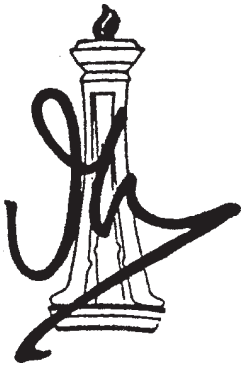
ISSN.0973-9319

ANNUAL REPORT

2010-2011



JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH

(A Deemed to be University)

Jakkur, Bangalore – 560 064.
Website: http://www.jncasr.ac.in

CONTENTS

The Centre

Foreword

It is a matter of great pride to present the Twenty First Annual Report for the year 2010-2011.

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 University.

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 such as organising a lecture for the summer school participants of Bangalore Science Forum; program on 'Physics for students and teachers'; a program to award the Outstanding Science Teachers for the year 2009; programme on 'Biology for students and teachers', are among the few. To celebrate the International Year of Chemistry, 2011, ETU compiled the book titled 'Chemistry Today' authored by Prof. C.N.R, Rao. ETU worked in collaboration with the World Scientific Publishing Company, Singapore in completing the book titled 'Climbing the limitless ladder – A life in Chemistry' authored by Prof. C.N.R. Rao. It was launched by Shri. Kapil Sibal, Hon'ble minister for Human Resource Development at New Delhi on July 16, 2010.

There is a steady increase in the number of research students at the Centre pursuing various academic programmes. During the year, 72 students (51 students for M S/ Ph D and 19 students for Integrated PhD) and 2 for Post Graduate Diploma in Materials Science have been admitted. The present student strength has reached to 217. 18 students were awarded Ph D, 4 students M S (Engineering) and 9 M S (Int. PhD) degrees have been awarded. 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, Chairman, Scientific Advisory Council to the Prime Minister and National Research Professor, has been offered the KFUPM Chair Professorship by the King Fahd University of Petroleum & Minerals, Saudi Arabia. Award of the prestigious Shanti Swarup Bhatnagar prize to Prof. Swapan K. Pati and Prof. Umesh Waghmare has added pride to the Centre. The continuous recognition of our faculty members with several honours has reflected our standing within academic peers.

Prof. P. Rama Rao, the Chairman of our Council of Management has been awarded Padma Vibhushan by the Government of India.

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's group along with the group of researchers led by Prof. Umesh V. Waghmare have found a new way to go around the tough challenge that scientists and industries face while trying to store hydrogen in a solid matrix. They have devised a unique storage medium — extremely thin graphite flakes called Few-Layer Graphene — which can capture the gas and release it upon heating or ultra-violet irradiation. Our knowledge about nanocrystals has been advanced by the research findings of Prof. G.U. Kulkarni and B. Radha (Ph.D. student, CPMU). They have developed a simple, inexpensive direct micromolding method for patterning Au nanocrystal superlattices using an elastomeric stamp hosting microchannels. Dr. Subi J. George (NCU) and Dr. M. Eswaramoorthy's group (CPMU) have designed highly fluorescent novel hybrid hydrogels by mixing clay materials with fluorescent dye molecules. US Patent is granted to Prof. Tapas Kumar Kundu, Selvi BR, Kishore AH, Mantelingu K for their invention related to ellagic acid (TBBD) and its derivatives as site-specific inhibitor of histone methyltransferase, especially CARM1 arginine methyltransferase. The Indian Patent Office has granted Patent (No. 245033) to JNCASR and the University of Mysore, for the invention "Derivatives of 4,6-Disubstituted 1,2,4-Triazolo-1,3,4-Thiadiazole, A Process and Uses Thereof", inventors being Prof. Tapas Kumar Kundu, Dr. Varier R.A., Mr. Shivananju N., Dr. Basappa, Prof. Rangappa K.S. The invention reports anti squamous cancer (cervical and oral) specific compounds having tremendous potential to be used as lead molecules.

The Science Outreach Program has become an important academic component of the Centre. It is heartening to note that many school children and teachers get 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 to popularize science among the young

students. Prof C N R Rao delivered lectures at various places followed by multimedia presentations on Learning Science.

The Centre has been expanding its formal ties with other research organizations in India and abroad. A Coordination Agreement has been signed for a collaborative project under the Seventh Framework programme of the European Community for the project "Modeling of Nano- scaled Advanced Materials Intelligently (NONAMI). A Memorandum of Understanding (MoU) between Bhabha Atomic Research Centre (BARC) and JNCASR has been signed for the project on Development of Test Facility for different studies. The Centre has also signed MoUs for collaborative research with Raja Ramanna Centre for Advanced Technology (RRCAT); GE India Technology Centre; Shell (I) Ltd; Intel Technology India Pvt. Ltd; Sasya Gentech Pvt. Ltd; CSTEP; iCeMS (Japan).

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.

The Centre has also witnessed a tremendous growth in the infrastructural facilities for both scientific and student activities. All these developments would not have been possible without the continuous support from the Department of Science and Technology.

M R S 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 two 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 M R S Rao is presently the President of the Centre.

☆☆☆

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.

☆☆☆

PROGRESS

The Centre has just completed 22 years encompassing several memorable and exciting moments. In addition to 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, new Unit/Centres like the International Centre for Materials Science, New Chemistry Unit, and the Centre for Computational Materials Science are 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 18 students were awarded Ph D, 4 students M S (Engineering) and 9 with M S (Int. PhD) degrees. Currently about 217 scholars are pursuing their research career. The research training at the Centre has led to the award of 91 Ph D degrees, 25 M S (Engg.) 29 M S degrees, one M S (by research) and one M Sc (by research) degree 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 offered the KFUPM Chair Professorship by the King Fahd University of Petroleum & Minerals, Saudi Arabia. Prof C N R Rao has also been awarded with Dhirubhai Ambani Life Time Achievement Award 2010 by Institute of Chemical Technology, Mumbai and EDGE Award for leadership in education for the year 2011. Prof P Rama Rao, the Chairman of our Council of Management has been awarded Padma Vibhushan by the Government of India. Prof R Narasimha has received the prestigious Kamal Kumari National Award for Science and Technology, 2009. Prof. Swapan K. Pati and Prof. Umesh Waghmare have been awarded Shanti Swarup Bhatnagar Prize for the year 2010. Dr. A. Sundaresan has been awarded the prestigious CRSI bronze medal for the year 2011. Prof Amitabh Joshi has been awarded with Lakshmipat Singhania National Leadership Awards – Young Leader in Science and Technology for the year 2010. Prof G U Kulkarni has been honoured with MRSI-ICSC Superconductivity and Materials Science Annual Prize, 2011. Prof N Chandrabhas has been felicitated with the prestigious Sir C.V. Raman Young Scientist Award of the Karnataka State. Dr M Eswaramoorthy has received MRSI Medal in Materials Science and Dr Tapas Kumar Maji has been chosen Young Investigator in the field of Chemical Sciences by the Journal Chemical Communications, 2011, published by Royal Society of Chemistry. Other prestigious awards which were bagged by our faculty members are Dr T Govindaraju with Innovative Young Biotechnologist Award (IYBA) 2010; Dr Meheboob Alam with DAE-SRC Outstanding Research Investigator Award in 2010 and Dr Ganesh Subramanian with INAE Young Engineer Award, 2010. In addition, many faculty members have been elected for the fellowships like Indian Academy of Science Fellowship, Indian National Science Academy Fellowship, Ramanujan Fellowship, etc.

The Faculty members of the Centre have published around 311 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 108 fresh fellowships that were awarded in 2010, 82 fellowships have been utilized in the same year. 87 fresh fellowships were awarded in 2011. For POCE, 10 meritorious students were offered the fellowship. Under POBE, 10 candidates were offered fresh fellowship. The POCE and POBE students who have completed their 3-year projects successfully were given Diploma (Chemistry and Biology respectively) from JNCASR.

Ten candidates from R&D institutions have been offered Visiting Fellowships for 2010-11.

Seven candidates from R&D institutions have been offered Visiting Fellowships for 2009-2010. Out of the eight candidates who joined DST Postdoctoral Fellowships in Nano Science and Technology – 3rd series, four have been continuing in the programme at JNCASR, IISc, IIT Kanpur, IIT Bombay and SINP-Kolkata.

Since the beginning of the financial year 2010-11, 29 Discussion Meetings, International Conferences, Workshops, and Schools were supported, either wholly or partially. About 76 seminars and 9 JNC Colloquia were held. Five Endowment Lectures by eminent scientists were also held in addition to seven guest lectures during the year.

HIGHLIGHTS OF RESEARCH AND OTHER ACTIVITIES

Research

Chemistry and Physics of Materials Unit

In the field of Molecular dynamics, the low frequency dynamics of room temperature ionic liquids has been characterized using atomistic and b initio molecular dynamics simulations, as well as using large scale, normal mode analyses. An existing controversy between two experimental groups on the nature of these modes in the far-infrared region has been resolved through our work. These modes are interionic in character have been demonstrated and also proved that they are reasonably delocalized in space.

Prof. Chandrabhas Narayana and his research group have been involved in field of Raman and Brillouin spectroscopic study of material properties. The group has worked on materials such as fast ionic conductors, graphene oxides and reduced graphene oxides, glasses, nanotube, pyrochlores to understand their properties by changing pressure and temperature.

Mimicking biological systems which can change their conformation and composition in response to external stimuli in present day materials is an ongoing challenge and has huge implications in various fields. One of the current tasks is to design and synthesize these materials with dynamic changes in structures and functions. Various functional aspects of metal-organic frameworks (MOFs) have been explored, such as luminescence properties, hydrogen storage, guest induced magnetic modulation and guest specific stepwise adsorption. The work on cyanometallate system has resulted a new bimetallic pillared-layer coordination framework $\{[Mn_3(bipy)_3(H_2O)_4][Cr(CN)_6]_2 \cdot 2(bipy) \cdot 4(H_2O)\}_n$ which has been constructed using ($[Cr(CN)_6]^{3-}$) and an organic linker (4,4′-bipyridyl).

MOFs have been developed from mixed-ligand system as they happen to be structurally flexible and hence interesting adsorption properties. Recently, a 2D flexible metal-organic porous solid, $\{[Ni(1,3\text{-adc})(bpp)\text{-}(H2O)_2](H_2O)(EtOH)\}_n$ has been reported, that has been synthesized using flexible organic linkers (bpp =1,3-bis(4-pyridyl)propane, 1,3-adc= 1,3-adamantanedicarbxylic acid). Silver nanorods have been synthesized in a novel, facile, and eco-friendly way through a simple chemical reduction method using 2,3-dihydroxyfumaric acid in aqueous solution under aerobic conditions. The system, $YFe_{1-x}Mn_xO_3$ has been investigated for its extraordinary properties such as spin-orientation, magnetization reversal, magnetoelectric effect and magnetocaloric effect. A flat GaN film on Si(111) surface has been formed by using the $\sqrt{3} \times \sqrt{3}$ Ga superstructure as template for GaN growth at 400°C, showing superior structural, optical and morphological properties. There has been active work on nanocarbons. 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.

New Chemistry Unit

Prof. C. N. R. Rao has pursued several aspects of the chemistry of materials. These include transition metal oxides, nanomaterials and carbon materials. In transition metal oxides, multiferroic and magnetoelectric oxides are of interest. Dr. T. Govindaraju has found that the development of chemosensors for various metals is important due to their roles in medical and environmental sciences. Dr. Subi Jacob George has concentrated on various aspects of functional organic materials and some of the specific research areas are organic/supramolecular synthesis of π- conjugated systems, organic-inorganic hybrid materials, stimuli responsive/supramolecular polymers and chiral nanotechnology. Dr. Jayanta Haldar and his research group has synthesized and characterized various derivatives of Vancomycin (last resort of antibiotic to treat gram-positive bacterial infection). Some of the derivatives showed quite promising antibacterial activity against both gram-positive and gram-negative bacteria. Dr. Sebastian C. Peter is focusing in the fields of inorganic and solid state chemistry such as structure–property relations in rare earth based intermetallics; rare earth doped chalcogenide glasses for optical and photonic applications; and heteropoly compounds and its catalytic activity. Prof. H. Ila's research activities revolve mainly around 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 research interest of Prof. Swapan K. Pati's research group encompasses a broad spectrum of condensed matter phenomena including excitation characteristics, low-temperature thermodynamics and dynamical behavior of a range of quantum systems. Dr. Sridhar Rajaram has found that the Hydrogen bond promoted reactions is an important subset of organocatalysts. Enzymes exercise precise control over the positioning and orientation of hydrogen bonds in their active sites to enhance reactivity as well as selectivity. Dr. Ranjani Viswanatha has conducted

research based on colloidal synthesis of semiconducting and metal nanocrystals. Tunable dimensions and shapes of the individual particles as well as the ease of manipulating them into a complex interacting structure make colloidal nanocrystals well suited for studies of size- and structure-dependent quantum-mechanical interactions as well as ideal building blocks for nanoscale engineering.

Education Technology Unit

The Unit has been actively involved in the concept, development and production of multimedia CDROMs and books especially for school students and teachers in various disciplines of science. The Six CDROM titles in Kannada are: Rasayanshastrada Arivu (Chemistry), Bhugola Parichaya (Geography), 'Vignyana Kaliyona' samputa 1, 2, 3 & 4 (Learning Science series). All the CDROM titles and book were developed and produced by ETU. ETU worked in collaboration with the World Scientific Publishing Company, Singapore in completing and designing the cover for the book titled 'Climbing the limitless ladder -A life in Chemistry' authored by Prof. C.N.R. Rao. The Vision Group on Science and Technology, Department of Science and Technology, Government of Karnataka entrusted ETU to supply 2100 nos, of both the CDROM and book titled 'Nanoworld: An introduction to nanoscience and technology'. The book titled 'Chemistry Today' was translated by Mrs. Indumati Rao and formatted and completed for printing by ETU for Kamataka Rajya Vignyana Parishat for distribution to schools and colleges.

Engineering Mechanics Unit

Research in aeronautical fluid dynamics led by Prof. Roddam Narasimha has continued on novel wing plan forms for turboprop aircraft. An international patent has been filed for the invention, and the designs have been registered. Prof. Rama Govindarajan and her group of researchers have studied in the area of instability of vortical flows. It was shown that a light-cored vortex can be unstable and a heavy cored vortex can be stable for certain density gradients. The reason for this counter-intuitive result was explained by wave interactions. Prof. S M Deshpande and his group of researchers have worked in the areas of "Development of Meshless Solver, Point clouds" and "Numerical simulation of multiscale supersonic flows with low dissipation shock capturing schemes. Dr. Meheboob Alam and his group of researchers have studied in the area of investigating the rheology and the dynamical patterns and related bifurcation phenomena in driven granular systems. Dr. Ganesh Subramanian and his group of researchers have studied in the area of Atmospheric Sciences: A fundamental mistake in prevailing emissivity schemes that attempt to model the nocturnal boundary layer was pointed out, and a resolution of the same was proposed.

Evolutionary Biology Unit

During the year 2010-2011, 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. Some salient research findings are: Drosophila also show "nocturnal sex drive" (enhanced night time activity and loss of sleep), and this is male driven and olfaction mediated, via the olfactory receptor 47b (Or47b); Circadian organization of Camponotus ants is adaptively plastic and their clocks can be entrained by social interactions; Molecular mark-recapture censusing of an Asian elephant population in Mondulkiri Province, Cambodia, in collaboration with WWF-Cambodia, to enable estimation of population size otherwise difficult due to landscape and low density of elephants.

Molecular Biology and Genetics Unit

In 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. Molecular Parasitology Laboratory has 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.

The *Human Molecular Genetics Laboratory*, in a study of over 750 families with non-syndromic hearing loss, has examined several deafness-causing genes *(Cx26, Cx30, TMPRSS3, TMC1, HAR, CDH23, PDS and TMIE)* and identified a large number of pathogenic mutations in these genes. This work has substantially extended allelic heterogeneity at these genes and provided a collection of mutant alleles for potential use in cell biological, biochemical and structure-function correlation studies. Another significant contribution made by the lab is the identification of a locus, DFNA59 for prelingual, profound, sensorineural hearing loss at chromosome 11p14.2-q12.3.

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. 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.

Molecular Virology Laboratory has screened a large number of Indian clinical samples and identified an immunodominant B-cell epitope in the cysteine-rich domain of Tat only in the HIV infected people. This finding has a direct relevance for HIV vaccine design.

The 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 are carried out with special emphasis on disease and therapeutics. Through an interdisciplinary approach a small molecule modulators of chromatin modifying enzymes have been searched and nanoparticles have been used to deliver these in animal model system.

The researchers in *Molecular Mycology Laboratory* have studied centromeres of a pathogenic yeast, Candida dubliniensis and compared centromere sequences with those of a closely- related yeast Candida albicans. The studies indicate that centromeres are evolving at a rate faster than any other genomic region in these two species.

Theoretical Sciences Unit

The work done in the Theoretical Sciences Unit continued to use a combination of analytical techniques and state-of-the-art computation in order to study the properties of materials, design new materials, and also apply the techniques of theoretical physics in order to gain insight into biological processes such as evolution.

The group of Prof. Shobhana Narasimhan continued to use density functional theory to study and design novel materials, with a special focus on surfaces and nanomaterials. They predicted and studied a new long-range-ordered surface alloy of bulk-immiscible components, viz., Fe-Au/Ru(0001).

Prof. Srikanth Sastry's group conducted research in the areas of liquid-liquid transition in silicon, crystal nucleation, relevant length scales in glass forming liquids, the role of spatial dimensionality in glassy behavior, jamming, gelation, fragility of glass formers and mechanical behavior of glasses.

In the area of nanomaterials, the group of Umesh Waghmare has theoretically analyzed the stability and properties of graphene-like nano-structures based on $(BN)_xC_{(1-x)}$ and transition metal-Si complexes, leading to the prediction of domain- structure in the former and a 2-D piezomagnet based on $CrSi_2$.

Prof. Swapan Pati's research group worked on a broad spectrum of condensed matter phenomena including excitation characteristics, low-temperature thermodynamics and dynamical behavior of a range of quantum systems. The role of dark states in resonance energy transfer beyond Forster formulation has been explored.

The group of Dr. N S Vidhyadhiraja continues to investigate effects of strong correlation in models and materials. For example, they studied the Mott metal-insulator transition within the Hubbard model. A new perspective of the hysteresis and avalanches across the inhomogeneous Mott transition as observed in various vanadium oxides is being developed.

Dr. Kavita Jain's group has looked at the evolutionary dynamics of deterministically and stochastically evolving populations on complex fitness landscapes, and have also worked on the calculation of asymptotic maximum value distributions for a class of non-independent random variables.

Dr. Subir Das' primary research involvement has been in the statistical mechanics of phase transitions and areas related to that. He has investigated condensed-matter systems both at and away from equilibrium.

International Centre for Materials Science

ICMS has several ongoing research programmes on Solid-State Lighting, Surface Physics, Polymers, High-Resolution Electron Microscopy, Soft Condensed Matter and Chemistry for Materials. This facility houses specialized instrumentation maintained and run by experts. The facility consists of Ultra High Resolution Transmission Electron Microscope, FESEM, Pulsed Laser Deposition, Molecular Beam Epitaxy System, Confocal Microscope, Optical Tweezers, High Resolution Thin film X-ray Diffractometer, NMR, Gas Chromatograph with Mass Spectrometry detector, High pressure liquid Chromatograph/Mass Spectrometer Instruments, Surface Area and related measurements. ICMS is in the process of expanding

its facility by installing additional equipment like SQUID Magnetometer, Thermal Gravimetric Analysis (TGA) system and Inductively Coupled Plasma (ICP) system. 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. The centre has many collaborative agreements and programmes with various universities, like Cambridge University, Northwestern University, Mesa+ at the University of Twente, National Institute of Materials Science in Tsukuba, Japan and with the Nano Institute in University of Waterloo, Canada.

Centre for Computational Materials Science

Using multiple computational tools, researchers in CCMS have examined five candidate crystal structures for beta-carbonic acid, a molecular crystal of environmental and astrophysical significance. These crystals comprise of hydrogen bonded molecules in either sheet-like or chain-like topologies. The use of density functional theory to study and design novel materials has been continued, with a special focus on surfaces and nanomaterials. A new long-range-ordered surface alloy of bulk-immiscible components, viz., Fe-Au/Ru(0001) has been predicted and studied.

Academic Activities

During the year, 72 students (51 students for M S/ Ph D and 19 students for Integrated PhD) and 2 for Post Graduate Diploma in Materials Science were admitted. 18 students were awarded Ph D, 4 M S (Engineering) and 9 with M S (Int. PhD) degrees. The present student strength has reached to 217.

Fellowship & Extension Programmes

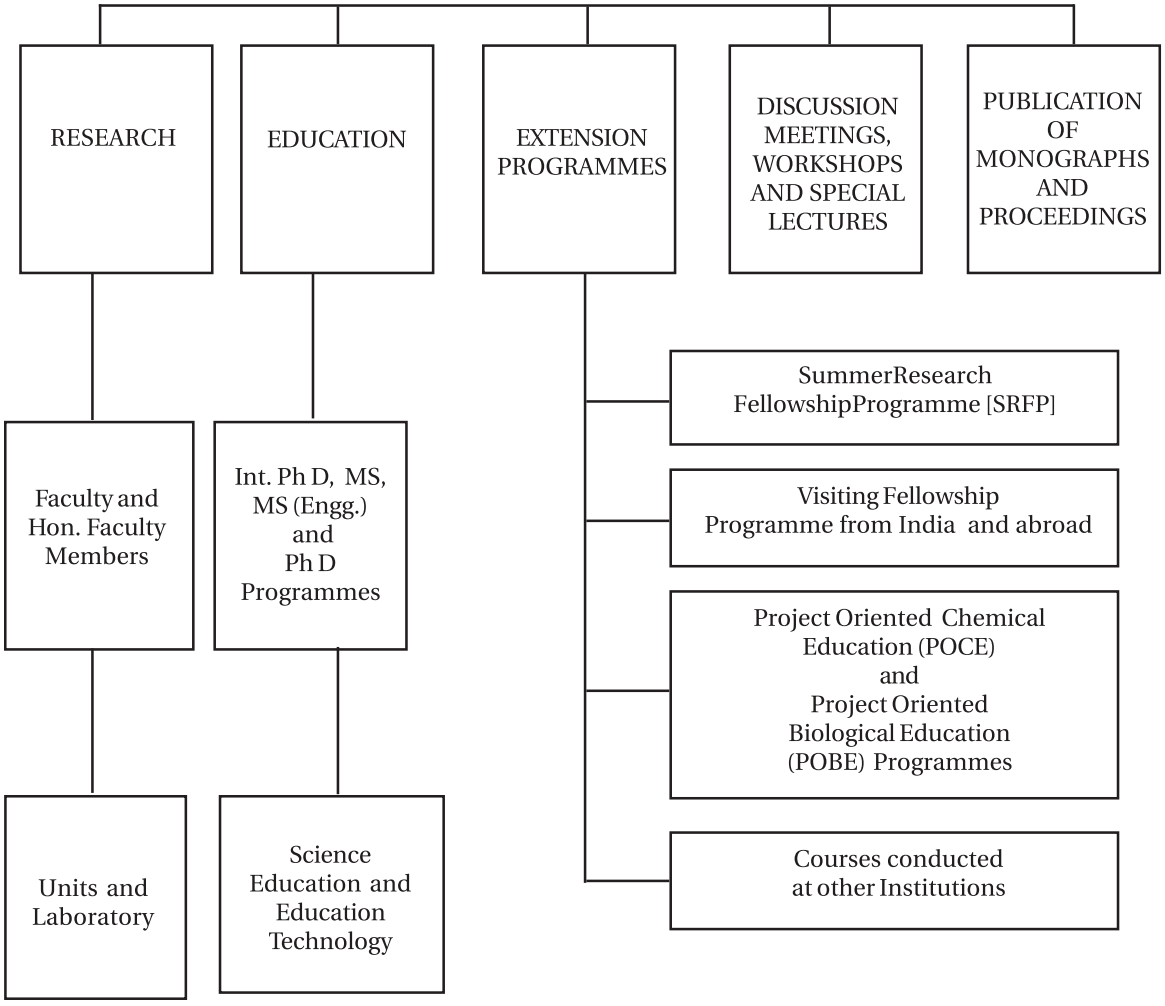
Under the Summer Research Fellowships Programme, 108 fellowships were awarded. For the JNCASR-CCSTDS Fellowship, eight students from different countries were selected and worked with faculty of various host institutions in the country. For the Project Oriented Chemical Education (POCE) 10 undergraduate students have been offered with fresh fellowships. Under the POBE programme ten students have been offered with fresh fellowships. Ten scholars (9 under physical sciences and 1 under life sciences category) have been offered Visiting Fellowships for 2010-2011. Out of 8 candidates joined for DST Postdoctoral Fellowship in Nano Science and Technology programme, 4 were continuing their fellowship. In order to provide opportunities to teachers and others to obtain training and for carrying out science education projects, the Centre is offering a post graduate diploma programme in science education.

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

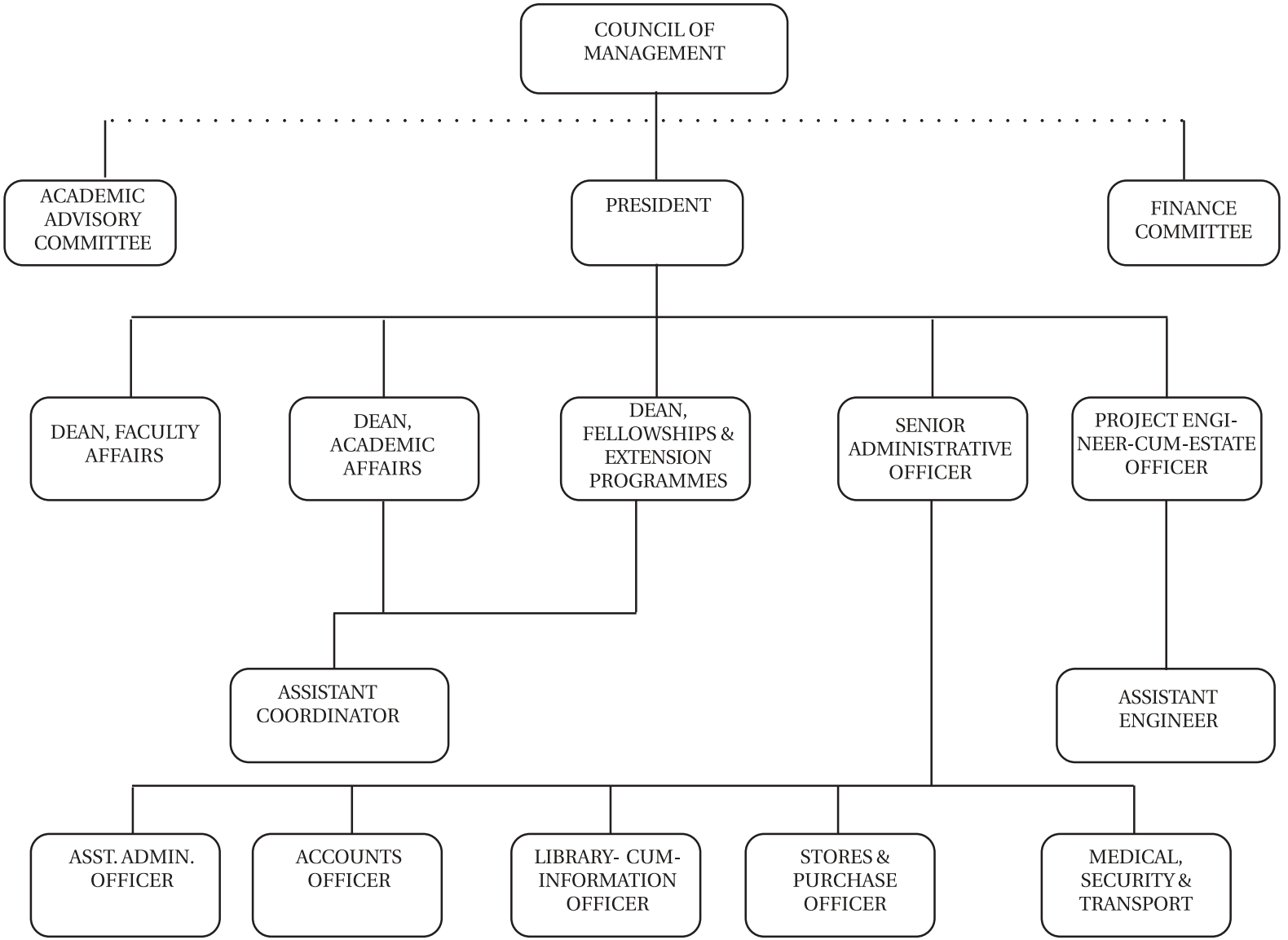
The Centre follows the national policy on reservation and official language as per rules and orders issued by the Government of India with necessary guidelines from the Council of Management from time to time. During the current year there were no cases pertaining to the Centre appeared before the CAT.

ACTIVITIES CHART

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH



ORGANISATION CHART



THE ORGANISATION

1. 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:

P Rama Rao ISRO Brahm Prakash Distinguished Professor, ARCI, Hyderabad	Chairman
M R S Rao President, JNCASR	Member
T Ramasami Secretary, Department of Science and Technology, New Delhi	Member
C N R Rao Linus Pauling Research Professor and National Research Professor, JNCASR	Member
S K Joshi National Physical Laboratory, New Delhi	Member
Sheila Sangwan Additional Secretary & Financial Adviser, Department of Science and Technology, New Delhi	Member
P Balaram Director, Indian Institute of Science, Bangalore	Member
Bikash Sinha Director, VECC & Saha Institute of Nuclear Physics, Kolkata	Member
S Chandrasekaran Indian Institute of Science, Bangalore	Member
A N Jayachandra Sr. Administrative Officer, JNCASR	Secretary

2 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:

M R S Rao President, JNCASR	Chairman
C N R Rao Linus Pauling Research Professor and National Research Professor, JNCASR	Member
Sheila Sangwan Additional Secretary & Financial Adviser, Department of Science and Technology, New Delhi	Member
S Chandrasekaran Indian Institute of Science, Bangalore	Member
Revathi Bedi Finance Officer, JNU, New Delhi	Member
R S Gururaj Accounts Officer, JNCASR	Member
A N Jayachandra Sr. Administrative Officer, JNCASR	Secretary

3. 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:

M R S Rao President, JNCASR	Chairman
C N R Rao Linus Pauling Research Professor and National Research Professor, JNCASR	Member
Chandan Das Gupta Indian Institute of Science, Bangalore	Member
Dipankar Chatterji Indian Institute of Science, Bangalore	Member
D D Sarma Indian Institute of Science, Bangalore	Member
Devang V Khakar Director, IIT-Mumbai	Member
K VijayRaghavan Director, NCBS-TIFR, Bangalore	Member
K B Sinha Dean, Faculty Affairs, JNCASR	Member
Hemalatha Balaram Dean, Academic Affairs, JNCASR	Member
N Chandrabhas Dean, Fellowships & Extension Programmes, JNCASR	Member
A N Jayachandra Sr. Administrative Officer, JNCASR	Secretary

4. 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 2010 which included lectures by the faculty on the advances made in various research areas. Local faculty meetings were held in August 2010 and February 2011 to review the progress and provide inputs wherever required.

5. Administration

President	
M R S Rao	Ph D (IISc), F A Sc, F N A, F N A Sc, FTWAS
Dean, Faculty Affairs	
K B Sinha	Ph D (Univ. of Rochester), F A Sc, F N A, FTWAS
Dean, Academic Affairs	
Hemalatha Balaram	Ph D (IISc), F A Sc
Dean, Fellowships and Extension Programmes	
N Chandrabhas	Ph D (IISc)
Warden & Student Counsellor	
A Sundaresan	Ph D (IIT Bombay)
Associate Warden	
Kavita Jain	Ph D (TIFR)
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	B.Sc. (Mysore) M P Ed (Bangalore)
Stores & Purchase Officer	
K Bhaskara Rao	M.Sc. (Hyderbad), 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 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)

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

In the field of Molecular dynamics, the low frequency dynamics of room temperature ionic liquids has been characterized using atomistic and b initio molecular dynamics simulations, as well as using large scale, normal mode analyses. An existing controversy between two experimental groups on the nature of these modes in the far-infrared region has been resolved through our work. These modes are interionic in character have been demonstrated and also proved that they are reasonably delocalized in space. Thus, they cannot be assigned to any specific motion such as the hydrogen bond stretching or bending. The liquid-vapour interface of ionic liquids with symmetric cations has been studied using MD simulations. These show that the interface is more structured than those found for liquids with asymmetric cations. The calculated surface tension of these liquids compare well with experimental data.

Prof. Chandrabhas Narayana and his research group have been involved in field of Raman and Brillouin spectroscopic study of material properties. The group has worked on materials such as fast ionic conductors, graphene oxides and reduced graphene oxides, glasses, nanotube, pyrochlores to understand their properties by changing pressure and temperature. In addition, the group has looked at understanding the interactions of therapeutic proteins (Aroura Kinase A and B) and potential drug molecules using SERS. Two M.S. Theses have been completed as part of the Integrated PhD and successfully defended. The group has published over 10 journal papers in this period and presented 6 invited lectures in national and international conferences.

Mimicking biological systems which can change their conformation and composition in response to external stimuli in present day materials is an ongoing challenge and has huge implications in various fields. One of the current tasks is to design and synthesize these materials with dynamic changes in structures and functions. Structurally flexible materials are advantageous over rigid solids in many aspects like selective sensing, separation, increased storage, facile delivery and on-off switches (switchable properties). Coupling porosity with flexibility would be highly essential for selective entrapment of dyes, small biomolecules, heavy metal ions, toxic gases etc. One such organic-inorganic hybrid material which modifies their framework structure in response to external chemical or physical stimuli is metal organic frameworks (MOF). Structural and pore flexibility is absent in the case of mesoporous silica, zeolites and mesoporous carbons which limit their usage in various sensing applications. Bringing softness (flexibility) into these systems is highly crucial and is quite challenging. Considering all these aspects a 'flexible porous layered carbons' containing nanographene domains by graphitizing glucose within the galleries of clay template by nanocasting technique has been rationally design.

The salient features of this report are:

- Mesostructured carbons obtained in our methodology shows flexibility in pore and structural ordering with applied mechanical force.
- Furthermore, the flexibility in the pore size has been exploited for a size selective separation of dye molecules.

The functional clay was used as the template to organise the dye molecules for light harvesting applications.

Various functional aspects of metal-organic frameworks (MOFs) have been explored, such as luminescence properties, hydrogen storage, guest induced magnetic modulation and guest specific stepwise adsorption. Synthesizing metal nanoparticles in a novel, facile, and eco-friendly way remained an area of focus. A novel molecular design concept to control the emission properties in a MOF, $\{Mg(DHT)(DMF)_2\}_n$, (DHT: 2,5-dihydroxyterephthalate) has been developed, based on excited state proton transfer (ESIPT) process in the organic linker, DHT. The framework unveils permanent porosity and exhibits ligand-based multicolor emission that can be tuned and well controlled by the solvent molecules in solution as well as in the solid state.

The work on cyanometallate system has resulted a new bimetallic pillared-layer coordination framework $\{[Mn_3(bipy)_3(H_2O)_4][Cr(CN)_6]_2 \bullet 2(bipy) \bullet 4(H_2O)\}n$ which has been constructed using ($[Cr(CN)_6]^{3-}$) and an

organic linker (4,4′-bipyridyl). The pore surfaces of the MOF is highly polar and was found to be exceedingly promising for high heat of hydrogen adsorption and establishes itself to be the first member of cyanometallate systems having high heat of hydrogen adsorption value of ~11.5 kJ mol^{-1}. The framework also demonstrates an interesting guest responsive magnetic modulation with a change in Tc as observed from dc susceptibility measurements.

MOFs have been developed from mixed-ligand system as they happen to be structurally flexible and hence interesting adsorption properties. Recently, a 2D flexible metal-organic porous solid, $\{[Ni(1,3\text{-adc})(bpp)\text{-}(H_2O)_2](H_2O)(EtOH)\}_n$ has been reported, that has been synthesized using flexible organic linkers (bpp =1,3-bis(4-pyridyl)propane, 1,3-adc= 1,3-adamantanedicarbxylic acid). The desolvated framework undergoes structural contraction and exhibits double-step hysteretic adsorption for CO_2, H_2O, and MeOH and single-step gate-opening behavior with EtOH. This type of guest-specific response is very unique and would provide a better understanding for the design and synthesis of new materials that would show guest-dependent dynamic behaviour and may find application as actuators, in molecular recognition, and in specific sensing.

Silver nanorods have been synthesized in a novel, facile, and eco-friendly way through a simple chemical reduction method using 2,3-dihydroxyfumaric acid in aqueous solution under aerobic conditions. Silver nanorods show increased surface-enhanced Raman scattering sensitivity and detection of small organic molecules.

The system, $YFe_{1-x}Mn_xO_3$ has been investigated for its extraordinary properties such as spin-orientation, magnetization reversal, magnetoelectric effect and magnetocaloric effect. Below spin reorientation, it exhibits magnetization reversal where the magnetic moment opposes the applied field which is quite unusual. It exhibits large magnetodielectric effect at room temperature. Further, it shows a positive and negative magnetocaloriceffect across the TN and spin reorientation transition temperature respectively. All the phenomena are very important for practical device applications. The coexistence of superconductivity and surface ferromagnetism in NbN nanoparticles has also been investigated.

The growth and characterization of GaN and InN has been worked upon. GaN nanowall network and nanocolumns spontaneously on c-plane sapphire has been successfully formed for the first time by MBE. A small parametric window has been determined in which these nanostructures are formed with superior structural and optical properties.

The controversy of the band gap value of InN films on sapphire has been investigated by studying the growth of InN by MBE at different temperatures. It has been shown that the band gap observed is independent of oxygen or indium cluster presence and depends only on the morphology and structure of the overlayer. The studies of the adsorption of Ag nanoparticles on GaN nanowall network show enhancement of the GaN band edge emission and also the dependence of the emission wavelength on Ag particle size.

