

# ENSEMBLE

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

**CEFIPRA**



**Catalysing Indo-French  
S&T Ecosystem**

# editor's note

By definition of dictionary a “catalyst” is any substance used in small proportion, that notably affects the rate of a chemical reaction without itself being changed or consumed. Since the time of its inception in 1987, CEFIPRA has evolved from being a bilateral funding agency to that of a catalyzing agency of Indo-French S&T ecosystem, while retaining its original character. The Centre has capitalized, essentially on the long standing Indo-French S&T relationships which go back to the early 1900s. The sporadic S&T interactions between the scientific communities of the two nations were systematized with the establishment of CEFIPRA.

By supporting more than 450 collaborative projects, CEFIPRA has contributed to the Indo-French S&T landscape through development of around 2600 human resources and mobility of over 2500 scientists and young researchers. The very fact that 140 research organisations/universities of India and 61 such institutions in France are directly or indirectly linked today is because of the efforts made through CEFIPRA, a testimony of its catalytic role in the evolution of vibrant Indo-French S&T ecosystem. CEFIPRA has also strengthened the different components of Indo-French S&T ecosystem in its external environment like the Indo-French joint laboratories, which have been highlighted in this edition. The center is also playing a lead role in the recently initiated Franco-Indian water network.

In our catalytic pursuit, recently we organized a successful Indo-French workshop on Himalayan Tectonics initiating interaction among 12 French and 16 Indian scientists to study the Himalayas from Jammu to Leh.

We congratulate the eight CEFIPRA-ESONN fellows who will be attending the European School on Nanosciences & Nanotechnologies (ESONN) 2014 training programme during August 24 to September 13, 2014 at Grenoble, France. ●



**Dr. Debapriya Dutta**  
Director, CEFIPRA

### CORRIGENDUM

The publication year of Joseph E. Stiglitz's book was mentioned as 1919 instead of 1999 in the editorial of Ensemble's issue dated May 2014 (Vol. 2/2). The error was inadvertent and is regretted. - Editors



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# leader



### Indo French Center for Ground Water Research

## Bridging the knowledge stream

For the last few decades, the intensive development of irrigation has resulted in over exploitation of underground aquifers. This is particularly so in the hard rock areas of southern India which are devoid of perennial rivers. Long-term management based on advanced scientific investigations and user friendly policies are required for the sustainability of these aquifers.

Recognising these concerns and needs, the Indo-French Center for Groundwater Research (IFCGR) was set-up in November 1999 as a specialised Centre supported by the National Geophysical Research Institute (CSIR-NGRI), India and the French Geological Survey (BRGM), France.

Based in the city of Hyderabad in the campus of NGRI, IFCGR is led by two Team Leaders one from NGRI and the other from BRGM. The team is strengthened further by two more research scientists from both the sides in addition to several PhD/MSc students/trainees from India as well as France. Day-to-day collaboration of NGRI and BRGM guarantees a strong and versatile expertise in different fields of hydro-geology and related

earth sciences, NGRI being the leading institution in Geophysics in India and BRGM being the reference institution on Earth Sciences in France.

### IFCGR : THE OBJECTIVES

- Understanding the structure and functioning of the hard rock aquifer system (being spread over two third part of India), determine their hydraulic properties, global water balance and simulation of flows.
- Development of methodologies for long-term management of groundwater resources (Quantity & Quality) in hard rock aquifers.

## Ground Water : A Critical Resource

At 230 km<sup>3</sup> per year, India is the largest consumer of ground water in the world. 80% of domestic and 60% of agriculture/irrigation water demand is met through groundwater. 90% of rural water supply is from groundwater sources.

Central Ground Water Board has estimated replenishable ground water resources at 433 BCM. However, its distribution is heavily skewed across the country.

A growing demand for water coupled with unreliable public supply schemes has led to a growing dependence on ground water resources. Unsustainable level of

exploitation has put the ground water resources at great peril, lowering groundwater table in many areas and causing saline water intrusion in various parts of the country.

While there is a lot of discussion on over exploitation of groundwater resources there is inadequate data on its various dynamics. This is a serious concern. There is an urgent need to do aquifer mapping as well as build a comprehensive data base on groundwater flow systems and ground water availability in each hydro-geological setting.

*Source: Water in India: Situation and Prospects (UNICEF 2013)*

The centre is running under the patronage of the Director, CSIR-NGRI and governed by the respective administrations of CSIR-NGRI and BRGM. In addition, two bodies viz., Scientific Council and Steering Committee consisting of members from both the countries have also been set-up. These two bodies meet annually in Hyderabad; the Scientific Council reviews the scientific work of the centre as well as suggests new research to be taken by the Centre while the Steering Committee looks after the administrative conduct of the centre and also steer the centre for the future progress.

### IFCGR : FIELDS OF EXPERTISE

The expertise available and Tools and Methodologies developed at the Centre are:

- **Geological Investigations:** Geology of crystalline rocks, analysis of intrusive structures, Geological mapping including Hard Rock weathering thickness mapping, Soil gas studies viz., Radon emanometry
- **Hydrogeology:** Water level analysis, Hydraulic tests including aquifer pumping tests and innovative test analysis and new tools suitable for hard rock aquifers.
- **Geophysics:** Magnetic Resonance Sounding (MRS), Electrical Tomography including SP, Borehole Geophysics,



**Dr. Shakeel Ahmed**

Dr. Shakeel Ahmed presently Chief Scientist at CSIR-NGRI is basically a Geophysicist from BHU, Varanasi and obtained PhD in Hydrogeology from Paris School of Mines, France.

Magnetic & Electromagnetic Survey and interpretation including VLF, etc. and Mise-a-la-Masse investigation.

- **Geostatistics:** Various Kriging methods for parameter estimation at unmeasured location and application of Theory of Regionalized variables in Groundwater Monitoring network design. Groundwater sampling and groundwater quality monitoring
- Aquifer modelling for flow and mass transport in various aquifer systems for prediction and management of groundwater with MODFLOW FLEX as well as MARTHE.
- Decision Support Tool (DST) for groundwater resource management in Hard Rock aquifers.
- Heliborne Transient Electromagnetic Survey acquiring high density data and their interpretation.
- Groundwater Quality analyses, interpretation and remediation.

IFCGR has started working right from the first day of its inception as we already had started a CEFIPRA funded project; perhaps the first CEFIPRA project on Water [2013-1] entitled "Optimal Development and Management of Groundwater in weathered-fractured aquifer" that dealt with the hard rock hydrogeology as the main objective of research for IFCGR. Later we were

**Dr. Alexandre Boisson**

Hydrogeologist, project manager at BRGM. Currently team leader of the Indo-French Centre for Groundwater Research (IFCGR) in Hyderabad.



awarded another project [No. 2700-W1] by CEFIPRA entitled "Proton Magnetic Resonance Technique in Weathered-Fractured Aquifers" carrying out advanced geophysical investigation in the same area of study. These two projects have been extremely helpful in boosting the research work at the IFCGR and we had set our goal very clearly using the study area as Pilot area for IFCGR as the area had been very well monitored for hydrogeological data.

