SAHA INSTITUTE OF NUCLEAR PHYSICS

ANNUAL REPORT

2016 – 2017

SINP

Sector – 1, Block - AF, Bidhannagar,
Kolkata – 700 064
Foreword

It is a great pleasure in bringing out the research and academic activities of the Institute carried out during the year 2016-17. As premier research institute catering to basic research and development in a wide variety of disciplines, Saha Institute of Nuclear Physics is now about to enter its 68th year of foundation.

Academic productivity of the Institute has remained steadily high over the last few years, with about 450 publications on an average. National and international collaborative works have contributed to about 60 high impact publications. While FRENA accelerator is about to be installed this year, an important development of SINP in collaboration with UCIL, Jaduguda has been in establishing an underground laboratory at 555 m level below the surface for dark matter and many other rare events search experiments. This is now the only working underground laboratory in India and second to the one at Kolar gold mine that is closed since 1992.

It is also noted with pride, the awards and honours bestowed on our faculty. Prof. Gautam Bhattacharyya was awarded the prestigious J.C. Bose National fellowship of DST-SERB. Dr. Biswarup Satpati has been awarded MRSI medal 2017, by the Material Research Society of India.

With a strong motivation to inspire more young minds to take up studies in basic sciences, our Institute has been conducting various types of outreach programs for school going children in and around Kolkata as well as in remote areas of West Bengal. The programs have gathered sufficient momentum with active participation from our young faculty and we look forward to intensifying our efforts in this direction.

SINP will be celebrating this year as the 125th birth anniversary of Prof. Meghnad Saha, our founder director. As a pioneer of modern physics in India, he opened new directions in the field of astrophysics with his theory of thermal ionisation and its application in the solar and stellar spectra, and was instrumental in laying the foundation for studies in nuclear physics. The initiation of National Institute of Science that went on to become the Indian National Science Academy and the formulation of the National Planning Committee are some of his great contributions to the Indian society. It is the appropriate time once again to draw lessons from the achievements of this great visionary as we become ready to face the challenges that are to come in these changing times. His scientific contributions will continue to inspire us and his social commitments will always be at our hearts.

Ajit Kumar Mohanty
Director

January 2018
Contents

IMPORTANT ACHIEVEMENTS 9

SPECIAL EVENTS 13

RESEARCH HIGHLIGHTS 17

1. APPLIED NUCLEAR PHYSICS 17
   1.1. Ph D Awarded 18
   1.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools 19

2. ASTROPARTICLE PHYSICS AND COSMOLOGY 21
   2.1. Ph D Awarded 23
   2.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools 23
   2.3. Teaching elsewhere 24

3. BIOPHYSICS AND STRUCTURAL GENOMICS 25
   3.1. Ph D Awarded 25
   3.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools 26
   3.3. Teaching elsewhere 26
   3.4. Publications in Books/Monographs/Edited Volumes 27

4. CHEMICAL SCIENCES 28
   4.1. Ph D Awarded 30
   4.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools 31
   4.3. Teaching elsewhere 33

5. COMPUTATIONAL SCIENCE 34
   5.1. Ph.D. awarded 35
   5.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools: 35
   5.3. Miscellany 35

6. CONDENSED MATTER PHYSICS 36
   6.1. Ph D Awarded 38
6.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools 38
6.3. Miscellany 39

7. CRYSTALLOGRAPHY AND MOLECULAR BIOLOGY 41
7.1. Ph D Awarded 41
7.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools 42
7.3. Teaching elsewhere 42
Abhijit Chakrabarti 42
7.4. Publications in Books/Monographs/Edited Volumes 43

8. HIGH ENERGY NUCLEAR AND PARTICLE PHYSICS 44
8.1. Ph D Awarded 48
8.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools 48

9. NUCLEAR PHYSICS 50
9.1. Ph D Awarded 51
9.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools 51
9.3. Teaching elsewhere 52
9.4. Miscellany 52

10. PLASMA PHYSICS 53
10.1. Ph D Awarded 54
10.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools 54
10.3. Teaching Elsewhere 54

11. SURFACE PHYSICS AND MATERIAL SCIENCE 55
11.1. Ph D Awarded 57
11.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools 57

12. THEORY 59
12.1. Ph D Awarded 63
12.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools 63
12.3. Teaching elsewhere 66
12.4. Miscellany 66
The Women Cell and CARE jointly organized a seminar on “Gender Sensitization: Issues at workplace”. The lecture was delivered by Dr. Chama Mukherjee, Advocate of the Calcutta High Court on November 18, 2016.
Saha Institute of Nuclear Physics (SINP) is engaged in basic scientific research on four broad subject areas, namely, (a) Astroparticle physics and Cosmology, Theory (b) Applied Nuclear Physics, High Energy Nuclear & Particle Physics, Nuclear Physics and Plasma Physics, (c) Condensed Matter Physics, Surface Physics and Material Science (d) Biophysics and structural Genomics, Crystallography & Molecular Biology, Computational sciences and Chemical sciences.

The following table represents information on the number of Faculties, Research Fellows, Research Associates/Post Doctoral Fellows and number of Ph.D’s awarded.

<table>
<thead>
<tr>
<th>Division</th>
<th>Faculties</th>
<th>Research Fellows</th>
<th>R.A. / Post-Doc</th>
<th>Ramanujan Fellow</th>
<th>Ph. D. Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astroparticle Physics &amp; Cosmology</td>
<td>6</td>
<td>6</td>
<td>1</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Theory</td>
<td>13</td>
<td>13</td>
<td>5</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Applied Nuclear Physics</td>
<td>7</td>
<td>7</td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>High Energy Nuclear &amp; Particle Physics</td>
<td>8</td>
<td>13</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Nuclear Physics</td>
<td>6</td>
<td>15</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Plasma Physics</td>
<td>2</td>
<td>8</td>
<td>1</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Condensed Matter Physics</td>
<td>12</td>
<td>21</td>
<td>9</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Surface Physics &amp; Material Science</td>
<td>12</td>
<td>14</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Biophysics &amp; Structural Genomics</td>
<td>7</td>
<td>15</td>
<td>3</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Crystallography &amp; Molecular Biology</td>
<td>6</td>
<td>13</td>
<td>5</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Chemical Science</td>
<td>8</td>
<td>10</td>
<td>3</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Computational Science</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>89</strong></td>
<td><strong>137</strong></td>
<td><strong>34</strong></td>
<td><strong>2</strong></td>
<td><strong>39</strong></td>
</tr>
</tbody>
</table>

View at a glance of each Divisions in Tabular Form

** Total 90 Faculties including Director

Thirty one (31) Post M.Sc. students have been inducted into research and teaching program during the year 2016-17. Eleven (11) undergraduate associates and twenty four (24) summer students have been trained in the Institute. The students come from different parts of the country.
Important Achievements

Research Publications and PhD Awarded

In this period about 39 theses have been awarded the Ph.D. degrees. Altogether 443 research publications have been credited during the period with 62 scientific articles published in high impact (I.F.≥ 6) journals like Nature, Science, ACS Catalysis, Nucleic Acids Research, Proceedings of The National Academy of Sciences of The United States of America, Chemistry of Materials, Physical Review Letters, ACS Applied Materials & Interfaces, Chemsuschem, Cancer Letters, Acta Biomaterialia, Chemical Engineering Journal and Journal of High Energy Physics, etc.

- **International Collaborations**

Besides, the institute is continuing several International Collaborations such as:

- ALICE and CMS experiments at CERN, PICASSO experiment at SNOLab.
- Experiments at Deutsches Elektronen-Synchrotron (DESY), Hamburg through the Indo-German Collaboration in synchrotron research.
- Successful operation of the Indian Beam Line at Photon Factory (KEK) at Tsukuba, Japan has been recognized as a flagship cooperative activity by the honorable Prime Minister of India. Publications through international collaborations are represented in the following graphical presentation.
Outreach Programme

The institute has organised several outreach programmes through the CARE unit (Centre for Advanced Research & Education) both inside and outside SINP and received overwhelming response from the participants.

A moment during Science Day Celebration at SINP, March 10, 2017

Award Giving Ceremony of Science Day Celebration Program: Award given by Prof Ajit Kumar Mohanty, Director, SINP and Prof Amitava Roy, Director, VECC

- **Honours & Distinctions**
  - Prof. Gautam Bhattacharyya
    - Prof. Gautam Bhattacharyya has been awarded the prestigious J.C. Bose National fellowship (DST-SERB) in 2017.
  - Dr. Biswarup Satpati
    - Dr. Biswarup Satpati has been awarded MRSI medal 2017, Material Research Society of India.
Tree plantation by Chief Guest Dr. Mammen Chandey, Director, Tata Medical Centre, Kolkata in the presence of our Director, Registrar and staff of SINP.

67th Foundation Day Lecture delivered by Dr. Mammen Chandy, Director, TMC, Kolkata
Celebration of 70th Independence Day at SINP
August 15, 2016

Flag hoisting and saluting on Independence Day 2016
Special Events

61st DAE-BRNS Symposium on Nuclear Physics
December 4 – 9, 2016

Participants of 61st DAE-BRNS Symposium on Nuclear Physics 2016 at Saha Institute of Nuclear Physics, Kolkata. Over 458 scientists and students from all over the country participated in this annual symposium organized by DAE, Govt. of India. The main symposium is preceded by a one-day Orientation Programme for the student participants with Nuclear Astrophysics as the theme of the programme.
Theory Division of Saha Institute of Nuclear Physics host its third “Saha Theory Workshop: Aspects of Early Universe Cosmology”. Experts who are actively working in this field had participated and young members who are pursuing research in this area. The workshop focuses on several theoretical aspects of early universe cosmology, how present and forthcoming data can guide us to unravel the mystery of early Universe.
Care Seminar Lecture given by Mark McCanghrean on February 14, 2017
Research Highlights

1. Applied Nuclear Physics

Research carried out at the Applied Nuclear Physics Division during 2016-17 involves probing the atomic, nuclear and nanocrystalline systems using nuclear probes and techniques. Intermetallic alloys of technological importance and low-dimensional systems, such as nano-crystalline materials are also being studied to explore their properties. Our members are working on dark matter search experiment, cosmic muon based tomography and developing instruments, experimental techniques and simulation of various aspects for these applications involving interdisciplinary areas of Physics. Development, characterization and optimization of radiation detectors for next generation high energy physics experiments, model based simulation and cognitive science research to understand the details of visual perception are also being carried out in our laboratories.

Our members, in collaboration with Astroparticle Physics and Cosmology (APC) Division, are working on the development of an underground laboratory in India for dark matter search experiment using scintillation based detectors. The experiment evolved as active collaboration between SINP, BARC, NISER and UCIL (and also INO). First phase of the experiment is to establish the laboratory, measure the radiation background and devise methods of reducing the effects of radiation background. Parallel development of scintillation detectors, their characterization for operation at cryogenic temperatures and optimizing the pulse shape discrimination to distinguish between electron and nuclear recoil events is in progress. Significant work has been done on simulation of the radiation background at the laboratory site by considering penetrating cosmic rays and residual rock radioactivity. Simulation of the detector response to background neutrons and gamma rays is also in progress.

Experiments on Electromagnetically Induced Transparency (EIT) and Electromagnetically Induced Absorption (EIA) in room temperature Rb atoms were carried out at Laser Spectroscopy and Quantum Optics laboratory at SINP. We have performed spectroscopic studies on neutral Rubidium atoms using pump-probe spectroscopic techniques, and results are interpreted by assuming V- and Λ-type multi-level systems for \(^{85}\text{Rb}\) and \(^{87}\text{Rb}\) atoms in D2 and D1 transitions. The results can be used to render the medium opaque and transparent in a controlled way for optical switching applications. Laguerre-Gaussian (LG) beams (optical Vortex beam) were set up using external cavity diode lasers. Narrowing of the line shapes of hyperfine transitions were observed for higher orders of the LG beam in comparison to the Gaussian beam.

Using time-differential perturbed angular correlation (TDPAC) technique, studies of point defects, structural and magnetic phase transitions in metallic and inter-metallic systems, thin films and nano-crystalline materials are carried out. A four-detector TDPAC spectrometer with ultrafast BaF\(_2\) or LaBr\(_3\)(Ce) detectors has been developed for the above purpose. Numerous technological applications of Ni-based Zr and Hf intermetallic alloys have prompted comprehensive studies in ZrNi\(_3\) and HfNi\(_3\) alloys by perturbed angular correlation (PAC) spectroscopy which were not studied earlier. The different phases produced in the samples have been identified by PAC and X-ray diffraction (XRD) measurements. Stoichiometry of the compounds was asserted by HRTEM analysis. Density functional theory (DFT) based calculations of electric field gradient (EFG) and asymmetry parameter (η) at \(^{181}\text{Ta}\) probe nucleus allowed us to assign the observed EFG fractions at the lattice sites in the compounds.

Positron annihilation spectroscopy (PAS) was used for the studies of properties and processes related to defects in nanomaterials including metals, alloys, ferrites and semiconductors. An
interesting aspect of these studies has been to look for the effect of doping and surface modification by defects and other substitutional elements in a nanocrystalline system. Investigation on several polymeric samples are also carried out for characterization of free volume defects in them and estimating their concentration.

Our members have successfully implemented the nearly exact Boundary Element Method (neBEM) to solve for potential and flux field in a non-dissipative system governed by Laplace’s equation. In an important break-through, we have been able to carry out analytic integration of Green’s function (and derivative) for singularities uniformly distributed over typical rectangular and triangular elements through the use of symbolic mathematics. The solver has been applied to study the physical as well as weighting field configurations of a diverse group of detectors that includes a few wire chambers, TPC, RPC and several new generation micro-pattern gaseous detectors (MPGD) such as Micro-Wire, Micro MEGAS, THGEM etc. We are working on the application-oriented field of cosmic ray muon tomography. Both experimental and numerical simulation tools are being used to explore various possibilities.

One of our members is working on computational neuroscience which is an interdisciplinary area involving computational science, cognitive science and various aspects of visual perception. Computational mechanism of filling in at the blind spot of the retina and its associated properties can be understood by taking into account the statistics of natural scene and the computational architecture (Hierarchical Predictive Coding) of the cortex, and demonstrated that several experimentally observed properties of filling-in at the blind-spot could be accommodated under the same computational framework. The findings, in this work, offer new insights into the role of natural scene statistics in our perception and suggest, what is possibly, the first systematic bridge linking anisotropy in three levels: natural environment, visual cortex, and perceptual filling-in at the blind spot.

Fig. Laser Spectroscopy Laboratory in SINP studies electromagnetically induced phenomenon in neutral Rubidium atoms using external cavity diode lasers (ECDLs) operating at 780 nm.

1.1. Ph D Awarded


1.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools

**Nayana Majumdar**


**Supratik Mukhopadhyay**

1. Ionization detectors in nuclear and astroparticle physics, 8th Vidyasagar-Satyendranath Bose National Workshop 2017 on Nuclear and Astrophysics: Two opposite ends of Dimension (NATD 2017), Vidyasagar University, Midnapore, West Bengal, India, January 17-19, 2017.


**P.M.G. Nambissan**


3. (i) Increasing the intensity of the consciousness of life through science and (ii) Nano is the word but Giga is the impact, INSPIRE Internship Science Camp, Sree Narayana College, Kannur, Kerala, December 25-30, 2016.


6. Positron annihilation studies of a metal oxide nanocomposite system, One day Workshop on Recent Advances in Nuclear Technique Based Materials Science Research, UGC-DAE Consortium for Scientific Research, Kolkata Centre, Kolkata, February 27, 2017.


**Sankar De**

1. Intra-molecular scattering within dissociative diiodoacetylene authored by Sankar
2. Probing ultrafast molecular dynamics with few-cycle infrared laser pulses and CEP control, Frontiers in Attosecond Science and Technology (FAST), Indian Institute of Science Education and Research (IISER), Mohali and Max Planck Society, Germany, March 2017.
2. Astroparticle Physics and Cosmology

The Astroparticle Physics & Cosmology (APC) Division carries out advanced research in the interface areas spanning High Energy Astrophysics, Cosmology, and Particle & Nuclear physics. During the year under review, members of the Division have carried out research on a variety of topics in Astroparticle Physics observational, experimental and theoretical. Some highlights are given below:

**Dark matter direct search with PICASSO/PICO and various aspects of superheated liquid detector**

Radiation linear energy transfer and drop size dependence of low frequency acoustic signal from tiny superheated droplets have been investigated experimentally at the SINP lab. The simulation of the response of superheated droplet detector to alpha particles has also been explored by incorporating the contamination both at the droplets and at the supporting matrix. Detection of bubble nucleation event has been carried out in superheated drop detector by using the pressure sensor. The design of the Camera Mount system for the next generation PICO-40L bubble chamber experiment has been done at SINP. The camera mount will be fitted with the viewing port of the chamber of the detector to view the bubble nucleation. Final sensitivity result from PICASSO dark matter search experiment has been published with the 32 detectors among which the two detectors were fabricated by the SINP group. We have also participated in the on-line shifts from SINP for the detector operation during actual physics run at SNOLab and in the data analysis program.

**High Energy Gamma Ray Astronomy**

The scientists of APC Division are involved in designing and building the calibration system for calibrating the camera of a prototype Large Size Telescope (LST) of Cerenkov Telescope Array (CTA) in close collaboration with Max Planck Institute for Physik, Munich and Tata Institute of Fundamental Research (TIFR), Mumbai. The calibration system has been assembled with help of engineers and technicians at SINP and TIFR and a graduate student from SINP. All tests to ascertain its performance have been completed. It is expected to be shipped to the observatory at La Palma, Canary Islands, Spain in autumn 2017 where the prototype LST is being constructed. Further field tests are envisaged in 2017.

The High Altitude Water Cerenkov (HAWC) detector array has recently released a catalog of very high energy gamma-ray sources above an energy threshold of \( \sim 10 \text{ TeV} \) which have no clear counterparts in lower energies (either at \( > 10 \text{ GeV} \) or \( > 300 \text{ GeV} \)). The MAGIC telescopes and archival data from Fermi-LAT satellite detector were used to search for high energy and very high energy gamma ray emission from a selected list of promising candidate sources. No significant emission of gamma rays from any of the candidate sources was detected and hence differential flux upper limits were calculated for these sources. The combination of HAWC and MAGIC results together allow us to put strong constraints on the extensions of the sources.

A very detailed study of the long term light curve of the Flat Spectrum radio Quasar (FSRQ) PKS1510-089 in high energy gamma rays was done using the data taken by Large Area Telescope on board Fermi Gamma Ray Space Telescope (Fermi-LAT). Several flares of this highly variable source were identified and their temporal and spectral properties were studied in detail and compared with previous works on flares of PKS 1510-089. Five major flares and few sub-flares / sub-structures have been identified in our study. The fastest variability time is found to be 0.95 +/− 0.10 hr where the minimum size of the emission region is estimated to be 4.82 x 10^{15} \text{ cm}. In most of the flares the spectral energy distributions are best fitted with Log-parabola distribution compared to simple Power law or Power law with
exponential cut-offs. This has strong physics implications regarding the nature of the high energy gamma-ray emission region

**Neutron Stars**

The magneto-elastic oscillations of magnetars were studied taking the effect of strong magnetic fields on the crustal composition, into account. Global magneto-elastic (GME) modes as well as modes confined to the crust (CME) only were investigated. Findings of model calculations were compared with frequencies of observed quasi-periodic oscillations in SGR 1806-20 and SGR1900+14. This comparison indicates that GME modes are essential to explain all the frequencies whereas CME modes can explain only the higher frequencies.

Furthermore, the influence of magnetic fields on the frame dragging effect of rotating neutron stars was investigated. It was found that the magnetic field has a non-negligible impact on the frame dragging.

**Theoretical Research on Dark Matter**

A new class of Dark Matter namely Feebly Interacting Dark Matter is explored in details. In this model, the Dark Matter is never in thermal equilibrium with the rest of the Universe’s plasma and produced by the very feeble interaction of other particles. In contrast to more popular WIMP (Weakly Interacting Massive Particle) scenario, the FIMP Dark Matter approaches towards equilibrium whereas for the case of WIMP, the Dark Matter particles move away from equilibrium leading to decoupling. We propose a FIMP-WIMP model for dark matter and explore its phenomenology. It is revealed that while the Galactic centre (GC) gamma excess can be explained by considering annihilation of WIMP type Dark Matter at GC, the observation based self interaction bound of Dark Matter can be well explained by the FIMP component. Besides, we explore Axions as another possible candidate of Dark Matter.

**Neutrino Physics and Astrophysics**

(a) **Neutrino Physics: Mass matrix phenomenology, Baryogenesis through Leptogenesis**

Baryogenesis via leptogenesis is investigated in a specific model of light neutrino masses and mixing angles. The latter was proposed on the basis of an assumed complex-extended scaling property of the neutrino Majorana mass matrix $M_{\nu}$, derived with a type-1 seesaw from a Dirac mass matrix $m_D$ and a heavy singlet neutrino Majorana mass matrix $M_R$. One of its important features, highlighted here, is that there is a common source of the origin of a nonzero $\Theta_{13}$ and the CP violating lepton asymmetry through the imaginary part of $m_D$. The model predicted CP violation to be maximal for the Dirac type and vanishing for the Majorana type. We assume strongly hierarchical mass eigenvalues for $M_R$. The leptonic CP asymmetry parameter $\epsilon^{\alpha L}_{\nu}$ with lepton flavor $\alpha$, originating from the decays of the lightest of the heavy neutrinos $N_1$ of mass $M_1$ at a temperature $T \sim M_1$, is what matters here with $\epsilon^{\alpha}_{2,3}$, originating from the decays of $N_{2,3}$, being washed out. The light leptonic and heavy neutrino number densities (normalized to the entropy density) are evolved via Boltzmann equations down to electroweak temperatures to yield a baryon asymmetry through sphaleronic transitions. The effect of flavored vs. unflavored leptogenesis in the three mass regimes (1) $M_1 < 10^9$ GeV, (2) $10^9$ GeV $< M_1 < 10^{12}$ GeV and (3) $M_1 > 10^{12}$ GeV are numerically worked out for both a normal and an inverted mass ordering of the light neutrinos. Corresponding results on the baryon asymmetry of the universe are obtained, displayed and discussed.
(b) **Supernova Neutrinos**

Supernova neutrinos can excite nuclei above their neutron emission thresholds. Simultaneous detection of the neutrons in a Fe (dominantly sensitive to neutral current) and a Pb (dominantly sensitive to charged current) can allow us to probe the flavor composition of the supernova neutrinos.

### 2.1. Ph D Awarded

1. Apurba Kheto [Debades Bandyopadhyay], Isospin dependent entrainment in rotating superfluid neutron stars, HBNI, Mumbai, April 2016.
2. Mainak Chakraborty [Ambar Ghosal], A Study on Neutrino Masses, Mixing and Baryogenesis through Leptogenesis in Some Electroweak models, University of Calcutta, Kolkata, June 2016.
5. Debabrata Adak [Debasish Majumdar], Studying Dark Energy from Theoretical and Observational Aspects of Late-time Cosmic Acceleration, University of Calcutta, November 2016.

### 2.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools

**Debades Bandyopadhyay**

1. Probing Exotic Fluid in Neutron Star Interior, One day seminar on the properties of nuclear fluid, VECC, Kolkata, December 29, 2016.

**Debasish Majumdar**

1. Fermionic Dark Matter in a Dark Sector, PHENO1@IISERM, IISER, Mohali, April 6-9, 2016.
4. Aspects of Dark Matter, National Workshop on Recent Advances in Astrophysics and Cosmology, Department of Physics, University of North Bengal, Siliguri, March 17-18, 2017.

Mala Das

Pijushpani Bhattacharjee

Pratik Majumdar

2.3. Teaching elsewhere

Debades Bandyopadhyay

Debasish Majumdar

Pijushpani Bhattacharjee
3. Biophysics and Structural Genomics

Biophysics and Structural Genomics Division is focussed in interdisciplinary area of basic and clinical research involving Proteomics, Biomolecular spectroscopy, Chemical Biology and Synthetic & Structural Biology. The widely prevalent diseases of eastern India, HbE-thalassemia and leukemia are being studied as model for hematological disorders while Alzheimer’s, Huntington’s, and the Prion diseases are being investigated for gaining insights into neurodegenerative diseases. Differential proteomics studies have been performed using clinical samples of cerebrospinal fluid, blood and plasma. Classes of redox regulators and chaperone proteins have been found to be up-regulated in hemoglobinopathy and an interactome for haemoglobin has been identified in erythrocytes. Investigations in cellular signaling and its role in cell fate determination vis a vis regulation of metabolism were studied using comparative mitochondrial proteome. Our findings clearly underline that cellular signalling and differentiation, lead to the alteration of mitochondrial proteome which in turn affects the functioning of key metabolic pathways. Similar studies have also implicated deregulation in self renewal pathways in the process of metastasis in gastric and breast cancer. Biophysical studies on elasticity of nuclear membrane proteins Lamins have implicated their role not only in cardiovascular diseases but in cell differentiation as well. Currently, investigation on the role of lamins and intermediate filaments in DNA damage response, karyokinesis and carcinogenesis are underway. Epigenomics studies on function and dynamics of transcription factors have been initiated to interpret the epigenetic language in eukaryotic cells. We aim to understand the critical interactions between histone posttranslational modifications and the ‘readers’ which regulate important cellular pathways and their dysfunctions leading to disease such as breast cancer.

Neurodegenerative disorders like Alzheimer’s, Huntington’s and Prion Diseases are being pursued to study the roles of various micro RNAs in the disease process. The major focus of research in Alzheimer’s has been the study of the downstream pathogenesis mediated through AICD and its adaptor network. AICD possesses conserved motifs that are known to interact with cytosolic adaptor proteins and these interactions in turn affect different signaling pathways. With Prion disease as a model system, we are trying to understand the significance of the ESCRT machinery and the endo-lysosomal pathway in Prion protein-mediated neurodegeneration. Our aim is to provide a molecular explanation for how the loss of function mutation of Mahogunin results in Prion disease like phenotype of spongiform neurodegeneration. In this regard, Ubiquitin-mediated regulation of the E3 ligase GP78 by MGRN1 in trans have been shown to affect mitochondrial homeostasis and positioning of spindle apparatus in development and disease.

Recently, we have initiated studies on a molecular systems level understanding of the combined effects of microgravity and space ionizing radiation (high energy particles) on human cells along with a metabolomics-guided system level elucidation of the effect of radiation exposure on living systems.

3.1. Ph D Awarded

1. Srijan Haldar [Subrata Banerjee], Biology of Megakaryocytes, University of Calcutta, May 2016.

2. Devika Srivastava [Oishee Chakrabarti], Mahogurin (MGRNI) mediated ubiquitination of α-tubulin and its regulation of cell division, University of Calcutta, July 2016.


3.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools

Chandrima Das


2. Epigenetic Reader ZMYND8 is a novel regulator of tumorigenicity, 11th Asian Epigenomics Meeting, JNCASR, Bangalore, September, 2016.


4. HBx hijacks nuclear body protein Speckled 110 and promotes Hepatitis B Virus pathogenesis, 19th Transcription Assembly Meeting, Bose Institute in association with SINP and IICB, Kolkata, 2016.

5. Decoding the Epigenetic Landscape by the Histone Readers: Implications in Human Diseases, Special Colloquium, NCCS, Pune, 2017.

Sangram Bagh


2. Can We Program a Living Cell Like an Engineer Programs a Device?, SN Bose National Center for Basic Research, Kolkata, February 07, 2017.


6. Teaching Cell an Engineering Language, Transcriptional Assembly Meeting, Bose Institute, Kolkata, November 9, 2016.


3.3. Teaching elsewhere

Chandrima Das

1. M.Sc. (3 Lectures) at Department of Biochemistry, Ballygunge Science College, November 2016.

Sangram Bagh
1. M.Sc course in Medical Biotechnology (8 Lectures), three departments including Department of Neuroscience, Department of Microbiology and Department of Genetics at Calcutta University, Kolkata, January-March 2017.

Pulak Ray


3.4. Publications in Books/Monographs/Edited Volumes

Chandrima Das

Research in the Chemical Sciences Division is wide-ranging and interdisciplinary, and addresses fundamental aspects of science. Overarching goals of the research projects include understanding of the excited state dynamics of complex phenomena using ultra fast spectroscopy and single molecule imaging, finding new functions for old drugs: Non Steroidal Anti-inflammatory Drugs (NSAIDs), different areas in Nuclear Chemistry, Radiochemistry and Green Chemistry, developing nanotechnology and novel advanced materials for a myriad of applications, unraveling problems associated with devising new, alternative sources of energy, neutron spectrometry and interaction, nano particle dosimetry and radiation safety.

Time-resolved spectroscopy within femtosecond to nanosecond time regime is being used extensively to study excited state dynamics on electronic and spatial control over the formation of transient ion pairs during photo induced electron transfer and proton transfer with small organic molecules like proflavine–amine, lumichrome-amines, etc. Similarly the results from laser flash photolysis experiments corroborated with magnetic field highlight the inter-radical separation distance between acridine derivatives and serum albumin proteins undergoing photo induced electron transfer during binding. Moreover, steady-state and time-resolved spectroscopic studies supported by theoretical docking analyses on structure dependent hydrophobic and hydrophilic interactions of Schiff base complexes, comprising of different metal ions and ligands, with serum albumins as well as hen egg white lysozyme proteins emphasize the potentiality of less explored nickel complexes in drug–protein interactions. In recent years emphasis has been given on extension of the work using crystallography and STD NMR spectroscopy, synthesizing copper(II) and Nickel(II) Schiff base complexes which can act as efficient small perturbing agents for biomacromolecules by distinguishing the relation of the structures and functions of these complexes towards different model biomacromolecules and cell lines like HeLa and WI-38 and assessment of antibacterial efficacy of therapeutically important small molecules conjugated with gold nanoparticles. Very recently we have succeeded in synthesizing ‘photo luminescent’ carbon dots. As per our concern, this is a pioneering work, where the plausible molecular structure and the intrinsic mechanisms governing photoluminescence of carbon dots are explained by trapping seven visibly distinct coloured intermediates evolved during pyrolytic metamorphosis of citric acid (CA) with dopent Ru(III) as an indicator. The metamorphosis of Ru: carbon dots is monitored by characterizing each trapped intermediate using HR-TEM, DLS, XPS, XRD, 1H-NMR, FT-IR, and steady-state and time-resolved UV-visible and fluorescence spectroscopy as well as magnetic field effect. The photo induced electron transfer ability of such carbon dots helps to develop their utility as quinone-sensor in live cells.

