

ANNUAL REPORT

2011-2012



**JAWAHARLAL NEHRU CENTRE FOR
ADVANCED SCIENTIFIC RESEARCH**

(A Deemed to be University)

Jakkur, Bangalore - 560 064.

Website: <http://www.jncasr.ac.in>



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The Centre

Foreword

I have great pleasure in presenting the Twenty Third Annual Report for the year 2011-12.

The Centre has been emerging as one of the leading institutions in the country for higher learning and research in frontier areas of science and engineering. The Centre has also been recognized as a Deemed to be University.

There is a steady increase in the number of research students in the Centre pursuing various academic programmes. The present student strength is 266. 73 students joined the Centre during August session of 2011 including 8 students who joined during mid-year admission of January 2012. 6 students were awarded with M S (Eng.) degree, 2 with M S (by research), 9 with M S (Materials Science) and 18 Ph D degrees. In order to provide opportunities to teachers and others to obtain training and for carrying out science education projects, the Centre is offering a postgraduate diploma programme in science education. The academic, research, fellowship and extension programmes have been progressing as envisaged. The publication record is growing steadily. The faculty members have made significant scientific contributions. It is a matter of great honour that Prof C N R Rao has been felicitated with H K Firodia Lifetime Achievement Award, 2011 and Einstein Professorship of Chinese Academy of Sciences. The prestigious H K Firodia Award 2011 for Excellence in Science & Technology to Prof. Roddam Narasimha and the Shanti Swarup Bhatnagar prize to Prof. S. Balasubramanian have added pride to the Centre. The continuous recognition of our faculty members with several honours has reflected our standing within academic peers.

This year significant progress has been made in all spheres of academic activities at the Centre. A series of programmes were organized by Education Technology Unit (ETU) and Hall of Science toward the promotion of science education.

C.N.R. Rao Hall of Science and ETU organized and conducted the program to award the Prizes for Outstanding Science Teachers for the year 2010 donated by the C. N. R. Rao Education Foundation. Shri. Arvind Gupta and Mrs. M.S. Prabhavathi were awarded the prizes. C. N. R. Rao Hall of Science and Education Technology Unit along with SOP-ETU took up a project of conducting four Workshops for 100 Pre-University Teachers from different places in Karnataka in using the College Chemistry Kit.

The Science Outreach Program has become an important academic component of the Centre. Many school children and teachers were exposed to the excitement of Science through various programmes at the Centre. The C N R Hall of Science and Education Technology Unit conducted various programmes for children in their endeavour in popularizing science among the young students.

This has been an another year of significant scientific discoveries made by our faculty and students; to name a few, Prof C N R Rao and Prof Umesh Waghmare have shown that an inorganic compound containing boron, carbon and nitrogen could absorb carbon dioxide (CO₂) and methane (CH₄) – two greenhouse gases (GHGs) that contribute to global warming. This graphene-like layered compound may open up novel ways to reduce the levels of greenhouse gases in the atmosphere; Ms Nisha Mammen and Prof Shobhana Narasimhan, together with Prof Stefano de Gironcoli, have suggested a novel and practicable way of changing the morphology of gold nanoparticles deposited on a metal oxide substrate, by doping the oxide with atoms of another metal. This can increase catalytic efficiency by changing the particle shape from three- to two-dimensional; Researchers (from Chemistry and Physics of Materials Unit, DST Unit on Nanoscience, and Birck Nanotechnology Center, Purdue University, USA) have carved charge-storing islands surrounded by nano-sized trenches on a graphite surface. The study offers a way of creating spatially confined graphene-like structures, which could form the foundation of functional devices; Prof. Srikanth Sastry, Mr Vishwas V Vasisht, Mr Shibu Saw, Theoretical Sciences Unit, have reported that liquid silicon can actually transform between two different 'phases' – one at low temperature and pressure and one at high temperature and pressure. The finding may suggest novel avenues for making silicon in the crystal phase as well as different forms of amorphous silicon.

During the current year, 24 patent applications (Indian Provisional Applications-8, Indian Complete Applications-2, PCT-3, USA-5, EPO-2, Brazil-1, China-1, Japan-1, Korea-1) have been filed. 3 patents (USA-1, EPO-2) were obtained and 7 inventions were licensed.

The Centre maintains its vibrant academic activities through conferences, seminars, colloquia and discussion meetings.

The infrastructure is being constantly upgraded to meet the academic requirements and for scientific and student activities. All these developments would not have been possible without the continuous support from the Department of Science and Technology.

MRS RAO
President



INTRODUCTION

The Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore, a premier research institute in the country, was established in the year 1989, the birth centenary year of Pandit Jawaharlal Nehru, by the Department of Science and Technology. The objectives of the institute shall be to pursue and promote scientific research and training at the highest level in the frontier and interdisciplinary areas of science and engineering. The number of publications in international journals of repute and the filing of patents are steadily increasing year by year. The Centre, which is just twenty three years old, is creating news regularly in the scientific world with its breakthrough discoveries. The Centre has research collaborations with several national and international institutions. In recognition of the achievements of the Centre, the Ministry of Human Resource Development (GOI) has accorded the status of Deemed University, to enable the Centre to train quality manpower. The faculty members of the Centre have received national and international recognitions. Several faculty members of the Centre are Fellows of National and International science and engineering academies.

Prof C N R Rao, the founder of the Centre, held the office of President from 1989 to 1999. He is presently the Honorary President of the Centre and Chairman of the Scientific Advisory Council to the Prime Minister. Prof V Krishnan, who succeeded him, served as its President from 2000 to 2003. Prof MRS Rao is presently the President of the Centre.

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OBJECTIVES

The objectives of the Centre are:

- To carry out front-line research in selected thrust areas of science and engineering;
- To promote collaborative research with scientists at the Indian Institute of Science and other institutions in the country;
- To provide a national and international forum for in-depth discussions on important scientific topics in areas of vital interest to scientists of the Centre and in the country at large;
- To organize periodic winter and summer schools in certain areas, where young talented scholars would be associated;
- To provide opportunities for talented young students to carry out research projects;
- To provide facilities to visiting scholars and faculty, from all over India and abroad, to work for extended periods with the faculty of the Centre;
- To publish monographs and reports on frontier and futuristic areas of science as well as monographs of educational value.

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PROGRESS

The Centre has just completed 23 years encompassing several memorable and exciting moments. Following are the research units: Chemistry and Physics of Materials Unit, Educational Technology Unit, Evolutionary and Organismal Biology Unit, Engineering Mechanics Unit, Geodynamics Unit, Molecular Biology and Genetics Unit, and Theoretical Sciences Unit, the International Centre for Materials Science, New Chemistry Unit, and new Unit/Centre like the Thematic Unit of Excellence in Computational Materials Science is the newer in the lot. The new Nanoscience Centre is equipped with the state of the art facilities for advanced research in materials science.

The Centre is equipped with good quality Library, an excellent computer support facility, Lecture Halls, a Chemical Education Laboratory, Conference and seminar halls, Faculty Offices and the Administrative Office. A seminar hall, a well-furnished accommodation for academic visitors and a Visitor House are also located at IISc campus.

During the year, 6 students were awarded with M S (Eng.) degree, 2 with M S (by research), 9 with M S (Materials Science) and 18 Ph D degrees. Currently about 266 scholars are pursuing their research career. The research and training at the Centre has led to the award of 117 Ph D degrees, 34 M S (Engg.) 39 M S degrees, 3 M S (by research) and one M Sc (by research) degrees so far. The Centre has emerged as a place for interdisciplinary research, with effective interactions among scientists with backgrounds in biology, chemistry, engineering and physics. The JNC community has been working not only in pursuit of research, but also on dissemination of science-related activities reaching out to the common man.

The Centre's faculty members have received number of national and international recognitions. Prof C N R Rao, Chairman, Scientific Advisory Council to the Prime Minister and National Research Professor, has been awarded with H K Firodia Lifetime Achievement Award, 2011 and Einstein Professorship of Chinese Academy of Sciences. Prof. Roddam Narasimha has been awarded with the prestigious H K Firodia Award 2011 for Excellence in Science & Technology and Prof. S. Balasubramanian with the Shanti Swarup Bhatnagar prize. Prof. C.N.R. Rao has been also felicitated with Ernesto Illy Trieste Science Prize (2011) for materials research; Dhirubhai Ambani Life-Time Achievement Award for Innovation(2011); EDGE Award for leadership in education (2011); D.Litt. by Karnataka State Open Univeristy (2011); D.Sc. (honoris causa) Université Joseph Fourier; D.Sc.(honoris causa) SRM University, Tumkur University. Prof. R Narasimha has been also awarded Distinguished Alumnus Award, University Visvesvaraya College of Engineering. Prof. Shobhana Narasimhan has received Stree Shakti Science Samman Award and Kalpana Chawla Award of the Government of Karnataka. Prof. Tapas Kumar Maji has been selected as an "Emerging Investigator" in Chemical Science by Journal of Chemical Communications in 2011. Dr. T. Govindaraju has received INSA Medal for Young Scientist (2011), Indian National Science Academy, New Delhi, India. Dr. Subi J. George has been chosen as a Young Investigator in the field of Chemical Sciences by the Journal Chemical Communications, 2012, published by the Royal Society of Chemistry. Prof. Amitabha Chattopadhyay has received Darshan Ranganathan Memorial Lecture Award (CRSI), 2011. Prof. Satyajit Mayor has been the recipient of TWAS Biology Prize, 2011. Prof. P. Rama Rao has been elected as Foreign Associate of the US National Academy of Engineering, 2012. Prof. Shobhana Narasimhan has been elected as Fellow, National Academy of Sciences of India and Prof. Vijay Kumar Sharma as Fellow, Indian Academy of Sciences, Bangalore, 2012. Prof. G Subramanian has received Indo-US Senior Fulbright Fellowship. Prof. Partha P. Majumder has been elected as Fellow, TWAS: The Academy of Sciences for the Developing World, Trieste - 2011.

The Faculty members of the Centre have published around 279 scientific papers in reputed international journals during the year 2010-11, some of them with very high impact factor.

Many patent applications were filed for new inventions. Details are provided in a separate section on "Intellectual Property".

The interactions with academic institutions and universities globally have continued and the Centre is expanding its formal ties in respect of collaborative research, exchange of graduate students and consultancy projects.

Honorary Faculty Members of the Centre have continued to play an important role in guiding academic and extension activities of the Centre.

Summer Research Fellowships, Project Oriented Chemical Education Programme, Project Oriented Biological Education Programme, Visiting Fellowships, Extension Programmes and Academic Exchange Programmes have attracted wide attention and have been highly successful.

For the Summer Research Fellowships programme, out of the 87 fresh fellowships that were awarded, 62 fellowships have been utilized. For POCE, 11 meritorious students were offered the fellowship. Nine students of POCE-2009-11 were awarded Diploma in Chemistry. Under POBE, 9 candidates have joined the programme. Eight students of POBE 2009 batch received their Diploma in Biology certificates this summer on successful completion of their 3 year project training.

Ten candidates from R&D institutions have been offered Visiting Fellowships.

JNCASR-CCSTDS has been renamed as JNCASR-CICS. It is jointly instituted by the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) Bangalore and the Centre for International Co-operation in Science (CICS), Chennai. Two Fellows selected for the year 2009-10 have been given certificates on successful completion of their 3 month training programme in India. 4 Fellows have been given JNCASR-CICS certificates for the year 2010-11. In 2011-12, 7 scholars have been selected for the fellowship.

Since the beginning of the financial year 2011-12, 30 Discussion Meetings, International Conferences, Workshops, and Schools were supported, either wholly or partially. About 100 seminars and 16 JNC Colloquia were held. 11 Endowment Lectures, 4 general lectures by eminent scientists were also held in addition to 1 guest lecture during the year.



HIGHLIGHTS OF RESEARCH AND OTHER ACTIVITIES

Research

Chemistry and Physics of Materials Unit (CPMU)

The ordering of ions of room temperature ionic liquids near a charged mica surface was studied using MD simulations and the formation of a capacitive double layer was observed. The mechanism of dissolution of cellulosic biomass in room temperature ionic liquids was studied using gas phase quantum chemical calculations.

Light Scattering Laboratory (LSL) was involved in research on multiferroic materials, drug protein interaction studies, synthesis of novel nano structures for Raman spectroscopy and setting up micro brillouin setup for studying nano materials under electric field.

Nanomaterial based devices have been fabricated. Specifically, nanoparticle array rectifiers, supramolecular fibre FETs and nanographene FETs have been developed with commendable performance. Using metal optical grating structures, a sensor with high sensitivity for hydrogen has been developed. Progress has been made in various lithography processes

The Molecular Electronics lab carried out studies of photo-physical properties of semiconducting polymers. Fabricated and studied Organic Photovoltaic and Field Effect Transistor devices. Explored the utility of conducting polymer interfaces for studying biophysical problems.

The Soft Matter Lab has designed and built a holographic optical tweezers around the confocal microscope to simultaneously manipulate multiple colloidal particles. Using the confocal-rheometer apparatus, it was recently unraveled that the microscopic underpinnings of directional grain growth under shear in colloidal polycrystals.

Attempt have been made to solve materials issues related to ZnO semiconductors in order to use it in many important technological areas for examples, photovoltaics, various bi-polar applications, spintronics etc.

Two new families of multiferroics have been designed on the basis of magnetic interactions between 4f-3d in orthoferrites and orthochromites with weak ferromagnetism and introducing spin disorder at the B-site of the perovskite.

Researchers were actively involved in exploring various functional aspects of metal-organic frameworks (MOFs), particular luminescence and magnetic properties of MOFs.

Various kinds of clay composites were synthesized and applied for catalysis and electrochemical oxygen reduction reactions. A new method to make mesoscopic gold bowl has been developed using a template based approach.

New Chemistry Unit (NCU)

Prof. C. N. R. Rao has pursued research on several aspects of the chemistry of materials. These include transition metal oxides, nanomaterials and carbon materials.

Dr. T. Govindaraju's research activities included the interface of chemistry and biology (Organic synthesis, Peptide chemistry, Nucleic acid chemistry, Nanobiotechnology). The design and synthesis of small molecules, peptides, nucleic acids and their conjugates based biomimetic systems and materials possessing well defined nano-, meso- and micro-structures with properties similar to natural materials through Nature-inspired molecular self-assembly approach has actively been pursued.

The underlying theme of Dr. Subi Jacob George's research was at the interface between synthetic efforts on p-conjugated systems and the organization of these molecules using supramolecular self-assembly principles, with the ultimate aim of developing novel functional materials.

Dr. Jayanta Halder worked in the area of infectious diseases which remain a major threat to global health and are now the world's biggest killers, causing over 15 million deaths per year. A platform was sought to integrate organic chemistry and materials science with biology to combat infectious diseases in a multipronged approach, namely, diagnosis, prevention and treatment.

Dr. Sebastian C. Peter has established two laboratories for the research activities and 3 PhD students and 3 R&D students have been recruited. Two new projects were approved by UGC-DAE and DST for research funds.

Dr. Ujjal Gautam has been working in research pertaining to green energy from water splitting.

Prof. H. Ila's research activities revolved around mainly towards design and development of new general, highly efficient synthetic methods for biologically important five and six membered heterocyclic compounds using novel organosulphur building blocks/synthons derived from broad range of active methylene compounds.

Prof. Swapan K. Pati's research interests span over a broad range of fields which include theoretical understanding of the mechanism and the role of a catalyst used in a catalytic reaction.

Prof. A. Sundaresan has worked in the area of developing new ferroelectric materials which have been designed based on Spin disorder and magnetic interaction between 4f-3d ions.

Dr. Ranjani Viswanatha's primary focus of research was the synthesis and study of optical and magnetic properties of semiconductor nanocrystals.

Prof. M. Eswaramoorthy worked in the area of Aminoclay which has been used as a template to make porous-layered carbon which has the ability to change its pore-size with respect to shear force.

Dr. Sridhar Rajaram's has been working on developing novel bifunctional organocatalysts. It was found that concomitant activation of reaction partners can be achieved using such catalysts.

Dr. Tapas Kumar Maji's research group was actively involved in exploring various functional aspects of metal-organic frameworks (MOFs), particular luminescence properties of MOFs.

Education Technology Unit (ETU)

The Education Technology Unit has been actively involved in the concept, development and production of multimedia CD-ROMs and books especially for school students and teachers in various disciplines of science since its inception. C. N. R. Rao Hall of Science and Education Technology Unit has continued conducting the highly popular Teachers/ students programs/ workshops for students and teachers on subjects like Physics, Chemistry and Biology. C N R Rao Hall of Science & Education Technology Unit along with SOP-ETU took up a project of conducting four Workshops for 100 Pre-University Teachers from different places in Karnataka in using the College Chemistry Kit. As part of the International Year of Chemistry (IYC), the Book 'Rasayanvigyan Aajkal' (Chemistry Today authored by Prof. C.N.R. Rao) was translated, edited by ETU for Sastha Sahitya Mandal. The science popularisation program "Learning Science" was organized at Pithoragarh, Uttarakhand in association with J. B. Memorial Manas Academy and sponsored by the C. N. R. Rao Education Foundation on May 18, 2011. Prof. C. N. R. Rao gave the theme lecture followed by a 30 minute multimedia presentation by Mrs. Indumati Rao. ETU and CNR Rao Hall of Science in association with the Oracle Education Foundation organized and conducted a lecture program 'Chemistry for students and teachers'. 220 Students and teachers participated in the program which was part of the IYC-2011 celebrations.

Engineering Mechanics Unit (EMU)

Granular Matter: It has been established that the emergence of shear-banding instabilities, that lead to shear-band formation along the gradient direction, depends crucially on the choice of the constitutive model.

In collaboration with a Doctoral student (Dr. Kyle Smith) and Prof. Tim Fisher of Purdue University, a molecular dynamics code, using an energy-based structural optimization technique, has been developed to simulate the jamming/ packing of Platonic solids (tetrahedron, icosahedron, dodecahedron, octahedron, and cube).

Geophysical Fluid Dynamics: The mean flow and the linear stability characteristics of a two-dimensional particulate suspension, driven horizontally via harmonic oscillation, have been analyzed. This work has been motivated to understand the topography formation on the ocean-bed and has relevance in geophysical context.

Spatial stability of supersonic compressible plane Couette flow, having relevance in astrophysical fluid dynamics, has been investigated. An analysis of the energy contained in the least-decaying mode reveals that the instability is due to the work by the pressure fluctuations and an increased transfer of energy from the mean-flow.



Study of Lifted Temperature Minimum (LTM) has resulted in identifying the error in earlier theory and a plausible explanation of the phenomenon based on vertical variation of aerosol concentration in nocturnal atmospheric surface layer.

Computational Fluid Dynamics and Lattice Boltzmann Method: A DNS study of the starting plume as a model for cumulus clouds has been initiated. Results from a 2D simulation have been published and a 3D simulation is being carried out on a powerful computing system.

Stability: An ongoing analytical investigation has helped characterize the modal response of a vortex column to external disturbances, and in particular, has led to the discovery of inviscid resonances.

Complex Fluids and Interfacial Flows: An ongoing analytical study focuses on the rheology of suspensions of anisotropic particles. In this regard, the formalism of vector spheroidal harmonics was used to analyze the orientation dynamics of spheroidal particles in shearing flows.

Experimental Fluid Dynamics: Main research activities of this group include: (a) Laboratory simulation of magma-convection, (b) Parametric study of flapping flight to identify optimal wing kinematics and the role of wing-flexibility on lift production, and (c) study on designing green buildings with natural ventilation (in collaboration with Prof. JH Arakeri, ME, IISc).

Evolutionary & Organismal Biology Unit (EOBU)

During the year 2011-2012, the faculty of EOBU continued their researches in the broad areas of evolutionary genetics, chronobiology, neurogenetics, animal behaviour/phylogeography and population dynamics. This research, which is largely unique in the Indian context, has contributed significantly to understanding of diverse aspects of evolution, ecology and behaviour. Most of this work is long-term, much of it based on selection experiments. Broadly, research is ongoing in the areas of (a) fruitfly metapopulation dynamics and stability, (b) evolution of adaptations to crowding, especially the interplay of food deprivation and waste buildup, (c) biogeography of large mammals in the Western Ghats, (d) social organization in Asian elephants, (e) fruitflies as a model system for neurodegenerative disorders, (f) behavioural, neurogenetic and molecular studies on aspects of *Drosophila* circadian organization, especially under quasi-natural conditions.

Molecular Biology and Genetics Unit (MBGU)

MBGU currently has several research and training avenues in broad areas of biological sciences. Research in nine of its laboratories spans diverse areas of modern biology with emphasis on biomedicine.

Autophagy Laboratory studied autophagy and autophagy-related pathways. A new live cell assay was designed to kinetically monitor general and selective autophagy pathways and have miniaturized it to suit the high throughput format.

Molecular Mycology Laboratory studied structure-function analysis of centromeres of several pathogenic yeasts: *Candida albicans*, *Candida dubliniensis*, *Candida tropicalis* and *Cryptococcus neoformans*. They observed that centromere DNA sequences are rapidly evolving when *C. albicans* and *C. dubliniensis* orthologous chromosomes were analyzed.

Research in *Molecular Parasitology Laboratories* is focused on understanding metabolism in the malaria parasite *Plasmodium falciparum*. Towards this end, the enzymes involved in purine nucleotide metabolism in the parasite was studied.

In *Chromatin Biology Laboratory* work in the chromatin TP2 was acetylated *in vivo* as detected by anti-acetylated lysine antibodies and mass spectrometric analysis. Recombinant TP2 is acetylated *in vitro* by p300 and PCAF. p300 acetylates TP2 in its C-terminal domain which is highly basic in nature possessing chromatin condensing properties. Mass spectrometric analysis showed that p300 acetylated 4 lysine residues in the C-terminal domain of TP2.

Human Molecular Genetics Laboratory has examined molecular genetic basis of human neurological disorders: idiopathic generalized epilepsy (IGE), in particular, juvenile myoclonic epilepsy (JME) and a reflex/sensory form of epilepsy widely known as hot water epilepsy (HWE). In addition to examining the role of the known epilepsy-causing alleles in ion-channel genes, Prof. Anand has been exploring possible new molecular mechanisms in the causation of epilepsies.

In *Vascular Biology Laboratory*, a comparative approach has been made by using embryonic stem cell models, mouse developmental biology and *Drosophila* genetics, to decipher the roles of novel genes expressed early in the cardiovascular and hematopoietic systems. This approach has given useful insight into gene function as well as ontogeny of the heart, blood and blood vessels.

The recent analysis of researchers from *Molecular Virology Laboratory* found that in India, over the past decade, the HIV-1 subtype C has acquired a stronger viral promoter and is expanding at a substantial rate, replacing the standard subtype C strains. This is the first time that anyone identified divergent evolution in a major viral subtype of HIV-1. The newly emerging HIV-1 subtype C viruses containing a stronger viral promoter produce more viral particles and a higher viral load, probably providing an enhanced transmission advantage.

Transcription and Disease Laboratory has focused on understanding the role of epigenetic modifications, histone chaperones and non-histone chromatin proteins in chromatin dynamics and transcription regulation. These studies were carried out with special emphasis on disease and therapeutics. Through an interdisciplinary approach, small molecule modulators of chromatin modifying enzymes have been searched and used nanoparticles to deliver these in animal model system. Based on their several original discoveries, the group is aiming towards unraveling the epigenetic signatures of diseases like cancer, diabetes and AIDS.

Theoretical Sciences Unit (TSU)

The group of Prof Shobhana Narasimhan continued to work on using density functional theory to understand the properties of materials, and to use this understanding to design novel materials for a variety of applications. They have shown how the surface states on the Au(111) surface become spin polarized on depositing iron on the gold surface, and matched this to experimental data.

Dr Kavita Jain has worked in the area of adaptation dynamics on complex fitness landscapes with a special emphasis on small populations.

Dr Subir K Das carried out work in the area of Critical Phenomena, Kinetics of Phase Separation, Pattern Formation, Wetting Phenomena, Nucleation in various systems of interest in condensed matter physics, biology, fluid dynamics, etc.

Prof Swapan K Pati's research interests encompass a broad spectrum of condensed matter phenomena including excitation characteristics, low-temperature thermodynamics and dynamical behaviour of a range of quantum systems.

The group of Dr N S Vidhyadhiraja has developed a strong focus on developing predictive theoretical approaches for strongly correlated materials by integrating first-principle based methods and methods for strong correlation such as iterated perturbation theory (IPT) and local moment approach within dynamical mean field theory (DMFT).

Some of the major works in Prof. Umesh V Waghmare's group has determined: properties of boride-Ni interfaces present in Ni-based superalloys and their implications to environmental embrittlement; the cause for enhanced photo-electro-catalytic properties of BaTiO₃ with Fe-doping for water splitting.

International Centre for Material Sciences (ICMS)

ICMS has established the major scientific user facilities to serve both in-house researchers and researchers from other institutions. It has further expanded its infrastructure by installing sophisticated equipments like Superconducting Quantum Interference Device (SQUID), Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES), UV Spectrometer, Photoluminescence Spectrometer (PL), etc.

The Centre for Computational Materials Science (CCMS) (renamed as Thematic Unit of Excellence on Computational Materials Science) of ICMS has established a High Performance Computing Facility, an instructional computing laboratory with 30 computers for hands-on training of the students. Four students have graduated until now. One student has been enrolled for this current year under the Post Graduate Diploma in Materials Science programme and 29 visitors have visited for collaborative research under short term visiting programmes.



ICMS has taken initiatives to establish more international collaborations. It has signed MoUs with Weizmann Institute, Scuola Internazionale superior di Studi Avanzati (SISSA), RMIT- Australia and Waterloo Institute of Nanotechnology. Students on exchange programme under these collaborations have visited ICMS.

In addition to carrying out innovative research, ICMS also organizes various seminars, schools, workshops and conferences in collaboration with colleagues in JNCASR and elsewhere.

Thematic Unit of Excellence in Computational Materials Science

Modelling of metal organic frameworks and the storage of gases in them has been carried out using density functional theory. A three-dimensional (3D) pillared-layer metal-organic framework, $[\text{Cd}(\text{bipy})_0.5(\text{Himdc})](\text{DMF})_n$ (1), (bipy = 4,4'-bipyridine and Himdc = 4,5-imidazoledicarboxylate) has been synthesized and structurally characterized by Prof. Maji's group. It was discovered that the highly rigid and stable framework contains a 3D channel structure with highly polar pore surfaces decorated with pendant oxygen atoms of the Himdc linkers.

Work continued on using density functional theory to understand the properties of materials, and to use this understanding to design novel materials for a variety of applications. It was shown how the surface states on the Au(111) surface become spin polarized on depositing iron on the gold surface, and matched this to experimental data.

Research was carried on nucleation in silicon, glass forming liquids with an emphasis on analyzing fragility, the Stokes-Einstein relation, and the dimensional dependence of the Adam-Gibbs relation, protein structure analysis, sheared amorphous solids.

Using first-principle and many-body method, a broad spectrum of condensed matter phenomena in many quantum systems has been studied. Current constraint method has been developed to understand transport phenomena in nanoscale systems.

Academic Activities

During the year, 73 students joined the Centre during August session of 2011 including 8 students who joined during mid-year admission of January 2012. The present student strength is 266. Six students were awarded with MS (Eng.) degree, 2 with MS (by research), 9 with MS (Materials Science) and 18 Ph D degrees.

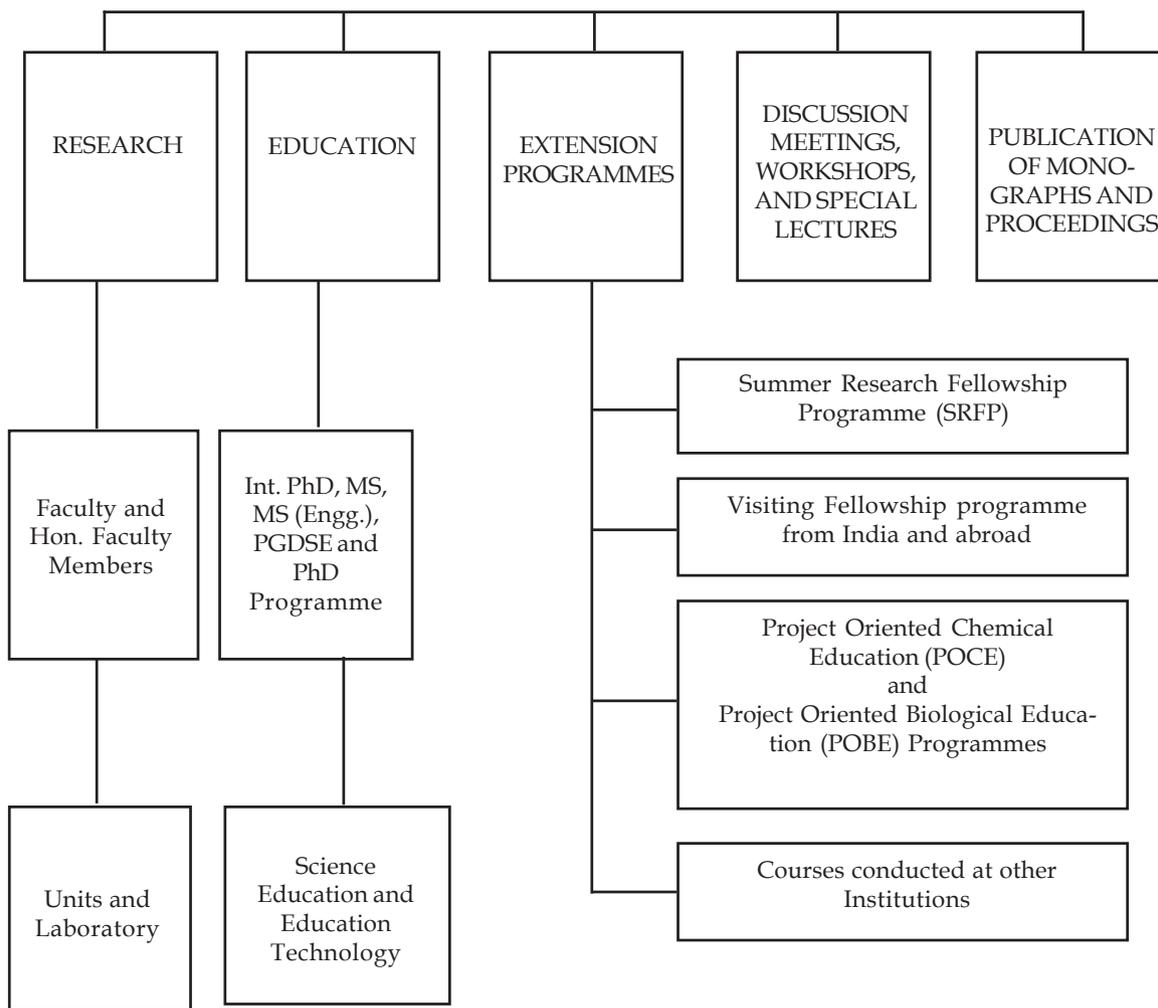
Fellowships & Extension Programmes

For the Summer Research Fellowships programme, out of the 87 fresh fellowships that were awarded, 62 fellowships have been utilized. For POCE, 11 meritorious students were offered the fellowship. Nine students of POCE-2009-11 were awarded Diploma in Chemistry. Under POBE, 9 candidates have joined the programme. Eight students of POBE 2009 batch received their Diploma in Biology certificates this summer on successful completion of their 3 year project training. Ten candidates from R&D institutions have been offered Visiting Fellowships. JNCASR-CCSTDS has been renamed as JNCASR-CICS. Two Fellows selected for the year 2009-10 have been given certificates on successful completion of their 3 month training programme in India. 4 Fellows have been given JNCASR-CICS certificates for the year 2010-11. In 2011-12, 7 scholars have been selected for the fellowship.