### IFCGR : MAJOR ACHIEVEMENTS

The Centre has taken up a small watershed in the Maheshwaram Mandal of Ranga Reddy District of erstwhile Andhra Pradesh after considering a number of scientific and logistic parameters for its study area in collaboration with the Andhra Pradesh State Groundwater Department. So far a large amount of basic data has been gathered, the aquifer system has been conceptualised and a number of experiments have been carried out to determine the aquifer parameters (groundwater flow and storing properties). Various experiments have provided knowledge on the variability of the properties of the system.

Global water balances are prepared for many years including the years of weak and good monsoons. It has now been proved that only Artificial Recharge is not a sustainable solution rather a combination of Artificial Recharge and changing cropping pattern would solve the problem in a sustainable way. Some important results are summarized below in brief.

**Geological Modelling:** The aquifers in hard rock terrains consist of two distinct zones viz., weathered and fractured/fissured zones with very different physical properties. The research at IFCGR initially used geological and geophysical methods to thoroughly investigate and conceptualize the system and characterize its flow and storage parameters through specialized methods. IFCGR has developed a new geological model to explain the weathering in such a terrain. The flow in the coupled system was simulated through a numerical model as two consecutive layered system i.e., weathered layer as porous medium and the fractured zone as equivalent porous medium without any aquiclude in between them. The aquifer model was calibrated and it showed that the water balance declines by 1.2 metres every year.

**Optimal Monitoring Network Design:** Monitoring the groundwater parameters requires drilling the bore wells at a high cost but at the same time the data is essential for any meaningful study. The geostatistical methods could provide the usefulness of a new data collection point before its collection and this reduces the cost of establishing redundant wells. A new procedure developed using the geostatistical techniques to optimize the number of wells to be monitored, has been applied to optimize the monitoring network for water level and Fluoride content in the study area facilitating fast and cost-effective monitoring.

**Specialized Artificial Recharge Experiment Using Defunct Dug-Wells:** Water conservation is a must as the demand outstrips natural availability of the water

resources in hard rock and semi-arid regions. IFCGR has developed the technique of water conservation to artificially recharge the aquifer through defunct dug wells. This is almost a no-cost technique that could easily be adopted in the rural areas. It captures the rain water making it fall into a trench connected to a pit of 2-3 meter depth that allows the water to fall down after silt removal into a selected dug-well using the natural slope. This method has a large



**INDO FRENCH CENTER FOR GROUND WATER RESEARCH  
TANGIBLE SCIENTIFIC OUTPUT**

- The IFCGR has celebrated its 5th Anniversary in March 2005 as well as 10th Anniversary in November 2009 by organizing a few workshops and awareness meetings. The 15th Anniversary is planned during November 2014 at Hyderabad.
- A number of bore-wells drilled in the project have been handed over to the farmers in whose lands they were drilled as a societal agenda and the EHP has come to rescue of the local public for their drinking water supply during the drought situation for a couple of years.
- In addition, a number of students and research scholars from France have been visiting the Center for completing their dissertations. Thirteen students have completed their PhDs based on the research at IFCGR. Three French students have completed doctoral research at the IFCGR/NGRI and awarded the doctorate degree in France.
- The Centre has bagged many prestigious awards where Dr. Shakeel Ahmed at the Center received the International Prize for Water Sciences (Prix International de L'eau et de la Science) in the series of prizes called Lights of water (Lumieres de l'eau) of 2004 awarded during the Cannes Water Symposium, Cannes, France and the National Mineral Award for 2006 from the Ministry of Mines, Govt. of India.
- The Centre was represented in many International conferences in various capacities in India and abroad including the 150<sup>th</sup> Anniversary of Darcy's Law in Dijon, France. The members of IFCGR have served as members of many scientific committees including Dr. Ahmed as Associate Editor of the Hydrogeology Journal.
- The research output of the Centre has been reported through a number of research papers (more than 60) published in SCI journals including the best journals of the subject, Water Resources Research and Journal of Hydrology.

**Books Edited:**

1. Eric Servat, W. Najem, Christian Leduc and Ahmed Shakeel (Eds.) "Hydrology of the Mediterranean and Semi-Arid Regions", IAHS publications No. 278, Proc. of International Conference on groundwater, Montpellier, 498p, France, April 1-4, 2003 (ISSN 0144-7815).
2. Ahmed, Shakeel., R. Jayakumar and S. Abdin (eds.) Groundwater Dynamics in Hard rock aquifers - including sustainable management and optimal monitoring network design, Capital Publishing Company, 2007. 265p (ISBN 81-85589-25-9).

number of advantages over the conventional de-silting tanks. The technology is being tested for a few years before handing it over to the state government for large scale application.

**Groundwater Management Through Decision Support Tool:** Unless socio-economic factors are factored into research studies, the solution will not be adopted by the masses. Therefore, an interactive model using the global groundwater balance is developed called "Decision Support Tools for Groundwater Management (DSTGM)". Based on IFCGR's thorough investigations, hydrogeological parameters are supplied to the model in background and based on the present scenario, a groundwater balance is prepared & projected for the next 20 years visualizing the water table condition for the given scenario. This model allows both the farmers and the policy makers to decide any possible scenario that they wish to plan or adopt. The model then prepares the revised water balance, producing the water table condition for the present scenario and allows the user to compare with previous ones. The scenarios could include the various amount and extent of artificial recharge, improved irrigation practices and the most interesting feature of changing the cropping pattern with time and extent. The users can also work out the outcomes under monsoonal extremes. Hence, the present model provides

both the user and the decision maker to choose the best scenario that ensures the sustainability with their satisfaction. An analysis is being developed to calculate even the income associated with various scenarios to make this further attractive and useful.

**International Experimental Hydrogeological Park (EHP) :** Groundwater holds more importance among water resources in the arid and semi-arid regions. To avoid its scarcity due to over-exploitation and mismanagement people need to be made more aware. The concept of groundwater cycle is hardly known to the common people. Complex nature of hard rock aquifers only makes things more complicated. We believe that 50% of the problems can be averted or solved through correct understanding of the system and cooperative action. It is perhaps time that this subject is included in the school curriculum. Therefore it is proposed to create an experimental site devoted to the study of hard rock aquifers at local scale.