Copper complexes of Oxicam NSAIDs have been synthesized to study their biological applications. They form a new class of membrane anchors that require neither molecular recognition nor strength of interaction between interacting molecular partners, but still can
effectively increase membrane fusogenic efficacy over the bare drugs. This new class of membrane anchors is therefore a step ahead of traditional anchors that are based on two interacting molecular partners. DNA-binding with high base sequence specificity and apoptosis inducing properties have also been found for these complexes. Also, the copper complexes of traditional NSAIDs have been found to cause structural alterations upon interaction with chromatin/histone that makes them exert their effect at the epigenomic and genomic level.

Au-Polyaniline based conducting nano-composite has been utilized for bio-sensing of glucose, DNA and protein, using different electrochemical techniques and also for detecting the positional effect of single base mismatch in oligonucleotides. PEDOT-MnO$_2$ and graphene based materials have been used to fabricate super capacitors of high specific capacitance. A non-enzymatic electrochemical biosensor has been fabricated for cholesterol detection, having a distinct advantage over other conventional enzymatic processes. Chemically converted Graphene modified with β-CD, being hydrophilic, electro active and high surface area material, provides a platform for the electrochemical detection of cholesterol using Methylene Blue as redox indicator. Graphite nanoplatelet (GNP)/conducting polymer (poly(3,4-ethylenedioxythiophene)–poly(styrenesulfonate)) (PEDOT:PSS) composites were synthesized for their application as highly efficient electromagnetic interference (EMI) shielding material (SE) in the X-band frequency region.

A single molecule and ensemble spectroscopic study of dynamics of double stranded DNA and other DNA structural motifs were carried out. Effect of interaction of DNA with different nano particles as well as graphene oxide was carried out using the above methods. The following results were obtained. i). Conformational changes and complete unzipping of dsDNA by surface modified Gold Nanoparticles. In this work the interaction of dsDNA with surface modified gold nano particles was studied. A collaborative effect of the nanoparticles resulted in structural changes e.g. compaction and strand separation depending on the size and hence the charge on the AuNPs. ii). Bubble dynamics and DNA flexibility in presence of base pair mismatch. Dynamics of the thermally induced DNA bubble formation shows spontaneously zipping- unzipping rate which follows multistate relaxation kinetics. The nature of bubble has been investigated using small DNA containing 23 nucleotides and having preferred nucleotide sequence nearly identical to that of the transcription initiation sequence. The selective introduction of base pair mismatch for creation of melting bubble affects the local base stacking, along with the base pairing. iii). Chaotic Dynamics During the Restricted Branch Migration of IHF Bound Holliday Junctions due to Applied Force: A smFRET study. The enhanced rigidity and reduced flexibility, that a Holiday junction experiences upon binding to a DNA binding/Bending Protein, IHF have been monitored. Using single molecule FRET technique, detection of the isomerization dynamics in presence of applied force becomes possible. iv). Single molecule FRET Studies of Hybridization mechanism during the noncovalent adsorption and desorption of DNA on Graphene Oxide. This provides the insight about the interaction of DNA with low dimensional material like ‘Graphene Oxide’ (GO) to give a detail hybridization mechanism during the adsorption and desorption of DNA on its surface.

Recently, different architectures of nanomaterials which include tunable gold nano-flowers, silver nano-wires, selenium nano-spheres, intercalated nano-prism, branched gold nano-crystals, and porous silver nano-materials have been developed. The main results areas probed:

a) Standardization of nanotemplated growth technique for overgrowth anisotropic SERS active nanomaterials synthesis.

b) Controlled nanowire synthesis with aspect ratio ~1000 can replace carbon nanotube for their flexibility and giant conductivity.

c) Miniaturized electroanalytical instrument for cost effective blood profiling.
d) Synthesized bimetallic noble metal nanoparticle shows effective and selective killing of tuberculosis bacteria.

e) New generation mesoporous silica nanoparticle (MSN) for pH induced non-toxic drug delivery.

f) Newly synthesized hedgehog gold nanoparticle with high molecular weight non toxic polymer screening for long retention in blood vessel with ~5000K nanoscale thermalization.

g) Establishment of new field “Magnetic Field Enhanced Spin Dynamics”.

The nuclear and radiochemistry group is engaged in various activities. For the first time non-destructive method have been designed to determine K content of ancient glass beads which eventually tells about the origin of glass bead. Contribution have made in Radio-Green Chemistry experiments. Ionic liquids and other green reagents have been used to separate no-carrier-added clinically important radionuclides like $^{61}$Cu, $^{62}$Zn, $^{97}$Ru, $^{95,96}$Tc, $^{111}$In and $^{109}$Cd. An effective separation of $^{163}$Ho was designed from $^{163}$Er which has implications in neutrino mass measurement. Another important program of nuclear and radiochemistry group is measurement of naturally occurring radioactive material in Sundarban and Punjab state in collaboration with University of Calcutta and Punjab University.

The decomposition of isolated carbonic acid ($\text{H}_2\text{CO}_3$) molecule into $\text{CO}_2$ and $\text{H}_2\text{O}$ ($\text{H}_2\text{CO}_3 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$) is prevented by a large activation barrier (>35 kcal/mol). Nevertheless, it is surprising that the detection of the $\text{H}_2\text{CO}_3$ molecule has not been possible yet in the Earth’s atmosphere and hunt for the free $\text{H}_2\text{CO}_3$ molecule has become challenging not only in the Earth’s atmosphere but also on Mars. In view of this fact, we first study the instability of $\text{H}_2\text{CO}_3$ molecule in presence of water ($\text{H}_2\text{O}$), formic acid (FA), acetic acid (AA) sulphuric acid (SA) and hydroperoxide radical (HOO), detected in the Earth’s atmosphere. It is seen from this study the vapor phase of $\text{H}_2\text{CO}_3$ molecule is unstable in presence of $\text{H}_2\text{O}$, FA and AA. Moreover, we also study the energetic and kinetics of the OH radical-initiated $\text{H}_2\text{CO}_3$ degradation reaction ($\text{H}_2\text{CO}_3 + \text{OH} \rightarrow \text{HCO}_3^- + \text{H}_2\text{O}$) to interpret the loss of the $\text{H}_2\text{CO}_3$ molecule in the Earth’s atmosphere, as the OH radical is known as the atmospheric detergent. Importantly, it is seen from these two studies that, although the atmospheric concentration of the OH radical is substantially lower than the concentrations of the $\text{H}_2\text{O}$, FA, AA in the Earth’s atmosphere, but nevertheless, the OH radical-initiated $\text{H}_2\text{CO}_3$ degradation reaction has significant impact, especially, towards the loss of $\text{H}_2\text{CO}_3$ molecule in the Earth’s atmosphere. In contrary, although the catalytic efficiencies of SA, FA and AA upon the $\text{H}_2\text{CO}_3$ decomposition reaction are similar to each other and the concentrations of both the SA and OH radical in the Earth’s atmosphere are more-or-less equal to each other, but nevertheless, the SA-assisted $\text{H}_2\text{CO}_3$ decomposition reaction cannot compete with the OH radical-initiated $\text{H}_2\text{CO}_3$ degradation reaction.

4.1. Ph D Awarded


2. Anupa Majumdar [Munna Sarkar], Effect of different physico-chemical properties of the drugs and the membranes on Non Steroidal Anti-Inflammatory Drugs induced membrane fusion. Jadavpur University, June 2016.

3. Banabithi Koley Seth [Samita Basu], Spectroscopic studies on structure dependent selective bindings of copper (II) and nickel (II) Schiff base complexes with macromolecules of biological relevane, Jadavpur University, September 2016.


4.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools

Dulal Senapati


Samita Basu

1. Photochemistry at Interface, DST INSPIRE Science Camp in collaboration with Department of Science and Technology, INSPIRE INTERNSHIP component of INSPIRE Program, JBNSTS, Kolkata, March 27, 2017.

2. Laser flash photolysis and magnetic field effect on photoinduced electron transfer reactions, National Seminar on Recent Trends in Chemistry Research, Department of Chemistry, Siksha-Bhavena (Institute of Science), Visva-Bharati, Santiniketan, West Bengal, March 26, 2017.


5. Basics of Spectrophotometry and Spectrofluorimetry, Ph.D. Course Work, Department of Biochemistry, Ballygunge Science College, Kolkata, February 09, 2017.


10. Spectroscopy as an elegant tool for investigating interactions of small molecules with biological macromolecules, National seminar on Recent Trends in Chemical Research, Department of Chemistry at Sarojini Naidu College for Women, Kolkata, September 29, 2016.

11. Spectroscopic exploration of drug–protein interactions, Colloquium, Department of Life Sciences, Presidency University, Kolkata, September 21, 2016.


15. Photoinduced electron transfer corroborated by magnetic field effect, Colloquium, Department of Chemistry, Presidency University, Kolkata, April 12, 2016.

Susanta Lahiri

1. Third School on Trace Analysis, Mizoram University, Radiotracer Technique, March 28, 2017.


5. Green Chemistry to mitigate environmental hazards, UGC Interdisciplinary Refresher Course on Environmental Hazard and Disaster Management, University of Calcutta, Kolkata, February 20, 2017.


10. Separation of lead and bismuth from proton irradiated lead-bismuth eutectic by differential precipitation, 99th Canadian Chemistry Conference and Exhibition, Halifax, Canada, June 05-09, 2016.


4.3. Teaching elsewhere

Samita Basu


2. Photochemistry, M.Sc Course in General and Physical Chemistry special, Bidhannagar College, West Bengal State University, West Bengal, September-October, 2016 & March-April, 2017.

Maitreyee Nandy

1. Radiation Safety, Pre-Ph.D course work, Department of Biophysics & Molecular Biology, University of Calcutta, December 30, 2016.


5. Radioisotopes and Nuclear Medicine, M. Tech. course in Biomedical Instrumentation, Department of Applied Optics and Photonics, University of Calcutta, 3rd semester, 2016-2017.
5. Computational Science

Infrastructure Development and Maintenance by the Division:

The project involves migration of all the services (HTTP, SMTP, IMAPS, SSH, FTP, LDAP, DNS, Webmail etc.) and data to the new hardware and further enhancement to that. The solution also included the scope of DC and DR (Disaster Recovery) architecture, so that in case of a declared Disaster Scenario of the regular Data Center the DR setup can give critical service continuity to the users. As SINP does not have a campus at a geographically separate location, a location within our campus with electrical isolation was chosen to house the DR infrastructure. Storage (SAN) at both location and data replication between the two sites was planned. Like before we planned to use Redhat HA Cluster Suite to handle High Availability between two nodes. The nodes can be in Active/Active or Active/Passive mode. There were provisions in the scope to also have a virtual system in place (using RHEV suite) and run some applications in that. The virtual infrastructure may grow in future to support Desktop and Server Virtualization Services to cater the need of other departments.

However, mainly due to the vast nature of the project, many customizations and other factors it took quite a while to have the migrated system in production. Eventually we have moved to a more of a Virtual environment with RHEV, with RedHat Enterprize Virtualization Manager to control the guest machines. Now there are more than 10 such hosts in the virtual environment running services like, WWW, Webmail, Mailstore, Mail Gateways, Name Servers, Gatekeeper (inward SSH access to SINP LAN), LDAP, IMAP/POP, Proxy, UFS etc. Virtualization benefits in better utilization of hardware resources, reduce Data Centre (DC) footprint, provides environment for testing, custom provisioning of hardware, reduce hardware vendor lock-in, extend the life of older applications. Recently we have moved to an open source solution for virtualization called oVirt.

The infrastructure continues to serve as a heart for email, web and other Internet services from 2013. However the DR infrastructure were fully utilized in 2016 with DR (Disaster Recover) System deployment followed by a DC-DR Drill. The DC-DR drill is actually a two part drill. The first part being migration of services from DC (#237) to DR(#3401) infrastructure. This involves switching off the primary site completely and run all the production services from DR site. A role reversal happens for all the connected LUNs of the SAN (Storage Area Network) pairs, the SAN of DR starts working as primary storage and stores all the production data. After few days of observation and running the production system on DR infrastructure a reverse drill i.e. DR-DC Drill was conducted and storage and services were brought back to the DC infrastructure.

After the successful completion of the weeklong (21st to 26th July, 2016) DC-DR Drill, Dr. Sekhar Basu, Chairman AEC, along with a team of distinguished members and our Director inaugurated/visited the newly implemented DR Site. A poster session was also organised at the venue. We plan to place the DR infrastructure in future at Belgachia Campus of SINP.

Research Activities of the Division

We have developed a software to generate accurate model of a base pair using the six relative orientation parameters, Buckle, Open, Propeller, Stagger, Shear and Stretch, as suggested by IUPAC-IUB. This software can generate three-dimensional coordinates of double helical fragment also with such unusual base pairs. We have carried out extensive quantum chemical studies using Density Functional Theory with Dispersion correction on stacking interaction between successive base pairs in those double helical fragments. The structures predicted to have strongest stacking energy are seen to be quite similar to experimental structures for Watson-Crick base pair containing stretches. Thus we hope we can extend this method of stacking energy analysis to double helices containing non Watson-Crick base pairs as well.
We have done extensive molecular dynamics simulation studies to understand different features of DNA and RNA, such as melting behavior of polymeric DNA, molecular recognition of DNA sequences by protein through conformational selection mechanism, relative stabilities of telomeric DNA of different topology types and dynamics of loop residues in miRNA like fragments. We have done density functional theory based quantum chemical calculations to study stacking between Watson-Crick and non Watson-Crick base pairs and effect of positive charge on stability of unusual base pairing.

5.1. Ph.D. awarded


5.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools:

Dhananjay Bhattacharyya

1. Understanding Structural Features of miRNA from Analogous Structural Fragments in RNA Database: Molecular Dynamics Simulation Studies, 8th RNA Group Meeting, CCMB, Hyderabad, January 8-10, 2016.


5.3. Miscellany

Dhananjay Bhattacharyya

1. Designed, written and delivered lecture for eight course materials for E-PG Pathsala, an MHRD project under National Mission on Education through ICT (NMEICT) on Quantum Biophysics. Students can listen and view the video and read the e-text on Internet.
6. Condensed Matter Physics

3D Dirac/Weyl semimetals: We have grown high quality single crystals of 3D topological materials such as Cd$_3$As$_2$, ZrTe$_5$ and ZrSiS using different techniques and studied their transport and magnetic properties [Phys. Rev. B 94, 165139 (2016); Sci. Rept. 7, 40327 (2017)]. The Fermi surface geometry of these systems is analyzed using Shubnikovde Haas and de Haasvan Alphen oscillations. We observe remarkably large charge carrier mobility and magnetoresistance in these materials; potential for fast electronic device and magnetic field sensor applications. By measuring resistivity under electric field parallel to magnetic field configuration, we observe negative magnetoresistance in ZrTe$_5$ and ZrSiS due to Adler-Bell-Jackiw anomaly as predicted by the relativistic theory of charged chiral fermions induced by external gauge fields with non-trivial topology. According to ISI web of science, our work on ZrSiS [PNAS 114, 2468 (2017)] has received enough citations to place it in the top 0.1% of papers in the academic field of Physics.

![Fig. Longitudinal magnetoresistance (Adler-Bell-Jackiw chiral anomaly) with both current and magnetic field along crystallographic axis a of ZrSiS Dirac system (left panel) and the theoretical fit (middle panel). Shubnikov–de Haas effect in ZrSiS single crystal and its fast Fourier transform for two different frequencies (right panel)](image)

Intermetallic compounds: Novel ternary intermetallic compounds of R$_2$NiSi$_3$ (R = Gd, Er) type have been recently synthesised. The magnetic ground state of the compounds found to exhibit frustrated glassy magnetic components coexisting with spatially limited long-range antiferromagnetic state, as revealed by dc & ac magnetization, heat capacity, and neutron diffraction studies. The compounds exhibit large magnetocaloric effect with, $-\Delta S_M \sim 18.4$ J/kg-K and RCP $\sim 525$ J/kg in Gd$_2$NiSi$_3$ and $-\Delta S_M \sim 22.6$ J/kg-K and RCP $\sim 540$ J/kg in Er$_2$NiSi$_3$ for 70 kOe magnetic field change. A correlation between large RCP and magnetic frustration is discussed for developing new magnetic refrigerant materials [Phys. Rev. B 94, 104414 (2016)]. Another interesting finding is the observation of zero thermal expansion behaviour in Ho$_2$Fe$_{16}$Cr, over a wide range of temperature (13330 K). Magnetovolume effect has been argued to be responsible for that kind of anomalous thermal expansion [RSC Adv. 6, 94809 (2016)].

In intermetallic compounds RECo$_2$Si$_2$ (RE = rare earth), when cobalt are partially substituted by another transition metal, namely vanadium, due to complex magnetic interactions, multiple magnetic transitions are observed [JMMM 401, 998 (2016)].

Rare-earth and transition metal oxides: We have shown disorder as well as particle size induced giant enhancement of the magnetoresistive properties in several manganite materials [RSC Adv. 7, 16575, (2017), J. Appl. Phys. 121, 103904 (2017), JMMM 403, 36 (2016)]. We also synthesized fascinating nano-tubes of Gadolinium oxide (Gd$_2$O$_3$) using controlled template assisted electrochemical deposition technique. Tube of diameter 200nm, wall thickness 20nm, are constituted of nano-clusters of diameter 7.5nm. It shows anisotropic,
large magnetocaloric effect at cryogenic temperature JMMM 417, 182 (2016), Physica E 80, 149 (2016).

Battery performance and basic physics: Established correlation between battery performance and basic physics of battery material (such as LiCo$_{y}$Mn$_{2-y}$O$_4$). The critical doping $y \sim 0.16$ results in breakdown of cooperative-distortion network, enhancing lithiation and delithiation of battery, thereby minimizing electrochemical capacity fading. [Appl. Phys. Lett. 110, 143901 (2017)].

Supersolidity in natural and artificial systems: Exploring supersolidity in naturally occurring and artificially designed systems is an area of immense interest. The cooperation of the super-fluid and charge-density-wave (CDW) orders is studied in a two-dimensional Bose-Holstein (BH) model where hard-core-bosons (HCBs) are coupled locally to optical phonons. In the parameter regimes of strong HCB-phonon coupling and nonadiabaticity, a novel mechanism for latticesupersolidity is found. At densities not far from half filling and in the parameter regime where the double-hopping terms are non-negligible (negligible) compared to the nearest-neighbor hopping, checkerboard-supersolidity (phase separation) is realized [Annals of Physics 375, 322 (2016)].

Localization effect in Graphene: I have been working recently on interplay of disorder and interactions to explore many-body localisation which is an exotic phase of matter as it challenges basic foundations of quantum statistical physics. We demonstrated recently that localisation does survive in presence of interactions even in system which has single particle mobility edges. We also studied localization in context of graphene and showed that even in this 2D system there are single particle mobility edges. I am also interested in transport in strongly correlated systems. Recently, we have shown in a system of hard core bosons that the normal phase of the superfluid, which undergoes a Kosterlitz-Thouless transition in 2D is ballistic having finite Drude weight [Phys. Rev. B 94, 134508 (2016); Phys. Rev. B 93, 235426 (2016)].

Diffusion of hard-core particles: Studied diffusion of hard-core particles on a one-dimensional periodic lattice subjected to a constraint that the separation between any two consecutive particles does not increase beyond a fixed value $n + 1$; an initial separation larger than $n + 1$ can however decrease. These models undergo an absorbing state phase transition when the conserved particle density of the system falls below a critical threshold $\rho_c = 1/(n + 1)$ [Phys. Rev. E 94, 062141 (2016)].

Exclusion processes in closed systems: It has been shown that closed asymmetric exclusion systems with weak particle nonconservation can lead to nontrivial steady states that are generically nonuniform. Further by using a similar lattice-gas type agent-based model for opinion dynamics, we have shown that diffusion of the agents plays a significant role in formation of consensus. General scaling behaviour and macroscopic profiles are obtained. These studies are expected to be relevant in a number of areas including intra-cellular transport in biology and traffic management in a city, and physical approaches to social dynamics [Phys. Rev. E 95, 012113 (2017); Reports in Advances of Physical Sciences 1 (01), 1740008 (2017)].
6.1. Ph D Awarded

1. Moumita Nandi [Prabhat Mandal], Study of structural, magnetic and thermal properties of some low-dimensional spin chain compounds, University of Calcutta, 2016.

2. S Kundu [Prabhat Mandal], Investigation of the physical properties of DNA and other nano-bio systems, University of Calcutta, March 2017.

3. Susmita Dhara [Bilwadal Bandyopadhyay], Preparation, characterization and study of magnetic properties of Co\textsubscript{x}Cu\textsubscript{1-x} (x \sim 0.01-0.7) granular alloys, Homi Bhabha National Institute, March 2017.

4. Rajeswari Roychowdhury [Bilwadal Bandyopadhyay], Effect of substitution at the transition metal site on the magnetic properties of rare earth ternary silicides, Homi Bhabha National Institute, March 17, 2017.

6.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools

Chandan Mazumdar

1. Griffiths phase in a frustrated antiferromagnetic intermetallic compound GdFe\textsubscript{0.17}Sn\textsubscript{2}, International Conference on Magnetic Materials and Applications (ICMAGMA - 2017), Defence Metallurgical Research Laboratory (DMRL), Hyderabad and the Magnetics Society of India (MSI), Hyderabad, February 1-3, 2017.

P.K. Mohanty

1. Sandpile models and Percolation, one day Seminar on D Dhar's retirement, TIFR, Mumbai, November 17, 2016.

2. Universality in self-organized criticality, Discussion meeting on 60 years of percolation phenomena, SNBNCBS, Kolkata, January 24, 2017.


Prabhat Mandal

1. Magneto-transport properties of 3D Dirac semimetal Cd\textsubscript{3}As\textsubscript{2}, National Workshop on Condensed Matter Physics, IIT Kharagpur, February 03 - 05, 2017.

2. Structural, magnetic, thermal, electrical properties Nb-doped EuTiO\textsubscript{3} single crystal, Indo-French Workshop on Pressure Effects on Strongly Correlated Materials, Bharathidasan University, Tiruchirappalli, January 9-12, 2017.


4. Breakdown of Wiedemann and Franz Law in Dirac semimetal Cd\textsubscript{3}As\textsubscript{2}, 9th India-Singapore Joint Symposium, National University of Singapore, February 24-26, 2016.

5. Magnetotransport properties of some Dirac Semimetals, University of Potsdam, Berlin, Germany, November 2016.
Sudhakar Yarlagadda


6.3. Miscellany

Barnana Pal

1 Best poster award by Ultrasonic Society of India in the 21st National Symposium on Ultrasonics, November 08-10, 2016 for her paper “Incidence of ultrasonic wave through Newtonian and non-Newtonian fluids”.
7. Crystallography and Molecular Biology

Main focus of Crystallography and Molecular Biology Division is study of the structure and conformation of proteins involved in various cellular regulatory processes. Studies relating the structure and dynamics of biological macromolecules to function are essential part of modern biophysics in order to unravel the mechanism of action of proteins at the molecular level. Our research is strongly focused on understanding the mechanistic insights of various classes of proteins such as membrane skeletal proteins; cell-cycle regulatory proteins; signaling and heat shock proteins; cysteine proteases and inhibitors; proteins involved in unique sugar metabolism; and integral membrane proteins. Using well-established expertise of recombinant DNA technology, X-ray crystallography and structure-guided protein engineering, we attempt to understand the mechanism of proteolytic activity of cysteine proteases, alter the function of cysteine proteases (like imparting hemoglobinase activity), design and generate specific protein inhibitors from serpin family against falcipain2 from Plasmodium falciparum, a drug target for the malaria parasite. Structural and functional aspects of Vibrio cholera proteins involved in many processes such as c-di-GMP mediated biofilm formation, transcription termination and activation (Rho-specific), small heat shock proteins (HSP31, HSP15, DnaK etc.) mediated protein folding and protein phosphorylation / dephosphorylation involved in metabolic activity and signal transduction will be studied in great detail.

Several unique sugar metabolizing proteins have been identified in Leishmania donavani, a protozoan parasite that causes Leishmaniases, which are potential drug targets. Structural characterizations have been initiated with the proteins UDP-Glc 4 '-epimerase, UDP-galactopyranose mutase and Galactose Mutarotase. Works are in progress to elucidate the functional interaction of DNA repair protein (Ku) with the cell cycle modifier polo-like kinase 1 (Plk1). Further, structural and thermodynamic insights related to the interaction of cyclophilin, a peptidyl-prolyl cis-trans isomerase, with a transmembrane protein CD147 would be examined since this interaction has been implicated in inflammation, cancer and cardiac disorders. We would use the newly installed Next Generation Sequencer (NGS) to elucidate any differential relationship of involvement of Ku with the origin-uses in a spatio-temporal manner. Another line of research would focus on the altered drug resistance in Leishmania strains against available drugs. NGS would effectively be used to identify proteins/pathways involved in drug resistance.

Erythroid spectrin is a major constituent of Red Blood Cells (RBC) and plays a vital role in maintaining the cytoskeletal structure and flexibility of the erythrocyte. Cloning, expression and purifications of spectrin domains such as the ankyrin binding domain, self-associating domain, SH3 domains etc have been initiated to explore their protein-protein interactions, chaperone activity and membrane binding potential. We are starting a new research area on characterizing the structural dynamics of membrane proteins. Importantly, ~30% of human genome codes for membrane proteins and ~60% of available drugs target membrane proteins. Structural dynamics of potassium and magnesium ion channels have been just initiated to decipher lipid-dependent voltage gating mechanisms.

7.1. Ph D Awarded


3. Soumita Mukherjee [Partha Saha], Role of post-translational modifications on cell cycle progression of eukaryotes, University of Calcutta, November 2016.

7.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools

Abhijit Chakrabarti


7.3. Teaching elsewhere

Abhijit Chakrabarti

1. On Proteomics, Refresher Course in Challenges and options in Life Science Research in the developing world today for College and University Teachers, Human Resource Development Centre/Academic Staff College, Department of Zoology, University of Calcutta, Kolkata, January 9, 2017.

7.4. Publications in Books/Monographs/Edited Volumes

Rahul Banerjee

8. High Energy Nuclear and Particle Physics

ALICE Collaboration activities

The Saha groups of ALICE are one of the cofounder laboratories of the Muon Spectrometer and collaborating since 1997. In past years, the Saha members have achieved major milestones such as detector hardware fabrication, designing of MANAS (ASIC readout chip), active participation in ALICE data collection, analysis of large volume data, publication of ALICE results in major national and international conferences and journals. The groups is focused to share the knowledge gained in the frontier of science experiment such as ALICE with the school, college, university students through various seminars and public. A short summary of the major hardware and analysis activities are summarized below.

Saha hardware performance and maintenance

The indigenously built large area cathode pad chamber by Saha group comprises with 2.2 lakh readout channels which have been fully fabricated commissioned and installed by the Saha members of ALICE. Since Muon Spectrometer is a tracking detector, the stable data collection with Indian made detector is critical for the physics prospects of the Spectrometer. Each year LHC exceeds its previous record in terms of luminosity and stable beam delivery. This imposes the detector operation challenging due to the high particle flux. The successful operation of the Indian made Muon detector marked a record due to the stable performance in high luminosity ($10^{29}$ cm$^{-2}$s$^{-1}$) during the pPb and Pbp data collection in 2016.

Nevertheless, it is to be mentioned that the successful operation requires critical and delicate maintenance work of the detector which are carried out by the special team of technical, engineer and scientific members of the group.

MANAS

The first stage of detector signal is processed by the ASIC chip named MANAS designed in Saha. Since the readout scheme of Muon Spectrometer and Photon Multiplicity Detector of ALICE are similar, the Saha team has delivered 88 thousands to two detector collaborations. An excellent performance of MANAS chip has been observed in LHC operation during Run I and II in high radiation background environment. The recent successful pPb data collection is an added confirmation of the stable operation of the chip in high luminosity environment.

Detector operation

The detector operation in complex setup like ALICE is a challenging task since ALICE hosts 18 different detection technologies. The Saha group of ALICE is also recognized for its leadership role during critical data collection periods such as pPb and high luminosity pp runs. The group took challenging responsibility of System Run Coordinator for Muon Spectrometer and ALICE Run Coordinator for ALICE setup in 2016 and 2017, respectively.

Data analysis

The high luminosity pPb runs allow to collect a large statistics for the study of the bound and open heavy flavour mesons of charm and beauty quarks. The suppression (or no suppression) quark-antiquark pair in pPb collisions provides and important information for saturation/shadowing parameter used to understand the quark gluon plasma created during the first epoch of Big-Bang. The number of J/psi, psi(2S), Upsilon(1S) and Upsilon(2S) as measured by the Muon Spectrometer and analyzed by Saha team is shown in the plot below [Fig (1) and (2)]. The anomalous psi(2S) suppression have been reported for the backward rapidity by the Saha group for p-Pb collisions at 8.16 TeV. The analysis note have been
submitted for psi(2S) analysis after the completion of the analysis where Saha Institute took leading role.

The Saha team is involved in the analysis of Pb-Pb data of 2015 for the measurement of nuclear modification factor of Upsilon(1S) and (2S) at 5 TeV collisions. The paper draft is prepared in present academic year and ready for collaboration review for publication.

The double differential measurement of J/psi production in Pb-Pb 2015 provide a new insight to the study of recombination effect. The Saha group has initiated this analysis and currently in advanced stage.