A flat GaN film on Si(111) surface has been formed by using the $\sqrt{3} \times \sqrt{3}$ Ga superstructure as template for GaN growth at 400°C, showing superior structural, optical and morphological properties.

In addition to the above, there is lot of activity related to graphene and nanomaterial patterning. Both these aspects are being used in device fabrication.

There has been active work on nanocarbons. 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.

Direct write methods have 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.

New Programmes

Computational work has been undertaken on various aspects of carbonic acid in both its gas and crystalline phases are being undertaken. Computations act as a predictive tool in this work.

In order to study nanomaterials and their phonon properties in device conditions, especially, its acoustic properties, it is necessary to develop a micro Brillouin spectroscopy. The group has developed the micro Brillouin spectroscopy setup and has demonstrated the ability to get Brillouin spectra from a few micron samples. This would be used to study the Nanotubes in device geometry to understand electron phonon coupling and its involvement in conduction in these systems a very vital question in these materials. Such a facility is first of its kind in India. The Light scattering Laboratory has received in 2010 the patent from Republic of South Africa for the Nucleic Acid (RNA) detection by SERS.

A new Indo-Spain program has been initiated supported by DST to investigate nitrides and oxynitride systems.

A novel experiment to study the growth of InN under the same growth conditions on differently surface modified substrates is in the process of designing. The results should enable to determine the cause of the variation of band gap values in literature.

The study the formation and structure of the GaN hexagonal nanowall matrix and evaluate for its utility in thermionic emission, thermoelectric power and in water splitting experiments due to its large surface area, tunable band gap, thermal stability and high carrier concentrations has been proposed.

The mechanism that is responsible for the dislocation driven GaN nanostructures on sapphire and silicon surfaces is proposed to be indentified.

The following are the members of the Unit:

Chair

G U Kulkarni	Ph D

Professors

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
K S Narayan	Ph D, F N A Sc, F A Sc.
G U Kulkarni	Ph D
S M Shivaprasad	Ph D
S Balasubramanian	Ph D
N Chandrabhas	Ph D

Associate Professors

A Sundaresan	Ph D
M Eswaramoorthy	Ph D

Faculty Fellow

Tapas Kumar Maji	Ph D

Technical Officers

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

Research Associates

Balraju P, Diptikanta Swain, Rashmi R Deshpande, Srinidhi Ramachandra, Shashi B Singh, Santosh Babu Gunda

Technical Assistants

Anil Kumar, Arokianathan S, Selvi NR, Srinath V, Srinivas S, Srinivasa Rao, Sundarayya Yanamandra, Usha Tumkurkar G, Vanitha B, Vasudeva B S.

R & D Assistants

Josena Justus, R Krishna Kumar, Vijay Venugopalan, Vijay Venugopalan, Kanchan Singh, Bharati Singh, Vijay Amirtharaj A, Madhushankar.

Lab Assistants

J Anil Kumar (DEE), B S Vasudev (BE), Alla Srinivasa Rao (BE)

Research Students

Soumya Saswati Sarangi, Shipra, Katla Sai Krishna, Monojit Bag, Pranab Mandal, Srinivas Raju G, Partha Pratim Kundu, Prakash Kanoo, Sudip Mohapatra, B. Radha, Sabyasachi, Mukhopadhyay, Leela Srinivas Panchakarla , Jithesh K , Manoj Kesaria, Subrahmanyam K.S, Kalyan Raidongia, 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, Rajdeep Singh Payal, Umesha Mogera, Nishit Srivastava, Amritroop Achari, Dhanya R, Gopalakrishnan K, Venkata Suresh M, B. Satyanarayana, Yelipeddi sreedhar, Kumara Ramanatha Datta K, Neenu Varghese, H S S Ramakrishna Matte, Arpan Hazra, S.R.K. Chaitanya Sharma Y, Chidambar Kulkarni, Dileep Krishnan, Gayatri Kumari, M. Pandeeswar, Rana Saha, Sudeshna Sen, Varun Thakur, Dibyajyoti Ghosh, Anindita Chakraborty, Darshana Joshi, Prashant Kumar, Ankush Kumar, Ram Kumar, Sisir Maity, Chandan Kumar, Chandan De, Anirban Mondal, Koushik Pal.

New Chemistry Unit

The New Chemistry Unit is a relatively new Unit currently with a few core faculty members and Prof CNR 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 most important areas that are actively pursued are at the interface of chemical biology, chemical science and materials science.

The Unit admits students for the PhD degree programme as well as integrated PhD in Chemical Sciences. The Unit also admits students for integrated MS-PhD 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. 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. Carbon nanotubes and graphene are the important aspects being investigated.

Dr. T. Govindaraju has found that the development of chemosensors for various metals is important due to their roles in medical and environmental sciences. In his laboratory, one of the projects involves the development of sensitive chemosensors for various metal ions. His research group has developed novel class of conformationally constrained chemosensors for selective detection of Al^{3+} which exhibits dual toxicity (to plants and humans). This design strategy has been extended to develop novel chemo-(bio) sensors for various other metal ions such as Cu(II) and Zn(II). In another project, he is working on developing biomimetic materials as they find applications as biomaterials, drug delivery systems, composites and optoelectronic materials. In particular, he is using cyclic dipeptides and linker appended amino acids or small peptides as the modular building blocks to build biomimetic materials with nanoscale order which mimic natural materials. Similarly, he uses biomimetic approach to tune the morphology of naphthalene diimide (n-type organic semiconductor) nanostructures. These materials will find applications as biomaterials, sensors materials, composite materials and optoelectronic materials.

Dr. Subi Jacob George has concentrated on various aspects of functional organic materials and some of the specific research areas are organic/supramolecular synthesis of π-conjugated systems, organic-inorganic hybrid materials, stimuli responsive/supramolecular polymers and chiral nanotechnology. Recently, his research group has developed a novel non-covalent amphiphilic strategy for the design of 1-D stacks of charge-transfer (CT) nanowires, from the co-assembly of donor and acceptor molecules, which would furnish highly conducting nanowires through inherent doping and hence can be a viable tool for nanoelectronics. Preliminary studies have shown remarkable conductivity for these nanowires and the design of new D-A systems using similar design principles is in progress. In addition, he has also concentrated on the molecular design and advanced synthesis of novel p-type and n-type semi conducting π-conjugated systems. In this context, he has carried out the synthesis of various coronene bisimide and tetraimide derivatives with solubilizing alkyl side chains, with high electron affinity and environmental stability, which could make them excellent candidates as a new class of n-type semiconductors. Since molecular engineering of graphene and carbon nanotubes, such as solubilization, chemical functionalization in solution and tailoring its electronic properties in the solid state are some of the challenges for exploring its applications, he has targeted the non-covalent functionalization of carbon nanomaterials with various aromatic donor and acceptor molecules (in collaboration with Prof. C. N. R. Rao) to form novel class of hybrid materials exhibiting ground- and excited-state charge-transfer, energy transfer and tunable opto-electronic properties. Another focus was on the design of highly fluorescent hybrid materials, by using inorganic silicate materials as templates, which would provide ideal spatial organization for the chromophores to facilitate energy transfer induced amplified emission from molecules such as perylene and coronene.

Dr. Jayanta Haldar has set up a chemistry lab (where organic synthesis will be performed) and a biology lab (where both antibacterial as well as antiviral studies will be done) which will provide a platform to integrate organic chemistry and material science with biology, to combat infectious diseases. Within this

short period his research group has synthesized and characterized various derivatives of Vancomycin (last resort of antibiotic to treat gram-positive bacterial infection). Some of the derivatives showed quite promising antibacterial activity against both gram-positive and gram-negative bacteria. He has been involved in synthesizing and exploring various biodegradable antimicrobial polymeric (both synthetic and natural) materials for various biomedical applications.

Since Dr. Sebastian C. Peter's joining on 29th November 2010 in the Centre, he has worked towards establishing his research lab wherein his research is focusing in the fields of inorganic and solid state chemistry. His research is focused on the following research projects: Structure–property relations in rare earth based intermetallics; Rare earth doped chalcogenide glasses for optical and photonic applications; Heteropoly compounds and its catalytic activity.

Presently, he has one PhD and two R&D students working in his research group.

Prof. H. Ila's research activities revolve mainly around 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.

The research interest of Prof. Swapan K. Pati's research group encompasses a broad spectrum of condensed matter phenomena including excitation characteristics, low-temperature thermodynamics and dynamical behavior 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 are found in many molecular-, 1D- and 2D- systems. Kagome antiferromagnetic clusters with Dzyaloshinskii-Moriya interaction have been studied to understand the magnetic behavior.

Dr. A. Sundaresan along with his group of researchers has worked towards the system, $YFe_{1-x}Mn_xO_3$ and investigated for its extraordinary properties such as spin-orientation, magnetization reversal, magnetoelectric effect and magnetocaloric effect. The research in this area reveals that below spin reorientation, it exhibits magnetization reversal where the magnetic moment opposes the applied field which is quite unusual. It exhibits large magnetodielectric effect at room temperature. Further, it shows a positive and negative magnetocaloriceffect across the TN and spin reorientation transition temperature respectively. All the phenomena are very important for practical device applications. They have also investigated the coexistence of superconductivity and surface ferromagnetism in NbN nanoparticles.

Dr. Tapas Kumar Maji's research group was actively involved in exploring various functional aspects of metal-organic frameworks (MOFs), such as luminescence properties, hydrogen storage, guest induced magnetic modulation and guest specific stepwise absorption. We also keep interest in synthesizing metal nanoparticles in a novel, facile, and eco-friendly way. We have developed a novel molecular design concept to control the emission properties in a MOF, $\{Mg(DHT)(DMF)_2\}_n$, (DHT: 2,5-dihydroxyterephthalate), based on excited state proton transfer (ESIPT) process in the organic linker, DHT. The framework unveils permanent porosity and exhibits ligand-based multicolor emission that can be tuned and well controlled by the solvent molecules in solution as well as in the solid state. His work on cyanometallate system has resulted a new bimetallic pillared-layer coordination framework $\{[Mn_3(bipy)_3(H_2O)_4][Cr(CN)_6]_2 \bullet 2(bipy) \bullet 4(H_2O)\}_n$ which has been constructed using ($[Cr(CN)_6]^{3-}$) and an organic linker (4,4′-bipyridyl). The pore surfaces of the MOF is highly polar and was found to be exceedingly promising for high heat of hydrogen adsorption and establishes itself to be the first member of cyanometallate systems having high heat of hydrogen adsorption value of ~11.5 kJ mol^{-1}. The framework also demonstrates an interesting guest responsive magnetic modulation with a change in T_c as observed from dc susceptibility measurements.

He was also involved in developing MOFs from mixed-ligand system as they happen to be structurally flexible and hence interesting adsorption properties. Recently, he has reported a 2D flexible metal-organic porous solid, $\{[Ni(1,3\text{-adc})(bpp)\text{-}(H_2O)_2](H_2O)(EtOH)\}_n$, that has been synthesized using flexible organic linkers (bpp =1,3-bis(4-pyridyl)propane, 1,3-adc= 1,3-adamantanedicarbxylic acid). The desolvated framework undergoes structural contraction and exhibits double-step hysteretic adsorption for CO_2, H_2O, and MeOH and single-step gate-opening behavior with EtOH. This type of guest-specific response is very unique and would provide a better understanding for the design and synthesis of new materials that would show guest-dependent dynamic behaviour and may find application as actuators, in molecular recognition, and in specific sensing.

He has also synthesized silver nanorods in a novel, facile, and eco-friendly way through a simple chemical reduction method using 2,3-dihydroxyfumaric acid in aqueous solution under aerobic conditions. Silvers nanorods show increased surface-enhanced Raman scattering sensitivity and detection of small organic molecules.

Dr. M. Eswaramoorthy and his research team have synthesized clay-polymer composite spheres by layer-by-layer adsorption method. The aminoclay used in this process in place of positively charged elctrolyte can be exfoliated to a different extent depending upon the pH. By introducing this aminoclay layers inbetween the polyelectrolyte layers they were able to show the reversible swelling behaviour of the composite with respect to pH. This property was utilized for pH induced release of drug moleclues. They have also prepared mesostructured carbons (poropus layered carbons) showing pore-switching behaviour using aminoclay as the template. The flexibility of the pores as against the rigid carbon pores has been exploited for the size selective separation of dye molecules. Furthermore, they have used the functional clay as the template to organise the dye molecules for light harvesting applications.

Dr. Sridhar Rajaram has found that the Hydrogen bond promoted reactions is an important subset of organocatalysts. Enzymes exercise precise control over the positioning and orientation of hydrogen bonds in their active sites to enhance reactivity as well as selectivity. In typical organocatalytic systems, control over substrate selectivity in activation is hard to implement. This is mainly because the orientation and acidity of hydrogen bonds cannot be tuned in a controlled manner. In his laboratory, he along with his research group is developing modular systems wherein the orientation and acidity of the hydrogen bond can be varied independently. This will lead to good control over substrate selectivity.

Dr. Ranjani Viswanatha's primary focus of research is the synthesis of semiconductor nanocrystals and metal-semiconductor hybrid structures using colloidal chemistry. She is also interested in studying optical and electronic properties of these materials. In the past few months, she is setting up a laboratory to conduct research based on colloidal synthesis of semiconducting and metal nanocrystals. Tunable dimensions and shapes of the individual particles as well as the ease of manipulating them into a complex interacting structure make colloidal nanocrystals well suited for studies of size- and structure-dependent quantum-mechanical interactions as well as ideal building blocks for nanoscale engineering. Understanding the mechanisms at work in these tiny particles can have very important implications in the areas of photovolatics, displays, biotagging and drug delivery, memory storage and optoelectronic devices. Fundamental research into the synthesis of these nanocrystals by various wet chemical routes, as well as studying and understanding the size dependent electronic, optical and magnetic properties of these materials will constitute the major research activity.

New programmes launched

- Organized “JNCASR Chemistry Symposium-2011” in celebration of International Year of Chemistry-2011 (IYC-2011) on January 10, 2011.
- Organized a programme for students jointly with Education Technology Unit (ETU) in celebration of International Year of Chemistry-2011 (IYC-2011) on January 11, 2011.
- Integrated PhD programme in Chemical sciences has been started in the academic year 2010-2011.

- A new building for the Unit with facilities such as conference room, NCU office, laboratory for Integrated PhD in Chemical Sciences and few research labs, has been inaugurated on December 06, 2010.
- I2CAM School and Conference on "Emergent Properties and Novel Behaviour at the Nanoscale", April 19-27, 2010. (Prof Swapan K Pati, Convenor)
- Winter School on "Chemistry and Physics of Materials", December 6-10, 2010. (Prof. Swapan K Pati, Convenor)

Dr. Sebastian C. Peter (Ramanujan Fellow) and Dr. Ranjani Viswanatha (Associate Faculty Fellow) have joined the Unit.

The following are the members of the Unit:

Chair

Prof 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

Faculty Fellows

Dr Subi Jacob George	Ph D
Dr T Govindaraju	Ph D
Dr Jayanta Haldar	Ph D

Ramanujan Fellow

Dr Sebastian C. Peter	Ph D

Honorary Professor

Prof H Ila	Ph D, FNA, F A Sc

Associate Faculty Members

Prof Swapan K Pati (Professor)
Dr A Sundaresan (Associate Professor)
Dr M Eswaramoorthy (Associate Professor)
Dr A. Govindaraj (Honorary Associate Professor)
Dr Tapas Kumar Maji (Faculty Fellow)
Dr Sridhar Rajaram (Faculty Fellow)
Dr Ranjani Viswanatha (Faculty Fellow)

Research Students

Avinash M.B, Debabrata Maity, Venkata Rao Kotagiri, Mohit Kumar, Ritesh Haldar, Yarlagadda Venkateswaralu, Divakara SS Murthy Uppu, Bhawani.N, S. Vijay Kumar, Nagarjun N, Chandradhish Ghosh, Sumanta Sarkar, Shivaprasad Manchineella, Pallavi Bothra, Arjun Kumar Chitoory, S. Yugandhar, Ajmala Shireen P, ArkamitaBandyopadhyay, K. Rajasekhar.

Research Associates

Ashly Panichithdathil Chandran

R&D Assistants

Jiaul Hoque, Padma A, Abishek Kannan Iyer

Education Technology Unit

Activities and Achievements

The Unit has been actively involved in the concept, development and production of multimedia CDROMs and books especially for school students and teachers in various disciplines of science. The Unit has been involved in developing and producing CDROMs and books in vernacular Indian languages.

Education Technology Unit has undertaken a project from Vision Group on Science and Technology, Department of Science and Technology, Government of Karnataka for supplying a package of six Kannada CDROM titles and the English book and CDROM titled Nanoworld: An introduction to nanoscience and technology to Government schools and Colleges. 7500 CDROM boxes (each containing six Kannada CDROM titles) and 1500 Nanoworld books and CDROM's were completed and handed over to the Principal Secretary. Govt. of Karnataka, Dept. of IT, BT and Science & Technology for distribution to schools and colleges of the state at a function held at the Centre on June 30, 2010.

The Six CDROM titles in Kannada are: Rasayanshastrada Arivu (Chemistry), Bhugola Parichaya (Geography), 'Vignyana Kaliyona' samputa 1, 2, 3 & 4 (Learning Science series). All the CDROM titles and book were developed and produced by ETU. All the inlay cards along with an attractive box to hold the CDROMs were designed and print-ready materials were given for bulk printing.

ETU was entrusted with the task of formatting and completing the book titled 'Chemistry Today' authored by Prof. C.N.R. Rao. All the graphics/pictures were sourced and converted into suitable format for the book. The entire formatting was completed in ETU. The book was brought out to celebrate the International Year of Chemistry, 2011. 7000 copies were printed.

ETU worked in collaboration with the World Scientific Publishing Company, Singapore in completing and designing the cover for the book titled 'Climbing the limitless ladder -A life in Chemistry' authored by Prof. C.N.R. Rao.

ETU was given the task to format and design a book for the Science Advisory Council to the Prime Minister, The book titled 'India as a global leader in science' was formatted and the cover was designed along with the graphics used in the book by ETU. A print-ready copy was sent for printing and 5000 copies were printed. The book was released by the Hon'ble Prime Minister.

The Vision Group on Science and Technology, Department of Science and Technology, Government of Karnataka entrusted ETU to supply 2100 nos, of both the CDROM and book titled 'Nanoworld: An introduction to nanoscience and technology'. This was completed and handed over to VGST. 2000 Nanoworld books and CDROM's were handed over to the Principal Secretary. Govt. of Kamataka, Dept. of IT, BT and Science & Technology for distribution at the 'Bangalore Nano 2010' held during 8th 9th December 2010.

The book titled 'Chemistry Today' was translated by Mrs. Indumati Rao and formatted and completed for printing by ETU for Kamataka Rajya Vignyana Parishat for distribution to schools and colleges. 3100 copies were printed.

ETU took up the project of bringing out the Book 'Nanoworid' in Kannada. Mrs. Indumati Rao carried out the translation. The editing, formatting and completing the printready copy for printing was taken up by ETU.

The CDROM titled 'Understanding Chemistry' with suitable modifications was replicated for distribution at the IYC function.

Organisation of Programs

The C.N.R. Rao Hall of Science and Education Technology Unit conducted various Teachers-students programs/workshops during the period January December 2010 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.

C.N.R. Rao Hall of Science and Education Technology Unit conducted a lecture program for the summer school participants of Bangalore Science forum on May 06, 2010.

On June 30, 2010 C.N.R. Rao Hall of Science and ETU organized the program to award the Outstanding Science Teachers for the year 2009 donated by the C.N.R. Rao Education Foundation. Ms. Kusum Tiwary and Ms. Remani Karthiyayani were awarded the prizes.

The following programs were conducted: Biology for students and teachers' July 15, 2010. 'Chemistry for students and teachers' August 26, 2010, Physics for students and teachers September 20, 2010, Biology for students and teachers October 27, 2010, Program in physical sciences for teachers November 19, 2010 and 'Program in life sciences for teachers' on December 10, 2010.

In the area of science popularization, 'A Celebration of Chemistry' 'Nanoworid', 'Learning Science' and 'Vignyana Kaliyona' (a science popularization program in Kannada for the benefit of Kannada medium school children) programs were conducted.

The Inaugural session of Project Oriented Chemical Education 2010 was conducted at the C.N.R. Rao Hall of Science. ETU presented a one hour multimedia presentation of the CDROM titled 'Nanoworld' and certain modules from the CDROM 'Understanding Chemistry' to the POCE participants.

'A celebration of chemistry' was conducted at Indira Gandhi Centre for Atomic Research, Kalpakkam on 13 March, 2010, on October 1, 2010 at Amrita University, Kochi, at Thiruvananthapuram on October 25, 2010 and in association with National Institute for Science Education & Research, Bhubaneswar on 12 November 2010.

The program 'Nanoworid' was conducted at 2010 Asian Science Camp (August 1721, 2010) at Mumbai, At the TWAS meet in Hyderabad during 17-21 October 2010. Prof. Rao gave the lecture titled 'Nanoworid' followed by a Multimedia Presentation of excerpts from the CDROM titled 'Nanoworld'. As part of Science Outreach Program, lecture programs by Prof. CNR Rao were conducted at Delhi (IIT), Hyderabad (BITS), Delhi (St. Stephens), Pune (NCL/IISER) and Hassan (UAS).

Chemical Research Society of India in association with Division of chemical sciences, IISc organized a function on January 1, 2011 to declare open 'The International Year of Chemistry' by Prof. C.N.R. Rao at the J.N. Tata Auditorium. The book titled 'Chemistry Today' produced by ETU was released at this function and was also distributed to the participants.

ETU and NCU jointly organized the 'Programme for students' on January 11, 2011 to celebrate the International Year of Chemistry' IYC-2011. The program was conducted at the Madan Mohan Malaviya Amphitheatre, CNR Rao Hall of Science. There were lectures by Prof. C.N.R. Rao, Prof. K.N. Ganesh, Prof. Uday Maitra and Prof. Samuelson along with many experimental demonstrations,

On January 24, 2011 C.N.R. Rao Hall of Science and ETU conducted the program 'Program in Engineering sciences' for engineering first semester students. About 200-225 students and teachers attended the program.

As National Science Day Program C.N.R. Rao Hall of Science and ETU organized a ha1fday program 'Chemistry in our lives' in celebration of IYC 2011. All the participating students and teachers were from different Jawahar Navodaya Vidyalayas (Mangalore, Bidar, Wynad, Bagalkot, Davangere and Shimoga). On March 9, 2011 C.N.R. Rao Hall of Science and ETU conducted a lecture program as part of the National Science Day Program 'INSPIRE' for selected students and teachers. There were three lectures, one each in Physics, Chemistry and Biology

Ongoing Projects

The unit is engaged in translating the book 'Understanding Chemistry' in Kannada.

ETU has taken up the project of assembling 200 College chemistry Kits for training teachers in its use and distribution to Colleges from all over Karnataka.

CNR Rao Hall of Science and Education Technology Unit will be organizing teachers/students workshops/ programs in different subjects like Physics. Chemistry, Biology, Nanoscience during June-December 2011. It is proposed to have lectures and demonstrations with different themes in a particular subject. In all the above programs faculty from JNCASR, IISc and other institutions will participate.

Future Plans

The unit will be organizing a large number of science popularization programs for the school children and teachers.

The unit will also be bringing out the book 'Chemistry Today' authored by Prof. C.N.R. Rao in Hindi and Bengali.

ETU has plans to develop a separate website highlighting the CNR Rao Hall of Science Programs/ workshops for students and teachers.

The unit will continue its work to develop and produce educational CDROMs and books focusing on learning aspects. These will essentially be for high school children and for teachers to aid in the teaching process.

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

Research in aeronautical fluid dynamics led by Prof. Roddam Narasimha has continued on novel wing plan forms for turboprop aircraft. An international patent has been filed for the invention, and the designs have been registered. Experiments on cloud flows have successfully reproduced many observed cloud forms and the results have been reported at two international conferences.

Prof. Rama Govindarajan and her group of researchers have studied in the area of instability of vortical flows. It was shown that a light-cored vortex can be unstable and a heavy cored vortex can be stable for certain density gradients. The reason for this counter-intuitive result was explained by wave interactions. Chaotic flow arising out of mode competition is shown to occur in the wake of an inline oscillating rectangular cylinder. In a study of the shallow water equations, it was shown that these equations are not valid in the neighbourhood of unit Froude number, i.e., when inertia and gravitational forces are of the same order of magnitude.

The normal and tangential forces acting on a static liquid drop sitting on an infinitely hysteretic inclined plane are written down, and it is shown that the plate may aid gravity over a portion of the drop while acting against gravity in the other.

Prof. S M Deshpande and his group of researchers have worked in the areas of “Development of Meshless Solver, Point clouds” and “Numerical simulation of multiscale supersonic flows with low dissipation shock capturing schemes.

Dr. Meheboob Alam and his group of researchers have studied in the area of investigating the rheology and the dynamical patterns and related bifurcation phenomena in driven granular systems. One particular work during 2010-2011 is the development of a "Ginzburg-Landau-type order parameter theory" that describes finite-amplitude patterns in a sheared granular fluid.

Our analysis of the related Landau equation suggests that the "shearband'' formation in a granular fluid originates from a competition among three types of bifurcations with increasing density from (i) the “bifurcation from infinity”' in the Boltzmann limit to (ii) “subcritical” bifurcations at moderate densities and finally to (iii) “supercritical” bifurcations in the dense limit.

The predicted bifurcation scenario of our analytical theory agrees qualitatively with earlier findings of molecular dynamics simulations as well as of a numerical bifurcation analysis of the same problem.

Dr. Ganesh Subramanian and his group of researchers have studied in the area of Atmospheric Sciences: A fundamental mistake in prevailing emissivity schemes that attempt to model the nocturnal boundary layer was pointed out, and a resolution of the same was proposed. The generic nature of the error, in terms of its occurrence in any frequency-parameterized scheme (outside of a line-by-line calculation) was emphasized. In light of this error, we have shown that the Ramdas layer can only occur in a heterogeneous atmosphere, and therefore proceeded to obtain evidence for the radiative forcing due to suspende aerosols that are responsible for such heterogeneity. Lab experiments conducted with the traditional two-plate set up have revealed pronouncedly asymmetric temperature profiles – a feature that can only be explained by medium heterogeneity. (Student: Ms. V.K. Ponnulakshmi).

Vortex Dynamics:The continuous spectrum of general vorticity profiles, and the approach of the associated eigenfunctions towards the Rankine form was characterized. The response of a generic vortex column to a critical layer forcing was identified, and in particular, the crucial difference between such a vortex column, and the theoretical Rankine profile, was emphasized. (Student: Mr. Anubhab Roy).

Spheroidal particles in shearing flows: The drift of spheroidal particles, due to inertia and viscoelasticity, as a function of aspect ratio was obtained analytically. The aspect ratio was a parameter that could be varied to enable one to access the whole range of orientation dynamics from slender fibers to flat disks. An effort was initiated to investigate the nature of the drift as a function of the Deborah number in cases where the polymeric relaxation is no longer asymptotically small. (Former Student: Mr. Vivekanand Dabade and Student: Mr. Navaneeth M).

Hydrodynamics of bacterial suspensions: A collaborative effort with Prof. Donald Koch at Cornell University has helped make further progress in understanding the nature of the collective dynamics in bacterial

suspensions; in particular, the non-trivial alteration of the collective dynamics due to chemotaxis. (Collaborator: Prof. Donald L. Koch).

Following are the members of this Unit:

Chair

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

Honorary Professor

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

Professor

Rama Govindarajan	Ph D, F N A Sc, F A Sc

Senior Associate

S.M. Deshpande	Ph D, F A Sc

Associate Professors

K. R. Sreenivas	Ph D
Ganesh Subramanian	Ph D
Meheboob Alam	Ph D

Faculty Fellow

Santosh Ansumali (DST Ramanujan Fellow)	Ph D

Research Students

Anubhab Roy, Sumesh P.T., Dhiraj Kumar Singh, Ponnulakshmi V.K., B.R. Rakshith, Shiwani Singh, K. Siddharth, Lakshminarayana Reddy M.H., Shashank H J, Manjusha Namburi N L D B, Rajesh Ranjan, Rama krishna Rongali, Ravichandran S, Vinay Kumar Gupta, Ujjayan Paul, Mohammed Istafaul, Haque Ansari, Srikanth T, Saikishan Suryanarayanan,Vybhav GR,Sunil V Bharadwaj, Jotkar Mamta Raju, Navaneeth K M, Mehta Mukul Hemant, Prasanth P, Sharath K Jose, Rohith V.S., Dhake Milind Prakash, Sorathiya Shahajhan Hassanali

Postdoctoral Fellows

Dhiraj Patil, Priyanka Shukla, Sourabh Suhas Diwan

R & D Assistants

Rohan Subbaiah, Satyendra Prasad

Trainee

Kiran Kumar, M D.

Evolutionary & Organismal Biology Unit

During the year 2010-2011, 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) evolution of maternal effects, (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) mechanisms of developmental plasticity in circadian organization in ants, (g) behavioural, neurogenetic and molecular studies on aspects of Drosophila circadian organization.

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

Drosophila also show "nocturnal sex drive" (enhanced night time activity and loss of sleep), and this is male driven and olfaction mediated, via the olfactory receptor 47b (Or47b).

Circadian organization of Camponotus ants is adaptively plastic and their clocks can be entrained by social interactions.

Molecular mark-recapture censusing of an Asian elephant population in Mondulkiri Province, Cambodia, in collaboration with WWF-Cambodia, to enable estimation of population size otherwise difficult due to landscape and low density of elephants.

Social structure in female Asian elephants may be more complex (multi-tiered) than previously thought.

Drosophila species with differences in circadian activity-rest rhythms also show neuroanatomical differences in clock neuronal networks.

During this year, the EOBU also started offering the first Integrated PhD programme in Evolutionary and Organismal Biology in the country; 4 students were admitted.

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

Honorary Professors

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

Koustubh M Vaze, Pankaj Yadav, Snigdhadip Dey, Shahnaz Rahman Lone, Nisha N.K., Priya M.P. , Pavitra Prakash, Nandini R Shetty, Antara Das, Tate Dhananjay Sukhanand, Nikhil K.L., Keerthipriya. P, Sheetal Potdar, Joydeep De, Avani Mital, Manaswini Sarangi, Geetanjali Prabhakar Vaidya

Research Associate

BM Prakash

R&D Assistant

Enakshi Ghosh

Geodynamics Unit

Science Outreach Programme in Uttarakhand

Organized Science Outreach Programme, funded by the C.N.R. Rao Hall of Science as follows:

At Nainital, hosted by Kumaun University
Date: May 4, 2010
Colleges Involved: 12
Students Participated: 58
Teachers Participated: 7
At Almora, hosted by Uttarakhand Sevanidhi Paryavaran Siksha Sansthan
Date: May 6, 2010
Colleges Involved: 5
Students Participated: 52
Teachers Participated: 7
At Gangolihat, hosted by Himalayan Gram Vikas Samiti Date: May 8 and 9,2010 Colleges Involved : 10 Students Participated: 56 Teachers Participated: 14

At Gangolihat, hosted by Himalayan Gram Vikas Samiti
Date: November 19 & 20, 2010
Colleges Involved: 16
Students Participated: 102
Teachers Participated: 20

Special Lectures

Centre for Earth Science Studies, IISc., Bangalore
7 lectures between August and September 2010
Geological Society of India Annual General Meeting
Keynote Address as Chief Guest, 12th October, 2010
Institute of Seismological Research, Gandhinagar, Gujarat
7 lectures from 28th October to 12th November, 2010
Banaras Hindu University, Varanasi
INSPIRE Programme, 3 lectures 18th to 21st January, 2011.

Books

The Making of India: Geodynamic Evolution, Macmillan, Noida, 2010, 816 p.
Ek Thi Nadi Saraswati (in Hindi), Aryan Books International, New Delhi, 2010, 111p.
Geography. Peoples and Geodynamics of India in Purans and Epics, Aryan Books International, New Delhi (In Press)

Research Papers

Geological framework and tectonics of Western Ghat, In: Madhav Gadgil et al (Eds) Western Ghat Ecology (a public domain website), Centre for Ecological Sciences, IISc, Bangalore.

Some burning questions remaining unanswered, Sent for publication in Journal of Geological Society of India.

Geodynamic history of Uttarakhand Himalaya, Journal of Nepal Geological Society (In Press)

Some geodynamic hotspots in India requiring urgent comprehensive investigations (Sent for publication in Current Science)

Chair

K S Valdiya — Ph D, F A Sc, F N A, F N A Sc, FTWAS

Molecular Biology and Genetics Unit

The Molecular Biology and Genetics Unit (MBGU) of the centre is well recognized for its research programme in biomedical and biological sciences. With eight laboratories conducting cutting-edge research, MBGU attracts some of the best students from all over India for its PhD and Integrated-PhD research and training programme. Research in the MBGU labs span diverse areas of biology. The current areas of research comprise infectious diseases, human genetic diseases, chromatin organization and transcription regulation, stem cells and cardiovascular development and molecular mechanism of chromosome segregation. Research programs in the unit are supported by grants from several national and international funding agencies and from biotechnology companies.

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 preferntially 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 immunoflourescence experiment with anti-TP2 and anti-TP1 anbtibodies 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 epxression 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.

Molecular Parasitology Laboratories

Research in this lab 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. Adenylosucinate 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. Our 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.

Human Molecular Genetics Laboratory

In a study of over 750 families with non-syndromic hearing loss, this lab has examined several deafness-causing genes (Cx26, Cx30, TMPRSS3, TMC1, HAR, CDH23, PDS and TMIE) and identified a large number

of pathogenic mutations in these genes. This work has substantially extended allelic heterogeneity at these genes and provided a collection of mutant alleles for potential use in cell biological, biochemical and structure-function correlation studies. Collectively, mutations at these genes are responsible for about 40% of recessive, nonsyndromic, sensorineural, severe-to-profound hearing loss in Indian populations. Indeed, about 25% of the hearing loss was found to be is due to mutations at a single gene, connexin 26 and the high prevalence of a particular connexin 26 mutant allele, W24X, was attributed to an approximately 8000-year old founder effect. Knowledge of the relative contributions of these genes to the load of hereditary hearing loss in Indian populations has helped devise a 'genetic algorithm' that has important implications for early detection of this disorder.

Another significant contribution made by the lab is the identification of a locus, DFNA59 for prelingual, profound, sensorineural hearing loss at chromosome 11p14.2-q12.3. Using a whole genome-based linkage mapping approach, his laboratory has defined the critical genomic region between the markers D11S929 and D11S480, which is proposed to harbour a hitherto unknown deafness-causing gene.

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. Our 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

The laboratory screened a large number of Indian clinical samples and identified an immunodominant B-cell epitope in the cysteine-rich domain of Tat only in the HIV infected people. This finding has a direct relevance for HIV vaccine design. Differential transcription factor binding to several sites in the viral promoter has been delineated in subtype-C HIV-1 promoter region.

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.

Molecular Mycology Laboratory

The reseasrchers in this Lab have studied centromeres of a pathogenic yeast, Candida dubliniensis and compared centromere sequences with those of a closely- related yeast Candida albicans. The studies indicate that centromeres are evolving at a rate faster than any other genomic region in these two species.

The laboratory also initiated a new programme to study the structure-function relation of centromeres in three Candida species: C. albicans, C. dubliniensis and C. tropicalis and to investigate the mechanism of this rapid change in centromere DNA sequence.

Structure-function analysis of centromeres of pathogenic yeasts Candida and Cryptococcus. Gene indexing and epigenomics in Candida albicans by histone H3 variants. Ploidy and pathogenicity - is there a connection? Molecular mechanism involved in rapid evolution of the centromere DNA sequence.

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, FTWAS
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, FTWAS
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

Associate Professor

Maneesha Inamdar	Ph D

Faculty Fellow

Kaustuv Sanyal	Ph D

Technical Officer (Veterinary)

R G Prakash	B V Sc & A.H.

Technical Staff

Anand Kumar K, N Jeelan Basha, Nishitha Patel, Prakash RG, Suma BS, Ushasree Pattamatta

Research Students

Javaid Bhat Yousuf, Bharat S, Mamta Jain, Mangaiarkarasi A, Surbhi Dhar, Nishtha Pandey, Abhishek Sinha, Laxmi Narayan Mishra, Mahesh B, Jitendra Thakur, 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., Yogesh Bhojraj Ostwal, Akhade Vijay Suresh, Khadilkar Rohan Jayant, Hari Raj Singh, Senapati Parijat Ramesh, Vijay J, Garima Verma, Shilpee, Malini Menon, Vaijayanthi Kandadai Raghavan, Amrutha Swaminathan, Shukla Arpit Prakashkumar, Shalini Roy Choudhury, Simi Muraleedharan, Prabhu S A, Lakshmi Prasoona, V. Sivani, Vikas, Shveta Jaishankar, Lakshmi Sreekumar, Surabhi Sudevan, R. Sunaina Singh, S. N. Suresh

Research Associates

Arun P. Sikarwar, Rahul Modak, Swati, Uttara Chakraborty, Vasudeva SP, Ashok Kumar, Vidya Devi, Ruthrotha Selvi B

Fellows (DBT)

Deepti Jain, Uttara Chakraborty, Vasudeva

Junior Research Fellows

K.S. Vinay, Chandan Kadur Nagaraju, Santosh S,

Senior Research Fellow

Surbhi Dhar

R&D Assistants

Akshay Bhat, Amogh Gopinathan Nair, Anusha Thota, B R Gowsica, CA Anitha, Devendra P. Muttalmuri, Lakshmi Swarupa Yalla, Lavanya T, Mekha G Mohan, Mohan V, Monalisa Das, Poulomi Banerjee, Ramachandran B, Satya Krishna Pentakota, Sonia Kulkarni, Tanmoy Chakraborty, Tushna Dehnugara, Vasudeva Bhat, Swetha Mishra

Theoretical Sciences Unit

The work done in the Theoretical Sciences Unit continued to use a combination of analytical techniques and state-of-the-art computation in order to study the properties of materials, design new materials, and also apply the techniques of theoretical physics in order to gain insight into biological processes such as evolution. In many cases, the work done was of a multidisciplinary nature, and involved a close collaboration between experimentalists and theoreticians.