The idea is to offer an adequate facility for detailed investigations of the hard rock aquifers through a large number of piezometers (and borewells) at different depths. This experimental park shall then be accessible to both Indian and International scientists working in the field of hard-rock hydrogeology who want to test new methodologies, calibrate methods, exchange ideas and field techniques on the best experimental site ever

**INDO-FRENCH CENTER FOR GROUND WATER RESEARCH  
MAJOR PROJECTS - COMPLETED AND RUNNING**

- CEFIPRA, New Delhi: Two Projects funded by CEFIPRA, New Delhi one on hard rock hydrogeology (2013-1) and the other on hard rock geophysics (2700-W1); BRGM and NGRI have been collaborators in both the projects.
- UNESCO, New Delhi: One Project Funded by the UNESCO under IHP VI program was taken up for establishing an effective monitoring network of Fluoride measurement in Groundwater.
- European Commission: One Project funded by the EC under Asia Pro Eco Program that has helped IFCGR to develop the Decision Support Tool (DST-GW) that was transferred to the State Government Departments in AP. Two more projects viz., Saph Pani and Saraswati are funded by the EC Under FP7. These projects are basically on the waste water treatment and are currently running.
- Agence Nationale de la Recherche (ANR), France: Two Projects funded by ANR, France have been completed one on the simulation of Fluoride transport in the groundwater and the other on the vulnerability and adaptability of Climate Change on groundwater system by the farmers.

implemented in the world. The main activities shall focus on hydraulic tests (e.g. hydraulic tomography, complex hydraulic tests, 3-D mapping of hydraulic heads, mapping of conductive fractures, etc.), geophysics (e.g. tools calibration, fracture network mapping, borehole logging, etc.), solute transport (e.g. controlled artificial experiments, solute transport from surface to aquifer, etc.), contaminant hydrology (controlled release of contaminants, tests of remediation techniques, etc.). The EHP has now been linked to an International network H Plus (H+, <http://hplus.ore.fr>) known as SOERE H+ International (Réseau Internationale de sites Hydrogéologiques) for exchange of information from other networks. ●



**INDO-FRENCH CENTER FOR GROUND WATER RESEARCH  
FUTURE ENDEAVOURS**

- A. Groundwater quality in Hard Rock aquifers**  
The distribution and transport of Fluoride (main widespread contaminant in Hard Rock aquifers) will be studied further; in addition other more localised contaminants such as pesticides and nitrates will also be studied and a conceptual model of their transport in the aquifer will be developed. This part will be included in the Decision Support Tool for groundwater quality management.
- B. Hard Rock aquifer vulnerability mapping**  
No specific vulnerability mapping methodologies for Hard Rock aquifer exist so far. The in-depth understanding of these aquifers functioning acquired at the Centre will be used for the development of appropriate vulnerability mapping methods.
- C. Industrial contaminants fate in Hard Rock aquifers**  
The region of Hyderabad is growing fast and rapid industrialisation is taking place. This is already impacting the water quality of Hard Rock aquifers surrounding the city. The Centre is in a good position for participating in research-oriented projects aiming at understanding the fate of industrial contaminants in these aquifers and at proposing adequate clean-up strategies as well as groundwater protection policies. One of the Centre test sites is rapidly transforming from a rural watershed into a largely built watershed; this offers the opportunity to follow the impact of land use changes onto groundwater quality.
- D. Hydrogeological studies in other geological settings**  
The expertise of the Centre does not limit to Hard Rock aquifers and there is sound interest in the future to develop research activities in other aquifers types located in India such as: sedimentary rock aquifers including karst which are widespread in the Southern part of Andhra Pradesh, alluvial aquifers in West Bengal which are severely contaminated by Arsenic from natural origin, basalts of the Deccan Traps which cover large land surfaces of Western India and whose aquifers have been little studied so far.
- E. Development of methodology for Multi-parameter groundwater monitoring network designing using Geostatistics**  
A complete understanding of Structure and Functioning of the hard rock aquifers, estimation of groundwater balance using specific methods and prediction of groundwater response with different scenarios adapted by the farmers or end-users for an adaptive management of groundwater resources.



Indo-French Cell for Water Sciences

# Fathoming the flow

The Indo - French Cell for Water Sciences (IFCWS) is an International Joint Laboratory between the Indian Institute of Science, India and the Institut de Recherche pour le Développement (IRD), France set up in 2001 at the IISc campus, Bangalore, India. The long-term goal of IFCWS is to develop a framework for Environmental Geosciences to study the issues pertaining to water and soils.

IISc is a premier research and training institution of India, which offers degree programmes at post-graduate and PhD level (<http://www.iisc.ernet.in>) in addition to a newly introduced undergraduate BS degree programme. IRD is a French government funded organisation under the supervision of the Ministry of Higher Education and Research and also Ministry of Foreign Affairs and has international presence mainly in Southern countries. The mandate of IRD encompasses three thrust areas: research, training and consultancy (<http://www.ird.fr>). The IFCWS is part of the Indo-French collaboration in S&T - water sciences in India along with the Indo-French Centre for Groundwater Research (IFCGR), established at the National Geophysical Research Institute, Hyderabad in

1999 and deals with applied research on groundwater resource management in irrigated hard-rock areas.

The IFCWS also facilitates the exchange-visit of scientists and offers training platforms both in laboratory and field for students and scientists. The team includes students at PhD and Post-graduate level. The participation of scientists from different disciplines like geochemistry, agronomy, hydrology, geophysics, geology, soil science, metallurgy, climate science, remote sensing has enabled the IFCWS to gain an international recognition through publications in top rank journals and participation at international conferences. The deputation of IRD scientists in India has strengthened the linkages between Indian and French scientists. The collaboration has

## IFCWS : CO-CHAIRS

### S Subramanian

Professor, Department of Materials Engineering  
Indian Institute of Science, Bangalore

### M S Mohan Kumar

Professor, Department of Civil Engineering  
Indian Institute of Science, Bangalore

### Jean Riotte

Scientist, Institut de Recherche pour le Développement  
(on deputation to IFCWS)

leader

## WATER SUSTAINABILITY IN INDIA

India has made significant progress in developing its water resources and supporting infrastructure, post independence. Large-scale investments in water storage structures have contributed significantly in India's march towards a self-sustaining economy. India today has the capacity to store about 200 BCM of water, irrigate about 90 Mha and potentially generate about 30,000 MW of hydropower (World Bank, 2005). Despite these efforts, rapid development, increasing population and non-uniform

distribution of water has seen an ever-widening gap between the demand and supply of this precious natural resource both at national and regional levels. In addition, problematic issues related to water management like expansion, maintenance and operation costs have added to India's struggle for achieving a water sustainable scenario. India has about 16 percent of the world's population but only 4 percent of its water resources with the per capita water availability of around 1,170 cum/person/year (NIH 2010).

harnessed the complementary skills between Indian and French researchers, such as the integrated studies of experimental watersheds, modeling, and assessment of environmental impact of mining on water quality. Many national and bilateral projects have been implemented. The IFCWS has also opened up opportunities to develop South-South collaborations with Southeast Asia (Thailand, Laos, Vietnam) and Central Africa (Cameroon).

scenarios for decennial and centennial scales. This situation requires an unprecedented intensity and scale of scientific observation and new knowledge to guide intervention.