![Fig. The J/psi and psi(2S) production in p-Pb collisions at forward (left) and backward (right) rapidities.](image1)

![Fig. The Upsilon(1S) and (2S) production in p-Pb collisions at forward (left) and backward (right) rapidities.](image2)

The photo production of J/psi in ultra-peripheral Pb-Pb collisions allows to study the electromagnetic production cross-section of charmonium state at relativistic energies. In recent times this has drawn attention of the high energy physics community since it provides access to the electromagnetic production effect without contribution of the hadronic interaction. This measurement is carried out by the Saha group in collaboration with a Ph.D student from Aligarh Muslim University (AMU).

In proton-proton collisions where medium formation is not expected has started to show some peculiar properties which were initially observed only in Pb-Pb collisions such long range correlation. The Saha group is involved in the study of J/psi production in pp collisions at 2.76 TeV and 5 TeV in collaboration with AMU student, which demonstrated that the production of charmonium increases linearly with charge particle multiplicity. This is understood to be originated due to multi-parton interactions in the high energy pp collisions.

The Saha group is also involved to analyze the pp 13 TeV data for the study of heavy flavor decay mouns from various sources.
ALICE Upgrade: Muon Forward Tracker (MFT)

The next ALICE upgrade includes the fabrication of silicon pixel detector in the forward rapidity known as Muon Forward Tracker. This will enhance the signal resolution due to the accurate identification of the collision vertex in the z-direction of the beam. A critical component of the detector in high luminosity environment is the reduction of the heat with proper cooling method. The SINP team is involved with the planning and fabrication of the cooling mechanism for MFT.

ALICE Upgrade: Readout Upgrade for Muon Spectrometer

The LHC luminosity will be increased further after LS2 and current readout of Muon Spectrometer cannot record at such high rate. Therefore, a new design have been proposed for the second station of Muon Spectrometer by the Saha group. The new readout PCB conceptual design has been reviewed and approved by the ALICE collaboration. This will be a multilayer PCB for continuous readout and finalization of detail design is in progress.

QGP Phenomenology

This activity is being pursued for the last 17 years with present emphasis on the properties of hadrons in non-zero magnetic field at finite temperature. The highlights of these studies in recent times are:

a) Spectral properties of rho and pi mesons in magnetic field at non-zero temperature.

b) Study of rho-omega mixing in vacuum in magnetic field.

c) QCD collective oscillations in hot magnetized plasma.

The other studies include the production ratio of Y(3S) to Y(1S) and Y(2S) to Y(1S) via pp collisions at the LHC energies is an important preliminary to the research on QGP. Such effects has been studied for forward rapidities along with J/psi(1S), Psi(2S)(charmonia) and compared with experimental results of ALICE and LHCb to understand both the hot and cold nuclear matter produced at LHC energies.

CMS Collaboration activities

The CMS group of SINP started in 2011 with 5 faculty members and 4 students. Some of the members have been involved in CMS for a much longer period contributing significantly to the design and construction of the CMS experiment. Since the beginning of data taking, the group has had major responsibilities in tracker operations, Hadron calorimeter (HCAL) calibration and overall Data Quality Monitoring (DQM). In physics analysis, the group’s major involvement has been in new particle searches including the Higgs boson. At the time of the Higgs discovery, the group was involved in search for Higgs in the high mass region. The group’s work in physics and detector development has resulted in 16 physics papers, about 15 public physics results and 10 detector related notes. So far, 9 students have graduated from the group. At present, the group with 6 faculty members and 10 students has major involvements in several important channels of Higgs Physics, physics of jets and in searches for dark matter and extra dimensions. The group has ongoing responsibilities for the Run II data taking, in detector performance and calibration studies of the hadron calorimeter, tracker validation, bad channel calibration, and tracking performance studies. The group has commitments for several important upgrades of the CMS detector for the High Luminosity LHC operations. SINP members have held positions of responsibilities, in detector development, operations and Physics analyses, within the collaboration.
Physics Studies and Computing

Analyses

The SINP-CMS group has been involved in several important LHC physics analyses, namely: (1) SM Higgs boson studies in the γγ decay mode, e.g. differential cross-section measurement, and in the 4-lepton decay mode (4e, 4μ, 2e2μ). (2) SM Higgs boson searches in the associated production mode with a W, where the Higgs boson decays into a pair of t leptons and the W decays to an electron or a muon; (3) di-Higgs production at the LHC energies; (4) search for dark matter and extra-dimensions; (5) inclusive jet production at different energies and event shape studies; (6) Feasibility study to trigger on Bs → φφ → 4 kaons events at Level 1 using the proposed CMS PhaseII tracker.

The SINP team played a central role in two important publications of CMS in 2016 from dark matter searches and excited lepton searches from 2012 data. Students from SINP were leading analyzers and served as analysis contact persons within the collaboration. The bound on dark matter nucleon scattering cross-section obtained from our monophoton analysis appears in the global plot of dark matter-nucleon scattering cross-section upper bound. The SINP members have also contributed towards rediscovery and first mass measurements of the Higgs boson using the Run II data.

Computing

The SINP-CMS cluster became fully operational in 2013, with the successful hosting of the Asian CMS Data Analysis (CMSDAS) school. The cluster served significantly for the PhaseII Tracker related simulation studies. In 2016 SINP has become a part of the LHConet network supported under the National Knowledge Network (NKN). A new divisional computing center has also been developed during the last year.

Run II Detector Performance related activities

The group has long-term responsibilities on current tracker and HCAL operations and calibration. The group is responsible for the validation of the present tracker detector; tracker bad channel calibration and tracking performance studies. The group have contributing substantially to the calibration of the hadron calorimeter making use of different approaches to do relative and absolute calibration of the calorimeter. In addition, strategies to trigger on isolated particles are pursued.

Hadron Calorimeter Upgrade

The backend electronics of HCAL has been upgraded during the long shutdown period 1 (LS1) of LHC. The group made substantial contribution in two broad areas: 1) microTCA based readout cards for HF and 2) Optical Splitters for barrel and end-cap HB/HE detectors.

A total of 54 µHTR cards were fabricated within LS1. All the required cards have been built in the industries in Bangalore and tested at SINP before being shipped to CERN. These cards required some power mezzanine cards and they have been tested at SINP. All the cards were successfully installed and commissioned for RunII data taking in 2015 and have been working successfully ever since.

Optical splitters for LS1 upgrade were crucial for the working of trigger with CMS HCAL back-end electronics. Students and post-doc have played a major role in designing and testing for 3 years, to meet our partial commitment towards LS1 upgrade. Eventually, 206 such units have been shipped to CERN and installed and integrated with the detector.
Phase II Upgrade

A number of sub-detectors of the CMS detector will be upgraded fully before the HL-LHC phase starts. The timeline for upgrade is 2020-23 and R&D activities are in full swing.

The CMS tracker detector will be replaced entirely in order to operate at the High Luminosity LHC. The proposed tracker design allows us to reconstruct tracks with sufficient resolution at Level 1 phase of the trigger system. The tracks reconstructed at Level 1 trigger is crucial to reduce and keep event rate at an acceptable limit. We have contributed towards the Associative Memory (AM) based L1 track trigger simulation studies. We have also made major contribution to the study of performance of the proposed L1 track trigger by looking at the improvement in electron rate. This study is already a part of the PhaseII tracker Technical Proposal (TP). We have also studied whether rare processes like $B_s \rightarrow \varphi \phi \rightarrow 4$ kaons can be triggered using the PhaseII tracker and the results have been included in the Tracker Technical Design report (TDR). The group members have contributed significantly to the PhaseII tracker module-test software development and Data Quality Monitoring (DQM) tool used in laboratory and Tracker Beam tests. The group is also responsible for the development of the digitizer software for the proposed new tracker. Presently, the group is setting up a module test facility in the institute.

The CMS-GEM activities have been going on since several years with a view to upgrade the tracking and triggering capabilities of the CMS muon system in the high rapidity region. The upgrade is also important to cope up with the HL-LHC scenario.

An infrastructure is being set up which will be used to carry out several quality control steps related to the final production of GE1/1. In addition, the same infrastructure is expected to be used for detector R&D for GE2/1 and ME0 upgrades. It may be noted that a large fraction of the components for this R&D will be based on products made within the country.

We hope to use the same laboratory for studies related to muon tomography, which can be considered as a spin-off having societal applications.

Both ECAL and HCAL endcap calorimeters will be replaced with a new detector, known as HGCal that will utilize highly granular silicon pads for both ECAL and the front part of the HCAL. The group has been involved in simulation studies, beam test data analysis and in setting up a test facility locally in the institute.

8.1. Ph D Awarded

1. Atanu Modak [Subir Sarkar and Suchandra Dutta], Search for the Standard Model Higgs boson decaying to a Tau lepton pair in proton-proton collisions using the CMS detector at the LHC, University of Calcutta, March 2017.

8.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools

Debasish Das

1. Quarkonia results from LHC at the CNT workshop on Quarkonia production and suppression in High Energy Heavy Ion Collisions, University of Calcutta, Salt Lake Campus, February 14, 2017.
Tinku Sinha

The members have been successfully continuing their activities in Accelerator based Nuclear Physics (In-Beam gamma spectroscopy and Reaction studies) using National and International Accelerator Facilities. They have been invited to present their work in several School, Conferences and Symposia during this tenure.

The division is involved in experiment done in international RIB facilities at GSI, Germany.

This group is a constituent member of the Indian National Gamma Array (INGA) collaboration since its inception. During this time-period, apart from collaborating with other National Institutes to utilize and maintain this INGA array, our group has actively participated in the submission of the upgrade proposal of INGA to DST.

**Achievements from National Accelerator Based Work**

The members have contributed significantly in understanding the shears mechanism and development of collectivity in nuclei in A~140 region. High-spin states in the dipole structure of $^{141}$Sm have been investigated using the fusion-evaporation using the Indian National Gamma Array. Comparisons between the experimental characteristic and the semi-classical shears mechanism with the principal axis cranking model calculation has shown that one of the dipole band may be interpreted as a magnetic rotational band.

Threshold behavior of interaction potential, fusion barrier distribution and channel coupling have experimentally investigated for the weakly bound stable projectiles and targets in medium mass and heavy nuclei. Fusion cross-sections, at above and below the Coulomb barrier, with stable projectile have been studied to understand the effect of breakup or breakup-like processes with medium-mass target in comparison with a projectile which has a lower breakup threshold.

Breakup effects on a spectroscopic factor of light nuclei have been investigated. The study of astrophysically important reaction using weakly bound projectiles and breakup induced alpha transfer process for some bound states have been pursued.

Shell model studies of neutron-rich nuclei near $^{132}$Sn done by divisional members have been successful in explaining data from National and International groups. Members have collaborated with other national institutes to study shape coexistence in rare-earth nuclei.

The high-spin states in $^{153}$Ho have been studied using Indian National Gamma Array (INGA) setup. From the comparison of experimental and theoretical results, it is found that there are definite indications of shape coexistence in this nucleus. The experimental and calculated lifetimes of several isomers have been compared to follow the coexistence and evolution of shape with increasing spin.

**Achievements from International Accelerator Based Work**

Experiments proposed by member of this group have been performed at international accelerator facilities using RIB in collaboration with many institutes of repute from different countries. One of remarkable achievements is observation of disappearance of magic numbers in the neutron rich nuclei. Measurement to probe neutron-skin of exotic nuclei has been undertaken which is important for improving nuclear equation of state important for understanding neutron-star properties.

First results are reported on the ground state configurations of the neutron-rich $^{29,30}$Na isotopes, obtained via Coulomb dissociation (CD) at energies of 400–430 MeV/nucleon using the FRS-ALADIN-LAND setup at GSI, Darmstadt.
Achievements from In-house Developmental work

- The group has been consistently involved in developmental activities in in-house labs.
- Performance of axial field ionization chamber with Xenon gas has been tested.
- An old sum spectrometer consisting of six large NaI(Tl) detectors has been rejuvenated and set up with a CAEN 5780 digitizer, characterized and then utilized to suppress room background.

This year Saha Institute has hosted the 61st DAE-BRNS Symposium on Nuclear Physics during 4-9th December 2016. Nuclear Physics Division has been involved in the organization of the Symposium in a major way. The academic and organizational aspect of the Symposium has been highly appreciated by more than 500 participants coming from all parts of India and even abroad.

9.1. Ph D Awarded

1. Subhendu Rajbanshi [A. Goswami], Generation of angular momentum in weakly deformed nuclei in mass \(\sim\) 140 regions, University of Calcutta, October 2016.

9.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools

Anjali Mukherjee

1. Large back angle quasi-elastic scattering for weakly bound systems at near-barrier energies, DAE-BRNS Symposium on Nuclear Physics, SINP, Kolkata, December 5-9, 2016.


M. Saha Sarkar


2. Studies in Nuclear Structure relevant to Astrophysics: experimental efforts, 61st DAE-BRNS National Symposium on Nuclear Physics, Bhabha Atomic Research Center (BARC), Mumbai [funded by Board of Research in Nuclear Physics (BRNS)], Kolkata, December 4-9, 2016.

3. Nuclear structure near exotic doubly closed Sn isotopes, Nuclear structure and inputs for possible experiments with upcoming high resolution gamma ray array at FAIR facility SPIN-2016 (2 Lectures), Department of Physics, University of Calicut, supported by Bose Institute Indo-FAIR Co-ordination Centre (BI-IFCC), Calicut, November 5-19, 2016.

6. Study of isomers near doubly closed $^{208}\text{Pb}$ with $N<126$, Workshop on isomer studies at the focal plane of HYRA, September 19, 2016.
7. Angular distribution, correlation, and DCO ratio, Experimental methods in gamma-ray spectroscopy (3 Lectures), Inter University Accelerator Centre, New Delhi, April 25-29, 2016.

9.3. Teaching elsewhere

Anjali Mukherjee
1. M.Sc. on Nuclear Physics (12 Lectures), West Bengal State University, Barasat, January – March 2017.

Chinmay Basu

9.4. Miscellany

Anjali Mukherjee
1. Member of the International Advisory Committee for the FUSION 17 conference, held at Hobart, Australia.
10. Plasma Physics

Research activities in the plasma physics division encompass a variety of theoretical and experimental topics in the field of linear and nonlinear wave propagation. Theoretical studies using Lagrange fluid description for various types of waves in unmagnetized and magnetized plasmas have been carried out to understand wave breaking phenomena due to phase-mixing processes. In a relativistic scenario, wave breaking limit of a cold electrostatic wave in an electron-positron-ion plasma has been derived and its dependence on various mass ratios obtained. Such studies have relevance to particle acceleration and heating in astrophysical environments and laboratory experiments. Investigations on stationary solutions of Bursian and non-neutral plasma diodes and their stability characteristics in presence of external magnetic fields reveal interesting results that are relevant in the design of fast electron switches. Studies are also being pursued to understand the formation of different types of nonlinear coherent structures such as solitons, double layers and vortices in classical as well as quantum plasmas. Dynamics of charged particles in chaotic magnetic fields is being explored to understand diffusion and energization aspects.

Strongly coupled dusty plasma having a viscoelastic nature supports propagation of longitudinal acoustic and transverse shear modes. Linear and nonlinear coupling between these modes as well as excitation of various instabilities driven by velocity shear, non-Newtonian characteristics and density dependent viscosity have been investigated. Simulation studies using pseudo-spectral analysis are being carried out to study the formation and evolution of vortices as well as interaction between co and counter propagating mono polar Gaussian vortices in a strongly coupled collisional dusty plasma.

Experimental activities are being carried out in the MaPLE (Magnetized Plasma Linear Experiment) device, double Layer experimental device (DLX), glow discharge plasma and the currentless toroidal device.

MaPLE device has been designed to study waves and instabilities in a controlled parameter regime. In the regime where both hot and cold flowing electron species are present, excitation of electron acoustic wave has been observed in the low wave number regime. Excitation of electron acoustic mode is an unconventional phenomena in laboratory plasmas and an understanding behind the excitation mechanism has been obtained using a kinetic model. In order to enhance the density in the MaPLE device that is currently produced by electron cyclotron resonance discharge a quiescent filamentary source has been developed, fabricated, tested and integrated with the machine. This will facilitate study of magnetic electron drift mode.

Double layer experimental device enables studies in radio-frequency produced plasma in presence of diverging magnetic fields. Self-excited drift waves with frequency greater than ion cyclotron frequency have been observed in an argon plasma and termed upper drift modes to distinguish them from conventional low frequency drift modes. In helium plasma, two drift modes coexisting over a wide range of axial and radial locations have been observed and accorded to smaller values of ion Larmor radius of helium compared to argon.

Nonlinear dynamic experiments are being carried out in DC glow discharge plasmas having cylindrical and toroidal configurations revealing a variety of nonlinear phenomena.

Application of dipolar magnetic field using bar magnet has lead to excitation of canard orbit and mixed mode oscillations when the system is in excitable state and period doubling bifurcation when the system is in oscillatory state. In a currentless toroidal assembly, floating potential fluctuations associated with anodic fireballs have been found to exhibit different kinds of oscillations depending on the vertical magnetic field applied. Different
statistical and spectral methods have been used to explore the complex dynamics of the plasma.

10.1. Ph D Awarded

1. Sudip Garai [M.S. Janaki and Nikhil Chakrabarti], Velocity shear driven phenomena in strongly coupled dusty plasma, HOMI Bhabha National Institute, April 2016.
3. Abhik Mukherjee [Prof. Anjan Kundu and M.S. Janaki], Study of nonlinear waves in oceanic and other physical systems, Homi Bhabha National Institute, June 2016.

10.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools

Nikhil Chakrabarti

3. DST-SERB school organized by Institute of Advanced Study in Science and Technology (IASST) (8 Lectures), November 9-12, 2016.

10.3. Teaching Elsewhere

M. S. Janaki

1. DST-SERB school organized by Institute of Advanced Study in Science and Technology (IASST) (4 Lectures), November 9-12, 2016.
2. Short term course entitled ‘Nonlinear dynamics, chaos and application’ at Department of Physics (2 Lectures), NIT Durgapur, July 14, 2016.
11. Surface Physics and Material Science

In order to achieve superior device performances, it is absolutely necessary to explore the properties of new materials within multifunctional platforms in the nanometer length scale (~1-100 nm), where the surface and the interface essentially dictates the functions. Keeping this view in mind, research activities of the Surface Physics & Material Science (SPMS) Division mainly encompass the growth of low-dimensional metallic, semiconducting and organic materials via physical and chemical routes followed by their extensive characterizations with state-of-the-art techniques/tools for achieving tunable mechanical / electrical / magnetic / optical properties relevant in the forefront research areas of micro-nano science & technology. Synthesis of the condensed and soft materials in the form of ultra-thin layer and nanometer sized particles with different morphology are implemented by sophisticated growth techniques, like, molecular beam epitaxy (MBE), metal oxide vapour phase epitaxy (MOVPE), cluster ion deposition, sputtering, ion implantation, Langmuir-Blodgett (LB) techniques along with other conventional growth techniques, like, spin coating and wet chemical methods. The state-of-the-art characterization techniques, such as a 300 kV transmission electron microscope (TEM) attached with electron energy loss spectroscopy (EELS) and energy dispersive x-ray spectroscopy (EDX), high resolution scanning electron microscope (SEM) augmented with cathode luminescence (CL) optical detection system, versatile x-ray diffraction (VXRD) system, X-ray photoelectron spectroscopy (XPS) systems along with angle resolved detection capability, ultra high vacuum based scanning tunnelling microscope (STM) and ambient scanning probe microscopes (SPMs) are utilized for structural, compositional, optical, tribological and surface/interface analysis in routine manner. In short, the faculty members of SPMS division, with their diversified fields of expertise, have been working on systems where surface/interface plays a crucial role in dictating its properties relevant to applications, such as, MOS-based electronic devices, magnetic devices, photonic devices, sensors for detecting hazardous gas and human blood glucose monitoring, bio-imaging, solar cells, to name a few. Many faculty members of the division have also been using advanced synchrotron facilities in India and abroad for a further detailed understanding of these materials, apart from developing an SINP beam line at the INDUS II synchrotron at RRCAT, Indore.

That an atomically sharp interface (revealed by cross-sectional TEM) plays a crucial role in determining the quality of the cutting-edge new materials having possible applications in next generation electronic, spintronic and quantum computation devices, has recently been demonstrated in a high-temperature ferromagnetic topological insulator utilizing our TEM facility through an international collaborative work. Our TEM work has been instrumental in the discovery of a super dense nonmagnetic fcc phase of cobalt and demonstrating the growth of nanoscale nickel monosilicide, a desired material for the future complementary metal oxide semiconductor (CMOS) technology.

Formation of 2D-networked structures of disk-like islands for ultrathin Langmuir-Schaefer (LS) films of thiol-coated Au-nanoparticles (DT-AuNPs) on H-passivated Si substrates is evidenced for the first time, directly from a broad peak in grazing incidence small angle X-ray scattering (GISAXS) data and also from atomic force microscopy (AFM) images [RSC Adv. 2016, 6, 12326]. The structural information of the LS films, obtained at different surface pressure, helps to infer the growth of Langmuir monolayers of DT-AuNPs, which is very important in understanding the self-assembly process of nanoparticles at the air-water interface and in controlling the growth of 2D-networked nanostructures in large areas.

The crystallization process ZrO₂ thin-film is identified and found that 1-D crystal growth took place initially that spreads laterally with temperature and time without increasing their numbers. The growth of Zr-Silicate and silicide is also investigated using differential scanning calorimetry. The substrate dependent performance of the high-k dielectric film is also investigated. Charge storage properties of InP quantum dots in GaAs metal-oxide-
semiconductor based nonvolatile flash memory devices is also investigated. A nanoparticle (NP)-based non-volatile memory devices with HfO$_2$ as tunnel and barrier layers are fabricated and characterized.

We work with nano dimensional organic semiconducting (OSc) thin films prepared on various substrates in ultra high vacuum chamber. Structure and electronic properties of these films are studied. OTFT devices are prepared and the field effect mobility of the devices is measured. We use various spectroscopic and microscopic techniques for our experiments such as XPS/UPS, NEXAFS, PRES (synchrotron based techniques), AFM etc. We also perform density functional theory calculations using StoBe and VASP software. The objective of our study is to understand interfacial's properties that are required for the development high mobility organic semiconductor devices.

We study the structures in different phases and their incorporation into the membrane depending on the temperature-surface pressure phase diagram of the mixed lipids. Self organization mechanism in supramolecular materials in presence of foreign species is also very crucial in developing new functional devices based on these self assembled materials. We have also demonstrated that these supramolecular nanofibers are very promising candidates for various applications such as solar cells, sensors, FETs, etc.

In our recent works on the dynamics in soft matter, i.e., the two-dimensional nanoscale pattern dynamics at air-water interface, we investigated the role of the nanoparticle–monolayer and monolayer–monolayer lipophilic attraction in influencing morphology and dynamics of AuNP cluster patterns in fatty acid monolayers. The corresponding pattern morphology, observed with a Brewster Angle Microscope (BAM) essentially reveals three stages in pattern evolution. On the otherhand, coalescence of myristic acid droplets on water surface is found to exhibit anomalous behaviour such as simultaneous increase of mean droplet size and droplet number with time at low surface pressure.

We have shown that the 3D micro-snowflake structured α-Fe$_2$O$_3$ synthesized by simple hydrothermal decomposition of K$_3$[Fe(CN)$_6$] without using any surfactant can be used for highly selective, sensitive and stable amperometric sensing of H$_2$O$_2$ and N$_2$H$_4$ in presence of common coexisting electroactive interferes. As an ideal enzyme less sensing material, the sample has good stability and selectivity against common coexisting interferes. We also report non-equilibrium dynamics and giant spontaneous exchange bias obtained in zero field cooled mode for Ni$_{48}$Mn$_{33}$In$_{11}$ alloy. The dc magnetic measurements indicate a super spin glass type magnetic ground state in the system.

We have started work on epitaxial growth of (Al$_{1-y}$Ga$_y$)$_x$In$_{1-x}$P/(Al$_{1-y'}$Ga$_y'$)$_x$In$_{1-x}$P/GaAs QW structures. Initial low temperature photoluminescence measurements show peaks correspond to the QW emission. While working on the growth of AlxGa1-xAs epitaxial layers in the QW structures, we have observed natural superlattice ordering in the material, which is not reported on (100) GaAs grown by this technique. This growth behaviour is further studied by growth of thick Al$_x$Ga$_{1-x}$As layer with different composition and their thermal stability using different x-ray techniques, TEM microscopy and photoluminescence. Effect of the superlattice on emission properties of the QW is also being studied in detail.

We have performed extensive studies of the antiferromagnetic NiO single crystals and ultrathin films using XPS, ARPES, LEED, LEEM, XMLD-PEEM methods and have been the subject of many publications. Electronic band structures of low-dimensional layered materials such as single crystal Graphite, MoS$_2$, MoSe$_2$ etc. have also been extensively investigated. Epitaxial Cr, V and Mn monolayers, and multilayers, as well as their oxides such as V$_2$O$_3$, MnO, Mn$_3$O$_4$ etc, have been studied in respect of their surface magnetism and electronic structures. Further systems studied includes ultrathin films and overlayers of CoO, MgO, Cu$_2$O, metallic Sn and SnO etc.
The time evolution of the spontaneous oxidation of the prepared film in air at room temperature (RT) was studied. A compositional analysis of the film was carried out in an ultra-high vacuum (UHV) deposition chamber using an in situ XPS system. The morphological aspects of the deposited film were studied with a high resolution scanning electron microscope (SEM) and an atomic force microscope (AFM). We report the spontaneous production of highly pure (95%) and technologically appealing nano-crystalline Cu$_2$O within 300 seconds of air exposure. The crystalline structure was probed using high resolution TEM (HRTEM) and the optical properties were studied using a cathodoluminescence (CL) device attached to a SEM.

Examination of radiative localized surface plasmon resonance (LSPR) modes of individual polyhedral nanoparticles (NPs) with high index facets, such as trisoctahedral (TOH) shaped or concave nanocube (CNC) shaped gold (Au) nanocrystals (NCs) using cathode luminescence (CL) across the visible spectral range show interesting results. Pronounced enhancement is observed in the Raman scattering on Rhodamine 6G (R6G)-covered TOH Au NPs aggregates on a Si substrate whereas for CNC shaped Au NPs, we report the existence of edge quadrupolar mode as well as substrate-mediated hybridized corner quadrupolar and octupolar modes.

11.1. Ph D Awarded

1. Ishani Roy [Satyajit Hazra], Structural ordering in semiconducting organic molecules or polymers, University of Calcutta, June 2016


11.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools

Biswarup Satpati

1. Transmission Electron Microscopy of Composite Materials, TEQIP II Sponsored One Day Seminar on Recent trend in composite material held at Mechanical Engineering Department, Jadavpur University, Kolkata, August 18, 2016.


3. Insight into the World of Nanomaterials: Microscopy and Spectroscopy with Electrons, UGC-SAP (DRS III) sponsored National Seminar on Advances in Materials Science, Department of Physics, Gauhati University, March 24-25, 2017.

Mrinmoy K. Mukhopadhyay


Satyanjan Bhattacharyya

Manabendra Mukherjee

1. Recent developments in the field of Nanomaterials, Dolphin (PG) Institute of Biomedical and Natural Sciences, Dehradun, April 4, 2016.

2. A systematic study of synthesis and self assembly of silver triblock copolymer nanoparticles, Physics Department of HNB Garhwal University, Srinagar, Uttarakhand, April 8, 2016.

3. Near Edge X-ray Absorption Fine Structure Spectroscopy (NEXAFS) and a few case studies, Center for Condensed Matter Sciences, National Taiwan University, Taipei, Taiwan, June 30, 2016.


5. An overview of synchrotron and related research, at Dolphin (PG) institute of Biomedical and Natural Sciences, Dehradun, December 6, 2016.

12. Theory

Particle Physics Phenomenology

Flavor-changing decays of the top quark have been predicted to be small in the Standard Model. The experimental limits on these processes are much higher. We have set up theoretical framework in which experimentally accessible results can be expected in models of new physics. We have discussed two models of supersymmetry, one with conserved R-parity, and the other in which R-parity is mildly violated. We show that in the latter case there is a distinct possibility of detecting the rare decay of top quark decaying to a charm quark and a Z boson at the LHC.

We have also worked on intergenerational symmetries and tried to explain fermion masses and mixings.

The SM at the LHC is being scrutinized at an unprecedented level of precision. It is only natural to have the competing BSM scenarios match the same order of accuracy in QCD as the SM observables.

At the LHC, first step towards a precision phenomenological study of the production of spin-2, coupling non-universally to the SM particles would be to compute form factors to the production of a singlet, on-shell spin-2 state via the quark-antiquark and gluon-gluon production channels, to the same order of accuracy as the SM background. A priori, it is not clear how the UV and IR structure would look like when spin-2 couples to particles of the SM with non-universal couplings, this is investigated up to the three loop level in QCD.

We have performed the very first calculation involving a massive spin-2 particle at NNLO level in QCD for the production of a pair of leptons at hadron colliders. We have included all the relevant sub-processes that can contribute to the invariant mass distribution of the dileptons. The methodology of reverse unitarity and IBP identities are systematically employed to achieve it.

The two-loop QCD correction to massive spin-2 graviton decaying to quark +anti-quark + gluon is presented considering a generic universal spin-2 coupling to the SM through the conserved energy-momentum tensor. The motivation are to (a) probe the structure of quantum field theory in the presence of a spin-2 field, to check the universality of IR pole structure in QCD and (b) present one of the important ingredients for full two-loop QCD correction for real graviton production in association with a jet.

Using the pseudo-scalar Higgs boson form factors that have recently become available up to three loops and the third order soft function from the real radiations, a complete N3LO threshold correction to the production of a pseudo-scalar Higgs boson at the LHC has been obtained. Using our approach, we have also computed the process dependent coefficient that appears in the threshold resumed cross section, which will be useful for resumed predictions at N3LL in QCD. Using threshold corrected N3LO results; we have presented a detailed phenomenological study of the pseudo-scalar Higgs boson production at the LHC for various center of mass energies as a function of its mass.