Below, some of the highlights of the work done in each research group in the TSU is listed below.

The group of Prof. Shobhana Narasimhan continued to use density functional theory to study and design novel materials, with a special focus on surfaces and nanomaterials. They predicted and studied a new long-range-ordered surface alloy of bulk-immiscible components, viz., Fe-Au/Ru(0001). This was successfully synthesized by their French collaborators. They showed that, surprisingly, the main driving force for mixing in this system is magnetism and not stress relief. This work was published in Physical Review Letters, and later covered in New Scientist. They also suggested a novel yet practicable way of controlling the morphology of Au nanoclusters on an oxide substrate, by doping the substrate. This can induce a three-dimensional to two-dimensional crossover in the cluster shape, which has considerable relevance for catalytic applications. They also studied carbon materials (using graphene as a model system) for natural gas storage, and a variety of nanosystems for magnetic properties such as spin spirals and magnetic anisotropy energies. They have also looked at transport in photoswitching molecules.

Prof. Srikanth Sastry's group conducted research in the areas of liquid-liquid transition in silicon, crystal nucleation, relevant length scales in glass forming liquids, the role of spatial dimensionality in glassy behavior, jamming, gelation, fragility of glass formers and mechanical behavior of glasses. The work in the group has established that a negative pressure liquid-liquid critical point exists in supercooled silicon (to be published in Nature Physics), and a new interesting crystal nucleation mechanism associated with this transition has been analyzed in more recent work. It has been shown that the relationship between configurational entropy and relaxation, called the Adam-Gibbs relation, is obeyed independently of spatial dimensionality. A new method has been employed to analyze void space in particle packings, which has been applied to the study of jamming in hard sphere packings.

In the area of nanomaterials, the group of Umesh Waghmare has theoretically analyzed the stability and properties of graphene-like nano-structures based on $(BN)_xC_{(1-x)}$ and transition metal-Si complexes, leading to the prediction of domain- structure in the former and a 2-D piezomagnet based on $CrSi_2$. They have also determined the impact of stress and Stone-Wales defects on the buckling behavior of graphene in both bulk and nano-ribbon forms. They have predicted spontaneous organization of small gold clusters to form 1-D chains when they interact with a bundle of carbon nanotubes. Their most significant achievement in the area of smart materials has been a scheme to derive a generalized Landau theory of structural phase transitions from first-principles, with a demonstration for the transition in ferroelectric $BaTiO_3$. They have also estimated the efficacy of various exchange correlation functionals in the density functional theory in predicting temperature-dependent phase transition behavior in ABO_3 ferroelectrics.

In the area of materials for energy and environment, they have identified the structural origin of high oxygen storage capacity M-doped of CeO_2, relevant to its role in environmental catalysis. In exploration of materials for H-storage, they have shown how the interactions between dopant Li and H-vacancy strongly affect kinetics of Hydrogen release.

In Prof. Swapan Pati's group, the interest encompasses a broad spectrum of condensed matter phenomena including excitation characteristics, low-temperature thermodynamics and dynamical behavior 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-metallcity and high mobility are found in many molecular-, 1D- and 2D- systems. Kagome aniferromagnetic clusters with Dzyaloshinskii-Moriya interaction have been studied to understand the magnetic behavior.

The group of Dr. N S Vidhyadhiraja continues to investigate effects of strong correlation in models and materials. For example, they studied the Mott metal-insulator transition within the Hubbard model. A new perspective of the hysteresis and avalanches across the inhomogeneous Mott transition as observed in various vanadium oxides is being developed. This work is a part of the collaboration with Prof. Erica Carlson of Purdue University. A comprehensive study of the crossover from mixed-valent to Kondo regime in heavy fermion materials has been completed, and is being drafted for publication. They have also been investigating the effects of a combined thermal and voltage bias on ballistic transport through nanodevices within the Landauer-Buttiker formalism. This study is a part of a collaboration with Prof. Tim Fisher of Purdue University. In collaboration with Prof. A. Sundaresan of CPMU, they have examined recent experimental results of magnetization reversal in doped orthoferrites. They have developed a new model which yields excellent agreement with experimental results and provides new insight into the effects of doping upon the magnetic interactions in these materials. They continue to collaborate with Prof. K S Narayan of CPMU, and in recent work, they have developed a theoretical model for lateral photocurrent scanning of donor and acceptor polymers on graphene coated substrates. An ongoing collaboration with Prof. Arghya Taraphder and Dr. Debabrata Parihari at IIT Kaharagpur has resulted in the completion of two studies, one being field dependent dynamics in the metallic regime of the half-filled Hubbard model and the second being a new proposal for the charge density wave formation in dichalcogenides.

In Dr. Kavita Jain's group, they have looked at the evolutionary dynamics of deterministically and stochastically evolving populations on complex fitness landscapes, and have also worked on the calculation of asymptotic maximum value distributions for a class of nonindependent random variables.

Dr. Subir Das' primary research involvement has been in the statistical mechanics of phase transitions and areas related to that. He has investigated condensed-matter systems both at and away from equilibrium. In particular following topics have been his focus in the last year: Phase Transition and Critical Phenomena, Kinetics of Phase Separation in Multicomponent Mixtures, Structure and Dynamics in Confined Systems, and Nucleation and Wetting Phenomena.

New Programmes Launched During the Year

The faculties of the Unit were involved in organizing several conferences and workshops during the past year. Some of these events are listed below:

- JNCASR re joined a collaborative programme to develop better cathode materials for Li-ion batteries (partner institute C-STEP).

The following are the members of the Unit:

Chair

Shobhana Narasimhan	Ph D

CSIR Bhatnagar Fellow and Hon. Professor

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

Professors

Shobhana Narasimhan	Ph D
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

Moumita Maiti, Himadri Barman Mighfar Imam, 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, Ershaad Ahamed Basheer, Nagamalleswara Rao Dasari, Pralok Kumar Samanta, Shirodkar Sharmila Narendra, Kaushelendra 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

Research Associates

Hembram KPSS, Siamkhanthang Neihsial, Ganga Periyasamy, Abhishek Kumar Mishra

R&D Assistants

Deb Sankar De, Meenakshi Sundaram M, Niladri Sengupta, Snehajyoti Chatterjee, Wasim Aftab, Ershaad Ahamed Basheer, Deb Sankar De, Jayashree Pan

Technical Staff

Anitha G, Ankita Goswami, Mighfar Mighfar

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. The centre was inaugurated and dedicated to the nation by the Hon'ble Prime Minister of India, Dr. Manmohan Singh.

Being a first centre of this kind it has been ensured that the centre not only fulfils its objectives but also creates new traditions in carrying out research, extension activities and international collaborations. The centre has ongoing research programmes on Solid-State Lighting, Surface Physics, Polymers, High-Resolution Electron Microscopy, Soft Condensed Matter and Chemistry for Materials.

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 major scientific research facilities to serve both in-house researchers and researchers from other institutions. This facility houses specialized instrumentation maintained and run by experts. The facility consists of Ultra High Resolution Transmission Electron Microscope, FESEM, Pulsed Laser Deposition, Molecular Beam Epitaxy System, Confocal Microscope, Optical Tweezers, High Resolution Thin film X-ray Diffractometer, NMR, Gas Chromatograph with Mass Spectrometry detector, High pressure liquid Chromatograph/Mass Spectrometer Instruments, Surface Area and related measurements. ICMS is in the process of expanding its facility by installing additional equipment like SQUID Magnetometer, Thermal Gravimetric Analysis (TGA) system and Inductively Coupled Plasma (ICP) system.

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. It also provides variety of analytical and computational tools.

The centre has various programmes as PhD and MS programmes, two semesters (one year) Post Graduate Diploma in Materials Science programme, Senior and Junior Fellowships under RAK-CAM Programme and Short term visiting programmes. Four students have graduated under the Post Graduate Diploma in Materials Science programme and 21 visitors have visited for collaborative research under short term visiting programmes.

The centre has many collaborative agreements and programmes with various universities, like Cambridge University, Northwestern University, Mesa+ at the University of Twente, National Institute of Materials Science in Tsukuba, Japan and with the Nano Institute in University of Waterloo, Canada. Several young scientists from other countries as well as from India have carried out short term research activities in the centre. Recently ICMS signed an MoU with Scuola Internazionale superior di Studi Avanzati (SISSA), Triesta. It is in process of establishing collaborations with Weizmann Institute of science and Cambridge University.

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 centre organizes an annual International Materials Lecture by eminent scientists from all over the world, and has many collaborative agreements and programmes with various universities. The first lecture was delivered by

Prof. Tobin Marks, Northwestern University on February 4, 2009. The second lecture was delivered by Prof. Stuart Parkin, IBM Almaden Research Center on December 11, 2009 and the third lecture by Prof. Sir Richard Friend, FRS, Cavendish Laboratory, University of Cambridge on December 7, 2010.

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 Frontier Lecutures on Advances in Materials Science in universities. ICMS has also sponsored various schools and workshops conducted by other organizations.

Fellowships of National and International Institutions

The centre has many collaborative agreements and programmes with various universities, like Cambridge University, Northwestern University, Mesa+ at the University of Twente, National Institute of Materials Science in Tsukuba, Japan and with the Nano Institute in University of Waterloo, Canada.

RAK-CAM Programme

This programme has been very successful in awarding Senior and junior fellowships. We have also received additional grants from RAK-CAM. It is also proposed to organize an annual "Sheik Saqr lecture", an international lecture series partly using the funds received from RAK-CAM to support the travel and an honorarium.

Short term visiting programmes

The centre offers short term visiting fellowships under these programmes. The visiting period may vary from one month to six months. The visiting fellows will be associated with the ICMS faculty and associate faculty to carry out the research work. Several young scientists from other countries as well as from India have carried out short term research activities in the centre. We have had 21 visitors under these programmes. Several scientists from ICMS have also visited other institutes under these programmes.

New Programmes launched

ICMS will launch a new Annual "Sheik Saqr Materials Lecture", an international lecture series. RAK-CAM for Advanced Materials and the International Centre for Materials Science will support this annual lecture series. It is planned to invite an eminent scientist from anywhere in the world to deliver a lecture on Material Science.

A short term Visiting Fellowship Programme for 3 to 10 teachers and research scholars has been started to help the best of young researchers and teachers to obtain appropriate exposure to research.

A research programme on "Hydrogen Energy and Artificial Photo-synthesis" has been initiated.

Following are members of the Unit:

Faculty

Prof. C N R Rao	F R S, Hon. F R S C, Hon. F Inst P, Director
Prof S M Shivaprasad	Ph D (Karnataka), Professor

Faculty Fellows

Dr Ranjan Datta	Ph D (University of Cambridge),
Dr Rajesh Ganapathy	Ph D (IISc.)
Dr Sridhar Rajaram	Ph D (University of Utah)

Adjunct professorship and other honorary positions

Prof Timothy Fisher, Purdue, Adjunct Professor
Prof Vinayak Dravid, Northwestern University, Adjunct Professor
Prof Pulickel M. Ajayan, Rice University, Adjunct Professor
Prof Vinod Subramaniam, University of Twente, Adjunct Professor
Prof U Ramamurty, Indian Institute of Science, Hon.Faculty
Prof S M Shivaprasad, Professor, ICMS, RAK-CAM Sheik Saqr Senior

Fellowship

Mr Rakesh V, RAK-CAM Sheik Saqr Junior Fellowship

Senior Fellows

Prof K S Narayan, (March 1, 2008 to February 28, 2010)
Prof S M Shivaprasad, (March 1, 2010 onwards)

Junior Fellows

Dr S R C Vivekchand, (March 1, 2008 to June 30, 2009)
Mr Rakesh Voggu, (July 1, 2009 to September 20, 2010)
Mr Pranab Mandal, (November 1, 2010 onwards)

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
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

Incharge Co-ordination

Aruna V Mahendarkar

R & D Assistants

Mamta Raju Jotkar, Sireesha Kanuri

Research Students

Loukya Chowdary, Santhosh V, Ramana Reddy, G

Diploma Students

Manjunatha S, Bello Abdulhakeem, Dzade Nelson Yaw
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

Technical Assistants

Sireesha Kanuri, Gajula Kishore Kumar

R&D Assistants

Praveen Kumar, Sunil Kumar

Chemical Biology Unit

Design of an HA2-based Escherichia coli expressed influenza immunogen that protects mice from pathogenic challenge

Influenza HA is the primary target of neutralizing antibodies during infection, and its sequence undergoes genetic drift and shift in response to immune pressure. The receptor binding HA1 subunit of HA shows much higher sequence variability relative to the metastable, fusion-active HA2 subunit, presumably because neutralizing antibodies are primarily targeted against the former in natural infection. We have designed an HA2-based immunogen using a protein minimization approach that incorporates designed mutations to destabilize the low pH conformation of HA2. The resulting construct (HA6) was expressed in Escherichia coli and refolded from inclusion bodies. Biophysical studies and mutational analysis of the protein indicate that it is folded into the desired neutral pH conformation competent to bind the broadly neutralizing HA2 directed monoclonal 12D1, not the low pH conformation observed in previous studies. HA6 was highly immunogenic in mice and the mice were protected against lethal challenge by the homologous A/HK/68 mouse-adapted virus. An HA6-like construct from another H3 strain (A/Phil/2/82) also protected mice against A/HK/68 challenge. Regions included in HA6 are highly conserved within a subtype and are fairly well conserved within a clade. Targeting the highly conserved HA2 subunit with a bacterially produced immunogen is a vaccine strategy that may aid in pandemic preparedness.

Lanthanide sensitization using a novel strategy

A novel strategy for the sensitizing lanthanides in a hydrogel matrix through a non-covalently bound sensitizer has been devised. The selective sensitization of Eu(II), Tb(III) and their mixtures has been achieved in a gel phase leading to tunable emission characteristics. It has also been shown that these materials retain the luminescence even in the dried state. The lyophilized powder ('xerogel') has been further processed to coat glass surfaces with these luminescent coatings. A functional hydrogel has also been devised for easy and selective detection of enzymes using a "pro-sensitizer" approach.

Interaction of minor groove binding ligands (MGBL) with DNA

DNA adopts different conformations not only based on novel base pairs, but also with different chain polarities. Besides several duplex structures [A, B, Z, parallel stranded (ps)-DNA, etc.], DNA also forms higher-order structures like triplex, tetraplex, and i-motif etc. Each of these structures has its own biological significance. The ps-duplexes have been found to be resistant to certain nucleases and endonucleases. Molecules that promote triple-helix formation have significant potential. These investigations have many therapeutic advantages which may be useful in the regulation of the expression of genes responsible for certain diseases by locking either their transcription (antigene) or translation (antisense). Each DNA minor groove binding ligand (MGBL) interacts with DNA through helical minor groove recognition in a sequence-specific manner, and this interferes with several DNA-associated processes. Incidentally, these ligands interact with some non-B-DNA and with higher-order DNA structures including ps-DNA and triplexes. While the design and recognition of minor grooves of duplex DNA by specific MGBLs have been a topic of a number of reports from our laboratory, limited information is available on the binding behavior of MGBLs with non-duplex DNA. We have initiated various attempts of the interaction of new synthetic MGBLs with ps-DNA and DNA triplexes.

Following are the members of the Unit:

Chair
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 2010-11, 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 two fluid model of manganites was extended to achieve an understanding of their anomalous optical properties. This work has been accepted for publication in Phys. Rev B.
- A strong coupling expansion was 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, for parameter regimes when super fluid regions are present. The expansion works well in much of the experimentally relevant regimes.
- A generalized gradient approximation to go beyond the local density approximation in handling strongly correlated inhomogeneous systems such as ultra cold atoms in a trap was developed.
- In recent studies 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 have been addressed.
- A model was developed combining the concepts of resistance and bosonization to describe transport through systems of quantum wires including junctions. Charge pumping in both an infinitely long wire and a ring was also studied.
- An understanding of topological phases, symmetry breaking and zero energy Majorana modes in one-dimensional systems with spins and electrons was achieved
- An understanding of the edge states in a simple fractional quantum Hall system was developed using bosonization and numerical analysis
- Transport of electrons through potential and magnetic barriers on the surface of a three-dimensional topological insulator was studied
- Quenching of a parameter of the Hamiltonian of models with topological degrees of freedom was studied, and it was shown that the effects depend crucially on the topological sector.

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.
- Studies of six classes of problems in the area of turbulence have been Systematized, namely, (I) the dynamic multiscaling of time-dependent structure functions in fluid and passive-scalar turbulence, (II) dissipation reduction by polymer additives in fluid turbulence, (III) the statistical properties of turbulence in two-dimensional fluid films, (IV) the effects of hyperviscosity in hydrodynamical equations, (V) the magnetic-Prandtl-number dependence of the dynamo boundary and the statistical properties of magnetohydrodynamic (MHD) turbulence, and (VI) the persistence problem in turbulence.
- Furthermore, studies have been carried out of spiral- and scroll-wave dynamics in a variety of mathematical models for cardiac tissue ranging from simple, two-variable models, which account for the transmembrane 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, ion pumps, and ion exchangers.

- Work was continued on (i) con_ned liquids and the glass transition (one paper submitted, under review), electrophoresis, sedimentation, and related phenomena in driven colloids, and active matter. On the last subject an important paper was published (Nitin Kumar, Sriram Ramaswamy and A K Sood, see below) combining experiment and theory, on some rather remarkable symmetry properties in the noisy self-propulsion of a tapered macroscopic rodlike particle on a surface. The paper was selected as an Editor's Suggestion in Phys Rev Letters, and has attracted much attention.
- A major review article was authored (Sriram Ramaswamy, see below) on the area of Active Matter. The work summarizes the remarkable progress made in recent years, substantially by his group, in understanding the collective behaviour of self-driven particles, such as motile organisms, cytoskeletal extracts of motors and filaments energized by ATP, or some remarkable non-living analogue systems. The article appeared in the inaugural issue of the Annual Review of Condensed Matter Physics, by invitation of its Chief Editor James S Langer.
- The problem of the spreading of a liquid drop containing self-propelled filaments was formulated and solved. This work is currently under review with J Fluid Mech.

Following are the members of the Unit:

Chair

Prof. H. R Krishnamurthy

Honorary Faculty

Prof. G Ananthakrishna
Prof. B Bagchi
Prof. BJ Cherayil
Prof. C Dasgupta
Prof. N Kumar
Prof. Rahul Pandit
Prof. S Ramasesha
Prof. S Ramaswamy
Prof. DD Sharma
Prof. K. L Sebastion
Prof. D Sen
Prof. S Yashonath

Centre for Computational Materials Science (CCMS)

Research Achievements

Using multiple computational tools, researchers in CCMS have examined five candidate crystal structures for beta-carbonic acid, a molecular crystal of environmental and astrophysical significance. These crystals comprise of hydrogen bonded molecules in either sheet-like or chain-like topologies. Gas phase quantum calculations, empirical force field based crystal structure search, and periodic density functional theory based calculations and finite temperature simulations of these crystals have been carried out. Results suggest crystals with one-dimensional hydrogen bonding topologies (chain-like) to be more stable than those with two-dimensional (sheet-like) hydrogen bonding networks. We predict that these structures can be distinguished on the basis of their far infra-red spectra.

The use of density functional theory to study and design novel materials has been continued, with a special focus on surfaces and nanomaterials. A new long-range-ordered surface alloy of bulk-immiscible components, viz., Fe-Au/Ru(0001) has been predicted and studied. This was successfully synthesized by our French collaborators. It was showed that, surprisingly, the main driving force for mixing in this system is magnetism and not stress relief. It was suggested that a novel yet practicable way of controlling the morphology of Au nanoclusters on an oxide substrate is by doping the substrate. This can induce a three-dimensional to two-dimensional crossover in the cluster shape, which has considerable relevance for catalytic applications. We also studied carbon materials for gas storage, and a variety of nanosystems for magnetic properties such as spin spirals and magnetic anisotropy energies. We have also looked at transport in photoswitching molecules.

Research conducted in the areas of liquid-liquid transition in silicon, crystal nucleation, relevant length scales in glass forming liquids, the role of spatial dimensionality in glassy behavior, jamming, gelation, fragility of glass formers and mechanical behavior of glasses. Established that a negative pressure liquid-liquid critical point exists in supercooled silicon (to be published in Nature Physics), and a new interesting crystal nucleation mechanism associated with this transition has been analyzed in more recent work. It has been shown that the relationship between configurational entropy and relaxation, called the Adam-Gibbs relation, is obeyed independently of spatial dimensionality. A new method has been employed to analyze void space in particle packings, which has been applied to the study of jamming in hard sphere packings.

Research interest encompasses a broad spectrum of condensed matter phenomena including excitation characteristics, low-temperature thermodynamics and dynamical behavior of a range of quantum systems. The role of dark states in resonance energy transfer beyond Forster formulation have been explored. Current constraint method have been developed to understand transport phenomena in nanoscale systems. Novel electronic transport properties like negative differential conductance (NDC), spin filter, half-metallicty and high mobility are found in many molecular-, 1D- and 2D- systems. Kagome aniferromagnetic clusters with Dzyaloshinskii-Moriya interaction have been studied to understand the magnetic behavior.

Stregnth of γ-γ' interface in Ni-Al Superalloys: Ni-Al superlloys are used in turbine blades and vanes in the most advanced gas turbine engines. The availability of such superalloys led during past decades to a steady increase in the turbine entry temperatures and hence efficiency and the trend is expected to continue. These alloys typically consist of Ni-matrix (γ-phase) with precipitates of Ni3Al (γ'-phase) and the properties of the interface between these two are critical to mechanical behavior of Ni-based superalloys, while the γ' which is largely responsible for the elevated-temperature strength of the material and its incredible resistance to creep deformation. With Kaushlendra Kumar from DMRL, we have extensively studied the tensile and shear strength of γ-γ' interface through determination of cleavage and generalized stacking fault (at the interface) energies using first-principles density functional theory-based calculations. We

have also determined the tendency of segregation of additives like Mo and W to the interface and estimated their effects on the interface strength.

Modeling of dielectric properties of composites for Stealth application: With Alok Dixit of DMSRDE, we have developed a computer program that uses Green's function based approach of scattering theory to simulate propagation of electromagnetic waves in a heterogeneous (e.g. a composite) material. This method has been tested and benchmarked though simulation of simple structures where the exact answer is known. The main accomplishment is that the same technique can be used to simulate a meta-material as well as a photonic crystal. A manuscript on this work (method development) is being prepared for submission to Computational Materials Science. Subsequently, it will be used in design/ optimization of properties with proportion of filler and host materials to achieve desired performance for stealth applications. e.g. 20 dB in desired frequency region e.g. 2-18 GHz.

Graphene-like nano-materials: With KPSS Hembram (funded by DRDO project), we have carried out first-principles simulations to understand (a) buckling transition in graphene, (b) properties of B and N doped graphene in terms of ordering of B and N, (c) interaction of carbon dioxide with graphene-like BCN (d) properties of BN in graphene-like structure, (e) hydrogen storage capacity of bi-layer graphene, and (f) mechanical stability of metal hydrides relevant to hydrogen storage applications.

First-principles Ginzburg-Landau theory of ferroelectrics: With Anil Kumar, we developed a methodology that derives a generalized Landau theory of ferroelectrics, which can be used for both bulk and nano-scale materials.

Pnictide superconductors: We have shown in complement to Raman spectroscopic measurements in AK Sood's lab how the spin-phonon coupling in pnictide superconductors is very strong and gives rise to anomalies in Raman spectrum.

New programmes/schools/conferences

A large program written in Fortran90 to carry out normal mode analyses of a bulk condensed system was developed successfully.

CCMS funded programmes:

JNCASR/SISSA/IBM School on First Principles Simulations, November 29 – December 2, 2010, organized by Prof. Shobhana Narasimhan.

JNCASR-UCL Workshop on Multiscale modeling and simulations of materials, January 11-13, 2011, organized by Prof. Umesh V Waghmare.

Programmes with external funding from CCMS:

Hands-on School on First Principles Simulations, ICTP, Trieste, January 2011. (Prof. Shobhana Narasimhan, Co-Director)

I2CAM School and Conference on "Emergent Properties and Novel Behaviour at the Nanoscale", April 19-27, 2010. (Prof. Swapan K Pati, Convener).

Winter School on "Chemistry and Physics of Materials", December 6-10, 2010. (Prof. Swapan K Pati, Convener)

The Physics of Glasses: Relating Metallic Glasses to Molecular, Polymeric and Oxide Glasses", April 12 - July 9, 2010, KITP, Santa Barbara, USA. (Prof. Sastry, Co-Coordinator)

Research publications for the period April 2010 to March 2011: about 57 papers were published during April 1, 2010 to March 31, 2011.

Following are the members of CCMS:

Coordinator

Prof. Balasubramanian Sundaram

Members

Prof. Shobhana Narasimhan
Prof. Srikanth Sastry
Prof. Swapan K Pati
Prof. Umesh V 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(1) 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 trioctahedralsmectites, such as talc but with covalently linked organosilicates in place of inorganic silicates, with an approximate composition $R_8S_{i8}Mg_6O_{16}$ $(OH)_4$ (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 film incorporated with Ag and Au metal could be used as food packaging materials.

We have developed direct write methods 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, we have discovered magnetism in nanoparticles of otherwise nonmagnetic inorganic materials where the surface defects give rise to such unexpected magnetism. We have also shown that the surface ferromagnetism can be combined with ferroelectricity to give multiferroic properties.

Prof. Swapan Pati's research group has worked on a broad spectrum of condensed matter phenomena including excitation characteristics, low-temperature thermodynamics and dynamical behavior 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-metallicty and high mobility are found in many molecular-, 1D- and 2D- systems. Kagome aniferromagnetic clusters with Dzyaloshinskii-Moriya interaction have been studied to understand the magnetic behavior.

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

Computer Laboratory (CompLab)

During the financial year April 2010 – March 2011, the Computer Laboratory has undertaken many initiatives to upgrade and enhance the IT infrastructure at JNCASR as per international industries standard. The internet bandwidth has now been increased to 120Mbps (100Mbps from BSNL and 20Mbps from HCL) which will further be increased to 1.2 Gbps in the near future. The 1Gbps link from BSNL is tied with NKN (National Knowledge Network) of the Government of India – a part of this bandwidth (about 850Mbps) will be used for connecting the knowledge institutions across the country. The 20Mbps HCL-link is a radio-link which means that even a fibre-cut will not make much hurdle to connect to the entire world. Presently we have 1Gbps backbone in core switching and the entire campus network is cabled with CAT-6 and fiber-optical cables. All units of JNCASR have independent wireless internet connection. The users are free to use internet in their mobile devices in entire hostel as well as in few units inside the campus.

We have installed a new Email-solution which is supported by Deeproot Linux via two web interfaces. Two Email-servers (16 core) are configured with active-active load balancing and are connected to the Netapp storage via SFC port for fast convergence. During this year, we have procured and implemented a new Netapp-2040 Storage and Backup system for all major servers in JNCASR. Our storage and backup system runs on SAS HDD, SATA HDD and a Tape library. Our data are stored in a highly secured environment. Our Fortigate Firewall and Analyser provide security to our network from outer threat. Presently we are in a position to handle security challenges for the World Wide Web. All Windows-based servers and desktop at JNCASR are secured with the Kaspersky Antivirus. Complab's desktops have been upgraded to latest hardware (Intel Core i5 with 4GB DDR3 and 2TB HDD) and software (Microsoft Windows Server 2008 R2 SP1). Users can safely browse and can take printout with two high-end XEROX colour and black and white printers. JNCASR users use latest OS like Microsoft Windows 7 Professional and latest softwares like Microsoft Office 2010 and Adobe Acrobat X.

The following are the members of the CompLab:

Head
Meheboob Alam PhD

R & D Assistants
B Madhushree, Vishnu Pradeep

Consultants
Vikas Mohan Bajpai, Ripon Medhi

Engineer (Facility Management from Locuz)
Ashish Purna

Library

The Library presently has a collection of 8498 books and access to over 4000 Scientific Journals. The Library continued to acquire, organize and disseminate information resources to render need based information services to faculty, students and researchers.

Collection Development

Overview of Collection

Books	
Books added during the financial Year	451
Total books in collection	8,498
Journals	
Online journals subscribed	127
Print journals subscribed	4
Patent database (Derwent Patent Index)	1
Abstracting and Indexing database (Web of Science)	Web of Science, SciFinder
Online journals in collection (Subscription + consortium resources)	Over 4000

Books Acquisition and Budget spent

In the financial year 2010-11, 451 books worth Rs. 19,53,011 (Rupees Nineteen lakhs fifty three thousand and eleven only) have been procured in the library based on the recommendations of JNCASR Faculty members. With the procurement of books for the financial year, the total books in stock has reached 8,498 (Eight thousand four hundred and ninety eight).

Journal Subscription and Budget

The total amount spent for the subscription of both print and online journals for the year 2010-11 is Rs. 1,23,30,278 (Rupees One Crore Twenty Three Lakh Thirty Thousand Two Hundred Seventy Eight only).

Document Delivery Service (DDS)

323 DDS requests have been successfully fulfilled during the year 2010-11 on requests received from faculty and students. The journal articles have been procured from libraries across the country and abroad.

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

D S Kothari Chair

M M Sharma — F R S, F A Sc, F N A

Hindustan Lever Chair

T V Ramakrishnan — F A Sc, F N A, F T W A S

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), 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, MS (by research) and MS Engg.(by research) degree programmes in Science and Engineering. Students are admitted to the six Units mentioned above. The minimum academic qualification required to apply for the MS/Ph.D programmes of the Centre is MSc/BE/BTech/ME/MTech/MBBS degree/s. Candidates applying for MS/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 examinations, recommendation from referees and performance in the interview. The selected candidates are offered course work, provided with research facilities and on successful completion offered with the degree.

Research Admissions

47 and 22 students were selected in the MS/Ph D programme in August 2010 and January 2011 sessions, respectively. With this the present student strength has reached to 217.

Degrees Awarded

The Centre is a Deemed University, and awards Ph.D, M.S (by research), M.S (in Chemical Sciences) and M.S (Engg. by research) degrees. Following are the students who have been awarded degrees during April 2010- March 2011:

M.S (in Materials Science) as part of the Integrated Ph.D Programme in Materials Science

Ms Ritu Gupta
Mr Nitesh Kumar
Mr Piyush Kumar Chaturbedy
Ms Urmimala Maitra
Mr Bivas Saha
Ms Vini Gautam
Mr Soumik Siddhanta
Mr Abhay Kumar Tiwari
Ms Nisha Mariam Mammen

M.S (Engg.by research)

Mr Rahul Bale
Mr Konduri Aditya
Mr Vivek N Prakash
Ms Gayatri Das

Ph D

Mr Arun N
Ms Rinki Ratna Priya
Mr Subhra Prakash Chakrabarty
Mr Srikanth Gadad
Ms Jayasha Shandilya
Ms Gayatri G
Mr Shibu Saw
Mr Venkatesh Prasanna Kashi
Ms Archana N
Ms Gomathi A
Mr Gopal Krushna Pradhan
Mr Anil Kumar
Mr S Venkataprasad Bhat
Ms Ruthrotha Selvi VB Vikru
Mr Jyothi Ranjan Sahu
Mr KM Satish
Mr Rakesh V
Mr B Vinay

Discussion Meetings/Workshops

1. *International conference and school under ICAM-I2CAM on Emergent properties and novel behaviour at the nanoscale,* April 19-27, 2010, Prof Swapan K Pati and Prof Umesh V Waghmare, JNCASR.
2. *Lecture workshop on nano science and nano technology,* April 28-30, 2010, Prof Umesh V Waghmare, JNCASR.
3. *School and Conference on "Emergent Properties and Novel Behavior at the Nanoscale"*, April 19-27, 2010.
4. *Science Outreach Programme in Eastern Uthar Khand,* May 4-9, 2010, Convener: Prof K S Valdiya.
5. *Advances in Magnetism: Phenomena and Materials* at Manali, June 3-5, 2010, Convener: Prof. A. Sundaresan (JNCASR).
6. *Nucleation Aggregation and Growth,* July 26-August 8, 2010, Convener: Prof. Srikanth Sastry (JNCASR).
7. *Hematological Malignancies Meeting,* August 2, 2010, Convener: Prof. Tapas Kumar Kundu.
8. *International Symposium on Nanotechnology – Present and Future Trends* – INSYN-2010, August 25-26, 2010, Convener: Prof J P Raina, VIT, Vellore.
9. *Workshop on Basics of Nanomaterials & Applications in Energy Conversion,* August 20-21, 2010, Convener: Prof G U Kulkarni.
10. *6th Kannada Vignana Sammelana,* September 15-17, 2010, Convener: Prof. K.I. Vasu, Swadeshi Vijnana Andolana, Bangalore.
11. *EUCLOCK & Indo Europe Chronobiology Meetings,* October 2-9, 2010, Convener: Prof V K Sharma, JNCASR.
12. *JNCASR-FCBS Annual Workshop for Post-graduate students and teachers in Chemistry,* October 25-27, 2010, Convenor: Prof. M.V. George, NIIST, Trivandrum.
13. *JNCASR Research Conference,* Alleppey, Kerala, October 2-5, 2010.
14. *Winter School on "Chemistry and Physics of Materials"* with University of Cambridge, UK, December 6-10, 2010.
15. *National Symposium on Frontiers Main Group & Organometallic Chemistry (NSFMOC),* November 20, 2010, Prof. A.G. Samuelson, IISc.
16. *Frontiers in Inorganic Chemistry (FIC-2010),* December 11-13, 2010, Prof. Sreebrata Goswami, IACS.
17. *3rd meeting of the Asian Forum of Chromosome & Chromatin Biology,* December 4-6, 2010, Prof. Tapas Kumar Kundu, JNCASR.
18. *International Conference on Quantum Effects in Solids of Today (I-Con QUEST-2010),* December 20-23, Prof. R.C. Bhudhani, IITK.
19. *JNCASR/SISSA/IBM School on First Principles Simulations,* December 29, 2010 – January 2, 2011, Prof. Shobhana Narasimhan, JNCASR.
20. *AIM Network Meeting, January 2011,* Prof. Rama Govindarajan, JNCASR.
21. JNCASR-UCL Workshop on Multiscale Modelling and Simulations of Materials, January 11-13, 2010, Prof. Umesh V. Waghmare, JNCASR
22. *Discussion on Ferroelectric and Piezoelectric Materials,* Dr. Dr. Joseph T. Evans , Jr. President of M/S Radiant Technologies Inc., USA on 20-01-2011.
23. *International Womens Day,* March 8, 2011, Mrs. Padma Vasudevan, IISc
24. *Winter School,* December 6 -10, 2010.
25. *DST Nano School,* January 18- 22 2011.
26. *MBGU Symposium: Prof. Xiankai Sun,* Prof. Matthew A. Lewis, Prof. Kevin M. Bennett, Prof. Vikram D. Kodibagkar February 15, 2011.

Colloquia

The following special lecture under the series JNCASR Colloquia were held during the period:

The following colloquia were held during the period:

1. *Turbulence in Rayleigh-Benardc convection,* Dr. Mahendra K. Verma, Dept. of Physics, I. I. T. Kanpur, April 01, 2010.
2. *Constructing Earth-like dynamo models,* Dr. Binod Sreenivasan, Assistant Professor, Mechanical Engineering Department, IIT Kanpur, June 8, 2010.
3. Geometry and Kinematics of the Fold-Thrust Belt and Structural Evolution of the Major Himalayan Fault zones in the Darjeeling "Sikkim Himalaya", Dr. Kathakali Bhattacharyya, Department of Earth and Environmental Sciences, University of Rochester, July 28, 2010.
4. *Global instability computations of separated flows,* Prof. Jitesh S.B. Gajjar, School of Mathematics, The University of Manchester, Alan Turing Building, Manchester M13 9PL,U.K, August 20, 2010.
5. *Chemical Heterogeneities and Microstructure,* Dr. Arvind Kumar, Ecole des Mines de Nancy, France, August 25, 2010.
6. *Two-dimensional Instabilities in Fluidised Beds,* Prof. Yuri Dumaresq Sobral, Departamento de Matematica, Instituto de Ciencias Exatas, Universidade de Braslia, Campus Universitario Darcy Ribeiro, 70910-900 Braslia - DF, Brazil, August, 26, 2010.
7. *Plasticity: A discrete dislocation dynamics perspective,* Dr. Guruprasad, P J, Centre des Mat´eriaux, Ecole des Mines de Paris (Mines Paris Tech), Paris, September 02, 2010.
8. Introduction to Methodologies and Challenges in Engineering Optimization, Dr. A. Deshpande, October, 13, 2010.
9. *Subgrid modeling: gaining insights from the subgrid conservation equations,* Dr. Sanjiv Ramachandran, Postdoctoral research associate, University of Massachusetts, Dartmouth, USA, USA, January 5, 2011.

ENDOWMENT LECTURES

1. **A V Rama Rao Foundation Lectures in Chemistry:** *Advances in the Strategies of Gene Transfection*, Prof. Santanu Bhattacharya, IISc, Bangalore; and **Prize Lecture**: *A Building Block Approach to Porous Solids*, Prof. R Murugavel, IIT Bombay, Mumbai, May 5, 2010.
2. **Prof. V. Ramalingaswami Memorial Lecture,** *The challenge of chronic non-communicable diseases in India needs an inter-disciplinary response*, Prof. K. Srinath Reddy, President, PHFI, New Delhi, July 13, 2010.
3. **CNR Rao Oration Award Lecture,** *Olfactory Receptor Mediated Nocturnal Male Sex Drive in Drosophila*, Prof. Vijay Kumar Sharma, EOBU, JNCASR, August 9, 2010.
4. **ISRO-Satish Dhawan Lecture:** *Two Cultures Revisited: Reflections on the Environment Growth Debate*, Mr Jairam Ramesh, Hon'ble Union Minister of State for Environment and Forests, September 28, 2010.
5. **DAE-Raja Ramanna Lectures in Physics**: *Strongly Correlated Superconductivity in Rh17 S15*, Prof S Ramakrishnan, TIFR, Mumbai; and **Prize lecture:** *The Flavours of Synchrony in the Natural World*, Prof Ramakrishna Ramaswamy, JNU, New Delhi, September 30, 2010.
6. **Michael Faraday Lecture**: *Personalized Energy for 1 (X 6 Billion)*, Prof. Dan Nocera, The Henry Dreyfus Professor of Energy & Prof. of Chemistry, Massachusetts Institute of Technology, Cambridge, March 21st, 2011
7. Reflections on the book "*Climbing the Limitless Ladder: A life in chemistry*", Prof. C.N.R. Rao, Linus Pauling Research Professor, JNCASR, July 30, 2010.