In India, water and environmental issues are directly linked to its ever-growing population and industrialization. Although a leading country of the 21st century, India is still a country with emphasis on agriculture. This activity represented 89% of water consumption in 2000, of which 39% comes from groundwater. The heterogeneous rainfall distribution in space and time and the geology of Peninsular India comprising of hard rock aquifers with low water storability, are linked to anthropogenic pressure on groundwater and leads to water scarcity. With future climate change, amplification in frequency of natural hazards is expected. The growing scarcity of water resources is considered as a major impediment to sustainable development, wealth creation, global human health and the eradication of poverty. It is clear that if we add to this a growing anthropogenic pressure, chronic shortages of water are expected in many regions of the subcontinent, even with sufficient rainfall. A better assessment of the water resources, the groundwater

### Indian context and scientific queries

Accelerating changes in land use and climate are forcing rapid and profound alterations in the continental surface. Within the next four decades, demand for food and fuel is expected to double along with more than 50% increase in demand for clean water. Understanding, predicting and managing intensification of land use and associated economic services, while mitigating and adapting to rapid climate change, is one of the most pressing societal challenges of the 21st century. A better understanding of the processes behind the variability of climate and an improvement of the capabilities of predictions in tropical environments will enable to refine climate change

Indian Institute of Science (IISc.) is a premier research and training institution of India, offering Masters/Doctoral level programmes (<http://www.iisc.ernet.in>) in addition to a newly introduced undergraduate BS degree programme.

IRD is a French government funded organisation under the supervision of the Ministry of Higher Education and Research and also Ministry of Foreign Affairs and has international presence mainly in Southern countries (<http://www.ird.fr>).



Acid mine drainage due to oxidation of pyrite at a copper mine

recharge and sustainable management are crucial for the country. Furthermore, domestic, agricultural pollutions are widespread in the subcontinent apart from specific hazards due to industrial and mining activities. At the same time the demand for clean water is growing rapidly through urbanisation, population increase, rising income and economic growth. Our capacity to address these important issues like the management of water and soil resources, climatic impacts, nutrient cycles and diverse pollution is therefore crucial.

Building on the strengths of the collaboration between IISc and IRD as part of the IFCWS first phase during the period 2009-2013, the second phase was launched in 2014 to consolidate the present research efforts and to develop new partnerships and projects. The research activities of the second phase of IFCWS have been chosen to address these important issues like the management of water and soil resources, climatic impacts, nutrient cycles and diverse pollution. These may be organized into 4 scientific themes that are highlighted below:

**Adaptation of pristine and agro-systems to climate and anthropogenic forcing**

The original multidisciplinary approach, based on both field studies and remote sensing data will be augmented

by involving new disciplines such as agronomy, social sciences and economy (agrosystems) and soil ecology (agro- and pristine ecosystems). The main objective will be to focus on the dynamics (response to perturbation, resilience) of these systems. In pristine ecosystems emphasis will be put on the role of biota (vegetation and soil fauna) on biogeochemical cycles and on soil processes with impact of long term climatic fluctuations. In agrosystems, the processes at stake in innovative agricultural practices (vermicompost, biochar, silica fertilization) and biogeochemical budgets in representative crop systems will be studied. An integrated model will be developed to study the adaptation of irrigated agriculture to global change, accounting for climate and socioeconomic forcings. A complementary objective of this theme would be to pursue the reconstruction of the decadal to millennial scale monsoon variability in South Peninsular India on the basis of Holocene records (speleothems and sediments).

**Continuum ocean-continent-atmosphere  
Hydro-logical cycle and climate variability**

The Indian Ocean is a dynamically complex and a highly variable system, in particular under the monsoonal influence. The main objective is the understanding of

climate variability, large-scale hydrology of the Indian subcontinent, physical and biogeochemical dynamics in the Indian Ocean, which are still rudimentary in many aspects. The topics to be studied include: (i) the large-scale continental hydrology of the Indian Subcontinent, (ii) the Northern Indian Ocean water cycle (impact of continental runoffs on hydrology and on salinity evolution of the Bay of Bengal), (iii) the climate variability and monsoon (role of air-sea coupling in modulating climate variability including tropical cyclones and monsoon, regional impacts of climate change on monsoon rainfall), and (iv) the biogeochemistry of the Northern Indian Ocean.

**Environmental Biotechnology and Bioremediation**

The objectives are directed towards developing technologies for the abatement of toxic metals from aqueous systems. The research programme will encompass both basic and applied aspects of metal dissolution processes from mine and industrial environments, their transport across watercourses, bacteria-mineral interaction, bioremediation and understanding of underlying mechanisms. The formation of nano-particles through bio-precipitation routes will be especially studied. The target elements include arsenic, chromium, zinc, cadmium and copper.

**Urban catchments and water systems**

In the context of rapid urbanization and also climate change, it becomes also important to undertake studies of urban ecosystems related to hydrological cycling, sustainable groundwater use, storm water management, analysis of water network distribution system with emphasis on optimal management, leakage and water quality aspects. Rain water harvesting at both local scale as well as at large scale becomes an important component of the urban water cycle. With the use of

ICT, water management in an urban setting takes a new turn to bring in new technologies / ideas / algorithms to deal with and leading towards an integrated urban water supply.

To achieve the second phase objectives, the partnership between the Indian and French sides has been expanded. Apart from the three research units with IRD leadership involved in phase 1, namely Géoscience Environnement Toulouse (GET), Laboratoire d'Etudes en Géophysique et Océanographie Spatiales (LEGOS), Centre Européen de Recherche en Géosciences de l'Environnement (CEREGE), three more units have been added to bring additional competences: Centre d'Etudes Spatiales de la Biosphère, (CESBIO) Toulouse, Biogéochimie et écologie des milieux continentaux (BIOEMCO), Paris and Laboratoire d'Océanographie Dynamique et de Climatologie (LOCEAN), Paris. This has led to the strengthening of the pre-existing collaborations between IISc and IRD with other Indian research institutions namely National Institute of Oceanography (NIO), Goa and Indian institute of Tropical Meteorology (IITM), Pune in water sciences.