Non-perturbative studies of Quantum Field Theories

The standard Wilson lattice gauge theory with compact gauge fields is explicitly gauge-invariant at all stages of the calculation and does not require gauge fixing. This works perfectly well for vector-like gauge theories. However, for proposals of chiral gauge theories on the lattice, gauge invariance is lost because lattice fermions do necessarily break chiral symmetry, and as a result the redundant longitudinal gauge degrees of freedom end up coupling with physical degrees of freedom, and render the theories unsuitable. Gauge-fixing
has been suggested as a possible remedy to control the couplings of the redundant degrees of freedom.

However, gauge-fixing at the non-perturbative level of compact gauge fields is a non-trivial business because of a rigorous no-go theorem by Neuberger which says that the partition function of a BRST-invariant theory of compact gauge fields is identically zero, apparently because of cancelling contributions from Gribov copies.

Here at SINP, we are pursuing particular proposals of non-perturbative gauge fixing both for Abelian and non-Abelian compact gauge theories.

For the Abelian case, a higher derivative gauge fixing term, breaking gauge and BRST invariance, is added to the Wilson term along with a counter-term to recover gauge symmetry. A new universality class is found at a continuous phase transition between a broken symmetry phase with regular order and another broken symmetry phase with spatially modulated order that has a vector condensate. Approaching this transition from the regularly ordered phase recovers the gauge symmetry and thereby decoupling the longitudinal gauge degrees of freedom. Contribution of the SINP group has been to determine the phase diagram beyond weak couplings and establish the availability of the new universality class to all gauge couplings through computation of various observables. Investigation of the Abelian gauge-fixing on the lattice has been completed in the past year.

The non-Abelian gauge fixing involves extension of the BRST called equi-variant BRST (eBRST) to evade the Neuberger's theorem. This is basically application of gauge fixing to the coset while a subgroup is kept gauge-invariant, and necessarily involves four-ghost term in the action. We have developed, from scratch, a code for generating gauge configurations with this eBRST action. The work is still in progress.

In pure QCD with free boundary conditions, work was also done to determine the lowest glue ball spectrum.

**Gravity and Cosmology**

An alternate model of gravity including torsion is being investigated. The main feature of this new model is it reduces to Einstein's theory at long distances and becomes a Yang-Mills' theory at short distances. However, no exact solution beyond the trivial ones (with non-vanishing torsion) has been found in which these features are exhibited. A report on this is yet to come out.

The number of observable e-foldings during inflation is sensitive to the post-inflationary history of the Universe. The generic presence of light scalar fields in theories motivated by supersymmetry or String theory leads to a late-time period of matter domination which lowers the required number of e-foldings, and in turn, the exact predictions of inflationary model. This issue has been explored in a concrete set-up of Kahler moduli inflation in String theory. The initial displacement of volume modulus has been calculated explicitly, and the generic expectation from supergravity theory was confirmed that the initial displacement is of the order of Planck mass. The constraints from reheating has also been analysed for this model in a subsequent work. In separate projects, the issue of attractor models in non-minimal f(R) gravity, and the supergravity contributions to inflation in models with non-minimal coupling to gravity have been analysed.

**Strings**

It has been shown earlier by us that, like BPS Dp branes, bulk gravity gets decoupled from the brane even for the non-susy Dp branes of type II string theories indicating a possible extension of AdS/CFT correspondence for the non-supersymmetric case. The detailed
decoupling limit and the throat geometry of the non-susy D3 brane when the charge
associated with the brane is very large have been worked out. This leads to the gravity dual
of a non-supersymmetric QCD-like gauge theory with running coupling constant having
confinement property. Also starting from an anisotropic non-susy D2 brane solution of type
IIA string theory an anisotropic space-like D2 brane solution has been constructed by the
standard trick of double Wick rotation. It is shown that upon compactification on six
dimensional hyperbolic space of time dependent volume of this SD2 brane solution leads to
accelerating cosmologies on the resultant four dimensional universe. On the other hand, at
early times this four dimensional space, under certain situations, leads to four dimensional
Kasner-like cosmology. Unlike in the standard four dimensional Kasner cosmology here all
three Kasner exponents could be positive definite, leading to expansions in all three
directions.

New examples of Lifshitz type vacua in 10D massive typeIIA supergravity are constructed.
These Lifshitz geometries arise when ‘massive’ closed strings are excited in D2-D8 brane
system. Upon compactification to four dimensions they produce 4-dimensional Lifshitz
solutions (with dynamical exponent of time being 2) like in the Einstein-Proca model of Son
et al. We also studied M5 action in six dimensions using Yang-Mills fields and adjoint
scalars with the help of auxiliary vector field and new axion field. The 6D covariant action is
well defined for ‘instantonic’ string solitons.

In addition, the following issues were explored and addressed: a) Building on earlier works
that describe a certain steady-state configuration, the causal structure of an emergent
geometry, which emerges from the dynamics of open strings, was explored within the context
of gauge-string duality. The similarity of causal structures emerging from dynamical gravity
and this particular kinematic space-time was elaborated on. b) Motivated by earlier works
within holography, a preliminary study of candidate infrared fixed points were carried out in
a system of arbitrary number of adjoint and fundamental degrees of freedom, in a strongly
coupled large N gauge theory. A large class of exact solutions were obtained, which are non-
perturbative in terms of the ratio of the number of fundamentals and the number of adjoints.

**QCD at Finite Temperature and Density**

A captivating nature of non-central heavy ion collisions indicates that a very strong
anisotropic magnetic field is generated in the direction perpendicular to the reaction plane,
due to the relative motion of the ions themselves. The initial magnitude of this magnetic field
can be very high at RHIC and LHC energies at the time of the collision and then it decreases
very fast. The presence of an external anisotropic field in the medium subsequently requires
modification of the present theoretical tools that can be applied appropriately to investigate
various properties of QGP. We have been involved in developing theoretical tools appropriate
for a hot magnetised QCD medium. Also involved in studying non-perturbative aspects of hot
QCD medium with effective models.

**Nuclear Theory**

The strong and model independent correlations of neutron star radii with the linear
combination of the slope of the nuclear matter incompressibility coefficient and slope of the
nuclear symmetry energy coefficient are reported for the first time. Such correlations are
found to be more or less independent of the neutron star mass over a wide range. This
correlation is traced back to be linked to the empirical relation existing between the star
radius and the pressure at a nucleonic density between one and two times saturation
density.
Mathematical Physics

An su(m)-invariant Haldane-Shastry like quantum spin chain with long-range interaction and open boundary condition has been studied. It is shown that this spin chain is integrable for some suitable choice of the lattice sites depending on the roots of the Jacobi polynomial. The ground state wave function of such integrable spin model can be obtained from the chiral correlator of the $c=m-1$ free boson boundary conformal field theory. The partition function of this spin chain is computed by using the freezing trick. Moreover, a complete description for the spectrum of this spin chain is given in terms of Haldane’s motifs and a related classical vertex model.

We analyzed the fermionic quasinormal modes of the BTZ black hole in the presence of space-time noncommutativity. Our analysis exploits a duality between a spinless and spinning BTZ black hole, the spin being proportional to the non commutative deformation parameter. Using the AdS/CFT correspondence we show that the horizon temperatures obtained from the dual CFT pick up non-commutative contributions. We demonstrate the equivalence between the quasinormal and non-quasinormal modes for the non-commutative fermionic probes, which provides further evidence of holography in the noncommutative setting. Finally we present an analysis of the emission of Dirac fermions and the corresponding tunnelling amplitude within this non-commutative framework.

We analyzed the effects of noncommutativity in conformal quantum mechanics (CQM) using the $\kappa$-deformed space-time as a prototype. Upto the first order in the deformation parameter, the symmetry structure of the CQM algebra is preserved but the coupling in a canonical model of the CQM gets deformed. We show that the boundary conditions that ensure a unitary time evolution in the non-commutative CQM can break the scale invariance, leading to a quantum mechanical scaling anomaly. We calculate the scaling dimensions of the two and three point functions in the non-commutative CQM which are shown to be deformed. The AdS$_2$/CFT$_1$ duality for the CQM suggests that the corresponding correlation functions in the holographic duals are modified. In addition, the Breitenlohner-Freedman bound also picks up a non-commutative correction. The strongly attractive regime of a canonical model of the CQM exhibit quantum instability. We show that the non commutativity softens this singular behaviour and its implications for the corresponding holographic duals are discussed.

We showed that the realizations of noncommutative coordinates that are linear in the Lorentz generators form a closed Lie algebra under certain conditions. The star product and the co-product for the momentum generators are obtained for these Lie algebras and the corresponding twist satisfies the co-cycle and normalization conditions. We also obtain the twisted flip operator and the $\mathcal{R}$-matrix that define the statistics of particles or quantum fields propagating in the se-non commutative space times. The Lie algebra obtained in this work contains a special case which has been used in the literature to put bounds on noncommutative parameters from the experimental limits on Pauli forbidden transitions. The general covariant framework presented here is suitable for analyzing the properties of particles or quantum fields at the Planck scale.

We showed that the N-particle Sutherland model with inverse-square and harmonic interactions exhibit orthogonality catastrophe. For a fixed value of the harmonic coupling, the overlap of the N-body ground state wave functions with two different values of the inverse-square inter action term goes to zero in the thermodynamic limit. When the two values of the inverse-square coupling differ by an infinitesimal amount, the wave function overlap shows an exponential suppression. This is qualitatively different from the usual power law suppression observed in the Anderson's orthogonality catastrophe. We also obtain an analytic expression for the wave function overlaps for arbitrary set of couplings, whose properties are analyzed numerically. The quasi-particles constituting the ground state wave functions of the Sutherland model are known to obey fractional exclusion statistics. Our
analysis indicates that the orthogonality catastrophe may be valid in systems with more
general kinds of statistics than just the fermionic type.

Recently unusual properties of water in single-walled carbon nanotubes (CNT) with
diameters ranging from 1.05 nm to 1.52 nm were observed. It was found that water in the
CNT remains in an ice-like phase even when the temperature ranges between 105 - 151 C
and 87 - 117 C for CNTs with diameters 1.05 nm and 1.06 nm respectively. Apart from the
high freezing points, the solid-liquid phase transition temperature was found to be strongly
sensitive to the CNT diameter. In this paper we show that water in such CNT's can admit
coherent nano-scale structures provided certain conditions are met. The formation of such
coherent structures allows for high values of solid-liquid phase transition temperatures that
are in qualitative agreement with the empirical data. The model also predicts that the phase
transition temperature scales inversely with the square of the effective radius available for
the water flow within the CNT. This is consistent with the observed sensitive dependence of
the solid-liquid phase transition temperature on the CNT diameter.

12.1. Ph D Awarded

1. Atanu Kumar [Amit Ghosh], Evolution of cosmological perturbation through
bounce in covariant perturbations theory and tests of linearity, Homi Bhabha
National Institute, August 2016.

2. Arindam Mazumdar [Palash Baran Pal], Effect of preheating on cosmic microwave
background, University of Calcutta, February 2017.

3. Chowdhury Aminul Islam [Munshi Golam Mustafa], Study of hot and dense
nuclear matter in effective QCD Model, Homi Bhabha National Centre, February
2017.

4. Avirup Ghosh [Amit Ghosh], Thermodynamics of horizons: some aspects of semi-
classical approaches, Homi Bhabha National Institute, March 2017.

12.2. Lectures/Talks given in Conference/ Symposium/ Workshop/ Schools

Arnab Kundu

1. Indian Association for the Cultivation of Science, SYK Model Black Hole Physics,
Kolkata, February 2017.

2. Fundamental Flavours, Veneziano Limit and Holography, Harish Chandra
Research Institute, Allahabad, November-December 2016.

3. Attaching Strings to Holography: A Study in Quantum Field Theories, Strings

4. Many Bodies Meet Massive Bodies: A Holographic Perspective, Recent trends in
Condensed Matter and High Energy Physics, IACS, Kolkata, January - February
2017.

5. Fundamental Matters (Veneziano Limit and Holography), Indian Strings Meeting
2016 (International), IISER Pune, December 2016.

6. Gauge-String Duality and Strongly Coupled Systems, String Theory: The Present
and the Future, Ramakrishna Mission Vidyamandira, September 2016.

7. Which way will the train go?, DST INSPIRE Internship Camp 2016, Visva-Bharati,
Santiniketan, September 2016.

Gautam Bhattacharyya

The hierarchy problem and physics beyond the standard model

1. Conference 'Pheno1@IISERM', Chandigarh, April 2016.
3. Indo-French network (INFRE-HEPNET) kick-off meeting, IISc, Bangalore, May 2016
5. LAPTh, Annecy, France, July 2016.
7. Department of Physics, University of Valencia, Spain, September 2016.
8. Colloquium at ICTS, Bangalore, October 2016.
9. Physics Department, Delhi University, November 2016.
11. School of Physics, NISER, Bhubaneswar, February 2017.

An Overview of Electroweak Precision Tests

1. Pedagogic Lecture for students in Sangam @ HRI 2016, HRI, Allahabad, February 2016.
2. Physics Department, Univ of Calcutta, February 2016.

Gauge-Higgs Unification

1. Looking for BSM physics, IISc, Bangalore, December 2016.

Fine-tuning in composite Higgs models

1. International Conference from Strings to LHC-IV, Chalsa, West Bengal, March 2017.
2. Scuola Normale Superiore, Pisa, Italy, June 2017.
3. INFN and Univ. Federico, Napoli, Italy, June 2017.

Harvendra Singh

2. Entanglement thermodynamic laws and perturbative corrections for Dp branes, INFN Sezione di Padova, Italy, December 06, 2016.
3. Entanglement thermodynamic laws and perturbative corrections in AdS, ASC, LMU, Munich, Germany, December 02, 2016.

**Koushik Dutta**

2. Moduli Vacuum Mis-alignment and Precise Predictions in String Inflation, Ladders of the Universe, Mainz Institute of Theoretical Physics, Germany, June 2016.
3. Moduli Domination and Precise Prediction in Inflation, PHENO01@IISERM, Mohali, April 2016.

**Munshi G. Mustafa**


**Palash Baran Pal**

1. Unification of forces, Science Camp, Physics Department, Jadavpur University, March 14, 2017.
2. Neutrinos and astrophysics, CNT Lectures on Special Topics in Nuclear Astrophysics (4 lectures of 1.5 hours each), Variable Energy Cyclotron Centre, Calcutta, March 06–09, 2017.
5. Neutrinoless double beta decay and neutrino mass, NDBD workshop (4 lectures of 75 minutes each), IIT Ropar and Tata Institute of Fundamental Research, IIT Ropar, October 17–21, 2016
7. Unification of forces, Frontiers of modern physics, Department of Physics, Jogamaya Devi College, Kolkata, November 21, 2016.

**Prakash Mathews**

12.3. Teaching elsewhere

Munshi G. Mustafa

1. Electromagnetic Theory-II; Integrated MSc course in Bose Institute, Kolkata, February-May 2017.

12.4. Miscellany

Munshi G. Mustafa

1. A talk on “My Association with Prof. Dinesh K. Srivastava” on his 64th Birthday, VECC, Kolkata, June 30, 2016.

Palash Baran Pal


4. Developing Bangtex, or Latex in Bengali, “Technology and the Bengali language”, organized by Sarsuna College and the Linguistics Department of Jadavpur University, held at Jadavpur University, November 25, 2016.


8. The history and mystery of calendars, “Public Lecture” at IIT Ropar, October 20, 2016.


10. মহাকেষ্ঠাদুর (Gravitational waves), “Young Scientists Forum”, held at the Senate Hall of Calcutta University, June 4, 2016.


12. The history and mystery of calendars, Institute of Engineering and Management, Kolkata, April 19, 2016.
13. Facilities

13.1. Centre for Advanced Research & Education

One Year Pre-PhD Training Program

CARE coordinated SINP’s participation in JEST, another nationwide written test conducted by several DAE institutions together, through Prof. M G Mustafa, the JEST coordinator of SINP. The written tests are followed by interviews conducted in SINP. The tests and interviews are conducted in two major areas – Physics and Biophysical Sciences. In 2016-17, 31 students were selected.

They are now going through the mandatory one-year pre-PhD course work. CARE coordinates the one-year course work following the HBNI guidelines through the Post-M.Sc. coordinators. It coordinates the formation of doctoral committee for each student as per HBNI guideline and reviews each PhD students’ annual progress and renewals of fellowships following the recommendation of doctoral committees. CARE office acts as the office of Dean, students’ welfare, HBNI, SINP.

Undergraduate Associateship Program & Summer Students’ program

In 2016-17, 13 undergraduate associates were trained in various labs of the Institute – the program is coordinated by Prof. Krishna Menon. In 2016-17 summer, 32 summer students were trained in various labs of the Institute – this program is coordinated by Prof. Nikhil Chakrabarti.

Institute Colloquiums, Distinguished Visitors

CARE organized 32 Institute colloquiums through colloquium coordinators, Prof. Y Sudhakar, Prof. Pratik Majumdar and Prof. Dulal Senapati.

Organizing Schools/Workshops (after getting the required approval of DAE)

- 8-th CARE School on Genomics & Proteomics for Clinicians in April 2016 in SINP.
- Partial support in organizing the Saha Theory workshop in cosmology and astrophysics at SINP during January 16-20, 2017.
- A meeting of LIGO and SINP scientists on November 9, 2016.
- Jointly organize 34th Young Physicist colloquium 2016 with Indian Physical Society during August 18-19, 2016 at SINP.
- CARE Seminar delivered by Dr. Chama Mukherjee on 07.01.17 on Gender sensitive issues at workplace. The seminar was jointly organized by CARE and Women Cell of SINP.
- CARE Seminar given by Mark McCaghrean of British Council on 14.2.17
Outreach Programs of Care

- 19-th National Science Exhibition during August 10–14, 2016, at Surer Math, DumDum, Kolkata, organized by the Central Calcutta Science & Culture Organization for Youth.
- 21-st Sundarban Kristi Mela o Lokosanskriti Utsav during 20-29 December 2016 at Sundarban, S 24 Parganas.

In house outreach programme organized by CARE on 08.11.2016

Science Day
CARE celebrated the Science Day on March 10, 2017. A day-long science outreach program was organized. About 500 students from local schools attended. Talks were delivered, followed by visits to several labs of the Institute. An interactive session was organized to address queries raised by the students. The day ended with a Science Quiz competition conducted by the SINP research fellows. Prizes were given to the winning schools by the Director.

Meghnad Saha Archive
CARE maintained and preserved the Prof. M.N. Saha Archive – a unique collection of numerous letters, documents, writings, personal items and memoirs of Prof. Saha and his colleagues. From time to time visitors from India and abroad, who are working on the history of Indian science, visit the archive. With permissions of our Director, CARE office hands over copies of these documents to scholars who are working on the subject.

Publication
Partial support in publishing a journal called Science and Culture, published by the Council of Indian Science News Association, Kolkata. Full financial support in developing the website of SINP and coordinating, preparing and publishing the annual report of SINP. CARE office also prints all posters requested by SINP students and faculties for participating in conference/workshops.


Theoretical Physics
1. Anwesha Chattopadhyay
2. Aranya Bhattacharya
3. Avik Paul
4. Bishnu Awon (has not completed)
5. Bithika Karmakar
6. Supriyo Ghosh

Experimental Physics
1. Amrita Datta
2. Ashok Kumar Mondal
3. Dipak Mazumdar
4. Gourab Saha
5. Md Samsul Islam
6. Pintu Barman
7. Piyasi Biswas
8. Prithwijita Ray
9. Rajkumar Santra
10. Ram Sewak
11. Sathi Sharma
12. Sayan Ghosh
13. Smruti Ranjan Mohanty
14. Sunita Sahoo
15. Tanmay Maiti
16. Vishal Kumar

Biophysical Sciences
1. Anindita Das
2. Anushka Chakravorty
3. Biswendu Biswas
4. Deopro Bonnerjee
5. Gargi Biswas
6. Priyadarshani Suchismita Sethy
7. Rajkamal Srivastava
8. Satyaki Chatterjee
9. Subhoja Chakraborty

Theoretical & Experimental Physics courses

Compulsory Courses in the First Trimester (Aug – Nov 2016)
1) Quantum Mechanics (Subinit Roy, Satyajit Saha)
2) Statistical Mechanics (Abhik Basu)
3) Advanced quantum Mechanics (Amit Ghosh)
4) Advanced Statistical Mechanics (Pradeep Mohanty)
5) Quantum Field Theory I (Asit K De)
6) Computational and Numerical Methods including C++ programming: Supratik Mukhopadhyay, Nayana Majumdar, Sandip Sarkar, Debasish Das
7) Short Experiments in Research Laboratories (Satyajit Hazra and Indranil Das, Coordinators)

Advanced Courses (optional) in Second Trimester (Dec 2016 – Mar 2017)
1) Quantum Field Theory-II (Asit K De)
2) Particle Physics (Palash B Pal)
3) Advanced Condensed Matter-I (Arti Garg & Kalpataru Pradhan)
4) Astro-Particle Physics-I (Debashis Majumdar)
5) Geometry and Gravity (Amit Ghosh)
6) Advances in High Energy and Astroparticle Physics: (Pijushpani Bhattacharjee, Naba Kumar Mondal)
7) Advanced tools for High Energy Physics and related detectors: (Subir Sarkar and Satyaki Bhattacharya)
8) Advanced Nuclear Physics I (Nuclear Structure and advanced nuclear radiation detectors & techniques): Maitreyee Saha Sarkar and Haridas Pai
9) Advanced Nuclear Physics II (Nuclear Reactions): Chinmay Basu
10) Materials Science / Nanoscience / Physics of Surfaces and Interfaces: Sangam Banerjee
11) Some Topics on Detection and Measurement of Radiation: Debasish Das, Co-ordinator

**Review works (Theoretical & Experimental physics) for 2015 – 16 batch**

1. Avik Banerjee, Higgs as pseudo Nambu-Goldstone Boson (Gautam Bhattacharyya, Theory)
2. Aritra Das, Collective oscillations in isotropic and anisotropic quark gluon plasma (Pradip K Roy, HENPP)
3. Augniva Ray, Conformal Bootstrap: a classic Idea and a modern Revival (Arnab Kundu, Theory)
4. Samanwaya Mukherjee, Two component dark matter model (Debasish Majumdar, AP&C)
5. Madhurima Pandey, Singlet scalar feebly interacting massive particle dark matter (Debasish Majumdar, AP&C)
6. Sajad Ahmad Bhat, Equation of state of neutron star matter (Debades Bandyopadhyay, AP&C)
7. Sourav Chakraborty, Metal-Insulator transition in binary disorder model (Kalpataru Pradhan, CMP)
8. Udit Narayan Chowdhury, Galilean Conformal Field Theories (Rudranil Basu, Theory)
9. Pintu Barman:- Growth process of size-selected metal nanoclusters and fabrication of soft-landed films (Satyaranjan Bhattacharyya, SPMSD)
10. Ashok Kumar Mondal:- Determination of the ANC of $^{16}$O states using $^{12}$C($^{6}$Li,d)$^{16}$O angular distribution data at sub-Coulomb energies (Chinmay Basu, NPD)
11. Piyasi Biswas:- Study of Quasi-elastic scattering for the system $^{7}$Li + $^{159}$Tb at around barrier energies (Anjali Mukherjee, NPD)
12. Sajad Ali:- Search for unobserved transitions and assignment of Multipolarity of different transitions: Investigation of level structures of $^{142}$Eu (Asimananda Goswami, NPD)
14. Jhuma Ghosh:- Charmonium Production as a function of rapidity and transverse momentum in pp and PbPb collisions (Sukalyan Chattopadhyay, HENPPD)
15. Wadut Shaikh:- Production yields of bottomonium states in pp and Pb-Pb collisions at LHC energies (Sukalyan Chattopadhyay, HENPPD)
16. Prasant Kumar Rout:- Particle Tracking In The Context Of CMS Experiment (Supratik Mukhopadhyay, ANPD)
17. Subhankar Roy:- Magnetothermal transports of 3D Dirac semimetal Cd3As2 (Prabhat Mandal, CMPD)
18. Moumita Das:- Giant magnetocaloric effect of rare earth orthoferrite GdFeO3 (Prabhat Mandal, CMPD)
19. Apurba Dutta:- Preparation and Characterization of MnPt Thin Film (Indranil Das, CMPD)
20. Snehal Mandal:- Deposition of thin film using magnetron sputtering and characterization using X-ray (Indranil Das, CMPD)
21. Arpita Das:- Slow Light in atomic medium & design of magneto-optical trap (Sankar De, ANPD)
22. Sridhar Tripathy:- Basic and Advanced aspects of Muon Tomography (Nayana Majumdar, ANPD)
23. Bibhuti Bhusan Jena:- Antiferromagnetic/Antiferromagnetic coupling (Krishnakumar S R Menon, SPMSD)
24. Debabrata Bhowmik:- (Satyaki Bhattacharya, HENPPD)

*Avik Banerjee in PMSc (Physics) was the recipient of:* Best performance award in PMSc (Physics) and Prof. A. P. Patra Memorial Prize in PMSc (Physics) for the session 2015-2016.
Bio-physical Sciences courses

Compulsory Courses in the First Trimester (Aug – Nov 2016)

2. Chemical Biology and Biophysics (CBB) (40 lectures by Montu Hazra, Padmaja Mishra and Sangram Bagh).
3. Spectroscopy and Nanoscience (SPN) (20 lectures by Samita Basu and Dulal Senapati)
4. Computer Programming & Bioinformatics (CPB) (40 lectures by Gautam Garai and Dhananjay Bhattacharyya)
5. Macromolecular Structure (MMS) (40 lectures by Rahul Banerjee, Dhananjay Bhattacharyya, Udayaditya Sen, Sampa Biswas, H Raghuraman, Kaushik Sengupta)
6. Radiochemistry & Radiation Physics (RRP) (20 lectures by Susanta Lahiri and Maitreyee Nandi)

Research Methodology (Compulsory)

i. Biochemical and Molecular Biology Techniques (BMBT) (by Debashis Mukhopadhyay, Partha Saha)
ii. Spectroscopy, Imaging and Crystallography Techniques (SICT) (by Padmaja Mishra, Montu Hazra, Dulal Senapati, Kaushik Sengupta and H Raghuraman)
iii. Good Laboratory Practices, Radiological safety (Radiation Protection Standards, Principles of Monitoring and Protection), Ethics of scientific research, writing of scientific articles and project proposals.
iv. Research colloquium: During the first two weeks of the course work, presentation on scientific research work carried out in the laboratories where students have opportunity to join for their doctoral work will be made by the respective faculty. Purpose of the colloquiums is to provide an overview of research activities at the Institute in the relevant subject area to the new students.

Advanced Courses (December 2016 – July 2017)

Each course consists of 20 lecture hours. Each student has to opt for 4 courses in total

1. Topics in Cell Biology - I (Kaushik Sengupta, Oishee Chakrabarti and Partha Saha)
2. Topics in Cell Biology – II (Chandrima Das and Subrata Banerjee)
3. Membrane Biophysics and Structural Dynamics of Membrane Proteins (H. Raghuraman)
4. Chromatography and Mass Spectrometry (Soumen Kanti Manna)
5. Synthetic Biology: 21st Century Biological Engineering (Sangram Bagh)
6. Macromolecular Crystallography (Udayaditya Sen and Sampa Biswas)
7. Advanced Spectroscopy and imaging (Samita Basu, Padmaja Mishra and Montu Hazra)
8. Drug Discovery: Modern Day Approach (Munna Sarkar)
9. Multi Scale Modeling (Dhananjay Bhattacharyya)
10. C programming language and its application in Bioinformatics (Gautam Garai)

**Review/Project work (December 2016 – July 2017)**

Each student has to do a literature review and laboratory work on a particular research topic under the supervision of a faculty in addition to their advance courses.

**Review works (Biophysical sciences) for 2015 – 16 batch**

1. Dibyashree Chowdhury, TDCR (Triple to Double Coincidence Ratio) - an excellent tool for low level analysis (Susanta Lahiri)
2. Kathakali Sarkar, Synthetic gene circuits in therapeutics: Towards the making of biochemical digital decoder in Escherichia coli (Sangram Bagh)
3. Kaushik Chanda, Targeting RTK Signaling Pathways in Neurodegeneration (Debashis Mukhopadhyay)
4. Payel Mondal, Regulation of gene expression by transcription factor 19 (TCF19) in association with tumour suppressor proteins during glucose metabolism (Chandrima Das)
5. Rajdeep Das, Dynamics of ER-Mitochondrial junctions (Oishee Chakrabarti)
6. Samrat Basak, DNA-Protein interactions and beyond: A single molecule Biophysical approach (Padmaja P. Mishra)
7. Sandip Kumar De, Synthesis of different shaped gold nanoparticles and their electrocatalytic study in different redox reactions and as a SERS substrate to detect fungicides/pesticides (Dulal Senapati)
8. Satyabrata Maiti, Hybrid coarse grain analysis and simulation of nucleic acid double helices (Dhananjay Bhattacharyya)
9. Sauvik Sarkar, Cross talk between membrane lipids and the skeletal proteins (Abhijit Chakrabarti)
10. Sayak Mukhopadhyay, Synthetic genetic devices for space missions (Sangram Bagh)
11. Sweta Singh, Immune evasion by Human Herpes Viruses (Subrata Banerjee)
12. Suparna Saha, Neuromyelitis Optica (Debashis Mukhopadhyay)
13. Tanushree Chakraborty, Organelle-specific changes in metabolome associated with cancer (Soumen Manna)
13.2. Library

Library is the hub for every educational sector. In research and development organisation, library is the resource centre for information, knowledge management and dissemination of information and knowledge. The SINP Library is also one of the major information resource centres within Eastern India in the field of Physical and Biophysical Sciences. It is our privilege to support the institutes march towards its vision - to be the pioneer research institute in India. Through our well equipped and digitised library, the members of our institution and the other members associated with our research and development program are being benefited and this will assist towards scientific development of our institute and our country at large. The Library not only acquires, organizes and disseminates knowledge; it has put its foot ahead towards policies and procedures, systems and services. The details of our library are given below.