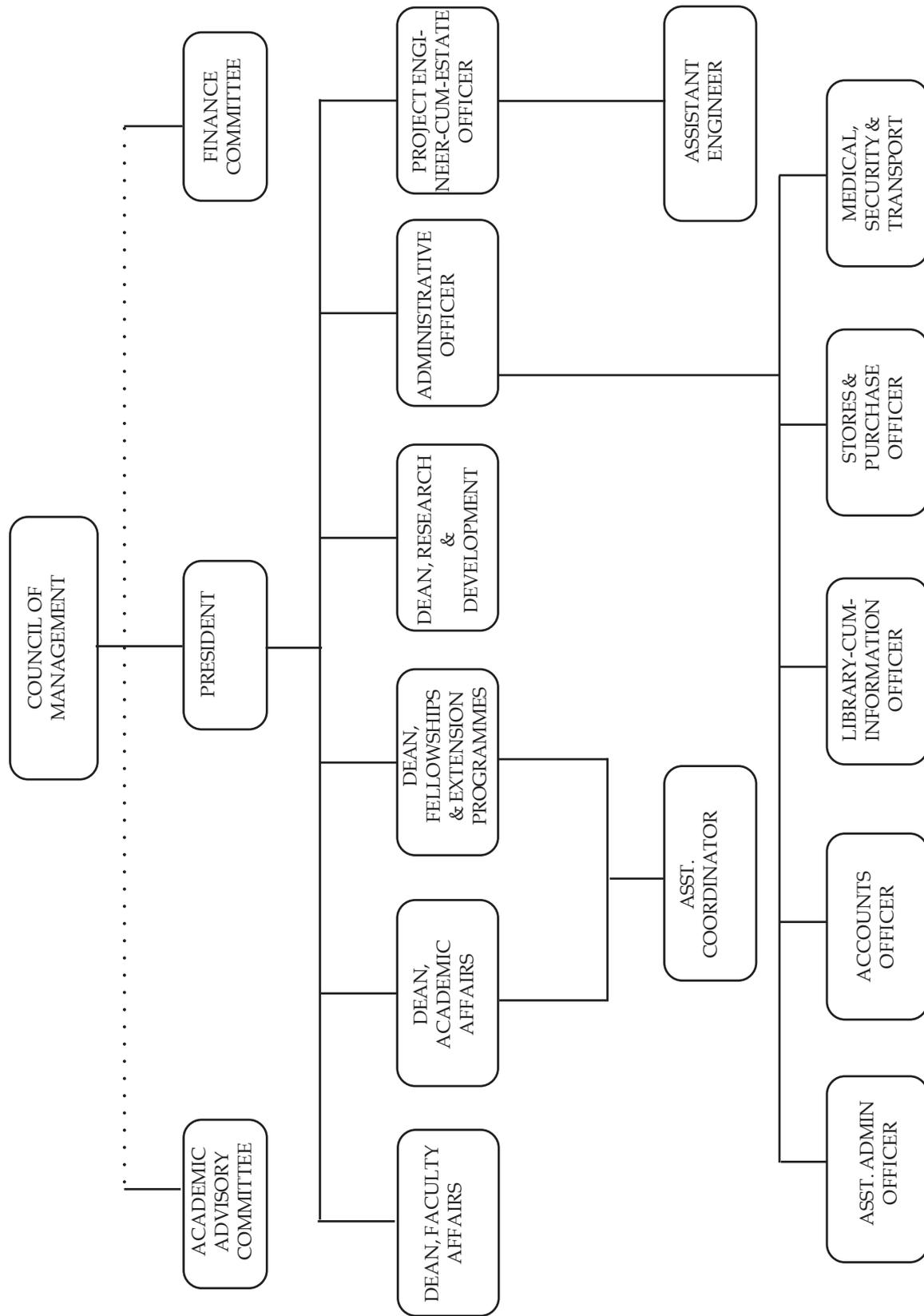
Reservation, Official Language and Implementation of the judgments/orders of the CAT

The Centre follows the national policy on reservation and official language as per rules and orders issued by the Government of India with necessary guidelines from the Council of Management from time to time. During the current year there were no cases pertaining to the Centre appeared before the CAT.

ACTIVITIES CHART
JAWAHARLAL NEHRU CENTRE
FOR ADVANCED SCIENTIFIC
RESEARCH



ORGANISATION CHART



THE ORGANISATION

Council of Management

Administration and management of the affairs and finances of the Centre are conducted by the Council of Management. The Council of Management of the Centre meets twice a year.

The following are the members of the Council:

Dr. P. Rama Rao Hyderabad	Chairman
Prof. M.R.S. Rao President, JNCASR	Member
Prof. C.N.R. Rao Hon. President, JNCASR (JNC nominee)	Member
Dr. T. Ramasami Secretary, DST	Member
Ms. Anuradha Mitra (2011-14) Joint Secretary & Financial Adviser (Ex-officio) Department of Science & Technology	Member
Prof. Bikash Sinha (2008-11) Director, Saha Inst. of Nuclear Physics (DST nominee), Kolkata	Member
Dr. Baldev Raj (2011-14) Director, IGCAR (DST nominee)	Member
Prof. Chandan Dasgupta(2011-14) IISc (IISc nominee)	Member
Prof. S.K. Joshi NPL, New Delhi (UGC nominee)	Member
Prof. P. Balaram Director, IISc	Member
Mr. A.N. Jayachandra Sr. Administrative Officer, JNCASR	Secretary



The Finance Committee

The Finance Committee of the Centre scrutinizes all financial proposals, and makes recommendations to the Council of Management.

The constitution of the Finance Committee is as follows:

Prof. M R S Rao President, JNCASR	Chairman
Prof. C N R Rao Linus Pauling Research Professor and National Research Professor, JNCASR	Member
Ms. Anuradha Mitra Joint Secretary & Financial Adviser (Ex-officio) Department of Science & Technology	Member
Prof. Chandan Dasgupta IISc (IISc nominee)	Member
Ms. Revathi Bedi Finance Officer, JNU, New Delhi	Member
Mr. R S Gururaj Accounts Officer, JNCASR	Member
Mr. A N Jayachandra Sr. Administrative Officer, JNCASR	Secretary

The Academic Advisory Committee

The functions of the AAC include planning, execution and coordination of research and other academic activities of the Centre. It also regulates the courses of study, procedure for admission of students, examination, etc. It meets at least twice a year. The Committee makes its recommendations to the Council of Management on all academic matters.

The members of the Academic Advisory Committee are:

Prof. M.R.S. Rao President, JNCASR	Chairman (Ex-officio)
Prof. C.N.R. Rao Director, ICMS National Research Professor	Member
Prof. K.B. Sinha Dean, Faculty Affairs, JNCASR	Member (Ex-officio)
Prof. G.U. Kulkarni (2012-14) Dean, Academic Affairs, JNCASR	Member (Ex-officio)
Prof. Namita Surolia (2012-14) Dean, Fellowships and Extension Programmes, JNCASR	Member (Ex-officio)
Prof. Chandrabhas Narayana (2010-12) Dean, Fellowships and Extension Programmes, JNCASR	Member (Ex-officio)
Prof. K.S. Narayan (2012-14) Dean, R&D, JNCASR	Member (Ex-officio)
Prof. Hemalatha Balaram Professor, JNCASR	Member
Prof. Dipankar Chatterji (2010-12) Professor, MBU, Indian Institute of Science	Member
Prof. K. VijayRaghavan(2010-12) Director, NCBS, Bangalore	Member
Prof. V. Nagaraja (2012-14) Professor, MCB, IISc	Member
Prof. U. Ramamurty(2012-14) AcP, Mat. Engg., IISc	Member
Prof. George K Thomas (2012-14) IISER, Thiruvananthapuram	Member
Prof. D.D. Sarma SSCU, IISc	Member
Prof. Devang V Khakhar Director, IIT, Mumbai	Member (UGC Nominee)
Mr. A N. Jayachandra Sr. Administrative Officer, JNCASR	Secretary (Ex-officio)



Faculties

All the faculty members are involved in various academic activities of the Centre and assist the Academic Advisory Committee in discharging its functions. The last Annual Faculty Meeting was held in November 2011 which included lectures by the faculty on the advances made in various research areas. Local faculty meetings were held in August 2011 and February 2012 to review the progress and provide inputs wherever required.

Administration

President M R S Rao	Ph D (IISc), F A Sc, F N A, F N A Sc, F A M S, F T W A S
Dean, Faculty Affairs K B Sinha	Ph D (Univ. of Rochester), F A Sc, F N A, FTWAS
Dean, Academic Affairs G U Kulkarni	Ph D (IISc)
Dean, Fellowships and Extension Programmes Namita Surolia	Ph D
Dean, Research and Development K S Narayan	Ph D (Ohio State Univ., USA), F N A Sc, F A Sc
Warden & Student Counsellor SM Shivaprasad	Ph D (Karnatak Univ., Dharwad)
Associate Warden TNC Vidya	Ph D (IISc)
Sr. Administrative Officer A N Jayachandra	B Com (Mysore), ICWA (Inter)
Assistant Administrative Officer C S Chitra	B Com (Bangalore)
Assistant Coordinator Princy Jaison Pereira	Ph D (Gujarat)
Accounts Officer R S Gururaj	S. A. S. (IA & AD)
Stores & Purchase Officer K Bhaskara Rao	M.Sc. (Hyderabad), M Phil (New Delhi)
Library-cum-Information Officer Nabonita Guha	MLIS (Varanasi)
Senior P A to President A Srinivasan	B A (Hyderabad)
Project Engineer S Chikkappa	B E (Mysore)
Junior Project Engineer (Civil) Nadiger Nagaraj	DCE

Junior Engineer (Elec.)

Sujeeth Kumar S

DEE

Chief Medical Officer

B S Subba Rao

MBBS (Mysore)

Consulting Lady Medical Officers

Kavitha Sridhar

MBBS (Bangalore)

Archana, M L V

MBBS (Bangalore)

HV Chandralekha

MBBS (Bangalore)

Honorary Medical Officers

G R Naghabhushan

MBBS (Mysore), FCCP, FCGP, P G Dip in M&CH

L Sharada

MBBS (DGO - Madras)

C Satish Rao

MBBS (Mysore)

P K Raghupathy

MBBS (RGU)

R Nirmala

MBBS (Madras)

Y Yogesh

Physiotherapist (BPT - Mangalore)

Honorary Security Officer

M R Chandrasekhar

B Sc, LLB (Bangalore)



UNITS, CENTRES, COMPUTER LABORATORY, LIBRARY AND ENDOWED RESEARCH PROFESSORS

Chemistry and Physics of Materials Unit

The ordering of ions of room temperature ionic liquids near a charged mica surface was studied using MD simulations and the formation of a capacitive double layer was observed. The mechanism of dissolution of cellulosic biomass in room temperature ionic liquids was studied using gas phase quantum chemical calculations

Light Scattering Laboratory (LSL) was involved in research on multiferroic materials, drug protein interaction studies, synthesis of novel nano structures for Raman spectroscopy and setting up micro brillouin setup for studying nano materials under electric field. Around 8 publications in international journal were published during this period based on these studies. Prof. Chandrabhas Narayana has setup high pressure facility for Indian community at both INDUS 2 AXRD beamline at Indore and BL 18, Indian Beamline at KEK, Tsukuba, Japan.

Nanomaterial based devices have been fabricated. Specifically, nanoparticle array rectifiers, supramolecular fibre FETs and nanographene FETs have been developed with commendable performance. Using metal optical grating structures, a sensor with high sensitivity for hydrogen has been developed. Progress has been made in various lithography processes

The Molecular Electronics lab carried out studies of photo-physical properties of semiconducting polymers. Fabricated and studied Organic Photovoltaic and Field Effect Transistor devices. The utility of conducting polymer interfaces for studying biophysical problems has been explored.

The Soft Matter Lab has designed and built a holographic optical tweezers around the confocal microscope to simultaneously manipulate multiple colloidal particles. Using the confocal-rheometer apparatus, it was recently unraveled that the microscopic underpinnings of directional grain growth under shear in colloidal polycrystals. The role of particle shape-anisotropy in the flow and jamming behavior of colloidal suspensions is under investigation.

Attempt have been made to solve materials issues related to ZnO semiconductors in order to use it in many important technological areas for examples, photovoltaics, various bi-polar applications, spintronics etc. Following are some of the major findings:

Lattice Matching Epitaxy: High quality GaN is grown by plasma assisted molecular beam epitaxy on Ga induced superstructural phases of Si(111)7×7.

Nanostructures of GaN: The growth of ordered, high quality GaN nanowall hexagonal honeycomb like network on c-plane sapphire under nitrogen rich (N/Ga ratio of 100) conditions at temperatures below 700°C is demonstrated.

Properties of nanowall network: Optical, electrical and magnetic properties of the nanostructured GaN film is investigated using a variety of techniques to understand the nature of the morphologically fascinating material.

It was discovered that Perylene diimides (PDIs) are cheap and durable alternatives to fullerenes in organic solar cells. However, their potential utility is belied by low efficiencies. By using the counterintuitive strategy of reducing the crystallinity of the perylene an order of magnitude increase in the current extracted from solar cells containing PDIs has been achieved. The overall power conversion efficiency is the highest achieved with a non-fullerene electron acceptor.

Two new families of multiferroics have been designed on the basis of magnetic interactions between 4f-3d in orthoferrites and orthochromites with weak ferromagnetism and introducing spin disorder at the B-site of the perovskite. The electric polarization can be reversed by applied magnetic field. Further, these materials exhibit quite high Curie temperature and thus important candidates for device applications.

Researchers were actively involved in exploring various functional aspects of metal-organic frameworks (MOFs), particular luminescence and magnetic properties of MOFs. Recently, a multi-chromophoric hybrid system was synthesized where exciplex emission sensitized by energy transfer by a chromophore, is yet to be

realized in MOF system. In another breakthrough results, it was shown that MOF can store higher amount CO₂ at room temperature compared to low temperature triggered by orientation change of the pillar which is unprecedented.

Various kinds of clay composites were synthesized and applied for catalysis and electrochemical oxygen reduction reactions. A new method to make mesoscopic gold bowl has been developed using a template based approach. The cell-entry mechanism of carbon spheres has been studied which has the potential to be used as a carrier in drug delivery applicaton.

New programmes launched

A Grand Canonical Monte Carlo program has been developed to calculate adsorption isotherms of gases in porous crystalline solids was launched.

A new micro Brillouin setup is being developed to study nanomaterials under external electric field and also to do high pressure Brillouin Scattering studies (one of its kind in India).

Thematic Unit on Nanochemistry has been conceived.

The following are the members of the Unit:

Chair

S Balasubramanian Ph D, FA Sc

Professors

C N R Rao Ph D, D Sc, F A Sc, F N A, F R S, F T W A S, Hon. FRSC

S Balasubramanian Ph D, FA Sc

K S Narayan Ph D, F N A Sc, F A Sc.

G U Kulkarni Ph D

S M Shivaprasad Ph D

N Chandrabhas Ph D, F N A Sc

Associate Professors

A Sundaresan Ph D

M Eswaramoorthy Ph D

Tapas Kumar Maji Ph D

Technical Officers

V Sreenath (BE), S Srinivas (BE), Usha Govind Tumkurkar (M Phil)

Research Students

Pranab Mandal, Partha Pratim Kundu, Prakash Kanoo, Sudip Mohapatra, B. Radha, Sabyasachi Mukhopadhyay, Jithesh K, Manoj Kesaria, Subrahmanyam K.S, Narendra Kurra, Anshuman Jyothi Das, Sandeep Kumar Reddy, Satish Shetty, Venkata Srinu Bhadram, Jaya Ramulu Kolleboyina, Satyaprasad Premswarup Senanayak, Malleswararao Tangi, K.D. Mallikarjuna Rao, R. Bharath, K. Hima Nagamanasa, Ravichandran S, B.V.V.S Pavan Kumar, Gangaiah Mettela, Loukya Chowdary B, Rajdeep Singh Payal, Umesha Mogera, Nishit Srivastava, Amritroop Achari, Dhanya R, P Sowjanya, Gopalakrishnan K, Venkata Suresh M, B. Satyanarayana, Yelipeddi sreedhar, S. Kiruthika, B. Karteek Kumar, A.Z. Ashar, Tarak Karmakar, Nivedita Sikdar, Devendra Singh Negi, Arpan De, Somnath Ghara, Sunita Dey, Rajeev Kumar, Ritu Gupta, Nitesh Kumar, Urmimala Maitra, Nisha Mariam Mammen, Soumik Siddhanta, Piyush Kumar Chaturbedy, Vini Gautam, Arpan Hazra, S.R.K. Chaitanya Sharma Y, Chidambar



Kulkarni, Dileep Krishnan, Gayatri Kumari, M. Pandeewar, Rana Saha, Sudeshna Sen, Varun Thakur, Dibyajyoti Ghosh, Anindita Chakraborty, Darshana Joshi, Ankush Kumar, Ram Kumar, Sisir Maity, Chandan Kumar, Chandan De, Anirban Mondal, Koushik Pal, Abhijit Sen, Rajib Sahu, Dipanwita Dutta, Sonu K.P, Kandula Neelima, Raaghesh A.V, Suchitra, Uttam Gupta, H S S Ramakrishna Matte

Research Associates

Sundarayya Yanamandra, Manoj Kesaria, Kishore
V Chellappan, N Padmavathy

Technical Assistant

N R Selvi

R & D Assistants

Bhavya D R, Rekha M, Srikanth Revoju, Bharati Singh, Vijay Amirtharaj A, Madhushankar, Salikolimi Krishnachary, Syamantak Roy, Kanchan Singh, Thripuranthanka M

Education Technology Unit

Activities and Achievements

The Education Technology Unit has been actively involved in the concept, development and production of multimedia CD-ROMs and books especially for school students and teachers in various disciplines of science since its inception. The Unit has been involved in developing and producing CD-ROMs and books in vernacular Indian languages.

C.N.R. Rao Hall of Science and Education Technology Unit has continued conducting the highly popular Teachers/students programs/workshops for students and teachers. These workshops/programs are conducted in different subjects like Physics, Chemistry and Biology. The Unit organized many science popularization programs in various parts of the country.

C. N. R. Rao Hall of Science & Education Technology Unit along with SOP-ETU took up a project of conducting four Workshops for 100 Pre-University Teachers from different places in Karnataka in using the College Chemistry Kit. The project was sponsored by the Vision group on Science & Technology, DST, Govt. of Karnataka and was taken up by ETU and SOP-ETU jointly. The project involved assembling 200 numbers of College Chemistry Kits. The entire kit consists of 32 plastic/glass laboratory items, 85 solid & liquid chemicals for carrying out chemistry experiments. The aim of the above workshops was to enable teachers to carry out experiments using very small quantities of the chemicals very effectively and safely even in the absence of a regular laboratory. ETU took the responsibility of designing, printing and getting the various labels pasted onto the vials, required for identification of chemicals etc. in the Kit, procuring all the chemicals and the labware required for the Kit. ETU undertook the assembling of the all the Kits. The two-day, four workshops were conducted in batches of 25 teachers by SOP-ETU on April 1-2, April 6-7, April 11-12 & April 15, 2011. At the end of each workshop each teacher was presented with two Kits to take back to their colleges.

National Book Trust has published the first edition of the book titled Rasayan Vigyan Ki Duniya (Hindi version of the book 'Understanding Chemistry' authored by Prof. C.N.R. Rao).

As part of the IYC, the Book 'Rasayan-vigyan Aajkal' (Chemistry Today authored by Prof. C.N.R. Rao) was translated, edited by ETU for Sastha Sahitya Mandal. Both the English and Hindi versions are published & marketed by M/s Sastha Sahitya Mandal, New Delhi.

The Book titled 'NANOPRAPANCHA', Kannada version of the Book 'NANOWORLD' was translated by Mrs. Indumati Rao. The book was edited, formatted and made print-ready by ETU for NavaKarnataka Publications Ltd.

The book 'Mithiyillada Eani, Rasayanashastradalli Jeevana' (Kannada Version of the autobiography 'Climbing the Limitless Ladder' written by Prof. CNR Rao) was translated by Dr. H.S. Niranjanaradhya, edited by Mrs. Indumati Rao for Karnataka Rajya Vijnana Parishath which has published the book.

The Book 'Nanoworld' & the Kannada version of "Nanoworld" (Nano Prapancha) (translated by Mrs. Indumati Rao) were released by Shri M.N. Venkatachaliah, Former Chief Justice, Supreme Court. Both the books are being marketed by M/s NavaKarnataka Publications (P) Ltd. The Book "Climbing the Limitless Ladder"(Kannada version) edited by Mrs. Indumati Rao was also released on October 24, 2011 for distribution by KRVP.

The Book 'Rasaayanshastrada Arivu' authored by Prof. C.N.R. Rao was translated by Mrs. Indumati Rao, edited, formatted and made print-ready at ETU for Karnataka Rajya Vijnana Parishath (KRVP). The book sponsored by Vision Group on Science & Technology, Dept. of Science & Technology, Govt. of Karnataka to commemorate International Year of Chemistry-2011 was released at a function held at AMRL Conference Hall, JNCASR on March 12, 2012. Prof. P. Balaram, Director, IISc was the Chief Guest.

Organisation of Programmes

The science popularisation program "Learning Science" was organized at Pithoragarh, Uttarakhand in association with J.B. Memorial Manas Academy and sponsored by the CNR Rao Education Foundation on



May 18, 2011. Prof. C. N. R. Rao gave the theme lecture followed by a 30 minute multimedia presentation by Mrs. Indumati Rao. This presentation was of the excerpts from the Hindi CD-ROM titled 'RasayanVigyan Samaje' (Understanding Chemistry in Hindi) developed and produced by Education Technology Unit, JNCASR. Around 250 students attended the program. RasayanVigyan Samaje CD-ROM's and Learning Science books were distributed to the teachers attending the program.

ETU presented one hour Multimedia Presentations from the CD-ROM titled 'Nanoworld' and 'Understanding Chemistry' on May 18 and May 19, 2011 to POCE -2011 students at the SOP-POCE Program.

C.N.R. Rao Hall of Science and Education Technology Unit conducted various Teachers-students programs/ workshops at the Madan Mohan Malaviya Amphitheatre, C.N.R. Rao Hall of Science. The workshops/ programs were conducted in different subjects like Physics, Chemistry and Biology. In the above programs, faculty from different institutes as well as in-house faculty were invited to give lectures on a particular theme in the concerned subject and were also invited to participate in an interactive question and answer session at the end of the program. As 2011 was the International Year of Chemistry, CNR Rao Hall of Science and ETU organized IYC programs for students and teachers from January 2011. Throughout the year many such programs were conducted.

C.N.R. Rao Hall of Science and ETU organized and conducted a Special program for students and teachers in Chemistry on June 14, 2011. Prof. C. N. R. Rao gave the inaugural address. The lecture program had three lectures in different areas of chemistry. Around 170 students and teachers participated in the program. Also, the participants from the Afro-Asia Workshop on Advanced Topics in Chemistry attended the lectures.

On June 30, 2011 C.N.R. Rao Hall of Science and ETU organized and conducted the program to award the Prizes for Outstanding Science Teachers for the year 2010 donated by the C. N. R. Rao Education Foundation. Shri. Arvind Gupta and Mrs. M.S. Prabhavathi were awarded the prizes. The award function was followed by a lecture program where Prof. C.N.R. Rao gave the lecture titled 'New dimensions of Chemical Science'. Shri Arvind Gupta gave the talk 'Science through activities' along with demonstrations. This was followed in the afternoon by a lecture 'The World of the Elephant' by Prof. R. Sukumar. About 200 students and teachers participated in the program.

On July 27 ETU and CNR Rao Hall of Science in association with the Oracle Education Foundation organized and conducted a lecture program 'Chemistry for students and teachers'. 220 Students and teachers participated in the program which was part of the IYC-2011 celebrations.

The Programs/ workshops organised by the CNR Rao Hall of Science and ETU and conducted at the Madan Mohan Malaviya Amphitheatre were as follows:

5 August 2011 - Biology for students and teachers

23 September 2011 - Physics for students and teachers

14 October 2011 - Biology for students and teachers

24 November 2011 - Physics for students and teachers

7 December 2011 - Chemistry Program - IYC 2011

29 December 2011 - Inspire Program

In each of the above programs over 200 students and teachers participated from various schools and colleges in and around Bangalore. All the above programs consisted of lectures and some demonstrations followed by an interactive Question and Answer session. All the above programs were organized and conducted by C N R Rao Hall of Science and ETU under the auspices of the Science Outreach program.

On February 19, 2012, Mrs. Indumati Rao presented a 30 minutes Multimedia presentation of excerpts from the CD-ROM 'Nanoworld' for students at the Sheikh Saud Bin Saqr Al Qasimi Foundation for Policy Research and Ras Al Khaimah Centre for Advanced Materials, Ras Al Khaimah.

On-going Projects and Future Plans

The unit is engaged in bringing out a book in Science describing the achievements of eminent and famous scientists.

ETU has taken up the task of bringing out a document about the Science Popularization programs conducted under the auspices of the Science Outreach Program. It is planned to also bring out a document listing all the programs conducted by C N R Rao Hall of Science and ETU.

ETU is undertaking a project to design and launch a Webpage for C N R Rao Hall of Science. An important feature to be available on this Webpage is to have videos of the lectures of the programs conducted at C N R Rao Hall of Science posted on the website.

C N R Rao Hall of Science and Education Technology Unit will be organizing teachers/ students workshops/ programs in different subjects. It is proposed to have lectures and demonstrations with different themes in a particular subject. In the above programs faculty from JNCASR, IISc and other institutions will participate.

Following are the members of this Unit:

Chair V Krishnan	Ph D, F A Sc, F N A, F T W A S
Coordinator (Hon.) Indumati Rao	M A, M S, C E
Technical Officer Jatinder Kaur	M Sc
Multimedia Asst. (Hon.) Sanjay Rao	B Sc, Cert. Multimedia



Engineering Mechanics Unit

Granular Matter

It has been established that the emergence of shear-banding instabilities, that lead to shear-band formation along the gradient direction, depends crucially on the choice of the constitutive model. For any constitutive model, the onset of this shear-banding instability is tied to a universal criterion in terms of constitutive relations for viscosity and pressure, and the sheared granular flow evolves toward a state of lower "dynamic" friction, leading to the shear-induced band formation, as it cannot sustain increasing dynamic friction with increasing density to stay in the homogeneous state. It has been shown that the vorticity banding can appear both as first-order and second-order phase transitions. A nonlinear resonance phenomenon has been uncovered in granular shear flow that calls for an appropriate mode-interaction theory for nonlinear patterns.

In collaboration with a Doctoral student (Dr. Kyle Smith) and Prof. Tim Fisher of Purdue University, a molecular dynamics code, using an energy-based structural optimization technique, has been developed to simulate the jamming/packing of Platonic solids (tetrahedron, icosahedron, dodecahedron, octahedron, and cube). The predicted jamming-density for tetrahedron agrees excellently with experimental results. It has been shown that all Platonic solids (except cube), though hypo-static according to Maxwell's (1864) criterion, satisfy a generalized isostaticity condition based on constraint counting. The numerical method developed here provides a platform for further analysis of jamming of non-smooth particles as well as related transport phenomena.

Geophysical Fluid Dynamics

The mean flow and the linear stability characteristics of a two-dimensional particulate suspension, driven horizontally via harmonic oscillation, have been analyzed. This work has been motivated to understand the topography formation on the ocean-bed and has relevance in geophysical context. Using Floquet theory, a linear stability analysis of the time-periodic mean flow indicates that the oscillatory suspension supports stationary- and traveling-wave instabilities that corresponds to particle-banding patterns that are aligned parallel or orthogonal or at an oblique angle to the driving direction. This stability work has been validated in recent particle simulations.

Spatial stability of supersonic compressible plane Couette flow, having relevance in astrophysical fluid dynamics, has been investigated. An analysis of the energy contained in the least-decaying mode reveals that the instability is due to the work by the pressure fluctuations and an increased transfer of energy from the mean-flow. The increase in Mach number and frequency is found to destabilize the unstable modes. A leading order viscous correction reveals that the neutral and unstable modes are destabilized by the no-slip enforced by viscosity. The viscosity has a dual role on the stable inviscid mode.