Outcomes on water development issues are expected in domains as diverse as water and soil management in rural agricultural watersheds, urban ecosystems, ecologically intensive agriculture (vermicompost, biochar, organic fertilizers), remediation strategies of mining and industrial wastes, cyclone and monsoon prediction, fisheries management. The vision of the IFCWS phase 2 is also to strengthen and develop the collaborations in water sciences and environment at regional (Indian Ocean countries, SE Asia) and international levels (Africa, Europe, Japan and USA), and to ensure technology transfers through the existing or forthcoming South-South collaborations (Cameroon and SE Asia, mainly). ●

**Forthcoming Events**

- Seminar on "Organic photovoltaics (OPV) for Solar Energy conversion" | October 15-17, 2014 Pune, India | Contact Person : **Dr. C.S Gopinath** | E-mail : cs.gopinath@ncl.res.in
- Seminar on "Strengthening capacity for inventory of fauna in biodiversity hotspots in India and its neighbouring countries" | October 14-17, 2014 Hyderabad, India | Contact Person : **Dr. Karthikeyan Vasudevan** | E-mail : karthik@ccmb.res.in
- Seminar on "Organic Semiconductor Gas Sensors" | February 10-12, 2015 Reims, France | Contact Person : **Dr. M.M. Chehimi** | E-mail : mmchehimi@yahoo.fr

## Indo French Water Network

## Connecting the dots

The Indo French Water Network (IFWN) stems from a convergence of interests and views between France and India on questions linked to water and the long-standing collaborations existing in this field. Jenifer Clark explains:



In order to ensure a better visibility of Indo-French actions and further facilitate synergies and collaborative work in the water sector between France and India, it was decided to establish a network. The IFWN was launched by the Ambassador of France to India, H.E. Mr François Richier, in 2013, and is driven by the Embassy of France in India, the National Institute of Advanced Studies (NIAS), and CEFIPRA.

IFWN aims to develop and strengthen partnerships between India and France in the water sector with a multidisciplinary perspective, by bringing together private enterprises, public entities, individuals, academics and any other individual or group from France or India working in the sector. A first preliminary seminar was organized at the National Institute of Advanced Studies (NIAS) on 7<sup>th</sup> and 8<sup>th</sup> November 2011 with over sixty France and India participants. The seminar culminated in a common expression of willingness towards the formation of the Indo French Water Network. IFWN is managed by a Steering Committee of experts from government, industry and academia from France and India.

IFWN is built on the foundation of strong collaborations between France and India on the resource and the quality of groundwater, the water cycle and biogeochemical cycles in tropical environment and finally the treatment and reuse of water in urban and mining environment. The **two Indo-French joint labs** in the water sector have developed stable and strong research collaboration for more than 13 years.



HE Mr François Richier, Ambassador of France to India visiting the Indo French Cell for Water Sciences

#### INDO FRENCH CENTRE FOR GROUND WATER RESEARCH, HYDERABAD

The National Geophysical Research Institute (NGRI) and *Bureau de Recherches Géologiques et Minières* (BRGM) collaboration was the first Indo-French collaboration project in water resources funded by CEFIPRA and started in 1999 at Hyderabad. The centre includes scientists in the fields of Aquifer modeling, Geophysics, Hydrogeology, etc.

#### INDO-FRENCH CELL FOR WATER SCIENCES (IFCWS), BANGALORE

The Indo-French Cell for Water Sciences (IFCWS) is a joint laboratory between the Indian Institute of Science (IISc) and the *Institut de Recherche pour le Développement* (IRD) set up in 2001 in the IISc campus, Bangalore. The other principle partners are NIO, IITM, UAS and ATREE in India, and CNRS, CNES, INRA and Agroparistech in France. The research at the Cell is multidisciplinary, including Hydrology, Remote sensing, Geochemistry, Oceanography, Atmospheric Sciences, Ecology, Biology, Modeling, Agronomy, and Social Sciences.

#### The objectives of the IFWN are:

- Put in place a structured, regular, and longstanding dialogue between French and Indian actors in the water sector to favor synergies;
- Favor the development of collaborations in different sectors (academic, scientific, industrial, civil society, policy makers, elected representatives, etc.) between Indian and French actors, concerning the knowledge

or the management of water in different contexts (urban, peri-urban, peri-rural, rural ...);

- Promote interdisciplinary research projects with an emphasis on applied water technology in a social context;
- Support the transfer of initiatives, capacity building and practical solutions which involve different levels of government (national, state, local), industry, legal expertise, decision making bodies, NGOs, civil society and communities;
- Inculcate knowledge sharing among other actors in the water sector besides the members on the challenges linked to water;
- Reinforce the visibility of the IFWN and its actors through all appropriate mediums/ means.

The initial **activities** are towards networking and establishing links between actors in France & India. After a successful seminar, funded by CEFIPRA, on “Recent Advances and Innovations for sustainable water management” organised at IIT Delhi in December 2012, IFWN launched a call for workshop proposals in August 2013; six proposals were received and evaluated by the Steering Committee and two were selected for funding. In addition, IFWN was active during the large India France Technology Summit with 900 participants.

#### OCTOBER 2013: INDIA FRANCE TECHNOLOGY SUMMIT

Two round table discussions focusing on water were organized by IFWN during the large India France

Technology Summit on 23<sup>rd</sup> and 24<sup>th</sup> October 2013. The first round table discussed the role of urban planning while addressing the demand for water and waste management in the coming future. The second panel discussion focused on the key areas of research and development on agricultural water resource management, and initiate or improve those where synergies between India and France exist.

#### NOVEMBER 2013: INDO-FRENCH WORKSHOP ON WATER RESOURCES MANAGEMENT USING MICROWAVE REMOTE SENSING

The first IFWN workshop took place at IISc Bangalore on 13<sup>th</sup> November 2013. Dr. Yann Kerr Director CESBIO, Toulouse, France and Prof. Sekhar Muddu, IISc Bangalore, India were the co-organizers of this workshop. This one day workshop focused on Water Resource Management using Remote Sensing. About 30 participants from various research institutions such as Indian Space Research Organization (ISRO), French National Centre for Space Studies (CNES) Toulouse, The National Institute for Agricultural Research (INRA) Bordeaux, Indian Institute of Science Bangalore (IISc), National Remote Sensing Centre (NRSC) Hyderabad, Karnataka State Natural Disaster Monitoring Centre (KSNDMC) Bangalore, and Institute of Research for Development (IRD) Paris participated with stimulating discussions leading to new collaborations.