13.2.1. Collections

Library has a huge collection of books, e-books and non-book materials. The details are given below:

- **Technical Books Accessioned**: 31980 (62 added in this year)
- **Non-Technical Books Accessioned**: E4315 (94 added in this year)
- **E- Books available**: 2929
- **Bound volumes of Journals Accessioned**: P51974
- **Current subscribed Journals**: 220 (Foreign)
- **Total no. of Online Journals including current subscription**: 3012 (Volume added from 2004 – 2012 of 8 Nature titles in this year)
- **Number of CD/DVD Rom Accessioned**: C1205 (total 26 CD added)
- **Theses accessioned**: T315 (26 added in this year)
13.2.2. Membership

In addition to our 609 institute members (faculties, research fellows and non academic), library has the privilege to serve more than six hundred (605) external users coming from different scientific and educational institutes of Eastern India. The external users includes; Calcutta University, Jadavpur University, Viswa Bharati, IACS, IICB, ISI, Bengal Engineering and Science University, WBUT, CMERI, Guwahati University, North-Eastern Hill University, Patna University etc. apart from numerous Under-Graduate/Post-Graduate colleges and project students.

13.2.3. Library Services

1. Borrowing of books and other documents.
2. Prints and Xerox of documents request by our students and faculties.
3. Prints all posters requested by our students and faculties for participating in conference/workshops.
4. Inter Library Loan request by our students and faculties.
5. Online access to more than three thousand journals.

13.2.4. Publications in Books/Monographs/Edited Volumes

Manlunching

1. Manlunching 2017, ‘Information Needs of Bioinformatics Researchers’ in Shri Ram, (ed), Library and Information Services for Bioinformatics Education and Research, pp.34-44. IGI Global Publisher, Hershey, PA.

Publications in Journals

Samit De


Publication in Conference proceedings

13.3. Crisis Management Section

Safety Awareness Programme conducted by Crisis Management Committee

Crisis Management Section under the supervision of Crisis Management Committee looks after the safety aspects of different activities carried out. This includes regular surveillance of fire safety, radiation safety and safety against biological hazards. Staff members are advised about safety against chemical hazard, electrical and mechanical accidents.

Safety Awareness Programme

The Committee has organized a Safety Awareness Programme on November 11, 2016, at Saha Institute of Nuclear Physics. The technical program comprised of five lectures on Electrical, Radiation, Fire Safety and Occupational health hazard. Demonstration of handling electrical and fire safety equipment and of handling accidents was carried out.

A Two day Fire Safety Awareness Programme was organized by the Crisis Management Committee on March 16-17, 2017. The programme was conducted by West Bengal Fire & Emergency Services Department. Handling of different types of fire, emergency measures to be taken, several fire accidents in the state were discussed. A mock fire drill was conducted with some participating members.
14. Miscellany

14.1. Cosmetics Committee

Swatch Bharat Mission conducted by Cosmetics Committee

14.2. Women Cell

The Women Cell and CARE jointly organized a seminar on “Gender Sensitization: Issues at workplace”. The lecture was delivered by Dr. Chama Mukherjee, Advocate of the Calcutta High Court on November 18, 2016.

In the seminar, Dr. Mukherjee explains the growing need of spreading awareness on the “Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013”. Staffs of SINC, irrespective of their gender, had attended the seminar.
15. Administration

15.1. Governing Council

Chairman:

**Dr Sekhar Basu**  
Chairman, Atomic Energy Commission &  
Secretary to the Government of India  
Department of Atomic Energy

Members:

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Institution/Department</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shri Ajay Sule</strong></td>
<td>Joint Secretary (R&amp;D)</td>
<td>Government of India</td>
</tr>
<tr>
<td><strong>Prof Amitava Raychaudhuri</strong></td>
<td></td>
<td>University of Calcutta</td>
</tr>
<tr>
<td><strong>Prof NR Das</strong></td>
<td></td>
<td>University of Calcutta</td>
</tr>
<tr>
<td><strong>Prof Dilip Kumar Maity</strong></td>
<td></td>
<td>University of Calcutta</td>
</tr>
<tr>
<td><strong>Prof Sudhakar Panda</strong></td>
<td>Director, Institute of Physics</td>
<td>Bhubaneswar</td>
</tr>
<tr>
<td><strong>Principal Secretary</strong></td>
<td></td>
<td>Higher Education Department</td>
</tr>
<tr>
<td><strong>Prof Mustansir Barma</strong></td>
<td>TIFR Centre for Interdisciplinary Science</td>
<td>Hyderabad</td>
</tr>
<tr>
<td><strong>Prof Ajit Kumar Mohanty</strong></td>
<td>Principal Secretary</td>
<td>Higher Education Department</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Government of West Bengal</td>
</tr>
<tr>
<td></td>
<td><strong>Director</strong></td>
<td>Saha Institute of Nuclear Physics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kolkata</td>
</tr>
</tbody>
</table>
15.2. Members of the Institute [As on March 31, 2017]

**DIRECTOR’S OFFICE**

2. Sri Subhasish Ghosal: Superintendent
3. Sri Manoj Biswas: Lower Division Clerk
4. Sri Ramesh Hari: Helper ‘D’
5. Sri Subodh Kr. Pradhan: Bearer-I

**REGISTRAR’S OFFICE**

1. Sri Anirban Banerjee: Registrar
2. Smt. Chandana Basu: A.A.O.
3. Sri Bimlesh Kr. Tripathi: Senior Hindi Translator
4. Shri Bibekbijay Bandopadhyay: Superintendent
5. Sri Abhijit Betal: Scientific Assistant-E
6. Sri Rudal Prasad Ram: Technician ‘F’
7. Sri Gobinda Ch. Das: Helper ‘D’ (Sweeper)

**Academic Departments and Divisions**

**ASTROPARTICLE PHYSICS & COSMOLOGY (APC)**

1. Prof. Debades Bandopadhyay: Sr. Professor ‘H+’ & HOD
2. Prof. Pijushpani Bhattacharjee Sr. Professor ‘H’
3. Prof. Debasish Majumdar: Professor ‘G’
4. Prof. Ambar Ghosal: Professor ‘G’
5. Prof. Mala Das: Associate Professor ‘F’
6. Prof. Pratik Majumder: Associate Professor ‘E’
7. Shri Nilanjan Biswas: Scientific Assistant ‘C’
8. Sri Bijay Kr. Das: Superintendent

**THEORY DIVISION**

1. Prof. Palash Baran Pal: Sr. Professor ‘H+’
2. Prof. Gautam Bhattacharyya: Sr. Professor ‘H’
3. Prof. Shibaji Roy: Sr. Professor ‘H’
4. Prof. Munshi Golam Mustafa: Sr. Professor ‘H’
5. Prof. Kumar Sankar Gupta: Sr. Professor ‘H’
6. Prof. Asit Kr. De: Sr. Professor ‘H’ & HOD
7. Prof. Bijay Kr. Agrawal: Sr. Professor ‘H’
8. Prof. Bireswar Basu Mallick: Sr. Professor ‘H’
9. Prof. Prakash Mathews: Professor ‘G’
10. Prof. Amit Ghosh: Professor ‘G’
11. Prof. Harvendra Singh: Professor ‘G’
12. Prof. Koushik Dutta: Associate Professor ‘E’
13. Prof. Arnab Kundu: Associate Professor ‘E’
15. Sri Pradyut Kr. Mitra: Technician ‘G’
16. Sri Sudarshan Hazra: Technician ‘C’
17. Sm. Dola Mallick: A.A.O.
18. Sri Arun Kr. Bose: Caretaker

**PLASMA PHYSICS DIVISION**

1. Prof. Mylavaram Sita Janaki: Sr. Professor ‘H’ & HOD
2. Prof. Nikhil Chakraborty: Professor ‘G’
3. Sri Shantanu Chowdhury: Engineer ‘G’
4. Sri Subhasis Basu: Scientific Officer ‘D’
5. Sri Monobir Chattopadhyay: Scientific Officer ‘D’
6. Sri Dipankar Das: Technician ‘F’
7. Sri Ashok Kr. Ram: Helper ‘C’

**SURFACE PHYSICS AND MATERIAL SCIENCE DIVISION**

1. Prof. Alkomay Datta: Sr. Professor ‘H+’
2. Prof. S. R. Bhattacharyya: Sr. Professor ‘H’ & HOD
3. Prof. Sangam Banerjee: Professor ‘G’
4. Prof. Manabendra Mukherjee: Professor ‘G’
5. Prof. Tapas Kr. Chini: Professor ‘G’
6. Prof. Satyajit Hazra: Professor ‘G’
7. Prof. Krishnakumar S.R. Menon: Professor ‘G’
8. Prof. Supratic Chakraborty: Associate Professor ‘F’
9. Prof. Madhusudan Roy: Associate Professor ‘F’
10. Prof. Satyaban Bhunia: Professor ‘F’
11. Dr. Biswarup Satpati: Scientist ‘F’
12. Prof. Minmoy Kr. Mukhopadhyay: Associate Professor ‘E’
13. Sri Avijit Das: Scientific Officer ‘D’
14. Sri Subir Roy: Scientific Officer ‘D’
15. Sri Susanta Banerjee: Scientific Officer ‘D’
16. Sri Souvik Banerjee: Scientific Assistant-D
17. Sri Goutam Sarkar: Scientific Assistant-D
18. Shri Debraj Dey: Scientific Assistant ‘C’
19. Sr. Mukul Ch. Das: A.A.O.
20. Sri Syama Prasad Mallik: Technician ‘G’
22. Sri Gobardhan Jana: Helper ‘C’

**APPLIED ELECTRONICS SECTION (AES)**

1. Prof. Mylavaram Sita Janaki: Sr. Professor ‘H’ & HOD
2. Smt. Chandana Basu: A.A.O.
3. Sri Bimlesh Kr. Tripathi: Senior Hindi Translator
4. Shri Bibekbijay Bandopadhyay: Superintendent
5. Sri Abhijit Betal: Scientific Assistant-E
6. Sri Rudal Prasad Ram: Technician ‘F’
7. Sri Gobinda Ch. Das: Helper ‘D’ (Sweeper)
APPLIED NUCLEAR PHYSICS DIVISION

1. Prof. Satyajit Saha: Sr. Professor 'H+' & HOD
2. Prof. Supratik Mukhopadhyay: Sr. Professor 'H'
3. Prof. P. M. G. Nambissan: Sr. Professor 'H'
4. Prof. Chandi Charan Dey: Professor 'G'
5. Prof. (Sm.) Nayana Majumdar: Professor 'G'
6. Prof. Sandip Sarkar: Professor 'G'
7. Prof. Sankar De: Associate Professor 'E'
8. Sri Pradip Kumar Das: Scientific Officer 'D'
9. Sri Shaibal Saha: Scientific Officer 'D'
10. Sri Haradhan Dhar: Scientific Assistant-F
11. Sri Chandra Nath Marik: Scientific Assistant-D
12. Smt. Soma Roy: Scientific Assistant-D
13. Smt. Suparna Das: Superintendent
14. Sri Dipil K. Sradda: Technician 'D'
15. Sri Kuntal Sarkhel: Helper 'C'
16. Sri Prabir Das: Helper 'C'

NUCLEAR PHYSICS DIVISION

1. Prof. Maitreyee Saha Sarkar: Sr. Professor 'H' & HOD
2. Prof. Ashimananda Goswami: Sr. Professor 'H'
3. Prof. Subinoy Roy: Sr. Professor 'H'
4. Prof. (Smt.) Anjali Mukherjee: Professor 'G'
5. Prof. Ushashree Datta: Professor 'G'
6. Prof. Chinmay Basu: Professor 'F'
7. Sri Sujib Ch. Chattopadhyay: Scientific Officer 'D'
8. Sri Kaushik Chatterjee: Scientific Officer 'D'
9. Smt. Jonaki Panja: Scientific Officer 'D'
10. Sri Ajay Kr. Mitra: Scientific Officer 'D'
11. Smt. Tutilal Dutta: Superintendent
12. Sri Pradip Barua: Technician 'D'
13. Sri Shankar Prasad Singh: Technician 'D'
14. Sri Siladitya Chakraborty: Helper 'C'

HIGH ENERGY NUCLEAR AND PARTICLE PHYSICS DIVISION

1. Prof. Sukalyan Chattopadhyay: "Sr. Professor 'H+' & HOD & Chairman, Housing Allotment Committee"
2. Prof. Pradeep K. Roy: Professor 'G'
3. Prof. Manoj K. Sharan: Professor 'G'
4. Prof. Satyakumar Bhattacharya: Professor 'G'
5. Dr. (Smt.) Tinku Sinha: Scientist 'F'
6. Prof. Subir Sarkar: Associate Professor 'F'
7. Prof. Suchandra Dutta: Associate Professor 'F'
8. Prof. Debasis Das: Associate Professor 'E'
9. Sri Arindam Das: Engineer 'D'
10. Sri Dipankar Das: Scientific Assistant-D
11. Smt. Lipi Das Bose: Scientific Assistant-D
12. Sri Sanjib Kr. Mondal: Superintendent
13. Sri Rakesh Kr. Ram: Helper 'C'
14. Sri Sudam Bagdi: Helper 'C'

CONDENSED MATTER PHYSICS DIVISION

1. Prof. Bikas Kanta Chakraborti: Sr. Professor 'T'
2. Prof. Sudhakar Varlagadda: Sr. Professor 'H' & HOD
3. Prof. Prabhat Kr. Mandal: Sr. Professor 'H'
4. Prof. Indranil Das: Sr. Professor 'H'
5. Prof. Asok Poddar: Professor 'G'
6. Prof. Bilwadad Bandopadhyay: Professor 'G'
7. Prof. Chandan Mazumdar: Professor 'G'
8. Prof. Pradeep K. Mohanty: Professor 'G'
9. Prof. Abhik Basu: Professor 'G'
10. Prof. Barnana Pal: Professor 'F'
11. Prof. Arti Garg: Associate Professor 'F'
12. Prof. Biswajit Karmakar: Associate Professor 'E'
13. Prof. Kalpataru Pradhan: Associate Professor 'E'
14. Smt. Sankari Chakraborti: Scientific Assistant-D
15. Sri Arindam Chakraborti: Scientific Assistant-D
16. Smt. Papia Mondal: Scientific Assistant-D
17. Sri Dhrubajyoti Seth: Scientific Assistant-D
18. Sri Kausik Das: Scientific Assistant-D
19. Sri Nilkamal Barai: Scientific Assistant 'B'
20. Sri Tapan Kr. Sarkar: Superintendent
21. Sri Arun Kumar Paul: Technician 'J'
22. Sri Anish Karmahapatra: Technician 'G'
23. Sri Prabir Das: Technician 'C'
24. Sri Jhantu Mallick: Helper 'C'
25. Shri Rajeshwar Dubey: Helper 'A'

CRYSTALLOGRAPHY & MOLECULAR BIOLOGY DIVISION

1. Prof. Abhijit Chakraborti: Sr. Professor 'H+' & HOD
2. Prof. Rahul Banerjee: Professor 'G'
3. Prof. Sampa Biswas: Professor 'G'
4. Prof. Partha Saha: Professor 'G'
5. Prof. Udayaditya Sen: Professor 'G'
6. Prof. H. Raghuraman: Associate Professor 'E'
7. Sri Upal Basu: Scientific Officer 'C'
8. Sri Abhijit Bhattacharya: Scientific Assistant-E
9. Sri Bikram Nath: Scientific Assistant-D
10. Sri Sushanta Debnath: Scientific Assistant-D
11. Sri Saikat Mukherjee: Scientific Assistant-D
12. Sri Ashis Kumar Dutta: Scientific Assistant-D
13. Smt. Durga Hazra: Superintendent
14. Sri Samir Kr. Majumdar: Technician 'D'
15. Sri Sakal Dev Ram: Helper 'C'
16. Sri Bipin Bose: Helper 'C'

BIOPHYSICS AND STRUCTURAL GENOMICS DIVISION

1. Prof. Subrata Banerjee: Sr. Professor 'H' & HOD
2. Prof. Debashis Mukhopadhyay: Professor 'G'
3. Prof. (Smt.) Oishee Chakraborti: Associate Professor 'E'
4. Prof. Kaushik Sengupta: Associate Professor 'F'
5. Prof. Chandrima Das: Associate Professor 'E'
6. Prof. Soumen Kanti Manna: Associate Professor 'E'
7. Prof. Sangram Bagh: Associate Professor 'E'

Page | 80
8. Sri Arijit Pal: Scientific Assistant-E
9. Smt. Mahuya Dutta: Lower Division Clerk
10. Sri Nirmal Das: Technician 'C'
11. Sri Raju Dutta: Technician 'C'
12. Sri Sanjay Shaw: Helper 'C'
13. Sri Shyamal Ch. Digar: Helper 'C'

CHEMICAL SCIENCES DIVISION
1. Prof. Samita Basu: Sr. Professor 'H+' & HOD
2. Prof. Susanta Lahiri: Sr. Professor 'H+'
3. Prof. Amitabha De: Sr. Professor 'H'
4. Prof. Maitreyee Nandy: Professor 'G'
5. Prof. Munna Sarkar: Professor 'G'
6. Prof. Padmaja Prasad Mishra: Associate Professor 'E'
7. Prof. Montu K. Hazra: Associate Professor 'E'
8. Prof. Dulal Senapat: Associate Professor 'E'
9. Sri Ajay Das: Scientific Assistant-F
10. Smt. Chitra Raha: Scientific Assistant-E
11. Sri Avijit Shome: Scientific Assistant-D
12. Sri Subir Bandyopadhyay: Superintendent

COMPUTATIONAL SCIENCES DIVISION
1. Prof. Dhananjay Bhattacharyya: Sr. Professor 'H' & HOD
2. Dr. Gautam Garai: Scientist 'G'
3. Sri Deeptish Dey: Engineer 'F'
4. Sri Gautam Datta: Scientific Assistant-F
5. Sri Sumit Basu: Scientific Assistant-D
6. Sri Subhendu Biswas: Scientific Assistant-B
7. Sri Nanda Lal Sanpui: Technician 'D'
8. Sri Soumya Majumdar: Technician 'D'

CENTRE FOR ADVANCED RESEARCH & EDUCATION
1. Prof. Amit Ghosh: Professor 'G' & Head
2. Sri Suchintya Kumar Gupta: Officer-In-Charge
3. Sri Amit Kumar Saha: Scientific Officer 'D'
4. Sri Sushanta Chakraborty: Scientific Assistant-F
5. Sri Jayant Kr. Mukherjee: Scientific Assistant-D
6. Sri Pradip Das: Scientific Assistant-C
7. Sri Sudarshan Mondal: Superintendent
8. Sri Nirmal Ch. Biswas: Technician 'B'
9. Sri Sanjib Kr. Roy: Helper 'C'

ELECTRON MICROSCOPE
1. Sri Pulak Kumar Roy: Engineer 'G' & Head
2. Sri Ajoy Chakrabarty: Scientific Assistant-E
3. Sri M. Mahendar: Scientific Assistant 'B'

LIBRARY
1. Prof. Mylavarapu Sita Janaki: Chairperson
2. Sri Abhijit Kumar Malakar: Scientific Assistant-F
3. Sri Samit De: Scientific Assistant-F
4. Shri Mahesh Hembram: Scientific Assistant 'C'
5. Dr. Manlunching: Scientific Assistant 'C'
6. Sri Manoj Karmakar: Technician 'D'
7. Sri Kishori Lal Ram: Technician 'D'
8. Sri Siblal Hari: Helper 'E' (Sweeper)
9. Sri Kartick Ch. Panigrahi: Helper 'C'

WORKSHOP
1. Prof. Sukalyan Chattopadhyay: Sr. Professor 'H+' & Chairman
2. Dr. Jisnu Basu: Engineer 'G' & Officer-In-Charge
3. Sri Ramen Jana: Technician 'H'
4. Sri Sadananda Dutta: Technician 'H'
5. Sri Sudipta Barman: Scientific Assistant 'E' (Fitter)
6. Sri Narayan Chandra Dey: Scientific Assistant-D (CNC Operator)
7. Sri Debasis Sen: Technician 'G'
8. Sri Supriya Mondal: Technician 'G'
9. Sri Biplab Kr. Dey: Technician 'G'
10. Sri Partha Sarathi Karmakar: Technician 'G' (Turner)
11. Sri Tarun Tapan Biswas: Technician 'G' (Fitter)
12. Sri Ramkrishna Roy: Technician 'G' (Machinist)
13. Sri Bhairab Ch. Nath: Technician 'F' (Mil. Fitter)
14. Sri Sunil Das: Technician 'F' (Mil. Fitter)
15. Sri Durlav Tudu: Technician 'F' (Turner)
16. Sri Subrata Baidya: Technician 'F' (Machinist)
17. Sri Sadip Patra: Technician 'F' (Welder)
18. Sri Himadri Chakraborty: Technician 'F' (Machinist)
19. Sri Subal Ch. Bindi: Technician 'D'
20. Shri C. Palanivel: Technician 'D' (Glass Blower)
21. Sri Adhir Sarkar: Technician 'D'
22. Sri Santosh Kr. Barman: Caretaker
23. Sri Deb Prasad Sardar: Caretaker
24. Sri Gopal Das: Helper 'C'

Central Facilities
## Administrative Departments

### BUILDING MAINTENANCE (ELECTRICAL)

1. Sri Rajkumar Sengupta: Chairman, BM(Elec) Committee
2. Sri Soumendra Pal: Engineer 'D', Engineer -in-Charge
3. Sri Swapan Kr. Mandal: Scientific Assistant-E
4. Sri Somenath Ghosh: Scientific Assistant-E
5. Sri Kali Kanto Dey: Technician 'H'
6. Sri Madhusudan Kaity: Technician 'G'
7. Sri Asok Kr. Majumdar: Technician 'G'
8. Sri Gautam Kr. Sabui: Technician 'D'
9. Sri Pratap Dhanuk: Technician 'D'
10. Sri Dilip Kr. Chakraborty: Technician 'D'
11. Shri Jai Prakash Tiwari: Technician 'D'
12. Sri Jagannath Mondal: Technician 'D'
13. Sri Mahendra M. Khapekar: Technician 'F'
14. Sri Pintu Sahoo: Technician 'B'
15. Sri Bijay Ram: Helper 'D'
16. Sri Sankar Adhikari: Helper 'C'

### BUILDING MAINTENANCE (CIVIL)

1. Sri Rajkumar Sengupta: "Engineer 'F' & Chairman, BM(Civil) Committee"
2. Sri Siddhartha Saha: Engineer 'D'
3. Sri Arup Polley: Technician 'H'
4. Sri Nil Kanta Sinha: Scientific Assistant-E
5. Sri Gobinda Pal: Scientific Assistant-D
6. Shri Sujay Halder: Scientific Assistant 'C'
7. Sri Subir Modak: Superintendent
8. Sri Sunil Murmu: Technician 'D'
9. Sri Samir Kr. Chakraborty: Caretaker
10. Sri Shyamal Kr. Bose: Helper 'E'

### ESTABLISHMENT

1. Sri Suchintya Kumar Gupta: Establishment Officer
2. Shri Biplab Kumar Ray: A.A.O.(E-I)
3. Sri Biswajit Dutta: Accountant
4. Shri Subhendu Naskar: Lower Division Clerk
5. Shri Paramita Pal: Lower Division Clerk
6. Shri Manoj Lakra: Lower Division Clerk
7. Mr. Rizwan Ahmed: Lower Division Clerk
8. Sri Subhash Ch. Gayen: Technician 'C'
9. Sri Nabin Kumar Halder: Technician 'C'

### DESPATCH

1. Smt. Chandana Mitra: A.A.O.
2. Sri Tarak Nath Bhattacharya: Technician 'C'
3. Sri Gouri Sankar Singh: Driver - V
4. Shri Ramesh Singh: Helper 'C'

### ACCOUNTS

#### ACCOUNTS (BUDGET & AUDIT)

1. Sri Somnath Sarkar: A.A.O.
2. Sri Pradip Dutta Sharma: Lower Division Clerk

#### ACCOUNTS (CASH)

1. Shri Raghunath Naskar: Superintendent
2. Smt. Seethalakshmi Rath: Superintendent
3. Sri Sanat Kumar Kotal: Technician 'C'

#### ACCOUNTS (SALARY)

1. Sri Debasis Das: A.A.O.
2. Sm. Nirupama Halder: Superintendent
3. Smt. Monika Bhattacharya: Lower Division Clerk
4. Shri Aditya Dhara: Lower Division Clerk

#### ACCOUNTS (PF)

1. Sri Goutam Mandal: Superintendent

#### ACCOUNTS (PF & PENSION)

1. Accounts (PF & Pension): Sri Ranjit Dutta
2. Accounts (PF & Pension): Sri Kalyan Paul Roy
PURCHASE

1. Smt. Seema Bhattacharyya: A.O.-III & Off.-In-Charge of Purchase Cell
2. Smt. Jhuma Rajak: Helper 'B'

Purchase (Domestic)
1. Sri Gautam Das: Superintendent
2. Sri Ajay Kumar Biswas: Superintendent, In-Charge Purchase (D)
3. Sri Asim Haldar: Superintendent
4. Ms. Rekha Ram: Upper Division Clerk
5. Sri Soumyajit Karmakar: Lower Division Clerk
6. Sri Ashoke Kr. Roy: Technician 'B'
7. Sri Asit Ranjan Deb: A.O.
8. Sri Ranjit Roy: Superintendent
9. Mr. James Wilson Kerketta: Lower Division Clerk
10. Sri Sourjyendu Ganguly: Caretaker

Purchase (Foreign Cell)
1. Sri Asit Ranjan Deb: A.O.
2. Sri Ranjit Roy: Superintendent
3. Mr. James Wilson Kerketta: Lower Division Clerk
4. Sri Gour Hari Das: Caretaker

STORES

1. Sri Shyamal Ch. Biswas: Superintendent
2. Sri Asish Ram: Helper ‘C’

MEDICAL UNIT

1. Prof. Munshi Golam Mustafa: Chairperson, MAC
2. Dr. Sanghamitra Nag: Part Time Medical Officer
3. Dr. Pranab Kumar Mukherjee: Part Time Medical Officer
4. Sri Dipak Kr. Das: A.A.O.
5. Sri Sankar Nath Dewan: Sr. Superintendent
6. Sri Subhasish Sanyal: Superintendent
7. Smt. Chandana Nayak: Lower Division Clerk
8. Shri Avishak Pal: Lower Division Clerk
9. Shri Gopal Banik: Lower Division Clerk
10. Shri Pintu Ram: Helper ‘C’

TELEPHONE

1. Prof. (Smt.) Samita Basu: Prof. & In-Charge
2. Smt. Sunanda Chakraborty: Technician ‘G’
3. Smt. Pampa Bhattacharjee: Technician ‘F’

SECURITY

1. Sri Supriya Gangopadhyay: Sr.Security Officer
2. Sri Ratan Kr. Bose: Security Officer
3. Sri Tapas Kr. Dalal: Security Officer
4. Sri Swaraj Nath Sarkar: Security Officer
5. Sri Ashok Kr. Singh: Security Officer
7. Sri Tarak Chandra Nath: Security Supervisor ‘B’
8. Sri Gobinda Chakraborty: A.A.O.
9. Sri Balli Rana: Technician ‘C’
10. Sri Dukha Krishna Reddy: Technician ‘B’
11. Sri Subrata Kr. Chowdhury: Technician ‘B’
12. Sri Joyram Murmu: Helper ‘E’ (Watchman)
13. Sri Madhusudan Bhakta: Caretaker
15. Sri Mongol Oraon: Helper ‘D’ (Watchman)
16. Sri Sibu Oraon: Helper ‘D’ (Watchman)
17. Sri Tapas Kr. Singh: Helper ‘D’ (Watchman)
20. Sri Arun Kumar Dutta: Helper ‘B’ (Watchman)
21. Sri Pran Gopal Das: Helper ‘C’ (Watchman)
22. Sri Gopal Chandra Saren: Helper ‘D’ (Watchman)

GUEST HOUSE & HOSTEL

1. Prof. Sukalyan Chattopadhyay: Prof.-in-Charge, Guest House & Hostel, SINP Housing Com.(MSA-II)
2. Prof. Pradip Kr. Roy: Prof.-in-Charge, Guest House & Hostel, Salt Lake Campus (MSA-I)
3. Sri Somenath Das: Helper ‘C’
4. Sri Suresh Ch. Das: Asstt. Halwai-cum-Cook
5. Sri Sakti Pada Bisui: Asstt. Halwai-cum-Cook

CANTEEN

1. Prof. Debasish Mukhopadhyay: Chairperson, Canteen Committee
2. Sri Asok Kumar Roy: Asstt. Manager-cum-Storekeeper
5. Sri Sujan Ch. Mistri: Asstt. Halwai-cum-Cook
7. Sri Shankar Andia: Asstt. Halwai-cum-Cook
8. Sri Sailen Halder: Helper-II
9. Sri Nemai Ch. Das: Helper-II
10. Sri Amar Das: Helper-II
11. Sri Sunil Ram: Helper-II
12. Sri Santosh Hari: Helper ‘C’ (Sweeper)
13. Sri Kala Chand Hela: Helper ‘C’ (Sweeper)

CRISIS MANAGEMENT COMMITTEE

1. Sri Umesh Kumar Gond: Scientific Assistant ‘B’
**COSMETIC**

1. Sri Sakhi Chand Hari: Caretaker  
2. Smt. Anjali Hari: Helper 'D' (Sweeper)  
3. Sri Ashok Mallick: Helper 'C'  
4. Smt. Suro Mahato: Helper 'C'  
5. Sri Amit Hari: Helper 'C'  
6. Smt. Radha Debi Ram: Helper 'B'

**GARDENER**

1. Sri Sushil Kr. De: Caretaker  
2. Sri Santosh Kr. Sarkar: Caretaker  
3. Sri Swapan Kr. Mondal: Caretaker  
4. Sk. Mostakin: Helper 'C'

**TRANSPORT**

1. Sri Shantanu Chowdhury: Chairman, Transport Committee  
2. Sri Kaushik Chatterjee: Officer-in-Charge, Transport Sec.  
3. Sri Dharmendra Prasad: Scientific Assistant-D  
4. Sri Aloke Kr. Sarkar: Transport Supervisor  
5. Sri Swapan Kumar Mondal: Technician 'H'  
7. Sri Surai Mandi: Technician 'D' (Vehi.Mech.)  
8. Sri Kanai Lal Malakar: Technician 'D'  
9. Sri Madhusudan Mondal: Driver - IV  
10. Sri Gopal Ch. Ghosh: Driver - V  
11. Sri Prabir Kr. Mistri: Driver - V  
12. Sri Kartick Ch. Pal: Driver - V  
13. Sri Prabir Biswas: Driver - III  
14. Sri Uttam Kr. Roy: Driver - III  
15. Sri Asit Kr. Mahapatra: Technician 'C'  
16. Sri Mongol Ch. Mondal: Caretaker  
17. Sri Shankar Ram: Helper: 'C'

**List of Retirement: April 2016 - March 2017**

1. Sri Asok Kr. Das / BM(C) 3.4.6  
2. Sri Tapan Kr. Pyne / CMP 3.5.6  
3. Sri Sanjoy Chakraborty / Adm 3.7.6  
4. Sri Dulal Chatterjee / Adm 3.8.6  
5. Prof. (Smt.) Bichitra Ganguly / ANP 3.8.6  
6. Prof. Partha Sarathi Mitra / Theory 3.9.6  
7. Smt. Rita Ghosh / NPD 3.6  
8. Prof. A. Harindranath / Theory 3.6  
9. Sri Dilip Ram / BM (E) 3.6  
10. Sri Alok Mitra / Adm 3.7  
11. Sri Debashis Bandyopadhyay / AES 3.7  
12. Prof. R. Ranganathan / CMP 8.7  
13. Sri Sakhi Chand Hari / BM(C) 3.3.7

**LIST OF DEMISE: April 2016 – March 2017**

2. Prof. Anjan Kundu / Theory "Demise on 31.12.2016"
Obituary

Our colleague **Prof. Anjan Kundu** has passed away on 31stDecember 2016. A mathematical physicist who specialized in
classical and quantum integrable systems, he is well known for the
Kundu, Kundu–Eckhaus and Radhakrishnan–Kundu–Lakshmanan
equations. Prof. Kundu worked with integrable nonlinear systems
with a tremendous zeal ranging from a new quantum algebra, new
integrable higher dimensional nonlinear Schrodinger equation, new
braided Yang-Baxter equation, new integrable models in presence
of defects, the list of "new" is very long... all of which have
innovative applications to physical contexts. Even during the days
of critical illness, he worked with an intense desire to invent even
more. His last work accepted for publication on January 3, 2017 is
an epitome of his passion " to contribute theoretical ideas that can
address the control of devastating events like tsunami.

