aquitaine and Karnataka regions.

Possible Knowledge Collaboration Pathways:
1. Students and Faculty Exchanges
   - Twinning Programme.
   - Student and Young scholar exchange
2. Joint testing and standardization centers
3. Scientific collaborative research projects
4. Industrial research projects
5. Joint innovation fund
6. Joint Ph.D with Academia and Industries (CIFRE programme by Dr. Clarisse Angelier of ANRT)

CEFIPRA has instituted a CEFIPRA lecture series where eminent scientists from France and India are invited to deliver a lecture every year. The first CEFIPRA Lecture was delivered by Prof. Jules Hoffmann, Noble Laureate (Medicine/Physiology, 2011) in five cities of India in year 2012. This year, Dr. R. Chidambaram, Principal Scientific Advisor to GOI, kindly consented and delivered the 2nd CEFIPRA Lecture on 2nd December, 2013 in CEA, Saclay, France. Excerpts:

Science & Technology-driven growth is needed to become a ‘developed country. But, for this development to be sustainable, a knowledge-driven economy is essential. To achieve this requires excellence in basic research (including what I call ‘directed basic research’), in applied research and R&D-led innovation, backed by high-quality manufacturing skills. Indian efforts in these areas will be discussed.

We must also factor in the fact that science is getting increasingly internationalized and that there is increasing international mobility among scientists. Large facilities like the Large Hadron Collider of CERN (Geneva) And ITER (Cadarache) are now built through international collaboration India has contributed/is contributing to these facilities as a member. More generally, much of research today needs mega-science facilities (often international). Indo-French S&T cooperation is also increasing and ranges from mathematics to nuclear and space.

India is going in for setting up world-class research facilities like the Centres for Excellence in Nanoelectronics, which are available to other users in universities and national laboratories. Such facilities also encourage international collaboration, and at the same time, attract young Indian faculty from abroad. The multi-gigabit per second optical fibre network, the National Knowledge Network (NKN), planned to connect 1500 knowledge institutions—universities and national laboratories, (of which more than 1100 are already connected), has encouraged setting up of virtual class-rooms, research collaborations, special grid connectivities for climate science, brain research, etc. NKN is connected to the E.U. Grid and CERN and this enables the data from the CERN detectors, in whose design and experiments with India is a partner, to reach the concerned institutes in real time. NKN also enables access to remote advanced research facilities, like the ESRF in Grenoble, from India.
Uranium 233 cycle in the third stage. After nearly three fast breeder reactors in the second stage and the Thorium-using natural Uranium in the first stage, Plutonium-fuelled stage programme—Pressurized Heavy Water Reactors nuclear programme has been and continues to be a three important for India, including nuclear. India has 17 reactors by six to eight times. In this ........ All energy options are term, the per capita electricity consumption must go up to become a 'developed country' in the fullest sense of the dependent on per capita electricity consumption. For India, the Human Development Index can be shown to be strongly related to the per capita electricity consumption. For India, Nuclear, for India, is not just power. It has numerous other applications for human well-being in health care, agriculture, desalination, aquifer recharge, etc. The nuclear community's extensive knowledge in thermal engineering, materials and computational fluid dynamics can be useful in other energy technologies ranging from renewable energy to advanced ultra super-critical thermal plant design.

FIRST MEETING OF REGION-TO-REGION COOPERATION KARNATAKA, INDIA AND AQUITAINE, FRANCE

1. A study on ST&I Ecosystems of Aquitaine and Karnataka
2. A joint seminar in Bengaluru
3. Possible Business Collaboration Pathways
   1. Identification of biotechnology and aerospace in Karnataka and developing collaborations with the clusters of the Aquitaine region.
   2. Training of industrial entrepreneurs from SMEs.
   3. Interaction of specialists from Aquitaine region, on key topics (Optics, Wine making etc.).
   4. Opportunity meetings between the regions on biological sciences.
   5. Reciprocal joint exhibitions.
   6. Joint industrial projects (possibly be supported by CEFIPRA).
7. Transfer of technology initiatives (by KSCST).
8. Joint industrial development (partly supported by CEFIPRA).
10. Identification of funding sources.
11. A delegation of the SME’s led by Groupement des Industries Françaises Aéronautiques et Spatiales(GIFAS) will be visiting in March 2014 to attend the Aerospace Hyderabad. It was decided the delegate will be hosted by Society of Indian Industries, Forum.