#### FEBRUARY 2014: INDO-FRENCH WORKSHOP ON WATER AND LAND MANAGEMENT

The four-day workshop on water and land management was co-organized by Prof. Devi Prasad, Department of Ecology and Environmental Sciences, University of Pondicherry and Dr. Audrey Richard-Ferroudji, French Institute of Pondicherry (IFP). This interdisciplinary workshop brought together 80 French and Indian participants to discuss the interactions and interfaces between water management and land development across jurisdictional and sectorial boundaries and how to go towards integrated management of surface and ground water possibilities. A one day field trip in the countryside of Pondicherry was extremely useful to base the discussion on the ground reality. The discussions led to the identification of topics of common interest, such as interdisciplinary approach of groundwater recharge, the farmer of the future and water resources, domestic water in urbanizing areas, etc.

#### JUNE 2014: NEW INTERACTIVE WEB PLATFORM

The new IFWN website was officially launched on 17<sup>th</sup> June 2014. The [www.ifwn.org](http://www.ifwn.org) is a virtual platform for the IFWN members to share and exchange ideas. The main goal of this website is to facilitate a structured dialogue between Indian and French actors in the water sector through a virtual platform. It also allows members to find partners, share their research, ideas and findings with the IFWN community.

#### JUNE 2014: NEW CALL FOR WORKSHOP PROPOSALS

A call for workshop proposals in water sector was launched on 18th June 2014. The IFWN will cover mobility costs and logistic expenses for the workshop. The submission deadline is 14th August 2014. For more information, please visit <http://ifwn.org/call-for-seminarworkshop-proposals-in-the-water-sector/>.

#### JULY 2014: OFFICIAL VISIT OF FRENCH FOREIGN AFFAIRS MINISTER

Mr. Laurent FABIUS, Hon'ble French Minister for Foreign Affairs and International Development, former Prime Minister of France, visited India on 30<sup>th</sup> June – 1<sup>st</sup> July 2014. He was the first western dignitary to engage with the new Indian government. In preparation of the 2015 Paris Climate Conference, issues of climate change and sustainable growth are high on the global agenda and Indo-French partnership. On 1<sup>st</sup> July, the Minister chaired a panel discussion on “Sustainable Growth in Response to Climate Change: Indo-French Perspectives”. In his speech, he emphasized the importance of Indo-French cooperation through the IFWN.

#### JULY 2014: IFWN JOINS INDO-EUROPEAN CALL FOR PROPOSALS

IFWN is associating with the INNO INDIGO Partnership Programme call for proposals 2014 in the field of “Clean Water and Health”. The French Embassy in India will support mobility costs for scientific exchanges between India and France for the successful projects of this call. These mobility grants are aimed at promoting and consolidating Indo-French collaboration, in a European context, through scientific exchange visits in the water sector. For more information, please visit <http://indigoprojects.eu/funding/inno-indigo-calls/ipp1>. ●

## Indo-French Workshop on Himalyan Tectonics

Srinagar | Leh  
20-28 July, 2014

Himalayas represent earth's most impressive and spectacular example of geological architecture, sculptured by intense denudation and involving a formidable combination of processes. These include frost-shattering, chemical weathering, glacial erosion, fluvial incision and mass movement processes. Understandably, Himalayas have been a matter of great interest to geoscientists across the world. Himalayan landscape is an exciting display of tectonic architecture, lithostratigraphy, evolutionary history, episodic magmatism and metamorphism. As a result it provides exciting opportunities to study variation along its entire length from pre-cambrian age to present times.

In the above context, CEFIPRA organised an Indo-French workshop cum field study on “Himalayan Tectonics” from 21-29 July, 2014. It was coordinated by Prof. T Ahmed, Vice Chancellor, Jamia Millia University, New Delhi and Dr. Satish Singh & Dr. Yann Klinger from Institut de Physique du Globe de Paris, the schedule included fieldwork, group discussions and a seminar. 30 Indian and French geologists participated in the workshop.

The group started its journey on 21 July (Day 1) from Jammu to reach Srinagar after cutting across three major tectonic zones viz., the Outer Himalaya, the Lesser Himalaya and the Kashmir Tethyan Himalaya. Enroute the group stopped at Jhajjar Kotli Nala, Khanpur, Udhampur Syncline near Patnitop, Peerah, Digdaul and Nowgam village for studying these zones.

On Day 2 (22 July) the participants' visited Guryul Ravine to review the Zewan formation, Khunamuh formation, Permo-Triassic Boundary, Panjal Traps and Triassic Limestone formation along the Srinagar-Khunamuh stretch, 13 km east of Srinagar.

On Day 3 (23 July) the group departed for Sonamarg, 87



km away from Srinagar at an altitude of 3000m above mean sea level. Along the route the group explored quaternary sediments of Karewa Group, basic volcanic rocks of Panjal Traps, Triassic Limestone and Zewan Formations and Thajiwas glacier. The discussions were focussed on thick sediments of Karewa group in Kashmir valley and the rocks of Salkhala series.

On Day 4 (July 24) the group took the road to Kargil beyond the famous Zozila pass on Srinagar-Leh highway. The group studied highly deformed rocks of Triassic Limestone, Metamorphic rocks of Zanskar Crystalline, basic volcanic rocks of Panjal and Drass volcanics, granitic rocks of Kargil Igneous Complex, mollase sediments of Indus Formations that line the sides of the road from Sonamarg to Kargil. Drass formation, Kargil Formation and Kargil Igneous Complex entrapped between the Drass volcanics to the south and the Ladakh Batholith to the north were of particular interest.

