

**REPORT  
OF THE**

**INTERNATIONAL SEMINAR  
ON**

***Correlative Advancement on Analytical  
and Applied Physics***

***(CAAAP – 2019)***

**ORGANIZED BY**

**DEPARTMENT OF PHYSICS  
ST. JOSEPH'S COLLEGE, NORTH POINT,  
DARJEELING**

**October 21-22, 2019**

**International Seminar**  
**on**  
**Correlative Advancement on Analytical and Applied Physics (CAAAP – 2019)**  
**Organized by**  
**Dept. of Physics, St. Joseph's College,**  
**North Point, Darjeeling.**

The International Seminar on Correlative Advancement on Analytical and Applied Physics was conducted by the Department of Physics, St. Joseph's College, North Point, Darjeeling, in collaboration with Internal Quality Assurance Cell (IQAC), and sponsored by the College, from 21<sup>st</sup> to 22<sup>nd</sup> October 2019. The seminar intended to highlight the recent trends and developments in Theoretical, Experimental and Applied Physics, with an aim to provide a platform for the researchers of the Eastern Himalayan Region, which includes part of Nepal and Bhutan, to showcase their research activities and findings. Taking the enormity of Physics into consideration, the seminar consisted of a variety of Sub-Themes. The Keynote and the Invited speakers present for the seminar were the pioneers in the area of the selected Sub-Themes. The Principal had instructed Dr Himanshu Joshi to act as the key person to initiate the seminar and invite speakers from outside India, the job which Dr. Joshi did with merit to bring in eminent scholars from the neighbourhood.

Participants from across the country and abroad contributed papers for oral and poster presentations. The call for papers was announced in the institution website [www.sjcdarjeeling.edu.in](http://www.sjcdarjeeling.edu.in) and in the official web site of the seminar [www.caaap19.webs.com](http://www.caaap19.webs.com) . An early bird registration of Rs. 700 and on the spot registration of Rs. 1000 was fixed for the participants. Total of 4 keynote speakers, 6 Invited speakers and 18 Contributory speakers shared

their research works with the audience strength of more than 100. The research papers presented are to be published as conference proceedings either as an edited volume with ISBN number or in international online journals.

### **Organizers:**

The organizing body consisted of the following members-

#### **Advisory Committee**

Fr. Rev. Dr. Donatus Kujur, Principal, St. Joseph's College, Darjeeling.

Dr. Padam Nepal, Co-ordinator, IQAC, St. Joseph's College, Darjeeling.

**Chief Patron:** Fr. Rev. Dr. DonatusKujur, Principal, St. Joseph's College, Darjeeling.

**Coordinator:** Dr. Navin Kumar Pradhan, Associate Professor, Department of Physics, St. Joseph's College, Darjeeling.

**Convener:** Mr. Debarghya Goswami , Assistant Professor, Department of Physics, St. Joseph's College, Darjeeling.

**Co-convener:** Mr. Pravat Dangal , Assistant Professor, Department of Physics, St. Joseph's College, Darjeeling.

**Co-Convener:** Dr. Himanshu Joshi, Assistant Professor, Department of Physics, St. Joseph's College, Darjeeling.

**Treasurer:** Mr. Navin Raya, Associate Instructor in Physics, St. Joseph's College, Darjeeling.

### **Theme of the Seminar**

Physics, as a stream has played a pivoting role in the development of our civilisation both from technological and philosophical perspective and is continuing to do so. Just like any other stream, as historically enriched and as vibrantly impactful as Physics, it has also got streamlined

in innumerable specialized themes spanning from classical Physics to relativistic Physics, quantum Physics to Astro-Physics, condensed matter Physics to high energy physics, nuclear physics, statistical physics, and many more. Each of these streams has also expanded through different sub streams. Even methodologically it has evolved through different approaches like theoretical, simulative and experimental techniques. This type of extremely streamlined practice of knowledge has certainly helped Physics to accomplish specialized realizations which would have been unattainable otherwise. On the other hand in research and ultimate decision-making in developing and applying technologies to meet wide array of problems, it requires cutting edge expertise across a broad array of sectors and disciplines. The specialized jargons and methodologies used in different streams of Physics stand as a major obstacle to communication not only with people with no scientific inclination, sometimes it has created the “other” even within the Physics practitioner of different streams. Need of outreach of science for better communication between broader public and scientific community has already been well understood. It is time to recognize an analogous need for enriching, to translate and transmit information between the moving pieces within different streams of Physics to have better shared understanding that we need in the context of an interdisciplinary collaborations.