CEFIPRA - EADS Loi
A NEW THRUST FOR AEROSPACE RESEARCH

Strengthening the research partnership between India and France with India, EADS signed a Letter of Intent (Loi) with CEFIPRA at the India-France Technology Summit 2013 for creating a new innovation initiative called the ‘EADS-CEFIPRA Aerospace Programme.’

The Loi envisages support to research projects proposed by Indian universities and institutes to propose research projects for funding as a means to foster research in India in the field of aerospace, particularly in sub-domains like aeronautics, composite materials, high performance computing, nanotechnology and applied mathematics.

In addition, the letter of intent envisages the launch of ‘EADS Postdoctoral Fellowship’ in India. Directed towards young French scientists, it will sponsor 2-3 postdoctoral fellows annually to pursue aerospace related research work in top Indian universities and R&D institutions of India. The programme will be for a duration of 5 years starting from 2014.

The Loi was signed by Arnaud Marturf, Vice-President, Innovation Works (International Operations), EADS and Dr. Dehapiyta Dutta, Director, CEFIPRA. Speaking on the occasion, Mr. Arnaud Marturf said: “This confirms our commitment to invest in promotion of aerospace research in India. India with its huge talent pool and top notch research institutes represents an important innovation hub for EADS. Such initiatives not only add value to our global R&D and engineering efforts but also bring us closer to our customers here.”

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European School on Nanosciences and Nanotechnologies
Opening New Windows

CEFIPRA SGRI MOU
SUSTAINABLE HABITAT FOR HOT AND/OR HUMID CLIMATES

CEFIPRA and SAINT GOBAIN RESEARCH INDIA Ltd. signed a Memorandum of Understanding to work together to promote research “Sustainable habitat for hot and/or humid climates”.

Saint-Gobain Research India Ltd., a cross functional R&D center of Saint Gobain based in Chennai, is aiming to develop solutions for sustainable habitat in hot and/or humid climates specifically related to building energy optimization, sustainable and affordable building materials/solutions. SGRI is a subsidiary of Saint Gobain, SA France and is the private industry participating in this program.

Under the MoU, CEFIPRA has committed a funding of one hundred thousand Euros (€100,000) for a period of one year from November 2014, towards this programme followed by one hundred and fifty thousand Euros (€150,000) per year for supporting Indian and French public research organisations subsequent next two years, with a possibility of renewal thereafter.

On its part, SGRI shall make an in-kind contribution of an equivalent amount as above under the following heads:

1. Manpower: SGRI nominated project research staff man hour equivalence will be considered toward the contribution of SGRI under the project.

2. SGRI will provide consumables/test materials to the research partner involved on a project basis. These materials will be categorized and quantified in terms of monetary aspects so that these could be taken into account toward the in-kind contribution.

3. SGRI will lend equipment and put in the premises of research partner the project to enable the research activity in the domains of choice by project. It is expected that the research partner will return the SGRI supplied equipment at the end of the program. All relevant costs could be captured as a part of in-kind contribution with approval by the selection committee.

Each selected project shall be initially funded for a period of twelve (12) to eighteen (18) months (such as for feasibility study and concept validation) with options for extensions of up to additional eighteen (18) months, up to a cumulative duration of thirty six (36) months.

In addition a Postdoctoral fellowship scheme for a French national to work at an appropriate research facility in India will be launched by SGRI in 2014, using CEFIPRA as a support to advertise and manage the call. SGRI will fund approximately 30,000 Euros for up to two fellowships each year for the two following years, starting from November 2014.

CEFIPRA had joined hands with European School on Nanosciences and Nanotechnologies (ESONN) in Grenoble, France, to support the participation of 5 Indian doctoral students in the ESONN training programme - Session 2013. We requested a few CEFIPRA supported participants to ESONN to share their experiences and feedback with us. Excerpts:

Held at University Joseph Fourier, Grenoble, France, ESONN-2013 consisted of 47 participants from different academia and industries of various European and Asian countries. The theme of ESONN school was nanosciences and nano-technologies.