GENERAL LECTURES

Guest Lectures

1. *Basics of Linkage Analyses; Basics of Quantitative Trait Locus Mapping*, April 13, 2010.
2. *Challenges in analyzing genome-wide case-control data; Family-based Tests of Association*, Dr. Saurabh Ghosh, Human Genetics Unit, Indian Statistical Institute, Kolkata, April 14, 2010.
3. *A Stretch-activated ion channel in Plasmodia*, Dr. Kempaiah Rayavara, NIH, USA, June 16, 2010.
4. *Development of novel therapeutic strategies for HIV and Cancer by understanding the role of INI1/hSNF5*, Prof. Ganjam V. Kalpana, Professor, Department of Genetics, Professor, Department of Microbiology & Immunology, Mark Trauner Faculty Scholar in Neuro-oncology, July 12, 2010.
5. *Anti-HIV RNA aptamers for use in hematopoietic stem cell therapy*, Prof. Vinayaka R. Prasad, Professor, Department of Microbiology and Immunology Director, AIDS International Training and Research Program Member, Einstein Global Health Center Steering Committee Albert Einstein College of Medicine, July 13, 2010.
6. *Patent Risk Analysis*, Dr. Kalyan C. Kankanala, Chief Knowledge Officer and Co-Founder, BrainLeague IP Services, December 13, 2010.
7. *IP Valuation*, Ms. Anjana Vivek, Founder, VentureBean Consulting, November 9, 2010.

Seminars

1. *Torsional electromechanics of carbon and inorganic nanotubes*, Dr. Nagapriya Kavoori Sethumadhava, Weizmann Institute of Science, Rehovot,Israel, April 6, 2010.
2. *Synthesis and structure property relations in rare- earth based intermetallic compounds*, Dr. Sebastian C. Peter, Department of Chemistry, Northwestern University, April 9, 2010.
3. *Mechanistic insights to DNA ligases through biochemical and structural studies*, Dr. Pravin A. Nair, Molecular Biology Program, Sloan-Kettering Institute, New York, USA, April 12, 2010.
4. *Autophagy in organelle degradation and unconventional secretion*, Dr. Ravi Manjithaya, Postdoctoral Fellow, University of California, San Diego, April 15, 2010.
5. *Force-induced melting of constrained DNA*, Prof. Sanjay Kumar, Banaras Hindu University, Banaras, April 20, 2010.
6. *Identifying cellular signals in CNS disorders using complex culture paradigms*, Dr. Prithi Rajan, Christian Medical College, Vellore, April 23, 2010.
7. *1-dimensional nanostructures: vapor-liquid-solid process mediated growth and possible applications*, Dr. Soumitra Kar, NanoScience Technology Center, University of Central Florida, Orlando, Florida, USA, May 6, 2010.
8. *Physical Chemistry and Applied Spectroscopy*, Dr. Ranjani Viswanatha, Los Alamos National Laboratory, Los Alamos, NM, USA, May 12, 2010.
9. *Demonstration experiments in chemical engineering*, Prof. K. Kesava Rao, Department of Chemical Eng., IISc, Bangalore, May 26, 2010.
10. *A Stretch-activated ion channel in Plasmodia*, Dr. Kempaiah Rayavara, NIH, USA, June 16, 2010.
11. *Time Resolved Gene Expression and Regulation of Transcription*, Dr. Xavier Darzacq, Functional Imaging of Transcription, Institut de Biologie se l'Ecole Normale Superieure, Paris, France, June 17, 2010.
12. *Anistropic Growth and High Performance Organic Field Effect Transistor (OFET)*, Prof. Subhasis Ghosh, School of Physical Sciences, Jawaharlal Nehru University, New Delhi, June 11, 2010.
13. *Conservation of Asian elephants in Sri Lanka*, Dr. Prithiviraj Fernando, JNCASR, Bangalore, June 18, 2010.
14. *Shock propagation in granular media*, Prof. Purusattam Ray, Professor, Institute of Mathematical Sciences, Chennai, June 29, 2010.

15. *The eukaryotic genome is remarkably stable in vegetative growth and meiosis*, Dr. K.T. Nishant, Dept. Molecular Biology & Genetics, Cornell University, Ithaca, NY, July 15, 2010.
16. *The eukaryotic genome is remarkably stable in vegetative growth and meiosis*, Dr. K.T. Nishant, Dept. of Molecular Biology and Genetics, Cornell University, Ithaca, New York, July 15, 2010.
17. *Behaviour and evolution of larval and adult Drosophila in wild populations*, Dr. RaA Godoy-Herrera, Department of Cellular Biology and Genetics, University of Chile, Santiago, Chile, July 28, 2010.
18. *TSU In-house Symposium,* JNCASR, Bangalore, August 09, 2010.
19. *Coordinating DNA replication by means of priming loop and differential synthesis rate*, Dr. Manjula Pandey, Dept. of Biochemistry, University of Medicine and Dentistry of New Jersey-Robert Wood Johnson Medical School, Piscataway, NJ, USA, August 10, 2010.
20. *Coordinating DNA replication by means of priming loop and differential synthesis rate*, Dr. Manjula Pandey, Prof, Dept. of Biochemistry, University of Medicine and Dentistry of New Jersey-Robert Wood Johnson Medical School, Piscataway, New Jersey 08854, USA, August 10, 2010.
21. *What happens when a bee stings? Insight into the action of antimicrobial peptides*, Dr. Durba Sengupta, University of Groningen, August 11, 2010.
22. *Self Assembled Nanomaterials and Their Applications in Materials and Medicine*, Dr. Praveen Kumar Vemula, Harvard-MIT Division of Health Sciences and Technology, Harvard Medical School, September 06, 2010.
23. *Bulk Fe16N2 and its Magnetic Properties and (2) Metal Organic Frameworks and Their Hydrogen Storage Properties*, Dr. S. G. Sankar, Advacned Materials Corporation, Pittsburgh, USA, September 9, 2010.
24. *Manipulation and Characterization at Nanoscale*, Dr. Stephan Kleindiek, Kleindiek Nanotechnik, Germany, September 20, 2010.
25. *Chemistry, Energy and Climate Change*, Dr. Richard Pike, Royal Society of Chemistry, London, September 21, 2010.
26. *Fermionic Many Body Physics Across Broad and Narrow Feshbach Resonances*, Professor. Vijay B. Shenoy, Centre for Condensed Matter Theory, Department of Physics, Indian Institute of Science, Bangalore, September 21, 2010.
27. *Non-coding RNA's & RNA Binding Proteins: Implications of their Individual and Mutual roles in Regulation of Gene Expression*, Dr. Srikanta Goswami, Department of Dermatology Research, Madison, WI, 53706, USA, September 21, 2010.
28. *DNA replication and translation in the apicoplast: searching potential drug targets in Plasmodium*, Dr. Saman Habib, Scientist, Division of Molecular and Structural Biology Central Drug Research Institute, Lucknow, September 23, 2010.
29. *T.Cadherin mediated cell signaling: implications in metabolic disorders*, Dr. Manjunath B Joshi, Dept. of Biomedicine, Switzerland, September 27, 2010.
30. *Structure-Property Relationship in Polymer and Biological Systems*, Dr. Balaji Iyer, Postdoctoral Fellow, NanoEngineering, UCSD, September 28, 2010.
31. *Signaling the glycoshield in Candida albicans*, Prof. Joachim F. Ernst, Institut fur Mikrobiologie, Molekulare Mykologie, Heinrich-Heine-Universitat Dusseldorf, Universitatsstr, Germany, September 29, 2010
32. *Small: Micro and Nano*, Dr. Dinesh Jegadeesan, Post Doc, University of Toronto, September 29, 2010.
33. *Carbon Nanotubes and Graphene Nanostructures for Energy Conversion*, Prof. Prashant V. Kamat, Department of Chemistry and Biochemistry and Radiation Laboratory, University of Notre Dame, Notre Dame, October 05, 2010.
34. *Microscopic modeling*, Dr. Bhaskaran Muralidharan, Nano-engineering, MIT, October 5, 2010.
35. *Publish or Perish*, Prof. Prashant V Kamat, Deputy Editor, Journal of Physical Chemistry Letters, October 5, 2010.

36. *Strained Endotaxial Nanostructures with High Thermoelectric Figure of Merit*, Dr. Kanishka Biswas, Department of Chemistry, Northwestern University, Evanston, Illinois 60208, USA, October 6, 2010.

37. *Fluctuation relations for systems driven far away from equilibrium*, Dr. Punyabrata Pradhan, Institut für Theoretische Physik, Universität Stuttgart, Stuttgart, Germany, October 7, 2010.

38. I*nterfaces and Patterns in Functionalized Graphene*, Dr. Abhishek K. Singh, Assistant Professor, Materials Research Centre, Indian Institute of Science, Bangalore, October 19, 2010.

39. *Nanion Technologies: Smart tools for ion channel research*, Dr. Alison Haythornthwaite, Munich, Germany, October 22, 2010.

40. *Introduction to Research at NIMS*, Prof. Sukekatsu Ushioda, President, National Institute for Materials Science (NIMS), Japan, November 2, 2010.

41. *Prof. Christoph Schneider*, Institut of Organische Chemie, Universitt Leipzig, Johannisallee 29, D-04103 Leipzig, Germany, December 14, 2010.

42. *Imaging and spectroscopy of wet electron states on TiO2*, Prof. Geoff Thornton, London Centre for Nanotechnology and Chemistry Department, UCL, December 14, 2010.

43. *Advanced Electron Microscopy Study of Nanoscale Structures and Defects in Functional Materials*, Prof. Jiaqing He, Department of Chemistry, Northwestern University, December 16, 2010.

44. Prof. David Cahen, Weizmann Inst. of Science, Israel, December 20, 2010

45. *Fluctuations, Response*, Entropy and Temperature in Granular Packings, Professor Bulbul Chakraborty, Physics Department, Brandeis University, Waltham, December 21, 2010.

46. *Expanded Self-Similarity Works for Burgers Equation - and Why*, Uriel Frisch, December 23, 2010.

47. *Spin dynamics of a strongly interacting quantum dot coupled to ferromagnetic lead*, Dr. Sourin Das, Department of Physics and Astrophysics, University of Delhi, Delhi - 110 007, December 24, 2010.

48. *Retrieving Quantum Information Despite Decoherence*, Professor. Sushanta Dattagupta , Indian Institute of Science Education & Research Kolkata, Mohanpur Campus, West Bengal, December 28, 2010.

49. *How Can Cells Robustly Sense Their Microenvironment to Respond Correctly*, Professor Michael Sheetz, Columbia University, USA & Mechanobiology Institute, Singapore, December 29, 2010.

50. *Mechanosensing and control of bacterial pathogenesis*, Professor Linda Kenny, University of Illinois, USA & Mechanobiology Institute, Singapore, December 29, 2010.

51. *EMBO Lecture series*, January 7, 2011

52. *Retroelements in the brain: boon or bane?* Josep Mathew Anthony, Sunny Brook Health Sciences Center, Toronto, January 11, 2011.

53. Prof. Santhosh Kar, Jawaharlal Nehru University, New Delhi, January 13, 2011.

54. *Towards a cure for cancer*, Dr. Shiladitya Sengupta, Medicine and Health Sciences and Technology, Harvard Medical School, Brigham and Women's Hospital, USA, January 13, 2011.

55. *CTBP is a critical determinant of the Retinoic acid signaling pathway*, Dr. Prashanth Kumar B R, Dept of Molecular Carcinogenesis, Netherlands Cancer Institute, Amsterdam, January 27, 2011.

56. *Plasmodium Enolase: Attempts to Understand its Biological Functions*, Prof. Gotam K Jarori, Department of Biological Sciences, Tata Institute of Fundamental Research, Mumbai, January 31, 2011.

57. *Local probe investigation of spin transport and dynamics in organic semiconductors*, Dr. A. J. Drew, Queen Mary University of London, February 7, 2011.

58. *Electrochemical studies of conducting polymers and nanomaterials*, Snehangshu Patra, Weizmann Institute of Science, Rehovot, Israel, February 8, 2011.

59. *Modelling properties of protein-solvent systems*, Dr. Juergen Pleiss, Institute of Technical Biochemistry, University of Stuttgart, Germany, February 8, 2011.

60. *Nanotechnology: some aspects and application in biomedicine*, Dr. Supratim Giri, Post Doctoral Fellow, Institute of Biomaterials and Biomedical Engineering, University of Toronto, Canada, February 8, 2011.

61. *Beyond Oil and Gas, Prof. G. K. Surya Prakash*, Professor and George A. and Judith A. Olah Nobel Laureate Chair in Hydrocarbon Chemistry Director, Loker Hydrocarbon Research Institute and Department of Chemistry, University of Southern Cal, February 17, 2011.

62. *Epigenetic regulation of skeletal muscle differentiation*, Prof. Reshma Taneja , Department of Physiology, Yong Loo Lin School of Medicine, National University of Singapore, Singapore, February 18, 2011.

63. *Observations near Transitions in Combustion and Flow Phenomena*, Dr. T.M. Muruganandam, February 22, 2011.

64. *Frustration and Field Induced Neel order on the honeycomb lattice*, Dr. Arun Paramekanti, University of Toronto, February 22, 2011.

65. *DNA Demethylation during Zebrafish Development and Colon Cancer*, Dr. Kunal Rai , Dana-Farber Cancer Institute, Harvard University, Boston, MA, February 23, 2011.

66. *Discovery and functional analysis of a novel human epigenetic mark*, Dr. Chandrima Das, Dept. of Biochemistry & Molecular Biology, University of Texas MD Anderson Cancer Center, Houston, TX 77030, USA. March 1, 2011.

67. *Molecular simulation studies on gas-hydrates*, Prof Sudeep N Punnathanam, Assistant Professor, Dept. of Chemical Engineering, Indian Institute of Science, Bangalore – 560012, March 1, 2011.

68. *Exploring the Nano-Bio Interface with Molecular Dynamics Simulation*, Dr. Bob Johnson, Institute for Computational Molecular Science, Temple University, Philadelphia, USA, March 7, 2011.

69. *Probing Electrons and Phonons in Graphene by Resonance Raman Scattering*, Prof. Marcos A. Pimenta Departamento de Fisica, Universidade Federal de Minas Gerais (UFMG), Belo Horizonte, Brazil, March 7, 2011.

70. *Perfect Entanglement Transport in a Quantum Spin Chain System*, Dr. Sujit Sarkar, PoornaPrajna Institute of Scientific Research, Bangalore-5600 80, India, March 7, 2011.

71. *Tuning the Optical and Structural Properties of Organic Semiconductors*, Dr. Suchi Guha, University of Missouri, USA, March 9, 2011.

72. *Recent Developments in Organolanthaniide Chemistry*, Dr. Ajay Venugopal , Humboldt Research Fellow, Institute for Inorganic Chemistry - RWTH, Aachen, Germany, March 10, 2011.

73. *Tuning optical and structural properties of blue-emitting polymeric semiconductor and Triplet excitations in polymer devices*, Prof. Sushismita Guha, University of Missouri, USA, March 18, 2011.

74. Dr. Murali Gururajan, Dept. of Hematology/Oncology, Cedars-Sinai Medical Center, Los Angeles, California, USA, March 28, 2011.

75. *MicroRNAs: Role in human B cell differentiation and B cell derived diseases*, Dr. Murali Gururajan, Cedars-Sinai Medical Center, Los Angeles, USA, March 28, 2011.

76. *Dense granular flows: Correlation-response relations in a far-from-equilibrium system*, Professor. V Kumaran, Chemical Engineering Department, Indian Institute of Sciences, Bangalore-12, March 29, 2011.

EXTENSION ACTIVITIES

Extension Programmes

Summer Research Fellowships Programme

The Centre offers summer fellowships for two months to bright undergraduate and M.Sc students (renewable for a second year for selected students). This programme has proved to be popular and competitive; each year, about 4000 students from all over India apply for the 80- 100 fellowships awarded. The fellowships are supported by the Department of Science & Technology, Government of India; by the Rajiv Gandhi Institute for Contemporary Studies, New Delhi, and by the Centre. Students are placed under faculty at the Centre or with scientists elsewhere in India. They are paid travel expenses and a stipend of Rs. 6000.

Category	No. of applications Received (for 2011)	No. of Fellowships offered in 2011	No of fellowships offered in 2010	No of fellowships utilized in 2010
Life Sciences	916	20	24	21
Engineering Sciences	798	23	30	23
Atmospheric Sciences	160	-	03	03
Physical Sciences	878	16	20	11
Chemical Sciences	346	21	27	23
Mathematics	219	04	05	01
Materials Sciences	108	03	02	02
Total	**3425**	**87**	**108**	**82**

JNCASR-CCSTDS Fellowship

This Fellowship programme is jointly instituted by the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) Bangalore and the Centre for Co – operation in Science & Technology Among Developing Societies(CCSTDS), Chennai to encourage mobility of scientists from developing countries. CCSTDS 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.

The fellowship covers short – term research, training or participatory research work in physical, chemical, biological or engineering sciences in reputed scientific institutions in India including JNCASR. The applicant must be a scientist, teacher or a research scholar, affiliated to a scientific or academic institution in a developing country in Asia (other than India), Africa, Latin America and Arab region. Travel support in the form of a prepaid Ticket Advice (PTA) and fellowship is provided for selected candidates by JNCASR. The duration of the fellowship is for 3months. The fellowship covers boarding, lodging (for the individual only) at the affiliated institution and other subsistence expenses in the form of an adequate allowance in Indian currency provided by CICS, Chennai.

The first fellowship under this programme was announced during 2009-10 and of the five individuals, who were offered, three have utilized their fellowships and the rest have yet to join.

Fresh Fellowships have been offered for the year 2010-11.

List of Selected Candidates

Sl. No	Name of the awardee	Country	Host institution where the awardee is placed
1	Mr. Buddhika Dilhan Madurapperuma. A.A	Srilanka	
2	Mr. Md. Nabur Rahman	Bangladesh	Tezpur University, Assam
3	Dr. Dzoyen Jean Paul	Cameroon	Indian Institute of Integrative Medicine, Jammu
4	Mr. Oludele Banji Ogunrinala	Nigeria	Anna University, Chennai.
5	Mr. Kehinde Adewale Akinsinde	Nigeria	NICED, Kolkata
6	Dr. Olajuwan Bakai Ishola	Nigeria	IIT, Madras.
7	Dr. Karlygash Seytomarovna Absattarova	Kazakhstan	Indian Institute of Technology, Roorkee.
8	Dr. Nurbanu Kilishpekovna Akhmetzhanova	Kazakhstan	Indian Institute of Technology, Roorkee.

Project Oriented Chemical Education (POCE)

Advertisement for POCE-2011 was placed in nine newspapers and on the website of JNCASR. Ten students have been offered with fresh fellowships.

The POCE batches of 2009, 2010 and 2011 will be coming during May 2011 and work under faculty of CPMU, NCU, ICMS and TSU of the Centre. Students of 2009 and 2010 batches had undergone project training during their mid- semester break . The batch of 2009 will be receiving their Diploma certificates this summer on successful completion of their 3 year project training.

Project Oriented Biological Education (POBE)

Advertisement for POBE-2011 was placed in nine newspapers and on the website of JNCASR. Ten students have been offered with fresh fellowships.

The POBE batches of 2009, 2010 and 2011 will be coming during May 2011 and work under faculty of MBGU and EOBU of the Centre. Students from POBE 2009 will be receiving their Diploma certificates this summer on successful completion of their 3 year project training.

Visiting Fellowships – 2010-2011

For the year 2010-11, out of 15 applications received, 9 were selected from Physical Sciences category and 1 from Life Sciences category.

Sl. No	Name of the visiting fellow (Physical Sciences)	Guide's name
1.	Dr. Mane Vishwas Ganpatrao	Prof. C.N.R Rao
2.	Dr. Syed Khasim	Prof. K.S. Narayan
3	Dr. Vijay Kumar Lamba	Prof. Swapan K. Pati.
5	Dr. Satish Kumar Maruri	Prof. G.U. Kulkarni
6	Dr. Joy Mittra	Prof. Umesh V. Waghmare
7	Dr. K. Subaharan	Dr. M. Eswaramoorthy
8	Dr. Elankumar Kannan	Dr. A. Sundaresan
9	Dr. Anandavadivel	Prof. Umesh V. Waghmare

Sl. No	Name of the Visiting Fellow (Life Sciences)	Guide's Name
1.	Dr. Suvroma Gupta	Prof. TK Kumdu

National Science Day

Keeping in view that the year 2011 was declared as the International Year of Chemistry by the UN General Assembly; the Centre held a Chemistry Symposium during January 2011 which saw scientists from abroad as well from the Centre give a series of lectures on different topics related to Chemistry at our Centre. These lectures were followed by chemistry based programmes for students at Prof. CNR Rao Hall of Science.

This Chemistry Symposium was considered part of the National Science Day celebration which the Centre held on 24 February, 2011. On this day, the Centre organized series of lectures for students and teachers from different Navodaya schools of the state at Prof. CNR Rao Hall of Science. There was an overwhelming participation from the schools with teachers and students having an interactive session with the scientists after the lectures. Eminent educationist Prof. CNR Rao gave the introductory lecture followed by scientists from IISC and JNC.

New programmes launched

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

Large number of applications have been received and a committee has been constituted to select candidates for this programme.

Intellectual Property

The Centre fosters the spirit of IP generation and has inculcated IP culture into the academics without diluting its mission. It has an enabling mechanism for obtaining IPR and its commercialization.

The Intellectual Property Management Committee addresses all issues concerned with IP generation, valuation, protection and valorization. So far, 15 patents have been granted (India-6, USA-5, EPO-1, South Africa-2, Australia-1), registered 1 industrial design and holds copyright over a number of educational monographs and multimedia packages on interesting areas of science and technology.

Five patents were obtained during the current year of the total 87 applications filed (India-29, PCT-18, USA-22, EPO-9, Japan-3, South Africa-2, Australia-1, Brazil-1, Vietnam-1, China-1). Rests of the applications are under prosecution/examination. It has also received one registration certificate for an industrial design.

To date, Centre has licensed 7 inventions including 4 inventions during this year. A few of the inventions are at various stages of commercialisation. Negotiations are on with a number of companies (including Invention Capitalists) for licensing of the inventions.

The IPM Committee met several times and reviewed number of inventions generated by the faculty. Twenty one patent applications for 14 inventions were approved. Of these, 5 Indian Applications, 12 National Phase Applications (USA-7, Europe-3, Japan-2), and 4 International Patent Applications under PCT have been filed and are listed below:

Indian Patent Applications filed for the inventions of:

- Inventors: Tapas Kumar Kundu, Jayasha Shandilya, Parijat Senapati (No. 1758/CHE/2010, 23/6/2010)
- Inventors: Kavasssery Narayan Sureswaran, Gautam Vini, Bag Monojit (No. 1822/CHE/2010, 28/06/2010)
- Inventor: Thimmaiah Govindaraju (No. 1914/CHE/2010, 6/7/2010)
- Inventor: Udaykumar Ranga (No. 1973/CHE/2010, 12/7/2010)
- Inventors: Thimmaiah Govindaraju, Manjula Basavanna Avinash (No. 159/CHE/2011, 17/1/2011)

International Patent Applications under PCT

Optimal Wing Planforms for Reducing Wing Induced Drag of Aircraft Driven by Wing-Mounted Tractor Propellers

Inventors: Roddam Narasimha, Suresh Madhusudan Deshpande, Chandrashekarappa Praveen and Belur Raghavan Rakshith (No. PCT/IN2010/000448, 5/7/2010)

Artificial Retina Device

Inventors: Kavasssery Narayan Sureswaran, Gautam Vini, Bag Monojit (No. PCT/IB2010/0002170, 2/9/2010)

Inhibition of Histone Acetyltransferases by CTK7A And Methods Thereof

Inventors: Tapas Kumar Kundu, Mohammed Arif, Kempegowda Mantelingu, Gopinath Kodaganur Srinivasachar (No. PCT/IB2010/053998, 6/9/2010)

A Synthetic Cyclic Dipeptide And A Process Thereof
Inventor: Thimmaiah Govindaraju (No. PCT/IB2010/054533, 7/10/2010)

USA Patent Applications

Intrinsically Fluorescent Carbon Nanospheres And A Process Thereof
Inventors: Tapas Kumar Kundu, MUTHUSAMY Eswaramoorthy, Bharathavikru Ruthrotha Selvi, Dinesh Jagadeesan (No. 12/681,596, 2/4/2010)

Nanoparticles Composition And A Process Thereof
Inventor: Chandrabhas Narayana (No. 12/739,395, 22/4/ 2010)

A Template Free Metal, Polymer Free Metal Nanosponge and a Process Thereof
Inventors: Muthusamy Eswarmoorthy, Katla Saikrishna (No. 12/935,129, 28/9/2010)

Formation of Palladium Sulfide
Inventors: Giridhar UdapiRao Kulkarni, Boya Radha (No. 12/881,700, 14/9/2010)

Site-Specific Inhibitors of Histone Methyltransferase (Hmtase) and Process of Preparation Thereof
Inventors: Tapas Kumar Kundu, Bharathavikru Ruthrotha Selvi, Annavarapu Hari Kishore, Kempegowda Mantelingu (No. 12/905,927, 15/10/2010)

Tat DNA Sequences, Gene Constructs, Vaccine And Processes Thereof
Inventor: Udaykumar Ranga
No. 12/988,341, 18/10/2010

Polynucleotide Sequences And Processes Thereof
Inventors: Kaustuv Sanyal, Sreedevi Padmanabhan, Jitendra Thakur
No. 13/061,937, 2/3/2011

European Patent Organisation Applications

Intrinsically Fluorescent Carbon Nanospheres And A Process Thereof
Inventors: Tapas Kumar Kundu, MUTHUSAMY Eswaramoorthy, Bharathavikru Ruthrotha Selvi, Dinesh Jagadeesan
No. 08836300.7, 21/4/2010

Tat DNA Sequences, Gene Constructs, Vaccine And Processes Thereof
Inventors: Udaykumar Ranga
No. 09 746 294.9, 18/10/2010

A Template Free Metal, Polymer Free Metal Nanosponge And A Process Thereof
Inventors: Eswarmoorthy Muthusamy, Saikrishna Katla
No. 09746288.1, 2/11/2010

Japan Applications

Tat DNA Sequences, Gene Constructs, Vaccine And Processes Thereof
Inventors: Udaykumar Ranga; No. 2011-509084, 14/10/2010

A Template Free Metal, Polymer Free Metal Nanosponge And A Process Thereof
Inventors: Eswarmoorthy Muthusamy, Saikrishna Katla; No. 2011-508052, 16/12/2010

Patents Granted for the following inventions

Derivatives Of 4,6-Disubstituted 1,2,4-Triazolo-1,3,4-Thiadiazole, A Process and Uses Thereof
Inventors: Tapas Kumar Kundu, Kanchugarakoppal Subbegowda Rangappa, Badi Sri Sailaja, Radhika Ashish Varier, Nanjundawamy Shivananju, Basappa
Applicants: JNCASR and University of Mysore
India: Patent No. 245033, 29/12/2010

Highly Specific Polyclonal Antibodies of Individual Core Histone And Uses Thereof
Inventors: Tapas Kumar Kundu, Febitha Kandan Kulangara, Radhika Ashish Varier, Chandrima Das

India: Patent No. 239873, 6/4/2010
Modulators (Inhibitors/Activators) of Histone Acetyltransferases
Inventors: Tapas Kumar Kundu, Karanam Balasubramanyam, Venkatesh Swaminathan

USA: Patent No. 7,750,047, 6/7/2010
Site-Specific Inhibitors of Histone Methyltransferase (HMtase) and Process of Preparation Thereof
Inventors: Tapas Kumar Kundu, Bharathavikru Ruthrotha Selvi, Annavarapu Hari Kishore, Kempegowda Mantelingu

USA: Patent No. 7,875,741, 25/1/2011
A High Sensitivity Assay for Molecular Typing of Biological Sample, Probes and a Kit Thereof
Inventors: Udaykumar Ranga, Narayana Chandrabhas, Narayana Jayasuryan

Republic of South Africa: No. 2009/03128, 28/4/2010
Industrial Design Registration
Wings for Propeller Driven Aircraft
Inventors: Roddam Narasimha, Suresh Madhusudan Deshpande, Chandrashekarappa Praveen and Belur Raghavan Rakshith

Registration Certificate No. 223622, 29/4/2010

Intellectual Property Rights Lectures organized at the Centre:

1. *Intellectual Property Valuation* by Ms. Anjana Vivek, Founder, M/s. VentureBean Consulting, Bangalore on September 9, 2010.
2. *Patent Risk Analysis* by Dr. Kalyan C Kankanala, Chief Knowledge Officer and Co-Founder of M/s. Brain League IP Services Pvt Ltd., Bangalore on December 13, 2010.

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:

- Nanomaterials, nanofabrication, molecular crystals
- Raman and brillouin spectroscopy in the study of materials
- Chemistry of materials
- Organic electronics & optoelectronics, device-physics & photophysics, solution processing & patterning, soft matter & hard properties, biophotonics
- Molecular modelling of materials
- Nanomaterials and catalysis
- Magnetism, superconductivity and multiferroicity
- Surface science, heteroepitaxy and nanostructures
- Self-assembled molecular materials: metal-organic coordination networks (mocns)
- Granular matter and other complex fluids
- Complex fluids and flows
- Minimal molecular dynamics
- Fluid mechanics and heat transfer
- Computational fluid dynamics
- Evolutionary genetics and population ecology
- Circadian rhythms
- Neuronal circuits in fruitflies
- Large mammal behaviour and phylogeography
- Neotectonics and environjment geology
- Soft materials
- Materials of the future
- Organic materials and organo catalysis
- Physics and chemistry of nanomaterials
- Exciting new chemistry
- Organic synthesis, peptide and protein chemistry & bionanotechnology (biomaterials)
- Antimicrobial research laboratory
- Functional organic and supramolecular materials
- Designing new ways to 'small molecule heterocyclic scaffolds'
- Inorganic chemistry, solid state chemistry
- Synthesis of nano materials and applications
- Molecular mechanisms of human genetic disorders
- Chromatin biology and genomics
- Mechanisms underlying host-pathogen interactions in malaria
- Protein engineering and molecular parasitology
- Molecular, genetic and developmental analysis of the cardiovascular system
- HIV
- Transcription regulation and chromatin dynamics; implications in disease and potential therapeutics
- Autophagy and related pathways

- Mechanism of chromosome segregation: a molecular approach
- Novel physics and chemistry at the nanoscale
- Non-commutative probability and geometry: mathematics of quantum mechanics
- Advanced quantum theory: moleculs to materials
- Phase transformations and dynamics in soft condensed matter and biological systems
- Addressing materials challenges of the future
- Correlated electron systems and organic electronics
- Statistial physics of equilibrium and nonequilibrium condensed-matter systems
- Nonequilibrium statistical physics of complex systems
- Electronic structure, especially strongly correlated electron systems
- Equilibrium and non-equilibrium statistical mechanics of soft condensed matter and other complex systems

Research Facilities

1 Drosophila activity monitors
2 X Ray photon electron spectrometer for chemical analysis of synthetic materials
3 NET APP disk based backup system
4 Digital mono cool camera for imaging quantification of drosophila tissues and fl. Tagged antibodies
5 Energy dispenser Xray Micro analysis system with LN2 free and flash detector
6 Leica Trinocular microscope for bacterial and virus work
7 Hall measurement system for electrical measurement of nitride films grown by MBE
8 Versa doc 4000 MP for temporal reporter gene analysis
9 Volumeteric velocimetry particle image system with telecentric lenses
10 Air conditioning with clean air system
11 RFID Security system at Library
12 Laboratory furniture
13 HPC node clusters four sets
14 Clean air facility at Animal House
15 Unified storage facility at computer lab
16 Super micro workstation Tyrone Janus
17 Transmitted base illumination for existing SZX9 microscope
18 SDS Page Unit mini protean tetra cell
19 Julabo Immersion cooler
20 Spectra Max Luminescence micro plate reader
21 Millipore Q direct water purification system
22 Nikon Japan Inverted Research microscope
23 Huber K6MPC NR Refregerated bath circulator
24 Examina probe system for existing microscope
25 Co_2 Incubator
26 Spectrography system
27 DC Magnetometer MPMS SQUID Evercool dewar
28 EDS Quantax 200 for SEM LEICA 440isystem
29 MCO-5AC CO_2 incubator
30 LEICA DMIL Led Trinicular phase fluroscence microscope
31 Thin film measurement system

32 Direct heat air jacketed Co_2 incubator
33 Monochromator CPL UV900
34 Brushless DC servometer
35 Electrorheological cell
36 Drosophila Chambers DR36VL
37 Servers, additonal 2TB Storage
38 Savant integrated speedvac system
39 Residual gas analyzer
40 NBS benchtop refregerator incubator shaker
41 Gatan single tilt rotation N_2 cooling holder
42 TECAN Infinite 2-PRO Multi mode reader
43 TKA Water purificiation system
44 Glove box work station
45 Tellus Elephant GPS Collar & GSM download
46 Oriel Sol3 Class AAA Solar simulator
47 LDS Shaker
48 Mini Arc melter
49 Bioruptor Sonication device
50 Thermal gas analysis system
51 Semiconductor characterization system
52 Tensor 27 FTIR Spectrometer
53 Lambda UV/VIS Spectrometer
54 JASCO Dichroism spectrometer
55 Optima 7000 dual view ICP Spectrometer
56 Autolab Potentiostat Galvanometer
57 Computer gel documentation system
58 Ultraspec 2100 PRO classic system
59 Benchtop 4KZL Freezer dryer system

Sponsored Ongoing Research Projects

Sl.No.	Project Investigator	Project Name	Funding Agency	Duration
1	Prof. K. S. Narayan	Development of semi conducting polymer based devices for spatially resolved photocurrent	DAE	3 years
2	Prof. R. Narasimha	Research programme on flow instabilities	DRDO	3 years
3	Prof. G. U. Kulkarni	Post doctoral fellowship in Nano-Science and Technology	DST	5 years
4	Prof. Ranga Uday Kumar	Immunological and molecular characterization of HIV-1 Tat and long terminal repeat (LTR) cloned from Indian patient with and without dementia and/or opportunistic infection	ICMR	3 years
5	Prof.G.U.Kulkarni	Unit on Nano-Science & Technology-UNANST - DST	DST	3 years
6	Prof.Tapas Kumar Kundu	Chromatin modifications (Methylation, Acetylation, Deacetylation) - a new target for cancer therapy and diagnostics.	DBT	3 years
7	Prof. Namita Surolia	X-Ray Crystallographic Analysis of the Proteins involved in the Fatty Acid Biosynthesis of plasmodium falciparum	DBT	3 years
8	Prof.M.R.S.Rao	NMITLI project on "A prospective study to correlate gene signatures with clinical outcome of astrocytomas and identification of potential therapeutic target(s) under the New Millennium Indian Technology Leadership Initiative scheme"	CSIR	3 years
9	Prof. Maneesha S Inamdar & Dr. MM Panikar	Training and research facility for human embryonic stem and human embryonic carcinoma cells	DBT	3 years
10	Prof.Anuranjan Anand	Investigator Award to Prof.Anuranjan Anand. Project title "Whole Genome-based Studies to Identify Novel Molecular Genetic Pathways Causing Human Epilepsy Syndrome"	DAE	5 years
11	Prof. S.Bala-Subramanian	Centre for Computational Materials Science	DST	5 years
12	Prof. Namita Surolia	Genetic Manipulations and Apicoplast Targetting Studies with Plasmodium Type II FAS proteins	DBT	3 years
13	Prof. M.R.S.Rao	"J.C. Bose Fellowship to Prof.M.R.S. Rao, President, JNCASR"	DST	5 years
14	Prof. Ranga Uday Kumar	Delineating viral determinants of HAD using SCID mice	AECOM	2 Years
15	Prof. Ranga Uday Kumar	Design and characterization of stable folded fragments/derivatives of HIV env for use as Immunogens	DBT	3 years

Sl.No.	Project Investigator	Project Name	Funding Agency	Duration
16	Prof. Tapas Kumar Kundu	Structure function analysis of Tumor suppressor, p53 interacting proteins: structural basis of p53 activation	DBT	3 years
17	Dr. Kaustuv Sanyal	Characterization of an evolutionarily conserved kinetochore protein Mtwlp:A tool to analyse kinetochore structure of the human fungal pathogen candida albicans	CSIR	3 years
18	Prof. Namita Surolia	Development of triclosan for treating human malaria and inhibitors of fatty acid synthesis especially enoyI-ACP reeducates of as anti-malarial agents	DBT	2 years
19	Prof. Namita Surolia	Structure-activity relationship of Plasmodium falciparum B-Ketoacyl-ACP reductase (FabG0)	DST	3 years
20	Prof. K.B. Sinha	Bhatnagar Fellowship -2005 Award to Prof.K.B. Sinha "Quantum mechanics - a Mathematical tool to study non-equilibrium processes and dissipative systems in physical sciences, Geometry and information theory"	CSIR	5 years
21	Prof. G.U. Kulkarni & Prof.Timothy S. Fisher, Purdue University, USA	Indo-US joint networked R&D centre on "Nanomaterials for Energy"	IUSSTF	2 years
22	Prof. K.R.Srinivas	Investigation of Lift and Thrust in Asymmetric Fight"	DST	2½ years
23	Prof. Namita Surolia	Functional Genomics based approach to Novel anti-malarial targets and agents	ICMR	3 years
24	Prof. K.R. Sreenivas	Experimental studies on the generation of internal wakes by the motion of self propelled under water bodies in stratified water medium and their characteristics: Observations measurements with visualization techniques and optical probes	NPOL	1 year
25	Prof. S.M. Deshpande	NMITLY Project on "Mesoscale modeling for m monsoon related weather predictions - Phase II"	CSIR	2½ years
26	Prof. Shobhana Narasimhan	Self-organized nanostructures at surfaces	IFCPAR	3 years
27	Prof. S. Balasubramanian	"Swarnajayanthi Fellowship" award to Prof.S.Balasubramanian	DST	5 years
28	Prof. Swapan K. Pati	Opto-Electronic Properties of conducting Polymers	CSIR	3 years
29	Prof. S.M. Deshpande	Development of TKFMG solver and its application to flutter prediction in turbo machines	GTRE	2½ years
30	Prof.S. Balasubramanian	DST-DAAD (German Academic Exchange Service) joint research Project entitled "Computer Simulation of Ionic liquids"	DST	2 Years