Keeping this in mind in this seminar we had invited experts from different field of Physics like condensed matter Physics, nuclear Physics, Astrophysics, cosmology, plasma Physics etc. We had invited speakers who have expertise in different methodologies like experimentation, simulation or theorization. We hope that the apparent diversity in themes and methodologies used by our speakers who are experts in their specialized streams will help us to initiate a much needed bridge of communication between different streamlined fields of research in Physics and will facilitate a platform to endorse an enriching programme in the said field.

This seminar aspired to provide a global platform to researchers and scientists in multidisciplinary streams of theoretical, experimental and simulative Physics to exchange their novel ideas and research. The objective of this seminar was to indulge a space to highlight the interweave between theoretical and experimental approach of scientific development of Physics from both fundamental and technological aspects.

**Subthemes**

The subtheme of the seminar was limited to but not restricted to the following-

- 1) Strongly correlated system
- 2) Soft Condensed Matter
- 3) Magnetism and magnetic material
- 4) Computational Physics
- 5) Materials for energy harvesting
- 6) Nano materials and applications
- 7) Optoelectronics and devices
- 8) Semiconductor and devices
- 9) Superconductivity
- 10) Thin film and devices
- 11) Particle and Nuclear Physics
- 12) Astronomy
- 13) Cosmology
- 14) Liquid crystals
- 15) Polymer Physics and composite materials
- 16) Quantum computation

**List of Keynote Speakers:**

| Name               | Affiliation  | Lecture Topic  |
|--------------------|--|--|
| Prof. P. K. Mandal | Physics Department, North Bengal University, Siliguri, West Bengal | Ferroelectric liquid crystals for display applications |

|                     |   |  |
|---------------------|---|--|
| Prof. B. C. Paul    | Physics Department & IUCAA Centre for Astronomy Research and Development (ICARD) North Bengal University, Siliguri, West Bengal | Gravitational Wave: A new window in Astronomy  |
| Prof. R. K. Thapa   | Department of Physics, Mizoram University, Aizawl, Mizoram.   | An Introduction to the Study of Photofield Emission from Metals & Band Structure Calculations                                |
| Prof. M. P. Ghimire | Central Department of Physics, Tribhuvan University, Kathmandu, Nepal.  | Tuning of Weyl Nodes at the Fermi Surface of Co <sub>3</sub> Sn <sub>2</sub> S <sub>2</sub> : Effects on Anomalous Transport |

### **List of Invited Speakers:**

| <b>Name</b>             | <b>Affiliation</b>  | <b>Lecture Topic</b>  |
|-------------------------|---|---|
| Dr. N. K. Chakradhari   | School of studies in Physics and Astrophysics, Pt. R. S. University, Raipur.    | Supernovae Explosions   |
| Dr. Gopi Chandra Kaphle | Central Department of Physics, Tribhuvan University, Kathmandu, Nepal.          | Effect of Fe and Cr doping on electronic and magnetic properties of Inverse Heusler alloys: Mn <sub>2</sub> CoCr <sub>x</sub> Ga (1-x) and Mn <sub>2</sub> CoFe <sub>x</sub> Ga (1-x) |
| Dr. Amit Shankar        | Department of Physics, Kurseong College, Darjeeling                             | Computational Physics in Material Research  |
| Dr. Sudarshan Tamang    | Department of Chemistry, Sikkim University, Gangtok, Sikkim                     | Changing Dynamics of Chemistry and Physics at Nanoscale   |
| Dr. Siddharth Rai       | Department of Physics, Salesian College, Siliguri Campus, Siliguri, West Bengal | Interplay of Intrinsic and Collective Nuclear Excitations in Mass Region A~60   |
| Dr. Dhiraj Brahman      | Department of Chemistry, St. Joseph's College, North Point, Darjeeling.         | Metal-Organic Hybrid complexes: Synthesis, crystal structure, magnetic property and catalytic activity  |