As expected we had our hands full with a total 10 lectures spread over 51 hours. In addition there were Practical Work sessions. These included Near –Field Microscopies by Prof. Hans J. Hug, Basel University, Switzerland; Mesoscopic Transport by Prof. Peter Samuelson, Lund University, Sweden; Molecular Electronics by: Prof. Luis E Hueso, CIC nano GUNE; Condenser, San Sebastian; Nano-thermodynamics by: Prof. Jukka Pekola, Aalto University, Helsinki, Finland; Single Electron Effects by: Prof. Per Delsing, Chalmers University of technology, Goteborg, Sweden; Spintronics by: Prof. Chris Marrows, LEEDS university, UK; Self Assembly for nanotechnologies by: Prof. Alain Jonas, UCL, Louvain-la-Neuve; MOSFET Physics and Technology by: Prof. Enrico Sangiorgi, University of Bologna, Italy and Nanofabrication by: Prof. Thierry Fournier, Ahmad Bisey and Roland Pantel, Grenoble, France. In addition there were practical sessions running over a total duration of 63 hrs.

Special Seminars by Sébastien Weisbuch, Immun ID, Grenoble; Dominique Thomas, ST Microelectronics, Grenoble and Nayla Farouki, CEA, Grenoble added a great deal to the depth of the content covered at ESONN 2013. Poster presentation by the participants allowed them to highlight their own ideas who were also asked to present their research work to other participants and ESONN organizing committee.

I sincerely appreciate CEFIPRA’s support to attend this school. The exposure and insights gained will be very useful for my doctoral research work and provided me a good exposure on various techniques and some of them will definitely help for my post doctoral research.

CEFIPRA had joined hands with European School on Nanosciences and Nanotechnologies (ESONN) in Grenoble, France, to support the participation of 5 Indian doctoral students in the ESONN training programme - Session 2013. We requested a few CEFIPRA supported participants to ESONN to share their experiences and feedback with us. Excerpts:

We learned the working principles and ways to realize a single electron transistor and were also introduced to the functionality of MOSFETs and various regions in which MOSFETs operates. Session on molecular electronics was very interesting. Lecture on Near field microscopies taught us about the various scanning techniques used for materials and devices. Learning about quantum physics of mesoscopic devices and descriptions of conductance...
feedback

A hand-to-hand practice of nanoparticle or nanoobjects synthesis, their characterization such as microscopy and spectroscopy was a remarkable learning experience. Networking, fun and student centered social activities throughout the school ensured that rigorous of coursework were suitably mitigated giving us the enthusiasm and energy to make best use of our time. The international exposure that came from participation in ESONN 2013 will surely help me realize my dream to become a formulation / pre-formulation designer and trouble-shooter.

ESONN2013 provided me with an excellent interdisciplinary platform to learn various aspects of nanotechnology techniques, their characterization and utility in various domains of human endeavor. In addition, participation in ESONN 2013 enabled me to exchange my own views and ideas with prominent scientists in the field of nano-science, from some of the most prominent R&D institutions of France and other countries The lectures by these eminent scholars and the interactive discussions that invariably followed were a great opportunity to gain new directions and inspiration for my efforts planned for the future.

I was involved in laboratory coursework ‘Session B’ which looked at the interface between physics, chemistry and biology. It focused on various aspects of nanotechnology, such as drug delivery, self-assembly, molecular biophysics, mechanics of molecules, microfluidics, near field microscopies and nanofabrication.

The program emphasized the geographical spectrum is one of the best ways to open up new intellectual windows in one’s mind. I am very grateful to CEFIPRA for giving me the wonderful opportunity of participating in ESONN13 in Grenoble, France. I would like to thank my friends and family members whose blessings and good wishes helped me to complete this work. I would like to thank my guide and mentor Dr. A. Abdul Rahuman, my friends and family members whose blessings and good wishes helped me to make use of this unique program.