Study of Lifted Temperature Minimum (LTM) has resulted in identifying the error in earlier theory and a plausible explanation of the phenomenon based on vertical variation of aerosol concentration in nocturnal atmospheric surface layer. It has been proved that the explanation offered by the VSN model for the origin of the Ramdas layer was fundamentally inconsistent, and that such a layer can only arise in a heterogeneous atmosphere.

Computational Fluid Dynamics and Lattice Boltzmann Method

A DNS study of the starting plume as a model for cumulus clouds has been initiated. Results from a 2D simulation have been published and a 3D simulation is being carried out on a powerful computing system. Numerical Simulation of multiscale supersonic flows with low dissipative shock capturing schemes: The MKFVS method has been successfully applied to transonic and supersonic flow around 2-D airfoils. The MKFVS method captures the shocks very crisply. This is an Indo-Russian Project.

Development of TKFMG solver and its application to flutter prediction in turbomachines: The TKFMG solver has been used to predict flutter for a 2-D blade of a turbine. Energy method has been used in flutter analysis. This is a CARS Project (Jointly with CTFD, NAL). Data assimilation for mesoscale modeling for monsoon related weather predictions - PhaseII: The Ensemble Kalman Filter (EnKF) has been applied to 3-D Lorenz model problem. The EnKF does follow the truth run because of Data Assimilation. This is NIMITLI-CSIR Project.

The work on entropic lattice Boltzmann method is continuing to study a variety of fluid flow problem, including turbulence, polymeric fluid and suspensions.

Stability

An ongoing analytical investigation has helped characterize the modal response of a vortex column to external disturbances, and in particular, has led to the discovery of inviscid resonances.

The problem of vortex dynamics in the presence of density stratification was studied analytically and numerically. The main result was that non-Boussinesq effects can be very important, acting sometimes to reduce vortex lifetimes drastically.

The two-dimensional stability of converging-diverging flows and of wall jets shows a number of interesting features. In particular the dependence of instability wave number on the normal coordinate is seen, which is impossible to find with traditional stability analyses. In our earlier work (in 2007) we had shown that channel flow with heated walls could display large amounts of transient growth in two-dimensions. This was surprising, because all known important transient growth situations hitherto had been three-dimensional. A basic understanding of our finding was obtained during this year, and we explain by a simple model how heat can take the place of the normal vorticity, i.e. of three dimensionality.

Complex Fluids and Interfacial Flows

An ongoing analytical study focuses on the rheology of suspensions of anisotropic particles. In this regard, the formalism of vector spheroidal harmonics was used to analyze the orientation dynamics of spheroidal particles in shearing flows.

In continuation of our earlier studies on the effects of micro-scale inertia, work carried out with a summer student helped characterize the effects of inertia on the non-Newtonian rheology of a dilute emulsion. Work carried out with a second summer student helped establish the crucial effect of the disperse phase viscosity on the Nusselt number correlation applicable to dilute emulsions.

Studies carried out in collaboration with Don Koch at Cornell University examined the evolution of sedimenting particle clouds, and the structure, dynamics and stability of fibrous suspensions at finite Reynolds number.

A new mechanism of instability was identified in a dilute suspension of active particles (bacteria).

The volume-of-fluid method was studied in detail, and a new computer code for computing interfacial flows is nearing completion. Droplet shapes were studied and a new class of static stable shapes for pendant drops was found.

Experimental Fluid Dynamics

Main research activities of this group include: (a) Laboratory simulation of magma-convection, (b) Parametric study of flapping flight to identify optimal wing kinematics and the role of wing-flexibility on lift production, and (c) study on designing green buildings with natural ventilation (in collaboration with Prof. JH Arakeri, ME, IISc).

For continuing experimental work on cloud flows, new and improved version of the apparatus used in earlier work by us is being set up. First results from the new apparatus should be available during the summer 2009.

A project has been started on the design of wings for aircraft driven by turbo-prop engines and propellers. Rotor-driven aircraft have become of great interest in recent years because of their much lower fuel consumption and lower carbon foot print, which has become a major concern because of the need to counter climate change through reduction of green-house gas emissions. A study using optimization techniques has given interesting and promising results.

The following are the members of the Unit:

Chair

Kalyan B. Sinha

Ph D, F N A, F A Sc, F T W A S



Honorary Professor

Roddam Narasimha

Ph D, F A Sc, F N A, F T W A S, F R S

Professors

Kalyan B. Sinha

Ph D, F N A, F A Sc, F T W A S

Rama Govindarajan

PhD, FASc, FNASc

Associate Professors

K R Sreenivas

Ph D

Meheboob Alam

Ph D

Ganesh Subramanian

Ph D

Faculty Fellow

Santosh Ansumali

Ph D

Research Students

Anubhab Roy, Sumesh P.T., Dhiraj Kumar Singh, Ponnulakshmi V.K., B.R. Rakshith, Ujjayan Paul, Shiwani Singh, Saikishan Suryanarayanan, K. Siddharth, Lakshminarayana Reddy M.H., Mohammed Istafaul Haque Ansari, Shashank HJ, Manjusha Namburi N L D B, Rajesh Ranjan, Jotkar Mamta Raju, Navaneeth K M, Sharath K Jose, Rama krishna Rongali, Ravichandran S, Saikat Saha, Vybhav G R, Sunil V Bharadwaj, Prasanth P, Rohith V.S., Dhake Milind Prakash, Sorathiya Shahajhan Hassanali, Thantanapally Chakradhar, Deepak Krishnamurthy, Kanwar Nain Singh, Rashmi Ramaadugu, Deepthi S

Research Associate

Ashish Malik

Visiting Scientist

Priyanka Shukla

R & D Assistants

Satyendra Prasad, Dinesh Kumar

Evolutionary & Organismal Biology Unit

During the year 2011-2012, the faculty of EOBUE continued their researches in the broad areas of evolutionary genetics, chronobiology, neurogenetics, animal behaviour/ phylogeography and population dynamics. This research, which is largely unique in the Indian context, has contributed significantly to understanding of diverse aspects of evolution, ecology and behaviour. Most of this work is long-term, much of it based on selection experiments. Broadly, research is ongoing in the areas of (a) fruitfly metapopulation dynamics and stability, (b) evolution of adaptations to crowding, especially the interplay of food deprivation and waste buildup, (c) biogeography of large mammals in the Western Ghats, (d) social organization in Asian elephants, (e) fruitflies as a model system for neurodegenerative disorders, (f) behavioural, neurogenetic and molecular studies on aspects of *Drosophila* circadian organization, especially under quasi-natural conditions. The Unit also continues its activities in training personnel in whole-organism biology through the regular PhD, Integrated PhD and MS/PhD programmes, as well as through participation of our faculty in POBE and SRFP programmes of the JNCASR as well as similar outreach programmes run by the three science academies and by DST and KVPY.

A few of the most salient research findings are summarized below.

- (a) *Drosophila ananassae* populations selected for adaptation to crowding exhibit the evolution of more stable population dynamics via increased K and an r-K tradeoff.
- (b) Elevated carrying capacity (K) can result in stabilization of population dynamics even in the absence of an r-K tradeoff, suggesting that density-dependent selection may be an important force favouring the evolution of stable dynamics in natural populations.
- (c) The relationship between constancy and persistence stability in *Drosophila* metapopulations is complex and is affected in an interactive manner by both local dynamics and migration rate.
- (d) Circadian clocks evolve in *Drosophila melanogaster* populations as a consequence of selection for faster pre-adult development.
- (e) Synchrony, precision and accuracy of circadian rhythms evolve in fruit fly populations as a correlated response to selection for emergence in a narrow window of time.
- (f) Genetic architecture underlying morning and evening emergence in early and late fruit fly populations is complex; while the genetic basis of circadian period is primarily autosomal and comprise additive interactions, those regulating phase of entrainment involve higher order dominance and epistatic interactions.
- (g) Temperature compensation mechanisms help fruit flies achieve strong (Type-0) phase-resetting in their circadian clocks.
- (h) Unique patterns of adult emergence and activity/ rest behaviours, not seen under laboratory conditions, become apparent when *Drosophila melanogaster* are exposed to semi-natural conditions.
- (i) Work on the social structure of female Asian elephants was continued and it was found that this social organization was more fluid than that of African savannah elephants.
- (j) There was no linear dominance hierarchy between Asian elephant female groups, although there was some effect of age on the initiators and recipients.
- (k) The population size of an Asian elephant population in Cambodia was estimated using DNA-based capture-mark-recapture methods, in collaboration with WWF-Cambodia.
- (l) Under a wide range of day lengths, the large ventral neurons of *Drosophila melanogaster*, determine the phase of the evening activity peak, a previously unknown function for this component of the circadian circuit.
- (m) Differential susceptibility of a subset of fruitfly neurons to neurodegeneration by mutant Huntington protein is partly mediated by developmental stage specificity.
- (n) A temperature sensitive ion channel dTRPA1 is needed for *Drosophila melanogaster* to exhibit a mid-day siesta under temperature cycles.



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- (o) *Drosophila ananassae*, a close relative and sympatric species of the canonical model system *Drosophila melanogaster* occupies a distinctly different temporal niche under a wide range of laboratory and semi-natural conditions.

The first MS/PhD programme student successfully presented her MS thesis and has enrolled for PhD in the Unit.

The first batch of Integrated PhD students in the Unit successfully completed their two years coursework and are engaged in the MS thesis research.

In January 2012, the Unit also organized a two-day Symposium on Organismal Biology in memory of our founding Chair, Prof. M. K. Chandrashekar. Our faculty have also been active in delivering lectures at various meetings and workshops around India.

The following are the members of the Unit:

Chair

Amitabh Joshi Ph D, F A Sc, F N A Sc, F N A

Professors

Amitabh Joshi Ph D, F A Sc, F N A Sc, F N A
Vijay Kumar Sharma Ph D, F A Sc, F N A

Honorary Professors

Raghavendra Gadagkar Ph D, F A Sc, F N A, F T W A S
Mewa Singh Ph D, F A Sc, F N A, F N A Sc
Vidyanand Nanjundiah Ph D, F A Sc, F N A

DST Ramanujan Fellows

T N C Vidya Ph D
Sheeba Vasu Ph D

Research Students

Pankaj Yadav, Nisha N.K., Priya M.P., Pavitra Prakash, Nandini R Shetty, Antara Das, Nikhil K.L., Keerthipriya. P, Donepudi Ravi Teja, Vishwanath Varma, Ananya Ali, Kulkarni Mihir Ravindra, Radhika Dilip Shindey, Hansraj Gautam, Sheetal Potdar, Joydeep De, Avani Mital, Manaswini Sarangi, Geetanjali Prabhakar Vaidya

Research Associates

Snigdhadip Dey, B M Prakash, Koustubh M Vaze (Provisional)

R&D Assistants

Subhankar Chakraborty, Viveka Singh

Geodynamics Unit

Book Published

1. K.S. Valdiya, 2012. Geography, Peoples and Geodynamics of India in Pranas and Epics, Aryan Books International, New Delhi, 240 p.

Research Papers Published

1. K.S. Valdiya, 2011. Some burning questions remaining unanswered, Jour. Geol. Soc. India, 78, 299-320.
2. K.S. Valdiya, 2011. Some geodynamic hotspots in India requiring urgent comprehensive studies, Current Science, 100, 1490-1499.
3. K.S. Valdiya, Bracing for flood hazards, Current Science, 101, 16-17.
4. K.S. Valdiya, 2012. The Tragedy of being geologist, Current Science, 102, 581-589.

Science Outreach Programme

Following lectures were organized under Science Outreach Programme sponsored and funded by the C.N.R. Rao Hall of Science:

- (1) At Gopeshwar, Garhwal, Uttarakhand
Dates: October 14-15, 2011
Colleges involved: 22
Students participated: 102
Teachers participated: 28
- (2) At Gangolihat, Kumaun, Uttarakhand
Dates: May 6 to 9, 2012
Colleges involved: 24
Students participated: 122
Teachers participated: 26

The following is the member of the Unit:

Chair

Prof. K. S. Valdiya



Molecular Biology and Genetics Unit

MBGU currently has several research and training avenues in broad areas of biological sciences. Research in nine of its laboratories spans diverse areas of modern biology with emphasis on biomedicine. These areas of research are: infectious diseases, cancer genomics, human genetics, mammalian stem cells, cardiovascular development, transcription regulation and mechanism of chromosome segregation. In the last two years there has been an active exchange of scientific ideas among this MBGU faculty and colleagues at the centre who are chemists, physicists and engineers. MBGU continues to attract some of the best students from all over the country. Students for the PhD, Integrated-PhD, MS-PhD, POBE and SRF programmes in MBGU are selected through competitive national-level selection process. Our academic programmes aim to provide training in a broad range of genetic, biochemical, cell and developmental biology approaches for basic and translational research. The essence of these programmes is to provide our students, ample flexibility and opportunity for pursuing a contemporary research theme. MBGU has a vibrant and interactive research atmosphere for its students, who find themselves immersed in multiple academic activities including research work presentations, journal club discussions, training workshops, thematic conferences and lectures by visiting scientists, throughout the year. Students are encouraged and supported to present their results at the scientific meetings. Certain important highlights of our work in this previous year are as follows:

Autophagy Laboratory

The laboratory studies autophagy and autophagy-related pathways. A new live cell assay has been designed to kinetically monitor general and selective autophagy pathways and have miniaturized it to suit the high throughput format. Through a genetic and a biochemical screening procedure, novel genes have been identified which are involved in these processes. Future work will include performing a small molecule screening using the HTS and characterizing the mutants involved in the autophagic processes.

Molecular Mycology Laboratory

This laboratory is studying structure-function analysis of centromeres of several pathogenic yeasts: *Candida albicans*, *Candida dubliniensis*, *Candida tropicalis* and *Cryptococcus neoformans*. They observed that centromere DNA sequences are rapidly evolving when *C. albicans* and *C. dubliniensis* orthologous chromosomes were analyzed. Centromeres of *C. tropicalis* have been recently identified. These centromere properties are different from those of *C. albicans* and *C. dubliniensis*. This laboratory also showed that kinetochore formation in *C. albicans* is a concerted process. Several members of the laboratory are now working to identify small molecules that can be used as inhibitors for a fungal specific protein complex present at the kinetochore

Molecular Parasitology Laboratories

Research in these laboratories is focused on understanding metabolism in the malaria parasite *Plasmodium falciparum*. Towards this end the enzymes involved in purine nucleotide metabolism in the parasite are being studied. Comparative structure-function analysis is also being carried out on the homologues from humans and archaea. Adenylosuccinate synthetase from *M. jannaschii* has been characterized biochemically. It is an archaeal enzyme that is 100 amino acids shorter than its counterparts from both eukaryotes and prokaryotes. This thermostable enzyme exhibits a biphasic Arrhenius plot with a switch in the rate-limiting step in catalysis contributing to the bend in the plot. GMP synthetase from *P. falciparum* has been kinetically characterized. The studies show that the parasite enzyme exhibits different inhibition profile from that of the human counterpart suggesting its suitability as a drug target. Characterization of *P. falciparum* adenylosuccinate lyase indicated that the parasite enzyme has retained its specificity for both the substrates, SAMP and SAICAR. The presence of SAICAR specificity suggests that this is probably the only activity of the de novo purine biosynthetic pathway that is retained in the parasite. Active recombinant *P. falciparum* SIR2 has been successfully expressed and purified. Screening for modulators of Sir2 activity led to the identification of surfactin, a depsipeptide produced by *Bacillus subtilis* as a potent inhibitor of the parasite enzyme competing for the NAD⁺ binding site. Another Parasitology lab in the unit is focusing its efforts on the role of *Plasmodium* kinases in host-pathogen interactions.

Chromatin Biology Laboratory

Work in the chromatin TP2 is acetylated *in vivo* as detected by anti-acetylated lysine antibodies and mass spectrometric analysis. Recombinant TP2 is acetylated *in vitro* by p300 and PCAF. p300 acetylates TP2 in its

C- terminal domain which is highly basic in nature possessing chromatin condensing properties. Mass spectrometric analysis showed that p300 acetylated 4 lysine residues in the C-terminal domain of TP2. Acetylation of TP2 leads to significant reduction of its DNA condensing property as studied by the CD and AFM analysis. Colocalization studies using GC-selective DNA binding dyes chromomycin A3 and 7-amino actinomycin D and AT selective dye DAPI indicate that TP2 is preferentially localized to the GC-rich sequences. Interestingly, as spermatids mature, TP2 and GC rich DNA moves towards nuclear periphery and in the later stages of spermatid maturation TP2 is predominantly localized at the nuclear periphery. Another interesting observation is the mutually exclusive localization of GC and AT rich DNA in the elongating and elongated spermatids. A combined immunofluorescence experiment with anti-TP2 and anti-TP1 antibodies revealed several foci of overlapping localization indicating that TP1 and TP2 may have concerted function role during chromatin remodeling in mammalian spermiogenesis. Chromatin remodeling factor BRDT has been cloned and expressed in insect cells. The recombinant BRDT shows histone chaperone activity *in vitro*. Gene expression perturbation following down regulation of *mrhl* RNA has been studied. Pathway construction has indicated that *mrhl* RNA plays an important role in the *wnt* signalling pathway.

Human Molecular Genetics Laboratory

This laboratory is examining molecular genetic basis of human neurological disorders: idiopathic generalized epilepsy (IGE), in particular, juvenile myoclonic epilepsy (JME) and a reflex/sensory form of epilepsy widely known as hot water epilepsy (HWE). In addition to examining the role of the known epilepsy-causing alleles in ion-channel genes, Dr. Anand has been exploring possible new molecular mechanisms in the causation of epilepsies. One of the recent findings from this lab comprises identification of an IGE locus and a gene at 3q13-q21 (*EIG8*, OMIM-601199). A new epilepsy gene encoding *CaSR* (extracellular calcium-sensing receptor) at chromosome 3q13-q21 has been discovered by the nominee's laboratory. *CASR* belongs to a family of G-protein coupled receptors. This is the first demonstration of *CaSR*'s function in the context of an epileptic disorder. The *CASR* protein is expressed in specific sub-regions of the human brain and that this protein 'measures' changes in extracellular calcium levels in the sub-regions and connects this information to intracellular signal transduction pathways in neurons. This contribution is well recognized in the field. Based on these findings, *CaSR*'s biological role in the epilepsy/human brain and the consequences of its misregulation are being addressed in several laboratories abroad. *CASR* has a crucial role in regulating the growth of neuronal processes in the developing brain. The epilepsy-causing R898Q mutation detected by the laboratory has been investigated by a laboratory elsewhere and shown to be a gain-of-function allele that disrupts a critical arginine-rich retention motif of the *CASR*. This laboratory has gone on to examine this gene further and has identified several patient-specific *CaSR* mutations. On the basis of his studies of this gene in nearly 500 familial and sporadic cases of epilepsy, it appears that an overlapping genetic predisposition may underlie two seemingly distinct clinical entities, generalized and localized epilepsies. It is amply clear that *CaSR*'s function in the human brain is crucial to maintaining normal neuronal excitability. Further studies on the role of *CASR* in neuronal signal transduction pathway may expand the pharmacological repertoire for seizure phenotypes.

Vascular Biology Laboratory

A comparative approach has been made by using embryonic stem cell models, mouse developmental biology and *Drosophila* genetics, to decipher the roles of novel genes expressed early in the cardiovascular and hematopoietic systems. This approach has given useful insight into gene function as well as ontogeny of the heart, blood and blood vessels. Analysis of these genes in the context of human development as well as in clinical studies with a focus on tumor angiogenesis and progression has been undertaken. Current studies are focused on understanding mechanisms that control cardiovascular development using ESCs and mutant mice.

Recently two new sibling human embryonic stem cell (hES) lines from discarded embryos have been derived and differentiated to cardiovascular derivatives that can be cultured to purity. These are called BJNhem19 and BJNhem20 and have been deposited in the UK Stem Cell Bank. The lines are also listed on the European hESC registry. The laboratory is currently involved in the International Stem Cell Initiative (ISCI) project on accumulation of genetic defects in ES cell cultures.



Molecular Virology Laboratory

Recent analysis from the laboratory found that in India, over the past decade, the HIV-1 subtype C has acquired a stronger viral promoter and is expanding at a substantial rate, replacing the standard subtype C strains. This is the first time that anyone identified divergent evolution in a major viral subtype of HIV-1. The newly emerging HIV-1 subtype C viruses containing a stronger viral promoter produce more viral particles and a higher viral load, probably providing an enhanced transmission advantage. This finding is perplexing because a stronger viral gene expression should also elicit enhanced immune activation that may be counter-productive to viral fitness. Some researchers believe that subtype C virus has a relatively higher degree of attenuation as compared to other subtypes and as a result is less pathogenic. Current results of this Laboratory propose that subtype C virus exploits a small window of opportunity to make higher viral load without eliciting a higher magnitude of immune activation. Future studies remain needed to further validate this notion. The laboratory is also credited with the most important finding that subtype-C Tat protein is a defective monocyte chemokine and proposed a hypothesis that the under representation of HIV-1 associated dementia in India is correlated to this important genetic difference. The laboratory undertook the evaluation of a polyherbal formulation of the Indian origin as a potential HIV-AIDS therapeutic strategy. The pilot clinical trial, the first of its kind, showed stabilized clinical profile in the study participants.

Transcription and Disease Laboratory

This lab is focusing on understanding the role of epigenetic modifications, histone chaperones and non-histone chromatin proteins in chromatin dynamics and transcription regulation. These studies are carried out with special emphasis on disease and therapeutics. Through an interdisciplinary approach we search for small molecule modulators of chromatin modifying enzymes and use nanoparticles to deliver these in animal model system. Based on their several original discoveries, the group is aiming towards unraveling the epigenetic signatures of diseases like cancer, diabetes and AIDS.

The researchers in this Lab have been working on the Chromatin dynamics and transcriptional regulation in humans with special emphasis on disease and therapeutics. They have made several original contributions in this area which include the discovery of human transcriptional coactivator PC4 a functional component of Chromatin organization, a Nucleophosmin (NPM1) as a histone chaperone and transcription regulator, hyperacetylation of histones and also NPM1 have been causally linked in the manifestation of oral cancer. They have discovered several inhibitors of Histone acetyltransferases which could serve as a lead reagent to design therapeutic and could be also used to study cellular functions of HATs. Most recently, by using carbon nanospheres conjugated to small molecule HAT activator CTPB (discovered by them) have been able to activate the histone acetylation both in cultured cells and in the mice brain.

Following are the members of the Unit:

Chair

Anuranjan Anand Ph D, F A Sc

Honorary Professors

Dipankar Chatterji Ph D, F N A Sc, F A Sc, F N A, F T W A S

H Sharat Chandra Ph D, F A Sc, F N A

Professors

Anuranjan Anand Ph D, F A Sc

Hemalatha Balaram Ph D, F A Sc

M R S Rao Ph D, F A Sc, F N A, F N A Sc, F A M S, F T W A S

Namita Surolia Ph D, F A Sc, F N A Sc

Ranga Uday Kumar Ph D

Tapas Kumar Kundu Ph D, F A Sc, F N A Sc, F N A

Maneesha Inamdar Ph D

Associate Professor

Kaustuv Sanyal Ph D

Faculty Fellow

Ravi Manjithaya

Ph D

Technical Officer (Veterinary)

R G Prakash

B V Sc & A.H.

Technical StaffAnand Kumar K, N Jeelan Basha, Nishitha Patel,
Prakash RG, Suma BS, Ushasree Pattamatta**Research Students**Bharath S, Mamta Jain, Nishtha Pandey, Abhishek Sinha,
Laxmi Narayan Mishra, Mahesh B, Mukti Nath Mishra,
Babhrubahan Roy, D. Karthigeyan, Sujata Kumari,
Sreyoshi Mitra, Manpreet Kaur, P.K. Raju
Pedabaliyarasimhuni, Sanjeev Kumar, Sourav Roy,
Nikhil Gupta, Shetty Ronak Kutty, Laxmi Shanker Rai, Gautam
Chatterjee, Anjali Verma, Kalpita Rashmi Karan, Deeti K. Shetty,
Kirthana M.V., Akhade Vijay Suresh, Khadilkar Rohan Jayant,
Senapati Parijat Ramesh, Vijay J, Garima Verma, Shilpee, Malini
Menon, Vajjyanthi Kandadai Raghavan, Amrutha Swaminathan,
Shukla Arpit Prakashkumar, Shalini Roy Choudhury, Simi
Muraleedharan, Prabhu S A, Amit Kumar Behera, Neha
Varshney, Stephanie Kaypee, Farheen Khan, Piyush
Mishra, Santosh S, Sutanuka Das, T. Lakshmi Prasoon,
V. Sivani, Vikas, Shveta Jaishankar, Lakshmi Sreekumar,
Surabhi Sudevan, R. Sunaina Singh, S. N. Suresh, Shreyas
Sridhar, S Sundar Ram, Mariyam Abdullah Khorakiwala,
Lakshmeesha K N, Pooja Barak**Research Associates**Swati Sinha, Ram Murthy A, Jeelan Basha, Rahul Modak, Diana
Rodrigues, Jitendra Thakur, Arti Baban Dumbrepatil, Uttara
Chakraborty**Research Associates (Provisional)**

Manoj Kumar, Somnath Mandal, Sudhanshu Yadav

Fellow (DBT)

Abhishek Baghela

Junior Research Fellow

B Saraiah

Senior Research Fellow

Laxmi Narayan Mishra

R&D AssistantsMonalisa Das, Vasudeva Bhat, Satya Krishna Pentakota,
Anayat Ullah Bhat, Prathima B N, Anitha Sanjay
Rokhade, Mekha G Mohan, Rebu K Verghese, Rishikesh
Gopal Lotke, Pavithra R, Shambhu Prasad G A, Chetan V
Kurthukoti, Sneha Jyothi Chatterjee, Akshay V Bhat, Mahadeva
Swamy MM, Deepthi Sudarshan, Tanmoy Chakraborty, Umesh T
G, Lavanya T, Shiny joy, Shashank Rai, Amol Baspurao Aher**Project Research Associate**

Nishitha Patel



New Chemistry Unit

The New Chemistry Unit is a relatively new Unit currently with a few core faculty members and Prof. C.N.R Rao as Chairman. Several faculty members from the other Units of the Centre are also associated with the NCU. The Unit works on interdisciplinary aspects of chemical science. The Unit admits students for the Ph.D. degree programme as well as integrated Ph.D. in Chemical Sciences. The Unit also admits students for integrated MS-Ph.D programme in Chemical Sciences through project-oriented chemical education (POCE). The students admitted for these programmes would undergo extensive course work and research training before continuing for dissertation work.

Prof. C. N. R. Rao has pursued several aspects of the chemistry of materials are being pursued. These include transition metal oxides, nanomaterials and carbon materials. In transition metal oxides, multiferroic and magnetoelectric oxides are of interest. Work on inorganic nanomaterials includes synthesis, characterization, study of properties and phenomena has been carried out. Carbon nanotubes and graphene are important areas being investigated.

Dr. T. Govindaraju's research activities included the interface of chemistry and biology (Organic synthesis, Peptide chemistry, Nucleic acid chemistry, Nanobiotechnology). The design and synthesis of small molecules, peptides, nucleic acids and their conjugates based biomimetic systems and materials possessing well defined nano-, meso- and micro-structures with properties similar to natural materials through Nature-inspired molecular self-assembly approach has actively been pursued. These biomimetic materials find applications as biomaterials, drug delivery systems, composites and in bioelectronics. Chiral unnatural amino acids and ligands as optical probes for sensing and bioimaging of variety of cations and anions through supramolecular host-guest interactions have been developed. The design and synthesis of new class of smart-building blocks for metal directed assemblies for biosensors and smart materials applications have been undertaken. Protocols have been established to develop biomimetic molecular self-assembly-based systems and materials through chiral transcription, amplification and retentive helical memory (studied by sergeants-and-soldiers method and majority rules) for use in chiral technology and to understand spontaneous deracemization and amplification pathways for biological homochirality in his laboratory.

The underlying theme of Dr. Subi Jacob George's research lies at the interface between synthetic efforts on p-conjugated systems and the organization of these molecules using supramolecular self-assembly principles, with the ultimate aim of developing novel functional materials. In this approach, the electronic, optical and self-assembling properties of the p-conjugated backbone for the design of materials has been targeted. In activities related to the electronic functionality, the synthesis of novel n-type coronene imide derivatives and on charge-transfer conducting nanofibers via a non-covalent amphiphilic strategy was focused upon. Solution processable fluorescent materials by a non-covalent organic (dyes) -inorganic (organoclay) hybrid co-assembly has been targeted, which also facilitated efficient light-harvesting. The optical functionality of chromophoric assemblies as multivalent guest scaffolds and for the concept of "supramolecular signal amplification" was further exploited. The chiroptical properties as a probe to study the mechanism of supramolecular self-assembly and chiral amplification such as 'Sergeant and Soldiers' and 'Majority Rules' was also used. Research has been undertaken towards non-covalent functionalization of carbon nanomaterials with various aromatic donor and acceptor molecules to form novel class of hybrid materials exhibiting ground- and excited-state charge-transfer, energy transfer and tunable opto-electronic properties. Recently, the design of novel microporous organic polymers has been initiated.

Dr. Jayanta Halder worked in the area of infectious diseases which remain a major threat to global health and are now the world's biggest killers, causing over 15 million deaths per year. A platform was sought to integrate organic chemistry and material science with biology to combat infectious diseases in a multipronged approach, namely, diagnosis, prevention and treatment. Towards this, novel antimicrobial macromolecules (AMMs) have been engineered and showed that AMMs inactivate pathogenic bacteria by interacting with and disrupting their lipid membrane, and are having little or no toxicity to mammalian cells. Recently, various derivatives of a glycopeptides antibiotic (vancomycin) have been developed and showed that the new derivatives are not only active against Gram positive bacteria but also active against Gram negative bacteria such as *E. coli*. It is believed that this new strategy can overcome the inherent resistance of vancomycin towards Gram-negative bacteria.