Cont. on page XIX














**MOBILITY OF SCIENTISTS SUPPORTED UNDER CEFIPRA PROJECTS**  
 JUNE - JULY 2014

	Project Title	Name and Institution Affiliation	Institute Visited	
1	Puzzling properties of Ultrathin polymer films	<b>Prof. Alain Gibaud</b> Laboratoire de Physique de l'Etat Condense, Université du Maine Avenue Olivier Messiaen 72058 Le Mans Cedex 9, France	Saha Institute of Nuclear Physics Saltlake, Kolkata	
2	Discontinuous Galerkin Method for Nonlinear Acoustics	<b>Dr. Baskar Sambandam</b> Department of Mathematics, Indian Institute of Technology Bombay, Mumbai	Institut Jean Le Rond d'Alembert Université Pierre et Marie Curie (Paris 6), Paris, France	
3	eSynapse based on heterostructures of binary oxides	<b>Prof. Bipin Rajendran</b> Department of Electrical Engineering, IIT Bombay, Mumbai	Institut des Nanotechnologies de Lyon, CNRS, Ecole Centrale de Lyon, Ecully, France	
4	Analytic aspects of modular forms	<b>Dr. Dipendra Prasad</b> School of Mathematics Tata Institute of Fundamental Research, Mumbai	Université Paris 13, Villetaneuse, France	
5	Arithmetic circuits computing polynomials	<b>Dr. Hervé Fournier</b> Institut Mathématique de Jussieu, Université Paris Diderot-Paris 7, Paris	Indian Institute of Technology Bombay, Mumbai	
6	Molecular mechanisms of immune evasion by M. Tuberculosis	<b>Dr. Jagdeesh Bayry</b> Centre de Recherche des Cordeliers, INSERM, Paris	Indian Institute of Science, Department of Microbiology and Cell Biology, Bangalore	
7	Bimetallic Catalysis Involving Ruthenium and Palladium: C-H Bond Activation/Functionalization and Beyond	<b>Dr. Jitendra K. Bera</b> Department of Chemistry Indian Institute of Technology Kanpur, Kanpur	Institut Sciences Chimiques de Rennes Université de Rennes, France	
8	Real time imaging through for over long distance (RTIFOLD)	<b>Prof. Julien Fade</b> Institut De Physique de Rennes, Université de Rennes 1, Campus de Beaulieu Rennes, France	Raman Research Institute, Bangalore	
9	Cenozoic denudation of South India	<b>Prof. M. Jayananda</b> Department of Geology Centre of Advanced Studies University of Delhi	IRD CEREGE Aix Marseille Université, Aix en Provence, France	
10	Controlling for Upscaling Uncertainty in Assessment of Forest Aboveground Biomass in the Western Ghats of India	<b>Dr. Pierre Coueron</b> UMR AMAP (Botanique et bioinformatique de l'Architecture des Plantes), Montpellier, France	National Remote Sensing Centre, Hyderabad	

**MOBILITY OF SCIENTISTS SUPPORTED UNDER CEFIPRA PROJECTS**  
 JUNE - JULY 2014

	Project Title	Name and Institution Affiliation	Institute Visited	
11	Extreme QCD in the LHC Era	<b>Prof. Rajeev S. Bhalerao</b> Department of Theoretical Physics Tata Institute of Fundamental Research, Mumbai	Institut de physique théorique CEA Saclay, France	
12	Smart Structure maintenance strategies based on Structural Health Monitoring damage indicators	<b>Prof. Ranjan Ganguli</b> Indian Institute of Science, Bangalore	Université Paul Sabatier, Toulouse, France	
13	Controlling for Upscaling Uncertainty in Assessment of Forest Aboveground Biomass in the Western Ghats of India	<b>Dr. Raphael Pelissier</b> UMR AMAP (Botanique et bioinformatique de l'Architecture des Plantes), Montpellier, France	National Remote Sensing Centre, Hyderabad	
14	Studying the role of rpoN, the alternative sigma factor, in the pathogenicity of R. solanacearum, the causal agent of bacterial wilt in plants	<b>Dr. Suwendra Kumar Ray</b> Tezpur University, Department of Molecular Biology and Biotechnology, Assam	Laboratoire des Interactions Plantes Micro-organismes, INRA, France	
15	Studying the interactome of NAD-dependent deacetylase Sirt1 in the testis	<b>Dr. Ullas Kolthur Seetharam</b> Tata Institute of Fundamental Research, Homi Bhabha Road, Mumbai 400 005	Institut de Pharmacologie et de Biologie Structurale, Toulouse, France	
16	Novel nano technological approaches for treatment of leishmaniasis using 2- propylquinoline	<b>Prof. V. Kesavan</b> Department of Biotechnology Indian Institute of Technology Madras, Chennai	Université Paris-Sud 11, Chatenay Malabry, France	


**MOBILITY OF STUDENTS SUPPORTED BY CEFIPRA**  
 JUNE - JULY 2014

Domain	Name & Institute	Institute Visited	
Mathematics	<b>Dr. Akshay Rane</b> Indian Institute of Technology- Bombay, Mumbai	Jean Monnet universite of Saint Etienne, France	
Earth Science	<b>Mr. Mohd Amir</b> Department of Earth Science Indian Institute of Technology, Kanpur	Université Paris Diderot & Institut de Physique du Globe de Paris, Laboratoire de dynamique des fluides Géologiques, 2 Place Jussieu 75251 Paris	
Chemical Sciences	<b>Mr. Simon Donck</b> Université Paris Sud	Indian Institute of Technology-Bombay, Mumbai	

**CONGRATULATIONS!! 2014 CEFIPRA-ESONN FELLOWS**

CEFIPRA, in collaboration with Joseph Fourier University, Grenoble; Grenoble-INP, is supporting the participation of Indian doctoral students in the European School on Nanoscience and Nanotechnology (ESONN) training programme-Session 2014, the details of which is available in (<http://esonn.fr>). The session is scheduled to be organised from August 24th - September 13th 2014 at Grenoble, France

The following eight students have been selected for participating in the ESONN Session 2014. The cost of their participation in ESONN shall be supported by CEFIPRA:

 <b>Atul Kumar Nishad</b> IIT, Ropar	 <b>Biplab Pal</b> University of Kalyani, West Bengal	 <b>Sonam Madani</b> IIT, Indore	 <b>Subodh Kumar Gautam</b> Inter University Accelerator Centre, New Delhi
 <b>S Kaviya</b> IIT Madras, Chennai	 <b>Kshipra Naik</b> BITS Pilani, Goa	 <b>Mahesh Chandra</b> IIT, Indore	 <b>Prarthana V.D.</b> IISc, Bangalore

CEFIPRA wishes all the shortlisted candidates an informative and productive participation in European School on Nanoscience and Nanotechnology (ESONN).

**DST-ANR TARGETED COLLABORATIVE RESEARCH PROGRAMME (2014)**

Under the CEFIPRA initiated targeted Collaborative Research Programme between Department of Science and Technology (DST), Government of India and Agence Nationale de la Recherche (ANR), 92 pre-project proposals were received in the areas of Neuro Science and Engineering Sciences.

After two stages of evaluation process, a Joint Indo-French Committee has selected the following two project proposals for support.