Sl.No.	Project Investigator	Project Name	Funding Agency	Duration
31	Prof.K.R. Sreenivas	Design, development and establishment of experimental facility at NPOL for studies on internal wake and wave fields generated by self propelled bodies in stratified water medium	NPOL	1 year
32	Prof. Meheboob Alam	Contract to establish a partner group of the MPI-MM "Partner Group for Topography Formation"	MPI	2 Years
33	Prof. K.S.Narayan	Studies of organic FETs and 3-terminal structures for switching memory and imaging applications	DST	3 Years
34	Dr. Kaustuv Sanyal	Characterization of factors required for determining centromere identity using human pathogenic yeast candida albicans as a model system	DST	3 Years
35	Prof. Tapas Kumar Kundu & Dr. M. Eswaramoorthy	Cellular Interaction of Nanoparticles; Effect on epigenetics and thereby its role in gene expression: Implications from Drug delivery to diagnosis	DBT	3 Years
36	Dr.Tapas Kumar Maji	SERC fast track scheme " Microporous metal-organic coordination networks (MOCNs): Application towards H_2-Storage"	DST	3 years
37	Prof.Umesh V.Wagmare	Density functional theory calculations	P&G	1 Year
38	Prof. Swapan K. Pati	AOARD-08-4008	AOARD	1 Year
39	Prof. M.R.S.Rao	Chromatin Biology: Epigenomics of chromatin and chromatin remodelling during male germ cell differentiations and glioma progression	DBT	3 Years
40	Prof. Tapas Kumar Kundu	Structure-Function analysis of histone chaperones: Role in chromatin dynamics and transcriptional regulation	IFCPAR	3 years
41	Prof. K.R. Sreenivas	Lift Generation Mechanisms in Flapping Flight	AOARD	2 years
42	Dr. TNC Vidya	Ramanujan Fellowship to Dr.TNC Vidya, JNCASR	DST	5 years
43	Prof. Sundaresan (Dr. Y. Tanka,- Niais, Japan)	India-Japan co-operative programme (DST-JST) 2007 - joint Project entitled "Feasibility study on the application of multiple order parameters in materials to information processing.	DST- JST	3 years
44	Prof. K.B. Sinha	British Council Grant "Quantum probability, Noncommutative Geometry and Quantum information	LANCASTER	3 years
45	Prof. G.U. Kulkarni	ICPCNanoNet Coordination and support action	ICPCNN	2 years
46	Prof. Swapan K. Pati	Award of Swarnajayanthi Fellowship and the project to Dr. Swapan K. Pati, TSU, JNCASR	DST	5 years

Sl.No.	Project Investigator	Project Name	Funding Agency	Duration
47	Dr. Kaustuv Sanyal	Functional Analysis of Dynamic Kinetochore- Microtubule Interaction in the human Pathogen Candida albicans	DBT	3 years
48	Prof. S.M. Deshpande	Numerical simulation of multiscale supersonic flows with low dissipative shock capturing schemes	DST	2 years
49	Prof. Tapas Kumar Kundu	Bovine Mastitis: Unraveling molecular details of host microbe interaction and development of molecular diagnostic methods	ICAR	3 years
50	Dr. Sheeba Vasu	Award of Ramanujan Fellowship to Dr. Sheeba Vasu	DST	5 years
51	Prof.G.U. Kulkarni; Prof. Hemalatha Balalaram; Prof. M. Eswaramoorthy	Extended applications of Highly Sensitive Nanometal Raman substrates, Paper based Nano Silver/Gold SERS Substrates (Plain Substrates, Au/Ag metal sponge based SERS Substrates), Specialised Substrates Bio-Chip, Nano silver - Antibacterial Products	YNL	1 year
52	Dr. Santosh Ansumali	Award of Ramanujan Fellowship to Dr. Santosh Ansumali	DST	5 years
53	Prof.Umesh V. Waghmare	DAE-SRC Outstanding Research Investigator Award for R/P "Multi scale modeling and simulations of functional Materials	DAE	5 years
54	Prof. K.S. Narayan	DAE-SRC Outstanding Research Investigator Award for R/P "Electronic, optoelectronics and photonic properties in soft matter and device exploration	DAE	5 years
55	Prof. Meheboob Alam	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"	BARC	3 years 5 months
56	Prof. Namita Surolia	"Understanding pathogenesis of Malaira and strategies to treat it"	DBT	3 years
57	Prof.Swapan K Pati; Prof.Anna Painelli, Univ. Degli Studi, Italy	Indo-Italian research Project:"Designing Novel Photosystems for Enhanced charge Transfer efficiency: A detailed theoretical modeling"	DST	3 years
58	Prof.Swapan K. Pati & Vinayak P. Dravid, North-Western Univ., Il, Usa	Indo-US joint Research Centre of Excellence in "Advanced Materials Research"	IUSSTF	3 years
59	Prof. Tapas Kumar Kundu	Role of multifunction human histone chaperone NPMI in transcription and stress associated chromatin dynamics: Relevance in cancer manifestation	DBT	3 years

Sl.No.	Project Investigator	Project Name	Funding Agency	Duration
60	Prof. Umesh V. Waghmare	IBM Faculty Award 2009	IBM	1 year
61	Prof. G.U. Kulkarni	Indo-Italian Research Project: "Innovative catalytic patterns for nanowire growth"	DST	3 years
62	Prof. Srikanth Sastry	India-European Union Research Project "MONAMI Modeling of Nano-scaled Advanced Materials Intelligently"	DST	3 years
63	Prof. Maneesha S. Inamdar	Lineage specification and differentiation from single embryonic stem cells tracked by live cell imaging of reporter gene expression	DBT	3 years
64	Prof. Ranga Uday Kumar	Optimization of the performance of DNA vaccine by engineering molecular strategies: use of HIV-1 tat as model antigen	ICMR	3 years
65	Prof. Shobhana Narasimhan	Theoretical Investigation of Oxide Supported Metal Nanoparticle Catalysts	DST	3 years
66	Prof. Hemalatha Balaram	Examination of the metabolic fate of fumarate a TCA cycle intermediate in Plasmodium falciparum	DST	3 years
67	Prof. Maneesha S. Inamdar	Analysis of conserved functions of rudhira in development, homeostasis and lifespan	DBT	3 years
68	Prof. Hemalatha Balaram	Structure-function studies on Plasmodium falciparum and Methanococcus jannaschii guanosine monophospate (GMP) synthetase: enzymes with ammonia channels	DBT	3 years
69	Dr. TNC Vidya	Dominance Relationships in Female Asian Elephants	CSIR	3 years
70	Prof. Anuranjan Anand	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"	DBT	3 years
71	Prof. R. Narasimha	Optimization of wing for RTA-70	NAL	1 year
72	Prof. S.M. Shivaprasad; Prof.N.G. Galkin, IACP, FEB, RAS, Russia	Indo-Russian Project - "Physico technical basics of the creation of new silicon-metal nanostructures on vicinal silicon surfaces"	DST	2 years
73	Dr.TNC Vidya	MOU between JNCASR & WWF-Cambodia project entitled "Asian elephant molecular mark-recapture censusing in the Eastern Plain Landscape, Mondulkiri Province, Cambodia	WWF	1 year
74	Prof. H. Ila	INSA Senior Scientist	INSA	5 years
75	Dr. TNC Vidya	Dominance relationship in female Asian Elephants	NGS	1½ year

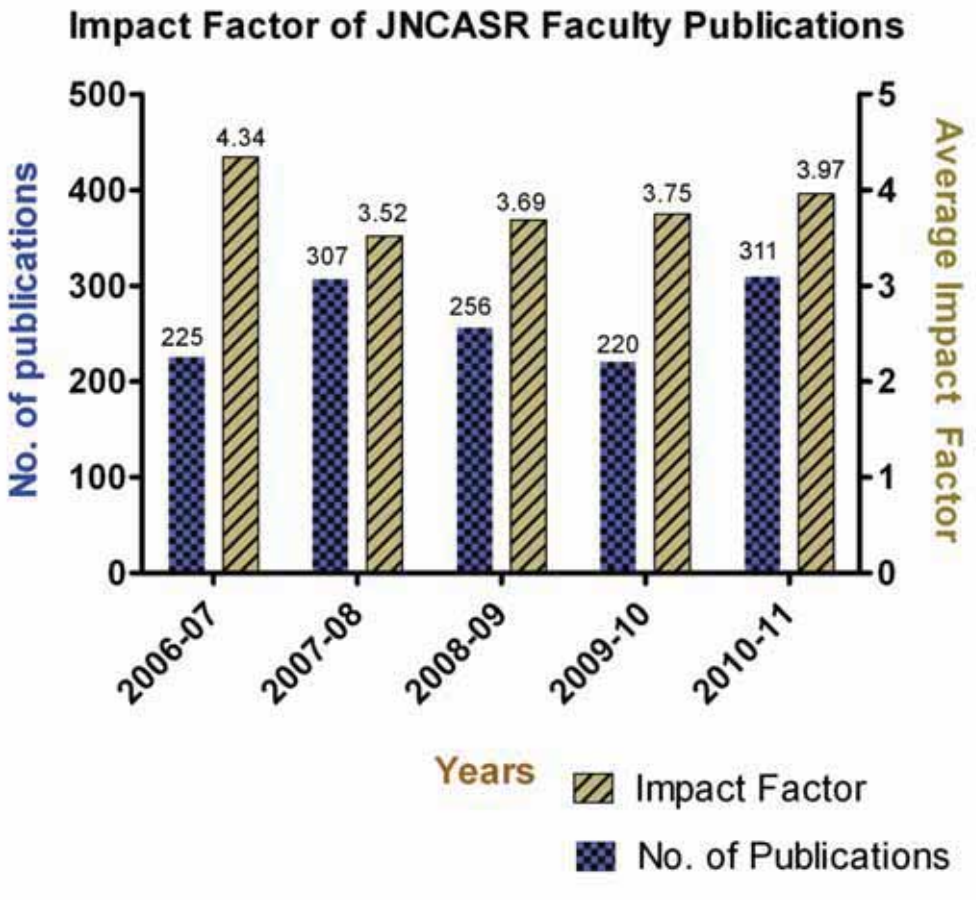
Sl.No.	Project Investigator	Project Name	Funding Agency	Duration
76	Prof. Ranga Uday Kumar	"Evaluation of molecular and immune status of the blood lymphocytes of subject who participated in the Siddha Clinical Trial CTRI/2008/091/000021" at JNCASR	DST	6 months
77	Dr. T.Govindaraju	Developing new synthetic routes for the preparation of unnatural amino acids and their use as metal (Bio-) sensors and chiral ligands in the asymmetric catalysis	DST	3 years
78	Dr. TNC Vidya	Dominance relationship in female Asian Elephants	NGS	1½ year
79	Prof. K.R. Srinivas	Design, development and establishment of experimental facility at NPOL for studies on internal wake and wave fields generated by self propelled bodies in stratified water medium	NPOL	1 year
80	Prof.K.R. Srinivas	Experimental studies on the generation of internal wakes by the motion of self propelled under water bodies in stratified water medium and their characteristics: Observations measurements with visualization techniques and optical probes	NPOL	1 year
81	Prof. Ranga Uday Kumar; Co-PI: Dr. Suniti Solomon Director, Yrgc For Aids Res. and Edu., Chennai	Evaluation of host immune responses to the Tat antigen of HIV-1 in the Indian clinical cohorts	DBT	3 years
82	Prof.Ranga Uday Kumar Co PI: Prof. Shobha Broor Dept. of Microbiology AIIMS, New Delhi	Mechanisms of Chikungunya virus disease: Determinants mouse model, virulent and fitness and the development of novel therapeutics	DBT	3 years
83	Dr. Rema Krishnaswamy	Award of Ramanujan Fellowship to Dr. Rema Krishnaswamy	DST	5 years
84	Prof. Shobhana Narasimhan	Swedish Research Links Programme entitled "Computational studies of the electronic, magnetic and transport properties of interfaces for nanospintronics applications.	SRC	3 years
85	Prof. Ranga Uday Kumar	Targheed delivery of anti-retrovirals using stealth immunoliposomes	ICMR	3 years
86	Prof. A Sundaresan	Indo-Spanish Joint Programme of cooperation in S&T entitled "Synthesis and properties of nitride-based nanomaterials"	DST	3 years
87	Prof. Maneesha S. Inamdar	Analysis of asrij in Drosophila hematopoiesis and immunity	DST	3 years

Sl.No.	Project Investigator	Project Name	Funding Agency	Duration
88	Prof. Umesh V. Wagmare	First-principles determination of thermal properties in nano-structured hexagonal solids with doping modifications for thermal energy harvesting	AOARD	1 year
89	Prof. Tapas Kumar Kundu	J C Bose Fellowship to Prof.Tapas Kumar Kundu	DST	5 years
90	Dr. Subir Kumar Das	Award of Ramanujan Fellowship to Dr. Subir Kumar Das	DST	5 years
91	Dr. Jayanta Haldar	Award of Ramanujan Fellowship to Dr. Jayanta Haldar	DST	5 years
92	Dr. Sebastian C Peter	Award of Ramanujan Fellowship to Dr. Sebastian C Peter	DST	5 years
93	Dr. Jayanta Haldar	Development of Novel biodegradable surface coatings for biomedical application	DST	3 years
94	Prof. S.M. Deshpande	Development of Meshless Solver, Point Clouds and preprocessor in Computational Fluid Dynamics (CFD)	NAL	3 years
95	Dr. Abhishek Kumar Mishra CCMS, JNCASR	Study of conformation and conformational dynamics of some conducting polymers in their neutral and doped forms using vibrational spectroscopy and quantum chemical methods	DST	3 years
96	Prof. Umesh V Waghmare	India-European Union (EU) research project entitled " ATHENA Advanced theories for functional oxides: New routes to handle the devices of future"	DST	3 years
97	Prof. Hemalatha Balaram	Plasfalsyn Structure/Function studies of plasmodium falciparum GMP synthetase	DBT	3 years
98	Prof. Namita Surolia	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	DST	3 years

Sl.No.	Project Investigator	Project Name	Funding Agency	Duration
99	Prof. Hemalatha Balaram	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	DST	3 years
100	Prof. Tapas Kumar Kundu	India-Japan research project: "Hematopoeitic Stem Cell Differentiation: Role of SAM Biosynthesis Arginine Methylation and p53	DST	2 years
101	Prof. K.S. Narayan	Advancing the Efficiency and Production Potential of Excitonic Solar cells (APEX)	DST	3 years
102	Prof. Meheboob Alam	DAE-SRCH Outstanding Research Investigator Award for the project titled "Dynamics and patterns in granular fluid: Theory and experiment"	DAE	3 years
103	Prof. H. Ila	Synthetic Investigation Heterocyclic scaffolds	CSIR	3 years
104	Prof. Umesh V Waghmare	Alloy development and mechanical behaviour	GEGR	2 years
105	Prof. Chandrabhas Narayana	Swedish Research Links Programme: "Multiplexed immune and DNA-based diagnosis of tuberculosis"	SRL	2 years
106	Prof. C.N.R. Rao; Prof. G.U. Kulkarni	INDO-IRAN Collaborative Programme in "Nano Science & Technology" at ICMS, JNCASR	DST	2 years
107	Prof. C.N.R.Rao	Collaborative projects between JNCASR and DRDO	DRDO	5 years
108	Prof. C.N.R.Rao	CSIR - COE	CSIR	5 years
109	Prof. C.N.R.Rao	Collaborative projects between JNCASR/ICMS & DST	DST ICMS	3 years
110	Dr. T. Govindaraju	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	DST	3 years
111	Prof.Ranga Uday Kumar	"Evaluation of molecular and immune status of the blood lymphocytes of subject who participated in the Siddha Clinical Trial CTRI/2008/091/000021" at JNCASR	DST	6 months

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. **Abhay A. Sagade, B. Radha and Giridhar U. Kulkarni,** Intricate nature of Pd nanocrystal–hydrogen interaction investigated using thermolysed Pd hexadecylthiolate films, *Sensors and Actuators B: Chemical,* 149, 345 - 351 (2010), DOI:10.1016/j.snb.2010.06.056
2. **Adina Scott, Ritu Gupta and Giridhar U. Kulkarni,** A Simple Water-Based Synthesis of Au Nanoparticle/PDMS Composites for Water Purification and Targeted Drug Release, *Macromolecular Chemistry and Physics*, 211, 1640 - 1647 (2010).
3. **Amit Kumar Singh Chauhan, Govind, S.M. Shivaprasad,** Adsorption/desorption kinetics of Na atoms on reconstructed Si (111)-7×7 surface, *Thin Solid Films*, 519, 3, 1012-1015 (2010).
4. **Awadesh K. Mallik, S. R. Binu, L. N. Satapathy, Chandrabhas Narayana, Md. Motin Seikh, S. A. Shivashankar and S. K. Biswas,** Effect of substrate roughness on growth of diamond by hot filament CVD, *Bulletin of Materials Science*, 33, 251 - 255 (2010).
5. **Boya Radha and Giridhar U. Kulkarni,** Micro- and Nanostripes of Self-assembled Au Nanocrystal Superlattices by Direct Micromolding, *Nano Research*, 3, 537 - 544 (2010), DOI:10.1007/s12274-010-0014-8.
6. **Boya Radha and Giridhar U. Kulkarni,** Patterned Synthesis of Pd4S: Chemically Robust Electrodes and Conducting Etch Masks, *Advanced Functional Materials*, 20, 879 - 884 (2010).

7. **Boya Radha, Mohammed Arif, Ranjan Datta, Tapas K. Kundu and Giridhar U. Kulkarni,** Movable Au Microplates as Fluorescence Enhancing Substrates for Live Cells, *Nano Research*, 3, 738 - 747 (2010), DOI:10.1007/s12274-010-0040-6.

8. **C.M. Nagaraja, T.K. Maji and C.N.R. Rao,** Synthesis and structures of CoII, NiII and CuII coordination frameworks formed by flexible 1, 3- phenylenediacetic acid, *Journal of Molecular Structure* (A. Barnes issue), 976, 168 (2010).

9. **C.N.R. Rao and A. Nag,** Inorganic analogues of graphenes, *European Journal of Inorganic Chemistry*, (Special Nano number), 4244 (2010).

10. **C.N.R. Rao and R. Voggu,** Molecular charge-transfer involving graphene and carbon nanotubes, *Materials Today*, 13, 34 (2010).

11. **C.N.R. Rao, A. Ghosh and A. Gomati,** Functionalization and solubilization of carbon and inorganic nanostructures, *Comprehensive Nanoscience and Technology*, 3, 445 (2011).

12. **C.N.R. Rao, A.K. Sood, R. Voggu and K.S. Subrahmanyam,** Some novel attributes of graphene, *Journal of Physical Chemistry Letters*, 1, 572 (2010).

13. **C.N.R. Rao, K.S. Subrahmanyam, H.S.S.R. Matte, P. Kumar, B. Das, B. Hakeem, D.J. Late and A. Govindaraj,** A study of the synthesis of and properties of graphenes, *Science and Technology of Advanced Materials*, 11, 054502 (2010).

14. **Chitara, D.J. Late, S.B. Krupanidhi and C.N.R. Rao,** Room-temperature gas sensors based on GaN nanoparticles, *Solid State Communications*, 150, 2053 (2010).

15. **Choudhury, B. Das, D.D. Sarma and C.N.R. Rao,** XPS evidence for molecular charge-transfer doping of graphene, *Chemical Physics Letters*, 497, 66 (2010).

16. **D. Swain, V.S. Bhadram, G.K. Pradhan, S.V. Bhat, C. Narayana and C.N.R. Rao,** Superionic phase transition in $KHSO_4$: A Raman investigation, *Journal of Physical Chemistry A*, 114, 10040 (2010).

17. **Geeta Saini, Josemon Jacob, S. Satyaprasad and K S Narayan,** Synthesis, characterization and OFET characteristics of 3,4-diaryl substituted poly(thienylene vinylene) derivatives, *Polymer Bulletin*, 1-9, (DOI: 10.1007/s00289-010-0417-4), (2010).

18. **Ghosh, K.V. Rao, S.J. George and C.N.R. Rao,** Non-covalent functionalization, exfoliation and solubilization of graphene in water employing a fluorescent coronene carboxylate, *Chemistry - A European Journal (Communication)*, 16, 2700 (2010).

19. **Ghoshal, T. K. Maji,** Fabrication of Three Supramolecular Frameworks Tuning the Binding Site of a Tripodal Ligand with d10 Metal Ions: Interplay of Covalent and Non-Covalent Interactions in Solid State Structure, *Journal of Chemical Science*, 122, 801-806 (2010).

20. **Gomati, K. Gopalakrishnan and C.N.R. Rao,** Covalent functionalization of metal oxide and carbon nanostructures with polyoctasilasesquioxane (POSS) and their incorporation in polymer composites, *Materials Research Bulletin*, 45, 1894 (2010).

21. **Gopal K. Pradhan, Anil Kumar, S.K. Deb, Umesh V. Waghmare and Chandrabhas Narayana,** Elastic and structural instability of cubic Sn_3N_4 and C_3N_4 under pressure, *Physical Review B*, 82, 144112 - 144115 (2010).

22. **Gopal K. Pradhan, Chandrabhas Narayana, O. Pagès, A. Breidi, J. Souhabi, A. V. Postnikov, S. K. Deb, F. Firszt, W.Paszkowicz, A. Shukla, and F. El Haj Hassan,** Pressure-induced phonon freezing in the $Zn_{1-x}Be_xSe$ alloy: A study via the percolation model, *Physical Review B*, 81, 115207-115212 (2010).

23. **Gupta, S. Mukhopadyay & K. S. Narayan,** Fill Factor in Organic Solar Cells, *Solar Energy Materials & Solar Cells*, 94, 1309-1313 (2010).

24. **H.A. Karimi-Varzaneh, F. Müller-Plathe, S. Balasubramanian and P. Carbone,** Studying long-time dynamics of imidazolium-based ionic liquids with a systematically coarse-grained model, *Physical Chemistry Chemical Physics*, 12, 4714 - 4724 (2010).

25. **H.S.S.R. Matte, A. Gomathi, A.K. Manna, D.J. Late, R. Datta, S.K. Pati and C.N.R. Rao,** Graphene analogues of MoS_2 and WS_2, *Angewandte Chemie International Edition*, 49, 4059 (2010).

26. **Hazra, P. Kanoo, S. Mohapatra, G. Mostafa, T. K. Maji,** A Flexible Supramolecular Host with a Crowned Chair Octameric Water Cluster and Highly Selective Adsorption Properties, *CrystEngComm*, 12, 2775 (2010).

27. **Jithesh K, Govind, Mahesh Kumar and S.M. Shivaprasad,** Clustering and layering of in adatoms on low and high index silicon surfaces: A comparative study, *Surface Science*, 604, 1972-1977 (2010).

28. **K. Jayaramullu, P. Kanoo, S. J. George, T. K. Maji,** Tunable Emission from a Porous Metal-Organic Framework by Employing an Excited State Intramolecular Proton Transfer Responsive Ligand, *Chemical Communications*, 46, 7906 (2010).

29. **K. L. Gurunatha, G. Mostafa, D. Ghoshal, T. K. Maji,** Single-Crystal-to-Single-Crystal Structural Transformation in a 3D Bimetallic (4f-3d) Supramolecular Porous Framework, *Crystal Growth and Design*, 10, 2483 (2010).

30. **K. Raidongia, A. Gomati and C.N.R. Rao,** Synthesis and characterization of nanoparticles, nanotubes, nanopans and graphene-like structure of BN, *Israel Journal of Chemistry*, 50, 399 (2010).

31. **K. Raidongia, A. Nag, A. Sundaresan and C.N.R. Rao,** Multiferroic and magnetoelectric properties of core-shell $CoFe_2O_4$@$BaTiO_3$ nanocomposites, *Applied Physics Letters*, 97, 062904 (2010).

32. **K. Raidongia, A. Nag, K.P.S.S. Hembaram, U.V. Waghmare, R. Datta and C.N.R. Rao,** BCN: A graphene analogue with remarkable adsorptive properties, *Chemistry A European Journal*, 16, 149 (2010).

33. **K. Raidongia, K.P.S.S. Hembaram, U.V. Waghmare and C.N.R. Rao,** Synthesis structure and properties of mesoporous B/C/N microspheres, *Zeitschrift für anorganische und allgemeine Chemie*, 636, 30 (2010).

34. **K. Sai Krishna, C. S. S. Sandeep, Reji Philip and M. Eswaramoorthy,** Mixing does the magic: A rapid synthesis of high surface area noble metal nanosponges showing broadband nonlinear optical response, *ACS Nano*, 4, 2681-2688 (2010).

35. **K. V. Rao, K. Jayaramulu, T. K. Maji, S. J. Goerge,** Supramolecular Hydrogels and High Aspect-Ratio Nanofibres through Charge Transfer Induced Alternate Co-assembly of a New Aromatic Donor-Acceptor Pair in Water, *Angewandte Chemie International Edition*, 49, 4218 (2010).

36. **K.S. Subrahmanyam, A.K. Manna, S.K. Pati and C.N.R. Rao,** A study of graphene decorated with metal nanoparticles, *Chemical Physics Letters*, 497, 70 (2010).

37. **K.S. Subrahmanyam, P. Kumar, A. Nag and C.N.R. Rao,** Blue-light emitting graphene-based materials and their use in generating white light, *Solid State Communications*, 150, 1774 (2010).

38. **L.S. Panchakarla, A. Govindaraj and C.N.R. Rao,** Boron- and nitrogen-doped carbon nanotubes and graphene, *Inorganica Chimica Acta*, 363, 4163 (2010).

39. **L.S. Panchakarla, Y. Sundarayya, S. Manjunatha, A. Sundaresan and C.N.R. Rao,** On the defect origin of room-temperature magnetism-exhibited by metal oxide nanoparticles, *ChemPhysChem*, 11, 1673 (2010).

40. **Late, A. Ghosh, K. Subrahmanyam, L.S. Panchakarla, S.B. Krupanidhi and C.N.R. Rao,** Characteristics of FETs based on undoped and B- and N-doped few-layer graphenes, Solid State *Communications*, 150, 734 (2010).

41. **M. Bag and K. S. Narayan,** Universality in the intensity-modulated photocurrent in bulk-heterojunction polymer solar cells, *Physical Review B: Condensed Matter*, 82, 075308 (2010).

42. **M. Nagaraja, J. N. Behera, T. K. Maji, S. K. Pati, C. N. R. Rao,** Organically-Templated Kagomé Compounds Containing Two Transition Metal Ions, *Dalton Transactions (communications)*, 39, 6947 (2010).

43. **M. Nagaraja, T. K. Maji, C. N. R. Rao, Synthesis and Structure of Co(II), Ni(II) and Cu(II) Coordination Frameworks Formed by Flexible 1,3-phenylenediaceticacid Ligand,** *Journal of Molecular Structure*, 976, 168 (2010).

44. **M. Viswanathan, P.S. Anil Kumar, Venkata Srinu Bhadram, Chandrabhas Narayana, A.K. Bera and S.M. Yusuf,** Influence of lattice distortion on the Curie temperature and spin-phonon coupling in $LaMn_{0.5}Ca_{0.5}O_3$, *Journal of Physics: Condense Matter*, 22, 346006 - 346013 (2010).

45. **M.K. Bera, M.K. Sanyal, L. Yang, K. Biswas, A. Gibaud and C.N.R. Rao,** Small-angle x-ray scattering study of the aggregation of gold nanoparticles during formation at the toluene-water interface, Physical Review B: *Condensed Matter*, 81, 115415 (2010).

46. **Manohar Rao, R. P. Ortiz, A. Facchetti,T. J. Marks and K. S. Narayan,** Studies of Photogenerated Charge Carriers from Donor-Acceptor Interfaces in Organic Field Effect Transistors: Implications for Organic Solar Cells. *Journal of Physical Chemistry C*, 114, 20609 (2010).

47. **N. Arun, S. Mukhopadhyay, and K. S. Narayan,** Monitoring Intermediate states of Bacteriorhodopsin Monolayers using near field Optical Microscopy, *Applied Optics*, 49, 1131-1138 (2010).

48. **N. Kurra, A. Scott and G.U. Kulkarni,** Electrocondensation and evaporation of attoliter water droplets: Direct visualization using AFM, *Nano Research*, 3, 307-316 (2010).

49. **N.J.M. Sanghamitra, N. Varghese and C.N.R. Rao,** Effect of curcumin and Cu^{2+}/Zn^{2+} ions on the fibrillar aggregates formed by the amyloid peptide and other peptides at the organic-aqueous interface, *Chemical Physics Letters*, 496, 104 (2010).

50. **Nag, K. Raidongia, R. Datta, K.P.S.S. Hembaram, U.V. Waghmare and C.N.R. Rao,** Graphene analogues of BN: Novel synthesis and properties, *ACS Nano*, 4, 1539 (2010).

51. **Neena S. John, Gargi Raina, Ashutosh Sharma and Giridhar U. Kulkarni,** Cellular network formation of hydrophobic alkanethiol capped gold nanoparticles on mica surface mediated by water islands, *Journal of Chemical Physics,* 133, 094704 (2010), DOI:10.1063/1.3484941.

52. **Nitesh Kumar and A. Sundaresan,** on the observation of negative magnetization under zero-field-cooled process, *Solid State Communications*, 150, 1162-1164 (2010).

53. **P. Kanoo, T. K. Maji,** Construction of 2D Rectangular Grid to 3D Diamondoid Interpenetrated and their Functionalities by Changing the Second Spacers, *European Journal of Inorganic Chemistry*, 2010, 3762–3769 (2010)

54. P**. Kumar, L.S. Panchakarla, S.V. Bhat, U. Maitra, K.S. Subrahmanyam and C.N.R. Rao,** Photoluminescence, white-light emitting properties and related aspects of ZnO nanoparticles admixed with graphene and GaN, *Nanotechnology*, 21, 385701 (2010).

55. **P. Kumar, S. Saha, C.R. Serrao, A.K. Sood and C.N.R. Rao,** Temperature-dependent infrared reflectivity studies of multiferroic $TbMnO_3$: Evidence for spin-phonon coupling, *Pramana*, 74, 281 (2010).

56. **P. Kumar, S. Saha, D.V.S. Muthu, J.R. Sahu, A.K. Sood and C.N.R. Rao,** Raman evidence for orbiton-mediated multiphonon scattering in multiferroic $TbMnO_3$, *Journal of Physics: Condensed Matter*, 22, 115403 (2010).

57. **P. Mandal, A. Iyo, Y. Tanaka, A. Sundaresan and C.N.R. Rao,** Structure, magnetism and giant dielectric constant of $BiCr_{0.5}Mn0._5O_3$ synthesized at high pressure, *Journal of Materials Chemistry*, 20, 1646 (2010).

58. **P. Mandal, A. Sundaresan, C. N. R. Rao, A. Iyo, P. M. Shirage, Y. Tanaka, Ch. Simon, V. Pralong, O. I. Lebedev, V. Caignaert and B. Raveau,** Temperature-induced magnetization reversal in $BiFe_{0.5}Mn_{0.5}O_3$ synthesized at high pressure, *Physical Review B*, 82, 100416 (2010).

59. **P. Mandal, A. Sundaresan, C.N.R. Rao, A. Iyo, P.M. Shirage, Y. Tanaka, Ch. Simon, V. Pralong, O.I. Lebedev, V. Caignaert and B. Raveau,** An interesting case of magnetization reversal in $BiFe_{0.5}Mn0._5O_3$ synthesized at high pressure, *Physical Review B, B82*, 100416R (2010).

60. **Piyush, J. Dinesh and M. Eswaramoorthy,** pH sensitive breathing of clay within the polyelectrolyte matrix, *ACS Nano*, 4, 5921 - 5929 (2010).

61. **Praveen Kumar, K. Jithesh and S.M. Shivaprasad,** Ga induced superstructures as templates for lattice matched heteroepitaxial growth of GaN on Si(111) substrates, Applied Physics Letters, 97, 221913 (2010).

62. **Praveen.Kumar, Mahesh.Kumar and S.M. Shivaprasad,** (7x7) reconstruction as barrier for Schottky-barrier formation at the Ga/Si(111) interface, *Applied Physics Letters*, 97, 122105 (2010).

63. **R. Shipra, H. Takeya, K. Hirata and A. Sundaresan,** Effects of Ni and Co doping on the physical properties of tetragonal $FeSe_{0.5}Te_{0.5}$ superconductor, *Physica C*, 470, 528 - 532 (2010).

64. **R. Voggu, A. Shireen and C.N.R. Rao,** One-step synthesis of high-purity flourous-capped inorganic nanoparticles, *Dalton Transactions*, 39, 6021 (2010).

65. **R. Voggu, K.V. Rao, S.J. George and C.N.R. Rao,** A simple method of separating metallic and semiconducting SWNTs based on molecular charge transfer, *Journal of the American Chemical Society*, 132, 5560 (2010).

66. **R. Voggu, S. Ghosh, A. Govindaraj and C.N.R. Rao,** New strategies for the enrichment of metallic single-walled carbon nanotubes, *Journal of Nanoscience and Nanotechnology*, 10, 4102 (2010).

67. **Radha and G. U. Kulkarni,** A Real Time Microscopy Study of the Growth of Giant Au Microplates, *Crystal Growth and Design*, 11, 320 - 327 (2010), DOI:10.1021/cg1015548.

68. **S. Bhattacharya, S.K. Samantha, A. Gomati and C.N.R. Rao,** Novel nanocomposites made of BN nanotubes and a physical gel, *Langmuir*, 26, 12230 (2010).

69. **S. Heun, B. Radha, D. Ercolani, G. U. Kulkarni, F. Rossi, V. Grillo, G. Salviati, F. Beltram and L. Sorba,** Pd-Assisted Growth of InAs Nanowires, C*rystal Growth and Design,* 10, 4197 - 4202 (2010), DOI:10.1021/cg1008335.

70. **S. K. Asha, Nagesh Kolhe, K. S. Narayan and Satyaprasad Senanayak,** n-Type Field Effect Transistors Based on Rigid Rod and Liquid Crystalline Alternating Copoly(benzobisoxazole) Imides Containing Perylene and/or Naphthalene, *Journal of Physical Chemistry B* 114 (50), 16694 (2010)

71. **S. Kumar, N. Kamaraju, K.S. Vasu, A. Nag, A.K. Sood and C.N.R. Rao,** Graphene analogue BCN: Femtosecond nonlinear optical susceptibility and hot carrier dynamics, *Chemical Physics Letters*, 499, 152 (2010).

72. **S. Mohapatra, S. Siddhanta, D. R. Kumar, C. Narayana, T. K. Maji,** Facile and Green Synthesis of SERS Active and Ferromagnetic Silver Nanorods, *European Journal of Inorganic Chemistry*, 4969, (2010).

73. **S. Murugavel, C. Vaid, Venkat Srinu Bhadram and Chandrabhas Narayana,** Ion Transport Mechanism in Glasses: Non-Arrhenius Conductivity and Non-Universal Features, *Journal of Physical Chemistry B*, 114, 13381 - 13385 (2010).

74. **S.G. Raju and S. Balasubramanian,** Molecular dynamics simulation of model room temperature ionic liquids with divalent anions, *Indian Journal of Chemistry A*, 49, 721 - 726 (2010).

75. **S.G. Raju and S. Balasubramanian,** Role of Cation Symmetry in Intermolecular Structure and Dynamics of Room Temperature Ionic Liquids: Simulation Studies, *Journal of Physical Chemistry B*, 114, 6455 - 6463 (2010).

76. **S.K. Samantha, A.Pal, S. Bhattacharya and C.N.R. Rao,** Carbon nanotube-reinforced supramolecular gels with electrically conducting, viscoelastic and near-infrared sensitive properties, *Journal of Materials Chemistry,* 20, 6881 (2010).

77. **S.S. Sarangi, W. Zhao, F. Muller-Plathe, S. Balasubramanian,** Correlation between dynamic heterogeneity and local structure in a room-temperature ionic liquid. A molecular dynamics study of [bmim][PF6], *ChemPhysChem*, 11,2001-2010 (2010).

78. **S.V. Bhat, S.B. Krupanidhi and C.N.R. Rao,** A comparative study of metallic Au and ReO_3 nanoparticles on the performance of silicon solar cells. *Applied Physics Express*, 3, 115001 (2010).

79. **Stefan Heun, Boya Radha, Daniele Ercolani, Giridhar U. Kulkarni, Francesca Rossi, Vincenzo Grillo, Giancarlo Salviati,** Fabio Beltram and Lucia Sorba, Coexistence of Vapor-Liquid-Solid and Vapor-Solid-Solid Growth Modes in Pd-Assisted InAs Nanowires, *Small*, 6, 1935 - 1941 (2010), DOI:10.1002/smll. 201000811.