Dr. Sebastian C. Peter has established two laboratories for the research activities and 3 PhD students and 3 R&D students have been recruited. Two new projects were approved by UGC-DAE and DST for research funds. Other two projects were funded by DST for the synchrotron beamline facilities at PETRA (Germany) and Photon Factory (Japan) and visited PF. Research works were communicated to different international journals. A new advanced course "Crystallography of Solid State Chemistry" for PhD & Int/MS-PhD students has been started and active participation was shown in training POCE students. Dr. Peter has been an invited speaker in seven national/international conferences/symposia.

Dr. Ujjal Gautam has been working in research pertaining to green energy from water splitting. A state-of-the-art facilities for the same has been set up. In addition, synthesis of novel nano-catalysts with higher light harvesting potentials has been pursued. In another field of research, investigations on the materials properties at the interfaces of two dissimilar liquids have been initiated.

Prof. H. Ila's research activities revolved around mainly towards design and development of new general, highly efficient synthetic methods for biologically important five and six membered heterocyclic compounds using novel organosulphur building blocks/synthons derived from broad range of active methylene compounds. The various methodologies involve transition metal (especially palladium and copper)catalyzed C-C and C-N bond formation reactions, regio- and chemoselective C-C and C-heteroatom bond formations with various carbon and heteronucleophile on these synthons, heteroaromatic annulations with bifunctional heteronucleophiles and cycloadditions with activated isocyanato methylene compounds on these substrates have been explored. Based on these methodologies, a new general approach has been developed for 2,4,5-substituted oxazoles involving copper catalyzed intramolecular cyclization, and two 2,5-diaryl oxazole natural products ie. balsoxine, texamine have been synthesised. A new general method for 2,4,5-substituted thiazoles using similar methodology has been developed. New reactions of activated methylene isocyanides carbanions with new organo sulphur synthons leading to a novel domino reaction yielding 2,4,5-substituted 4,5-bisoxazoles and substituted thiazoles have also been explored. This work is in the form of 4-5 publications which will be communicated soon.

Prof. Swapan K. Pati's research interests span over a broad range of fields which include theoretical understanding the mechanism and the role of a catalyst used in a catalytic reaction. In particular, the relevant parameters in designing an efficient catalyst were focused. Towards this goal, the kinetics of methane formation from CO₂ have been investigated and have explored the role of Ni (110) surface as an effective catalyst. The metal surface properties by introducing various dopants on the Ni (110) have been modulated which showed an immense catalytic activity producing CH₄ from CO₂. Additionally, the DNA-protein/ drug molecules interaction to understand the site specificity and modes of interactions of various drugs when those are brought in contact with DNA have been studied.

Prof. A. Sundaresan has worked in the area of developing new ferroelectric materials which have been designed based on Spin disorder and magnetic interaction between 4f-3d ions. For example, ferroelectricity is induced at the magnetic ordering temperature of transition metal ions in YCr_{1-x}M_xO₃ (M=Fe or Mn) where the polarization is maximum at x=0.5. In RCrO₃ system the magnetic interactions between Cr and R ions results in ferroelectricity at the Cr-magnetic ordering temperature.

Dr. Ranjani Viswanatha's primary focus of research was the synthesis and study of optical and magnetic properties of semiconductor nanocrystals. To that end, in the past one year work related to the synthesis of Cu doped CdSe to use copper as a nanosensor to study the electronic structure and surface properties of CdSe have been undertaken. Work is currently under process towards extending these studies to other II-VI semiconductors. The second area of interest actively pursued in the last one year was to synthesize CdTe and CdTe/CdS core shell systems to dope them with magnetic impurities like Fe, Co.

Prof. M. Eswaramoorthy worked in the area of Aminoclay which has been used as a template to make porous-layered carbon which has the ability to change its pore-size with respect to shear force. Size-selective sorption has been demonstrated in the same material for two types of dynamic pores. The clay has also been used as a template to organize the organic chromophores for different applications.

Dr. Sridhar Rajaram has been working on developing novel bifunctional organocatalysts. It was found that concomitant activation of reaction partners can be achieved using such catalysts. In addition, a novel catalytic



system has been developed wherein an alkali metal cation provides the structural scaffolding for an organocatalyst.

Dr. Tapas Kumar Maji's research group was actively involved in exploring various functional aspects of metal-organic frameworks (MOFs), particular luminescence properties of MOFs. Recently, a multi-chromophoric hybrid system has been synthesized where exciplex emission sensitized by energy transfer which is unprecedented. In another breakthrough results, crystal-to-crystal transformation of a 3D porous framework to 1D chain structure triggered by conformational change of the organic spacer was shown.

New Programmes launched

The First Annual Chemistry Lecture was delivered by Prof. Herbert W. Roesky, University of Gottingen, Germany on "Chemistry Inspired by Interstellar Molecules".

"JNCASR Chemistry Symposium-2011" was organised in celebration of International Year of Chemistry-2011 (IYC-2011) on January 10, 2011.

A programme for students jointly with Educational technology Unit (ETU) was organised in celebration of International Year of Chemistry-2011 (IYC-2011) on January 11, 2011.

Dr. Ujjal Gautam has joined the Unit as DST Ramanujan Fellow.

Following are the members of the Unit:

Chair

C. N. R. Rao

Ph D, D Sc, F A Sc, F N A, F R S,
F T W A S, Hon. F R S C

Honorary Professor

H. Ila

Ph D, FNA, F A Sc

Faculty Fellows

T. Govindaraju

Ph D

Subi Jacob George

Ph D

Jayanta Halder (DST Ramanujan Fellow) Ph D

DST Ramanujan Fellows

Sebastian C. Peter

Ph D

Ujjal Gautam

Ph D

Associate Faculty Members

Swapan K. Pati (Professor)

A. Sundaresan (Associate Professor)

M. Eswaramoorthy (Associate Professor)

A. Govindaraj (Honorary Associate Professor)

Ranjani Viswanatha (Faculty Fellow)

Tapas Kumar Maji (Faculty Fellow)

Sridhar Rajaram (Faculty Fellow)

Research Students

Avinash M.B, Debabrata Maity, Venkata Rao Kotagiri, Mohit Kumar, Ritesh Halder, G. Ramana Reddy, Yarlagadda Venkateswaralu, Divakara SS Murthy Uppu, Bhawani N, S. Vijay Kumar, Nagarjun N, Chandradhish Ghosh, Sumanta Sarkar, Shivaprasad Manchineella, Pallavi Bothra, Arjun Kumar Chittoory, S. Yugandar, Udumula Subba Rao, Pramoda K, Ankit Jain, Nikhil Aggarwal, Moumita Rana, Swastika Banerjee, Lingampalli Srinivasa Rao, G. Krishnamurthy Grandhi, Anand Acharya, Avijit Saha, Jiaul Hoque, Ajmala Shireen P, Monali Moirangthem, Debopreeti Mukherjee, Yelisetty Venkata Suseela, Komal Prasad, Pallabi Halder,

Krishnendu Jalani, Mohini Mohan Konai, K. Rajasekhar,
Arkamita Bandyopadhyay

Research Associate

G Parameshwarappa

Junior Research Fellow

B Saraiah

R&D Assistants

Sasikumar, Madhu Mohan Saga, A Padma, Gowtham B.M,
Abishek Kannan Iyer, Pradeep P Shanbogh, Deepti Kalsi,
R Bharathanatha Reddy



Theoretical Sciences Unit

The group of Prof Shobhana Narasimhan continued to work on using density functional theory to understand the properties of materials, and to use this understanding to design novel materials for a variety of applications. They have shown how the surface states on the Au(111) surface become spin polarized on depositing iron on the gold surface,

and matched this to experimental data. They have also studied spin dependent transport through photoswitching molecules connected to magnetic leads, in the field of molecular spintronics. They have also shown that doping substrates can significantly lower barriers

when nanoparticles are used in heterogeneous catalysts. They have extended the Frenkel Kontorova model, which is used to predict reconstruction in homoepitaxial systems, to heteroepitaxial systems. Another exciting result was that the magnetoresistance of metal-organic molecule systems depends crucially on the shape of the contact.

Dr Kavita Jain has worked in the area of adaptation dynamics on complex fitness landscapes with a special emphasis on small populations.

Dr Subir K Das carried out work in the area of Critical Phenomena, Kinetics of Phase Separation, Pattern Formation, Wetting Phenomena, Nucleation in various systems of interest in condensed matter physics, biology, fluid dynamics, etc.

Prof Swapan K Pati research interests encompass a broad spectrum of condensed matter phenomena including excitation characteristics, low-temperature thermodynamics and dynamical behaviour of a range of quantum systems. The role of dark states in resonance energy transfer beyond Forster formulation has been explored. Current constraint method has been developed to understand transport phenomena in nanoscale systems. Novel electronic transport properties like negative differential conductance (NDC), spin filter, half-metallicity and high mobility have been found in many molecular-, 1D- and 2D- systems. Kagome aniferromagnetic clusters with Dzyaloshinskii-Moriya interaction have been studied to understand magnetic behaviour. Many biological systems, including DNA, G-quadruplexes and their metal-mediated properties have also been explored.

The group of Dr N S Vidhyadhiraja has developed a strong focus on developing predictive theoretical approaches for strongly correlated materials by integrating first-principle based methods and methods for strong correlation such as iterated perturbation theory (IPT) and local moment approach within dynamical mean field theory (DMFT). A fully consistent multi-orbital IPT has been derived for the first time, and is presently being benchmarked against more exact methods such as continuous time quantum Monte Carlo. Exact results for resonant transmission through nano-devices have been utilized for designing new protocols. This work is under review. A new model for orthoferrite solid solutions has been developed that explains experimental results quantitatively and consistently. The periodic Anderson model was investigated through a combination of local moment approach and DMFT to see the effects of a change in valence on spectral and transport properties. Many anomalous changes were seen, and quite a few experimental results in mixed-valent heavy fermion materials could be explained based on these results.

Work in Waghmare's group has determined (a) properties of boride-Ni interfaces present in Ni-based superalloys and their implications to environmental embrittlement, (b) the cause for enhanced photo-electrocatalytic properties of BaTiO₃ with Fe-doping for water splitting, (c) role of disorder and structure in controlling magnetoelectric properties of FeAlO₃, (d) various properties of metal doped CeO₂, BCN and related materials for gas storage, (e) nano-scale form and properties silver films and gold clusters, (f) development of designer piezoelectrics based on perovskite superlattices, and (g) metal-semiconductor nitride superlattices for thermoelectric applications.

The following are the members of the Unit:

Chair

Shobhana Narasimhan

Ph D, F N A Sc

Vikram Sarabhai Professor and Hon. Professor

Kalyan B Sinha

Ph D (Univ. of Rochester),
F A Sc, F N A, FTWAS

Professors

Shobhana Narasimhan	Ph D, F N A Sc
Srikanth Sastry	Ph D
Swapan K Pati	Ph D, F A Sc, F N A Sc
Umesh V Waghmare	Ph D, F A Sc F N A Sc

Faculty Fellows

Kavita Jain	Ph D
N S Vidhyadhiraja	Ph D
Subir Kumar Das	Ph D

Research students

Shiladitya Sengupta, Madhura Marathe Pradeep, Arup Chattopadhyay, V. Vishwas, Prakash Parida, Arun Kumar Manna, Suman Majumder, Sutapa Roy, Sananda Biswas, Pramod Kumar, Ulman Kanchan Ajit, Nagamalleswara Rao Dasari, Pralok Kumar Samanta, Shirodkar Sharmila Narendra, Kaushlendra Kumar, Alok Kumar Dixit, Summayya Kouser, Sarada S, Wasim Raja Mondal, Priyanka, Saugata Patra, Durga Lakshmi Bokka, Rukhsan Ul Haq, Sona John, Vasudevan M V, Ananthu James, Jiarul Midya, Anshul Deep Singh Parmar, Subhajit Paul, Anjali Singh, Vinutha H A, Saikat Chakraborty, Naushad Ahamad Kamar, Vinay Ishwar Hegde, Meha Bhogra, Bradraj Pandey

DST Post Doctoral Fellows

Ganga Periyasamy, Abhishek Kumar Mishra

Research Associate

Siamkhanthang Neihzial

Research Associates (Provisional)

Himadri Barman, Moumita Maiti, Mighfar Imam, Shuvrajyoti Bhattacharjee

R&D Assistants

Somananda Sanyal, Kavyashree P, Sakti Veena



International Centre for Materials Science

ICMS is the first international centre of its kind devoted to high impact, interdisciplinary scientific research, education and extension in materials science, established in the confines of a scientific cum educational institution under the direction of Prof. C. N. R. Rao. The Centre was envisaged by the Department of Science and Technology (DST), Government of India and the Jawaharlal Nehru Centre for Advanced Scientific Research took the necessary steps to establish ICMS with the financial support of DST.

Being a first centre of this kind everything is being done to make sure that the centre not only fulfils its objectives but also creates new traditions in carrying out research, extension activities and international collaborations.

Objectives of the Centre are:

- Carry out in-house research of high quality in selected areas of materials science.
- Promote well-planned programme of collaboration in research and education with important centres and individuals in India and abroad.
- Provide opportunities to students as well as faculty through exchange programmes between ICMS and other centres.
- Conduct discussion meetings, schools and workshops.
- Organize Winter/Summer Schools on Materials.
- Provide visiting fellowships to teachers and young research workers from other institutions in India.
- Provide sophisticated instrumental and analytical services of the highest quality to facilitate materials research.

ICMS has established the major scientific user facilities to serve both in-house researchers and researchers from other institutions. It has further expanded its infrastructure by installing sophisticated equipments like Superconducting Quantum Interference Device (SQUID), Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES), UV Spectrometer, Photoluminescence Spectrometer (PL), etc.

The Centre for Computational Materials Science (CCMS) of ICMS has established a High Performance Computing Facility, an instructional computing laboratory with 30 computers for hands-on training of the students. CCMS is expanding its activities and laboratories under a new project: "Thematic Unit of Excellence on Computational Materials Science".

The centre supports programmes for PhD and MS degrees and offers a two semester (one year) Post-graduate Diploma in Materials Science. It offers Senior and Junior Fellowships under RAK-CAM Programme and also Short-term visiting programmes. The students admitted by JNCASR under PhD and MS programmes based on their performance in interviews also get an opportunity to use the state-of-the-art facility, attend national/international conferences, meetings and visit other universities under various collaborative and exchange programmes. Four students have graduated until now. One student has been enrolled for this current year under the Post Graduate Diploma in Materials Science programme and 29 visitors have visited for collaborative research under short term visiting programmes.

ICMS has taken initiatives to establish more international collaborations. It has signed MoUs with Weizmann Institute, Scuola Internazionale superior di Studi Avanzati (SISSA), RMIT- Australia and Waterloo Institute of Nanotechnology. Students on exchange programme under these collaborations have visited ICMS.

In addition to carrying out innovative research, ICMS also organizes various seminars, schools, workshops and conferences in collaboration with colleagues in JNCASR and elsewhere.

The following is the list of special annual seminars series:

The International Materials Lecture is an annual lecture series by eminent scientists from all over the world. This series has also been well appreciated and successful.

Fourth International Materials Lecture was delivered by Prof. Dr. E. W. Meijer, Eindhoven University of Technology, on December 5, 2011. The fifth International Materials Lecture is scheduled to be delivered by Prof. Chad Mirkin, Northwestern University, in July 2012.

Annual Materials Lecture initiated in 2011, in another annual lecture series to be delivered by eminent scientists from all over India. The first Annual Materials Lecture was delivered by Dr. Baldev Raj, President, Indian National Academy of Engineering, President-elect, International Institute of Welding on June 24, 2011. The second Annual Materials Lecture was delivered by Prof. Satishchandra B. Ogale, National Chemical Laboratory (CSIR-NCL), Pune. on March 20, 2012.

ICMS organizes seminars, schools, workshops and conferences in collaboration with colleagues in JNCASR and elsewhere. To name few, Winter School on Chemistry and Physics of Materials with University of Cambridge, Chemistry of Materials meeting arranged in collaboration with Swedish Academy of Sciences, JNCASR research conference on Materials in Kerala in collaboration with National Institute for Interdisciplinary Science and Technology, Trivandrum and Indo-Israel conference. ICMS has also sponsored various schools and workshops conducted by other organizations.

Sheik Saqr Laboratory

The Memorandum of Understanding with Ras al Khaimah Centre for Advanced Materials (RAK-CAM) was signed on December 3, 2011 by Prof. A. K. Cheetham, F.R.S., Chairman, Scientific Advisory Board of RAK CAM and Prof. M.R.S. Rao, President, JNCASR. The support provided by Ras al Khaimah Centre for Advanced Materials will be used to establish the Sheikh Saqr Laboratory (SSL) here, in the premises of the International Centre for Materials Science. This grant is already supporting various activities and Fellowships.

- Prof. G. U. Kulkarni has been awarded the Sheikh Saqr RAK CAM Senior Fellowship.
- Mr. Rama Krishna Matte H. S. S. has been awarded the Sheikh Saqr RAK CAM Junior Fellowship.
- Sheikh Saqr Career awards have been given to Prof. A. Sundaresan and Dr. Tapas K. Maji.
- Sheikh Saqr Student Fellowships have been awarded to Mr. Anshuman J. Das and Ms. Urmimala Maitra.
- Two short term visiting fellows have been enrolled under this project. SSL will support the travel of one.

Sheikh Saqr Materials Lecture, a special annual lecture series supported by ICMS and RAK-CAM grant was initiated in 2011. The first annual "Sheik Saqr Materials Lecture" was delivered by Prof. J.M.D. Coey, Trinity College, Ireland on October 20, 2011, in the Nevill Mott Hall of ICMS. The lecture was titled "Dilute Ferromagnetic Oxides and d-zero Magnetism; what can we believe?" and was attended by 70 students and faculty. The feedback of the participants confirmed that the seminar was very much appreciated. The second Sheikh Saqr Materials Lecture will be delivered by Prof. Claudia Felser, Director, Max Plank Institute, Mainz in December 2012.

New Programmes launched

- Annual Materials Lecture series
- Annual International "Sheik Saqr Materials Lecture" series.
- Sheikh Saqr Career Award to encourage the scientists
- Sheikh Saqr Student Fellowships to encourage the students
- SSL visiting fellowship programme

Following are the members of the Unit:

Faculty

C.N.R. Rao, F.R.S., Hon. F. R. S.C., Hon. F. Inst. P., *Director*
S. M. Shivaprasad, Ph.D. (Karnataka), *Professor*, jointly with CPMU
Ranjan Datta, Ph. D (Cambridge), *Faculty Fellow*
Rajesh Ganapathy, Ph. D (IISc.), *Faculty Fellow*
Sridhar Rajaram, Ph. D (Univ. of Utah), *Faculty Fellow*
Ranjani Viswanatha Ph.D. (IISc.), *Faculty Fellow*

Honorary Faculty

A. K. Sood, F. A. Sc., F. N. A., F. T. W. A. S. of IISc. A. Govindaraj, Ph.D. (Mysore), of SSCU, IISc



U. Ramamurty, Ph.D. (Brown Univ.), of IISc

Adjunct Professors
Timothy Fisher, Purdue (Nov 2010 - Nov 2012)
Vinayak Dravid, Northwestern University (Nov 2010 - Nov 2012)

Research Associates
Krishnendu Biswas, Suguna Perumal, Jay Ghatak

ICMS In-charge Co-ordinator
Aruna V Mahendarkar

Research Students
Loukya Chowdary, Santhosh V, Ramana Reddy, G

Diploma Students
Sharvani Shivaprasad, Bolla Govinda Rao

Graduated students (Post Graduate Diploma programme)
Bello Adedeji Abdulhakeem from Nigeria
Dzade Nelson Yaw from Ghana
S. Manjunath from Gulbarga University, Karnataka
Arghya Bhowmik from Pohang University, South Korea

Junior Lab Assistant
Munnegowda

R&D Assistants
Mahesh J I, Srishti Arora, Sunil Kumar, Renu Tomar

Technical Assistant
Gajula Kishore Kumar

Fellows and scientists visiting ICMS
Prof. Venkatesan Manivannan from USA
Mr. Tran Duc Hoang from Vietnam
Mr. Jafar Hoseini from Iran
Ms. Nguyen Thi Mua from Vietnam
Mr. Joey Mangadlao from Philippines
Dr. Sharmin Kharazzi, Iran
Mr. Bello Adedeji Abdulhakeem from Nigeria
Mr. Dzade Nelson Yaw from Ghana
Mr. Kasper Wenderich from The Netherlands
Dr. Nusrat J. M. Sanghamitra from Saudi Arabia
Dr. Umesh A. Palnitkar from India
Dr. Papia Chowdhury from India
Ms. Nabanita Saikia, from India (Twice)
Mr. Biswajit Choudhury, from India
Dr. Vikas Jindal, from India
Dr. Sandeep Kumar Poola from USA
Dr. Hrushikesh Joshi from USA
Dr. Blake Plowman from Australia
Ms. Anisha Dutta from India
Dr. Prashant Dubey from India
Dr. Mohammed Ikram from India (twice)
Dr. Ahsanulhaq Qurashi from Saudi Arabia
Dr. Mane Vishwas from India
Prof. Stefano Baroni from Italy
Dr. Thirumurugan from Cambridge University
Dr. Muhmmad Shah Alam from India
Prof. Stephano De Girancoli from Italy
Dr. Takeshi Nishimatsu from Japan
Prof. Nacir Tit from UAE University

Chemical Biology Unit

A significant segment of work in the Bhattacharya lab concentrated on the lipid molecular design, formation of membranous structure and assembly and uses them for gene transfection and related cellular delivery issues. Wide varieties of synthetic, spectroscopic, calorimetric, biochemical, molecular biological and computational tools have been used to obtain information on the structure, stability and dynamics of various assemblies, lipoplexes and complexes that are formed. A corollary to the design of amphiphilic lipid molecules is the preparation of a large number of low molecular mass precursors, a few of which also manifest interesting aggregation properties, including the propensity of developing into two-dimensional 'films' and solvent entrapped 'gel', an interesting class of soft matter. This laboratory has attempted to understand the molecular basis of such phenomena, their flow behavior, temperature sensitivity and other attributes so that one can use them for specific biological or materials applications. Another focus of research has been the molecular design of small molecule ligands that stabilize duplex, triplex and quadruplex DNA or even certain folds of RNA structures and exploit such properties for developing lead inhibitors for enzymes such as telomerase or topoisomerase etc.

The Varadarajan lab has carried out in the general area of protein structure and folding. A wide variety of spectroscopic, calorimetric, crystallographic, molecular biological and computational tools have been used to obtain information on protein structure, stability and dynamics. Some of the areas which have been explored during the current period include: Ligand-modulated parallel mechanical unfolding pathways of maltose-binding proteins; Conformational changes of the chaperone SecB upon binding to a model substrate--bovine pancreatic trypsin inhibitor (BPTI); Conformational analysis and design of cross-strand disulfides in antiparallel β -sheets; Design and characterization of stabilized derivatives of human CD4D12 and CD4D1; DEPTH: a web server to compute depth and predict small-molecule binding cavities in proteins; Protein model discrimination using mutational sensitivity derived from deep sequencing; Smart polymer mediated purification and recovery of active proteins from inclusion bodies; Designed cyclic permutants of HIV-1 gp120: implications for envelope trimer structure and immunogen design.

The Maitra group has been involved in the chemistry of bile acids. The studies of novel analogues of bile salts have led to the design of unusual gelators with potential applications. The current emphasis is on the development of functional or 'smart' gels. To this end, hybrid organic-inorganic soft materials have been created in which a lanthanide ion (typically europium or terbium, or a mixture of the two) has been successfully used as luminescent handles. The first example of a self-assembled luminescent gel involving a sensitizer and a lanthanide was recently reported. This work has also led to the design of novel enzyme sensors using a 'pro-sensitizer' strategy. Work has also been initiated in the design of hybrid sugar-bile-acid-peptide systems.

Following are the members of the Unit:

Chairman

Prof. Uday Maitra

Honorary Faculty

Prof. P. Balaram

Prof. Santanu Bhattacharya

Prof. V. Krishnan

Prof. Goverdhan Mehta

Prof. Raghavan Varadarajan



Condensed Matter Theory Unit

Significant Research Accomplishments

The members of the Condensed Matter Theory Unit (CMTU) are engaged in theoretical research on a wide variety of topics in the general area of Condensed Matter Science.

During the period from 2011-12, they achieved significant progress on several problems in this area in which support from JNCASR has been acknowledged, and these are summarized below.

Quantum Condensed Matter, especially Strongly correlated Systems

- The strong coupling expansion developed for quantities that are directly experimentally measured in systems of ultra-cold bosonic atoms in a deep optical lattice as described by the Bose-Hubbard model with a trap potential, was used to calculate density profiles for parameter regimes when super fluid regions are present. A scaling analysis was carried out using the LDA. The expansion is shown to work well in much of the experimentally relevant regimes
- The strong coupling expansion for the Hubbard model was extended to study non-equilibrium problems such as the Bloch oscillations in the presence of an electric field.
- Extensive studies, by using mean-field and density-matrix-renormalization-group methods, of a variety of Bose-Hubbard models that can be realised experimentally in cold-atom systems in optical lattices were carried out.
- Several important issues (effects of “blocking” and role of grain boundaries) related to the observation of “super-solid” behavior in solid He in torsional-oscillator experiments were addressed.
- The effects of resistances in quantum wires with interacting electrons modeled as Tomonaga-Luttinger liquids was studied.
- Topological phases and Majorana modes in spin systems or p-wave superconductors in one dimension were studied
- Spin-polarized STM spectra of fermions on the surface of a topological insulator, and junctions of surfaces of topological insulators, were studied
- The ground state fidelity in the vicinity of quantum critical points in one- and two-dimensional models was studied.

Soft Condensed Matter and Nonequilibrium Statistical Physics

- Numerical studies using atomistic molecular dynamics simulations revealed a number of interesting properties of water molecules in narrow carbon nanotubes and nanorings. These also provided theoretical support for the experimental observation of single-file diffusion of water molecules in carbon nanotubes.
- Using finite-size scaling for a four-point susceptibility that characterizes dynamic heterogeneity and numerical evaluation of the corresponding four-point correlation function, the existence of a growing length scale in a realistic glass-forming liquid was established for the first time.
- Systematized studies on our classes of problems in the area of turbulence, were carried out. Namely, (I) the dynamic multi-scaling of time-dependent structure functions in two-dimensional fluid turbulence. (II) dissipation reduction by polymer additives in two-dimensional fluid turbulence, (III) the effects of hyperviscosity in hydrodynamical equations, and (IV) Hall-MHD turbulence.
- Spiral- and scroll-wave dynamics were studied in a variety of mathematical models for cardiac tissue ranging from simple, two-variable models, which account for the trans membrane potential V and a slow, recovery variable, to state-of-the-art models, which include V and several ionic currents, gating variables for the associated voltage-gated ion channels; in recent work the effects of fibroblasts, Purkinje fibres, and mechanical deformation in such models were studied.

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- Work was continued on (i) confined liquids and the glass transition, electrophoresis, sedimentation, and related phenomena in driven colloids, and active matter.

Following are the members of the Unit:

Chairman

Prof. H. R. Krishnamurthy

Honorary Faculty

Prof. G. Ananthakrishna

Prof. B. Bagchi

Prof. B.J. Cherayil

Prof. C. Dasgupta

Prof. N. Kumar

Prof. Rahul Pandit

Prof. S. Ramasesha

Prof. S. Ramaswamy

Prof. D.D. Sharma

Prof. K.L. Sebastian

Prof. D. Sen

Prof. S. Yashonath



Thematic Unit of Excellence in Computational Materials Science

(Formerly known as Centre for Computational Materials Science (CCMS))

Modelling of metal organic frameworks and the storage of gases in them has been carried out using density functional theory. A three-dimensional (3D) pillared-layer metal-organic framework, $[\text{Cd}(\text{bipy})_{0.5}(\text{Himdc})](\text{DMF})_n$ (1), (bipy = 4,4'-bipyridine and Himdc = 4,5-imidazoledicarboxylate) has been synthesized and structurally characterized by Prof. Maji's group. It was discovered that the highly rigid and stable framework contains a 3D channel structure with highly polar pore surfaces decorated with pendant oxygen atoms of the Himdc linkers. The desolvated framework $\text{Cd}(\text{bipy})_{0.5}(\text{Himdc})_n$ (1') is found to exhibit permanent porosity with high H_2 and CO_2 storage capacities. Two H_2 molecules occluded per unit formula of 1' and the corresponding heat of H_2 adsorption $\Delta H(\text{H}_2)$ is about 9.0 kJ/mol. The high value of $\Delta H(\text{H}_2)$ stems from the preferential electrostatic interaction of H_2 with the pendent oxygen atoms of Himdc and aromatic bipy linkers as determined from first-principles density functional theory (DFT) based calculations. Similarly, DFT studies indicate CO_2 to preferentially interact electrostatically ($\text{Cd} \cdots \text{O} \cdots \text{C}$) with the uncoordinated pendent oxygen of Himdc. It also interacts with bipy through $\text{C}-\text{H} \cdots \text{O}$ bonding, thus rationalizing the high heat ($\Delta H_{\text{CO}_2} \sim 35.4$ kJ/mol) of CO_2 uptake. It was unveiled that better H_2 or CO_2 storage materials can be developed through the immobilization of reactive hetero atoms (O, N) at the pore surfaces in a metal-organic framework.

Work continued on using density functional theory to understand the properties of materials, and to use this understanding to design novel materials for a variety of applications. It was shown how the surface states on the Au(111) surface become spin polarized on depositing iron on the gold surface, and matched this to experimental data. The spin dependent transport through photoswitching molecules connected to magnetic leads was studied, in the field of molecular spintronics. It was shown that doping substrates can significantly lower barriers when nanoparticles are used in heterogeneous catalysts. The Frenkel Kontorova model is extended, which is used to predict reconstruction in homoepitaxial systems, to heteroepitaxial systems. Another exciting result was that the magnetoresistance of metal-organic molecule systems depends crucially on the shape of the contact.

Research was carried on nucleation in silicon, glass forming liquids with an emphasis on analyzing fragility, the Stokes-Einstein relation, and the dimensional dependence of the Adam-Gibbs relation, protein structure analysis, sheared amorphous solids.