The objective of ESONN13 was to provide training for graduate students, postdoctoral and junior scientists from universities and laboratories from all over the world, in the field of nanosciences and nanotechnologies. The course covered such aspects as the elaboration, characterization and functionalization of nanoobjects. A disordered system of pre-existing components forms an ordered system through some interactions among the components. The various local interactions involved in forming this ordered system was explained along with one of the most important phenomenon, Langmuir–Blodgett film. The lecture on Research to Business with nanotechnologies was the icing on the cake in which they talked about the innovation required for new device to launch in market with examples of marketing strategy adopted by industries for new products.

In ESONN13 I had a great time and I would like to thank CEFIPRA for the same.

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<tr>
<th>S. No.</th>
<th>Project Title</th>
<th>Name</th>
<th>Institutional Affiliation</th>
<th>Institute Visited</th>
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<tbody>
<tr>
<td>1</td>
<td>Self assembly in novel macromolecular systems based on bioresource materials: Synthesis, characterization and applications</td>
<td>Dr. P.R. Rajamohan</td>
<td>Central NMR Facility, National Chemical Laboratory, Pune</td>
<td>Laboratoire de Physico-Chimie des Polymères et des Milieux Disperse, ESPCI, Paris</td>
</tr>
<tr>
<td>2</td>
<td>Controlling for upscaling uncertainty in assessment of forest above ground biomass in the Western Ghats of India</td>
<td>Dr. Gopalakrishnan Raja</td>
<td>National Remote Sensing Centre, Hyderabad</td>
<td>AMAP, Mompelli</td>
</tr>
<tr>
<td>3</td>
<td>Dynamics of Serotonin 1A receptors by Single particle Tracking</td>
<td>Dr. Sandeep Shrivastava</td>
<td>Centre for Cellular and Molecular Biology, Hyderabad</td>
<td>Universite Paul Sabatier, Toulouse</td>
</tr>
<tr>
<td>4</td>
<td>Chemistry and application of metallaula and metallagermanoboranes derived from group 14 unsaturated organic substrates</td>
<td>Dr. Sundargopal Ghosh</td>
<td>Indian Institute of Technology, Chennai</td>
<td>Universite de Rennes 1, 35042 Rennes</td>
</tr>
<tr>
<td>5</td>
<td>Developing design guidance for rammed earth construction</td>
<td>Prof. B V Venkatarama Reddy</td>
<td>Indian Institute of Science, Bangalore</td>
<td>Ecole National des Travaux Publics de l’Etat, Lyon</td>
</tr>
<tr>
<td>6</td>
<td>Global transcriptomics of sex-specific splicing</td>
<td>Dr. K.P. Arun Kumar</td>
<td>Centre for DNA Fingerprinting &amp; Diagnostics, Hyderabad</td>
<td>Universite Paris Sud 11, Orsay</td>
</tr>
<tr>
<td>7</td>
<td>Thermo-hydrodynamics of phase-change induced oscillating Taylor bubble flows</td>
<td>Dr. Sameer Khandekar</td>
<td>Indian Institute of Technology-Kanpur</td>
<td>Institut National des Sciences Appliquees de Lyon, Centre de Thermique de Lyon, Villeurbanne</td>
</tr>
<tr>
<td>8</td>
<td>Real-Time through for over long distance (RTIFOLD)</td>
<td>Dr. Hema Ramachandran</td>
<td>Raman Research Institute, Bangalore</td>
<td>Institut de Physique de Rennes, Rennes</td>
</tr>
<tr>
<td>9</td>
<td>Selective oxidations with Hydrogen Peroxide</td>
<td>Dr. Shubhangi B Umbarkar</td>
<td>National Chemical Laboratory, Pune</td>
<td>Unité de Catalyse et Chimie du Solide, Lille &amp; ARKEMA, Centre de Recherche Rhône-Alpes, Pierre-Bézieu</td>
</tr>
<tr>
<td>10</td>
<td>Hydrology and Water resources from space over the Indian Continent</td>
<td>Dr. V.M. Tiwari</td>
<td>National Geophysical Laboratory, Hyderabad</td>
<td>Laboratoire d’Etudes en Géophysique et Océanographie Spatiales, Toulouse</td>
</tr>
<tr>
<td>11</td>
<td>Slow highly charged ion molecule collisions</td>
<td>Dr. C.P. Salvan</td>
<td>Accele</td>
<td>Centre de Recherche sur les Ions, les Matériaux et la Photonoique, Caen</td>
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<tr>
<td>12</td>
<td>Slow highly charged ion molecule collisions</td>
<td>Dr. Jyoti Rajput</td>
<td>Delhi University</td>
<td>Centre de Recherche sur les Ions, les Matériaux et la Photonoique, Caen</td>
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<td>13</td>
<td>Mechanisms of new long-lasting luminescence biomarkers</td>
<td>Dr. K.P.S. Priolkar</td>
<td>Goa University</td>
<td>Laboratoire de Chimie de la Matiere Condensee de Paris, LCMCP, Paris</td>
</tr>
<tr>
<td>14</td>
<td>Comet grays: observations and simulations</td>
<td>Prof. Robert Botet</td>
<td>Laboratoire de Physique des Solides Universite Paris-Sud</td>
<td>Assam University, Silchar</td>
</tr>
<tr>
<td>15</td>
<td>Analytic aspects or modular forms</td>
<td>Dr. Farred Brumley</td>
<td>Universite de Lorraine, France</td>
<td>Tata Institute of Fundamental Research, Mumbai</td>
</tr>
</tbody>
</table>
### VISITS OF SCIENTISTS SUPPORTED UNDER CEFIPRA PROJECTS
**OCTOBER - DECEMBER 2013**