Prof. Kundu was elected to fellowship of the Indian National
Science Academy (2014) and the Indian Academy of Sciences,
Bangalore (2015). He was acting as a member of the editorial board
of the Proceedings of the Royal Society of London since 2012.

We, the members of Saha Institute of Nuclear Physics are deeply saddened
by his demise.

***

**Sekhar Bhattacharyya** worked for 33 long years in SINP before passing
away on 14th August 2016, after a brief illness, just about a month before
his superannuation. He was one of the most popular and smart scientific
workers of the Institute. Sekhar was well known and loved by all. He could
speak three languages English, Hindi and Bengali fluently and was a
champion cricket player. His demise has been most untimely and
unfortunate, however, like a true cricketer, missing the century only by
one run, without completing his tenure at SINP.
### 15.3. Audited Accounts

#### 15.3.1. Balance Sheet

**SAHA INSTITUTE OF NUCLEAR PHYSICS**

**Balance Sheet as at 31st March, 2017**

<table>
<thead>
<tr>
<th>Schedule</th>
<th>2016-17</th>
<th>2015-16</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CAPITAL FUND &amp; LIABILITIES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CORPUS / CAPITAL FUND</td>
<td>1</td>
<td>387790058.56</td>
</tr>
<tr>
<td>RESERVE &amp; SURPLUS</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>EARMARKED FUNDS / ENDOWMENT FUNDS</td>
<td>3</td>
<td>5917372.00</td>
</tr>
<tr>
<td>SECURED LOANS &amp; BORROWINGS</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>UNSECURED LOANS &amp; BORROWINGS</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>DEFERRED CREDIT LIABILITIES</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>CURRENT LIABILITIES AND PROVISIONS</td>
<td>7</td>
<td>2963681313.12</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>3357388743.68</td>
</tr>
</tbody>
</table>

**ASSETS**

<table>
<thead>
<tr>
<th>Schedule</th>
<th>2016-17</th>
<th>2015-16</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIXED ASSETS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gross Block</td>
<td>8</td>
<td>4178298888.84</td>
</tr>
<tr>
<td>Less : Accumulated Depreciation</td>
<td>8</td>
<td>2502123858.65</td>
</tr>
<tr>
<td><strong>INVESTMENTS- FROM EARMARKED/ ENDOWMENT FUNDS</strong></td>
<td>9</td>
<td>1676176030.29</td>
</tr>
<tr>
<td>INVESTMENTS- OTHERS</td>
<td>10</td>
<td>593000.00</td>
</tr>
<tr>
<td>CURRENT ASSETS, LOANS &amp; ADVANCES</td>
<td>11</td>
<td>1055684023.07</td>
</tr>
<tr>
<td><strong>EXCESS OF EXPENDITURE OVER INCOME</strong></td>
<td></td>
<td>624936690.31</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>3357388743.68</td>
</tr>
</tbody>
</table>

**SIGNIFICANT ACCOUNTING POLICIES**

<table>
<thead>
<tr>
<th>Schedule</th>
<th>24</th>
</tr>
</thead>
</table>

**CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS**

<table>
<thead>
<tr>
<th>Schedule</th>
<th>25</th>
</tr>
</thead>
</table>

The Schedules referred to above form part of these Accounts

In terms of our attached Report of even date
For K. Sharma & Co
Chartered Accountants
FRN 302045E

(K. K. Sharma )
Partner
Membership No. 005313
1/B, Old Post Office Street, Room No.8, (First Floor),
Kolkata - 700 001
Dated - 05th September, 2017

( V. P. Mishra )
Accounts Officer

( N. Sanyal )
Dy. Controller of Accounts

( Anirban Banerjee )
Registrar

( Ajit Kumar Mohanty )
Director
### 15.3.2. Income & Expenditure Account

**SAHA INSTITUTE OF NUCLEAR PHYSICS**

**Income & Expenditure Account for the year ended 31st March, 2017**

<table>
<thead>
<tr>
<th>Income/Expenditure</th>
<th>Schedule</th>
<th>2016-17</th>
<th>2015-16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income from Sales/Services</td>
<td>12</td>
<td>377600.00</td>
<td>642897.00</td>
</tr>
<tr>
<td>Grants</td>
<td>13</td>
<td>1005597579.37</td>
<td>883584669.27</td>
</tr>
<tr>
<td>Fees / Subscriptions</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income from Investments</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income from Royalty, Publication</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest Earned</td>
<td>17</td>
<td>5811907.00</td>
<td>3758762.12</td>
</tr>
<tr>
<td>Other Income</td>
<td>18</td>
<td>5480529.32</td>
<td>4586766.83</td>
</tr>
<tr>
<td>Increase / Decrease in stock of finished goods and works-in-progress</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excess of Expenditure over Income transferred to Balance Sheet</td>
<td>624935690.31</td>
<td>708452967.77</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1642183306.00</td>
<td>1601026082.99</td>
</tr>
</tbody>
</table>

**EXPENDITURE : -**

<table>
<thead>
<tr>
<th>Expenditure</th>
<th>Schedule</th>
<th>2016-17</th>
<th>2015-16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establishment Expenses</td>
<td>20</td>
<td>1193448756.00</td>
<td>1164789486.60</td>
</tr>
<tr>
<td>Other Administrative Expenses</td>
<td>21</td>
<td>265676308.59</td>
<td>233272243.29</td>
</tr>
<tr>
<td>Expenditure on Grants, Subsidies</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest</td>
<td>23</td>
<td>19774.10</td>
<td>28630.00</td>
</tr>
<tr>
<td>Depreciation</td>
<td>8</td>
<td>183038467.31</td>
<td>202935723.10</td>
</tr>
</tbody>
</table>

The Schedules referred to above form part of these Accounts

(V.P. Mishra)
Accounts Officer

(N. Sanyal)
Dy. Controller of Accounts

(Anirban Banerjee)
Registrar

(Ajit Kumar Mohanty)
Director

In terms of our attached Report of even date
For K. Sharma & Co
Chartered Accountants
FRN 302045E

(K. K. Sharma)
Partner
Membership No. 005313
1/B, Old Post Office Street, Room No.8, (First Floor), Kolkata - 700 001
Dated :- 05th September, 2017
<table>
<thead>
<tr>
<th>Receipts</th>
<th>2015-16</th>
<th>2016-17</th>
<th>Payments</th>
<th>2015-16</th>
<th>2016-17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening Balance b/f :-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash in hand</td>
<td>54,196.00</td>
<td>16,82,322.00</td>
<td>Establishment Expenses</td>
<td>64,63,64,724.60</td>
<td>68,19,74,527.00</td>
</tr>
<tr>
<td>Current Account Balances</td>
<td>93,31,16,961.18</td>
<td>49,31,23,882.18</td>
<td>Administrative Expenses</td>
<td>22,97,08,845.29</td>
<td>26,30,15,206.59</td>
</tr>
<tr>
<td>Bank Charges</td>
<td></td>
<td></td>
<td></td>
<td>28,630.00</td>
<td>19,774.10</td>
</tr>
<tr>
<td>Grant-in-aid received from DAE :-</td>
<td></td>
<td></td>
<td></td>
<td>7,79,74,871.23</td>
<td>7,11,76,777.93</td>
</tr>
<tr>
<td>Recurring</td>
<td>80,00,00,00,00.00</td>
<td>88,51,08,00,00.00</td>
<td>Expenses paid for ongoing projects of other agencies</td>
<td>70,37,87,800.38</td>
<td>4,21,04,817.17</td>
</tr>
<tr>
<td>Non-Recurring</td>
<td>35,00,00,00,00.00</td>
<td>30,00,00,00,00.00</td>
<td>HSA &amp; Other Advances paid</td>
<td>11,28,190.00</td>
<td>9,35,907.00</td>
</tr>
<tr>
<td>Grant received from other agencies for on going projects</td>
<td>3,16,59,775.68</td>
<td>2,78,62,450.61</td>
<td>Other Deposit</td>
<td>3,57,93,800.00</td>
<td>23,62,54,172.00</td>
</tr>
<tr>
<td>HSA &amp; Other Advance recovery</td>
<td>32,46,616.00</td>
<td>35,29,679.00</td>
<td>Advances paid</td>
<td>1,01,78,000.00</td>
<td>6,65,08,000.00</td>
</tr>
<tr>
<td>Realisation of Margin Money Deposit</td>
<td>5,07,49,300.00</td>
<td>10,33,84,216.00</td>
<td>Last Year's provision paid</td>
<td>2,29,33,658.00</td>
<td>2,25,95,171.73</td>
</tr>
<tr>
<td>Realisation from other Deposit</td>
<td>1,77,50,456.00</td>
<td>29,17,000.00</td>
<td>Last Year's current liabilities paid</td>
<td>42,45,658.00</td>
<td>39,70,346.00</td>
</tr>
<tr>
<td>Realisation of other advances</td>
<td>2,26,93,172.00</td>
<td>2,06,18,629.73</td>
<td>Pension Fund Payments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest Received</td>
<td>37,58,762.12</td>
<td>58,11,907.00</td>
<td>Closing Balance of :-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income Receipts</td>
<td>52,29,683.50</td>
<td>58,38,129.32</td>
<td>Cash in hand</td>
<td>16,82,322.00</td>
<td>90.00</td>
</tr>
<tr>
<td>Liabilities (Deposits)</td>
<td>86,91,557.00</td>
<td>1,35,63,445.00</td>
<td>Current Account Balances</td>
<td>49,31,23,982.18</td>
<td>47,48,85,271.52</td>
</tr>
<tr>
<td>Pension Fund Receipts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2,22,69,50,481.68 | 1,86,34,39,761.04

(SAHAR INSTITUTE OF NUCLEAR PHYSICS)

Receipts & Payments Account for the year ended 31st March, 2017

<table>
<thead>
<tr>
<th>(V. P. Mishra)</th>
<th>(N. Sanyal)</th>
<th>(Anirban Banerjee)</th>
<th>(Ajit Kumar Mohanty)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounts Officer</td>
<td>Dy. Controller of Accounts</td>
<td>Registrar</td>
<td>Director</td>
</tr>
</tbody>
</table>

In terms of our attached Report of even date
For K. Sharma & Co
Chartered Accountants
FRN 302045E

Membership No. 005313
1/B, Old Post Office Street, Room No.8, (First Floor),
Kolkata - 700 001
Dated :-06th September, 2017
List of Publications – Without Collaboration
(April 2016 – March 2017)


2. Adhikary, Biswajit; Chakraborty, Mainak; Ghosal, Ambar. ‘Flavored leptogenesis with quasidegenerate neutrinos in a broken cyclic symmetric model’, PHYSICAL REVIEW D 93 (2016) Art No: 113001

3. Adhya, Souvik Priyam; Mandal, Mahatsab; Biswas, Subhrajyoti; Roy, Pradip K. ‘Pionic dispersion relations in the presence of a weak magnetic field’, PHYSICAL REVIEW D 93 (2016) Art No: 074033


6. Ahmed, Taushif; Das, Goutam; Mathews, Prakash; et al. The two-loop QCD correction to massive spin-2 resonance \(\rightarrow q(q)\overline{b}(q)\)’, EUROPEAN PHYSICAL JOURNAL C 76 (2016) Art No: 667

7. Ahmed, Taushif; Bonvini, Marco; Kumar, M. C.; Mathews, Prakash; et al. ‘Pseudo-scalar Higgs boson production at N\(^3\)LO+A+N\(^4\)LL’, EUROPEAN PHYSICAL JOURNAL C 76 (2016) Art No: 663

8. Ahmed, Taushif; Kumar, M. C.; Mathews, Prakash; et al. ‘Pseudo-scalar Higgs boson production at threshold N\(^3\) LO and N\(^3\)LL QCD’, EUROPEAN PHYSICAL JOURNAL C 76 (2016) Art No: 355


10. Aomoa, N.; Sarmah, Trinayan; Sah, Puspalata; et al. (Satpati, B.). ‘Development of a plasma assisted ITER level controlled heat source and observation of novel micro/nanostructures produced upon exposure of tungsten targets’, FUSION ENGINEERING AND DESIGN 106 (2016) 63-70


13. Baksi, Shounak; Bagh, Sangram; Sarkar, Sandip; et al. (Mukhopadhyay, Debashis). ‘Systemic study of a natural feedback loop in Huntington’s disease at the onset of neurodegeneration’, BIOSYSTEMS 150 (2016) 46-51

14. Bandopadhyay, Manikankana; Sarkar, Neelakshi; (Datta, Sibnarayan; et al. (Das, Chandrima). ‘Hepatitis B virus X protein mediated suppression of miRNA-122 expression enhances hepatoblastoma cell proliferation through cyclin G1-p53 axis’, INFECTIOUS AGENTS AND CANCER 11(2016) Art No: 40
15. Bandyopadhyay, Abhijit; Bhattacharjee, Pijushpani; Chakraborty, Sovan; et al. (Saha Satyajit). 'Detecting supernova neutrinos with iron and lead detectors', PHYSICAL REVIEW D 95 (2017) Art No: 065022


17. Bandyopadhyay, Aritra; Mustafa, Munshi G. 'Power corrections to the electromagnetic spectral function and the dilepton rate in QCD plasma within operator product expansion in D=4’, JOURNAL OF HIGH ENERGY PHYSICS 11 (2016) Art No: 183

18. Banerjee, Amrita; Sanyal, Sulagna; Dutta, Shreyasi; et al. (Das, Prajna Paramita; Das, Chandrima; Dasgupta, Dipak). ‘The plant alkaloid chelerythrine binds to chromatin, alters H3K9Ac and modulates global gene expression’, JOURNAL OF BIOMOLECULAR STRUCTURE & DYNAMICS 35 (2017) 1491-1499


20. Banerjee, Indranil; De, Kakali; Mukherjee, Dibyanti; et al. (Mukherjee, Manabendra). Paclitaxel-loaded solid lipid nanoparticles modified with Tyr-3-octreotide for enhanced anti-angiogenic and anti-glioma therapy’, ACTA BIOMATERIALIA 38 (2016) 69-81


25. Banik, Sanjib; Das, Kalipada; Das, I. 'Enhancement of the magnetoresistive property by introducing disorder in the (La1-xYx)(0.7)Ca0.3MnO3 compound', RSC ADVANCES 7 (2017) 16575-16580

26. Banik, Sanjib; Das, Kalipada; Das, I. ‘Size-induced modification of magneto-transport properties in nanocrystalline Sm0.5Ca0.5MnO3 compound’, JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS 403 (2016) 36-40


28. Banu, Nasrin; Satpati, Biswarup; Bhukta, Anjan; et al. ‘Nanoscale eta-NiSi formation via ion irradiation of Si/Ni/Si’, JOURNAL OF APPLIED PHYSICS 121 (2017) Art No: 045302
29. Bardhan, Debjyoti; Bhattacharyya, Gautam; Ghosh, Diptimoy; et al. 'Detailed analysis of flavor-changing decays of top quarks as a probe of new physics at the LHC', PHYSICAL REVIEW D 94 (2016) Art No: 015026


32. Bayan, Sayan; Mishra, Sheo K.; Satpati, Biswarup; et al. (Chakraborty, Purushottam). 'Modified photoluminescence and photodetection characteristics of chemically grown SnO coated ZnO nanoneedles', JOURNAL OF VACUUM SCIENCE & TECHNOLOGY B 34 2016) Art No: 061201

33. Behera, Tapan Kumar; Sahu, Subash Chandra; Satpati, Biswarup; et al. 'Branched Platinum Nanostructures on Reduced Graphene: An excellent Transducer for Nonenzymatic Sensing of Hydrogen Peroxide and Biosensing of Xanthine', ELECTROCHIMICA ACTA 206 (2016) 238-245

34. Bera, A. K.; Yusuf, S. M.; Kumar, Amit; et al. (Majumder, M.). 'Long-range and short-range magnetic correlations, and microscopic origin of net magnetization in the spin-1 trimer chain compound CaNi3P4O14', PHYSICAL REVIEW B 93 (2016) Art No: 184409

35. Bera, Kalloil; Sau, Abhishek; Mondal, Pritiranjan; et al. (Mukherjee, Rukmini; Moorkherjee, Debdatto; Metya, Amresh; Kundu, Asish K.; Mandal, Debranj; Satpati, Biswarup; Chakrabarti, Oishee; Basu, Samita). 'Metamorphosis of Ruthenium-Doped Carbon Dots: In Search of the Origin of Photoluminescence and Beyond', CHEMISTRY OF MATERIALS 28 (2016) 7404-7413

36. Bera, Manindra; Ainarvarapu, Sri Rama Koti; Sengupta, Kaushik. 'Significance of 1B and 2B domains in modulating elastic properties of lamin A', SCIENTIFIC REPORTS 6 (2016) Art No: 27879

37. Bera, Subhas C.; Sanyal, Kasturi; Senapati, Dulal; et al. (Mishra, Padmaja P.). 'Conformational Changes Followed by Complete Unzipping of DNA Double Helix by Charge-Tuned Gold Nanoparticles', JOURNAL OF PHYSICAL CHEMISTRY B 120 (2016) 4213-4220

38. Bhardwaj, Neha; Pandey, Akhilesh; Satpati, Biswarup; et al. 'Enhanced CO gas sensing properties of Cu doped SnO2 nanostructures prepared by a facile wet chemical method', PHYSICAL CHEMISTRY CHEMICAL PHYSICS 18 (2016) 18846-18854

39. Bharti, Rashmi; Dey, Goutam; Banerjee, Indranil; et al. (Mukherjee, Manabendra). 'Somatostatin receptor targeted liposomes with Diacerein inhibit IL-6 for breast cancer therapy', CANCER LETTERS 388 (2017) 292-302


41. Bhattacharya, M.; Mandal, A. R.; Das Chakraborty, S.; et al. (Maiti, Arpan; Maity, Achyut; Mondal, P.; Senapati, D.). 'Direct experimental observation of salt induced aspect ratio tunable PFPT silver-nanowire formation: SERS-based ppt level Hg2+ sensing from ground water', RSC ADVANCES 6 (2016) 45279-45289
42. Bhattacharya, Satyaki; Jain, Shilpi. ‘A review of the discovery of SM-like Higgs boson in H ->gamma gamma decay channel with the CMS detector at the LHC’, PRAMANA-JOURNAL OF PHYSICS 87 (2016) Art No: UNSP 35


44. Bhattacharyya, Arpan; Sanyal, Milan K.; Mogera, Umesha; et al. (Mukhopadhyay, Mrinmoy K.; Maiti, Santanu). ‘In-Situ GISAXS Study of Supramolecular Nanofibers having Ultrafast Humidity Sensitivity’, SCIENTIFIC REPORTS 7 (2017) Art No: 246

45. Bhattacharyya, Dhananjay; Halder, Sukanya; Basu, Sankar; et al. (Mukherjee, Debasis). ‘RNAHelix: computational modeling of nucleic acid structures with Watson-Crick and non-canonical base pairs’, JOURNAL OF COMPUTER-AIDED MOLECULAR DESIGN 31 (2017) 219-235


47. Bhattacherjee, Biplob; Chakraborty, Sabyasachi; Mukherjee, Swagata. ‘Lepton flavor violating decay of 125 GeV Higgs boson to mu tau channel and excess in t(t)over-barH’, MODERN PHYSICS LETTERS A 31 (2016) Art No: 1650174


49. Bhukta, Anjan; Ghosh, Arnab; Guha, Puspendu; et al. (Satpati, Biswarup). ‘Effect of Au thickness on AuAg bimetallic growth on reconstructed Si(5512) surfaces’, APPLIED PHYSICS A-MATERIALS SCIENCE & PROCESSING 123 (2017) Art No: 174


56. Chakrabarti, Bikas K. ‘Can economics afford not to become natural science?’, EUROPEAN PHYSICAL JOURNAL-SPECIAL TOPICS 225 (2016) 3121-3125
60. Chatterjee, A. ‘Is it "natural" to expect economics to become a part of the natural sciences?’, EUROPEAN PHYSICAL JOURNAL-SPECIAL TOPICS 225 (2016) 3145-3149
61. Chatterjee, Amit Kumar; Daga, Bijoy; Mohanty, P. K. ‘Phase coexistence and spatial correlations in reconstituting k-mer models’, PHYSICAL REVIEW E 94 (2016) Art No: 012121
64. Chatterjee, Debarati; Chakraborty, Chandrachur; Bandyopadhyay, Debades. ‘Gravitomagnetic effect in magnetized neutron stars’, JOURNAL OF COSMOLOGY AND ASTROPARTICLE PHYSICS Issue 1 (2017) Art No: 062
65. Chatterjee, Tridip; Halder, Suchismita; et al. (Chakrabarti, Abhijit). ‘A FACS based case study on two HbE-β thalassaemia member of a family, having similar mutational background’, SCIENTIFICA 2016 (2016) Art No:3181937
67. Chaturvedi, Smita; Shyam, Priyank; Apte, Amey; et al. (Bhattacharyya, Arpan). ‘Dynamics of electron density, spin-phonon coupling, and dielectric properties of SmFeO3 nanoparticles at the spin-reorientation temperature: Role of exchange striction’, PHYSICAL REVIEW B 93 (2016) Art No: 174117
71. Chauhan, Himani; Kumar, Yogesh; Dana, Jayanta; et al. (Satpati, Biswarup). ‘Photoinduced ultrafast charge separation in colloidal 2-dimensional CdSe/CdS-Au hybrid nanoplatelets and corresponding application in photocatalysis’, NANOSSCALE 8 (2016) 15802-15812


73. Choudhuri, Madhumita; Datta, Alokmay. ‘Time-structuring in the evolution of 2D nanopatterns through interactions with substrate’, SOFT MATTER 12 (2016) 5867-5875

74. Choudhury, Kamalika Roy; Bucha, Sudha; Baksi, Shounak; et al. (Mukhopadhyay, Debashis; Bhattacharyya, Nitai P.). ‘Chaperone-like protein HYPK and its interacting partners augment autophagy’, EUROPEAN JOURNAL OF CELL BIOLOGY 95 (2016) 182-194

75. Chowdhury, Debasree; Satpati, Biswarup; Ghose, Deabrata. ‘Temperature and high fluence induced ripple rotation on Si(100) surface’, MATERIALS RESEARCH EXPRESS 3 (2016) Art No: 125003

76. Chowdhury, Debasree; Ghose, Deabrata. ‘Nanoripple formation on GaAs (001) surface by reverse epitaxy during ion beam sputtering at elevated temperature’, APPLIED SURFACE SCIENCE 385 (2016) 410-416

77. Chowdhury, Debasree; Ghose, Deabrata. ‘Highly-ordered ripple structure induced by normal incidence sputtering on monocrystalline GaAs (001): ion energy and flux dependence’, VACUUM 129 (2016) 122-125

78. Chowdhury, Ujjal; Goswami, Sudipta; Bhattacharya, Dipten; et al. (Midya, Arindam; Mandal, P.). ‘Determination of intrinsic ferroelectric polarization in lossy improper ferroelectric systems’, APPLIED PHYSICS LETTERS 109 (2016) Art No: 092902

79. Cicoli, Michele; Dutta, Koushik; Maharana, Anshuman; et al. ‘Moduli vacuum misalignment and precise predictions in string inflation’, JOURNAL OF COSMOLOGY AND ASTROPARTICLE PHYSICS Issue: 8 (2016) Art No: 006

80. Daga, Bijoy; Mondal, Souvik; Chandra, Anjan Kumar; et al. (Banerjee, Tirthankar; Basu, Abhik). ‘Nonequilibrium steady states in a closed inhomogeneous asymmetric exclusion process with generic particle nonconservation’, PHYSICAL REVIEW E 95 (2017) Art No: 012113

81. Dalui, Amit; Chakraborty, Arup; Thupakula, Umamahesh; et al. (Satpati, Biswarup). ‘Chemical Tailoring of Band Offsets at the Interface of ZnSe-CdS Heterostructures for Delocalized Photoexcited Charge Carriers’, JOURNAL OF PHYSICAL CHEMISTRY C 120 (2016) 10118-10128

82. Dan, Shovan; Mukherjee, S.; Mazumdar, Chandan; et al. (Ranganathan, R). ‘Zero thermal expansion with high Curie temperature in Ho2Fe16Cr alloy’, RSC ADVANCES 6 (2016) 94809-94814


84. Das, Anjan; Mandal, Atis Chandra; Roy, Soma; et al. (Prashanth, Pendem; Ahamed, Sk Iza; Kar, Subhrasmita; Prasad, Mithun S.; Namissan, P. M. G.). ‘Synthesis and characterization of magnesium oxide nanocrystallites and probing the vacancy-type defects through positron annihilation studies’,
85. Das, Anjan; Mandal, Atis Chandra; Roy, Soma; et al. (Nambissan, P. M. G.). ‘Mn-Doping in NiO Nanoparticles: Defects-Modifications and Associated Effects Investigated Through Positron Annihilation Spectroscopy’, JOURNAL OF NANOSCIENCE AND NANOTECHNOLOGY 16 (2016) 4153-4163


87. Das, Bankim Chandra; Bhattacharyya, Dipankar; Das, Arpita; et al. (Chakrabarti, Shrabana; De, Sankar). ‘Simultaneous observations of electromagnetically induced transparency (EIT) and absorption (EIA) in a multi-level V-type system of Rb-87 and theoretical simulation of the observed spectra using a multi-mode approach’, JOURNAL OF CHEMICAL PHYSICS 145 (2016) Art No: 224312

88. Das Chakraborty, Sudeshna; Sau, Abhishek; Kuznetsov, Denis V.; et al. (Banerjee, Amrita; Bardhan, Munmun; Bhattacharya, Maireyee; Basu, Samita; Senapati, Dulal). ‘Development of a Triplet-Triplet Absorption Ruler: DNA- and Chromatin-Mediated Drug Molecule Release from a Nanosurface’, JOURNAL OF PHYSICAL CHEMISTRY B 120 (2016) 6872-6881

89. Das, Debashree; Pramanik, Ushashi; Patra, Malay; et al. (Chakrabarti, Abhijit). ‘Differential interactions of imatinib mesylate with the membrane skeletal protein spectrin and haemoglobin’, RSC ADVANCES 6 (2016) 55203-55210

90. Das, Debasis; Samanta, Dibyendu; Bhattacharya, Arpita; et al. (Chakrabarti, Abhijit). ‘A Possible Role of the Full-Length Nascent Protein in Post-Translational Ribosome Recycling’, PLOS ONE 12 (2017) Art No: e0170333


92. Das, Dipanwita; Sarkar, Neelakshi; Sengupta, Isha; et al. (Das, Chandrima). ‘Anti-viral role of toll like receptor 4 in hepatitis B virus infection: An in vitro study’, WORLD JOURNAL OF GASTROENTEROLOGY 22 (2016) 10341-10352


97. Das, Srijit; Bhattacharyya, Nitai Pada. ‘Huntingtin interacting protein HYPK is a negative regulator of heat shock response and is downregulated in models of Huntington’s Disease’, EXPERIMENTAL CELL RESEARCH 343 (2016) 107-117
98. Datta, Debi Prasad; Garg, Sandeep K.; Thakur, Indrani; et al. (Satpati, Biswarup). ‘Facile synthesis of a superhydrophobic and colossal broadband antireflective nanoporous GaSb surface’, RSC ADVANCES 6 (2016) 48919-48926