Using first-principle and many-body method, a broad spectrum of condensed matter phenomena in many quantum systems has been studied. Current constraint method has been developed to understand transport phenomena in nanoscale systems. Novel electronic transport properties like negative differential conductance (NDC), spin filter, half-metallicity and high mobility are found in many molecular-, 1D- and 2D- systems. The catalytic behaviors of nickel nanocatalyst have been explored for the conversion of CO_2 to methane. Many graphitic materials have been studied which show promising properties for their applications. Specifically, graphene nanoribbons have been explored considering the case of doping, edge-reconstruction and defects. Electronic structures, transport behaviors and drug-delivery properties have been studied in a range of Bio-molecules. Interactions of DNA with carbon nanotube, graphene and metal nanoclusters have been studied for bio-sensors activity.

The following have been determined (a) properties of boride-Ni interfaces present in Ni-based superalloys and their implications to environmental embrittlement, (b) the cause for enhanced photo-electro-catalytic properties of BaTiO_3 with Fe-doping for water splitting, (c) role of disorder and structure in controlling magnetoelectric properties of FeAlO_3 , (d) various properties of metal doped CeO_2 , BCN and related materials for gas storage, (e) nano-scale form and properties silver films and gold clusters, (f) development of designer piezoelectrics based on perovskite superlattices, and (g) metal-semiconductor nitride superlattices for thermoelectric applications.

New programmes launched

- Proposed work on development of catalysts for water splitting and T-dependent behavior of stacking faults.
- The development of a Grand Canonical Monte Carlo code to calculate adsorption isotherms in porous solids was initiated.

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- The new project funded by the Nano Mission called “Thematic Unit of Excellence in Computational Materials Science” was initiated.

Visitor’s Programme:

During this financial year, 3 students and 9 scientists have visited for period of about a week to three months period for research / collaborative work with CCMS members.

Following are the members of the Unit:

Coordinator

Prof. Balasubramanian Sundaram

Members

Prof. Shobhana Narasimhan

Prof. Srikanth Sastry

Prof. Swapan Pati

Prof. Umesh Waghmare

Associate Members

Prof. Amalendu Chandra, IIT Kanpur

Prof. Sanjoy Bandyopadhyay, IIT Kharagpur

Prof. Prabal K. Maiti IISc, Bangalore

Prof. S. Yashonath IISc, Bangalore

Prof. Tanusri Saha-Dasgupta, S.N. Bose

National Centre for Basic Sciences, Kolkata

Prof. Lavanya M. Ramaniah, Bhabha Atomic Research Centre, Mumbai

Prof. P.B. Sunil Kumar, IIT Madras, Chennai

Prof. K.P.N. Murthy, Indira Gandhi Centre for Atomic Research, Kalpakkam

Prof. Charusita Chakravarty, IIT Delhi

Prof. Surajit Sengupta, S.N. Bose National Centre for Basic Sciences, Kolkata

Prof. Gautam Menon, Institute of Mathematical Sciences, Chennai

Prof. B. Jayaram, IIT Delhi

Prof. Rajendra Prasad, IIT Kanpur

Prof. Dilip G. Kanhere, University of Pune

Prof. G.P. Das, Indian Association for the Cultivation of Science, Kolkata

Prof. Ganapathy Ayappa, IISc, Bangalore

Prof. T.A. Abinandanan, IISc, Bangalore

Prof. Indra Dasgupta, Indian Association for the

Cultivation of Science, Kolkata

Prof. Dilip Angom, Physics Research Laboratory, Ahmedabad

Prof. Satyavani Vemparala, Institute of Mathematical Sciences, Chennai

Prof. Indira Ghosh, University of Pune

Programme Assistant

Venkatesh K

Staff

Basavaraj T, Bharati Singh, Vijay Amirtharaj A



DST Unit on Nanoscience

Conversion of inorganic carbonates to methane has been carried out using mixed metal carbonates as an alternative way to capture and convert the carbon dioxide: an important environmental problem. It was observed that presence of cobalt facilitate the complete conversion of carbonate to methane.

Aminoclay is a layered magnesium organosilicate with the structure analogous to 2:1 trioctahedral smectites, such as talc but with covalently linked organosilicates in place of inorganic silicates, with an approximate composition $R_8S_{18}Mg_6O_{16}(OH)_4$ (R= alkylamine covalently linked to Si) This clay is easily exfoliable in water into nano sheets due to protonation of amino groups. These functional groups are very efficient in stabilizing metal nanoparticles to form clay-metal nanoparticles. Composite film made with the aminoclay slabs and the polymer, polyvinylalcohol, showed enhanced strength without compromising its ductility, a problem commonly encountered in using inorganic filler with the polymer in macro composites. These composite films incorporated with Ag and Au metal could be used as food packaging materials.

Direct write methods have been developed which make use of a variety of metal-organic complexes as single source precursors to produce micro and nanoscale patterns of metals, oxides, sulfides, nitrides as well as of alloys. A desired interface can be easily obtained by exercising control over the chemical treatment. Based on this principle, a few devices such as strain sensor have been produced. The direct methods not only cut down the number of process steps but also the cost and importantly, enable design of material interfaces which are beyond the conventional lithography.

There has been substantial effort in the recent past towards fabricating devices on soft substrates and realise sensors which can be integrated to our surroundings. The additional possibility of incorporating stretching and bending capabilities of such products introduces valuable features which can be incorporated in novel design concepts.

In this group, there has been work on nanocarbons from the very beginning. Important contributions have been made in the area of carbon nanotubes as well as graphene, and some of the contributions in this area have received international attention. More importantly, in addition to the nanotubes and graphene made of carbon, graphene analogues of other inorganic layered materials have been synthesized and characterized in this laboratory.

Recently, magnetism in nanoparticles of otherwise nonmagnetic inorganic materials has been discovered where the surface defects give rise to such unexpected magnetism. It has also been shown that the surface ferromagnetism can be combined with ferroelectricity to give multiferroic properties.

Following are the members of the Unit:

Faculty members

Prof. C. N. R. Rao
Prof. G. U. Kulkarni
Prof. K. S. Narayan
Prof. Swapan K. Pati
Dr. A. Sundaresan
Dr. M. Eswaramoorthy
Dr. A. Govindaraj

Technical Assistance

Ms. N. R. Selvi

Library

The Library presently has a collection of over 8000 books and access to 5000+ scientific journals. The Library continued to acquire, organize and disseminate information resources to render need based information services to faculty, students and researchers.

Overview of Collection

Books	
Books procured	516
Total books in collection	8039
Journals	
Online journals subscribed	129
Print journals subscribed	5
Patent database (Derwent Patent Index) - from National Knowledge Resource Consortium	1
Abstracting and Indexing database (Web of Science) - from National Knowledge Resource Consortium	Web of Science, SciFinder
Online journals in collection (Subscription + consortium resources)	5000+

Books Acquisition and Budget spent

In the financial year 2011-12, 516 books worth Rs. 22,00,000/- (Rupees Twenty two lakhs only) have been procured in the library based on the recommendations of JNCASR Faculty members. With the procurement of books for the financial year, 8039 is the total number of books in stock.

Journal Subscription and Budget

The total amount spent for the subscription of both print and online journals for the year 2011-12 is Rs. 1,48,32,332 (Rupees One crore forty eight lakhs thirty two thousand three hundred and thirty two only)

Document Delivery Service (DDS)

Journal articles have been procured from libraries across the country and abroad have on requests received from faculty and students under Document Delivery Service. Total 579 articles have been procured under this service.

Following are the library staff members:

Library-Cum-Information Officer

Ms. Nabonita Guha

Library Assistants

Mrs. Nandakumari, E.

Mr. Nagesh Hadimani

Mr. Senthil Kumar, N.

Library Trainee

Ms. Kalpana S.

Helper

Mr. Rajeeva, J.

ENDOWED RESEARCH PROFESSORS

Linus Pauling Research Professor

C N R Rao
Jawaharlal Nehru Centre for
Advanced Scientific Research, Bangalore
(Term: Life time)

FRS, D Sc, F A Sc, F N A, FRS,
FTWAS, Hon. FRSC

D S Kothari Chair

M M Sharma
Emeritus Professor of Eminence,
Mumbai University, Mumbai
(Term: 01/01/1999 to 31/10/2013)

FRS, F A Sc, F N A, FTWAS

Hindustan Lever Chair

S Chandrasekaran
Department of Organic Chemistry and, Chairman,
Division of Chemical Sciences,
Indian Institute of Science
(Term: 01/11/2011 to 31/10/2013)

F A Sc, FTWAS, F N A

Dr Vikram Sarabhai Research Professor

Kalyan B Sinha
Jawaharlal Nehru Centre for
Advanced Scientific Research, Bangalore
(Term: 01/12/2011 to 31/11/2013)

F N A, F A Sc, FTWAS



ACADEMIC PROGRAMMES

Academic Activities

At JNCASR, research is carried out in six Units: Chemistry and Physics of Materials Unit (CPMU), Evolutionary and Organismal Biology Unit (EOBU), Engineering and Mechanics Unit (EMU), International Centre for Materials Science, Molecular Biology and Genetics Unit (MBGU), New Chemistry Unit (NCU) and Theoretical Sciences Unit (TSU). The research undertaken is inter-disciplinary in nature.

The Centre offers Ph. D, Integrated Ph. D, M.S (Research) and M.S Engg . degree programmes in Science and Engineering. Students are admitted to the Units mentioned above. The minimum academic qualification required to apply for the MS/Ph.D programmes of the Centre is MSc./B.E./B.Tech./M.E./M.Tech./MBBS degree/s. Candidates applying for M.S/Ph.D programmes should have at least 50% in their highest University examination, and should also have qualified in GATE/UGC-CSIR-JRF/ICMR-JRF/DBT-JRF/JEST/equivalent examinations. Candidates applying for Integrated Ph.D Programme of the Centre should have at least 55% marks in their Bachelor's degree in any area of Science or Statistics.

The Centre selects candidates on the basis of their academic record, performance in GATE/UGC-CSIR-JRF/ICMR-JRF/DBT-JRF/JEST/equivalent examination(s), recommendation from referees and performance in the interview. The selected candidates are offered course work, provided with research facilities for research and on successful completion offered with the degree.

(a) Research Admissions

The present student strength is 266. 73 students joined the Centre during August session of 2011 including 8 students who joined during mid-year admission of January 2012.

(b) Degrees Awarded

The Centre is a Deemed to be University, and awards Ph.D and M.S degrees. Following are the students who have been awarded degrees under the various degree programmes during April 2011- March 2012:

M. S. (Engg.)

1. Ms Kopal Arora
2. Mr Arun R
3. Mr Dinesh Kumar
4. Mr Ershaad Ahamed Basheer
5. Mr Vinay Kumar Gupta
6. Mr Srikanth T

M. S. (Research)

1. Mr Muzafar Beigh
2. Mr Mohan Krishna DV

M. S. (Materials Science)

1. Mr M Pandeeshwar
2. Ms Gayatri Kumari
3. Mr SRK Chaitanya Sharma Y
4. Mr Chidambar Kulkarni
5. Mr Rana Saha
6. Ms Sudeshna Sen
7. Mr Varun Thakur
8. Mr Arpan Hazra
9. Mr Dileep Krishnan

Ph. D.

1. Mr N.V Manohar Rao
2. Ms Vani Kulkarni
3. Ms Sasmita Mohakud
4. Mr Sudipta Dutta
5. Mr Bhat Javaid Yusuf
6. Ms Priyanka Shukla
7. Ms Gayathri S
8. Mr Ratul Das Gupta
9. Mr Harish N Dixit
10. Ms Soumya Saswati Sarangi
11. Mr Kalyan Raidongia
12. Mr Katla Sai Krishna
13. Mr Srinvasa Raju
14. Mr Leela Srinivas Panchakarla
15. Mr Shahnaz Rahman Lone
16. Mr Kumara Ramanatha Datta
17. Mr Monojit Bag
18. Ms Neenu Varghese

New programmes launched

Post Graduate Diploma in Science Education (PGDSE)

In order to provide opportunities to teachers and others to obtain training and for carrying out science education projects, this Centre is offering a postgraduate diploma programme in science education. Some of

the aspects covered in the programme would be courses related to subject content, laboratory experiments, research experience and experience in education technology. The training will be provided through projects and few formal courses. The programme will be for one year (for full-time students), at the end of which they will be given a post-graduate diploma in science education. The programme will take two years for teachers in service who do this on a part-time basis. Advertisement for this programme was published in all major newspapers of the country. The programme was offered in the areas of Chemistry, Physics, Biology and Maths. A committee had met to scrutinize 516 applications received for this programme. Eleven candidates were shortlisted for this programme. Under this programme, two students had joined on 1st August 2011 and are undergoing course work at JNCASR. The students selected under this programme receive a monthly fellowship of Rs 10,000 (full time and non-employed) and Rs 6,000 (part time and employed) for the period of stay at the Centre.

For the year 2012, the advertisement has been released in 4 national dailies (covering all the regions of the country) and on our web site. The last date for the receipt of application was 5 March 2012.



Discussion Meetings/Workshops

The following discussion meetings were supported by the Centre. The meetings were organized by its faculty in association with faculty of other reputed research institutions in various areas of current interest.

1. 2nd National Molecular Virology Meeting, April 29-30, 2011, Prof. C. Durga Rao, IISc.
2. Group Research Conference, Entrainment and Universality in Jets and Plumes: an 'Integral' Approach, Dr. Sourabh Diwan, Prof. Narasimha Roddam, Prof. S.M. Deshpande, May 5, 2011.
3. Science Outreach Programme–Summer 2011, May 18-19, 2011, Prof. K.S. Valdiya, JNCASR.
4. Sourabh Diwan, “Entrainment and Universality in Jets and Plumes: an Integral Approach” Participants: Prof. Narasimha Roddam and Prof. S.M. Deshpande on May 26, 2011.
5. Indo-US Workshop on New Functional Materials, Manali, June 2-6, 2011.
6. Indo-US-Symposium on “New Functional materials Synthesis, Properties and methods”, Prof. Ashok K Ganguli, IIT-D, June 2-7, 2011.
7. Afro-Asia Workshop on Advanced Topics in Chemistry, June 13-17, 2011.
8. EICOON Meeting, June 13-17, 2011.
9. National Conference on “Nanoscience and Engineering for Better Ceramics NanoSEC-2011”, Prof. Arun M Umarji, IISc, June 23-24, 2011.
10. Third Management Board Meeting held on June 24, 2011.
11. TSU In-House Symposium, August 4, 2011.
12. Research Conference on Chemistry of Functional Materials, Prof. R. Murugavel, IIT-Bombay, August 12-14, 2011.
13. “Theoretical and Experimental Immunology”, Prof. Dipankar Nandi, IISc, August 16, 2011.
14. 7th Kannada Vijnana Sammelana, Prof. K.I. Vasu, September 15-17, 2011.
15. JNCASR Research Conference in Kochi, October 1-3, 2011.
16. JSPS/DST Workshop in Graphene, Japan October 13-15, 2011.
17. Meeting on Chemistry & Physics of Advanced Materials, Prof. A.J. Paul, IACS, Kolkata, October 29-31, 2011.
18. Indo-Australia Joint Symposium on Nano Materials, November 2-4, 2011 at RMIT, Melbourne Australia.
19. Meeting with Dr. Caroline Ash, Sr. Editor, Science Magazine, AAAS, November 4, 2011.
20. 3-days International Conference on “Dynamics of Phase Transformation”, November 28-30, 2011.
21. Winter School on Chemistry and Physics of Materials, Convenors: Dr. A. Sundaresan and Prof. Swapan K. Pati, December 5 - 10, 2011, JNCASR.
22. Four days workshop on Magnetism: Practice and Theory, Dr Dipankar Das Sharma, IISc
23. 8th Indo-Australia Biotechnology Conference on Stem Cell Biology, December 7 - 9, 2011.
24. Dr. Santhosh Ansumali, 20th Discrete Simulations of Fluid Dynamics (DSFD), JNCASR, 2012.
25. Prof. Uday Maitra, “Opening Scientific Doors: Exploration of Potential Areas for Collaboration in Chemistry and Physics”, IISc, January 5-7, 2012,
26. Indo-US Workshop and Seminar on Malaria, January 16-18, 2012.
27. EOBUSymposium, JNCASR, Bangalore, January 19 - 20, 2012.
28. Prof. Srikanth Sastry, “Unifying Concepts in Materials”, JNCASR, February 1-8, 2012.
29. Unifying Concepts in Materials, James A Krumhansl School and Symposium (JAKS-2012), Prof Srikanth Sastry, JNCASR, Bangalore, January 30 - February 5, 2012.
30. 6th RNA Group Meeting, Prof Sanmitra Das, March 30 - 31, 2012

Colloquia

1. Dr. J. Ravi Prakash, "Concentration Dependent Dynamics Of Semi-Dilute DNA Solutions", Department of Chemical Engineering, Monash University Melbourne, Victoria 3800 Australia, July 8, 2011.
2. Dr. Vijayakumar K. Chikkadi, "Long-range spatial correlations in sheared colloidal glasses" Institute of Physics, University of Amsterdam, The Netherlands, August 10, 2011.
3. Manikandan Mathur, "Modelling bistability of mid-latitude atmospheric jets", Laboratoire des Ecoulements Geophysiques et Industriels, Grenoble, France, August 19, 2011.
4. B. Ashok, "Serrated flow in nanotether formation from vesicles", ACRHEM, University of Hyderabad, August 16, 2011.
5. "Multiphase Lattice Boltzmann simulation of buoyancy-driven flow of two immiscible fluids in an inclined channel", Dr Kirti Chandra Sahu, Department of Chemical Engineering, Indian Institute of Technology Hyderabad, October 3, 2011.
6. "Stability of spinning, self-gravitating, rubble-pile asteroids", Prof Ishan Sharma, Assistant Professor, Department of Mechanical Engineering, IIT, Kanpur, November 11, 2011.
7. Numerical Simulation of HP Vane cascade under free stream turbulence, Dr Sanjiva Lele and Dr R Bhaskaran, Department of Mechanical Engineering and Astronautics and Aeronautics, Stanford University, November 18, 2011.
8. The PSE-3D instability analysis methodology for flows depending strongly on two and weakly on the third spatial dimension, Pedro Paredes, Vassilios Theofilis and Daniel Rodra guez, School of Aeronautics, Universidad Politecnica de Madrid, E-28040 Madrid, Spain 2 Division of Engineering and Applied Science, California Institute of Technology, Pasadena CA, USA, November 30, 2011.
9. On the relation between the equation for large-eddy simulation of turbulent flow and for weakly nonlinear evolution of disturbances for flows in transition, Prof V Vasanta Ram, Ruhr University, Bochum, November 22, 2011.
10. Climate Science, Waves, and PDEs for the Tropics: Observations, Theory, and Numerics, Prof Andrew J Majda, Morse Professor of Arts and Sciences, Department of Mathematics and Climate, Atmosphere, Ocean Science (CAOS), Courant Institute of Mathematical Sciences, New York University, December 9, 2011.
11. Some insights into wetting hysteresis - experiments and modeling, Prof Mahesh Panchagnula, Department of Applied Mechanics, IIT Madras, January 13, 2012.
12. Optimal Path to Turbulence in Shear Flows, Prof Dan Henningson, Professor in Fluid Mechanics, FLOW, KTH Mechanics, Sweden, January 17, 2012.
13. Drag reduction and the nonlinear dynamics of Newtonian and viscoelastic turbulence, Prof Michael D Graham, Department of Chemical and Biological Engineering University of Wisconsin-Madison, USA, January 24, 2012.
14. Some insights into wetting hysteresis - experiments and modeling, Prof Mahesh Panchagnula, Department of Applied Mechanics, IIT Madras, January 24, 2012.
15. Generation of solitary waves in an oceanic thermocline by internal gravity waves, Prof Chantal Staquet, Laboratory of Geophysical and Industrial Fluid Flows (LEGI), Grenoble, France, February 14, 2012.
16. Dynamical systems approach to the investigation of thermoacoustic instabilities, Dr Priya Subramanian, Department of Aerospace Engineering, Indian Institute of Technology Madras, March 21, 2012.



ENDOWMENT LECTURES

A V Rama Rao Foundation Lectures in Chemistry: Phosphorus-Supported Ligands: Versatile Coordination Platforms for the Assembly of Molecular Materials, Prof. V Chandrashekar, IIT Kanpur, May 13, 2011. Prize Lecture: Hybrid Nanomaterials for Sensing and Light Energy Conversation, Prof. K George Thomas, IISER, Trivandram, May 13, 2011.

DAE Raja Ramanna Lectures in Physics 2011: "Solving Quantum Field Theory using Black Holes in one higher dimension" Prof. Spenta R Wadia, Director, International Centre for Theoretical Sciences, TIFR, Mumbai. Prize Lecture: "Condensed Matter Physics with Cold Atoms: From Bose Condensation to Synthetic Non-Abelian Gauge Fields" Prof. Vijay B Shenoy, Associate Professor, Centre for Condensed Matter Theory, Department of Physics, IISc, Bangalore, September 30, 2011.

Prof. V. Ramalingaswami Memorial Lecture, "The Inside Story of the Impoverished Gut", Dr. Gopinath Balakrish Nair, Director, NICED, Kolkata, July 8, 2011.

Prof. C N R Rao Oration Award Lecture 2011: "Modifying materials for super-efficient Solar Cells and Light Emitting Diodes" Prof. S.M. Shivaprasad, Chemistry and Physics of Materials Unit, JNCASR, August 5, 2011.

ISAAC Newton Lecture: Mr. Jean Marie Tarascon, "From Volta to Lithium and Beyond", Professor of Chemistry Université de Picardie Jules Verne, Amiens, France, August 22, 2011.

ISRO- Satish Dhawan Lecture 2011: Dr. Vikram Sampath, "Lords of 33 villages: Mysore under the wodeyars" October 14, 2011.

ICMS Sheik Saqr Materials Lecture: Professor J. M. D. Coey, "Dilute Ferromagnetic Oxides and d-zero Magnetism; what can we believe?" School of Physics and CRANN, Trinity College, Dublin 2, Ireland, October 20, 2011.

Special Lecture: Prof. Sauro Succi, "Lattice kinetic theory across scales: from fluid turbulence to electron flows in grapheme", Research Director, IAC-CNR, Rome Italy, October 24, 2011.

Prof. M K Chandrashekar Memorial Lecture: "A Brief History of Internal Time", Prof Serge Daan, Niko Tinbergen distinguished honorary chair in Behavioral Biology, Linnaeusborg, University of Groningen, The Netherlands, January 19 - 20, 2012.

Annual Chemistry Lecture: "Chemistry Inspired by Interstellar Molecules", Prof Herbert W Roesky, University of Gattingen, Institute of Inorganic Chemistry, February 23, 2012.

ICMS-Second Annual Materials Science Lecture: Prof Satishchandra B Ogale, Centre of Excellence in Solar Energy, Physical and Materials Chemistry Division, National Chemical Laboratory (CSIR-NCL), Pune, March 20, 2012.

GENERAL LECTURES

1. Administrative Staff Orientation Programme, Dr S Ramesh Babu, November 29, 2011.
2. Conference on Science Communication Addressing Women's Issues, Mr A P Deshpande, NCSC, Mumbai, January 7 - 8, 2012
3. Women, Law and Society, Justice Mrs Sudha V Manohar, Former Judge of Supreme Court of India, JNCASR, March 26, 2012
4. Can the Poor afford Solar Lamps, Dr Harish Hande, January 10, 2012

Guest Lecture

1. IP Valuation, Ms. Anjana Vivek, Founder, Venture Bean Consulting, November 9, 2011.

Lectures delivered at the Annual Faculty Meeting by Faculty/Hon. Faculty

1. Phenomenological theory of high-temperature superconductivity in the cuprates, Prof. Chandan Dasgupta
2. Genetics of an epilepsy precipitated by tactile and temperature cues, Prof. Anuranjan Anand
3. Self-Assembly approach towards Functional Organic Materials, Dr. Subi Jacob George

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4. The Curious Case of NiS: Is it a metal or is it not!, Prof. D D Sarma
 5. Disorder, Freezing and Spiral Dynamics in the complex Ginzburg – Landau Equation, Dr. Subir K Das

SEMINARS

1. Dr. Kavita Babu, Synaptic plasticity at the *C. elegans* Neuromuscular Junction, Massachusetts General Hospital & Harvard University, Boston, USA, April 4, 2011.
2. Stability Theory and Turbulent Wall Flow, Srinivas Veeravalli, IIT Delhi, April 7, 2011.
3. Dr. Hiren Ghosh, Femtosecond Interfacial Electron Transfer Dynamics in Dye-Quantum Sensitized Solar Cell, BARC, Mumbai April 11, 2011.
4. ICeMS Symposium, April 18, 2011.
5. Watching electrons in nanostructures, Dr. Jerome Lagoute, University of Paris-Dederot, France, April 26, 2011.
6. Mechanobiology : An Evolving Science at the Interface, Dr. Sitikantha Roy, Biomedical Engineering Department, Johns Hopkins University, April 30, 2011.
7. Mechanism of In-vivo Transport by Multiple Molecular Motors, Dr. Ambarish Kunwar, Department of Neurobiology, Physiology & Behavior, University of California, Davis, May 6, 2011.
8. Charge-transfer chromophores for advanced applications: optical properties and essential-state models, Dr. Cristina Sissa, Department of Chemistry GIAF, University of Parma, May 10, 2011.
9. Solute rotation in polar liquids: Microscopic basis for the SED model, Dr. Jaydeb Chakrabarti, S. N. Bose National Centre for Basic Sciences, Kolkata, India, May 16, 2011.
10. Electrochemical transformation of Multiwalled Carbon Nanotubes graphene Layers, Vijayamohanan Pillai, NCL Pune & Director, CECRI, May 18, 2011.
11. Photoconductivity anisotropy study in uniaxially aligned polymer based planar photodiodes, Dr. Dhritiman Gupta, Cambridge University, May 20, 2011.
12. Dr. Mahesh M Bandi, “The onset of rigidity in a loose granular pack under compression”, School of Engineering and Applied Sciences, Harvard University, Cambridge, USA, June 14, 2011.
13. “Novel Phases at Magnetic instability and Multipolar ordering”, Physikalisches Instiut, Gottingen, Germany, June 17, 2011.
14. Dr. Baldev Raj, “Challenges in Materials Science of Sodium Cooled Fast Reactors and Fuel Cycle: Approaches” President, Indian National Academy of Engineering President-elect, International Institute of Welding, June 24, 2011.
15. Dr. Srikumar P. Chellapan, “The Rb-E2F Transcriptional Regulatory Pathway in Tumor Growth, Stemness and Metastasis: Novel Targets for Drug Discovery”, Prof. & Chair, Dept. of Tumor Biology, Senior Member, H. Lee Moffitt Cancer Center and Research Institute, Tampa, FL 33612, June 29, 2011.
16. Dr. Deepshikha, “Magnetocaloric effect and magnetic cooling near a field-induced quantum-critical point”, Jaiswal-Nagar, Physics Institute, Goethe University, Frankfurt, June 28, 2011.
17. Dr. Mohan Ananth, “The Helium Ion Microscope: Technology Introduction”, Carl Zeiss NTS, LLC, July 4, 2011.
18. Prof. Surajit Sengupta, “Non-affine droplets and deformation of crystalline solids”, Centre for Advanced Materials, Indian Association for the Cultivation of Science, Jadavpur, Kolkata, July 5, 2011.
19. Dr. Eric Hovestreydt, “Recent Development in Detector Technology for Single Crystal X-ray Diffraction system, Single Crystal X-ray Diffraction” M/S. Bruker AXS GmbH, Germany, July 8, 2011.
20. Prof. R. Vijayaraghavan, “Inorganic Functional Materials for Selected Applications: From Bio to Energy, Materials Division”, School of Advanced Sciences, VIT University, TN, India, July 18, 2011.



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21. Dr. Balaji I. Birajdar, "Structure-Property Relationship in Materials using Electron beam techniques by University of Erlangen-Nürnberg", Germany, July 19, 2011.
 22. Dr. B.L.V. Prasad, "New approaches for the preparation of nanoparticle dispersions and superlattices", Scientist, Materials Chemistry Division, National Chemical Laboratory, Pune 411 008, July 22, 2011.
 23. MBGU Seminar, Dr. Sankar Bhattacharya, Institute of Pathology, Wuerzburg University, Germany, July 25, 2011.
 24. Prof. D. Venkatraman, "Self-Assembly Strategies for Charge Transport", Dept. of Chemistry, Univ. of Massachusetts Amherst, August 1, 2011.
 25. Indo-German conference on pathogenic fungi at JNCASR during Aug 01 - 03, 2011.
 26. Prof. D. Venkatraman, "Self-Assembly Strategies for Charge Transport", Univ. of Mass., Amherst, August 1, 2011.
 27. Dr. Priya Shrama, "3He In Aerogel: A Dirty Superfluid", Leverhulme Early Career Fellow, Royal Holloway University of London, Egham, Surrey, UK, August 5, 2011.
 28. Dr. Akash Gulyani, "Imaging protein activity in living cells: Src kinases at the leading edge", Dept. of Pharmacology, University of North Carolina, Chapel Hill, August 9, 2011.
 29. Dr. Chainani Ashish Atma, "Electronic structure of the iron pnictide superconductors $Ba_{1-x}K_xFe_2As_2$ using laser photoemission spectroscopy" RIKEN (Institute of Physics and Chemistry) Spring-8 Center, Japan, August 9, 2011.
 30. Dr. Mukul Kabir, "Multiscale materials modeling toward sustainable energy applications" Department of Materials Science and Engineering, Massachusetts Institute of Technology, Cambridge, MA 02139, USA, August 9, 2011.
 31. Dr. B. Ashok, "Serrated flow in nanotether formation from vesicles", Advanced Centre of Research in High Energy Materials (ACRHEM), University of Hyderabad, Hyderabad, August 16, 2011.
 32. Prof. Fernando Galembeck, "Charge storage in water and electrostatic charging with water", Instituto de Química Universidade Estadual de Campinas Brazil, August 17, 2011.
 33. Dr. Manikandan S. Mathur, "Wave Scattering by Stratification and Topography", LMD, Ecole Polytechnique, Palaiseau, France and LEGI, Grenoble, France, August 22, 2011.
 34. Krupa Ramasesha, "Hydrogen Bond Dynamics of Water Probed with Ultrafast Nonlinear IR Spectroscopy", Tokmakoff Group, Department of Chemistry and George R. Harrison Spectroscopy Laboratory Massachusetts Institute of Technology Cambridge, MA 02139, U.S.A, August 22, 2011.
 35. Dr. Sujit Sarkar, "Nonuniversal tunneling resistance at the quantum critical point of mesoscopic SQUID array", PPISR, September 2, 2011.
 36. Dr. Sankar Bhattacharyya, "Role of transcription factor NFATc1 in survival, immunoglobulin class switch and regulatory capacity of B lymphocytes", Dept. of Molecular Pathology, Institute of Pathology, University of Wuerzburg, Germany, September 5, 2011.
 37. Dr. V. Kartik, "Advances in Actuation and Sensing for Atomic Force Microscopy: Applications to VideoRate AFM and HighSpeed, Minimally Invasive Imaging", Visiting Faculty, JNCASR, Bangalore, India, September 6, 2011.
 38. Dr. Swati Bhattacharya, "Engineering nanopore sensors: laying the foundations of personal genomics", University of Illinois, Urbana-Champaign, September 12, 2011.
 39. Prof. S M Deshpande, "Boundary Conditions in CFD", JNCASR, Bangalore, India, September 15, 2011.
 40. Dr. Bala Krishna, "Pathem, Designing, Measuring, and Controlling Molecular and Supramolecular Assemblies", California Nanosystems Institute, September 15, 2011.
 41. Prof. Subhasish Dutta Gupta, "Perfect transmission and perfect absorption/anti-lasers", School of Physics, University of Hyderabad, September 16, 2011.