<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
<th>Name &amp; Institute</th>
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<tr>
<td>16</td>
<td>Gene resources from polluted soils</td>
<td>Dr. Roland Marmeise (Laboratoire d’Ecologie Microbiennne, Universite Lyon 1, Villeurbanne)</td>
<td>Thapar University, Patiala</td>
</tr>
<tr>
<td>17</td>
<td>Mechanisms of Lysine acetyl transferase activation by small molecule activators and use thereof in memory</td>
<td>Dr. Laurence Boutilier (ULabatoire d’Imagerie et de Neurosciences Cognitives, Strasbourg)</td>
<td>Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore</td>
</tr>
<tr>
<td>18</td>
<td>Development of carbon nanotube metal hybrid catalysts</td>
<td>Dr. Edmond Gravel (Service de Chimie Biorganique et de Marquage, CEA/Saclay, Gil-sur-Yvette)</td>
<td>Indian Institute of Technology, Mumbai</td>
</tr>
<tr>
<td>19-20</td>
<td>Arithmetic circuits computing polynomials</td>
<td>Dr. Guillaume Malod (Institut Mathematique de Jussieu, Universite Paris Diderot-Paris)</td>
<td>The Institute of Mathematical Sciences, CIT Campus, Taramani, Chennai</td>
</tr>
<tr>
<td>21</td>
<td>Discontinuous Galerkin method for nonlinear acoustics</td>
<td>Dr. Regis Marchiano (Institut Jean le Rond d’Alemberg, UPMC, Paris)</td>
<td>Indian Institute of Technology Bombay, Mumbai</td>
</tr>
<tr>
<td>22</td>
<td>Development of a non-hydrostatic finite-volume icosahedral model for climate simulation and weather forecast</td>
<td>Dr. Thomas Dubos (Laboratoire de Meteorologie Dynamique, Paris)</td>
<td>Indian Institute of Technology Delhi, New Delhi</td>
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<tr>
<td>23-24</td>
<td>Financial inclusion based rural mobiquitous services technological platform</td>
<td>Dr. Yann Meurdesois (CEA Saclay, DSM, LSCE, Gil-sur-Yvette)</td>
<td>Indian Institute of Technology Delhi, New Delhi</td>
</tr>
<tr>
<td>25-26</td>
<td>Nonadiabatic quantum reactive scattering dynamics on multilevelled potential energy surfaces</td>
<td>Prof. Pascal Honvault (Institut UTINAM, Universite de Franche-Comte, Besancon)</td>
<td>University of Hyderabad, Hyderabad</td>
</tr>
<tr>
<td>27</td>
<td>Deep Structure of the Indian Continent</td>
<td>Prof. Jean Paul Montagner (Institut de Physique du Globe de Paris)</td>
<td>National Geophysical Research Institute, Hyderabad</td>
</tr>
<tr>
<td>28</td>
<td>Deep Structure of the Indian Continent</td>
<td>Dr. Eleonore Stutzmann (Institut de Physique du Globe de Paris)</td>
<td>National Geophysical Research Institute, Hyderabad</td>
</tr>
<tr>
<td>29</td>
<td>Analysis of protein flexibility in biological recognition</td>
<td>Dr. Charles Robert (Institut de Biologie Physico Chimique, Paris)</td>
<td>Bose Institute, Kolkata</td>
</tr>
<tr>
<td>30</td>
<td>Puzzling properties of Ultra thin polymer films</td>
<td>Dr. Alain Gibaud (Laboratoire de Physique de l’Etat Condense, Universite du Maine, Le Mans)</td>
<td>Saha Institute of Nuclear Physics, Kolkata</td>
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<td>31-33</td>