80. **Sudip Mohapatra, Soumik Siddhanta, D. Ravindar Kumar, Chandrabhas Narayana and Tapas K. Maji,A,** Facile bottom up approach for fabricating multifunctional silver nanorods, *European Journal of Inorganic Chemistry*, 31, 4969-4974, (2010).

81. **T Bhuvana, Anurag Kumar, Aditya Sood, Roger H. Gerzeski, Jianjun Hu, Venkata Srinu Bhadram, Chandrabhas Narayana and Timothy S. Fisher,** Contiguous Petal-like Carbon Nanosheet Outgrowths from Graphite Fibers by Plasma CVD, *ACS Applied Materials and Interfaces*, 2, 644-648 (2010).

82. **T. Bhuvana, W. Boley, B. Radha, B. D. Dolash, G.Chiu, D. Bergstrom, R. Reifenberger, T.S. Fisher and G.U. Kulkarni,** Inkjet printing of palladium alkanethiolates for facile fabrication of metal interconnects and surface-enhanced Raman scattering substrates, *Micro & Nano Letters*, 5, 296-299 (2010), DOI:10.1049/mnl.2010.0109.

83. **U. Kulkarni and B. Radha,** Metal nanowire grating patterns, *Nanoscale*, 2, 2035 - 2044 (2010).

84. **U. Maitra, S. Ghosh, K. Biswas and C.N.R. Rao,** Scaling behavior of Plasmon coupling in Au and ReO_3 nanoparticles incorporated in polymer matrices, physica status solidi (RRL) - *Rapid Research Letters*, 4, 169-171 (2010).

85. **U.A. Palnitkar, R.V. Kashid, M.A. Mose, D.S. Joag, L.S. Panchakarla and C.N.R. Rao,** Remarkably low turn-on field emission in undoped, nitrogen-doped and boron-doped graphene, *Applied Physics Letters*, 97, 063102 (2010).

86. **U.K. Gautam, M. Imura, C.S. Rout, Y. Bando, X. Fang, B. Dierre, L. Sukharov, A. Govindaraj, J. Sekiguchi, D. Goldberg and C.N.R. Rao,** Unipolar assembly of ZnO rods manifesting polarity-driven collective luminescence, *Proceedings of the National academy of Sciences of the United States of America*, 107, 13588 (2010).

87. **V. Gautam, M. Bag and K. S. Narayan,** Dynamics of Bulk Polymer Heterostructure: Electrolyte Devices, *Journal of Physical Chemistry Letters*, 1, 3277-3282 (2010).

88. **Y. Tanaka, A. Iyo, K. Tokiwa, T. Watanabe, A. Crisan and A. Sundaresan,** Topological structure of the inter-band phase difference soliton in two-band superconductivity, *Physica C*, 470, 1010 - 1012 (2010).

89. **Ankur Verma, Ashutosh Sharma and Giridhar U. Kulkarni,** Ultrafast Large-Area Micropattern Generation in Nonabsorbing Polymer Thin Films by Pulsed Laser Diffraction, *Small*, 7, 758 - 765 (2011), DOI:10.1002/smll.201001939.

90. **Anshuman J Das, Sabyasachi Mukhopadhyay and K. S. Narayan,** Characteristic noise features in light transmission across membrane protein undergoing photocycle, *Journal of Chemical Physics*, 134, 175101 (2011).

91. **C.M. Nagaraja, N. Kumar, T.K. Maji and C.N.R. Rao,** Amine-templated cobalt (II) coordination polymer exhibiting novel magnetic properties: Effect of hydration, *European Journal of Inorganic Chemistry*, 2057 (2011).

92. **C.N.R. Rao, K.S. Subrahmanyam, H.S.S.R. Matte, A. Govindaraj,** Graphene: Synthesis, functionalization and properties, *Modern Physics Letters B*, 25, 427 (2011).

93. **C.N.R. Rao, S.R.C. Vivekchand and A. Govindaraj,** Inorganic Nanowires, *Comprehensive Nanoscience and Technology*, 1, 289 (2011).

94. **Chandra Sekhar Rout, Anurag Kumar, Nitesh Kumar, A. Sundaresan and Timoty S. Fisher,** Room-temperature ferromagnetism in graphitic petal arrays, *Nanoscale*, 3, 900 - 903 (2011).

95. **D.J. Late, U. Maitra, L.S. Panchakarla, U.V. Waghmare and C.N.R. Rao,** Temperature effects on the Raman spectra of graphenes: Dependence on the number of layers and doping, *Journal of Physics: Condensed Matter*, 23, 055303 (2011).

96. **Das, B. Choudhury, A. Gomati, A.K. Manna, S.K. Pati and C.N.R. Rao,** Interaction of inorganic nanoparticles with graphene, *ChemPhysChem*, 12 (5), 937-943 (2011).

97. **H.S.S.R. Matte, B. Plowman, R. Datta and C.N.R. Rao**, Graphene analogues of layered metal selenides, *Dalton Transactions*, (2011).

98. **H.S.S.R. Matte, K.V. Rao, K.S. Subrahmanyam, S. George and C.N.R. Rao,** Quenching of fluorescence of aromatic molecules by graphene due to electron transfer, *Chemical Physics Letters*, 506, 260-264 (2011).

99. **Hazra, P. Kanoo, T. K. Maji,** High Heat of Hydrogen Adsorption and Guest-Responsive Magnetic Modulation in a 3D Porous Pillared-Layer Coordination Framework, *Chemical Communications*, 47, 538 (2011).

100. **Jithesk K, M. Tangi and S.M. Shivaprasad,** Dependence of crystal orientation and bandgap on substrate temperature of molecular-beam epitaxy grown InN on bare Al_2O_3 (0001), *Journal of Applied Physics*, 109, 093513 (2011).

101. **K. Bhar, S. Das, T. K. Maji, B. K. Ghosh,** Syntheses, Structures and Magnetic Properties of 1,5-dicyanamide Bridged Coordination Polymers of Cu(II) and Ni(II) containing Tetradentate N-donor Schiff Base, *Inorganica Chimica Acta*, 370, 492-498,(2011).

102. **K. K. R. Datta, D. Jagadeesan, C. Kulkarni, A. Kamath, R. Datta and M. Eswaramoorthy,** Observation of Pore-switching Behaviour in Porous Layered Carbon through Mesoscale Order-Disorder Transformation, *Angewandte Chemie International Edition*, 50, 3929-3933, (2011).

103. **K. Mallikarjuna Rao, T. Bhuvana, B. Radha, K. Narendra, N. Vidhyadhiraja and G. U. Kulkarni,** Metallic Conduction in NiS_2 Nanocrystalline Structures, *Journal of Physical Chemistry C*, 21, 10462 - 10467 (2011).

104. **K. V. Rao, K. K. R. Datta, M. Eswaramoorthy and S. J. George,** Light-Harvesting Hybrid Hydrogels: Energy Transfer Induced Amplified Fluorescence in Non-Covalently Assembled Chromophore-Organoclay Composites, *Angewandte Chemie International Edition*, 50, 1179 - 1184 (2011).

105. **K.S. Subrahmanyam, P. Kumar, U. Maitra, A. Govindaraj, K.P.S.S. Hembaram, U.V. Waghmare and C.N.R. Rao,** Chemical storage of hydrogen in few-layer graphene, *Proceedings of the National academy of Sciences of the United States of America*, 108, 2674 (2011).

106. **M. Kesaria, Satish Shetty and S.M. Shivaprasad,** Spontaneous formation of GaN nanostructures by Molecular Beam Epitaxy, *Journal of Crystal Growth*, 326, 191-194 (2011).

107. **M.S.R.N. Kiran, K. Raidongia, U. Ramamurthy and C.N.R. Rao**, Improved mechanical properties of polymer nanocomposites incorporating graphene-like BN: Dependence on the number of BN layers, *Scripta Materialia*, 64, 592 (2011).

108. **Narendra Kurra, Gyan Prakash, S Basavaraja, Timothy S Fisher, G U Kulkarni and Ronald G Reifenberger,** Charge storage in mesoscopic graphitic islands fabricated using AFM bias lithography, *Nanotechnology*, 22, 245302 (2011), DOI:10.1088/0957-4484/22/24/245302.

109. **Narendra Kurra, T. Vijaykumar and G. U. Kulkarni,** CNT Manipulation: Inserting a Carbonaceous Dielectric Layer Beneath Using Electron Beam Induced Deposition, Journal of Nanoscience and *Nanotechnology*, 11, 1025 - 1029 (2011), DOI:10.1166/jnn.2011.3112.

110. **Nitesh Kumar, Dinesh Jagadeesan, PremlalPillain, MelbyChacko, M. Eswaramoorthy and A. Sundaresan,** Ferromagnetism in Thin-Walled Hollow Spheres of Non-Magnetic Inorganic Materials, *Chemical Physics Letters*,504, 189-192 (2011).

111. **P. Kanoo, A. C. Ghosh, T. K. Maji,** A Vanadium (VO^{2+}) Metal-Organic Framework: Selective Vapor Adsorption, Interesting Magnetic Properties and as a Precursor for a Polyoxovanadate, *Inorganic Chemistry*, 50, 5145–5152 (2011).

112. **P. Kanoo, R. Sambhu, T. K. Maji,** Guest-Specific Double- or Single-Step Adsorption in a Flexible Porous Framework Based on a Mixed Ligand System, *Inorganic Chemistry*, 50, 400 (2011).

113. **P. Kumar, L.S. Panchakarla and C.N.R. Rao,** Laser-induced unzipping of carbon nanotubes to yield graphene nanoribbons, *Nanoscale*, 3, 2127 (2011).

114. **ParthaMahata, DebajitSarma, C. Madhu, A. Sundaresan and Srinivasan Natarajan,** $CoMn_2O_4$ spinel from a MOF: synthesis, structure and magnetic studies, *Dalton Transactions*, 40, 1952 - 1960 (2011).

115. **R. Saha, A. Shireen, A.K. Bera, S.N. Shirodkar, Y. Sundarayya, N. Kalarikkal, S.M. Yusuf, U.V. Waghmare, A. Sundaresan and C.N.R. Rao,** Structure and magnetic properties of the $Al_{1-x}Ga_xFeO_3$ family of oxides: A combined experimental and theoretical study, Journal of Solid State *Chemistry*, 184, 494-501 (2011).

116. **Radha, Abhay A. Sagade and Giridhar U. Kulkarni**, Flexible and Semitransparent Strain Sensors Based on 2 Micromolded Pd Nanoparticle-Carbon µ-Stripes, *ACS Applied Materials and Interfaces*, (2011), DOI:10.1021/am2002873.

117. **Radha, Abhay A. Sagade, Ritu Gupta and G. U. Kulkarni,** Direct Micromolding of Pd-Stripes for Electronic Applications, *Journal of Nanoscience and Nanotechnology*,11, 1 - 6 (2011), DOI:10.1166/jnn.2011.3799.

118. **Ritu Gupta and G. U. Kulkarni**, Organic removal from water using a Au nanoparticle-PDMS nanocomposite foam, *ChemSusChem*, 4, 737 – 743 (2011), DOI:10.1002/cssc.201000410.

119. **S. L. Hodson, T. Bhuvana, G. U. Kulkarni and T. S. Fisher**, Palladium Thiolate Bonding of Carbon Nanotube Thermal Interfaces, *Journal of Electronic Packaging*, 33, 020907 (2011), DOI:10.1115/1.4004094.

120. **S. Manjunatha, L.S. Panchakarla, K. Biswas and C.N.R. Rao,** Nanorods and nanofilms of ZnO generated at the liquid-liquid interface, *Inorganica Chimica Acta (A. Chakravorty issue)* 363, 2125 (2010).

121. **S. Mohapatra, R. K. Kumar, T. K. Maji,** Green Synthesis of Catalytic and Ferromagnetic Gold Nanoparticles, *Chemical Physics Letters*, 508(1-3), 76-79 (2011).

122. **S. Mukhopadhyay, R. Voggu, C.N.R. Rao, N.S. Vidyadhiraja and K.S. Narayan**, Lateral photo current scanning of donor and acceptor polymers on graphene-coated substrates, *Japanese Journal of Applied Physics*, 50(6), 061602-061602-5, (2011).

123. **S.K. Reddy, C.H. Kulkarni and S. Balasubramanian**, Theoretical investigations of candidate crystal structures for ß-carbonic acid, *Journal of Chemical Physics*, 134, 124511 (2011), doi:10.1063/1.3567307.

124. **S.S. Sarangi, S.G. Raju and S. Balasubramanian**, Molecular dynamics simulations of ionic liquid-vapour interfaces: Effect of cation symmetry on structure at the interface, *Physical Chemistry Chemical Physics,* 13, 2714 - 2722 (2011).

125. **S.S. Sarangi, S.K. Reddy and S. Balasubramanian,** Low-Frequency Vibrational Modes of Room Temperature Ionic Liquids, *Journal of Physical Chemistry B*, 115, 1874 - 1880 (2011).

126. **S.V. Bhat, A. Govindaraj and C.N.R. Rao,** Hybrid solar cell based on P3HT-ZnO nanoparticle blend in the inverted device configuration, *Solar Energy Mater and Solar Cells*, 95(8), 2318-2321, (2011).

127. **Sasidaran, L.S. Panchakarla, S. Nair and C.N.R. Rao,** Differential nano-bio interactions and toxicity effects of pristine versus functionalized graphene, *Nanoscale*, 3, 2461-2464 (2011).

128. **Shireen, R. Saha, A. Sundaresan and C.N.R. Rao**, Multiferroic and magnetodielectric properties of the Al1-xGaxFeO3 family of oxides, *Journal of Materials Chemistry (Communications)*, 21, 57 (2011).

129. **U. Maitra, A. Jain, S.J. George and C.N.R. Rao,** Tunable fluorescence in Chromophore-Functionalized Nanodiamonds Induced by Energy Transfer, *Nanoscale*, (2011), DOI: 10.1039/C1NR10295H.

130. **U. Maitra, B. Das, N. Kumar,** A. Sundaresan and C.N.R. Rao, Ferromagnetism exhibited by nanoparticles of noble metals, *ChemPhysChem*, (2011), DOI: 10.1002/cphc.201100121.

131. **V. Vijay, D. Arun and K. S. Narayan,** In-situ Studies of Strain Dependent Transport Properties of Conducting Polymers on Elastomeric Substrates, *Journal of Applied Physics*, 109, 8 (2011).

Books Chapters:

1. **K. Biswas, C.S. Rout and C.N.R. Rao,** Metal oxide nanostructures: Synthesis, properties and applications in Metal Oxide Nanostructures, *American Scientific Publishers*, 4, 423 (2010).

2. **C.N.R. Rao, S.R.C. Vivekchand and A. Govindaraj,** Inorganic nanotubes and nanowires in *Low dimensional solids (Eds. D.W. Bruce, D.O'Hare and R.I. Walton), John Wiley*, 77-162 (2010). ISBN: 9780470997512.

3. **V.R. Bommisetty, N.S. Sariciftci, K. S. Narayan, G. Rumbles, P. Peumans, J. van de Lagemaat, G. Dennler, S.E. Shaheen,** Organic Photovoltaics and Related Electronics-From Excitons to Devices , *MRS Proceedings*, 1270, (2010), ISBN: 978-1-60511-247-3.

Conference Proceedings

1. **Praveen Kumar, Mahesh Kumar, Govind, B. R. Mehta and S. M. Shivaprasad,** Ion induced formation of Silicon nitride substrate and GaN overlayer growth at room temperature on Si (111) surface, *MRS Symposium Proceedings*, 1202-I05-09 (2010)

New Chemistry Unit

1. **A. Ghosh, K.V. Rao, S.J. George and C.N.R. Rao,** Non-covalent functionalization, exfoliation and solubilization of graphene in water employing a fluorescent coronene carboxylate, *Chemistry - A European Journal (Communication)*, 16, 2700 (2010).
2. **A. Gomati, K. Gopalakrishnan and C.N.R. Rao,** Covalent functionalization of metal oxide and carbon nanostructures with polyoctasilasesquioxane (POSS) and their incorporation in polymer composites, *Materials Research Bulletin*, 45, 1894 (2010).
3. **A. Hazra, P. Kanoo, S. Mohapatra, G. Mostafa, T. K. Maji,** A Flexible Supramolecular Host with a Crowned Chair Octameric Water Cluster and Highly Selective Adsorption Properties *CrystEngComm*, 12, 2775 (2010).
4. **A. K. Yadav, H. Ila, H. Junjappa,** Synthesis of Novel Substituted Phenanthrenes and Polycyclic Heteroaromatics by Pd-Catalyzed Direct Intramolecular Arylation/Heteroarylation, *Eurpeam Journal of Organic Chemistry*, 338 (2010).
5. **A. Nag, K. Raidongia, R. Datta, K.P.S.S. Hembaram, U.V. Waghmare and C.N.R. Rao,** Graphene analogues of BN: Novel synthesis and properties, *ACS Nano*, 4, 1539 (2010).
6. **A. Shireen, R. Saha, A. Sundaresan and C.N.R. Rao,** Multiferroic and magnetodielectric properties of the $Al_{1-x}Ga_xFeO_3$ family of oxides, *Journal of Materials Chemistry (Communications)*, 21, 57 (2011).
7. **Alisha K. Weight, Jayanta Haldar, Luis Alvarez De Cienfuegos, Larisa V Gubareva, Terrence M Tumpey, Jianzhu Chen, and Alexander M. Klibanov,** Attaching zanamivir to a polymer markedly enhances its activity against drug-resistant strains of influenza a viruses, *Journal of Pharmaceutical Sciences*, 100, 831-835 (2011).
8. **Alyssa M Larson, Bryan Hsu, Debabrata Rautaray, Jayanta Haldar, Jianzhu Chen, and Alexander M. Klibanov,** Hydrophobic polycationic coatings disinfect poliovirus and rotavirus solutions, *Biotechnology and Bioengineering*, 108, 720-723 (2011).
9. B**. Chitara, D.J. Late, S.B. Krupanidhi and C.N.R. Rao,** Room-temperature gas sensors based on GaN nanoparticles, *Solid State Communications*, 150, 2053 (2010).
10. B**. Das, B. Choudhury, A. Gomati, A.K. Manna, S.K. Pati and C.N.R. Rao,** Interaction of inorganic nanoparticles with graphene, *ChemPhysChem*, 12 (5), 937-943 (2011).
11. **C. M. Nagaraja, J. N. Behera, T. K. Maji, S. K. Pati, C. N. R. Rao**, Organically-Templated Kagomé Compounds Containing Two Transition Metal Ions, *Dalton Transactions (communications)*, 39, 6947 (2010).
12. **C. M. Nagaraja, T. K. Maji, C. N. R. Rao,** Synthesis and Structure of Co(II), Ni(II) and Cu(II) Coordination Frameworks Formed by Flexible 1,3-phenylenediaceticacid Ligand, *Journal of Molecular Structure*, 976, 168 (2010).
13. **C. Piyush, J. Dinesh and M. Eswaramoorthy,** pH sensitive breathing of clay within the polyelectrolyte matrix, *ACS Nano*, 4, 5921 - 5929 (2010).
14. **C.M. Nagaraja, N. Kumar, T.K. Maji and C.N.R. Rao,** Amine-templated cobalt (II) coordination polymer exhibiting novel magnetic properties: Effect of hydration, *European Journal of Inorganic Chemistry*, 2057 (2011).
15. **C.N.R. Rao and A. Nag**, Inorganic analogues of graphenes, *European Journal of Inorganic Chemistry, (Special Nano number)*, 4244 (2010).
16. **C.N.R. Rao and R. Voggu,** Molecular charge-transfer involving graphene and carbon nanotubes, *Materials Today*, 13, 34 (2010).

17. **C.N.R. Rao, A.K. Sood, R. Voggu and K.S. Subrahmanyam,** Some novel attributes of graphene, *Journal of Physical Chemistry Letters*, 1, 572 (2010).

18. **C.N.R. Rao, K.S. Subrahmanyam, H.S.S.R. Matte, P. Kumar, B. Das, B. Hakeem, D.J. Late and A. Govindaraj,** A study of the synthesis of and properties of graphenes, *Science and Technology of Advanced Materials*, 11, 054502 (2010).

19. **D. Choudhury, B. Das, D.D. Sarma and C.N.R. Rao,** XPS evidence for molecular charge-transfer doping of graphene, *Chemical Physics Letters,* 497, 66 (2010).

20. **D. Ghoshal, T. K. Maji,** Fabrication of Three Supramolecular Frameworks Tuning the Binding Site of a Tripodal Ligand with d10 Metal Ions: Interplay of Covalent and Non-Covalent Interactions in Solid State Structure, *Journal of Chemical Sciences*, 122, 801 (2010).

21. **D. Late, A. Ghosh, K. Subrahmanyam, L.S. Panchakarla, S.B. Krupanidhi and C.N.R. Rao,** Characteristics of FETs based on undoped and B- and N-doped few-layer graphenes, Solid State Communications, 150, 734 (2010).

22. D. Maity and T. Govindaraju, Conformationally Contrained (Coumarin-Triazolyl-Bipyridyl) Click Fluoroionophore as Selective Al^{3+} Sensor'. *Inorganic Chemistry*, 49, 7229-7231 (2010).

23. **D. Maity and T. Govindaraju,** Highly selective visible and near-infrared sensing of Cu^{2+} based on thiourea-salicylaldehyde ligand in aqueous media, *Chemistry - A European Journal*, 17, 1410-1414 (2011)

24. **D. Maity and T. Govindaraju,** Pyrrolidine constrained bipyridyl-dansyl click fluoroionophores as selective Al^{3+} sensor'. *Chemical Communications*, 46, 4499-4501 (2010).

25. **D. Swain, V.S. Bhadram, G.K. Pradhan, S.V. Bhat, C. Narayana and C.N.R. Rao,** Superionic phase transition in $KHSO_4$: A Raman investigation, *Journal of Physical Chemistry A*, 114, 10040 (2010).

26. **D.J. Late, U. Maitra, L.S. Panchakarla, U.V. Waghmare and C.N.R. Rao,** Temperature effects on the Raman spectra of graphenes: Dependence on the number of layers and doping, Journal of Physics: *Condensed Matter*, 23, 055303 (2011).

27. **Dutta Sudipta, Pati SK**, Edge reconstructions induces magnetic and metallic behavior in zigzag graphene nanoribbons, *Carbon*, 48, 4409 – 4413 (2010).

28. **Dutta Sudipta, Pati SK**, Novel Properties of Graphene Nanoribbons: A Review, *Journal of Materials* Chemistry, 20, 8207 – 8223 (2010).

29. **Ghosh, K. V. Rao, R. Voggu and S. J. George,** Non-Covalent Functionalization, Solubilization of Graphene and Single-Walled Carbon Nanotubes with Aromatic Donor and Acceptor Molecules, *Chemical Physics Letters*, 488, 198–201 (2010).

30. **H. Pandith and S. K. Pati,** Conformational Analysis and Vibrational Circular Dichroism of tris(ethylenediamine)ruthenium(II) Complex: A Theoretical Study, *Journal of Physical Chemistry* A , 114, 87 – 92 (2010).

31. **H.S.S.R. Matte, A. Gomathi, A.K. Manna, D.J. Late, R. Datta, S.K. Pati and C.N.R. Rao,** Graphene analogues of MoS2 and WS2, *Angewandte Chemie International Edition*, 49, 4059 (2010).

32. **H.S.S.R. Matte, K.V. Rao, K.S. Subrahmanyam, S. George and C.N.R. Rao,** Quenching of fluorescence of aromatic molecules by graphene due to electron transfer, *Chemical Physics Letters*, 506, 260-264 (2011).

33. **Hazra, P. Kanoo, T. K. Maji**, High Heat of Hydrogen Adsorption and Guest-Responsive Magnetic Modulation in a 3D Porous Pillared-Layer Coordination Framework, *Chemical Communications*, 47, 538 (2011).

34. **J. van Herrikhuyzen, R. Willems, S. J. George, C. Flipse, J. C. Gielen, P. C. M. Christianen, A. P. H. J. Schenning and S. C. J. Meskers,** Atomic Force Microscopy Nanomanipulation of Shape Persistent, Spherical, Self-Assembled Aggregates of Gold Nanoparticles, *ACS Nano*, 4, 6501–6508 (2010).

35. **Jayanta Haldar, Luis Alvarez De Cienfuegos, Terrence M Tumpey, Larisa V Gubareva,** Jianzhu Chen, and Alexander M. Klibanov, Bifunctional polymeric inhibitors of influenza a viruses, *Pharmaceutical Research*, 27, 259-263 (2010).

36. **K. Jayaramulu, P. Kanoo, S. J. George and T. K. Maji,** Tunable emission from a porous metal-organic framework by employing an excited-state intramolecular proton transfer responsive ligand, *Chemical Communication*, 46, 7906 –7908 (2010).

37. **K. K. R. Datta, D. Jagadeesan, C. Kulkarni, A. Kamath, R. Datta and M. Eswaramoorthy,** Observation of Pore-switching Behaviour in Porous Layered Carbon through Mesoscale Order-Disorder Transformation, *Angewandte Chemie International Edition,* 123, 4015–4019 (2011).

38. **K. L. Gurunatha, G. Mostafa, D. Ghoshal, T. K. Maji,** Single-Crystal-to-Single-Crystal Structural Transformation in a 3D Bimetallic (4f-3d) Supramolecular Porous Framework, *Crystal Growth and Design*, 10, 2483 (2010).

39. **K. Raidongia, A. Gomati and C.N.R. Rao,** Synthesis and characterization of nanoparticles, nanotubes, nanopans and graphene-like structure of BN, *Israel Journal of Chemistry*, 50, 399 (2010).

40. **K. Raidongia, A. Nag, A. Sundaresan and C.N.R. Rao,** Multiferroic and magnetoelectric properties of core-shell $CoFe_2O_4$@$BaTiO_3$ nanocomposites, *Applied Physics Letters*, 97, 062904 (2010).

41. **K. Raidongia, A. Nag, K.P.S.S. Hembaram, U.V. Waghmare, R. Datta and C.N.R. Rao,** BCN: A graphene analogue with remarkable adsorptive properties, *Chemistry A European Journal*, 16, 149 (2010).

42. **K. Raidongia, K.P.S.S. Hembaram, U.V. Waghmare and C.N.R. Rao,** Synthesis structure and properties of mesoporous B/C/N microspheres, *Zeitschrift für anorganische und allgemeine Chemie*, 636, 30 (2010).

43. **K. Sai Krishna, C. S. S. Sandeep, Reji Philip and M. Eswaramoorthy**, Mixing does the magic: A rapid synthesis of high surface area noble metal nanosponges showing broadband nonlinear optical response, *ACS Nano*, 4, 2681 - 2688 (2010)

44. **K. V. Rao and S. J. George,** Synthesis and Controllable Self-Assembly of a Novel Coronene Bisimide Amphiphile, *Organic Letters*, 12, 2656–2659 (2010).

45. **K. V. Rao, K. Jayaramulu, T. K. Maji and S. J. George,** Supramolecular Hydrogels and High-Aspect-Ratio Nanofibers through Charge-Transfer-Induced Alternate Coassembly, *Angewandte Chemie International Edition*, 49, 4218–4222 (2010).

46. **K. V. Rao, K. K. R. Datta, M. Eswaramoorthy and S. J. George,** Light-Harvesting Hybrid Hydrogels: Energy Transfer Induced Amplified Fluorescence in Non-Covalently Assembled Chromophore-Organoclay Composites, *Angewandte Chemie International Edition*, 50, 1179 - 1184 (2011).

47. **K.S. Subrahmanyam, A.K. Manna, S.K. Pati and C.N.R. Rao,** A study of graphene decorated with metal nanoparticles, *Chemical Physics Letters,* 497, 70 (2010).

48. **K.S. Subrahmanyam, P. Kumar, A. Nag and C.N.R. Rao,** Blue-light emitting graphene-based materials and their use in generating white light, *Solid State Communications,* 150, 1774 (2010).

49. **K.S. Subrahmanyam, P. Kumar, U. Maitra, A. Govindaraj, K.P.S.S. Hembaram, U.V. Waghmare and C.N.R. Rao,** Chemical storage of hydrogen in few-layer graphene, *Proceedings of the National academy of Sciences of the United States of America*, 108, 2674 (2011).

50. **L.S. Panchakarla, A. Govindaraj and C.N.R. Rao,** Boron- and nitrogen-doped carbon nanotubes and graphene, *Inorganica Chimica Acta*, 363, 4163 (2010).

51. **L.S. Panchakarla, Y. Sundarayya, S. Manjunatha, A. Sundaresan and C.N.R. Rao,** On the defect origin of room-temperature magnetism-exhibited by metal oxide nanoparticles, *ChemPhysChem,* 11, 1673 (2010).

52. **M. Kumar and S. J. George,** Green fluorescent organic nanoparticles by self-assembly induced enhanced emission of a naphthalene diimide bolaamphiphile, *Nanoscale*, 3, 2130-2133 (2011), DOI: 10.1039/C1NR10151J

53. **M.B. Avinash, K. S. Subrahmanyam, Y. Sundarayya and T. Govindaraju,** Covalent modification and exfoliation of graphene oxide using ferrocene, *Nanoscale*, 49, 7229-7231 (2010).

54. **M.K. Bera, M.K. Sanyal, L. Yang, K. Biswas, A. Gibaud and C.N.R. Rao,** Small-angle x-ray scattering study of the aggregation of gold nanoparticles during formation at the toluene-water interface, Physical Review B: *Condensed Matter*, 81, 115415 (2010).

55. **Mallajosyula Sairam S, Pati SK,** Towards DNA Conductivity: A Theoretical Perspective (A Review), *Journal of Physical Chemistry Letters*, 1, 1881 – 1894 (2010).

56. **Manna Arun K, Pati SK,** Doping single-walled carbon nanotubes through molecular charge-transfer: a theoretical study, *Nanoscale*, 2, 1190 – 1195 (2010).

57. **Mohakud S, Andrews Alex P, Pati SK**, Ambipolar charge transport in a-oligofurans: A theoretical study, *Journal of Physical Chemistry C*, 114, 20436 – 20442 (2010).

58. **N. C. Mishra, H. Ila**, 4-Bis (methylthio) methylene-2-phenyloxazol-5-one: Versatile template for synthesis of 2-phenyl-4, 5-functionalized oxazoles, *Journal of Organic Chemistry*, 75, 5195 (2010).

59. **N.J.M. Sanghamitra, N. Varghese and C.N.R. Rao**, Effect of curcumin and Cu^{2+}/Zn^{2+} ions on the fibrillar aggregates formed by the amyloid peptide and other peptides at the organic-aqueous interface, *Chemical Physics Letters*, 496, 104 (2010).

60. **Nitesh Kumar, Dinesh Jagadeesan, Premlal Pillai, Melby Chacko, M. Eswaramoorthy and A. Sundaresan,** Ferromagnetism in Thin-Walled Hollow Spheres of Non-Magnetic Inorganic Materials, *Chemical Physics Letters*, 504, 189-192 (2011).

61. **P. Kanoo, R. Sambhu, T. K. Maji,** Guest-Specific Double- or Single-Step Adsorption in a Flexible Porous Framework Based on a Mixed Ligand System, *Inorganic Chemistry*, 50, 400 (2011).

62. **P. Kanoo, T. K. Maji,** Construction of 2D Rectangular Grid to 3D Diamondoid Interpenetrated and their Functionalities by Changing the Second Spacers, *European Journal of Inorganic Chemistry*, 3762 (2010)

63. **P. Kumar, L.S. Panchakarla, S.V. Bhat, U. Maitra, K.S. Subrahmanyam and C.N.R. Rao,** Photoluminescence, white-light emitting properties and related aspects of ZnO nanoparticles admixed with graphene and GaN, *Nanotechnology*, 21, 385701 (2010).

64. **P. Kumar, S. Saha, C.R. Serrao, A.K. Sood and C.N.R. Rao,** Temperature -dependent infrared reflectivity studies of multiferroic $TbMnO_3$: Evidence for spin-phonon coupling, *Pramana,* 74, 281 (2010).

65. **P. Kumar, S. Saha, D.V.S. Muthu, J.R. Sahu, A.K. Sood and C.N.R. Rao,** Raman evidence for orbiton-mediated multiphonon scattering in multiferroic $TbMnO_3$, Journal of Physics: *Condensed Matter*, 22, 115403 (2010).

66. **P. Mandal, A. Iyo, Y. Tanaka, A. Sundaresan and C.N.R. Rao,** Structure, magnetism and giant dielectric constant of $BiCr_{0.5}Mn_{0.5}O_3$ synthesized at high pressure, *Journal of Materials Chemistry,* 20, 1646 (2010).

67. **P. Mandal, A. Sundaresan, C.N.R. Rao, A. Iyo, P.M. Shirage, Y. Tanaka, Ch. Simon, V. Pralong, O.I. Lebedev, V. Caignaert and B. Raveau,** An interesting case of magnetization reversal in $BiFe_{0.5}Mn_{0.5}O_3$ synthesized at high pressure, *Physical Review B*, B82, 100416R (2010).

68. **Parida Prakash, Kundu Anasuya, Pati SK,** Organometallic Vanadium-Anthracene and its B-N Analogue: Efficient Spin Filters, *Physical Chemistry Chemical Physics*, 12, 26, 6924-6927 (2010).

69. **R. K. Verma, H. Ila, M. S. Singh,** Heteroaromatic annulations studies on 2-[bis(methylthio)methylene]-1,3-indanedione: efficient routes to indeno fused heterocycles, *Tetrahedron*, 66, 7389 (2010).

70. **R. Voggu, A. Shireen and C.N.R. Rao**, One-step synthesis of high-purity flourous-capped inorganic nanoparticles, *Dalton Transactions*, 39, 6021 (2010).

71. **R. Voggu, K.V. Rao, S. J. George and C. N. R. Rao,** A Simple Method of Separating Metallic and Semiconducting Single-Walled Carbon Nanotubes Based on Molecular Charge Transfer, *Journal of the American Chemical Society*, 132, 5560 –5561 (2010).

72. **R. Voggu, S. Ghosh, A. Govindaraj and C.N.R. Rao,** New strategies for the enrichment of metallic single-walled carbon nanotubes, *Journal of Nanoscience and Nanotechnology*, 10, 4102 (2010).

73. **S. Bhattacharya, S.K. Samantha, A. Gomati and C.N.R. Rao,** Novel nanocomposites made of BN nanotubes and a physical gel, *Langmuir*, 26, 12230 (2010).

74. **S. J. George, Z. Tomovic, A.P.H.J. Schenning and E.W.Meijer,** Insight into the Chiral Induction in Supramolecular Stacks through Preferential Chiral Solvation, *Chemical Communication*, 47, 3451-3453 (2011).

75. **S. Kumar, N. Kamaraju, K.S. Vasu, A. Nag, A.K. Sood and C.N.R. Rao,** Graphene analogue BCN: Femtosecond nonlinear optical susceptibility and hot carrier dynamics, *Chemical Physics Letters*, 499, 152 (2010).

76. **S. Manjunatha, L.S. Panchakarla, K. Biswas and C.N.R. Rao,** Nanorods and nanofilms of ZnO generated at the liquid-liquid interface, *Inorganica Chimica Acta (A. Chakravorty issue)* 363, 2125 (2010).

77. **S. Mohapatra, S. Siddhanta, D. R. Kumar, C. Narayana, T. K. Maji,** Facile and Green Synthesis of SERS Active and Ferromagnetic Silver Nanorods, *European Journal of Inorganic Chemistry*, 4969 (2010).

78. **S. Nandi, S. Kumar, H. Ila, H. Junjappa**, Attempted Cycloaromatization of a-Arylmethylsulfones with 2-bis1methylthio)methylene-1-tetralone: Unexpected formationof 2-aryl-3-(methylthio)-4,5-dihydronaphtho[1,2-b]furans, *Arkivoc*, (dedicated to Prof. Franklin Davis on his 70th birthday), 22-31 (2010).

79. **S.K. Samantha, A.Pal, S. Bhattacharya and C.N.R. Rao,** Carbon nanotube-reinforced supramolecular gels with electrically conducting, viscoelastic and near-infrared sensitive properties, *Journal of Materials Chemistry*, 20, 6881 (2010).

80. **S.V. Bhat, S.B. Krupanidhi and C.N.R. Rao,** A comparative study of metallic Au and ReO_3 nanoparticles on the performance of silicon solar cells. *Applied Physics Express*, 3, 115001 (2010).

81. *T. A. Khan, S. Kumar, C. Venkatesh , H. Ila,* Regioselective rapid analogue synthesis of 1,3-(or 1,5-) diphenyl-4-aryl/heteroaryl-5-(or 3-)(methylthio)pyrazoles via Suzuki cross-coupling, *Tetrahedron*, 67, 2961(2011).

82. **U. Maitra, S. Ghosh, K. Biswas and C.N.R. Rao,** Scaling behavior of Plasmon coupling in Au and ReO3 nanoparticles incorporated in polymer matrices, physica status solidi (RRL) - *Rapid Research Letters*, 4, 169-171 (2010).

83. **U.A. Palnitkar, R.V. Kashid, M.A. Mose, D.S. Joag, L.S. Panchakarla and C.N.R. Rao,** Remarkably low turn-on field emission in undoped, nitrogen-doped and boron-doped graphene, *Applied Physics Letters*, 97, 063102 (2010).

84. **U.K. Gautam, M. Imura, C.S. Rout, Y. Bando, X. Fang, B. Dierre, L. Sukharov, A. Govindaraj, J. Sekiguchi, D. Goldberg and C.N.R. Rao,** Unipolar assembly of ZnO rods manifesting polarity-driven collective luminescence, *Proceedings of the National academy of Sciences of the United States of America*, 107, 13588 (2010).

Evolutionary and Organismal Biology Unit

1. **Amitabh Joshi**, Hardy-Weinberg equilibrium and the foundations of evolutionary genetics. III. Incorporating mutation and migration, *Resonance*, 16(2), 116-128 (2011).

2. **Amitabh Joshi,** The deep roots of evo-devo and the 'origins' question. Review of *Treasure your exceptions*: the science and life of William Bateson, by Alan G. Cock and Donald R. Forsdyke, Journal of Genetics 89: 555-557 (2010).