100. De, Asit K.; Sarkar, Mugdha. ‘Toricritical points in a compact U(1) lattice gauge theory at strong coupling’, PHYSICAL REVIEW D 93 (2016) Art No: 114504

101. Debnath, Sushanta; Ballav, Niladri; Maity, Arjun; et al. ‘Competitive adsorption of ternary dye mixture using pine cone powder modified with betacyclodextrin’, JOURNAL OF MOLECULAR LIQUIDS 225 (2017) 679-688

102. Dey, B.; Mukherjee, S.; Mukherjee, N.; et al. (Satpati, B; Senapati, D). ‘Green silver nanoparticles for drug transport, bioactivities and a bacterium (Bacillus subtilis)-mediated comparative nano-patterning feature’, RSC ADVANCES 6 (2016) 46573-46581

103. Dey, Debarati; Sarangi, Manas Kumar; Ray, Angana; et al. (Bhattacharyya, Dhananjay). ‘Excited state hydrogen bonding fluorescent probe: Role of structure and environment’, JOURNAL OF LUMINESCENCE 173 (2016) 105-112


107. Dhara, S.; Chowdhury, R. Roy; Bandyopadhyay, B. ‘Observation of resistivity minimum at low temperature in CoxCu1-x (x similar to 0.17-0.76) nanostructured granular alloys’, PHYSICAL REVIEW B 93 (2016) Art No: 214413


109. Dutta, Debanjan; Mukherjee, Riya; Patra, Mousumi; et al. (Mukherjee, Manabendra). ‘Green synthesized cerium oxide nanoparticle: A prospective drug against oxidative harm’, COLLOIDS AND SURFACES B-BIOINTERFACES 147 (2016) 45-53


111. Dutta, Koushik; Panda, Sukanta; Patel, Avani. ‘Viability of an arctan model of f(R) gravity for late-time cosmology’, PHYSICAL REVIEW D 94 (2016) Art No: 024016

112. Dutta (Pal), Gopa; Chakraborty, Priyanka; Yadav, Somnath; et al. (Bardhan, Munmun). ‘Time Resolved Spectroscopic Investigations to Compare the
Photophysical Properties of a Short-Chain Dyad When Combined with Silver and Gold Nanoparticles to Form Nanocomposite Systems’, JOURNAL OF NANOSCIENCE AND NANOTECHNOLOGY 16 (2016) 7411-7419

113. Dutta, Sruti; Choudhury, Debi; Roy, Sumana; et al. (Dattagupta, Jiban Kanti; Biswas, Sampa). ‘Mutation in the Pro-Peptide Region of a Cysteine Protease Leads to Altered Activity and Specificity-A Structural and Biochemical Approach’, PLOS ONE 11 (2016) Art No: e0158024


115. Faruque, Sk Abdul Kader Md; Debnath, Debika; Giri, Bimalesh; et al. (Chakraborty, Supratic). ‘Crystal growth kinetics of ultra-thin ZrO2 film on Si by differential scanning calorimetry’, JOURNAL OF CRYSTAL GROWTH 459 (2017) 38-42

116. Faruque, Sk Abdul Kader Md; Chakraborty, Supratic; Giri, Rajendra Prasad. ‘Effect of N2O ratio on the crystallization temperature of ZrO2 film deposited on Si by reactive sputtering in Ar/O-2/N2O plasma’, MATERIALS RESEARCH EXPRESS 3 (2016) Art No: 116406


118. Gangopadhyay, Moumita; Gantait, Saikat; Palchoudhury, Shouroseni; et al. ‘UVC-priming mediated modulation of forskolin biosynthesis key genes against Macrophomina root rot of Coleus forskohlii-A tissue culture based sustainable approach’, PHYTOCHEMISTRY LETTERS 17 (2016) 36-44

119. Ganguly, Bichitra Nandi; Verma, Vivek; Chatterjee, Debanuj; et al. (Satpati, Biswarup; Debnath, Sushanta; Saha, Partha). ‘Study of Gallium Oxide Nanoparticles Conjugated with beta-Cyclodextrin: An Application To Combat Cancer’, ACS APPLIED MATERIALS & INTERFACES 8 (2016) 17127-17137


124. Ghorai, Soumyajit; Bhunia, Satyaban; Roy, Madhusudan; et al. ‘Mechanochemical devulcanization of natural rubber vulcanizate by dual function disulfide chemicals’, POLYMER DEGRADATION AND STABILITY 129 (2016) 34-46

125. Ghose, Srabantika; Gogurla, N.; Ranganathan, R.; et al. ‘The simultaneous emergence of free exciton emission and d(0) ferromagnetism for undoped ZnO nanoparticles’, RSC ADVANCES 6 (2016) 83909-83915


129. Ghosh, Kaustab; Lahiri, Susanta; Sarkar, Kangkana; et al. (Naskar, Nabanita; Choudhury, Dibyasree). ‘Ionic liquid-salt based aqueous biphasic system for rapid separation of no-carrier-added Pb-203 from proton irradiated (Ti2CO3)-Tl-nat target’, JOURNAL OF RADIOANALYTICAL AND NUCLEAR CHEMISTRY 310 (2016) 1311-1316

130. Ghosh, Kaustab; Lahiri, Susanta; Maiti, Moumita. ‘Separation of no-carrier-added Hg-195(m,Hg-g),Hg-197m from Au target by ionic liquid and salt based aqueous biphasic systems’, JOURNAL OF RADIOANALYTICAL AND NUCLEAR CHEMISTRY 310 (2016) 1345-1351

131. Ghosh, K.; Maiti, M; Lahiri, S. ‘Separation of $^{195}(m,g),^{197}Hg$ from bulk gold target by liquid-liquid extraction using hydrophobic ionic liquids’, RADIOCHIMICA ACTA (2017)

132. Ghosh, S; Mukherjee, A; Mandal, M; et al. ‘Spectral properties of rho meson in a magnetic field’, PHYSICAL REVIEW D 94 (2016) Art No: 094043

133. Ghosh, Sabuj; Shaw, Pankaj Kumar; Saha, Debajyoti; et al. (Janaki, M. S.; Iyengar, A. N. Sekar). ‘Hysteresis of fluctuation dynamics associated with a fireball in a magnetized glow discharge plasma in a currentless toroidal assembly’, PHYSICS OF PLASMAS 23 (2016) Art no: 093511


135. Ghosh, Snigdha; Mukherjee, Arghya; Mandal, Mahatsab; et al. (Roy, Pradip). ‘Spectral properties of the rho meson in a magnetic field’, PHYSICAL REVIEW D 94 (2016) Art No: 094043


140. Giri, S. K.; Sahoo, R. C.; Dasgupta, Papri; et al. (Poddar, A.). ‘Giant spontaneous exchange bias effect in Sm1.5Ca0.5CoMnO6 perovskite’, JOURNAL OF PHYSICS D-APPLIED PHYSICS 49 (2016) Art No: 165002

141. Goswami, Sathi; Ray, Suhiita; Sarkar, Munna. ‘Spectroscopic studies on the interaction of DNA with the copper complexes of NSAIDs lornoxicam and isoxicam’, INTERNATIONAL JOURNAL OF BIOLOGICAL MACROMOLECULES 93 (2016) Pt: A 47-56


146. Houngbo, D; Bernardes, A.P.; David, J. C.; et al. (Lahiri, S.). ‘Development of a liquid Pb-Bi target for high-power ISOL facilities’, NUCLEAR INSTRUMENTS AND METHOD IN PHYSICS RESEARCH B 376 (2016) 57-59


150. Jana, Sayanee; Banerjee, Debabrata; Chakrabarti, Nikhil. ‘Formation and evolution of vortices in a collisional strongly coupled dusty plasma’, PHYSICS LETTERS A 380 (2016) 2531-2539

151. Jana, Sayanee; Ghosh, Samiran; Chakrabarti, Nikhil. ‘Nonlinear coherent structures of Alfven wave in a collisional plasma’, PHYSICS OF PLASMAS 23 (2016) Art No: 072304


155. Kanrar, Sarat; Debnath, Sushanta; De, Pradip; et al. ‘Preparation, characterization and evaluation of fluoride adsorption efficiency from water of iron-aluminium oxide-graphene oxide composite material’, CHEMICAL ENGINEERING JOURNAL 306 (2016) 269-279


157. Karmakar, Mithun; Maity, Chandan; Chakrabarti, Nikhil; et al. ‘Relativistic wave-breaking limit of electrostatic waves in cold electron-positron-ion plasmas’, EUROPEAN PHYSICAL JOURNAL D 70 (2016) Art No: 144


160. Karthigeyan, Dhanasekaran; Surabhi, Sudhevan; Mizar, Pushpak; et al. (Banerjee, Amrita; Dasgupta, Dipak). ‘A Dual Non-ATP Analogue Inhibitor of Aurora Kinases A and B, Derived from Resorcinol with a Mixed Mode of Inhibition’, CHEMICAL BIOLOGY & DRUG DESIGN 87 (2016) 958-967


163. Konar, Sushan; Bagchi, Manjari; Bandyopadhyay, Debades; et al. ‘Neutron Star Physics in the Square Kilometre Array Era: An Indian Perspective’, JOURNAL OF ASTROPHYSICS AND ASTRONOMY 37 (2016) SI Art No: 36

164. Kisslinger, Leonard S.; Das, Debashish. ‘Psi(2S) and Y(3S) Suppression in p-Pb 8 TeV Collisions and Mixed Heavy Quark Hybrid Mesons’, INTERNATIONAL JOURNAL OF THEORETICAL PHYSICS 55 (2016) 5152-5156


166. Konar, Sushan; Bagchi, Manjari; Bandyopadhyay, Debades; et al. ‘Neutron Star Physics in the Square Kilometre Array Era: An Indian Perspective’, JOURNAL OF ASTROPHYSICS AND ASTRONOMY 37 (2016) SI Art No: 36

167. Kratochvil, Huong T.; Carr, Joshua K.; Matulef, Kimberly; et al. (Raghuraman, H.). ‘Instantaneous ion configurations in the K+ ion channel selectivity filter revealed by 2D IR spectroscopy’, SCIENCE 353 (2016) 1040-1044
170. Kumar, Deepak; Maiti, Moumita; Lahiri, Susanta. ‘Experimental probe for the production of Ru-97 from the Li-7+Nb-93 reaction: A study of precompound emissions’, PHYSICAL REVIEW C 94 (2016) Art No: 044603

171. Kumar, Mukesh; Soni, Kiran; Satpati, Biswarup; et al. ‘Exploration of magnetically separable Ag@AgxNiy core/graded-alloy-shell nanostructures’, CHEMICAL COMMUNICATIONS 52 (2016) 8737-8740

172. Kumari, Chanda; Sain, Dibyendu; Kumar, Ashish; et al. (Debnath, Sushanta; Saha, Partha). ‘Intracellular detection of hazardous Cd2+ through a fluorescence imaging technique by using a nontoxic coumarin based sensor’, DALTON TRANSACTIONS 46 (2017) 2524-2531

173. Kumari, Chanda; Sain, Dibyendu; Kumar, Ashish; et al. (Debnath, Sushanta; Saha, Partha). ‘A real time colorimetric ‘two in one’ kit for tracking ppb levels of uric acid and Hg2+ in live HeLa S3 cells and Hg2+ induced keto-enol tautomerism’, RSC ADVANCES 6 (2016) 62990-62998


178. Kundu, Ranadip; Bhattacharya, Sanjib; Roy, Debasish; et al. (Nambissan, P.M.G.). ‘Positron annihilation studies and complementary experimental characterization of xAg(2)O-(1-x)(0.3CdO-0.7MoO(3)) metal oxide glass nanocomposites’, RSC ADVANCES 7 (2017) 8131-8141


181. Kuznetsov, V. I.; Pramanik, Sourav; Gerasimenko, A. B.; et al. (Chakrabarti, Nikhil). ‘Stability properties of the steady state solutions of a non-neutral plasma diode when there is a uniform magnetic field along transverse direction’, PHYSICS OF PLASMAS 24 (2017) Art No: 023107

182. Lakshmanan, M.; Chakrabarti, Bikas K. ‘Anjan Kundu (1953-2016)’, CURRENT SCIENCE 112 (2017) 865-866


185. Maiti, Arpan; Maity, Achyut; Satpati, Biswarup; et al. (Chini, Tapas Kumar). ‘Efficient Excitation of Higher Order Modes in the Plasmonic Response of


188. Maity, Santu; Datta, Arpita; Lahiri, Susanta; et al. ‘A dynamic chitosan-based self-healing hydrogel with tunable morphology and its application as an isolating agent’, RSC ADVANCES 6 (2016) 81060-81068


192. Majumdar, Anupa; Sarkar, Munna. ‘Small Mismatches in Fatty Acyl Tail Lengths Can Effect Non Steroidal Anti-Inflammatory Drug Induced Membrane Fusion’, JOURNAL OF PHYSICAL CHEMISTRY B 120 (2016) 4791-4802


198. Mandal, Suman; Das, Jayanta; Menon, Krishnakumar S. R. ‘Surface magnetism of NiO investigated by magnetic spectromicroscopies’, JOURNAL OF ELECTRON SPECTROSCOPY AND RELATED PHENOMENA 208 (2016) SI 51-55


201. Mehta, Romil; Brahmbhatt, H.; Mukherjee, M.; et al. ‘Tuning separation behavior of tailor-made thin film poly (piperazine-amide) composite membranes for pesticides and salts from water’, DESALINATION 404 (2017) 280-290


203. Mitra, Piyali; Pal, Uttam; Maiti, Nakul Chandra; et al. (Basu, Samita). ‘Identification of modes of interactions between 9-aminoacridine hydrochloride hydrate and serum proteins by low and high resolution spectroscopy and molecular modelling’, RSC ADVANCES 6 (2016) 53454-53468


207. Mollick, Safiul Alam; Kumar, Mohit; Singh, Ranveer; et al. (Satpati, Biswarup; Ghose, Debabrata). ‘Gold-decorated highly ordered self-organized grating-like nanostructures on Ge surface: Kelvin probe force microscopy and conductive atomic force microscopy studies’, NANOTECHNOLOGY 27 (2016) Art No: 435302


211. Mukherjee, Rukmini; Chakrabarti, Oishee. ‘Regulation of Mitofusin1 by Mahogunin Ring Finger-1 and the proteasome modulates mitochondrial fusion’, BIOCHIMICA ET BIOPHYSICA ACTA-MOLECULAR CELL RESEARCH 1863 (2016) 3065-3083

212. Mukherjee, Soumita; Chakraborty, Prabal; Saha, Partha. ‘Phosphorylation of Ku70 subunit by cell cycle kinases modulates the replication related function of Ku heterodimer’, NUCLEIC ACIDS RESEARCH 44 (2016) 7755-7765
213. Mukherjee, Sudip; Chatterjee, Arnab. ‘Disorder-induced phase transition in an opinion dynamics model: Results in two and three dimensions’, PHYSICAL REVIEW E 94 (2016) Art No: 062317
216. Nagamatsu, Shin-ichi; Takao, Shinobu; Samjeske, Gabor; et al. (Gayen, Sirshendu; Velaga, Srirahi; Saniyal, Milan K.). ‘Structural and Electronic Transformations of Pt/C, Pd@Pt(1 ML)/C and Pd@Pt(2 ML)/C Cathode Catalysts in Polymer Electrolyte Fuel Cells during Potential-step Operating Processes Characterized by In-situ Time-resolved XAFS’, SURFACE SCIENCE 648 (2016) SI 100-113
217. Naiya, Gitashri; Raha, Paromita; Mondal, Manas Kumar; et al. (Bhattacharyya, Dhananjay). ‘Conformational selection underpins recognition of multiple DNA sequences by proteins and consequent functional actions’, PHYSICAL CHEMISTRY CHEMICAL PHYSICS 18 (2016) 21618-21628
219. Nandi, Rana; Char, Prasanta; Chatterjee, Debarati; et al. (Bandyopadhyay, Debadee). ‘Role of nuclear physics in oscillations of magnetars’, PHYSICAL REVIEW C 94 (2016) Art No: 025801
225. Pais, H.; Sulaksono, A.; Agrawal, B. K.; et al. ‘Correlation of the neutron star crust-core properties with the slope of the symmetry energy and the lead skin thickness’, PHYSICAL REVIEW C 93 (2016) Art No: 045802
226. Pakhira, Santanu; Mazumdar, Chandan; Ranganathan, R.; et al. ‘Large magnetic cooling power involving frustrated antiferromagnetic spin-glass state in R2NiSi3 (R = Gd,Er)’, PHYSICAL REVIEW B 94 (2016) Art No: 104414

228. Pal, Barnana. ‘Fourier Transform Ultrasound Spectroscopy for the determination of wave propagation parameters’, ULTRASONICS 73 (2017) 140-143

229. Pandey, Abhishek; Mazumdar, Chandan; Ranganathan, R.; et al. ‘Multiple crossovers between positive and negative magnetoresistance versus field due to fragile spin structure in metallic GdPd3’, SCIENTIFIC REPORTS 7 (2017) Art No: 42789

230. Parashar, Kamya; Ballav, Niladri; Debnath, Sushanta; et al. ‘Rapid and efficient removal of fluoride ions from aqueous solution using a polypyrrole coated hydrous tin oxide nanocomposite’, JOURNAL OF COLLOID AND INTERFACE SCIENCE 476 (2016) 103-118

231. Parashar, Kamya; Ballav, Niladri; Debnath, Sushanta; et al. ‘Hydrous TiO2@polypyrrole hybrid nanocomposite as an efficient selective scavenger for the defluoridation of drinking water’, RSC ADVANCES 6 (2016) 99482-99495


233. Pariari, Arnab; Mandal, Prabhat. ‘Coexistence of topological Dirac fermions on the surface and three-dimensional Dirac cone state in the bulk of ZrTe5 single crystal’, SCIENTIFIC REPORTS 7 (2017) Art No: 40327


235. Patra, Malay; Mandal, Manoj; Chakrabarti, Abhijit; et al. ‘Localization and dynamics of the anticarcinogenic curcumin with GMI and other micelle assemblies’, GLYCOCONJUGATE JOURNAL 34 (2017) 171-179

236. Pattanayak, Sutanuka; Chakraborty, Sharmila; Mollick, Md. Masud Rahaman; et al. (Basu, Samita). ‘In situ fluorescence of lac dye stabilized gold nanoparticles; DNA binding assay and toxicity study’, NEW JOURNAL OF CHEMISTRY 40 (2016) 7121-7131

237. Paul, Barnita; Chatterjee, Swastika; Roy, Anushree; et al. (Midya, A.; Mandal, P.). ‘Geometrically frustrated GdInO3: An exotic system to study negative thermal expansion and spin-lattice coupling’, PHYSICAL REVIEW B 95 (2017) Art No: 054103

238. Paul, Rima; Paramanik, Tapas; Das, Kalipada; et al. (Satpati, B.; Das, I.). ‘Magnetocaloric effect at cryogenic temperature in gadolinium oxide nanotubes’, JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS 417 (2016) 182-188


240. Paul, Sabyasachi; Nandy, Maitreyee; Mohanty, A. K.; et al. ‘Preequilibrium neutron emission in heavy ion reaction: Mean field effect and multiple emission’, PHYSICAL REVIEW C 94 (2016) Art No: 034607


243. Payghan, Pavan V.; Bera, Indrani; Bhattacharyya, Dhananjay; et al. 'Capturing state-dependent dynamic events of GABA(A)-receptors: a microscopic look into the structural and functional insights', JOURNAL OF BIOMOLECULAR STRUCTURE & DYNAMICS 34 (2016) 1818-1837

244. Payghan, Pavan V.; Payghan, Pavan V.; Bera, Subhas Chandra; Selvaraj, Selva Chandrasekaran; Ramachandran, Meera; et al (Nambissan, PMG). 'Capturing state-dependent dynamic events of GABA(A)-receptors: a microscopic look into the structural and functional insights', JOURNAL OF BIOMOLECULAR STRUCTURE & DYNAMICS 34 (2016) 1818-1837

245. Pradhan, Bapi; Kumar, Gundam Sandeep; Dalui, Amit; et al. 'Shape-controlled cobalt phosphide nanoparticles as volatile organic solvent sensor', JOURNAL OF MATERIALS CHEMISTRY C 4 (2016) 4967-4977

246. Pradhan, Jayita; Mukherjee, Soham; Khan, Ali Hossain; et al. 'Two-Dimensional Hybrid Organohalide Perovskites from Ultrathin PbS Nanocrystals as Template', JOURNAL OF PHYSICAL CHEMISTRY C 121 (2017) 6401-6408


248. Pramanik, Sourav; Kuznetsov, V. I.; Gerasimenko, A. B.; et al (Chakrabarti, Nikhil). 'Time-independent states of a non-neutral plasma diode when emitted electrons are partially turned around by a transverse magnetic field', PHYSICS OF PLASMAS 23 (2016) Art No: 103105


250. Pramanik, Sourav; Maity, Chandan; Chakrabarti, Nikhil. 'The phase mixing of an upper hybrid wave in a magnetized pair-ion plasma', PHYSICA SCRIPTA 91 (2016) Art No: 065602

251. Pramanik, Sourav; Kuznetsov, V. I.; Gerasimenko, A. B.; et al. (Chakrabarti, Nikhil). 'Non-neutral plasma diode in the presence of a transverse magnetic field', PHYSICS OF PLASMAS 23 (2016) Art No: 062118

252. Prusty, Sudakshina; Siva, Vantari; Shukla, Neeraj; et al. (Satpati, Biswarup). 'Unusual ferromagnetic behaviour of embedded non-functionalized Au nanoparticles in Bi/Au bilayer films', RSC ADVANCES 6 (2016) 106584-106590


254. Rahangdale, H. V.; Mitra, D.; Das, P. K.; et al. (De, S.; Saha, S). 'Spectroscopic investigations of L-shell ionization in heavy elements by electron impact',


257. Rani, Poonam; Satpati, Biswarup; Srivastava, Rajendra. ‘Natural Template Mediated Sustainable Synthesis of Nanocrystalline Zeolite with Significantly Improved Catalytic Activity’, CHEMISTRYSELECT 2 (2017) 2870-2879


264. Roychowdhury, Krishanu; Wadhawan, Disha; Mehta, Poonam; et al. (Karmakar, Biswajit). ‘Quantum Hall realization of polarized intensity interferometry’, PHYSICAL REVIEW B 93 (2016) Art No: 220101

265. Saha, Srilekha; Maiti, Santanu K.; Karmakar, S. N. ‘Multiple mobility edges in a 1D Aubry chain with Hubbard interaction in presence of electric field: Controlled electron transport’, PHYSICA E-LOW-DIMENSIONAL SYSTEMS & NANOSTRUCTURES 83 (2016) 358-364


270. Samal, Alaka; Swain, Smrutirekha; Satpati, Biswarup; et al. ‘3D Co-3(PO4)(2)-Reduced Graphene Oxide Flowers for Photocatalytic Water Splitting: A Type II Staggered Heterojunction System’, CHEMSUSCHEM 9 (2016) 3150-3160

271. Samanta, Rome; Chakraborty, Mainak; Roy, Prabir; et al. (Ghosal, Ambar). ‘Baryon asymmetry via leptogenesis in a neutrino mass model with complex scaling’, JCAP 1703 (2017) Art No:025

272. Samanta, Rome; Roy, Prabir; Ghosal, Ambar. ‘Complex scaling in neutrino mass matrix’, ACTA PHYSICA POLONICA B 9 (2016) Special issue 807-808

273. Samanta, Rome; Roy, Probir; Ghosal, Ambar. ‘Extended scaling and residual flavor symmetry in the neutrino Majorana mass matrix’, EUROPEAN PHYSICAL JOURNAL C 76 Art No: 662

274. Samanta, Rome; Ghosal, Ambar. ‘Probing maximal zero textures with broken cyclic symmetry in inverse seesaw’, NUCLEAR PHYSICS B 911 (2016) 846-862


276. Samantaray, B.; Singh, Akhilesh Kr; Banerjee, Chandrima; et al. (Mandal, P.). ‘Perpendicular Standing Spin Wave and Magnetic Anisotropic Study on Amorphous FeTaC Films’, IEEE TRANSACTIONS ON MAGNETICS 52 (2016) Art No: 2003104


279. Sarkar, Kangkana; Lahiri, Susanta; Sen, Kamalika. ‘Separation of no-carrier-added Pb-203, a surrogate radioisotope, from proton irradiated (Tl2CO3)-Tl-nat target using calcium alginate hydrogel beads’, RADIOCHIMICA ACTA 104 (2016) 891-896


281. Sarmah, Bhaskar; Satpati, Biswarup; Srivastava, Rajendra. ‘Cu ion-exchanged and Cu nanoparticles decorated mesoporous ZSM-5 catalysts for the activation and utilization of phenylacetylene in a sustainable chemical synthesis’, RSC ADVANCES 6 (2016) 87066-87081

282. Sau, Abhishek; Bera, Kallol; Mondal, Pritiranjan; et al. (Satpati, Biswarup; Basu, Samita). ‘Distance-Dependent Electron Transfer in Chemically

284. Sengupta, Chaitrali; Sarangi, Manas Kumar; Sau, Abhishek; et al. (Basu, Samita). 'Micellar control over tautomerization and photo-induced electron transfer of Lumichrome in the presence of aliphatic and aromatic amines: a transient absorption study', METHODS AND APPLICATIONS IN FLUORESCENCE 5 (2017) Art No: 014008

285. Sengupta, Chaitrali; Mitra, Piyali; Seth, Banabithi Koley; et al. (Basu, Samita). 'Electronic and spatial control over the formation of transient ion pairs during photoinduced electron transfer between proflavine-amine systems in a subpicosecond time regime', RSC ADVANCES 7 (2017) 15149-15157

286. Sengupta I; Das, C; Das, D; et al. 'HBx hijacks nuclear body protein Sp110 and promotes viral pathogenesis', JOURNAL OF CLINICAL AND EXPERIMENTAL HEPATOLOGY 6 (2016) Suppl.1 S10

287. Sengupta, Mohor B.; Saha, Suparna; Mohanty, Pradeep K.; et al. Increased expression of ApoA1 after neuronal injury may be beneficial for healing, MOLECULAR AND CELLULAR BIOCHEMISTRY 424 (2017) 45-55

288. Sengupta, Mohor Biplab; Chakrabarti, Arunabha; Saha, Suparna; et al. (Mukhopadhyay, Debashis). 'Clinical proteomics of enervated neurons', CLINICAL PROTEOMICS 13 (2016) Art No:10

289. Seth, Banabithi Koley; Saha, Arpita; Haldar, Srijan; et al. (Chakraborty, Partha Pratim; Saha, Partha; Basu, Samita). 'Structure dependent selective efficacy of pyridine and pyrrole based Cu(II) Schiff base complexes towards in vitro cytotoxicity, apoptosis and DNA-bases binding in ground and excited state', JOURNAL OF PHOTOCHEMISTRY AND PHOTOBIOLOGY B-BIOLOGY 162 (2016) 463-472

290. Seth, Susnata; Das, Mala. Radiation linear energy transfer and drop size dependence of the low frequency signal from tiny superheated droplets, NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION A-ACCELERATORS SPECTROMETERS DETECTORS AND ASSOCIATED EQUIPMENT 837 (2016) 92-98


292. Shaikh, Md. Moin; Das, Mili; Roy, Subinit; et al. (Sinha, M.; Basu, P.; Datta, U.). Threshold behavior of interaction potential for the System Li-7+Ni-64: Comparison with Li-6+Ni-64', NUCLEAR PHYSICS A 953 (2016) 80-94

293. Shaikh, Md Moin; Roy, Subinit; Rajbanshi, S.; et al. (Mukherjee, A.; Pradhan, M. K.; Basu, P.). 'Measurement of fusion excitation function for 7Li+64Ni near the barrier', EPJ Web of Conferences 117 (2016) Art No:08020

294. Shaikh, Md Moin; Roy, Subinit; Rajbanshi, S.; et al. (Mukherjee, A.; Pradhan, M. K.; Basu, P.). 'Probing the fusion of Li-7 with Ni-64 at near-barrier energies', PHYSICAL REVIEW C 93 (2016) Art No: 044616

295. Shaw, Pankaj Kumar; Saha, Debajyoti; Ghosh, Sabuj; et al. (Janaki, M. S.; Iyengar, A. N. Sekar). 'Investigation of multifractal nature of floating potential
fluctuations obtained from a dc glow discharge magnetized plasma', PHYSICA A-STATISTICAL MECHANICS AND ITS APPLICATIONS 469 (2017) 363-371

296. Shaw, Pankaj Kumar; Ghosh, Sabuj; Saha, Debajyoti; et al. (Janaki, M. S.; Iyengar, A. N. Sekar). 'Investigation of coherent modes and their role in intermittent oscillations using empirical mode decomposition', PHYSICS OF PLASMAS 23 (2016) Art No: 112103


299. Singha, Ratnadwip; Pariari, Arnab Kumar; Satpati, Biswarup; et al. (Mandal, Prabhat). 'Large nonsaturating magnetoresistance and signature of nondegenerate Dirac nodes in ZrSiS', PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA 114 (2017) 2468-2473 Published: MAR 7 2017


301. Sinha, Roopam; Samanta, Rome; Ghosal, Ambar. ‘Maximal zero textures in Linear and Inverse seesaw’, PHYSICS LETTERS B 759 (2016) 206-213


303. Siva, Vantari; Chettah, Abdelhak; Satpati, Biswarup; et al. Enhanced surface and interface diffusion in Ni-Bi bilayers by swift heavy ion irradiation, RSC ADVANCES 6 (2016) 58950-58956

304. Srivastava, Devika; Mukherjee, Rukmini; Mookherjee, Debdatto; et al. (Chakrabarti, Oishee). ‘Mahogunin-mediated regulation of G alpha(i) localisation during mitosis and its effect on spindle positioning’, BIOCHEMISTRY AND CELL BIOLOGY 94 (2016) 359-369