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42. Prof. Rama Govindarajan, "Stratification dogmata", JNCASR, Bangalore, India, September 27, 2011.
 43. Dr. Kirti Chandra Sahu, "Multiphase Lattice Boltzmann simulation of buoyancy-driven flow of two immiscible fluids in an inclined channel" Department of Chemical Engineering, Indian Institute of Technology Hyderabad, India, October 3, 2011.
 44. Professor Ross McKenzie, "A unified picture of hydrogen bonding and of proton transfer", Physics Department, University of Queensland, Brisbane, Australia, October 7, 2011.
 45. Prof. Vivek Malhotra, "Exiting the cells without entering the secretory pathway", ICREA Research Professor, Group Leader and Coordinator of the Cell & Developmental Biology Programme at the Centre for Genomic Regulation (CRG), Barcelona, Spain, October 20, 2011.
 46. Professor Sauro Succi, "Frustrated lattice Boltzmann models for soft-flowing materials", Research Director, IAC-CNR, Rome, October 25, 2011.
 47. Prof. Ishan Sharma, "Stability of spinning, self-gravitating, rubble-pile asteroids", Assistant Professor, Department of Mechanical Engineering, IIT, Kanpur, November 11, 2011.
 48. Growth of amyloid fibrils, Dr Govardhan Reddy, Institute for Physical Science and Technology University of Maryland-College Park, Maryland, November 23, 2011.
 49. Vijyoshi (Vigyan Jyothi Shivir) Program, November 26-28, 2011.
 50. Dynamics of phase transformation conference, JNCASR, November 27 - 30, 2011.
 51. Catalysis Using Gold and Gold-palladium Nanoparticles, Prof David Knight, Department of Chemistry Cardiff University, UK, December 1, 2011.
 52. Computation of basic nanoparticle transport properties by path-integration, Dr Jack F Douglas, Polymers Division, Centre for Theoretical and Computational Materials Science, National Institute of Standards and Technology, Gaithersburg, MD 20899, USA, December 7, 2011.
 53. Double exchange in double perovskites: novel ground state magnetic phase transitions, Dr Prabuddha Sanyal, Physics Department, Hyderabad University, Hyderabad, December 13, 2011.
 54. From molecular catalyst to nano-structured materials, skeletons and catalysts, Prof Yoshinori Yamamoto, Director, WPI-AIMR (Advanced Institute for Materials Research), Tohoku University, Japan, December 13, 2011.
 55. Bouncing jets, Prof Navish Wadhwa, Engineering Science and Mechanics, Virginia Tech, Blacksburg, USA, December 19, 2011.
 56. Hybrid photovoltaics, Dr Dinesh Kabra, Cavendish Laboratory, Cambridge, December 21, 2011
 57. Nephronectin: its role in heart valve morphogenesis, Dr Chinmoy Patra, Max Planck Institute for Heart and Lung Research, Germany, December 22, 2011.
 58. Towards autonomous soft matter: gel emulsions, self-organizing oscillators and squirming droplets, Dr Shashi Thutupalli, Max Planck Institute for Dynamics and Self-Organization, Gatingen, Germany, December 22, 2011.
 59. Connection of metabolism and transcription by methionine adenosyltransferase, Prof Kazuhiko Igarashi, Tohoku University Graduate School of Medicine, December 23, 2011.
 60. Magnetism, structural transition and orbital order in the iron pnictide materials, Dr Rajiv Singh, University of California, Davis, December 27, 2011.
 61. Rare beneficial mutations can halt Muller's ratchet, Dr Sidhartha Goyal, Kavli Institute for Theoretical Physics, University of California, Santa Barbara, CA, December 29, 2011.
 62. Field-theoretic modeling of supramolecular polymer networks and gels, Dr Aruna Mohan, Exxon Mobil Upstream Research Company, Houston, TX, USA, January 3, 2012.
 63. Reciprocal changes in Th17 and Regulatory T cells in HIV disease progression, Dr Madhu Vajpayee, Department of Microbiology, All India Institute of Medical Sciences, New Delhi, January 3, 2012.



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64. Quantum dot solar cells, Prof Prashant V Kamat, Department Of Chemistry and Biochemistry Radiation Laboratory, University of Notre Dame Notre Dame, USA, January 9, 2012.
 65. The curious case of cytochrome c oxidase: elusive mutational effects on proton transport pathways, Dr Suman Chakrabarty, Department of Chemistry, University of Southern California, Los Angeles, USA, January 10, 2012.
 66. Inhomogeneous shear flow of soft jammed materials, Dr Pinaki Chaudhuri, University of Duesseldorf, Germany, January 11, 2012.
 67. Genetic and epigenetic mechanisms of mitochondrial retrograde signaling and its role in cancer progression, Prof Narayan G Avadhani, Professor of Biochemistry, University of Pennsylvania, USA, January 11, 2012.
 68. From carrier multiplication and hot-electron transfer to the mysteries of quantum dot blinking due to sub-excitonic dimensions, Prof Victor I Klimov, Center for Advanced Solar Photophysics, Chemistry Division, Los Alamos, New Mexico, January 12, 2012.
 69. Functional coupling of transcription and splicing, Dr Jean Beggs, University of Edinburgh, Edinburgh, UK, January 12, 2012.
 70. From pattern to process: eyespots and sexual parasites in butterflies, Dr Ullasa Kodandaramaiah, Cambridge University, UK, January 16, 2012.
 71. On vector spin glasses, Dr Auditya Sharma, International Institute of Physics-UFRN Natal, Brazil, January 17, 2012.
 72. Defining hydrogen bonds to determine the structure and dynamics of water and aqueous solutions, Dr Richard Henchman, Manchester Interdisciplinary Biocentre, University of Manchester, UK, January 18, 2012.
 73. Maskless photolithography system, Dr Jay Sasserath, Chief Executive Officer, Intelligent Micro Patterning, LLC, January 19, 2012.
 74. Extinction as a breakdown phenomenon, D. P K Mohanty, TCMP division, Saha Institute of Nuclear Physics, Kolkata, January 19, 2012.
 75. Group Research Conference, Dr U N Sinha, Distinguished Scientist, CSIR Centre for Mathematical Modelling and Computer Simulation (C-MMACS), Bangalore, January 19, 2012.
 76. Gene-based vaccination against influenza in multiple animal models, Dr Srinivas Rao, Chief, Laboratory Animal Medicine Vaccine Research Center, NIAID, January 27, 2012.
 77. Horror autotoxicus: T cell receptor recognition of self and foreign antigens, Dr Dhruv Sethi, Dana-Farber Cancer Institute, Harvard Medical School, Boston, USA, February 2, 2012.
 78. Multi-objective optimization for rapidly rotating flows, Dr Ajit Kumar Mahendra, BARC, February 6, 2012.
 79. Proteomics, ITSI CEO, USA, February 6, 2012.
 80. Chemistry on carbon nanotubes, Dr Alberto Bianco, CNRS, Institut de Biologie Molaculaire et Cellulaire, Laboratoire da Immunologie et Chimie Therapeutiques, Strasbourg, France, February 9, 2012.
 81. Flows of microparticles, Prof Eric Clement, Institute of Fluids Mechanics Toulouse, France, IMFT Deputy Director and Head of the Master program on Fluids Engineering for Industrial Processes, February 9, 2012.
 82. Approaches to transition state analogs of amino acids through Asymmetric Michael Addition of Phosphonates and Phosphites to electron deficient alkenes, Prof Irishi N Namboothiri, Department of Chemistry, Indian Institute of Technology, Bombay, February 10, 2012.
 83. The Midas Touch - Let us talk about Gold, Prof Suresh Bhargava, RMIT, February 13, 2012.

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84. The Attraction of Magnetic Nanomaterials, Prof Raju V Ramanujan, School of Materials Science and Engineering, Nanyang Technological University, Singapore, February 14, 2012.
 85. DFT Studies of Structural and Electronic Properties of Bare and Supported Small Palladium Clusters, Dr Bulumoni Kalita, JNCASR, February 14, 2012.
 86. Nanotechnologies: Towards Safety and Health Regulatory Monitoring, Dr Geok Bee, Division of Chemistry and Biology, School of Arts and Science, Tunku Abdul Rahman College, Kuala Lumpur, Malaysia, February 20, 2012.
 87. Revisiting the hexagonal manganites, Prof Nicola Spaldin, Materials Theory, ETH Zurich, Switzerland, February 20, 2012.
 88. An introduction to branching processes, Prof Kishna B Athreya, Departments of mathematics and statistics, Distinguished professor, College of Liberal Arts and Sciences, Iowa State University Ames, Iowa, USA, February 21, 2012.
 89. Nano-structured graphene fabricated from the top-down and the bottom-up approaches compared to current materials, Prof Padma Gopalan, University of Wisconsin, USA, February 27, 2012.
 90. Life beyond DNA, Prof Stefan Dimitrov, Institut Albert Bonniot, Domaine de la Merci, France, March 2, 2012.
 91. Synchrony based evolution of microtubule and its applications, Prof Satyajit Sahu, NIMS, Tsukuba, Japan, March 5, 2012.
 92. Population-based association mapping of quantitative traits: stratification issues and family-based alternatives, Dr Saurabh Ghosh, Indian Statistical Institute, Kolkata, March 6, 2012.
 93. Galectin-1: a key morphoregulator in mesenchymal and epithelial pattern formation, Dr Ramray Bhat, Lawrence Berkeley National Laboratory, Berkeley, USA, March 7, 2012.
 94. The studies of magnetoplumbite-type(M-type) ferrites, Dr Geok Bee, Division of Chemistry and Biology, School of Arts and Science, Tunku Abdul Rahman College, Kuala Lumpur, Malaysia, March 7, 2012.
 95. Regulation of genome transcription: research strategy and tactics, Prof Akira Ishihama, Professor and Head, Department of Frontier Bioscience, Hosei University, Tokyo, March 19, 2012.
 96. Development of "feram" free software, a fast molecular dynamics simulator for bulk and thin-film ferroelectrics, Dr Takeshi Nishimatsu, Institute for Materials Research, Tohoku University, Katahira, Aoba-ku, Sendai, Japan, March 20, 2012.
 97. Molecules, morphology, and back: Phylogenetic revision and evolution of gingers (Alpinioideae, Zingiberaceae), Dr Vinita Gowda, Department of Botany, National Museum of Natural History, Smithsonian Institution, Washington DC, USA, March 22, 2012.
 98. Fluorescence resonance energy transfer to nanoparticles, graphene and carbon nanotubes", Prof K L Sebastian, Department of Inorganic and Physical Chemistry, Indian Institute of Science, Bangalore, India, March 27, 2012.
 99. Untangling the genetic basis of complex neurodevelopmental disorders, Dr Santhosh Girirajan, Department of Genome Sciences, University of Washington, Seattle, WA, USA, March 29, 2012.
 100. Universality of the plastic instability in strained amorphous solids, Dr Ratul Dasgupta, Postdoctoral Fellow, Department of Chemical Physics, Weizmann Institute of Science, Israel, March 30, 2012.



FELLOWSHIPS AND EXTENSION ACTIVITIES

Extension Programmes

Summer Research Fellowships Programme

For Summer Research Fellowships Programme 2011, the advertisement was released in nine major newspapers in the country and on www.jncasr.ac.in/fe. The committees' screened the applications and the selected students had joined faculty at various institutions. They completed their mandatory 2 month training under this programme. The students selected under this programme receive a fellowship of Rs 6000.

Category	No. of applications Received	No. of Fellowships offered	No of fellowships utilized
Life Sciences	916	20	10
Engineering Sciences	798	23	15
Atmospheric Sciences	160	-	-
Physical Sciences	878	16	14
Chemical Sciences	346	21	18
Mathematics	219	04	02
Materials Sciences	108	03	03
Total	3425	87	62

Project Oriented Chemical Education (POCE)

Out of 490 applicants (from 17 states), 10 (+1) students were selected for this year's POCE program. One of the POCE students has co-authored a research paper published by Prof. Tapas Kumar Maji. Nine students of POCE-2009-11 were awarded Diploma in Chemistry. One student of POCE-2009 batch had joined JNCASR for Integrated M.S-Ph. D program of New Chemistry Unit.

Project Oriented Biological Education (POBE)

Out of the ten students that were shortlisted after the scrutiny of applications, 9 joined this programme on 16th May 2011. They attended lectures given by faculty from JNCASR, IISc, IISER Pune, etc. Batches of 2009 and 2010 returned for their training during this period to work under the MBGU and EOBU faculty of the Centre. Eight students of POBE 2009 batch received their Diploma in Biology certificates this summer on successful completion of their 3 year project training.

JNCASR-CICS Fellowship

This Fellowship programme (earlier called as JNCASR-CCSTDS) has been renamed as Centre for International Co-operation in Science (CICS). It is jointly instituted by the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) Bangalore and the Centre for International Co-operation in Science (CICS), Chennai to encourage mobility of scientists from developing countries. CICS is a Unit of the Indian National Science Academy (NISA), supported by the Department of Science & Technology, New Delhi. This programme aims to promote co - operation among developing regions.

Two Fellows selected for the year 2009-10 have been given certificates on successful completion of their 3 month training programme in India. 4 Fellows have been given JNCASR-CICS certificates for the year 2010-

The status of the selections done for the year 2011-12 is as follows:

Sl. No	Name	Country	Guide and Host Institution	Present Status
1	Ms. Woranan Nakbanpote	Thailand	Prof. M.N.V. Prasad, Dept of Plant Science, University of Hyderabad	Not joined

2	Dr. Taopheed Bamidele Rabi	Nigeria	Dr. Sanjay Gupta, Sr.Consultant (Pediatric Neurosurgeon) Fortis Hospital, Noida	Not joined
3	Dr. Adekunle Olugoenga Olowe	Nigeria	J. Johnson Rajeswar, Professor & Head, Dept. of Veterinary Microbiology, Veterinary College & Research Institute. Namakkal.	Not joined
4	Dr. Michael Ayodele Odeniyi	Nigeria	Dr. K.K. Bhutani, Prof. & Head, Dept. of Natural Products, NIPER, Punjab.	Not joined
5	Ms.Zinnat Shahina	Bangladesh	Dr. Shanta Dutta, Scientist, National Institute of Cholera and Enteric Diseases (NICED) Kolkata.	Not joined
6	Ms. Mathulo Mathabiso Shauli	Republic of South Africa	Dr. Aleyamma Thomas, Scientist G & Director, NIRT, Chennai.	Not joined
7	Mr. Idowu Hazeer Adebakin	Nigeria	Mr. Nagesh R. Iyer, FNAE, FIE, Director, CSIR – Structural Engineering Research Centre, Chennai.	Joined

Visiting Fellowships

The following are the details of Fellows who have been selected for Visiting Fellowships 2011-12:

1. Physics/Chemistry/ Materials Sciences:

Sl. No.	Name	Guide	Present Status
1	Dr. N. Raman	Prof. A. Sundaresan	First Spell is completed.
2	Dr. Manish K. Niranjani	Prof. Umesh Waghmare	Completed.
3	Dr. P. Murali Krishna	Prof. C.N.R Rao	Completed.
4	Dr. Vinay Venugopal	Prof. S.M. Shivaprasad	Completed.
5	Dr. S. Suresh	Prof. C.N.R. Rao	Completed.
6	Dr. Utpal S. Joshi	Prof. K.S. Narayan	Completed.
7	Dr. Priyabrata Banerjee	Dr. Tapas Kumar Maji	Working under First spell.

2. Life Sciences:

Sl. No.	Name	Guide	Present Status
1	Dr. P. Chellapandi.	Prof. Hemalatha Balaram	Completed.
2	Dr. Bijoy Kumar Choudhary	Prof. P. Balaram, IISc	Working under First Spell.
3	Vivek Rohidas Vartak	Prof. V.K. Sharma	Completed.



Other Extension Activities

The Centre and its faculty have been active in popularizing science at the school level, with a specific focus on students between the ages of 13 and 18 years. JNCASR organized National Science Day on 28 February 2012. Lectures by Faculty of the Center, laboratory visits and visit to the chemistry exposition of the Prof. C. N. R. Rao Hall of Science were organized. The aim is to expose, both, teachers and students to current research in various fields of science. In addition, student visits from colleges and institutions from the state and different parts of the country are organized at the Centre. Lectures and laboratory visits are organized to motivate them towards taking science as their career.

Intellectual Property

Recognizing the importance of application oriented intellectual property (novel ideas and inventions in the form of processes, products, designs, software, multimedia packages, etc.) development at the Centre and to foster its access to industry, the Centre has constituted an IP Management Committee to address issues pertaining to generation, valuation, protection and valorization of IP. It has framed an enabling mechanism for managing IP that blend with its mission.

During the year, the Committee reviewed inventions generated by the researchers and recommended filing of patent applications based on the patentability criteria and its commercial potential. The Committee approved filing of 24 patent applications (Indian Provisional Applications-8, Indian Complete Applications-2, PCT-3, USA-5, EPO-2, Brazil-1, China-1, Japan-1, Korea-1). Also, 3 patents (USA-1, EPO-2) were obtained and 7 inventions were licensed.

Patent Applications Filed

Indian Provisional Patent applications filed for the inventions of:

- Subi Jacob George, Mohit Kumar (Appl. No. 3299/CHE/2011, 23/9/2011)
- Subi Jacob George, Kotagiri Venkata Rao (Appl. No. 3290/CHE/2011, 23/9/2011)
- Subi Jacob George, Kotagiri Venkata Rao (Appl. No. 3297/CHE/2011, 23/9/2011)
- Jayanta Haldar, Yarlagadda Venkateswarlu, Akkapeddi Padma (Appl. No. 3889/CHE/2011, 14/11/2011)
- Tapas Kumar Kundu, Anne-Laurence Boutillier, Snehajyoti Chatterjee, Muthusamy Eswarmoorthy, Puspak Mizar, Chantal Mathis, Jean-Christophe Cassel, Romain Neidl, Mohankrishna Dalvoy Vasudevarao, Vedamurthy Bhusainahalli Maheswarappa (Appl. No. 4646/CHE/2011, 29/12/2011)
- Giridhar U Kulkarni, Ritu Gupta, Abhay A Sagade (Appl. No. 205/CHE/2012, 18/1/2012)
- Udaykumar Ranga, Asokan Mangaiarkarasi (Appl. No. 102/KOL/2012, 31/1/2012)
- Kavassery Sureswaran Narayan, Anshuman Jyothi Das (Appl. No. 1128/CHE/2012, 26/3/2012)

Indian Complete Applications

1. Manufacturing Strain Sensitive Sensors and/or Strain Resistant Conduits from a Metal and Carbon Matrix
Inventors: Kulkarni Giridhar Udapi Rao, BoyaRadha, Abhay A Sagade
Appl. No. 1940/CHE/2011, 7/6/2011
2. Bulk Heterojunction/Electrolyte Polymers as Novel Biocompatible Photoactive Multi color-Sensing Technology
Inventors: Kavassery Sureswaran Narayan, Vini Gautam, Monijit bag
Appl. No. 2997/CHE/2011, 30/8/2011

International Patent Application under PCT

1. Highly Specific Antibodies, Composition and Methods Thereof
Inventors: Tapas Kumar Kundu, Jayasha Shandilya, Parijat Senapati
Appl. No. PCT/IB2011/052734, 22/6/2011
2. Self Assembly of Naphthalene Diimide Derivatives and Process Thereof
Inventors: Govindaraju Thimmaiah, Manjula Basavanna Avinash, Makam Pandeewar
Appl. No. PCT/IB2011/052939, 4/7/2011
3. Vector, Vector Combinations, Methods and Kit Thereof
Inventor: Ranga Udaykumar
Appl. No. PCT/IB2011/053081, 11/7/2011



US Patent Applications

1. Methods and Compositions for the Separation of Single-Walled Carbon Nanotubes
Inventors: Chitamani Nagesa Ramachandra Rao, Subi Jacob George, K Venkata Rao, Rakesh Voggu
Appl. No. 13/078154, 1/4/2011
2. Artificial Retina Device
Inventors: Kavassery Narayan Sureswaran, Vini Gautam, Monojit Bag
Appl. No. 13/124,357, 14/04/2011
3. Optimal Wing Planforms for Reducing the Induced or Total Drag of the Wing of an Aircraft Driven by Wing-Mounted Tractor Propellers/Rotors
Inventors: Roddam Narasimha, Madhusudan Deshpande, Praveen Chandrashekarappa, Rakshith Belur Raghavan
Appl. No. 13/381,190, 28/12/2011
4. A Novel Process for Micropattern Generation on Polymer Thin Films Using Pulsed Laser Diffraction
Inventors: Giridhar U Kulkarni, Ashutosh Sharma, Ankur Verma
Appl. No. 13/359,798, 27/1/2012
5. Inhibition of Histone Acetyltransferases by CTK7A and Methods Thereof
Inventors: Tapas Kumar Kundu, Mohammed Arif, Kempegowda Mantelingu, Gopinath Kodaganur Srinivasachar
Appl. No. 13/394541, 6/3/2012

European Patent Applications

1. Optimal Wing Planforms for Reducing the Induced or Total Drag of the Wing of an Aircraft Driven by Wing-Mounted Tractor Propellers/Rotors
Inventors: Roddam Narasimha, Madhusudan Deshpande, Praveen Chandrashekarappa, Rakshith Belur Raghavan
Appl. No. 10809638.9, 28/12/2011
2. Inhibition of Histone Acetyltransferases by CTK7A and Methods Thereof
Inventors: Tapas Kumar Kundu, Mohammed Arif, Kempegowda Mantelingu, Gopinath Kodaganur Srinivasachar
Appl. No. 10 813 423.0, 7/3/2012

Brazilian, Chinese, Japanese and Korean Patent Application

1. Optimal Wing Planforms for Reducing the Induced or Total Drag of the Wing of an Aircraft Driven by Wing-Mounted Tractor Propellers/Rotors
Inventors: Roddam Narasimha, Madhusudan Deshpande, Praveen Chandrashekarappa, Rakshith Belur Raghavan
Brazilian Appl. No. DE RS 16110007209, 29/12/2011
Chinese Appl. No. 201080030144.1, 4/1/2012
Japanese Appl. 2012/519121, 4/1/2012
Korean Appl. No. 10-2012-7002975, 2/2/2012

Patents Granted

1. Derivatives Of 4,6-Disubstituted 1,2,4-Triazolo-1,3,4-Thiadiazole, A Process and Uses Thereof Inventors: Tapas Kumar Kundu, Radhika Ashish Varier, Kanchugarakoppal Subbegowda Rangappa, Badi Sri Sailaja, Nanjundaswamy shivananju, Basappa EPO Patent No. 1945648, granted on 8th June 2011
2. Site-Specific Inhibitors of Histone Methyltransferase (Hmtase) And Process Of Preparation Thereof Inventors: Tapas Kumar Kundu, Selvi Ruthrotha Bharatha Vikru, Hari Kishore, Annavarapu, Mantelingu Kempegowda USA Patent No. 8003698, granted on 23rd August 2011
3. Polyisoprenyl Benzophenones as Inhibitors of Histone Acetyl Transferases and Uses thereof Inventors: Tapas Kumar Kundu, Balasubramanyam Karanam, Mantelingu, Kempegowda, Mohammad Altaf, Swaminathan Venkatesh, Radhika Ashish Varier EPO Patent No. 1694622 granted on 14th March 2012

Inventions Licensed

1. Bulk Heterojunction/Electrolyte Polymers as Novel Biocompatible Photoactive multi color-Sensing Technology
Inventors: Kavassery Sureswaran Narayan, Vini Gautam, Monojit bag
Licensed on: 12/4/2011
2. Flexible and Transparent Strain Sensor using Micromolded Pd μ -Stripes
Inventors: Giridhar Udapi Rao Kulkarni, Boya Radha, Abhay A Sagade
Licensed on: 13/5/2011
3. Fast and Sensitive Detection of VOCs
Inventors: Subi Jacob George, Mohit Kumar
Licensed on: 5/12/2011
4. Super-Absorbent Microporous Material for Petroleum Recovery
Inventors: Subi Jacob George, Kotagiri Venkata Rao
Licensed on: 5/12/2011
5. A Novel Process for Micropattern Generation on Polymer Thin Films Using Pulsed Laser Diffraction
Inventors: Ashutosh Sharma, Giridhar Udapi Rao Kulkarni, Ankur Verma
Licensed on: 4/1/2012
6. Novel Biocompatible Julolidine Conjugates for Selective Copper Detection Using Near Infrared and Fluorescence Detection
Inventors: Thimmaiah Govindaraju, Debabrata Maity, Swapan K Pati, Tapas K Kundu, Arun K Manna, D Karthigeyan
Licensed on: 20/2/2012
7. Direct Laser Ablative Patterning of Graphite to Produce Graphene Ribbons
Inventors: Giridhar U Kulkarni, Narendra Kurra, Abhay A Sagade
Licensed on: 5/3/2012



RESEARCH PROGRAMMES

Research Areas

There are ongoing research programmes in several frontier, interdisciplinary areas of science and engineering. The main areas of research interest at present are:

1. Molecular modelling of materials
2. Nanomaterials and catalysis
3. Nanomaterials, nanofabrication, molecular crystals
4. Functional materials based on Metal-Organic Frameworks (MOFs)
5. Organic electronics: device physics & photophysics
6. Raman and Brillouin Spectroscopy, high pressure research in the study of materials
7. Chemistry of materials
8. Epitaxy and nanostructures
9. Magnetism, superconductivity and multiferroicity
10. Granular matter and other complex fluids
11. Mesoscale simulations and high performance computing
12. Instabilities and interfacial flows
13. Aerospace and atmospheric fluid mechanics
14. Fluid mechanics and heat transfer
15. Rheology of complex fluids, vortex dynamics, transport processes in the nocturnal boundary layer
16. Circadian rhythms in fruit flies and ants
17. Evolutionary genetics and population ecology
18. Neuronal circuits in fruitflies
19. Animal behaviour and sociogenetics
20. Neotectonics and environmental geology
21. Aberration corrected transmission electron microscopy
22. Soft materials
23. Physics of soft matter
24. Organic materials and organocatalysis
25. Physics and chemistry of nanomaterials
26. Functional organic and supramolecular materials
27. Organic synthesis, molecular probes, peptide and protein chemistry, nucleic acid chemistry, bionanotechnology
28. Bio-organic and medicinal chemistry
29. Designing new ways to small molecule heterocyclic scaffolds
30. Inorganic and solid state chemistry
31. Nanomaterials and renewable energy
32. Solid state inorganic chemistry
33. Molecular and cellular mechanisms of human genetic disorders

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34. Molecular parasitology and molecular enzymology
 35. Molecular, genetic and developmental analysis of the cardiovascular system
 36. Transcription regulation and chromatin dynamics: implications in disease and potential therapeutics
 37. Autophagy and autophagy related pathways
 38. Chromatin biology and genomics
 39. The HIV-1 subtype-c strain: success story of the fittest viral subtype
 40. Genetic and epigenetic definition of Centromeres
 41. Mechanisms underlying host-pathogen interactions in malaria
 42. Materials theory
 43. Statistical physics of equilibrium and non-equilibrium condensed matter systems
 44. Mathematical models of biological evolution
 45. Novel physics and chemistry at the nanoscale
 46. Chemistry and physics of systems ranging from atoms to extended materials
 47. Phase transformations and dynamics in soft condensed matter, and biological systems
 48. Non-commutative probability and geometry: mathematics of quantum mechanics
 49. Correlated electron systems and organic electronics
 50. Chemical biology
 51. Condensed matter theory