Project Title	Indian PI	French PI
Study of the association of micro RNA and mitochondria and their role in regulation of neuronal cell death in Fragile X Tremor Ataxia Syndrome (FXTAS)	<b>Dr Rajesh Singh</b> Associate Professor Department of Biochemistry The M S University of Baroda, Gujrat, India	<b>Dr. N. Charlet Berguerand</b> Group Leader INSERM, France
Self-sorting donors and acceptors assemblies	<b>Dr Suhrit Ghosh</b> Associate Professor Polymer Science Unit Indian Association for the Cultivation of Science, Kolkata, India	<b>Dr. Philippe Mésini</b> Directeur de recherch, Institut Charles Sadron, France

*Reader's MAIL*



*Bonjour à vous. Merci pour cette belle parution qui est en même temps un bon souvenir de notre rencontre.*

**Dr. Denis Randet, Délégué général**  
Association Nationale de la Recherche de la Technologie, Paris

*Excellent work and newsletter!*

**Dr. Thilo Schönfeld**  
Délégué aux affaires internationales /Deputy Director International Affairs, Aerospace Valley, Toulouse

*Thank you very much for this very interesting newsletter and congratulations for all your activities.*

**Madame Olivia Calvet-Soubiran**  
Conseiller, Inde Service Asie Amériques, Direction du développement international des entreprises, Chambre de Commerce et d'Industrie de Région Paris Ile de France

*Thank you for the impressive report/ update on CEFIPRA.*

**Prof. Raghavendra Gadagkar**  
Centre for Ecological Sciences,  
Indian Institute of Science, Bangalore

*Please accept my compliments for nice compilation of many initiatives/ developments. It is quite informative and lists out developments in respect of quite a few important and challenging projects.*

**Dr. D R Prasada Raju**  
Scientist-G/Adviser & Head (TMC, Disha, SEED and GLP),  
Department of Science and Technology, Government of India

*As an ex-participant in several projects supported by CEFIPRA, it gives me great pleasure to know, through ENSEMBLE, the excellent work done by the Indian and French scientists. Wishing the organisation all the best!*

**Dr. R. Suryanarayanan**  
Hony scientist, Univ Paris Sud, Orsay, France

*Always looking forward to ENSEMBLE, your excellent newsletter.*

**Dr. Sujit Bhattacharya**  
Professor AcSIR| Academy of Scientific Research & Innovation Senior Principal Scientist (NISTADS)

**Indo-French Workshop on Himalyan Tectonics**

*Cont. from page XV*

Day 5 (25th July) of the field trip was devoted to study Formations in Mulbek, Lamayuru and Leh. Day 6 (26th July) saw the group off for the famous Tso-Morari Lake located at a height of 12000 feet southeast of Leh. After crossing the Indus River at Mahe Bridge, the team on its way to Tso-Morari Lake near Karzog village traversed the Late Cretaceous-Eocene Ladakh Batholith. This was a great opportunity to see deeper exposures, characterized by coarse-grained granite and granodiorite, abundant diorite enclaves concentrated towards the margin of the Batholith but nearly absent towards its core. The participants deliberated on the possibilities of reviving the knowledge on Tso-Morari eclogites remarkable for the depths at which their assemblages have formed and intensely studied by several international teams of geologists. The team returned to Leh on July 27th. All through the trip the days were spent in the field, the evenings were dedicated to sharing perspectives and insights through presentations.

On July 28th, the last day was devoted to exploring geological sights around Leh. A seminar was organised for participant recount experiences and exchange notes with each other on observations/learning during the seven days spent in this geologically exciting landscape. Presentations by various participants, not only analysed the observations during the field excursion but also explored possibilities of advancing Indo-French collaboration in this field through CEFIPRA.

All participants felt that field trips such as these, especially those involving students/young scientists can go a long way to future collaborations between India and France. The French participants expressed great interest to develop contacts with Indian geologists who could jointly work with them on their area of expertise and vice-versa. ●

## CALL FOR PROPOSALS

### Call for proposals in Information and Communication Science & Technology under CEFIPRA initiated targeted programme.

Department of Science and Technology (DST) and Institut National de Recherche en Informatique et en Automatique (INRIA) jointly with the Centre National de la Recherche Scientifique of France (CNRS) launch a joint call for proposals to foster collaboration between scientific communities of two countries in the area of Information and Communication Science & Technology. Jointly selected proposals will be funded in India by DST and in France by Inria (for INRIA Research Team) or by CNRS (for CNRS Research unit).

In India, on behalf of the Department of Science & Technology, CEFIPRA invites proposals from the Indian scientists / researchers.

Proposals will be supported in the following scientific areas:

- Big Data
- Computer Science for Biology and Life Science
- Reliable and Scalable Computation

**Eligibility :** Applicants must be holding a permanent position as scientists/ Faculty members in universities/ deemed universities, academic institutes and national research and development laboratories/institutes.

For details regarding the application process, format, supporting documents and funding pattern please visit [www.cefipra.org](http://www.cefipra.org) or contact:

**The Director**

Indo-French Centre for the Promotion of Advanced Research,  
5B Ground Floor, India Habitat Centre, Lodhi Road, New Delhi 110 003

Email: [director@cefipra.org](mailto:director@cefipra.org) • Website: [www.cefipra.org](http://www.cefipra.org) | Tel. : (+91-11) 24682251, (+91-11) 24682252, Fax: (+91-11) 24688632

**DEADLINE FOR SUBMITTING OF PROPOSALS: 30TH SEPTEMBER, 2014**

## CALL FOR PROPOSALS

### INDO-FRENCH CENTRE FOR APPLIED MATHEMATICS

The Indo-French Centre for Applied Mathematics (IFCAM) has been jointly set up by the Indian and French Governments at the Indian Institute of Science, Bangalore as an international joint research unit. IFCAM is designed as a platform for cooperation in mathematical sciences with the primary focus being the area of applied mathematics.

IFCAM funds joint research projects between Indian and French investigators in the area of applied mathematics (interpreted broadly to include projects in other areas like engineering and physics long as they have non-trivial mathematical content), exchange visits of faculty and students (within the ambit of a research collaboration), post-doctoral fellowships, joint research workshops and visits by Indian researchers (particularly from universities and colleges) to IFCAM. In addition there are targeted funds made available by various French institutions for visits, PhD scholarships etc. Indian researchers and students can apply to the concerned French Institution for these targeted activities. Further details on all of the above can be obtained from the IFCAM web site: <http://www.math.iisc.ernet.in/~ifcam/>

Proposal for joint research projects and research project should have an Indian and French principal investigator. Proposal should be in the format given on the IFCAM web site. This year, priority will be given to proposals in statistics, machine learning and mathematical biology. Completed proposal should be sent by email to [ifcam@math.iisc.ernet.in](mailto:ifcam@math.iisc.ernet.in) and hard copies should be sent to the following address:

**The Director**

Indo-French Centre for Applied Mathematics, Department of Mathematics, Indian Institute of Science, Bangalore 560 012, India  
Tel: +91-80-2360 0365 Fax: +91-802360 0365

**DEADLINE FOR SUBMITTING OF PROPOSALS: 28TH SEPTEMBER, 2014**



Indo-French Centre for the Promotion of Advanced Research (CEFIPRA) is a model for international collaborative research in advanced areas of science and technology. The centre was established in 1987 with support from Department of Science & Technology, Government of India and the Ministry of Foreign Affairs, Government of France.



For further information please contact:

Pour toute information complémentaire, veuillez contacter:

**Director**

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