305. Srivastava, Vishal; Bhattacharya, C.; Rana, T. K.; et al. (Roy, Subinit; Shaikh, Md. M.) ’Experimental investigation of T=1 analog states of Al-26 and Mg-26’, PHYSICAL REVIEW C 93 (2016) Art No: 044601

List of Publications in International Collaboration
(April 2016 – March 2017)

1. ALICE Collaboration. ‘J/Psi suppression at forward rapidity in Pb-Pb collisions at root s(NN)=5.02 TeV’, PHYSICS LETTERS B 766 (2017) 212-224

2. ALICE Collaboration. 'Determination of the event collision time with the ALICE detector at the LHC', EUROPEAN PHYSICAL JOURNAL PLUS 132 (2017) Art No: 99

3. ALICE Collaboration. ‘W and Z boson production in p-Pb collisions at TeV root s(NN)=5.02 TeV’, JOURNAL OF HIGH ENERGY PHYSICS (2017) Issue: 2 Art No: 077
4. ALICE Collaboration. ‘Charged-particle multiplicities in proton-proton collisions at root $s=0.9$ to $8$ TeV’, EUROPEAN PHYSICAL JOURNAL C 77 (2017) Art No: 33


7. ALICE Collaboration. ‘Pseudorapidity dependence of the anisotropic flow of charged particles in Pb-Pb collisions at root $s(\text{NN})=2.76$ TeV’, PHYSICS LETTERS B 762 (2016) 376-388


11. ALICE Collaboration. ‘Multiplicity dependence of charged pion, kaon, and (anti)proton production at large transverse momentum in p-Pb collisions root $S_{\text{NN}}=5.02$ TeV’, PHYSICS LETTERS B 760 (2016) 720-735


15. ALICE Collaboration. ‘Centrality dependence of $(\text{sic})(2S)$ suppression in p-Pb collisions at root $s(\text{NN})=5.02$ TeV’, JOURNAL OF HIGH ENERGY PHYSICS Issue: 6 (2016) Art No: 050


18. ALICE collaboration. ‘Differential studies of inclusive $J/\psi$ and $\psi(2S)$ production at forward rapidity in Pb-Pb collisions at root $s(\text{NN})=2.76$ TeV’, JOURNAL OF HIGH ENERGY PHYSICS Issue: 5 (2016) Art No: 179

20. ALICE Collaboration. 'Multipion Bose-Einstein correlations in pp, p-Pb, and Pb-Pb collisions at energies available at the CERN Large Hadron Collider', PHYSICAL REVIEW C 93 (2016) Art No: 054908

21. ALICE Collaboration. 'Centrality dependence of charged jet production in p-Pb collisions at root(NN)=5.02 TeV', EUROPEAN PHYSICAL JOURNAL C 76 (2016) Published: MAY 17 2016

22. ALICE Collaboration. 'Production of K*(892)(0) and phi(1020) in p-Pb collisions at root s(NN)=5.02 TeV', EUROPEAN PHYSICAL JOURNAL C 76 (2016) Art No: 245


26. ALICE Collaboration. 'Charge-dependent flow and the search for the chiral magnetic wave in Pb-Pb collisions at root s(NN)=2.76 TeV', PHYSICAL REVIEW C 93 (2016) Art No: 044903


28. CMS Collaboration. 'Combined search for anomalous pseudoscalar HW couplings in VH(H -> b(b)over-bar) production and H -> VV decay', PHYSICS LETTERS B 759 (2016) 672-696

29. CMS collaboration. 'Overview of large area triple-GEM detectors for the CMS forward muon upgrade', NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION A-ACCELERATORS SPECTROMETERS DETECTORS AND ASSOCIATED EQUIPMENT 845 (2017) 298-303


31. CMS collaboration. 'Fiber Bragg Grating (FBG) sensors as flatness and mechanical stretching sensors', NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION A-ACCELERATORS SPECTROMETERS DETECTORS AND ASSOCIATED EQUIPMENT 824 (2016) 493-495

32. CMS collaboration. 'Status report of the upgrade of the CMS muon system with Triple-GEM detectors', NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION A-ACCELERATORS SPECTROMETERS DETECTORS AND ASSOCIATED EQUIPMENT 824 (2016) 521-525

33. CMS collaboration. 'Measurement and QCD analysis of double-differential inclusive jet cross sections in pp collisions at root s=8 TeV and cross section ratios to 2.76 and 7 TeV', JOURNAL OF HIGH ENERGY PHYSICS Issue: 3 (2017) Art No: 156
34. CMS Collaboration. ‘Observation of Charge-Dependent Azimuthal Correlations in p-Pb Collisions and Its Implication for the Search for the Chiral Magnetic Effect’, PHYSICAL REVIEW LETTERS 118 (2017) Art No: 122301


36. CMS Collaboration. ‘Search for CP violation in t(t)over-bar production and decay in proton-proton collisions at root s=8 TeV’, JOURNAL OF HIGH ENERGY PHYSICS Issue: 3 (2017) Art No: 101

37. CMS Collaboration. ‘Search for heavy neutrinos or third-generation leptoquarks in final states with two hadronically decaying tau leptons and two jets in proton-proton collisions at root s=13 TeV’, JOURNAL OF HIGH ENERGY PHYSICS Issue: 3 (2017) Art No: 077


45. CMS Collaboration. ‘Search for supersymmetry in events with one lepton and multiple jets in proton-proton collisions at root s=13 TeV’, PHYSICAL REVIEW D 95 (2017) Art No: 012011

46. CMS Collaboration. ‘Search for R-parity violating supersymmetry with displaced vertices in proton-proton collisions at root s=8 TeV’, PHYSICAL REVIEW D 95 (2017) Art No: 012009

47. CMS Collaboration. ‘Search for high-mass Z gamma resonances in e(+)+e(-)gamma and mu(+)+mu(-)gamma final states in proton-proton collisions at root s=8 and 13 TeV’, JOURNAL OF HIGH ENERGY PHYSICS Issue: 1 (2017) Art No: 076

49. CMS Collaboration. ‘Observation of the decay $B^+ \rightarrow \psi(2S)\phi(1020)K^+$ in pp collisions root $s=8$ TeV’, PHYSICS LETTERS B 764 (2017) 66-86

50. CMS Collaboration. ‘Measurements of the $t\bar{t}$ production cross section in lepton plus jets final states in pp collisions at 8 and ratio of 8 to 7 cross sections’, EUROPEAN PHYSICAL JOURNAL C 77 (2017) Art No: 15


56. CMS Collaboration. ‘Search for lepton flavour violating decays of the Higgs boson to $e$ tau and $e$ mu in proton-proton collisions at root $s=8$ TeV’, PHYSICS LETTERS B 763 (2016) 472-500

57. CMS Collaboration. ‘Studies of inclusive four-jet production with two b-tagged jets in proton-proton collisions at 7 TeV’, PHYSICAL REVIEW D 94 (2016) Art No: 112005


64. CMS Collaboration. ‘Measurement of the integrated and differential $t\bar{t}$ production cross sections for high-$p(T)$ top quarks in pp collisions at root $s=8$ TeV’, PHYSICAL REVIEW D 94 (2016) Art No: 072002
65. CMS Collaboration. ‘Upsilon (nS) polarizations versus particle multiplicity in pp collisions at root s=7 TeV’, PHYSICS LETTERS B 761 (2016) 31-52
69. CMS Collaboration. ‘Search for two Higgs bosons in final states containing two photons and two bottom quarks in proton-proton collisions at 8 TeV’, PHYSICAL REVIEW D 94 (2016) Art No: 052012
71. CMS Collaboration. ‘Search for R-parity violating decays of a top squark in proton-proton collisions at root s=8TeV’, PHYSICS LETTERS B 760 (2016) 178-201
72. CMS Collaboration. ‘Measurements of t(t)over-bar charge asymmetry using dilepton final states in pp collisions at root s=8 TeV’, PHYSICS LETTERS B 760 (2016) 365-386
73. CMS Collaboration. ‘Measurement of the Z gamma -> nu(nu)over-bar gamma production cross section in pp collisions at root s=8 TeV and limits on anomalous ZZ gamma and Z gamma gamma trilinear gauge boson couplings’, PHYSICS LETTERS B 760 (2016) 448-468
74. CMS Collaboration. ‘Search for Higgs boson off-shell production in proton-proton collisions at 7 and 8 TeV and derivation of constraints on its total decay width’, JOURNAL OF HIGH ENERGY PHYSICS Issue: 9 (2016) Art No: 051
78. CMS Collaboration. ‘Evidence for exclusive gamma gamma -> W (+) W (-) production and constraints on anomalous quartic gauge couplings in pp collisions at and 8 TeV’, JOURNAL OF HIGH ENERGY PHYSICS Issue: 8 Art No: 119
79. CMS Collaboration. ‘Search for direct pair production of supersymmetric top quarks decaying to all-hadronic final states in pp collisions at root s=8 TeV’, EUROPEAN PHYSICAL JOURNAL C 76 (2016) Art No: 460

81. CMS Collaboration. ‘Search for supersymmetry in events with soft leptons, low jet multiplicity, and missing transverse energy in proton-proton collisions at root s=8 TeV’, PHYSICS LETTERS B 759 (2016) 9-35

82. CMS Collaboration. ‘Study of Z boson production in pPb collisions at root S-NN=5.02 TeV’, PHYSICS LETTERS B 759 (2016) 36-57

83. CMS Collaboration. ‘Search for neutral resonances decaying into a Z boson and a pair of b jets or tau leptons’, PHYSICS LETTERS B 759 (2016) 369-394

84. CMS Collaboration. ‘Search for supersymmetry in electroweak production with photons and large missing transverse energy in pp collisions at root s=8TeV’, PHYSICS LETTERS B 759 (2016) 479-500

85. CMS Collaboration. ‘Measurement of the inelastic cross section in proton-lead collisions at root s(NN)=5.02 TeV’, PHYSICS LETTERS B 759 (2016) 641-662


87. CMS Collaboration. ‘Measurement of the t(t)over-bar production cross section in the e mu channel in proton-proton collisions at root s=7 and 8 TeV’, JOURNAL OF HIGH ENERGY PHYSICS Issue: 8 (2016) Art No: 029


90. CMS Collaboration. ‘Search for Narrow Resonances in Dijet Final States at root s=8 TeV with the Novel CMS Technique of Data Scouting’, PHYSICAL REVIEW LETTERS 117 (2016) Art No: 031802


92. CMS Collaboration. ‘Search for a low-mass pseudoscalar Higgs boson produced in association with a b(b)over-bar pair in pp collisions at root s=8 TeV’, PHYSICS LETTERS B 758 (2016) 296-320


94. CMS Collaboration. ‘Measurement of t(t)over-bar production with additional jet activity, including b quark jets, in the dilepton decay channel using pp collisions at root s=8TeV’, EUROPEAN PHYSICAL JOURNAL C 76 (2016) Art No: 379

95. CMS Collaboration. ‘Search for heavy resonances decaying to two Higgs bosons in final states containing four b quarks’, EUROPEAN PHYSICAL JOURNAL C 76 (2016) Art No: 371

97. CMS Collaboration. ‘Search for the associated production of a Higgs boson with a single top quark in proton-proton collisions at root s=8 TeV’, JOURNAL OF HIGH ENERGY PHYSICS Issue: 6 (2016) Art No 177


100. CMS Collaboration. ‘Search for lepton flavour violating decays of heavy resonances and quantum black holes to an e mu pair in proton-proton collisions at root s=8 TeV’, EUROPEAN PHYSICAL JOURNAL C 76 (2016) Art No: 317

101. CMS Collaboration. ‘Search for supersymmetry in events with a photon, a lepton, and missing transverse momentum in pp collisions at root s=8 TeV’, PHYSICS LETTERS B 757 (2016) 6-31

102. CMS Collaboration. ‘Measurement of the CP-violating weak phase phi(s) and the decay width difference Delta Gamma(s) using the B-s(0) -> J/psi phi (1020) decay channel in pp collisions at root s=8 TeV’, PHYSICS LETTERS B 757 (2016) 97-120

103. CMS Collaboration. ‘Inclusive and differential measurements of the t(t)over-bar charge asymmetry in pp collisions at root s=8 TeV’, PHYSICS LETTERS B 757 (2016) 154-179


107. CMS Collaboration. ‘Measurement of the ratio B(B-s(0) -> J/psi f(0)(980))/B(B-s(0) -> J/psi phi(1020)) in pp collisions at root s=7 TeV’, PHYSICS LETTERS B 756 (2016) 84-102

108. CMS Collaboration. ‘Search for massive WH resonances decaying into the l nu b(b)over-bar final state at root s=8 TeV’, EUROPEAN PHYSICAL JOURNAL C 76 (2016) Art No: 237


111. CMS Collaboration. ‘Search for new phenomena in monophoton final states in proton-proton collisions at root s=8 TeV’, PHYSICS LETTERS B 755 (2016) 102-124

112. CMS Collaboration. ‘Search for W ’ decaying to tau lepton and neutrino in proton-proton collisions at root s=8 TeV’, PHYSICS LETTERS B 755 (2016) 196-216

113. CMS Collaboration. ‘Searches for a heavy scalar boson H decaying to a pair of 125 GeV Higgs bosons hh or for a heavy pseudoscalar boson A decaying to Zh, in the final states with h -> tau tau’, PHYSICS LETTERS B 755 (2016) 217-244

114. CMS Collaboration. ‘Measurement of the top quark mass using proton-proton data at root(s)=7’, PHYSICAL REVIEW D 93 (2016) Art No: 072004


120. CMS Collaboration. ‘Search for massive resonances decaying in to WW,WZ or ZZ bosons in proton-proton collisions at root s=13 TeV’, JOURNAL OF HIGH ENERGY PHYSICS Issue: 3 (2017) Art No: 162


Author Index

The number given against the author indicates the list of publication serial number.
<table>
<thead>
<tr>
<th>Name</th>
<th>Pages</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adhikari, S</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Adhya, Souvik Priyam</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Agnihotri, Nidhi</td>
<td>241</td>
<td></td>
</tr>
<tr>
<td>Agrawal, B. K</td>
<td>9, 208, 209, 225</td>
<td></td>
</tr>
<tr>
<td>Ahamed, Sk Iza</td>
<td>84</td>
<td></td>
</tr>
<tr>
<td>Alam, N.</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Ali, Sajad</td>
<td>256</td>
<td></td>
</tr>
<tr>
<td>Bagh, Sangram</td>
<td>13, 214, 264</td>
<td></td>
</tr>
<tr>
<td>Baks, Shounak</td>
<td>13, 74</td>
<td></td>
</tr>
<tr>
<td>Bandyopadhyay, Aritra</td>
<td>16, 17</td>
<td></td>
</tr>
<tr>
<td>Bandyopadhyay, B.</td>
<td>107</td>
<td></td>
</tr>
<tr>
<td>Bandyopadhyay, Debades</td>
<td>64, 168, 219</td>
<td></td>
</tr>
<tr>
<td>Banerjee, Amrita</td>
<td>18, 88, 160, 189</td>
<td></td>
</tr>
<tr>
<td>Banerjee, Avik</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Banerjee, M</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Banerjee, P</td>
<td>23, 247</td>
<td></td>
</tr>
<tr>
<td>Banerjee, S.</td>
<td>196</td>
<td></td>
</tr>
<tr>
<td>Banerjee, Tirthankar</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>Banik, Amit Dutta</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Banik, Sanjib</td>
<td>25, 26</td>
<td></td>
</tr>
<tr>
<td>Bardhan, Munmun</td>
<td>88, 112</td>
<td></td>
</tr>
<tr>
<td>Basu, Abhik</td>
<td>59, 80</td>
<td></td>
</tr>
<tr>
<td>Basu, C.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Basu, P.</td>
<td>293, 294, 295</td>
<td></td>
</tr>
<tr>
<td>Basu, Rudranil</td>
<td>11, 12</td>
<td></td>
</tr>
<tr>
<td>Basu-Mallick, B</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Bayan, Sayan</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>Bera, Kallol</td>
<td>35, 283</td>
<td></td>
</tr>
<tr>
<td>Bera, Manindra</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Bera, Subhas C.</td>
<td>37, 241</td>
<td></td>
</tr>
<tr>
<td>Bhatracharyya, N. P.</td>
<td>22, 74, 97, 223</td>
<td></td>
</tr>
<tr>
<td>Bhatracharee, P.</td>
<td>15, 301</td>
<td></td>
</tr>
<tr>
<td>Bhatracharya, M.</td>
<td>41, 88</td>
<td></td>
</tr>
<tr>
<td>Bhatracharya, P.</td>
<td>21, 69</td>
<td></td>
</tr>
<tr>
<td>Bhatracharya, S.</td>
<td>42, 154, 247</td>
<td></td>
</tr>
<tr>
<td>Bhatracharyya, Arpan</td>
<td>44, 67</td>
<td></td>
</tr>
<tr>
<td>Bhatracharyya, D.</td>
<td>45, 103, 210, 217, 243</td>
<td></td>
</tr>
<tr>
<td>Bhatracharyya, Gautam</td>
<td>29, 46</td>
<td></td>
</tr>
<tr>
<td>Bhatracharyya, S. R.</td>
<td>269</td>
<td></td>
</tr>
<tr>
<td>Bhunia, Satyaban</td>
<td>124</td>
<td></td>
</tr>
<tr>
<td>Biwas, Subhrayoti</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Biswas, Anirban</td>
<td>24, 50</td>
<td></td>
</tr>
<tr>
<td>Biswas, Debaleen</td>
<td>51, 52</td>
<td></td>
</tr>
<tr>
<td>Biswas, Nilanjnan</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>Biswas, Sampa</td>
<td>113</td>
<td></td>
</tr>
<tr>
<td>Bucha, Sudha</td>
<td>74</td>
<td></td>
</tr>
<tr>
<td>Chakrabarti, Abhijit</td>
<td>55, 65, 66, 83, 89, 90, 235</td>
<td></td>
</tr>
<tr>
<td>Chakrabarti, Arunabha</td>
<td>289</td>
<td></td>
</tr>
<tr>
<td>Chakrabarti, Bikas K.</td>
<td>56, 63, 127, 182</td>
<td></td>
</tr>
<tr>
<td>Chakrabarti, N.</td>
<td>122, 132, 134, 150, 151, 157, 158, 181, 220, 248, 249, 250, 251</td>
<td></td>
</tr>
<tr>
<td>Chakrabarti, Oishee</td>
<td>35, 195, 211, 305</td>
<td></td>
</tr>
<tr>
<td>Chakrabarti, Shrabana</td>
<td>87</td>
<td></td>
</tr>
<tr>
<td>Chakraborty, Mainak</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Chakraborty, P.</td>
<td>27, 32</td>
<td></td>
</tr>
<tr>
<td>Chakraborty, Partha Pratim</td>
<td>290</td>
<td></td>
</tr>
<tr>
<td>Chakraborty, Prabal</td>
<td>212</td>
<td></td>
</tr>
<tr>
<td>Chakraborty, S.</td>
<td>99</td>
<td></td>
</tr>
<tr>
<td>Chakraborty, Supratic</td>
<td>51, 52, 115, 116, 117</td>
<td></td>
</tr>
<tr>
<td>Chakraborty, Suvankar</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>Char, Prasanta</td>
<td>219</td>
<td></td>
</tr>
<tr>
<td>Chatterjee, A.</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Chatterjee, Amit Kumar</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>Chatterjee, Arijit</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>Chatterjee, Arnab</td>
<td>63, 127, 213</td>
<td></td>
</tr>
<tr>
<td>Chatterjee, M.</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>Chatterjee, M. B.</td>
<td>108</td>
<td></td>
</tr>
<tr>
<td>Chattopadhyay, S.</td>
<td>86, 256</td>
<td></td>
</tr>
<tr>
<td>Chini, Tapas Kumar</td>
<td>185, 187, 259</td>
<td></td>
</tr>
<tr>
<td>Choudhuri, Madhumita</td>
<td>72, 73</td>
<td></td>
</tr>
<tr>
<td>Choudhury, Debi</td>
<td>113</td>
<td></td>
</tr>
<tr>
<td>Choudhury, Dibyasree</td>
<td>129</td>
<td></td>
</tr>
<tr>
<td>Choudhury, Kamalika Roy</td>
<td>74</td>
<td></td>
</tr>
<tr>
<td>Chowdhury, Debasesree</td>
<td>75, 76, 77</td>
<td></td>
</tr>
<tr>
<td>Chowdhury, R. Roy</td>
<td>107</td>
<td></td>
</tr>
<tr>
<td>Chowdhury, S.</td>
<td>126</td>
<td></td>
</tr>
<tr>
<td>Chowdhury, Sanghati Roy</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>Daga, Bijoy</td>
<td>61, 80</td>
<td></td>
</tr>
<tr>
<td>Das Chakraborty, S.</td>
<td>41, 88, 143</td>
<td></td>
</tr>
<tr>
<td>Das, Arpita</td>
<td>87</td>
<td></td>
</tr>
<tr>
<td>Das, Ashok K.</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>Das, B.</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>Das, Bankim Chandra</td>
<td>87</td>
<td></td>
</tr>
<tr>
<td>Das, Chandrima</td>
<td>14, 18, 91, 92, 287</td>
<td></td>
</tr>
<tr>
<td>Das, Debashree</td>
<td>89</td>
<td></td>
</tr>
<tr>
<td>Das, Debasish</td>
<td>166, 167</td>
<td></td>
</tr>
<tr>
<td>Das, Dipankar</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>Das, Goutam</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Das, I.</td>
<td>25, 26, 93, 238, 239</td>
<td></td>
</tr>
<tr>
<td>Das, Jayanta</td>
<td>198</td>
<td></td>
</tr>
<tr>
<td>Das, Kalipada</td>
<td>26, 93, 238</td>
<td></td>
</tr>
<tr>
<td>Das, Kumar</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td>Das, Mala</td>
<td>95, 291, 292</td>
<td></td>
</tr>
<tr>
<td>Das, Mili</td>
<td>293</td>
<td></td>
</tr>
</tbody>
</table>
Das, P. K., 254
Das, Prajna Paramita, 18
Das, Samir, 96
Das, Srijit, 97
Dasgupta, Dipak, 18, 88, 160, 189
Dasgupta, P., 57, 140
Dasgupta, Shinjinee, 247
Datta, Alokmay, 72, 73
Datta, Arpita, 188
Datta, U., 99, 293
Dattagupta, Jiban Kanti, 113
De, Asit K., 209
De, J. N., 209
De, S., 87, 254
Debnath, Sushanta, 101, 119, 155, 172, 173, 230, 231
Dey, C. C, 104, 105, 106
Dey, S. K., 104, 105, 106
Dhara, S., 107
Dutta, Koushik, 79, 94, 110, 111
Dutta, S., 114
Dutta, Shreyasi, 18
Dutta, Sruti, 113
Faruque, Sk Abdul Kader Md, 115, 116, 117
Gangopadhyay, Moumita, 118
Ganguly, Bichitra Nandi, 119
Garai, Sudip, 123
Garg, Arti, 193, 215
Gayen, Sirshendu, 216
Ghosal, Ambar, 2, 272, 273, 274, 275, 302
Ghose, Debabrata, 75, 76, 77, 207
Ghosh, Abhijit, 126
Ghosh, Asim, 127
Ghosh, Avirup, 128
Ghosh, K., 131, 129, 130
Ghosh, Madhurima, 214
Ghosh, Sabuj, 133, 296, 297
Ghosh, Sujay, 138
Ghosh, Tapas, 139
Ghoshray, A., 194
Ghoshray, K., 34, 194
Giri, R. P., 40, 116, 147
Goswami, A., 43, 86, 247, 256
Goswami, Sathi, 141
Haldar, Srijan, 290
Halder, Suchismita, 55, 66
Halder, Sukanya, 45
Hazra, S., 263
Islam, Chowdhury Aminul, 16
Iyengar, A. N. Sekar, 68, 133, 204, 205, 296, 297
Jana, S., 150, 151, 221
Janaki, M. S., 122, 126, 133, 205, 220, 221, 296, 297
Jash, A., 152, 153, 200
Kar, Satyaki, 156
Kar, Subhrasmita, 84
Karmakar, Biswajit, 265
Karmakar, Mithun, 157, 158
Karmakar, S. N., 179, 180, 266, 267
Karmakar, Shilpita, 55
Khan, N., 147, 232
Kundu, Anjan, 19, 174, 175, 176
Kundu, Asish K., 35, 177, 197
Kundu, Sourav, 179, 180
Lahiri, S., 70, 129, 130, 131, 146, 170, 188, 221, 222, 234 278, 279, 280
Lone, Muzalfar Qadir, 184
Maiti, Arpan, 41, 185, 187
Maiti, M., 130, 131
Maiti, Santanu, 44, 186
Maitiy, A., 41, 185, 187, 259
Majhi, Abhishek, 190, 191
Majumdar, Anupa, 192
Majumdar, Debasis, 24
Majumdar, N., 152, 153, 260
Majumder, Gourab, 193
Majumder, M., 34, 194
Majumder, Priyanka, 195
Majumder, S., 196
Mandal, Debranjan, 35
Mandal, Mahatsab, 3, 135
Mandal, P., 78, 147, 148, 149, 165, 206, 218, 232, 233, 237, 253, 277, 300
Mathews, Prakash, 4, 5, 6, 7, 8
Mazumdar, Arindam, 199
Mazumdar, C., 82, 194, 226, 229
Meghna, K.K., 200
Menon, K.S.R., 58, 177, 197, 198
Metya, Amaresh, 35
Midya, A., 148, 149, 237
Midya, Arindam, 78
Mishra, Padmaja P., 242
Mishra, Padmaja P., 37, 241
Mishra, Rohit, 128
Mitra, A. K., 1
Mitra, Piyali, 203
Modak, Kamakshya Prasad, 199
Mohanty, A. K., 161, 202, 240
Mohanty, P. K., 61, 62, 142, 165, 288
Mondal, C., 208, 209
Mondal, Manas, 210
Mondal, Manas Kumar, 217
Mondal, P., 35, 41, 283
Mondal, Souvik, 80
Mookherjee, Debdatto, 35, 305
Mukherjee, A., 247
Mukherjee, A., 294, 295
Mukherjee, Arghya, 135
Mukherjee, Debasish, 45
Mukherjee, M., 20, 39, 109, 201, 268, 276, 303
Mukherjee, Rukmini, 35, 211, 305
Mukherjee, Soumita, 212
Mukherjee, Sudip, 213
Mukhopadhyay, S., 260
Mukhopadhyay, D., 13, 74, 288, 289
Mukhopadhyay, M.K., 40, 44
Mukhopadhyay, S., 152, 153, 214
Mustafa, Munshi G., 16, 17
Nag, Sabyasachi, 215
Nambissan, P.M.G., 84, 85, 178, 244, 298
Nandi, M., 218
Nandy, Maitreyee, 220, 240
Naskar, Nabanita, 70, 129, 221
Nayek, Kuntal, 224
Pai, H., 284
Pakhira, Santanu, 226
Pai, Arijit, 214
Pal, Arun Kumar, 118
Pal, Barnana, 227, 228
Pal, R., 136, 137
Pal, Uttam, 138
Palanisamy, Anbarasi, 214
Pandey, Abhishek, 229
Paramanik, Tapas, 238
Pariari, A., 232, 233
Pariari, Arnab Kumar, 300
Paul, Rima, 238, 239
Paul, Tapas, 241, 242
Poddar, A., 57, 140, 194
Pradhan, M.K., 247, 294, 295
Pramanik, S., 181, 248, 249, 250, 251
Prasad, Mithun S., 84
Prashanth, Pendum, 84
Ragavendran, K., 253
Raghuraman, H., 169
Rahaman, A., 99
Rahangdale, H. V., 254
Rajak, Atanu, 255
Rajbanshi, S., 86, 256, 294, 295
Ramachandran, Meera, 244
Ranganathan, R., 48, 82, 125, 226, 229
Rather, N., 86
Ray, Angana, 103
Ray, Indrani, 247
Ray, Sudatta, 247
Roy, I., 263
Roy, Madhusudan, 124, 262
Roy, Pradip, 135
Roy, Pradip K., 3
Roy, Shibaji, 224
Roy, Soma, 84, 85
Roy, Subinit, 293, 294, 295, 306
Roy, Sumana, 113
Saha Satyajit, 15
Saha, Arpita, 290
Saha, B., 196
Saha, Debdijoti, 133, 296, 297
Saha, Partha, 119, 172, 173, 212, 290
Saha, Rohini, 214
Saha, S., 104, 105, 106, 152, 200, 254
Saha, S.K., 126
Saha, Satyajit, 15
Saha, Srikha, 266, 267
Saha, Suparna, 288, 289
Samaddar, S.K., 209
Samanta, Rome, 272, 273, 274, 275, 302
Samanta, Tanusree, 276
Samantaray, B., 206, 277
Sanyal, Kasturi, 37
Sanyal, Milan K., 44, 186, 216
Sanyal, Sulagna, 18
Sarangi, Manas Kumar, 103
Sarkar, Kathakali, 214
Sarkar, M. Saha, 247, 256
Sarkar, Mugdha, 100
Sarkar, Munna, 141, 192
Sarkar, Sandip, 13
Sau, Abhishek, 35, 88, 283, 285
Sen, Udayaditya, 96
Senapati, Dulal, 37, 41, 88, 102, 143
Sengupta, Chaitrali, 285, 286
Sengupta, Isha, 91, 92, 287
Sengupta, K., 36, 114
Sengupta, Mohor B., 288, 289
Seth, Banabithi Koley, 286, 290
Seth, Susnata, 291, 292
Shaikh, Md Moin, 293, 294, 295, 306
Shaw, Pankaj Kumar, 133, 296, 297
Shyam, R., 232, 299
Singha, Ratnadwip, 300
Sinha, M., 293
Sinha, Roopam, 302
Sinha, Sumona, 276, 303
Srivastava, Alok, 221
Srivastava, Devika, 305
Velaga, Srihari, 216
Yarlagadda, S., 156, 184