<td>Novel nanotechnological approaches for treatment of leishmaniasis using 2-propylquinoline</td>
<td>Dr. Philippe Loiseau (Dr. Gillian Barratt</td>
<td>Prof. Denis Labarre (Universite Paris Sud, Chatenay-Malabry)</td>
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<tr>
<td>Domain</td>
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<tr>
<td>Physics</td>
<td>Dr. Redouane Zamsoum Centre de Physique Theorique, Marseille</td>
<td>Harish Chandra Research Institute, Allahabad</td>
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<td></td>
<td>Aditya Narain Agnihotri Tata Institute of Fundamental Research, Mumbai</td>
<td>CIMAP, ENSICAEN, Caen</td>
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<tr>
<td>Chemistry</td>
<td>Sreekutan Maraveedu Umi National Chemical Laboratory, Pune</td>
<td>Institut de Chimie des Milieux et Matéraux de Poitiers, UMR-CNRS 7285, Université de Poitiers</td>
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<tr>
<td></td>
<td>Mr. Dhanendra Tomar Indian Institute of Advanced Research, Gandhinagar</td>
<td>Neuro Centre magendie, INSERM U862, Université Bordeaux II, Bordeaux</td>
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<tr>
<td></td>
<td>Shubhra Singh Central Drug Research Institute, Lucknow</td>
<td>Dynamique des Interactions Membranaires Normales et Pathologiques, Universite Montpellier</td>
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<td></td>
<td>Estev Dalko Université de Lille, Lille</td>
<td>Institute of Life Sciences, Bhubaneswar &amp; Tata Institute of Fundamental Research, Mumbai</td>
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</tr>
<tr>
<td></td>
<td>Emmanuel S Victor Indian Institute of Science, Bangalore</td>
<td>INSERM U 872, Centre de Recherche des Cordeliers, 15 rue de l’Ecole de Medecine, Paris</td>
<td></td>
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<td></td>
<td>Amikutmar Gaibidas Fulzele ARCTRAC, Navi Mumbai</td>
<td>Institut de Pharmacologie et de Biologie Structurale, CNRS, Toulouse</td>
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<td>Ms. Sahana Holla, Indian Institute of Science, Bangalore</td>
<td>INSERM U 872, Centre de Recherche des Cordeliers, Paris</td>
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<tr>
<td>Mathematics</td>
<td>Bharat Bhusan Tripathi Institut Jean Le Rond d’Alembert, UPMC, Paris</td>
<td>Indian Institute of Technology Bombay, Mumbai</td>
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Forthcoming Events

• January 13-16, 2014, Bangalore, India
  Indo-French School of New Avenues for Networks Models: Theory and Application

• January 20-22, 2014 Madurai, India
  Seminar on “Filamentous fungal pathogens-current trends and future perspectives”

• February 20-23, 2014 Bhubaneswar, India
  Seminar on “Functional metal-organics: Applications in materials and catalysis”

• March 18-21, 2014 Bangalore, India
  Indo-French Physics Conference on Optics, Nano Sciences, Cold Atoms and Synchrotron facilities

• July 20-28, 2014 Srinagar & Leh, 2014 India
  Indo-French workshop on “Himalayan Tectonics”

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