Research facilities

1. Huffle furnace upto 1000°C & ceramic furnace tubes
2. Agilent 8453 UV visible spectrometer with accessories & softwares
3. Tandberly Edge 95 High Definition Camera, Hitachi make multi System LCD TV-47", trolley for VC & LCD & audio amplifier with speakers
4. 40 KVA UPS Solomec make 3 phase input with batteries
5. Laben Inverted Darkfield Microscope with accessories
6. IVC Ventilator Model V-3, IVC Cage Rack, IVC Cage Assembly, Animal Change Station/Workstation
7. Garaventa Genesis Vertical Platform Lift
8. Surveillance System
9. UCD-200 to-Bioruptor Sonication Devise
10. Easyheat 5060LI Solid State Induction Power Supply
11. Tecan Infinite 200 Pro (Monochromator Based) Multi Mode Reader with accessories
12. Benchtop 4K ZL Freezer Dryer with accessories
13. Oriel Sol3 A Class AAA Solar Simulator, I-V Tester
14. User PC for LSM7 & LSM5 system with accessories
15. Tellus Elephant GPS Collar , Tellus Remote GSM Download Opt
16. Glove Box Work Station Code : 1500001
17. Semiconductor Characterization System
18. JASCO Circular Dichroism Spectrometer with accessories



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19. Bruker Model Tensor 27 FTIR Spectrometer with accessories
 20. Lambda 650 UV / VIS Spectrometer with accessories
 21. Optima 7000 Dual View ICP Spectrometer with accessories
 22. Perkinelmer Pyris 1 high temp. TGA system, Thermal Analysis Gas Station, Power Cord West Asia, Alumina Sample Pan PK/6
 23. DC Magnetometer & MPMS Squid Evercool Dewar Pulse Tube Base
 24. Mini Arc Melting System with accessories
 25. Drosophila Chamber
 26. Autolab 101 Potentiostat Galvanostat
 27. Thermo Scientific Savant Integrated Speedvac System
 28. Vibrator V456 10/32UNF with Trunnion with accessories
 29. Leica S6 D Trinocular Stereo Zoom Microscope, Leica High Speed Digital Color Fire Wire Camera.
 30. 200AMU Residual Gas Analyzer with RS232, Electron Multiplier (EM), built-in Power Module for AC Line Operation

Sponsored Ongoing Research Projects

Sl. No.	Project	Project Investigator (s)	Funding Agency	Duration
1	Study of conformation and conformational dynamics of some conducting polymers in their neutral and doped forms using vibrational spectroscopy and quantum chemical methods	Dr. Abhishek Kumar Mishra, CCMS, JNCASR	DST	3 years
2	Studies on the physiological basis of maternal effects due rearing density in <i>Drosophila melanogaster</i>	Dr. B M Prakash	DST	3 years
3	Women Scientist Scheme A entitles: "Computational studies on structural, mechanistic and spectroscopic characterization of lignocellulosic materials salvation and photosystem I charge/energy transfer processes"	Dr. Ganga Periyasamy	DST	3 years
4	Development of Novel biodegradable surface coatings for biomedical application	Dr. Jayanta Halder	DST	3 years
5	DST Ramanujan Fellowship	Dr. Jayanta Halder	DST	5 years
6	DST Ramanujan Fellowship	Dr. Kanishka Biswas	SERB	5 years
7	Wellcome Trust - DBT India Alliance award to Dr. Ravi Manjithaya an Intermediate Fellowship entitles: Small molecule modulators of autophagy and autophagy related pathways	Dr. Ravi Manjithaya	WT-DBT	5 years
8	DST Ramanujan Fellowship	Dr. Rema Krishnaswamy	DST	5 years
9	Grid-based libraries	Dr. Santosh Ansumali	INTEL	1 year
10	DST Ramanujan Fellowship	Dr. Santosh Ansumali	DST	5 years
11	Structure-property relations in RE ₂ TGe ₃ (RE=rare earths; T=transition metals) compounds" (CRS-M-166)	Dr. Sebastian C Peter	UGC-DAE	3 years
12	DST Ramanujan Fellowship	Dr. Sebastian C Peter	DST	5 years
13	DST Ramanujan Fellowship	Dr. Sheeba Vasu	DST	5 years
14	DST Ramanujan Fellowship	Dr. Subir Kumar Das	DST	5 years



Sl. No.	Project	Project Investigator (s)	Funding Agency	Duration
15	Developing new synthetic routes for the preparation of unnatural amino acids and their use as metal (Bio-) sensors and chiral ligands in the asymmetric catalysis	Dr. T. Govindaraju	DST	3 years
16	Innovative Young Biotechnologists Award to Dr. T. Govindaraju entitles: "Development of Biomimetic Materials as substitutes for Natural Fibers using Designed Modular Peptides"	Dr. T. Govindaraju	DBT	3 years
17	Dominance Relationships in Female Asian Elephants	Dr. TNC Vidya	CSIR	3 years
18	DST Ramanujan Fellowship	Dr. TNC Vidya	DST	5 years
19	DST Ramanujan Fellowship	Dr. Ujjal K Gautam	DST	5 years
20	Indo-Spanish Joint Programme of cooperation in S&T entitled "Synthesis and properties of nitride-based nanomaterials"	Prof. A Sundaresan	DST	3 years
21	DST J. C. Bose Fellowship	Prof. Amitabh Joshi	SERB	5 years
22	National Bioscience Award for career development 2008 project entitles "Towards isolation of a novel gene for non syndromic hearing loss at the 11p14.2-q12.1 locus"	Prof. Anuranjan Anand	DBT	3 years
23	MOU between SHELL and JNCASR entitles: "To develop and validate a predictive method for modelling physical properties of hydrocarbons"	Prof. Balasubramanian S	SHELL	NA, continuing
24	Collaborative projects between JNCASR and DRDO	Prof. C.N.R. Rao	DRDO	5 years
25	CSIR - COE	Prof. C.N.R. Rao	CSIR	5 years
26	Collaborative projects between JNCASR/ICMS & DST	Prof. C.N.R. Rao	DST-ICMS	5 years
27	INDO-IRAN Collaborative Programme in "Nano Science & Technology" at ICMS, JNCASR	Prof. C.N.R. Rao & Prof. G.U. Kulkarni	DST	3 years
28	Swedish Research Links Programme: "Multiplexed immune and DNA-based diagnosis of tuberculosis"	Prof. Chandrabhas Narayana	SRL	3 years

Sl. No.	Project	Project Investigator (s)	Funding Agency	Duration
29	MOU between JNCASR & Raja Ramanna Centre for Advanced Technology on " High Pressure XRD Measurement System"	Prof. Chandrabhas Narayana	RRCAT	1 year
30	Thematic Unit of Excellence on Nanochemistry at JNCASR	Prof. G.U. Kulkarni	DST	5 years
31	Indo-Italian Research Project: "Innovative catalytic patterns for nanowire growth"	Prof. G.U. Kulkarni	DST	3 years
32	Development and evaluation of active polymer nanocomposite packaging materials for food contact applications	Prof. G.U. Kulkarni	DFRL	1 year
33	Synthetic Investigation Heterocyclic scaffolds	Prof. H. Ila	CSIR	3 years
34	INSA Senior Scientist	Prof. H. Ila	INSA	5 years
35	Examination of the metabolic fate of fumarate a TCA cycle intermediate in Plasmodium falciparum	Prof. Hemalatha Balaram	DST	3 years
36	Structure-function studies on Plasmodium falciparum and Methanococcus jannaschii guanosine monophosphate (GMP) synthetase: enzymes with ammonia channels	Prof. Hemalatha Balaram	DBT	3 years
37	Plasfalsyn Structure/Function studies of plasmodium falciparum GMP synthetase	Prof. Hemalatha Balaram	DBT	3 years
38	Indo-Brazil Megaproject entitled " to decipher biological processes of organisms causing diseases of clinical importance in both the countries" (1) Determination of the structure of Plasmodium falciparum proteins involved in the purine nucleotide synthesis by X-ray srystallography	Prof. Hemalatha Balaram	DST	3 years
39	Estimating the lift in flapping flight for the design of Entompter/ MAV	Prof. K.R. Sreenivas	ADE	3 years
40	Advancing the Efficiency and Production Potential of Excitonic Solar cells (APEX)	Prof. K.S. Narayan	DST	3 years
41	DAE-SRC Outstanding Research Investigator Award for R/P "Electronic, optoelectronics and photonic properties in soft matter and device exploration"	Prof. K.S. Narayan	DAE	5 years



Sl. No.	Project	Project Investigator (s)	Funding Agency	Duration
42	Understanding the Parasexual cycle of a hybrid formed between two asexual human pathogens candida albicans and Candida dubliniensis: A novel way to identify virulence factors	Prof. Kaustuv Sanyal	CSIR	3 years
43	Identification of DNA replication origins and origin binding proteins of the human pathogen, Candida albicans	Prof. Kaustuv Sanyal	DBT	3 years
44	MOU between JNCASR and NCI (Nippon Chemical Industrial Co. Ltd.) on project "Develop inorganic nanomaterials for drug release"	Prof. M Eswaramoorthy	NCI	NA, continuing
45	DST J.C. Bose Fellowship	Prof. M.R.S. Rao	DST & JCB	5 years
46	Chromatin Biology: Epigenomics of chromatin and chromatin remodelling during male germ cell differentiations and glioma progression	Prof. M.R.S.Rao	DBT	5 Years
47	Analysis of asrij in Drosophila hematopoiesis and immunity	Prof. Maneesha Inamdar	DST	3 years
48	Analysis of conserved pathways involved in maintaining homeostasis and survival in mammals and Drosophila	Prof. Maneesha S Inamdar	WT	3 years
49	Analysis of conserved functions of rudhira in development, homeostasis and lifespan	Prof. Maneesha S. Inamdar	DBT	3 years
50	DAE-SRCH Outstanding Research Investigator Award for the project titled "Dynamics and patterns in granular fluid: Theory and experiment"	Prof. Meheboob Alam	DAE	3 years
51	MOU between BARC and JNCASR "Development of Test Facility for Thermal Hydraulics studies/ Basic research Salt Water/Fine Hydrogen Bubble Test Facility for simulation of Hydrogen Transport - Management/ Fire safety behaviour/Containment thermal hydraulics/pollution dispersion studies"	Prof. Meheboob Alam	BARC	3 years 5 months
52	Understanding pathogenesis of Malaria and strategies to treat it	Prof. Namita Surolia	DBT	3 years

Sl. No.	Project	Project Investigator (s)	Funding Agency	Duration
53	Indo-Brazil Megaproject entitled " to decipher biological processes of organisms causing diseases of clinical importance in both the countries" (1) Profiling of FAS genes in populations of Plasmodium sp. In the Amazonian region Brazil; (2) Electron microscopy characterization of the intracellular traffic pathway of Apicoplast proteins in falciparum and Toxoplasma gondii and Relationship between the endoplasmic reticulum and the Anicoplast (3) Effect of drugs interfering with FAS biosynthesis pathway on Toxoplasma gondii, Trypanosoma cruzi and Leishmania	Prof. Namita Surolia	DST	3 years
54	Numerical Simulation of cloud flow and mixing layers	Prof. R. Narasimha	INTEL	1 year
55	Indo-Finland collaboration on biotechnology titled: "Innovative concept for infectious disease diagnostics"	Prof. Ranga Uday Kumar & Dr. Swaminathan, RGP Lab. ICGEB, New Delhi	DBT	2 years
56	Optimization of the performance of DNA vaccine by engineering molecular strategies: use of HIV-1 tat as model antigen	Prof. Ranga Udaykumar	ICMR	3 years
57	Targheed delivery of anti-retrovirals using stealth immunoliposomes	Prof. Ranga Udaykumar	ICMR	3 years
58	India-South Africa thematic sub-project entitled "HIV Vaccine Immunogen Design: Identification of T-cell epitopes associated with control of viral replication in Indian and South African"	Prof. Ranga Udaykumar	DST	3 years
59	Indo-Brazil S&T Cooperation of Joint Project: Pathogenic and molecular characterization of HIV-1 from diverse tissues and body fluids of subjects characterized with HIV associated dementia and other neurologic manifestations	Prof. Ranga Udaykumar	DST	5 years



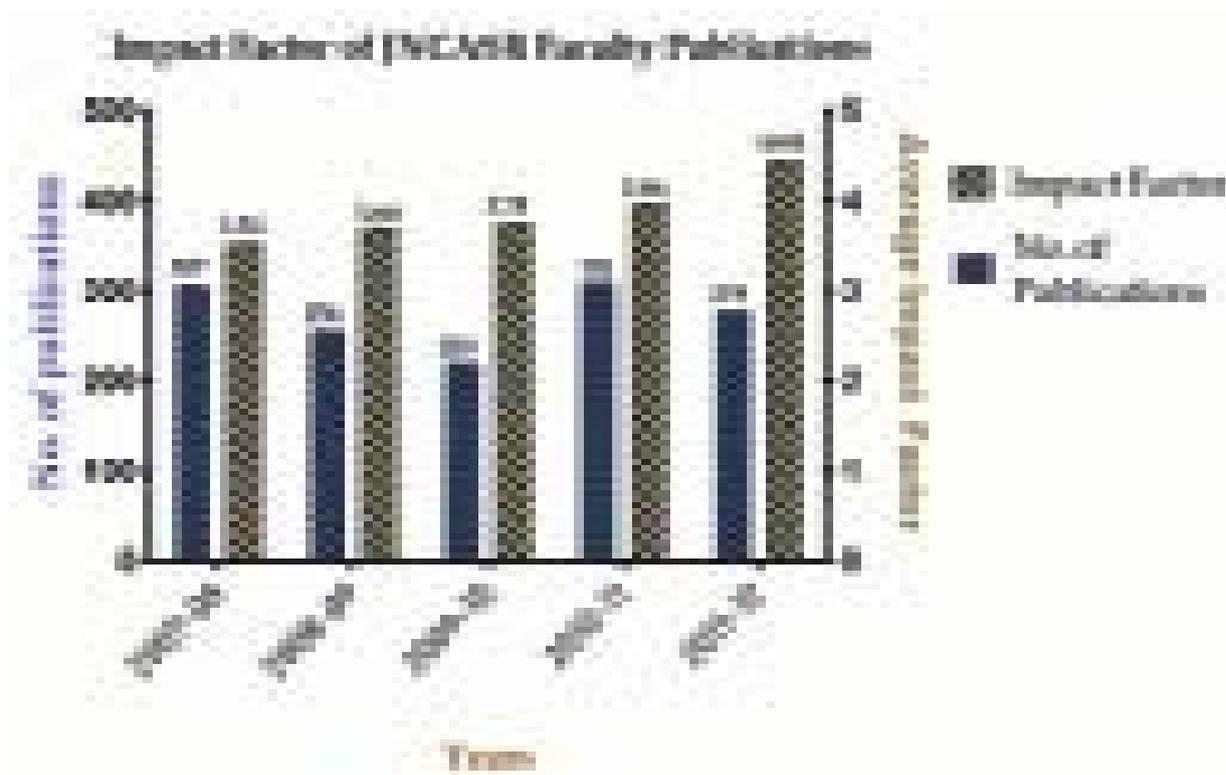
Sl. No.	Project	Project Investigator (s)	Funding Agency	Duration
60	Delineating viral determinants of HAD using SCID mice	Prof. Ranga Udaykumar	AECOM	NA, continuing
61	Indo-Finland collaboration on biotechnology titled: "Innovative concept for infectious disease diagnostics"	Prof. Ranga Udaykumar, JNCASR & Dr. Swaminathan, RGP Lab. ICGEB, New Delhi	DBT	2 years
62	Evaluation of host immune responses to the Tat antigen of HIV-1 in the Indian clinical cohorts	Prof. Ranga Udaykumar; Co-PI: Dr. Suniti Solomon Director, YRGC for AIDS Res. And Edun., Chennai	DBT	3 years
63	Mechanisms of Chikungunya virus disease: mouse model, virulent and fitness determinants and the development of novel therapeutics	Prof. Ranga Udaykumar; Co-PI: Prof. Shobha Broor, Dept. of Microbiology, AIIMS, New Delhi	DBT	3 years
64	Thematic Unit of Excellence on "Computational Materials Science" at JNCASR	Prof. S. Balasubramanian	DST	5 years
65	Aerodynamic shape optimization	Prof. S.M. Deshpande	INTEL	1 year
66	Development of Meshless Solver, Point Clouds and preprocessor in Computational Fluid Dynamics (CFD)	Prof. S.M. Deshpande	NAL	3 years
67	Theoretical Investigation of Oxide Supported Metal Nanoparticle Catalysts	Prof. Shobhana Narasimhan	DST	3 years
68	India-European Union Research Project "MONAMI Modeling of Nano-scaled Advanced Materials Intelligently"	Prof. Srikanth Sastry	DST	3 years
69	Indo-Italian research Project: "Designing Novel Photosystems for Enhanced charge Transfer efficiency: A detailed theoretical modeling"	Prof. Swapan K Pati & Prof. Anna Painelli, Univ. degli studi, ITALY	DST	3 years
70	Indo-US joint Research Centre of Excellence in "Advanced Materials Research"	Prof. Swapan K. Pati & Vinayak P. Dravid, North-Western Univ., IL, USA	IUSSTF	3 years
71	DST Swarnajayanthi Fellowship	Prof. Swapan. K. Pati	DST	5 years
72	India-Japan research project: "Hematopoietic Stem Cell Differentiation: Role of SAM Biosynthesis Arginine Methylation and p53	Prof. Tapas Kumar Kundu	DST	2 years

Sl. No.	Project	Project Investigator (s)	Funding Agency	Duration
73	Role of multifunction human histone chaperone NPMI in transcription and stress associated chromatin dynamics: Relevance in cancer manifestation	Prof. Tapas Kumar Kundu	DBT	3 years
74	DST J. C. Bose Fellowship	Prof. Tapas Kumar Kundu	DST	5 years
75	Targeting protein lysine acetylation in oral cancer and neurodegenerative disorders using nanomaterials	Prof. Tapas Kumar Kundu & Prof. Eswaramoorthy M	DBT	3 years
76	Programme support on chromatin and disease (Chromatin dynamics and transcription regulations: Implications in disease and therapeutics)	Prof. Tapas Kumar Kundu; Co-PI: Prof. Ranga Udaykumar	DBT	5 years
77	Alloy development and mechanical behaviour	Prof. Umesh V. Waghmare	GEGR	2 years
78	India-European Union (EU) research project entitled "ATHENA	Prof. Umesh V. Waghmare	DST	3 years
	Advanced theories for functional oxides: New routes to handle the devices of future"			
79	Density functional theory calculations	Prof. Umesh V. Waghmare	P&G	1 Year
80	DAE-SRC Outstanding Research Investigator Award for R/P "Multi scale modeling and simulations of functional Materials"	Prof. Umesh V. Waghmare	DAE	5 years



PUBLICATIONS

The Centre has registered a very good progress in its publications. A chart showing the year-wise publication and the impact factor thereof is appended below:



Chemistry and Physics of Materials Unit

1. Bhar, K.; Chattopadhyay, S.; Khan, S.; Kumar, R. K.; Maji, T. K.; Ribas, J.; Ghosh, B. K., Syntheses, structures and magnetic properties of $\mu(1,5)$ dicyanamide bridged coordination polymers of copper(II) and nickel(II) containing a tetradentate N-donor Schiff base. *Inorganica Chimica Acta*, **2011** (May), 370, (1), 492-498.
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Evolutionary Biology and Genetics Unit

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Theoretical Sciences Unit

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Chemical Biology Unit

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Condensed Matter Theory Unit

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RESEARCH PUBLICATIONS OF HON. PROFESSORS/HON.FACULTY/ENDOWED PROFESSORS

1. Chaudhuri, A., and Chattopadhyay, A. (2011) "Transbilayer Organization of Membrane Cholesterol at Low Concentrations: Implications in Health and Disease" *Biochim. Biophys. Acta (Biomembranes)* 1808: 19-25.
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8. Ganguly, S., Saxena, R., and Chattopadhyay, A. (2011) "Reorganization of the Actin Cytoskeleton upon G-protein Coupled Receptor Signaling" *Biochim. Biophys. Acta (Biomembranes)* 1808: 1921-1929.
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10. Ganguly, S., Paila, Y.D., and Chattopadhyay, A. (2011) "Metabolic Depletion of Sphingolipids Enhances the Mobility of the Human Serotonin1A Receptor" *Biochem. Biophys. Res. Commun.* 411: 180-184.
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12. Paila, Y.D., Kombrabail, M., Krishnamoorthy, G., and Chattopadhyay, A. (2011) "Oligomerization of the Serotonin1A Receptor in Live Cells: A Time-Resolved Fluorescence Anisotropy Approach" *J. Phys. Chem. B* 115: 11439-11447.
13. Chattopadhyay, A., and Jafurulla, M. (2011) "A Novel Mechanism for an Old Drug: Amphotericin B in the Treatment of Visceral Leishmaniasis" *Biochem. Biophys. Res. Commun.* 416: 7-12.
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17. Halder, S., Kanaparthi, R.K., Samanta, A., and Chattopadhyay, A. (2012) "Differential Effect of Cholesterol and its Biosynthetic Precursors on Membrane Dipole Potential" *Biophys. J.* 102: 1561-1569.
18. Chaudhuri, A., Halder, S., and Chattopadhyay, A. (2012) "Structural Transition in Micelles: Novel Insight into Microenvironmental Changes in Polarity and Dynamics" *Chem. Phys. Lipids* 165: 497-504.

CONFERENCE PROCEEDINGS

1. Rakshith B R, Deshpande S M, Praveen C, Narasimha R. Assessment of lifting-line theory optimization of turboprop wings in tractor configuration using Euler code. *Proc. Symp. Applied Aerodynamics and Design of Aerospace Vehicles*, pp 564 (2011)
2. Venkataraman D, Bottaro A, Govindarajan R. Flow control via porous coating of compliant actuators: a simple interactive model Flow control via porous coating of compliant actuators: a simple interactive model, *Proc. IUTAM Symposium on Bluff Body Wakes* (2011).
3. Kumar, P, Tangi, M, Kesaria, M., Shetty S., Shivaprasad, S. M., Growth of aligned wurtzite GaN nanorods on Si(111): Role of Silicon nitride intermediate layer, *MRS Proceedings*, 1411, mrsf11-1411-ee09-24, (2012) .



BOOKS/BOOK CHAPTERS AUTHORED/EDITED BY FACULTY

1. Narasimha, R., *Satish Dhawan*, in *A Voyage Through Turbulence* P.A. Davidson, et al., Editors. 2011, Cambridge University Press: Cambridge.
2. Dinesh, J. and Eswaramoorthy, M., *Nanomaterials for therapeutic drug delivery*, in *CRC Handbook on Nanobiomaterials*, Taylor & Francis: 2011.
3. R. Murugavel and C.N.R. Rao, *Secondary building units and framework structures in aluminium and zinc phosphates*, in *Metal Phosphonate Chemistry*, ed. A. Clearfield, Royal Society of Chemistry, 2011.
4. Manna, A. K. and Pati, S. K., *Doping of Graphene: A Computational Study*, in *Graphene and its fascinating attributes*, eds. Swapan Kumar Pati, T. Enoki and C. N. R. Rao, World Scientific Publishing Co. Pte. Ltd: Singapore: ISBN: 13-978-981-4329-35-4, 59 (2011).
5. Pati, S.K., T. Enoki, and C.N.R. Rao, eds. *Graphene and its fascinating attributes*. 2011, World Scientific Publishing Co. Pte. Ltd.: Singapore.
6. Rao, C.N.R., *Climbing the limitless ladder -A life in chemistry (in Kannada)*. 2011: IISc Press, World Scientific
7. Valdiya, K.S., *Geography, Peoples and Geodynamics of India in Pranas and Epics*. 2011, New Delhi: Aryan Books International. 240 p.

BOOK AUTHORED BY HON. PROFESSORS/HON. FACULTY

1. Haldar, S., and *Chattopadhyay, A.* (2012) "Hydration Dynamics of Probes and Peptides in Captivity" in *Reviews in Fluorescence 2010* (Geddes, C.D., Ed.), Springer, New York, pp. 155-172.

AWARDS/DISTINCTIONS

Prof. C.N.R. Rao

Honoris Causa Doctorate degree by Prof. Eric Beaugnon, from Joseph Fourier Universite, Grenoble, France

Honoris Causa Doctorate degree from SRM University, Punjab University and Tumkur University

Ernesto Illy Trieste Science Prize (2011) for materials research.

Dhirubhai Ambani Life-Time Achievement Award for Innovation(2011)

EDGE Award for leadership in education (2011).

Erudite Visiting Professorship from Mahatma Gandhi University, Kottayam

Speaker in the celebrations of the 100th anniversary of the first Solvay Conference on Physics in Belgium (October 18, 2011).

H.K. Firodia Life-Time Achievement Award (2011).

Einstein Professorship of the Chinese Academy.

D.Litt. by Karnataka State Open Univeristy (2011)

Honoris Causa D.Sc. from IISER, Mohali

Prof. Roddam Narasimha

Distinguished Alumnus Award, University Visvesvaraya College of Engineering

H. K. Firodia Award, 2011 for Excellance in Science and Technology

Sir M. Visvesvaraya Senior Scientist Award

Prof. K. S. Valdiya

G. M. Modi Award for Geology and Environmental Sciences

Prof. Shobhana Narasimhan

Stree Shakti Science Samman Award

Kalpana Chawla Award of the Government of Karnataka

Prof. G. U. Kulkarni

MRSI-ICSC Superconductivity and Materials Science Annual Prize, 2011

Prof. S. Balasubramanian

CSIR Bhatnagar Award for 2011 in Chemical Sciences

Prof. S. M. Shivaprasad

Prof. C. N. R. Rao Oration Award, 2011

MRSI-ICSC Superconductivity and Materials Science Annual Prize, 2012

Prof. Tapas Kumar Maji

Selected as an "Emerging Investigator" in *Chemical Science* by *Journal of Chemical Communications* in 2011



Prof. Maneesha S. Inamdar

National Bioscience Awar for Career Development 2012

Awarded Wellcome Trust Grant, UK

DBT's National Women Bioscientists Award under the Junior category, 2011

Dr. Subir Kumar Das

Young Scientist Award (Buti Foundation), 2012 of the Indian Physics Association

Dr. T. Govindaraju

INSA Medal for Young Scientist (2011): Indian National Science Academy, New Delhi, India.

Dr. Subi J. George

Chosen as a Young Investigator in the field of Chemical Sciences by the Journal *Chemical Communications*, 2012, published by The Royal Society of Chemistry

Prof. Amitabha Chattopadhyay

Prof. B.K. Bachhawat Memorial Lecture, Institute of Microbial Technology, Chandigarh, 2011

Founder's Day Lecture, Indian Institute of Chemical Technology, Hyderabad, 2011

Darshan Ranganathan Memorial Lecture Award (CRSI), 2011

Member, Academy of Scientific and Innovative Research (AcSIR) Senate, 2011

Prof. Satyajit Mayor

TWAS Biology Prize recipient 2011

FELLOWSHIPS

Prof. P. Rama Rao

Elected as Foreign Associate of the US National Academy of Engineering, 2012

Prof. Kalyan B. Sinha

Elected as Emeritus Scientist of Indian Statistical Institute, Kolkata

Prof. Amitabh Joshi

DST J. C. Bose National Fellowship 2011

Prof. S. Balasubramanian

Fellow of Indian Academy of Sciences

Prof. Shobhana Narasimhan

Elected as Fellow, National Academy of Sciences of India

Prof. Umesh V. Waghmare

DST J. C. Bose National Fellowship

Prof. Swapan Kumar Pati

DST J. C. Bose National Fellowship

Prof. Vijay Kumar Sharma

Elected as Fellow, Indian Academy of Sciences, Bangalore, 2012.

Prof. Ganesh Subramanian

Indo-US Senior Fullbright Fellowship

Prof. Partha P. Majumder

Elected as Fellow, TWAS: The Academy of Sciences for the Developing World, Trieste - 2011

Prof. VijayRaghvan, NCBS

Elected as the Fellow of The Royal Society, London

Prof. A. K. Cheetam, University of Cambridge

Honorary Fellowship of JNCASR

Dr. Rajesh Ganapathy

Associate of Indian Academy of Sciences

Dr. Ranjan Datta

Associate of Indian Academy of Sciences

MEMBERSHIPS/ APPOINTMENTS

Prof. Shobhana Narasimhan

Appointed as member of Governing Council of Malaviya National Institute of Technology, Jaipur

Member, Physical Sciences Research Council of CSIR

Prof. Swapan K. Pati

Member, American Chemical Society, 2011-2012.

Member, American Physical Society, 2011-2012.

Prof. K R Sreenivas

Member - Board of Studies, Department of Mechanical Engineering, Gayathri Vidhya Parishat College of Engineering, Vishakapattanam, AP, India.

Dr. Subi J. George

Associate (2011): Indian Academy of Sciences, Bangalore, India

Dr. T. Govindaraju

Associate (2011): Indian Academy of Sciences, Bangalore, India

Dr. Sebastian C. Peter

Memberships - ACS, CRSI, ASM

Prof. Amitabha Chattopadhyay

Member, National Committee for International Union of Biological Sciences of the Indian National Science Academy.



Member, Sectional Committee (Biochemistry and Biophysics) of the Indian National Science Academy.
Member, Executive Committee of the Indian Society of Cell Biology
Member, CSIR Working Group for 12th Five Year Plan Preparation

EDITORIAL BOARDS

Prof. Swapan K. Pati

Editorial Advisory Board Member: Journal of Physical Chemistry, American Chemical Society (2009-2012).

Editorial Board Member: Journal of Scientific and Industrial Research, National Institute of Science Communication and Information Resources (2011-2014).