3. **Lone, S. R., Ilangovan, V., Murugan, M., and V. K. Sharma**, Short and long day responses in the pre-adult developmental durations of two sympatric species of Camponotus ants, *Chronobiology International*, 28: 163-169 (2011).

4. **Lone, S. R., Sadanandappa, M. K. and V. K. Sharma,** Cyclic presence and absence of conspecifics alters circadian clock phase but does not entrain the locomotor activity rhythm of fruit fly Drosophila melanogaster, *Chronobiology International, Jul*;28(6) 497-508. (2011).

5. **Lone, S.R., Ilangovan, V., Murugan, M. and V. K. Sharma,** Circadian resonance in the development of two sympatric species of Camponotus ants, *Journal of Insect Physiology*, 56, 1611-1616 (2010).
6. **Sheeba, V. Fogle, K. J. and T. C. Holmes,** Persistence of morning anticipation behavior and high amplitude morning startle response following functional loss of small ventral lateral neurons in Drosophila, *PLoS One*, 5,7, e11628 (2010).
7. **Shetty N. R. and T. N. C. Vidya,** To split or not to split: the case of the African elephant. *Current Science*, 100, 810-812 (2011).
8. **Sivaperumal, R., Subramanian, P., Yadav, P. and V. K. Sharma,** Analysis of light pulse induced phase shift in locomotor activity rhythm of vg and Cryb mutants of Drosophila melanogaster, *Journal of Pharmaceutical Science and Research*, 2, 433-444 (2010).
9. **Sivaperumal, R., Subramanian, P., Yadav, P. and V. K. Sharma,** Analysis of circadian locomotor rhythms in vg and cryb mutants of Drosophila melanogaster under different light-dark regimes, *Biological Rhythm Research*, 42, 4, 321–335 (2011).
10. **Vidya T. N. C. and V. Thuppil,** Immediate behavioural responses of humans and Asian elephants in the context of road traffic in southern India, *Biological Conservation*, 143, 1891-1900 (2010).

Engineering Mechanics Unit

1. **A Majumder, V. Kariwala, S. Ansumali, and A. Rajendran,** Entropic lattice Boltzmann method for crystallization processes, *Chemical Engineering Science*, 65(13), 3928, (2010).
2. **A Majumder, V. Kariwala, S. Ansumali, and A. Rajendràn,** Fast High Resolution Method for Solving Multi-dimensional Population Balances in Crystallization, *Industrial & Engineering Chemistry Research*, 49 (8), 3862-3872, (2010).
3. **Alam, Meheboob and V. Chikkadi,** Velocity distribution function and correlations in a granular Poiseuille flow, *Journal of Fluid Mechanics*, 653, 175--219 (2010).
4. **D L Koch, Ganesh Subramanian,** Collective hydrodynamics of swimming microorganisms: Living fluids, *Annual Reviews of Fluid Mechanics,* 43, 637659 (2011).
5. **Ganesh Subramanian,** Viscosityenhanced biomixing of the oceans, *Current Science*, 98(8), 1103-1108 (2010).
6. **Ganesh Subramanian,** Wading through Batchelor's book, Resonance: *journal of science education*, 15(4), 363383, (2010).
7. **Harish N Dixit & Rama Govindarajan**, Jortexinduced instabilities and accelerated collapse due to inertial effects of density stratification, *Journal of Fluid Mechanics*, 646, 415-439 (2010).
8. **Harish N Dixit & Rama Govindarajan**, Stability of a vortex in radial density stratification: role of wave interactions, *Journal of Fluid Mechanics*, 679, 582 – 615 (2011).
9. **K B Sinha, Data Matrices,** Entropy and Applications (Dr. Rajendra Prasad Memorial Lecture delivered for the 64th ISAS conference in Dec. 2010), to appear in *Journal of the Indian Society of Agricultural Statistics*, 65(1), 16, (2011).
10. **K B Sinha,** Index theorems in Quantum Mechanics, Maths Newsletter, *Ramanujam Mathematical Society*, 19(1), 195-203 (2010).
11. **K B Sinha,** Lingaraj Sahu and Un Cig Ji, Characterization of Unitary Processes with Independent increnients, *Communications on Stochastic Analysis*, 4(4), 593 614, (2010).
12. **Kirti Chandra Sahu, A Sameen, Gayathri Swaminathan, & Rama Govindarajan,** Global Instabilities in Diverging Channel Flows, *Theoretical and Computational Fluid Dynamics, Special Issue on* Global Instabilities in Shear Flows, (2011), DOI: 10.1 007/sOOl 6201 001 875.
13. **Mukund, V., Ponnulakshmi, V. K. , Singh D.K., Subramanian, G. and Sreenivas, K.R.,** Hypercooling in the nocturnal boundary layer the Ramdas paradox, *PhysicaScripta*, Tl42, 014041 (2010).
14. **N. Prasianakis, and S. Ansumali,** Micro Flow simulation via Lattice Boltzmann Method, Communications in *Computational Physics*, 1128, (2011).

15. **OP Singh, Devesh Ranjan, J. Srinivasan, K. R. Sreenivas,** A Study of Basalt Fingers using Experiments and Numerical Simulations in Double-Diffusive Systems, *Journal of Geography and Geology*, 3, 1 (2011)

16. **P T Sumesh & Rama Govindarajan,** The possible equilibrium shapes of static pendant drops, *Journal of Chemical Physics*, 133, 144707 (2010).

17. **Rahul Bale and Rama Govindarajan,** Transient growth and why we should care about it, Resonance: *Journal of Science Education*, 15, 5, 441457 (2010).

18. R**atul Dasgupta & Rama Govindarajan,** Nonsimilar solutions of the viscous shallow water equations governing weak hydraulic jumps, *Physics of Fluids*, 22, 112108 (2010).

19. **RV Simha, JH Arakeri, S Usha and KR Sreenivas,** EAT and Comfort cooling, *Air Conditioning and Refrigeration Journal,* 13 (4), 48-60 (2010).

20. **S. Ansumali,** Mean Field Model beyond Boltzmann-Enskog Picture for Dense Gases, *Communications in Computational Physics*, 1106, (2011).

21. **Shukla P. and Alam, Meheboob,** Weakly nonlinear theory of shear-banding instability in granular plane Couette flow: analytical solution, comparison with numerics and bifurcation, *Journal of Fluid Mechanics*, 666, 204-253, (2011).

22. **Singh, C. Subramanian and S. Ansumali,** A lattice Boltzmann method for dilute polymer solutions, *Philosophical Transactions A of Royal Society*, 369, 1944 2301-2310 (2011), doi: 10.1098/rsta.2011.0069.

23. **Smith KC, Alam, Meheboob and Fisher, TS,** Athermal jamming of soft frictionless Platonic solids, *Physical Review E*, 81, 1-13 (2010).

24. **Subramanian G., Koch D.L. and Sean R. Fitzgibbon,** The stability of a homogeneous suspension of chemotactic bacteria, *Physics of Fluids*, 23, 041901 (2011); doi:10.1063/1.3580271 2011.

25. **W.P. Yudistiawan, S.K. Kwak, D.V. Patil, and S. Ansumali,** Higher-order Galilean-invariant lattice Boltzman n model for microflows: Single-component gas, *Physical Review E*, 82(4), 046701, (2010).

Book Chapters

1. **Ratul Dasgupta and Rama Govindarajan**, The Hydraulic Jump and the Shallow Water Equations, *Recent Advances in Mechanics*, ed. J Murali Krishnari (2011).

Paper in conference proceedings

1. **Srikanth T., Harish N Dixit & Rama Govindarajan,** Shedding behaviour in flow past an inline oscillating square cylinder, Proceedings of the IUTAM Symposium on Bluff Body Wakes, 2010.

2. **Anubhab Roy & Rama Govindarajan,** An introduction to hydrodynamic stability, *Rheology of Complex Fluids* ed. J Murali Krishnan, Springer (2010).

International Centre for Materials Science

1. **Angshuman Nag, Kalyan Raidongia, KPSS Hembram, Ranjan Datta, Umesh V Waghmare, CNR Rao,** Graphene Analogues of BN: Novel Synthesis and Properties, *ACS Nano*, 4, 1539 – 1544 (2010).

2. **HSSR Matte, A Gomati, AK Manna, DJ Late, R Datta, S K Pati, CNR Rao,** MoS and WS_2 Analogues of Graphene, *Angewandte Chemie International Edition*, 49, 24, 4059–4062 (2010).

3. **Raidongia Kalyan, Angshuman Nag, KPSS Hembram, Umesh V Waghmare, Ranjan Datta, CNR Rao,** BCN: A Graphene Analogue with Remarkable Adsorptive Properties, *Chemistry - A European Journal*, 16, 149 – 157 (2010).

Molecular Biology and Genetics Unit

1. **Arif M, Selvi BR and Kundu TK,** Lysine acetylation: the tale of a modification from transcription regulation to metabolism, *Chembiochem* 11, 1501 - 4 (2010).

2. **Arif M, Shandilya J, Senapati P and Kundu TK,** Protein lysine acetylation in cellular function and its role in cancer manifestation, *Biochim Biophys Acta* 1799, 702 - 716 (2010).

3. **Arif M, Vedamurthy BM, Choudhari R, Ostwal YB, Mantelingu K, Kodaganur GS and Kundu TK,** Nitric oxide-mediated histone hyperacetylation in oral cancer: target for a water-soluble HAT inhibitor, CTK7A, *Chemistry and Biology* 17, 903 - 913 (2010).

4. **B. Radha, M. Arif, Ranjan Datta, T. Kundu, G.U.Kulkarni,** Movable Au microplates as fluorescence enhancing substrates for live cells, *Nano Research*, 3, 738 - 747 (2010).

5. **Bodhini D, Radha V, Ghosh S, Sanapala KR, Majumder PP, Rao M.R.S., Mohan V.,** Association of Calpain 10 gene polymorphism with Type 2 Diabetes mellitus in Southern Indians. *Metabolism* 60(5), 681-688 (2010).

6. **Das C, Gadad SS, Kundu TK,** Human positive coactivator 4 controls heterochromatinization and silencing of neural gene expression by interacting with REST/NRSF and CoREST. *Journal of Molecular Biology* 397, 1-12 (2010).

7. **Gadad SS, Shandilya J, Kishore AH, Kundu TK,** NPM3, a member of the nucleophosmin/nucleoplasmin family, enhances activator-dependent transcription. *Biochemistry*, 49, 1355-7(2010).

8. **Jayashree Ladha, Sainitin Donakonda, Shipra Agrawal, Balaram Thota, M.R, Srividya, S.Sridevi, A. Arivazhagan, K. Thennarasu, Anandh Balasubramaniam, B.A. Chandramouli, A.S. Hegde, Paturu Kondaiah, Kumaravel Somasundaram, Vani Santosh and Satyanarayana MR Rao,** Glioblastoma specific protein interaction network identifies PP1A and CSK21 as connecting molecules between cell cycle associated genes, *Cancer Research* 70, 6437 - 6447 (2010).

9. **K.S. Vimaleswaran, V. Radha, S. Ghosh, Partha P. Majumder, Rao, M.R.S., V. Mohan**, Uncoupling Protein 2 and 3 Gene Polymorphisms and Their Association with Type 2 Diabetes in Asian Indians. *Diabetes Technology & Therapeutics*, 13(1), 19-25 (2010)

10. **Kumar GG, Mahadevan A, Guruprasad AS, Jerry M.E, Kovoor MD, P. Satishchandra, Nath A, Udaykumar, Ranga and S.K. Shankar,** Eccentric target sign in cerebral toxoplasmosis: neuropathological correlate to the imaging feature, *Journal of Magnetic Resonance Imaging* 31, 1469 - 1472 (2010).

11. **Kundu TK,** Small molecule modulators of chromatin and coactivators. Biochimica et Biophysica Acta (BBA) - *Gene Regulatory Mechanisms* 1799, 669-70 (2010)

12. **Liu Y, Nonnemacher MR, Stauff DL, Li L, Banerjee A, Irish B, Kilareski E, Rajagopalan N, Suchitra JB, Khan ZK, Ranga U, Wigdahl B.,** Structural and functional studies of CCAAT/enhancer binding sites within the human immunodeficiency virus type 1 subtype C LTR. *Biomedicine & Pharmacotherapy*, 64(10) 672-80, (2010).

13. **Madhavi Y, Puliyel JM, Mathew JL, Raghuram N, Phadke A, Shiva M, Srinivasan S, Paul Y, Srivastava RN, Parthasarathy A, Gupta S, Ranga U, Lakshmi VV, Joshi N, Nath I, Gulhati CM, Chatterjee P, Jain A, Priya R, Dasgupta R, Sridhar S, Dabade G, Gopakumar KM,, Abrol D, Santhosh MR, Srivastava S, Visalakshi S, Bhargava A, Sarojini NB, Sehgal D, Selvaraj S, Banerji D,** Evidence-based National Vaccine Policy, Indian *Journal of Medical Research* 131, 617 - 628 (2010).

14. **P. Sreekanth Reddy, Harish Srinivasan,, S Sridevi, M Vrinda, A Arivazhagan, Anandh Balasubramaniam, A. S. Hegde, B. A. Chandramouli, Vani Santosh, Rao, M.R.S.,** Paturu Kondaiah and Kumaravel Somasundaram Identification of potential serum biomarkers of glioblastoma: Serum osteopontin levels correlate with poor prognosis *Cancer Epidemiology, Biomarkers and Prevention* 19(6),1409-1422 (2010)

15. **R. Ratnapriya, J. Vijai, J. Kadandale, R. Iyer, K. Radhakrishnan and A. Anand,** A locus for juvenile myoclonic epilepsy maps to 2q33-q36, *Human Genetics* 128, 123-130, doi: 10.1007/s00439-010-0831-6 (2010).

16. **Ramana LN, Sethuraman S, Ranga U and Krishnan UM,** Development of a liposomal nanodelivery system for nevirapine, *Journal of Biomedical Science* 17, 57 (2010).

17. **Sanchari Bhattacharyya, Roshan Elizabeth Rajan, Yalla Swarupa, Ujjwal Rathore, Anjali Verma, Udaykumar, Ranga and Raghavan Varadarajan,** Design of a non-glycosylated outer domain derived

HIV-1 gp120 immunogen that binds to CD4 and induces neutralizing antibodies, *Journal of Biological Chemistry* 285, 27100 - 27110 (2010).

18. **Santosh, V., Arivazhagan, A., Sreekantha Reddy, P., Srinivasan ,H., Thota, B., Srividya, M.R., Vrinda, M., Sridevi, S., Shailaja, B.C., Samuel, C., Prasanna, K.V., Thennarasu, K., Balasubramaniam, A., Chandramouli, B.A., Hegde, A.S., Somasundaram, K., Kondaiah, P., Rao, M.R.S.,** Grade specific expression of IGFBP-2, -3 and -5 in astrocytomas: IGFBP3 emerges as a strong predictor of survival in patients with newly diagnosed glioblastoma. *Cancer Epidemiology, Biomarkers and Prevention* 19(6), 1399-1408 (2010)

19. **Selvi BR, Batta K, Kishore AH, Mantelingu K, Varier RA, Balasubramanyam K, Pradhan SK, Dasgupta D, Sriram S, Agrawal S, Kundu TK,** Identification of a novel inhibitor of coactivator-associated arginine methyltransferase 1 (CARM1)-mediated methylation of histone H3 Arg-17. *Journal of Biological Chemistry*, 285, 7143-52 (2010).

20. **Selvi RB, Cassel JC, Kundu TK and Boutillier AL,** Tuning acetylation levels with HAT activators: therapeutic strategy in neurodegenerative diseases, *Biochim Biophys Acta* 1799, 840 - 853 (2010).

21. **Selvi RB, Krishna DV, Ostwal YB and Kundu TK,** Modulators of Chromatin modifying enzymes in transcription and disease – A Connotation to Epigenetic Therapy, *Biochim Biophys Acta* 1799, 810 - 828 (2010).

22. **Ujjwal Neogi, Sreenivasa B Prarthana, George D'Souza, Ayesha DeCosta, Vijesh S Kuttiatt, Udaykumar Ranga and Anita Shet,** Co-receptor tropism prediction among 1045 Indian HIV-1 subtype C sequences: Therapeutic implications for India. *AIDS Research and Therapy,* 7(24), (2010).

23. **Venu P, Chakraborty S., Inamdar M.,** Analysis of long- term culture properties and pluripotent character of two sibling human embryonic stem cell lines derived from discarded embryos. *In vitro Cellular & Developmental Biology – Animal*, 46, 200 - 205 (2010).

24. **Babhrubahan Roy, Laura S. Burrack, Museer A. Lone, Judith Berman and Kaustuv Sanyal,** CaMtw1, a member of the evolutionarily conserved Mis12 kinetochore protein family, is required for efficient inner kinetochore assembly in the pathogenic yeast Candida albicans, *Molecular Microbiology* 80, 14 - 32 (2011).

25. **Banerjee M, Balaram H, Joshi NV, Balaram P.,** Engineered dimer interface mutants of triosephosphate isomerase: the role of inter-subunit interactions in enzyme function and stability. *Protein Engineering Design and Selection* 24, 463-72 (2011).

26. **Banerjee M, Gupta K, Balaram H, Balaram P.** Mass spectrometric identification of an intramolecular disulfide bond in thermally inactivated triosephosphate isomerase from a thermophilic organism Methanocaldococcus jannaschii. *Rapid Communications in Mass Spectrometry* 25, 1915-23 (2011).

27. **Bhat JY, Venkatachala R, Balaram H.** Substrate-induced conformational changes in Plasmodium falciparum guanosine monophosphate synthetase. *FEBS Journal* 278, 3756-68 (2011).

28. **Bhat JY, Venkatachala R, Singh K, Gupta K, Sarma SP, Balaram H.** Ammonia channeling in Plasmodium falciparum GMP synthetase: investigation by NMR spectroscopy and biochemical assays. *Biochemistry* 50, 3346-56 (2011).

29. **Bodhini D, Radha V, Ghosh S, Majumder PP, Rao MR, Mohan V.,** Glut 4 Gene polymorphisms and their association with Type 2 Diabetes in South Asians. *Diabetes Technology & Therapeutics* 13(9), 913-20, (2011).

30. **Bulusu V, Jayaraman V, Balaram H.,** Metabolic fate of fumarate, a side product of the purine salvage pathway in the intraerythrocytic stages of Plasmodium falciparum. *Journal of Biological Chemistry* 286, 9236-45 (2011).

31. **Bulusu V, Thakur SS, Venkatachala R, Balaram H.,** Mechanism of growth inhibition of intraerythrocytic stages of Plasmodium falciparum by 5-aminoimidazole-4-carboxamide ribonucleoside (AICAR). *Molecular and Biochemical Parasitology* 177, 1-11 (2011).

32. **Debnath S, Chatterjee S, Arif M, Kundu TK,** Roy S, Peptide-protein interactions suggest that acetylation of lysines 381 and 382 of p53 is important for positive coactivator 4-p53 interaction. *Journal of Biological Chemistry* 286, 25076-87 (2011)

33. **Gadad SS, Rajan RE, Senapati P, Chatterjee S, Shandilya J, Dash PK, Ranga U, Kundu TK,** HIV-1 infection induces acetylation of NPM1 that facilitates Tat localization and enhances viral transactivation. *Journal of Molecular Biology* 410, 997-1007 (2011).

34. **Gadad SS, Senapati P, Syed SH, Rajan RE, Shandilya J, Swaminathan V, Chatterjee S, Colombo E, Dimitrov S, Pelicci PG, Ranga U, Kundu TK,** The multifunctional protein nucleophosmin (NPM1) is a human linker histone H1 chaperone. *Biochemistry* 50, 2780-9 (2011).

35. **Gogia S, Balaram H, Puranik M.,** Hypoxanthine guanine phosphoribosyltransferase distorts the purine ring of nucleotide substrates and perturbs the pKa of bound xanthosine monophosphate. *Biochemistry* 50, 4184-93 (2011).

36. **Karthigeyan D, Prasad SB, Shandilya J, Agrawal S, Kundu TK,** Biology of Aurora A kinase: Implications in cancer manifestation and therapy. *Medicinal Research Reviews* 31, 757-793 (2011)

37. **Maity D, Manna AK, Karthigeyan D, Kundu TK, Pati SK, Govindaraju T,** Visible-near-infrared and fluorescent copper sensors based on julolidine conjugates: selective detection and fluorescence imaging in living cells. Chemistry – *A European Journal* 17, 11152-61 (2011)

38. **Partha P. Kundu, G. V. Pavan Kumar, K. Mantelingu, Tapas K. Kundu and Chandrabhas Narayana,** Raman and surface enhanced Raman spectroscopic studies of specific, small molecule activator of histone acetyltransferase p300, *Journal of Molecular Structure* 999, 10 - 15 (2011).

39. **Samanta M, Banerjee M, Murthy MR, Balaram H, Balaram P.,** Probing the role of the fully conserved Cys126 in triosephosphate isomerase by site-specific mutagenesis--distal effects on dimer stability. *FEBS Journal* 278, 1932-43 (2011).

40. **Samanta M, Murthy MR, Balaram H, Balaram P.,** Revisiting the mechanism of the triosephosphate isomerase reaction: the role of the fully conserved glutamic acid 97 residue. *Chembiochem* 12, 1886-96 (2011).

41. **Vemparala S, Mehrotra S, Balaram H.** Role of loop dynamics in thermal stability of mesophilic and thermophilic adenylosuccinate synthetase: a molecular dynamics and normal mode analysis study. *Biochim Biophys Acta*, 1814, 630-7 (2011).

Book Chapters:

1. **Agrawal, S., Nishant, K.T. and Rao, M.R.S.** Analysis of Meiotic Recombination Hotspots: A Bioinformatic approach. **In A Practical Guide to Bionformatic Analysis. iConcept Press,** pp133-149 (2010)

2. **Shipra Agrawal and M.R.S. Rao** Biological Network, Disease Mechanism Network. **In Encyclopedia of Systems Biology, In Press**

3. **Shipra Agrawal and M.R.S. Rao** Functional / Signature Network Module for Target Pathway / Gene Discovery. **In Encyclopedia of Systems Biology, In Press**

Theoretical Sciences Unit

1. **Alison Hatt, Brent Melot and Shobhana Narasimhan,** Harmonic and anharmonic properties of Fe and Ni: Thermal expansion, exchange-correlation errors, and magnetism, *Physical Review B,* 82, 134418 (2010).

2. **Benjamin J. Block, Subir K. Das, Martin Oettel, Peter Virnau and Kurt Binder,** Curvature Dependence of Surface Free Energy of Liquid Drops and Bubbles: A Simulation Study, *Journal of Chemical Physics* (Research Highlight), 133, 154702 (2010).

3. **Bhattacharjee Joydeep, Waghmare UV,** Wannier orbital overlap population (WOOP), Wannier orbital position population (WOPP) and the origin of anomalous dynamical charges. *Physical Chemistry Chemical Physics*, 12(7), 1564-1570 (2010).

4. **Bhowmick S, Waghmare UV.,** Anisotropy of the Stone-Wales defect and warping of graphene nanoribbons: A first-principles analysis, *Physical Review B*, 81, 155416 (2010).

5. **Choudhury D, Hazarika A, Venimadhav A, Kakarla C, Delaney KT, Devi S, Mondal P, Nirmala R, Gopalakrishnan J, Spaldin NA, Waghmare UV, Sarma DD,** Electric and magnetic polarizabilities of hexagonal $Ln_{(2)}CuTiO_{(6)}$ (Ln = Y, Dy, Ho, Er, and Yb), *Physical Review B*, 82, 134203 – 134210 (2010).

6. **Choudhury D, Venimadhav A, Kakarla C, Delaney KT, Devi PS, Mondal P, Nirmala R, Gopalakrishnan J, Spaldin NA, Waghmare UV,** SarmaDD. Unusual dielectric response in B-site size-disordered hexagonal transition metal oxides. *Applied Physics Letters*, 96, 162903 (2010).

7. **D. Parihari, N. S. Vidhyadhiraja and A. Taraphder,** Field dependent dynamics in the metallic regime of the half-filled Hubbard model, *Journal of Physics: Condensed Matter*, 23, 055602 (2011).

8. **Das H, Spaldin NA, Waghmare UV, Saha-Dasgupta T.,** Chemical control of polar behavior in bicomponent short-period superlattices, *Physical Review B*, 81, 235112 – 235119 (2010).

9. **Deepak J, Pradeep T, Waghmare UV,** Interaction of small gold clusters with carbon nanotube bundles: formation of gold atomic chains. *Journal of Physics-Condensed Matter*, 22, 125301 (2010).

10. **Dutta G, Saha SK, Waghmare UV,** Effects of Zr and Ti doping on the dielectric response of CeO_2: A comparative first-principles study, *Solid State Communications*, 150, 2020 – 2022 (2010).

11. **Dutta Sudipta, Pati SK,** Edge reconstructions induces magnetic and metallic behavior in zigzag graphene nanoribbons, *Carbon*, 48, 4409-4413 (2010).

12. **Dutta Sudipta, Pati SK,** Novel Properties of Graphene Nanoribbons: A Review. *Journal of Materials Chemistry*, 20, 8207 - 8223 (2010).

13. **Dzade NY, Obodo KO, Adjokatse SK, Ashu AC, Amankwah E, Atiso CD, Bello AA, Igumbor E, Nzabarinda SB, Obodo JT, Ogbuu AOFemi OE, Udeigwe JO, Waghmare UV,** Silicene and transition metal based materials: prediction of a two-dimensional piezomagnet, *Journal of Physics: Condensed Matter*, 22, 375502 – 375510 (2010).

14. **Gupta A, Kumar A, Hegde MS, Waghmare UV,** Structure of $Ce_{1-x}Sn_xO_2$ and its relation to oxygen storage property from first-principles analysis, *Journal of Chemical Physics*, 132, 194702 (2010).

15. **Gupta A, Waghmare UV Hegde MS,** Correlation of Oxygen Storage Capacity and Structural Distortion in Transition-Metal-, Noble-Metal-, and Rare-Earth-Ion-Substituted CeO_2 from First Principles Calculation, *Chemistry of Materials*, 22, 5184 – 5198 (2010).

16. **H. Barman and N. S. Vidhyadhiraja,** Transport and Spectra in the half-filled Hubbard model: A dynamical mean-field study, *International Journal of Modern Physics B*, (2011). In Press.

17. **H. Pandith and S. K. Pati,** Conformational Analysis and Vibrational Circular Dichroism of tris(ethylenediamine)ruthenium(II) Complex : A Theoretical Study, *Journal of Physical Chemistry A*, 114, 87-92 (2010).

18. **K. Jain,** Extreme value distributions for weakly correlated fitnesses in block model, *Journal of Statistical Mechanics*, P04020 (2011), doi:10.1088/1742-5468/2011/04/P04020.

19. **K. Jain, J. Krug and S.-C. Park,** Evolutionary advantage of small populations on complex fitness landscapes, *Evolution*, 65, 7 (2011), doi:10.1111/j.1558-5646.2011.01280.x.

20. **Kumar A, Kumar P, Waghmare UV, Sood AK,** First-principles analysis of electron correlation, spin ordering and phonons in the normal state of $FeSe_{1-x,}$ *Journal of Physics: Condensed Matter*, 22, 385701 – 385708 (2010).

21. **Kumar Anil, Waghmare UV,** First-principles free energies and Ginzburg-Landau theory of domains and ferroelectric phase transitions in BaTiO3, *Physical Review B*, 82, 05411 – 05419 (2010).

22. **Kumar Pradeep, Saha Surajit, Kumar Anil, Muthu DVS, Prakash J, Patnaik S, Waghmare UV, Ganguli AK, Sood AK,** Anomalous Raman Scattering from Phonons and Electrons of Superconducting $FeSe_{0.82}$, Solid State Communications, 150(13-14), 557-560, (2010).

23. **Mallajosyula Sairam S, Pati SK,** Towards DNA Conductivity: A Theoretical Perspective (A Review). *Journal of Physical Chemistry Letters*, 1, 1881 - 1894 (2010).

24. **Manna Arun K, Pati SK,** Doping single-walled carbon nanotubes through molecular charge-transfer: a theoretical study, *Nanoscale*, 2, 1190- 1195 (2010).

25. **Mighfar Imam and Shobhana Narasimhan,** Magnetism of surface alloys of the type M_xN_{1-x}/Rh(11), *Journal of Magnetism and Magnetic Materials*, 323, 1873 - 1881 (2011).

26. **Mohakud S, Andrews Alex P, Pati SK,** Ambipolar charge transport in a-oligofurans: A theoretical study, *Journal of Physical Chemistry C*, 114, 20436 - 20442 (2010).

27. **Moumita Maiti, Madan Rao, Srikanth Sastry**, Competition between folding and aggregation in a model for protein solutions, *European Physical Journal E*, 032, 217221 (2010).

28. **Nag Angshuman, Raidongia Kalyan, Hembram KPSS, Datta Ranjan, Waghmare UV, Rao CNR,** Graphene Analogues of BN: Novel Synthesis and Properties, *ACS NANO*, 4 (3), 1539-1544 (2010).

29. **Nagaraja CM, Behera JN, Maji Tapas K, Pati SK, Rao CNR,** Organically-templated Kagomé compounds containing two transition metal ions. *Dalton Transactions*, 39, 6947 (2010).

30. **Nisha Mammen, Shobhana Narasimhan and Stefano de Gironcoli,** Tuning the Morphology of Gold Clusters by Substrate Doping, *Journal of the American Chemical Society*, 133, 2801 - 2802 (2011).

31. **Nishimatsu T, Iwamoto M, Kawazoe Y, Waghmare UV,** First-principles accurate total energy surfaces for polar structural distortions of $BaTiO_3$, $PbTiO_3$, and $SrTiO_3$: Consequences for structural transition temperatures, *Physical Review B*, 82, 134106 – 134112 (2010).

32. **P. Chaudhuri, L. Berthier, and S. Sastry,** Jamming Transitions in Amorphous Packings of Frictionless Spheres Occur over a Continuous Range of Volume Fractions, *Physical Review Letters*, 104, 165701 (2010).

33. **Parida Prakash, Kundu Anasuya, Pati SK,** Organometallic Vanadium-Anthracene and its B-N Analogue: Efficient Spin Filters, *Physical Chemistry Chemical Physics*, 12 (26), 6924-6927 (2010).

34. **Prabhat K. Jaiswal, Sanjay Puri and Subir K. Das,** Kinetics of Surface Enrichment: A Molecular Dynamics Study, J*ournal of Chemical Physics* (Research Highlight), 133, 154901 (2010).

35. **Pradhan GK, Kumar A, Deb SK, Waghmare UV, Narayana C,** Elastic and structural instability of cubic Sn_3N_4 and C_3N_4 under pressure. *Physical Review B* 82, 144112 – 144118 (2010).

36. **Raidongia K, Nag A, Hembram KPSS, Waghmare UV, Datta R, Rao CNR,** BCN: A Graphene Analogue with Remarkable Adsorptive Properties, *Chemistry European Journal A*, 16, 149 – 157 (2010).

37. **Raidongia Kalyan, Hembram KPSS, Waghmare UV, Eswaramoorthy M, Rao CNR,** Synthesis, Structure, and Properties of Mesoporous B/C/N Microspheres, *Zeitschrift für anorganische und allgemeine Chemie*, 636, 30 – 35 (2010).

38. **Ramakrishna Matte HSS, Gomathi A, Manna Arun K, Dattatray J. Late, Datta Ranjan, Pati SK, Rao CNR,** Graphene analogues of MoS_2 and WS_2. *Angewandte Chemie International Edition*, 49, 4059 (2010).

39. **S Kumar, KPSS Hembram, Waghmare UV.** Intrinsic buckling strength of graphene: First-principles density functional theory calculations, *Physical Review B*, 82, 115411 (2010).

40. **S. Karmakar, C. Dasgupta, Srikanth Sastry,** Analysis of dynamic heterogeneity in a glass former from the spatial correlations of mobility, *Physical Review Letters*, 105, 015701, (2010).

41. **S. Karmakar, C. Dasgupta, Srikanth Sastry,** Comment on Scaling Analysis of Dynamic Heterogeneity in a Supercooled Lennard-Jones Liquid, *Physical Review Letters*, 105, 019801 (2010).

42. **S. Mehendale, Y. Girard, V. Repain, C. Chacon, J. Lagoute, S. Rousset, M. Marathe and S. Narasimhan,** Ordered Surface Alloy of Bulk-Immiscible Components Stabilized by Magnetism, *Physical Review Letters*, 105, 056101 (2010).

43. **S. Seetharaman and K. Jain,** Evolutionary dynamics on strongly correlated fitness landscapes, *Physical Review E*, 82 , 031109 (2010).

44. **S. V. Buldyrev, P. Kumar, S. Sastry, H. E. Stanley, and S. Weiner,** Hydrophobic Collapse and Cold Denaturation in the Jagla Model of Water [Proc. Lausanne CECAM Conference], *Journal of Physics: Condensed Matter,* 22, 284109 (2010).

45. **Sabyasachi Mukhopadhyay, Rakesh Voggu, C.N.R.Rao, N.S.Vidhyadhiraja and K.S.Narayan,** Lateral photocurrent scanning of donor and acceptor polymers on graphene coated substrates, *Japanese Journal of Applied Physics*, 50, 6, 061602-061602-5 (2011).

46. **Saha Bivas, Acharya J, Sands T, Waghmare UV,** Electronic structure, phonons, and thermal properties of ScN, ZrN, and HfN: A first-principles study, *Journal of Applied Physics*, 107, 033715 (2010).

47. **Shaista Ahmad, Subir K. Das and Sanjay Puri,** Kinetics of Phase Separation in Fluids: A Molecular Dynamics Study, *Rapid Communication Physical Review E*, 82, 040107 (2010).

48. **Shibu Saw, Niels Ellegaard, Walter Kob, Srikanth Sastry,** Computer Simulation Study of Phase Behavior and Structural Relaxation in a Gel-former Modeled by Three Body Interactions, *Journal of Chemical Physics*, 134, 164506 (2011); doi:10.1063/1.3578176

49. **Smith KC, Fisher TS, Waghmare UV, Leew N de, Grau-crespo R,** Dopant-vacancy binding effects in Li-doped magnesium hydride, *Physical Review B*, 82, 134109 – 134117 (2010).

50. **Srikanth Sastry,** Illuminating liquid polymorphism in silicon, *Proceedings of the National academy of Sciences of the United States of America*, 107, 17063 (2010).

51. **Subir K. Das and Kurt Binder,** Does Young's equation hold on the nanoscale? A Monte Carlo test for the binary Lennard-Jones fluid, submitted, E*urophysics Letters EPL*, 92, 26006 (2010).

52. **Subrahmanyam KS, Manna Arun K, Pati SK, Rao CNR,** A study of graphene decorated with metal nanoparticles, *Chemical Physics Letters*, 497, 70-75 (2010).

53. **Suman Majumder and Subir K. Das,** Domain coarsening in two dimensions: Conserved dynamics and finite-size scaling, *Rapid Communication Physical Review E*, 81, 050102 (2010).

54. **Sutapa Roy and Subir K. Das,** Transport Phenomena in Fluids: Finite-size scaling for critical behavior, *Europhysics Letters EPL*, 94, 3(2011). doi:10.1209/0295-5075/94/36001.

55. **Tripathi Madhvendra Nath, Waghmare UV, Ramesh Thimmasandra Narayan, Kamath Vishnu P,** Polytypism and Stacking Disorders in Nickel Hydroxide: A First-Principles Study, *Journal of the Electrochemical Society*,157A, 280 – 286 (2010).

56. **Tripathi S, Kumar A, Waghmare UV, Pandey D,** Effect of $NaNbO_3$ substitution on the quantum paraelectric behavior of $CaTiO_3$, *Physical Review B*, 81, 212101 – 212108 (2010).

57. **V.Vishwas, Shibu Saw and Srikanth Sastry,** Liquid-liquid critical point in supercooled silicon, *Nature Physics*, 7,549–553 (2011).

58. **Venu K, Kanuri S, Raidongia K, Hembram KPSS, Waghmare UV, Datta R,** Band gap and chemically ordered domain structure of a graphene analogue $B_xC_yN_z$, *Solid State Communications*, 150, 2262-2265 (2010).

Book chapters:

1. **Datta A, Mallajosyula SS, Pati SK,** Computational Studies on Molecules with Unusual Aromaticity: What to Expect? *Aromaticity and Metal Clusters*, Taylor and Francis 69-94 (2010).

2. **S. Rousset, V. Repain and S. Narasimhan,** Stress Driven Nanopatterning in Metallic Systems, *Mechanical Stress on the Nanoscale*, ed. M. Hanbuecken, P. Mueller and R.B. Wehrspohn, Wiley Books (2011).

Conference Proceedings

1. K**urt Binder and Subir K. Das,** Computer Simulations of Phase Diagrams, Critical Phenomena and Interfacial Properties of fluids, *AIP Conference Proceedings*, 1319, 129 - 140 (2010).