## **Contributory Speakers:**

| <b>Name</b>            | <b>Affiliation</b>   | <b>Lecture Topic</b>   |
|------------------------|--|--|
| Dr. Sandeep Agarwal    | CAS Key Laboratory of Materials Technology and Engineering, Ningbo 315201, Republic of China       | Spin-Valve-Like Magnetoresistance in Ni-Mn-In Thin Film  |
| Debashis Sinha         | Department of Physics, University of North Bengal, Siliguri, India                                 | Study of Molecular Associations, Static Permittivity and Dielectric Relaxation of Fluorinated Nematic Liquid Crystal                               |
| P. Dasgupta            | Department of Physics, Surendra Institute of Engineering and Management, Siliguri, West Bengal     | Development of Advanced Materials for Liquid Crystal Displays  |
| Dr. AsimDebnath        | Department of Physics, University of North Bengal, Siliguri, India                                 | Effect of single-wall carbon nanotube dispersion on the physical properties of a room temperature ferroelectric liquid crystal mixture             |
| Puja Pradhan           | Department of Physics, Sikkim University, Gangtok, Sikkim  | Classification of Teeth Using Laser Induced Breakdown Spectroscopy   |
| Tamal Sarkar           | Department of Physics, University of North Bengal, Siliguri, India                                 | Importance of Synchrotron Radiation in X-Ray Astronomy   |
| Koyel Bhattacharya     | Department of Physics, Kalipada Ghosh TaraiMahavidyalaya, Bagdogra, Darjeeling, West Bengal, India | New Generation Chalcogenide Glassy System: Electrical Transport and Microstructure   |
| Ram Bahadur Ray        | Central Department of Physics, Tribhuvan University, Kirtipur, Kathmandu, Nepal                    | Study of Electronic Structure and Magnetic Properties of Quaternary Heusler Alloys RhZrTiIn and RuZrTiAl   |
| R. K. Rai              | Central Department of Physics, Tribhuvan University, Kirtipur, Kathmandu, Nepal                    | Ab-Initio Study of the Doping Effect on Electronic Structure and Transport Properties of Heterostructure of LaTiO <sub>3</sub> /SrTiO <sub>3</sub> |
| S.Ranjan Bhattacharyya | Department of Physics, SuriVidyasagar College, Suri,   | Application of zinc oxide nanostructures towards   |

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|--------------------------|--|--|
|                          | Birbhum  | realization of dye sensitized solar cells: fabrication and characterization  |
| Manish Pal Chowdhury     | Department of Physics, IEST, Shibpur, West Bengal, India                                   | Investigation of surface free energy(SFE) of fluorine doped tin oxide thin films deposited by aerosol pyrolysis technique.                                 |
| Dr. R. N. Gayen          | Department of Physics, Presidency University, 86/1, College Street, Kolkata                | Solution-processed zinc oxide nanowire based dye-sensitized solar cells  |
| R. Majumdar              | Saha Institute of Nuclear Physics, Kolkata, West Bengal, India                             | Investigation of the effect of single and two bar magnets on the breakdown characteristics in a DC glow discharge plasma                                   |
| Dr. Sudin Singh          | Department of Physics, Bolpur College, Bolpur, Birbhum, West Bengal                        | Single particle charge density in context of Correlation and Information Entropy   |
| Sailesh Kumar Gupta      | Department Of Physics, Darjeeling Govt. College, Darjeeling                                | New Exact Analytical Solutions for Dust Ion Acoustics (DIA) Waves in Unmagnetised Plasma in Cylindrical Geometry   |
| Dr. Banashree Ghosh      | Department of Physics, Gushkaramahavidyalaya, W.B., India                                  | Comparative analysis of microstructure characterization of nanocrystallineTiC and Ni <sub>3</sub> C metal Carbides synthesized by high energy ball milling |
| Dr. Tirthankar Choudhury | Department of Physics, Haldia Government College, Haldia, West Bengal                      | The Physics of Dye Sensitized Solar Cells  |
| Mahesh Ram               | 1Department of Physics, North-Eastern Hill University, Umshing, Shillong, Meghalaya, India | New 5-4 rule in full inverse Heusler alloys following Slater-Pauling rule of 18 and design of half-metal compensated ferrimagnets                          |