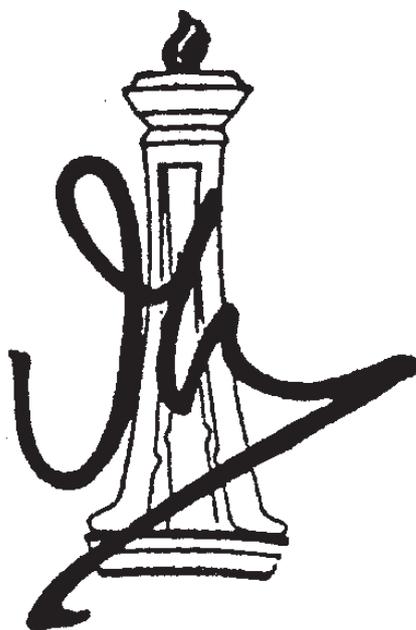
Prof. Amitabha Chattopadhyay

Handling Editor, the Journal of Neurochemistry (Wiley-Blackwell)

Member, Editorial Advisory Board of the Journal of Physical Chemistry (ACS publication)

Reviewer, The Italian Research and University Evaluation Agency (ANVUR), 2012

FINANCIAL STATEMENTS



Name : JAWAHARLAL NEHRU CENTRE FOR
ADVANCED SCIENTIFIC RESEARCH

Address : JAKKUR POST, BANGALORE - 560 064

Year Ended : 31st MARCH 2012

Assessment Year : 2012-13



**JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
BALANCE SHEET AS AT 31ST MARCH 2012**

Description	Schedule	Current year 2011-12 Rs.	Previous year 2010-11 Rs.
LIABILITIES			
Corpus/Capital Fund	1	1,748,078,797.32	1,558,321,561.54
Reserves & Surpluses	2	36,041,572.19	3,341,615.34
Earmarked and Endowment Funds	3	218,031,724.82	181,713,717.72
Secured loans and Borrowings	4	-	-
Unsecured loans and Borrowings	5	-	-
Deferred Credit Liabilities	6	-	-
Current Liabilities and Provisions	7	29,029,543.04	13,586,621.63
Other funds-Cluster Studies		39,541.00	39,541.00
Scheme Balances		258,230,931.46	98,562,761.33
Total		2,289,452,109.83	1,855,565,818.56
ASSETS			
Fixed Assets (gross)	8	1,748,078,797.32	1,558,321,561.54
Investments-Endowment Funds	9	265,447,196.00	171,028,500.00
Investment - Others	10	-	-
Current Assets, Loans, Advances etc.	11	275,926,116.51	126,215,757.02
Total		2,289,452,109.83	1,855,565,818.56
Significant accounting policies	24		
Contingent Liabilities & Notes on Accounts	25		

Schedule 1 to 25 form integral part of Accounts

For Jawaharlal Nehru for Advanced
Scientific Research

This is the Balance sheet referred
to in our report of even date.

for **P V PRABHU & CO**
Chartered Accountants
Sd/-
(NAGARAJA)
Partner
M NO. 205345
ICAI.F.R.No.050121S

Sd/-
R.S.Gururaj
Accounts Officer

Place : Bangalore
Date : 25.09.2012

Sd/-
Prof.M.R.S.Rao
President

**JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH 2012**

Description	Schedule No	Current year	Previous year
		2011-12 Rs.	2010-11 Rs.
Income			
Income from services	12	0.00	1,159,160.00
Grants/Subsidies received	13	532,124,049.00	480,366,778.00
		532,124,049.00	481,525,938.00
Less: Extent of fixed assests procured		191,507,778.78	141,386,844.00
		340,616,270.22	340,139,094.00
Add:Proceeds of sale of fixed assets		1,750,543.00	0.00
		342,366,813.22	340,139,094.00
Income from Fees/Subscriptions etc	14	1,370,677.00	1,621,649.00
Income from investments	15	0.00	0.00
Royalty Income,Publication,Licence fee etc	16	1,133,297.69	1,630,684.63
Interest earned	17	6,549,486.00	3,389,929.35
Other income	18	37,595,352.97	26,439,713.00
Increase/ decrease in stocks	19	0.00	0.00
Total		389,015,626.88	373,221,069.98
Expenditure			
Establishment expenses	20	183,487,959.00	159,266,070.00
Other administrative expenses	21	157,781,920.03	202,774,833.80
Expenditure on Grants,Subsidies etc	22	0.00	0.00
Interest & bank charges	23	45,791.00	164,765.00
Total		341,315,670.03	362,205,668.80
Excess of income over expenditure		47,699,956.85	11,015,401.18
Balance brought forward		3,341,615.34	326,214.16
		51,041,572.19	11,341,615.34
Transferred to Corpus Fund Account		15,000,000.00	8,000,000.00
Balance carried to Balance sheet		36,041,572.19	3,341,615.34
Significant accounting policies (Enclosed)	24		
Contingent Liabilities & Notes on Accounts	25		

Schedule 1 to 25 form an integral part of Accounts

For Jawaharlal Nehru Centre for Advanced
Scientific Research

This is the Income and Expenditure account
referred to in our report of even date.

for **P V PRABHU & CO**
Chartered Accountants
Sd/-
(NAGARAJA)
Partner
M NO. 205345
ICAI.F.R.No.050121S

Sd/-
R.S.Gururaj
Accounts Officer

Place : Bangalore
Date : 25.09.2012

Sd/-
Prof.M.R.S.Rao
President



**JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
CPF & NPS FUND STATEMENT OF AFFAIRS FOR THE YEAR ENDED ON 31.03.2012**

Particulars	Rs.	Ps.	Rs.	Ps.	Particulars	Rs.	Ps.	Rs.	Ps.
CONTRIBUTORY PROVIDENT FUND SUBSCRIPTION:					INVESTMENT OF FUNDS:				
Opening Balance	5,871,927.00		33,624,858.00		Investments in:			18,500,000.00	
Add :Subscriptions received during the year	2,374,052.00				Government of India 8 % Bonds (SHCIL)			31,100,000.00	
Loan repayments	2,803,857.00		11,049,836.00		Fixed Deposits at Canara Bank			27,500,000.00	
Interest on subscriptions			44,674,694.00		Fixed Deposit at HDFC				
Less: Loans granted during the year	5,634,442.00				Closing Cash and Bank Balance :				
Less: Amount transferred to NPS	34618.00				Cash at Bank :				
Less: Withdrawals on retirement/ death	0.00		5,669,060.00		SB A/C No.17513				
Closing Balance			39,005,634.00		Canara Bank,IISc branch			2,319,587.87	
CONTRIBUTION					TDS on investment in GOI Bonds receivable			335,492.00	
Opening balance	2,715,736.00		25,552,521.00		TDS receivable from Endowment account			103,000.00	
Add : Contribution during the year	2,041,160.00		4,756,896.00		TDS receivable - GOI Bonds (2011-12)			148,000.00	
Interest on total contributions			30,309,417.00		Due to be remitted to bank on account of short payment during 2007 08				179.00
Less: Transferred to NPS			34,050.00						
Closing Balance			30,275,367.00						
NEW PENSION SCHEME SUBSCRIPTION									
Opening Balance	34618.00		4,891,010.00						
Add : Transfer from CPF	1,716,955.00		2,207,578.00						
Interest on subscriptions	456,005.00		7,098,588.00						
Less : withdrawals of previous year			58,666.00						
Closing Balance			7,039,922.00						
CONTRIBUTION									
Opening balance	1,716,955.00		4,315,481.00		Accrued interest on Deposits :			1,744,314.00	
Add : Contribution during the year	34,050.00		2,094,098.00		On Fixed deposits with Canara Bank				
Add : Transferred from CPF	343,093.00		6,409,579.00		Balance deficit			979,929.13	
Interest on total contributions									
Closing Balance			82,730,502.00		Total			82,730,502.00	

for Jawaharlal Nehru Centre for Advanced Scientific Research

for P V PRABHU & CO
Chartered Accountants

Sd/-
(NAGARAJA)
Partner

MNO : 205345
ICAI.F.R.No. 0501215

Place : Bangalore, Dated: 25.09.2010

R.S.Gururaj
Accounts Officer

Prof.M.R.S.Rao
President, JNCASR

**JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
RECEIPTS AND PAYMENTS ACCOUNT FOR THE YEAR ENDED 31.03.2012**

OPENING BALANCES & RECEIPTS	2011-12 Rs Ps	2010-11 Rs Ps	PAYMENTS & CLOSING BALANCES	2011-12 Rs Ps	2010-11 Rs Ps
I. Opening Balances:			I. Expenses:		
a. Cash in hand & Imprest at centre	713,613.00	475,506.00	a. Establishment Expenses	183,487,959.00	159,266,070.00
b. Bank balances:			b. Administrative Expenses	157,781,920.03	199,882,352.80
In savings bank Accounts:			c. Expenditure of endowments	2,445,760.00	1,914,711.00
At Canara bank	22,769,251.69	17,484,984.49	II. Payment made against funds for various projects:	343,715,639.03	361,063,133.80
At Union Bank of India	155,663.00	77,692.00	III. Investments and Deposits made:	0.00	0.00
At SBI	486,759.00	0.00	IV. Expenditure on Fixed assets and Capital Work-in-progress:		
In Deposit accounts:			a. Purchase of fixed assets	191,507,778.78	138,330,800.00
At IDBI bank					
At HDFC trust	34,325,000.00	12,125,000.00			
At GOI Bonds(SHICIL & SBI)	11,700,000.00	38,900,000.00			
At Canara Bank	124,388,000.00	84,941,750.00			
	194,538,286.69	154,004,932.49			
II. Grants Received:					
From DST-Grant in aid	532,000,000.00	480,000,000.00		0.00	0.00
From DST for Meeting/Seminars	0.00	366,778.00		45,791.00	164,765.00
From other international agencies	124,049.00	0.00			
On behalf of Endowments	12,957,248.00	9,045,841.00			
	545,081,297.00	489,412,619.00			
III. Income on Investments from:					
A. Interest on FD's:					
a. From Earmarked/Endowment Funds	16,863,067.10	14,043,585.67			
b. From Own funds	3,083,929.00	1,940,450.35			
	19,946,996.10	15,984,036.02			
IV. Interest received:					
a. On Bank S.B A/c	2,431,861.00	1,449,479.00			
	761,998,440.79	660,851,066.51	Balance Carried Over	535,269,208.81	499,558,698.80

(Contd...)



**JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
RECEIPTS AND PAYMENTS ACCOUNT FOR THE YEAR ENDED 31.03.2012 (Contd...)**

OPENING BALANCES & RECEIPTS	2011-12 Rs Ps	2010-11 Rs Ps	PAYMENTS & CLOSING BALANCES	2011-12 Rs Ps	2010-11 Rs Ps
Balance Brought Forward	761,998,440.79	660,851,066.51	Balance Brought Forward	535,269,208.81	499,558,698.80
V. Other Income:			Other payments:		
a. Royalty	789,456.69	1,482,672.63	Earnest money deposit returned	514,840.00	0.00
b. Licence Fee	343,841.00	148,012.00	Staff advances	1,301,199.00	60,599.00
c. Collections from Visitors, Guest room etc	2,786,860.00	3,374,394.00	Caution money deposit returned	0.00	59,185.00
d. from fee, subscription etc	1,370,677.00	1,621,649.00	TDS on interest	0.00	560,184.00
e. CSIR fellowships, SRFP reimbursements	21,417,220.00	15,449,946.00	Other advances given	6,521,807.40	0.00
f. Overhead recoveries	12,500,000.00	6,000,000.00	Payment to sundry creditors	0.00	4,974,470.65
g. From services	0.00	1,159,160.00			
h. From others	891,272.97	1,615,373.00			
	40,099,327.66	30,851,206.63	VIII. Closing Balances:		
VI. Amount Borrowed	0.00	0.00	a. Cash in hand & Imprest at centre	221,661.00	713,613.00
VII. Other Receipts:			b. Bank balances:		
From disposal of fixed assets	1,750,543.00	0.00	In savings bank accounts:		
Income tax refunds	1,389,862.00	0.00	Canara Bank	7,270,018.65	22,769,251.69
From Sundry creditors	10,516,713.41	0.00	Union Bank of India	161,751.00	155,663.00
Other advances recovered	0.00	279,042.00	State Bank Of India	80,901.00	486,759.00
Earnest money received	0.00	841,284.00	In deposit accounts:		
Recoveries from current assets	0.00	6,928,825.00	At canara bank	217,408,000.00	124,388,000.00
	13,657,118.41	8,049,151.00	At SHCIL	0.00	11,700,000.00
			At HDFC trust	47,005,500.00	34,325,000.00
TOTAL	815,754,886.86	699,751,424.14	TOTAL	272,147,831.65	194,538,286.69
				815,754,886.86	699,751,424.14

This is the Receipts and payments account referred to in our report of even date.

for P V PRABHU & CO
Chartered Accountants

Sd/-
(NAGARAJA)
Partner
MNO. 205345
ICAI.F.No.0501215

Place : Bangalore, Dated: 25.09.2012

For Jawaharlal Nehru Centre for Advanced
Scientific Research

Sd/-
R.S.Gururaj
Accounts Officer

Sd/-
Prof.M.R.S.Rao
President

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH

Schedule forming part of the accounts

Description	2011-12		2010-11	
	Rs.	Ps.	Rs.	Ps.
SCHEDULE 1- Capital Fund				
Balance as at the beginning of the year	1,558,321,561.54		1,416,934,717.54	
	1,558,321,561.54		1,416,934,717.54	
Less : Depreciation up to the end of previous year	366,473,463.28		306,428,939.30	
	1,191,848,098.26		1,110,505,778.24	
Add : Addition to Fixed Assets during current year	191,507,778.78		141,386,844.00	
	1,383,355,877.04		1,251,892,622.24	
Less : Deletion to Fixed Assets during Current Year	1,750,543.00		-	
	1,381,605,334.04		1,251,892,622.24	
Less : Depreciation for the current year	70,677,467.00		60,044,523.98	
	1,310,927,867.04		1,191,848,098.26	
Add : Depreciation Reserve per contra	437,150,930.28		366,473,463.28	
TOTAL	1,748,078,797.32		1,558,321,561.54	
SCHEDULE 2- Reserves And Surpluses:				
General Reserve:				
Surplus In Income and expenditure Account	36,041,572.19		3,341,615.34	
SCHEDULE 3- Earmarked/ Endowment Funds:				
A : Infrastructure Corpus Fund				
Opening Balance	128,460,673.54		112,149,339.65	
Additions during the year	15,000,000.00		8,600,000.00	
Funds-Income from Investments made	12,448,415.10		7,711,333.89	
Total : Infrastructure Corpus fund	155,909,088.64		128,460,673.54	
B : Other funds				
Opening Balance of the Funds	53,253,044.18		44,558,829.40	
Add : Additions :				
Funds/Donations/Grants/Royalties	7,516,200.00		8,445,841.00	
Funds-Income from Investments made	3,799,152.00		2,163,084.78	
	64,568,396.18		55,167,755.18	
Less : Funds-utilisation/Expenditure incurred	2,445,760.00		1,914,711.00	
Total : Other Funds	62,122,636.18		53,253,044.18	
Grand Total - Infrastructure Corpus and Other Funds	218,031,724.82		181,713,717.72	
SCHEDULE 4-Secured Loans And Borrowings:				
-				
SCHEDULE 5-Unsecured Loans And Borrowings:				
-				
SCHEDULE 6-Deferred Credit Liabilities:				
-				
SCHEDULE 7- Current liabilities and provisions				
Sundry Creditors EMD	1,141,989.00		1,656,829.00	
Sundry Creditors for others	27,887,554.04		11,929,792.63	
TOTAL	29,029,543.04		13,586,621.63	

Sd/-
R.S. Gururaj
Accounts Officer



JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
Schedule forming part of the accounts

Description	2011-12		2010-11	
	Rs.	Ps.	Rs.	Ps.
SCHEDULE 8- FIXED ASSETS				
Land - Free Hold	17,715,351.00		17,715,351.00	
Buildings :				
General	81,638,128.26		79,984,160.26	
Hostel Building	15,660,055.00		15,570,835.00	
New Lab Building - AMRL	25,930,339.00		25,930,339.00	
Animal House	6,787,344.00		6,787,344.00	
Staff Housing	4,319,353.00		4,156,168.00	
ETU Building	3,091,348.00		3,091,348.00	
Engineering & Mechanical Unit Block	7,426,272.00		7,426,272.00	
Other buildings like extn to Hostel, College etc.,	11,883,626.00		11,883,626.00	
Nano Science Block	7,042,909.00		7,042,909.00	
Extention to Pauling Building - Biology Block	4,766,109.00		4,680,084.00	
Dining Hall & Kitchen Block	12,404,330.00		12,404,330.00	
Radio Active Lab	203,233.00		203,233.00	
International Centre for Material Science	48,077,623.00		47,414,359.00	
Lecture Hall & Academic Block	9,636,712.00		9,636,712.00	
Hostel Phase II	19,552,377.00		19,552,377.00	
STP Building	291,699.00		291,699.00	
Hostel Phase III	27,501,103.00		27,425,891.00	
International house	23,142,418.00		23,142,418.00	
CNR Rao Hall of Science	10,186,569.00		10,186,569.00	
Extention to HIV lab	1,016,085.00		1,016,085.00	
Security Office Block	742,632.00		232,612.00	
Animal House - Additional Block	8,292,632.00		8,284,752.00	
Residential Quarters (Sr.AO)	3,629,170.00		3,110,495.00	
Child Care Centre	728,827.00		728,827.00	
New Biology Lab	25,900,635.00		25,845,905.00	
Hostel Phase IV	19,424,005.00		18,455,896.00	
SCADA - DG Room	240,660.00		240,660.00	
President's Residence	4,457,440.00		172,000.00	
Visiting Students Hostel	25,451,063.00		1,895,000.00	
Health Centre	3,049,882.00		-	
Nano Institute Shivanapura	3,364,466.00			
Material Science Lab Block	2,980,155.00			
	418,819,199.26		376,792,905.26	
Infrastructure Facilities:				
Roads, Streetlights, Dranages, partitions etc	84,377,350.32		80,515,671.32	
Tubewells and water supply	248,912.00		248,912.00	
	84,626,262.32		80,764,583.32	
Plant/Machinery/Equipment:				
Scientific Equipments/Plant/Machinery	617,526,236.45		557,561,403.45	
ICMS-Laboratory equipments & facilities	142,472,753.00		81,355,879.00	
Equipments - Chemistry & Physics of Materials	74,041,456.00		74,041,456.00	
	834,040,445.45		712,958,738.45	
Others :				
Vehicles	2,018,246.00		2,018,246.00	
Furniture and fixtures	53,919,958.87		52,579,464.87	
Office equipment	12,220,675.41		11,167,098.63	
Computer/peripherals	61,007,190.00		59,074,680.00	
Electrical installations	112,738,560.00		112,738,560.00	
Library Books	25,566,902.21		23,549,543.21	
Library Journals	123,807,031.80		108,962,390.80	
	391,278,564.29		370,089,983.51	
Intangible Assets:				
Software	1,598,975.00		-	
TOTAL	1,748,078,797.32		1,558,321,561.54	
Less - Depreciation up to the end of previous year	366,473,463.28		306,428,939.30	
Depreciation for the current year	70,186,035.00		60,044,523.98	
Written down value of the assets as at the year end	1,311,419,299.04		1,191,848,098.26	
Add - depreciation reserve per contra	436,659,498.28		366,473,463.28	
TOTAL	1,748,078,797.32		1,558,321,561.54	

Sd/-

R .S. Gururaj
Accounts Officer

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
Schedule forming part of the accounts

Description	2011-12		2010-11	
	Rs.	Ps.	Rs.	Ps.
SCHEDULE 9- Investments - Earmarked/Endowment Funds				
Long Term Deposits				
Fixed Deposits with HDFC Trust	47,005,500.00		34,325,000.00	
Govt of India 8% Savings Bonds 2003 [SHCIL & SBI] -		-	11,700,000.00	
Fixed Deposits with Canara bank	217,408,000.00		124,388,000.00	
Interest accrued on Fixed Deposits with banks	1,033,696.00		615,500.00	
TOTAL	265,447,196.00		171,028,500.00	
SCHEDULE 10- Investments - Others				
Short Term Deposits - SCHEMES		-		-
TOTAL		-		-
Schedule 11 Current Assets, Loans, Advances etc.,				
Cash & Bank Balances (Schemes)				
Cash in hand - Schemes Account	11,723.00		75,487.00	
Cash at Bank -Schemes - Canara Bank	5,937,148.46		8,487,274.33	
Interest accrued on FD	3,582,060.00		0.00	
Fixed deposit with Canara Bank (Schemes)	248,700,000.00		90,000,000.00	
	258,230,931.46		98,562,761.33	
Cash & Bank Balances - Centre				
Cash in hand at Centre	166,189.00		74,018.00	
Cash at Bank - Canara Bank	7,270,018.65		22,769,251.69	
Cash at Bank - Union Bank	161,751.00		155,663.00	
Cash at Bank - SBI	80,901.00		486,759.00	
Imprest balance	55,472.00		639,595.00	
	7,734,331.65		24,125,286.69	
Loans and Advances				
Advances to staff	1,652,115.00		350,916.00	
Other advances & Receivables	7,441,691.40		919,884.00	
TDS receivable	725,107.00		1,795,436.00	
Amount receivable from Income Tax Department	141,940.00		461,473.00	
Interest receivable (Endowment Account)	-		-	
	9,960,853.40		3,527,709.00	
TOTAL	275,926,116.51		126,215,757.02	

Sd/-
R.S. Gururaj
Accounts Officer



JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH

Schedule forming part of the accounts

Description	2011-12		2010-11	
	Rs.	Ps.	Rs.	Ps.
SCHEDULE 12-Income from sales / services				
Consultancy fee	0.00		957,360.00	
DNA sequencing fee	0.00		201,800.00	
	0.00		1,159,160.00	
SCHEDULE 13-Grants/subsidies :				
Grants - DST	532,000,000.00		480,000,000.00	
Grants - Travel grants	0.00		366,778.00	
Grants - Other international agencies	124,049.00		0.00	
TOTAL	532,124,049.00		480,366,778.00	
SCHEDULE 14-Income from Fee/Subscriptions etc :				
Income from fee, subscriptions,medical contribution etc.,	1,370,677.00		1,621,649.00	
TOTAL	1,370,677.00		1,621,649.00	
SCHEDULE 15-Income from investments;	0.00		0.00	
SCHEDULE 16-Royalty Income,Publication,Licence fee etc :				
From Royalty	789,456.69		1,482,672.63	
Licence fee	343,841.00		148,012.00	
TOTAL	1,133,297.69		1,630,684.63	
SCHEDULE 17-Interest earned:				
From Term deposits	4,117,625.00		1,940,450.35	
From SB accounts with nationalised banks	2,431,861.00		1,449,479.00	
TOTAL	6,549,486.00		3,389,929.35	
SCHEDULE 18-Other income:				
From Visitors house,Guest rooms,Students residence etc,	2,786,860.00		3,374,394.00	
CSIR Fellowships, ICMS, SRFP reimbursement etc.,	21,417,220.00		15,449,946.00	
Overhead recoveries	12,500,000.00		6,000,000.00	
From others(tender fee & other fee collected)	891,272.97		1,615,373.00	
TOTAL	37,595,352.97		26,439,713.00	
SCHEDULE 19 - Increase / Decrease in stock:	-		-	

Sd/-
R.S. Gururaj
Accounts Officer

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH

Schedule forming part of the accounts

Description	2011-12		2010-11	
	Rs.	Ps.	Rs.	Ps.
SCHEDULE 20- Establishment expenses:				
Salaries & Scholarship to students	134,021,801.00		114,432,537.00	
Wages	33,517,514.00		30,153,701.00	
Allowances (Medical reimbursements etc.,)	8,594,319.00		4,206,920.00	
Bonus	206,069.00		203,786.00	
Contribution to CPF	2,715,736.00		2,630,259.00	
Contribution to new Pension Sceme	1,716,955.00		1,465,004.00	
Contribution to Group Gratuity Scheme	1,500,000.00		4,465,577.00	
Leave Encashment Benefits	328,671.00		600,121.00	
LTC	886,894.00		1,108,165.00	
TOTAL	183,487,959.00		159,266,070.00	
SCHEDULE 21- Other Administrative expenses				
Electricity & Power	25,673,910.00		30,230,183.00	
Water charges	5,427,788.00		5,734,756.00	
Insurance	469,859.00		472,696.00	
Repairs & Maintenance	29,434,199.00		25,967,794.00	
Rents, Rates & Taxes	1,227,280.00		3,368,989.00	
Vehicles Running & Maintenance	5,291,803.00		3,483,280.00	
Postage, Telephone & Communication	6,182,408.00		3,738,250.00	
Printing & stationery	4,812,810.24		6,325,154.10	
Travelling and conveyance	7,354,701.00		5,567,217.00	
Expneses on Seminars/workshops/discussion meetings	7,319,821.51		7,507,330.47	
Membership & Subscriptions	318,026.00		63,358.00	
Fees towards Training etc.,	105,274.04		322,376.00	
Professional charges	4,937,304.00		12,737,092.00	
Laboratory Consumables	38,037,529.60		43,449,538.00	
Frieght Inwards	2,592,415.00		3,404,352.00	
Other Consumables	539,546.00		1,452,948.00	
Advertisement & Publicity	4,191,869.00		4,667,508.00	
Other miscellaneous expenses	2,322,192.64		3,621,066.17	
Statutory Audit fee	56,180.00		44,120.00	
POBE & POCE prgramme	635,863.00		154,405.00	
Summer Research Fellowship Programme	919,610.00		1,218,052.00	
Fellowships - Department of Bio-Technology	27,262.00		14,641.00	
ICMS - Workshops, Schools etc.,	2,094,776.00		5,878,740.00	
ICMS - Visitor Programmes (National & International)	281,716.00		3,003,483.06	
ICMS - Recurring Expenses	4,456,747.00		5,051,424.00	
ICMS - Scientists & Supporting Staff	2,701,825.00		1,950,874.00	
Fellowship & Honorarium to visiting Students&Scientists	369,205.00		0.00	
Transfer of funds to Proj/Endowments of earlier years	0.00		8,916,382.00	
Vijyoshi programme-Supported by DST of earlier year	0.00		6,928,825.00	
Twows Conference-supported by DST	0.00		7,500,000.00	
TOTAL	157,781,920.03		202,774,833.80	
SCHEDULE 22-Expenditure on grants, subsidies Etc:	0.00		0.00	
SCHEDULE 23- Interest and Bank charges:	45,791.00		164,765.00	
TOTAL	341,315,670.03		362,205,668.80	

Sd/-
R .S. Gururaj
Accounts Officer



JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH

Schedule forming part of the accounts

SCHEDULE 25

A. Contingent Liabilities	2011-12		2010-11	
	Rs.	Ps.	Rs.	Ps.
1. Claims against the entity not acknowledged as debts		Nil		Nil
2. Letter of credit outstanding		50326000		Nil
B. Notes on Accounts				
1. Estimated amount of contracts remaining to be executed on capital account and not provided for		Nil		Nil
		50326000		

Sd/-
R.S. Gururaj
Accounts Officer

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH

SCHEDULE 24

Accounting Policies

1. The fixed assets are stated at cost. The Centre has identified depreciation on Fixed Assets, and since they are created out of Grant in Aid funds, they have been classified the same in the statement of affairs under Capital Fund and also under Fixed Assets schedule respectively.
2. Grants received and utilised for procurement of Fixed Assets have been reduced from the total grants received in the Income and Expenditure Account and the same have been included under the Capital Fund Account.
3. The leave encashment to the staff members is accounted as and when it is paid.
4. Investments of the Centre are stated at cost.
5. The foreign currency transactions are translated at the rates prevailing on the date of transaction.
6. Previous years figures have been regrouped and reclassified to read in conformity with the current year's figures.
7. The Centre has put in to operation a system whereby the accounting standards with respect to the above are brought in conformity with the mandatory accounting standards recommended by the institute of Chartered Accountants of India.
8. Royalty income has been accounted as and when received.
9. The Expenditure listed under Schedule 20 as Establishment Expenses include the salaries paid to Faculty, Scientific and Research Personnel. The Expenditure listed under the Schedule 21 as Administrative Expenses include the expenses towards Laboratory Consumables and Seminar/Workshops/ Discussion meetings exclusively incurred for Research purposes.

For **P.V.Prabhu & Co.,**
Chartered Accountants

R.S. Gururaj.
Accounts Officer.

(Nagaraja)
Partner

Membership no.205345

Prof. M.R.S.Rao
President

Place: Bangalore

Date : 25.09.2012



Auditor's Report to the Members of the Governing Body of Jawaharlal Nehru Centre for Advanced Scientific Research

We have audited the attached Balance Sheet of Jawaharlal Nehru Centre for Advanced Scientific Research as at March 31, 2012 and also the Income & Expenditure Account for the year ended on that date and the Receipts and Payment account for the year ended on that date annexed thereto. These financial statements are the responsibility of the management of Jawaharlal Nehru Centre for Advanced Scientific Research. Our responsibility is to express an opinion on these financial statements based on our audit.

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

We report that:

1. We have obtained all the information and explanations, which to the best of our knowledge and belief were necessary for the purpose of our audit.
2. In our opinion proper books of accounts as required by law have been kept by Jawaharlal Nehru Centre for Advanced Scientific Research so far as it appears from our examination of those books.
3. The Balance Sheet, Income and Expenditure Account and Receipts and Payment account dealt with by this report are in agreement with the books of account.
4. The Balance Sheet and Income and Expenditure Account dealt with by this report are prepared in accordance with the Accounting Standards issued by the Institute of Chartered Accountants of India subject to the following observations:
 - a) Non-Provisions of accrued liability in respect of leave encashment which is not in conformity with the Accounting, Standard 15 [Accounting for retirement benefits in the financial statements of Employer] issued by the Institute of Chartered Accountants of India. [Refer Note No. 3 of Schedule No. 24]
 - b) The amount spent on acquisition of fixed assets has been deducted from the total grants/ subsidies received in the Income & Expenditure account. This is not in conformity with the Accounting Standard - 5 issued by the Institute Of Chartered Accountants of India. It has been explained that this format has been consistently used to present the accounts before the authority who grant the funds.
5. In our opinion and to the best of our information and according to the explanations given to us and subject to notes on accounts and our qualifications in para 4 above, the said accounts give a true and fair view in conformity with the accounting principles generally accepted in India:
 - i) In the case of Balance Sheet, of the state of affairs of the Jawaharlal Nehru Centre for Advanced Scientific Research as at March 31, 2012; and
 - ii) In the case of Income and Expenditure Account, of the excess of Income over Expenditure for the year ended on that date.

For **M/s. P.V. PRABHU & CO.,**
Chartered Accountants
ICAI FIRM REG.No. 050121S

(NAGARAJA)
Partner

Membership No.205345

Place: Bangalore
Date: 25/09/2012