Chemical Biology Unit

1. **Banerjee, S., Kandanelli, R., Bhowmik, S. and Maitra,** U, Self-organization of multiple components in a steroidal hydrogel matrix: Design, construction and studies on novel tunable luminescent gels and xerogels, *Soft Matter* (2011), DOI: 10.1039/C1SM05672G.
2. **Bhattacharya, S. and Biswas, J,** Understanding Membranes through the Molecular Design of Lipids, *Langmuir*, 26, 4642–4654 (2010).
3. **Bhattacharya, S. and Biswas, J,** Vesicle and Stable Monolayer Formation from Simple "Click" Chemistry Adducts in Water, *Langmuir*, 27, 1581–1591 (2011).
4. **Bhattacharya, S. and Samanta, S. K., J,** Surfactants Possessing Multiple Polar Heads, A Perspective on their Unique Aggregation Behavior and Applications, *Journal of Physical Chemistry Letters*, 2, 914–920 (2011).
5. **Bhattacharya, S., Chaudhuri, P., and Paul, A,** Symmetrical Bisbenzimidazoles with Benzenediyl Spacer: The Role of the Shape of the Ligand on the Stabilization and Structural Alterations in Telomeric G-Quadruplex DNA and Telomerase Inhibition, *Bioconjugate Chemistry*, 21, 1148–1159 (2010).
6. **Bhattacharyya, S., Rajan, R. E., Swarupa, Y., Rathore, U., Verma, A.,** Udaykumar, R. and Varadarajan, R, Design of a non-glycosylated outer domain-derived HIV-1 gp120 immunogen that binds to CD4 and induces neutralizing antibodies, *Journal of Biological Chemistry*, 285, 27100-10 (2010).
7. **Biswas, J., Bajaj, A. and Bhattacharya, S,** Membranes of Cationic Gemini Lipids based on Cholesterol with Hydroxyl Headgroups and their Interactions with DNA and Phospholipid, *Journal of Physical Chemistry B*, 115, 478–486 (2011).
8. **Biswas, J.. Mishra; S.K.. Kondaiah, P. and Bhattacharya,** S., Syntheses, Transfection Efficacy and Cell Toxicity Properties of Novel Cholesterol-based Gemini Lipids having Hydroxyethyl Head group, *Organic & Biomolecular Chemistry*, 9, 4600–4613 (2011).
9. **Bommakanti, G., Citron, M. P., Hepler, R. W., Callahan, C., Heidecker, G. J., Najar, T. A., Lu, X., Joyce, J. G., Shiver, J. W., Casimiro, D. R., ter Meulen, J., Liang, X. and Varadarajan, R,** Design of an HA2-based Escherichia coli expressed influenza immunogen that protects mice from pathogenic challenge, *Proceedings of the National academy of Sciences of the United States of America*, 107, 13701-6 (2010).
10. **Das, R.K., Kandanelli, R., Linnanto, J., Bose, K. and Maitra, U,** Supramolecular chirality in organogels: a detailed spectroscopic, morphological, and rheological investigation of gels (and xerogels) derived from alkyl pyrenyl urethanes, *Langmuir*, 26, 16141- 16149 (2010).
11. **Indu, S., Kochat, V., Thakurela, S., Ramakrishnan, C. and Varadarajan R,** Conformational analysis and design of cross-strand disulfides in antiparallel beta-sheets, *Proteins*, 79, 244-60 (2011).
12. **Indu, S., Kumar, S.T., Thakurela, S., Gupta, M., Bhaskara, R.M., Ramakrishnan, C. and Varadarajan R,** Disulfide conformation and design at helix N-termini, *Proteins*, 78, 1228-42 (2010).
13. **Jain A.K. and Bhattacharya, S,** Groove Binding Ligands for the Interaction with Parallel-Stranded ps-Duplex DNA and Triplex DNA, *Bioconjugate Chemistry*, 21, 1389–1403 (2010).
14. **Maitra, U. and Chakrabarty, A. Beil. J,** Protonation and deprotonation induced organo/hydrogelation: Bile acid derived gelators containing a basic side chain, *Beilstein Journal of Organic Chemistry*, 7, 304-309 (2011).
15. **Samanta, S. K., Gomathi, A., Bhattacharya, S. and Rao, C.N.R,** Novel Nanocomposites made of Boron Nitride Nanotubes and a Physical Gel, *Langmuir* 26, 12230–12236 (2010).
16. **Samanta, S.K., Pal, A., Bhattacharya, S. and Rao, C.N.R,** Carbon nanotube reinforced supramolecular gels with electrically conducting, viscoelastic and near-infrared sensitive properties, *Journal of Materials Chemistry*, 20, 6881–6890 (2010).

Condensed Matter Theory Unit

1. **B. Mukherjee, P. K. Maiti, C. Dasgupta and A. K. Sood,** Single-file diffusion of water inside narrow carbon nanorings, *ACS Nano*, 4, 985 (2010).
2. **C. Dasgupta and O.T. Valls,** Non-classical rotational inertia in a two-dimensional solid containing grain boundaries, *Physical Review B*, 82, 024523 (2010).
3. **G. Sahoo, P. Perlekar and R. Pandit,** Systematics of the magnetic-Prandtl-number dependence of homogeneous, isotropic magnetohydrodynamic turbulence, *New Journal of Physics*, 13,0130363 (2011); doi:10.1088/1367-2630/13/1/013036.
4. **Nitin Kumar, Sriram Ramaswamy, and A. K. Sood,** Symmetry Properties of the Large-Deviation Function of the Velocity of a Self-Propelled Polar Particle, *Physical Review Letters*,106(4), 118001 (2011).
5. **P. Perlekar, D. Mitra, and R. Pandit,** Direct numerical simulations of statistically steady, homogeneous, isotropic fluid turbulence with polymer additives, *Physical Review E*, 82, 066313 (2010), (also available at http://arxiv.org/abs/1008.0051)
6. **P. Perlekar, S. S. Ray, D. Mitra, and R. Pandit,** The Persistence Problem in Two-Dimensional Fluid Turbulence, *Physical Review Letters*, 106, 054501 (2011), (also available at http://arxiv.org/abs/1009.1494)
7. **R. Majumder, A. R. Nayak, and R. Pandit,** Scroll-wave dynamics in human cardiac tissue: lesson from a mathematical model with inhomogeneties and fiber architecture, *PLoS ONE*, 6(4), e18052 (2011). doi:10.1371/journal.pone.0018052.
8. **S. Karmakar, C. Dasgupta and S. Sastry,** Analysis of dynamic heterogeneity in a glass former from the spatial correlations of mobility, *Physical Review Letters*, 105, 015701 (2010).
9. **S. Karmakar, C. Dasgupta and S. Sastry,** Comment on "Scaling analysis of dynamic heterogeneity in a supercooled Lennard-Jones liquid", *Physical Review Letters*, 105, 019801 (2010).
10. **S. Ramaswamy,** The Mechanics and Statistics of Active Matter, *Annual Reviews of Condensed Matter Physics*, 1, 323-345 (2010).

Book Chapter

1. **R. Majumder, A. R. Nayak, and R. Pandit,** An Overview of Spiral- and Scroll-Wave Dynamics In Mathematical Models for Cardiac Tissue, Invited book chapter, In O.N. Tripathi, U. Ravens, and M.C. Sanguinetti (eds.), *Heart Rate and Rhythm*, DOI 10.1007/978-3-642-17575-6 14, (Springer-Verlag, Berlin, Heidelberg 2011) Chapter 14, pp 269-282.

Books/Proceedings authored/edited by Faculty

1. **C.N.R. Rao,** *Climbing the limitless ladder-A life in chemistry*, IISc Press-World Scientific (2010). Kannada Translation 2011.
2. **C.N.R. Rao,** Nanoworld, Nava Karnataka and JNCASR (2010).
3. **K B Sinha,** Coeditor of *Advances in Mathematical Physics Nonlinear and Non commutative Mathematics: New Developments and Applications in Quantum Physics*, Hindawi Publishing Corporation, (2010).
4. **T. Enoki and C.N.R. Rao ed. by S. Pati**, *Graphene and its fascinating properties*, World Scientific (2011). ISBN 978-981-4329-35-4.

   This book has been translated to Swedish and several Indian languages.
5. **V.R. Bommisetty, N.S. Sariciftci, K. S. Narayan, G. Rumbles, P. Peumans, J. van de Lagemaat, G. Dennler, S.E. Shaheen,** Organic Photovoltaics and Related Electronics-From Excitons to Devices, *MRS Proceedings*, 1270, (2010), ISBN: 978-1-60511-247-3

AWARDS/DISTINCTIONS

The following faculty and honorary faculty members of the Centre have received various honours and awards both at the national and international level in recognition of their significants contributions to the progress of science and technology.

AWARDS & HONOURS

Prof C N R Rao

Kelly Lecture, Cambridge University (2009)
The First International Prize for Materials Science by MRSI (India) (2009)
A.D. Little Lectures in Chemistry, Massachusetts Institute of Technology (2010).
Honorary Fellow, Chinese Chemical Society, China (2010).
KFUPM Chair Professorship by the King Fahd University of Petroleum & Minerals, Saudi Arabia.
First PC Ray Lecture, IACS Kolkata (2010).
Doctorate of Science (Honoris Causa) from the University of Liverpool (2010).
Dhirubhai Ambani Life Time Achievement Award 2010 by Institute of Chemical Technology, Mumbai.
EDGE Award for leadership in education (2011).
D.Litt. by Karnataka State Open Univeristy (2011)
Distinguished Lecture, Waterloo Institute of Nanotechnology.
D.Sc. (Honoris Causa) by SRM University, Chennai and Punjab University.

Prof P Rama Rao
Padma Vibhushan award by the Govt of India.

Prof R Narasimha
The Kamal Kumari National Award for Science and Technology, 2009
Distinguished Alumnus Award, University of Visveswaraya College of Engineering and Key Note speaker the UVCE Mega Reunion, 2011

Prof Ajay Kumar Sood
Vigyan Ratan Award, Punjab University, 2010

Prof Amitabh Joshi
Lakshmipat Singhania National Leadership Awards – Young Leader in Science and Technology for the year 2010.

Prof G U Kulkarni
MRSI-ICSC Superconductivity and Materials Science Annual Prize -2011

Prof N Chandrabhas
Sir C.V. Raman Young Scientist Award of the Karnataka State

Prof Rahul Pandit
Distinguished Alumini Award, IIT Delhi, August 2010
UGC-BSR one-time research grant, December 2010

Prof Amitabha Chattopadhyay
Darshan Ranganathan Memorial Lecture Award, CRSI.

Prof Raghavendra Gadagkar
Millennium Plaques of Honour, 2010, Indian Science Congress Association, Kolkata.

Prof Sabyasachi Bhattacharya
Homi Bhabha Lectureship Award,
Indian Physics Association & Institute of Physics (United Kingdom) 2010

Prof Swapan K Pati
Shanti Swarup Bhatnagar Prize in 2010

Prof A Sundaresan
CRSI bronze medal for the year 2011.

Prof M Eswaramoorthy
MRSI Medal in Materials Science

Dr Tapas Kumar Maji
Young Investigator in the field of Chemical Sciences by the Journal Chemical Communications, 2011, published by Royal Society of Chemistry.

Dr T Govindaraju
Innovative Young Biotechnologist Award (IYBA) 2010

Prof Umesh V Waghmare
Shanti Swarup Bhatnagar Prize in 2010.
Unrestricted research grant from GE Global Research (2011)

Prof Meheboob Alam
DAE-SRC Outstanding Research Investigator Award in 2010

Dr Ganesh Subramanian
INAE Young Engineer Award, 2010

Mr Sachin Belvadi
Kempe Gowda State Award for contribution in sports

FELLOWSHIPS

Prof V Krishnan
Honorary Fellowship, Chinese Chemical Society

Prof Upadrasta Ramamurty
Fellow, Indian Academy of Sciences, Bangalore
Fellow, Indian National Academy of Engineering, 2010

Prof Amitabh Joshi
Elected as Fellow, Indian National Science Academy, New Delhi

Prof Anuranjan Anand
Fellow of Indian Academy of Sciences

Prof Tapas Kumar Kundu
J C Bose Fellowship by Department of Science and Technology

Prof Swapan K Pati
Fellow of Indian National Academy of Sciences, November 2010
Fellow of Indian Academy of Sciences, 2010

Prof S M Shivaprasad
Sheik Saqr RAK-CAM Senior International Fellowship

Dr Jayanta Haldar
Ramanujan Fellowship in 2010

Dr Sebastian C Peter
Ramanujan Fellowship 2010

Dr Subir K Das
Regular Associate, International Centre for Theoretical Physics, Trieste, Italy.

Dr Santosh Ansumali
Young Associate, Indian Academy of Science, 2010

Dr Ranjan Datta
Associate, Indian Academy of Sciences, Bangalore, 2010

Dr Rajesh Ganapathy
Associate, Indian Academy of Sciences, Bangalore, 2010

MEMBERSHIPS/APPOINTMENTS

Prof K B Sinha
Vice President, Indian Academy of Sciences, Bangalore.
Vice President, the Ramanujan Mathematical Society.

Prof N Chandrabhas
Membership of American Chemical Society

Prof Srikanth Sastry
Member, International Advisory Committee, STATPHYS 24, Cairns, Australia, July 2010.

Prof K S Narayan
Member, International Advisory Committee, ICSM Series 2012- Atlanta, USA
Member, International Advisory Committee, Excitonic solar cell conference 2012, Brisbane

Dr Santosh Ansumali
Member, International Scientific Advisory Committee for "Discrete simulation of fluid dynamics".

Prof Srikanth Sastry
Co-Coordinator - The Physics of Glasses, April 12 - July 9, 2010, KITP, Santa Barbara, USA.

EDITORIAL BOARDS

Prof M R S Rao
Senior Editor, American Journal of Cancer Research

Prof Amitabha Chattopadhyay
Review Editor, Frontiers in Membrane Physiology and Biophysics.

LECTURESHIPS

Prof Rahul Pandit
Utrecht-Asia Visiting Professorship, July 2010

Prof Amitabha Chattopadhyay
Adjunct Professor, IISER, Mohali, India.

Prof Raghavendra Gadagkar
INSA S N Bose Research Professorship, 2010 –2015.

☆☆☆

FINANCIAL STATEMENTS

Name	:	JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
Address	:	JAKKUR POST, BANGALORE – 560 064
Year Ended	:	31st MARCH 2011
Assessment Year	:	2011-12

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 31,2011 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 Jawallarlal 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 out 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 for 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 accounts of India subject to the following observations:
   a) Non-provisions of accrued liability in respect of leave encashment which is not in benefits in conformity with the Accounting, Standard 15 (Accounting for retirement the financial statements of employers) issued by the Institute of Chartered Accountants of India. (Refer Note No. 3 of Schedule No. 24)
   b) The amount spent grants/ subsidies on acquisition of fixed assets has been deducted from the total 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, 2011; 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

Sd/-
(Nagaraja)
Partner
Membership N0.205345
ICAI Firm Regn No. 050121S

Place : Bangalore
Date : 20.09.2011

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
BALANCE SHEET AS AT 31ST MARCH 2011

Description	Schedule	Current year 2010-11 Rs. Ps.	Previous year 2009-10 Rs. Ps.
LIABILITIES			
Corpus/Capital Fund	1	1,558,321,561.54	1,416,934,717.54
Reserves & Surpluses	2	3,341,615.34	326,214.16
Earmarked and Endowment Funds	3	181,713,717.72	156,708,169.05
Secured loans and Borrowings	4	0.00	0.00
Unsecured loans and Borrowings	5	0.00	0.00
Deferred Credit Liabilities	6	0.00	0.00
Current Liabilities and Provisions	7	13,586,621.63	11,830,468.28
Other funds-Cluster Studies		39,541.00	39,541.00
Scheme Balances		98,562,761.33	106,630,809.46
Total		**1,855,565,818.56**	**1,692,469,919.49**
ASSETS			
Fixed Assets (gross)	8	1,558,321,561.54	1,416,934,717.54
Investments-Endowment Funds	9	171,028,500.00	140,178,858.00
Investment - Others	10	0.00	0.00
Current Assets, Loans, Advances etc.	11	126,215,757.02	135,356,343.95
Total		**1,855,565,818.56**	**1,692,469,919.49**
Significant accounting policies	24		

Schedule 1 to 24 form integral part of Accounts

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

Place : Bangalore
Date : 20.09.2011

For Jawaharlal Nehru for Advanced Scientific Research

Sd/-
R.S.Gururaj
Accounts Officer

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

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH 2011

Description	Schedule	Current year 2010-11 Rs. Ps.	Previous year 2009-10 Rs. Ps.
Income			
Income from services	12	1,159,160.00	812,605.00
Grants/Subsidies received	13	480,366,778.00	487,959,748.00
		481,525,938.00	488,772,353.00
Less: Extent of fixed assests procured		141,386,844.00	243,869,588.00
		340,139,094.00	**244,902,765.00**
Income from Fees/Subscriptions etc	14	1,621,649.00	1,070,756.00
Income from investments	15	0.00	0.00
Royalty Income,Publication,Licence fee etc	16	1,630,684.63	197,016.87
Interest earned	17	3,389,929.35	758,855.57
Other income	18	26,439,713.00	18,129,347.50
Increase/decrease in stocks	19	0.00	0.00
Total		**373,221,069.98**	**265,058,740.94**
Expenditure			
Establishment expenses	20	159,266,070.00	124,095,711.00
Other administrative expenses	21	202,774,833.80	137,098,330.55
Expenditure on Grants,Subsidies etc	22	0.00	0.00
Interest & bank charges	23	164,765.00	27,853.00
Total		**362,205,668.80**	**261,221,894.55**
Excess of income over expenditure		11,015,401.18	3,836,846.39
Balance brought forward		326,214.16	1,489,467.77
		11,341,615.34	**5,326,314.16**
Transferred to Corpus Fund Account		8,000,000.00	5,000,000.00
Balance carried to Balance sheet		**3,341,615.34**	**326,314.16**
Significant accounting policies	24		

Schedule 1 to 24 form an integral part of Accounts

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

Place : Bangalore
Date : 20.09.2011

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
RECEIPTS AND PAYMENTS ACCOUNT FOR THE YEAR ENDED 31.03.2011

OPENING BALANCES & RECEIPTS	2010-11 Rs Ps	2009-10 Rs Ps	PAYMENTS & CLOSING BALANCES	2010-11 Rs Ps	2009-10 Rs Ps
I. **Opening Balances:**			I. **Expenses;**		
a. Cash in hand & Imprest at centre	475,506.00	561,864.00	a. Establishment Expenses	159,266,070.00	124,095,711.00
			b. Administrative Expenses	199,882,352.80	137,098,430.55
b. Bank balances:			c. Expenditure of endowments	1,914,711.00	2,285,846.00
In savings bank Accounts:				**361,063,133.80**	**263,479,987.55**
At Canara bank	17,484,984.49	8,308,064.06	**II. Payment made against funds**		
At Union Bank of India	77,692.00	1,631,688.00	**for various projects:**	**0.00**	**0.00**
In Deposit accounts:					
At IDBI bank					
At HDFC trust	12,125,000.00	12,125,000.00	**III. Investments and Deposits made:**	NA	NA
At GOI Bonds(SHCIL & SBI)	38,900,000.00	47,900,000.00			
At Union Bank of India					
At Canara Bank	84,941,750.00	76,480,750.00			
	154,004,932.49	**147,007,366.06**			
II. Grants Received:					
From DST-Grant in aid	480,000,000.00	480,000,000.00	**IV. Expenditure on Fixed assets and**		
From DST for Collaborative programmes	0.00	3,600,000.00	**Capital Work-in-progress:**		
From DST for Meeting/Seminars	366,778.00	2,086,498.00	a. Purchase of fixed assets	138,330,800.00	243,869,588.00
From other international agencies	0.00	2,273,250.00			
On behalf of Endowments	9,045,841.00	482,000.00			
	489,412,619.00	**488,441,748.00**			
III. Income on Investments from:					
A. Interest on FD's:			**V. Refund of surplus money/Loans**	0.00	0.00
a. From Earmarked/Endowment Funds	14,043,585.67	8,353,197.00			
b. From Own funds	1,940,450.35	186,841.47	**VI. Finance charges(Bank charges)**	**164,765.00**	**27,853.00**
	15,984,036.02	**8,540,038.47**			
IV. Interest received:					
a. On Bank S.B A/c	1,449,479.00	572,014.10			
Balance Carried Over	**660,851,066.51**	**644,561,166.63**	**Balance Carried Over**	**499,558,698.80**	**507,377,428.55**

(Contd...)

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH
RECEIPTS AND PAYMENTS ACCOUNT FOR THE YEAR ENDED 31.03.2010 (Contd...)

OPENING BALANCES & RECEIPTS	2010-11 Rs Ps	2009-10 Rs Ps	PAYMENTS & CLOSING BALANCES	2010-11 Rs Ps	2009-10 Rs Ps
Balance Brought Forward	**660,851,066.51**	**644,561,166.63**	**Balance Brought Forward**	**499,558,698.80**	**507,377,428.55**
V. Other Income:			**VII. Other payments:**		
a. Royalty	1,482,672.63	57,678.87	Earnest money deposit returned	0.00	4,549,518.00
b. Licence Fee	148,012.00	139,338.00	Staff advances	60,599.00	100,250.00
c. Collections from Visitors,Guest room etc	3,374,394.00	3,538,045.50	Caution money deposit returned	59,185.00	294,824.69
			TDS on interest	560,184.00	490,729.00
			Contingent Advances paid	0.00	0.00
d. From fee,subscription etc	1,621,649.00	1,070,756.00	Other advances given-Vijyoshi prog		6,928,825.00
e. CSIR fellowships,SRFP reimbersements	15,449,946.00	1,007,802.00	Payment to sundry creditors	4,974,470.65	0.00
				5,654,438.65	**12,364,146.69**
f. Overhead recoveries	6,000,000.00	10,000,000.00			
g. From services	1,159,160.00	812,605.00			
h. From others	1,615,373.00	3,583,500.00	**VIII. Closing Balances:**		
	30,851,206.63	20,209,725.37	a. Cash in hand & Imprest at centre	713,613.00	475,506.00
			b. Bank balances:		
VI. Amount borrowed	0.00	0.00	*In savings bank accounts:*		
			Canara Bank	22,769,251.69	17,484,984.49
VII. Other receipts:			Union Bank of India	155,663.00	77,692.00
			State Bank Of India	486,759.00	0.00
Earnest money received	841,284.00	0.00	*In deposit accounts:*		
Recoveris from current assets	6,928,825.00	0.00			
			At canara bank	124,388,000.00	84,941,750.00
From Sundry creditors	0.00	8,769,776.73	At SHCIL	11,700,000.00	38,900,000.00
Other advances recovered	279,042.00	205,839.00	At HDFC trust	34,325,000.00	12,125,000.00
	8,049,151.00	**8,975,615.73**		**194,538,286.69**	**154,004,932.49**
TOTAL	**699,751,424.14**	**673,746,507.73**	**TOTAL**	**699,751,424.14**	**673,746,507.73**

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
M NO. 205345
ICAI.F.R.No.050121S
Place : Bangalore, Dated: 20.09.2011

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	2010-11		2009-10
Rs.	Ps.	Rs.	Ps.
SCHEDULE 1- Capital Fund			
Balance as at the beginning of the year		1,416,934,717.54	1,173,065,129.54
		1,416,934,717.54	1,173,065,129.54
Less : Depreciation up to the end of previous year		306,428,939.30	246,580,248.30
		1,110,505,778.24	926,484,881.24
Add : Addition to Fixed Assets during current year		141,386,844.00	243,869,588.00
		1,251,892,622.24	1,170,354,469.24
Less : Depreciation for the current year		60,044,523.98	59,848,691.00
		1,191,848,098.26	1,110,505,778.24
Add : Depreciation Reserve per contra		366,473,463.28	306,428,939.30
TOTAL		**1,558,321,561.54**	**1,416,934,717.54**
SCHEDULE 2- Reserves And Surpluses:			
General Reserve:			
Surplus In Income and expenditure Account		**3,341,615.34**	**326,214.16**
SCHEDULE 3- Earmarked / Endowment Funds:			
A : Infrastructure Corpus Fund			
Opening Balance		112,149,339.65	97,097,051.65
Additions during the year		8,600,000.00	5,000,000.00
Funds-Income from Investments made		7,711,333.89	10,052,288.00
Total : Infrastructure Corpus fund		**128,460,673.54**	**112,149,339.65**
B : Other funds			
Opening Balance of the Funds		44,558,829.40	43,849,658.40
Add : Additions :			
Funds/Donations/Grants/Royalties		8,445,841.00	482,000.00
Funds-Income from Investments made		2,163,084.78	2,513,017.00
		55,167,755.18	**46,844,675.40**
Less : Funds-utilisation/Expenditure incurred		1,914,711.00	2,285,846.00
Total : Other Funds		**53,253,044.18**	**44,558,829.40**
Grand Total - Infrastructure Corpus and Other Funds		**181,713,717.72**	**156,708,169.05**
SCHEDULE 4-Secured Loans And Borrowings:		0.00	0.00
SCHEDULE 5-Unsecured Loans And Borrowings:		0.00	0.00
SCHEDULE 6-Deferred Credit Liabilities:		0.00	0.00
SCHEDULE 7- Current liabilities and provisions			
Sundry Creditors EMD		1,656,829.00	815,545.00
Sundry Creditors CMD		0.00	59,185.00
Sundry Creditors for others		11,929,792.63	10,955,738.28
TOTAL		**13,586,621.63**	**11,830,468.28**

Sd/-
R.S. Gururaj
Accounts Officer

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

Description	2010-11	2009-10
SCHEDULE 8- Fixed Assets:	**Rs. Ps.**	**Rs. Ps.**
Land - Free Hold	17715351.00	17715351.00
Buiildings :		
General	79984160.26	79658165.26
Hostel Building	15570835.00	15570835.00
New Lab Building - AMRL	25930339.00	25930339.00
Animal House	6787344.00	6787344.00
Staff Housing	4156168.00	4156168.00
ETU Building	3091348.00	2048814.00
Engineering & Mechanical Unit Block	7426272.00	7426272.00
Other buildings like extn to Hostel,College etc.,	11883626.00	11,883,626.00
Nano Science Block	7042909.00	7042909.00
Extension to Pauling Building - Biology Block	4680084.00	4680084.00
Dining Hall & Kitchen Block	12404330.00	12404330.00
Radio Active Lab	203233.00	203233.00
International Centre for Material Science	47414359.00	45408202.00
Lecture Hall & Academic Block	9636712.00	9636712.00
Hostel Phase II	19552377.00	19552377.00
STP Building	291699.00	291699.00
Hostel Phase III	27425891.00	19005471.00
International house	23142418.00	20845705.00
CNR Rao Hall of Science	10186569.00	10186569.00
Extention to HIV lab	1016085.00	1016085.00
Security Office Block	232612.00	90373.00
Animal House - Additional Block	8284752.00	8275189.00
Residential Quarters (Sr.AO)	3110495.00	1097925.00
Child Care Centre	728827.00	343644.00
New Biology Lab	25845905.00	11146723.00
Hostel Phase IV	18455896.00	16841044.00
SCADA - DG Room	240660.00	0.00
President's Residence	172000.00	0.00
Visiting Students Hostel	1895000.00	0.00
	376,792,905.26	**341,529,837.26**
Infrastructure Facilities:		
Roads,Streetlights,Drianages,partitions etc	80515671.32	68488873.32
Tubewells and water supply	248912.00	248912.00
	80,764,583.32	**68,737,785.32**
Plant/Machinery/Equipment:		
Scientific Equipments/Plant/Machinery	557561403.45	526189107.45
ICMS-Laboratory equipments & facilities	81355879.00	63752358.00
Equipments - Chemistry & Physics of Materials	74,041,456.00	74,041,456.00
	712,958,738.45	**663,982,921.45**
Others :		
Vehicles	2018246.00	2018246.00
Furniture and fixtures	52579464.87	45587937.87
Office equipment	11167098.63	7009106.63
Computer/peripherals	59074680.00	48964989.00
Electrical installations	112738560.00	103891761.00
Library Books	23549543.21	20856762.21
Library Journals	108962390.80	96640019.80
TOTAL	**1,558,321,561.54**	**1,416,934,717.54**
Less - Depreciation up to the end of previous year	306,428,939.30	246,580,248.30
Depreciation for the current year	60,044,523.98	59,848,691.00
Written down value of the assets as at the year end	1,191,848,098.26	1,110,505,778.24
Add - depreciation reserve per contra	366,473,463.28	306,428,939.30
TOTAL	**1,558,321,561.54**	**1,416,934,717.54**

Sd/-
R.S. Gururaj
Accounts Officer

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

Description	2010-11	2009-10
Rs.	Ps. Rs.	Ps.
SCHEDULE 9- Investments -Earmarked/Endowment Funds:		
Long Term Deposits		
Fixed Deposits with HDFC Trust	34,325,000.00	12,125,000.00
Govt of India 8% Savings Bonds 2003 [SHCIL & SBI]	11,700,000.00	38,900,000.00
Fixed Deposits with Canara bank	124,388,000.00	84,941,750.00
Interest accrued on Fixed Deposits with banks	615,500.00	4,212,108.00
TOTAL	**171,028,500.00**	**140,178,858.00**
SCHEDULE 10- Investments - Others		
Short Term Deposits - SCHEMES	0.00	0.00
TOTAL	**0.00**	**0.00**
Schedule 11 Current Assets, Loans, Advances etc.,		
Cash & Bank Balances (Schemes)		
Cash in hand - Schemes Account	75,487.00	52,354.00
Cash at Bank -Schemes - Canara Bank	8,487,274.33	42,677,240.63
Cash at Bank -Schemes - State Bank of India	0.00	1,922,046.83
Fixed deposit with Canara Bank (Schemes)	90,000,000.00	61,979,168.00
	98,562,761.33	**106,630,809.46**
Cash & Bank Balances - Centre		
Cash in hand at Centre	74,018.00	84,157.00
Cash at Bank - Canara Bank	22,769,251.69	17,484,984.49
Cash at Bank - Union Bank	155,663.00	77,692.00
Cash at Bank - SBI	486,759.00	
Imprest balance	30,472.00	27,472.00
Imprest with Faculty	609,123.00	363,877.00
	24,125,286.69	**18,038,182.49**
Loans and Advances		
Advances to staff	350,916.00	290,317.00
Contingent Advance VIJYOSHI	0.00	6,928,825.00
Other advances	919,884.00	1,198,926.00
TDS receivable	1,795,436.00	1,235,252.00
Amount receivable from Income Tax Department	461,473.00	461,473.00
Interest receivable (Endowment Account)	0.00	572,559.00
	3,527,709.00	10,687,352.00
TOTAL	**126,215,757.02**	**135,356,343.95**
SCHEDULE 12-Income from sales / services		
Consultancy fee	957,360.00	657,005.00
DNA sequencing fee	201,800.00	155,600.00
TOTAL	1,159,160.00	812,605.00

Sd/-
R.S. Gururaj
Accounts Officer

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH

Schedule forming part of the accounts

Description	2010-11	2009-10
Rs.	Ps. Rs.	Ps.
SCHEDULE 13 - Grants/subsidies :		
Grants - DST	480,000,000.00	480,000,000.00
Grants - Discussion meetings/Seminars	0.00	2,086,498.00
Grants - Travel grants	366,778.00	0.00
Grants - DST towards Indo Iran collaborative programme	0.00	3,600,000.00
Grants - Other international agencies	0.00	2,273,250.00
TOTAL	**480,366,778.00**	**487,959,748.00**
SCHEDULE 14-Income from Fee/Subscriptions etc :		
Income from fee, subscriptions,medical contribution etc.,	1,621,649.00	1,070,756.00
TOTAL	**1,621,649.00**	**1,070,756.00**
SCHEDULE 15-Income from investments:	0.00	0.00
SCHEDULE 16-Royalty Income,Publication,Licence fee etc :		
From Royalty	1,482,672.63	57,678.87
Licence fee	148,012.00	139,338.00
TOTAL	**1,630,684.63**	**197,016.87**
SCHEDULE 17-Interest earned:		
From Term deposits	1,940,450.35	186,841.47
From SB acounts with nationalised banks	1,449,479.00	572,014.10
TOTAL	**3,389,929.35**	**758,855.57**
SCHEDULE 18-Other income:		
From Visitors house,Guest rooms,Students residence etc,	3,374,394.00	3,538,045.50
CSIR Fellowships, SRFP reimbursement etc,.	15,449,946.00	1,007,802.00
Overhead recoveries	6,000,000.00	10,000,000.00
From others(tender fee & other fee collected)	1,615,373.00	3,583,500.00
TOTAL	**26,439,713.00**	**18,129,347.50**
SCHEDULE 19 - Increase / Decrease in stock:	**0.00**	**0.00**

Sd/-
R .S. Gururaj
Accounts Officer

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH

Schedule forming part of the accounts

Description	2010-11	2009-10
	Rs. Ps.	Rs. Ps.
SCHEDULE 20 Establishment Expenses:		
SSalaries & Scholarship to students	114,432,537.00	97,011,550.00
Wages	30,153,701.00	17,483,695.00
Allowances (Medical reimbursements etc.,)	4,206,920.00	3,301,569.00
Bonus	203,786.00	203,128.00
Contribution to CPF	2,630,259.00	2,141,666.00
Contribution to new pension sceme	1,465,004.00	904,690.00
Retirement benefits paid	0.00	989,672.00
Contribution to Group Gratuity Scheme	4,465,577.00	1,462,198.00
Leave encashment benefits	600,121.00	168,551.00
LTC	1,108,165.00	428,992.00
TOTAL	**159,266,070.00**	**124,095,711.00**
SCHEDULE 21- Other Administrative expenses		
Electricity & Power	30,230,183.00	27,779,057.00
Water charges	5,734,756.00	4,066,577.00
Insurance	472,696.00	453,097.00
Repairs & maintenance	25,967,794.00	21,489,323.00
Rents,rates & taxes	3,368,989.00	2,881,979.00
Vehicles running & maintenance	3,483,280.00	1,601,160.00
Postage, telephone & communication	3,738,250.00	3,328,744.00
Printing & stationery	6,325,154.10	2,041,628.00
Travelling and conveyance	5,567,217.00	6,990,307.18
Expneses on Seminars/workshops/discussion meetings	7,507,330.47	8,305,986.00
Subscriptions	63,358.00	167,321.05
Fees towards training etc.,	322,376.00	85,000.00
Professional charges	12,737,092.00	9,724,907.00
Laboratory Consumables	43,449,538.00	34,944,924.67
Frieght Inwards	3,404,352.00	3,392,456.00
Other consumables	1,452,948.00	671,025.00
Advertisement & Publicity	4,667,508.00	1,403,179.00
Other miscellaneous expenses	3,635,707.17	960,168.55
Statutory Audit fee	44,120.00	44,120.00
POBE & POCE programme	154,405.00	250,277.00
Summer Research Fellowship Programme	1,218,052.00	159,511.00
ICMS - Workshops, Schools etc,.	5,878,740.00	1,701,059.10
ICMS - Visitor Programmes (National & International)	3,003,483.06	387,000.00
ICMS - Recurring expenses	5,051,424.00	2,888,640.00
ICMS - Scientists & Supporting Staff	1,950,874.00	1,380,884.00
Transfer of funds to Proj/Endowments of earlier years	8,916,382.00	0.00
Vijyoshi programme-Supported by DST of earlier year	6,928,825.00	0.00
Twows Conference-supported by DST	7,500,000.00	0.00
TOTAL	**202,774,833.80**	**137,098,330.55**
SCHEDULE 22-Expenditure on grants, subsidies Etc:	0.00	0.00
SCHEDULE 23- Interest and Bank charges:	164,765.00	27,853.00
TOTAL	**362,205,668.80**	**261,221,894.55**

Sd/-
R.S. Gururaj
Accounts Officer

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH

SCHEDULE 24

Significant 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 in the Balance Sheet under Capital Fund and also under the Fixed Assets schedule respectively

2 Grants received and utilisd 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 Capital Fund Account

3 Leave encashment to staff members is accounted as and when it is paid

4 Investments of the Centre are stated at cost. The interest on investments is accounted on accrual basis

5 The foreign currency transactions are translated at the rates prevailing on the date of transaction.

6 Royalty income has been accounted as and when received

Sd/-
R .S. Gururaj
Accounts Officer

JAWAHARLAL NEHRU CENTRE FOR ADVANCED SCIENTIFIC RESEARCH

CPF & NPS FUND STATEMENT OF AFFAIRS FOR THE YEAR ENDED ON 31.03.2011

Particulars	Rs. Ps.	Rs. Ps.	Particulars	Rs. Ps.	Rs. Ps.
CONTRIBUTORY PROVIDENT FUND:			**INVESTMENTS OF FUNDS:**		
SUBSCRIPTIONS			**INVESTMENTS IN :**		
Opening Balance		27,674,149.00	Government of India 8 % Bonds (SHCIL)	20,500,000.00	
Add :Subscriptions received during the year	5,304,676.00		State Government Securities (25 lakhs)	2,640,416.67	
Loan repayments	1,386,480.00		Fixed Deposits at Canara Bank	16,000,000.00	
Interest on subscriptions	2,353,833.00	9,044,989.00	Fixed Deposit at HDFC	22,500,000.00	61,640,416.67
		36,719,138.00			
Less: Loans granted during the year	3,094,280.00		Closing Cash and Bank Balance :		
Less: Withdrawals on retirement/death	0.00	3,094,280.00	Cash at Bank :		
Closing Balance		33,624,858.00	SB A/C No.17513		
			Canara Bank,IISc branch		3,825,452.87
CONTRIBUTION					
Opening balance		21,145,089.00			
Add : Contribution during the year	2,712,309.00		TDS on investment in GOI Bonds receivable		335,492.00
Interest on total contributions	1,695,123.00	4,407,432.00	TDS receivable from Endowment account		103,000.00
		25,552,521.00			
Less: Withdrawals on retirement/death		0.00			
Closing Balance		25,552,521.00			
NEW PENSION SCHEME			Due to be remitted to bank on account		
SUBSCRIPTION			of short payment during 2007 08		179.00
Opening Balance		3,268,429.00			
Add : Subscriptions received during the year	1,313,318.00				
Interest on subscriptions	309,263.00	1,622,581.00			
Closing Balance		4,891,010.00			
CONTRIBUTION			Accrued interest on Deposits :		
Opening balance		2,791,021.00	On Fixed deposits with Canara Bank		1,083,747.00
Add : Contribution during the year	1,306,049.00				
Interest on total contributions	218,411.00	1,524,460.00			
Closing Balance		4,315,481.00	Balance deficit		1,395,582.46
Total		**68,383,870.00**	**Total**		**68,383,870.00**

for P V PRABHU & CO
Chartered Accountants

Sd/-
(NAGARAJA)
Partner
M NO. 205345
ICAI.F.R.No.050121S
Place : Bangalore, Dated: 20.09.2011

for Jawaharlal Nehru Centre for Advanced Scientific Research

Sd/-
R.S.Gururaj
Accounts Officer

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