## **DAY 1: 21<sup>st</sup> Oct 2019**

The inaugural session of the seminar started from 10:00 am and was inaugurated by lighting of the lamp, which is a common Indian tradition to signify the removal of darkness by the light of knowledge. Chief Patron, Principal Fr. Rev. Dr. DonatusKujur addressed the gathering by a welcome speech and briefly introduced the theme of the seminar. Coordinator of the seminar, Dr. N. K. Pradhan further addressed the assembly and highlighted the theme of the seminar followed by the concluding welcome address by the Convener Mr. Debarghya Goswami. The inaugural keynote lecture was then delivered by Prof. P. K. Mandal from Department of Physics, North Bengal University. Mr. N. K. Raya, Associate Instructor of Physics, then felicitated the speaker with a short welcome speech.

After a short tea break, the session resumed at 11:30 AM and the first technical session of the seminar was started. The technical session began directly from the stars, far away planets and the millions of light years away galaxies, as Prof. B. C Paul from North Bengal University introduced a new window in Astronomy through Gravitational waves. The keynote lecture was followed by an invited talk of Dr. Gopi Chandra Khafle, who brought us back to the Earth from the stars and galaxies and took us directly into the minute world of atoms and electrons. He introduced the origin of electronic and magnetic properties considering this atomic scale. The audience enjoyed the lectures and experienced the Relativity theory of Einstein as nearly one and half hours had passed just feeling like ten minutes or so and it was time for lunch.

Post lunch session, started with the interphase of energy and matter as Prof. R. K. Thapa from Mizoram University delivered a keynote discussing the photo emission and photo absorption on a metal surface by computational models. Contributory speakers consisting of

Research Scholars, Post-Doctoral Researchers and few faculty members then presented their research papers, with Dr. Gopi Chandra Kafle as chair person, to conclude the session for the day.

The first day of the seminar ended with a tea break at 4:30 PM.

## **DAY 2: 22<sup>nd</sup> Oct 2019**

The second day of the seminar started with a very empowering Keynote lecture by Prof. M. P. Ghimire from Tribhuvan University, Kathmandu Nepal. He took us back again to the micro world of atoms and electrons and discussed about the transport phenomenon associated with them. He flooded the event by sharing immense knowledge, useful both to the Ph.D. scholars as well as the Undergraduate audience. The brain had just finished processing all the information it collected from the speaker, when came Dr. N. K. Chakradhari with his revolutionary research on Supernovae explosions, with an audacity to explain the origin of the Universe. We flew back to that state of creation when time had not even begun. The famous topics like the Big Bang Theory and the singularity point was discussed with the students with deep interest by the speaker.

The post lunch session started with a completely new field of physics which involved computational methodology and computer simulations. Dr. Amit Shankar from Kurseong College, Darjeeling explained the use and importance of computational methods to address the common problems that arises in the subject. It was followed by a very interesting lecture by Dr. Sudarshan Tamang who took us down to the nano-scale of materials and discussed how the properties of every known materials change in this level. The lecture was followed by series of discussion with the audience. The last invited lecture of the seminar was presented by Dr. Siddharth Rai from Salesian College, Siliguri. His talk took us beyond the atomic and electronic

level, all down to the nucleus of the atoms. Dr. Rai beautifully explained the excitation of nuclear states and gave an idea to the general public about the lesser known fundamental particles of matter like quarks.

The last part of the technical session included oral presentation and poster presentation by the contributory speakers, followed by a long discussion with the experts in the respective areas.

After a short tea break, the head of the institution Fr. Rev. Dr. DonatusKujur distributed certificates to the participants and felicitated the speakers with token of appreciation. The two day International seminar finally came to an end by a short vote of thanks speech from Mr. PravatDangal, Assistant professor, Department of Physics which was at last elaborated by the Principal.



**CAAAP-2019 COSING CEROMENY PHOTOGRAPH**

## **Cessation of the Seminar**

One of the main motives of the seminar was to establish a strong collaborating ground for the upcoming researchers of the region. This was achieved by a discussion between the Head of the institution Fr. Rev. Dr. Donatus Kujur with Dr. Madhav P. Ghimire where they came up with a decision to sign MOU with the Central Department of Physics, Tribhuvan University to undertake further research collaboratively.