



**A brief report on**

**One Day Symposium**

**on**

**RECENT TRENDS IN PHYSICAL SCIENCES**

**March 19, 2018**

An outreach program  
organized by  
S.N.Bose National Centre for Basic Sciences, Kolkata  
in collaboration with  
Department of Physics, Assam University, Silchar.

As a part of celebration of 125<sup>th</sup> Birth Anniversary of Prof. Satyendra Nath Bose



**ONE DAY SYMPOSIUM  
on  
"RECENT TRENDS IN PHYSICAL SCIENCES"**

*An outreach program organized by  
S. N. BOSE NATIONAL CENTRE FOR BASIC SCIENCES*

*in collaboration with  
DEPARTMENT OF PHYSICS, ASSAM UNIVERSITY, SILCHAR*

*March 19, 2018*

*Venue: Bipin Chandra Pal Auditorium, Assam University, Silchar*

**Prof. Biswajit Chakraborty**  
(SNBNCBS, Kolkata)

**Prof. Kalyan Mandal**  
(SNBNCBS, Kolkata)

**SPEAKERS**

**Dr. Himadri Sekhar Das**  
(AU, Silchar)

**Dr. Utpal Sarkar**  
(AU, Silchar)

A ] Total number of participating institutions : 07  
(Covering three districts of Assam)

Gurucharan college, silchar  
Cachar College, Silchar  
S S College, Hailakandi  
Karimganj college, Karimganj  
Ramkrishnanagar College, Ramkrishnanagar  
NIT, Silchar  
Assam University, Silchar

B] Total number of participants : 165

Gurucharan college, silchar : 25  
Cachar College, Silchar : 08  
S S College, Hailakandi : 28  
Karimganj college, Karimganj : 46  
Ramkrishnanagar College, Ramkrishnanagar : 03  
NIT, Silchar : 07  
Assam University, Silchar : 48

C] Total number of Speakers : 04

Prof Biswajit Chakraborty

Title of the talk: Bosons, Fermions and  
Geomery Prof Kalyan Mandal

Title of the talk: Magnetism: Bulk to Nanostructured Materials

Dr Himadri Sekhar Das

Title of the talk: Recent Advances in Astronomy and  
Astrophysics Dr Utpal Sarkar

Title of the talk: Computational Physics : A brief Overview

## PROGRAM

10:00-11: Registration

11:00-11:20: Inauguration

11:20- 11:30: Tea break

11:30-12:00: Lecture I ( Speaker: Prof Biswajit Chakraborty)

12:10-13:10: Lecture II ( Speaker : Dr Utpal Sarkar)

13:10-13:40: Lunch Break

13:40- 14:40 : Lecture III ( Speaker : Prof Kalyan Mandal)

14:50 – 15:20: Lecture IV ( Speaker : Dr Himadri Sekhar Das)

15:30-16:00 : Documentary film show on Prof S N Bose

16:00- 16:30: Student Interaction

16:30- 16:45 : Concluding Remarks

# SUMMARY of THE TALKS

## Bosons, Fermions and Geomery Biswajit Chakraborty

S.N. Bose National Centre for Basic Sciences, Salt Lake, Kolkata

Starting with a brief history of the struggle with Euclid's fifth postulate to the eventual formulation of Non-Euclidean geometry and the vital role played by it in the formulation of General Theory of Relativity by Albert Einstein was discussed. Later, I touched upon the formulation of relativistic quantum mechanics and quantum field theory, where special theory of relativity is merged with quantum mechanics. Finally, I mentioned about the difficulties in merging General Relativity and quantum mechanics, which remains an unsolved problem till now. Some recent attempts through Noncommutative Geometry was briefly discussed.

## Computational Physics : A brief Overview Utpal Sarkar

Assam University , Silchar

A brief overview of Computational Physics was discussed by Dr Utpal Sarkar, Assistant Professor, from Department of Physics, Assam University, Silchar. On the first half of his talk he shed insight on a new area of scientific research namely 'Computational science' and its application to solve large and complex problems. He compares three "pillars" of scientific investigations Experiment, Theory and Simulation (theoretical experiments) and concludes that the aim of computational science is not to replace theory or experiment, but to enhance our understanding of physical processes. According to his view, simulation is nothing but "a means of scientific discovery that employs a computer system to simulate a physical system according to laws derived from theory and experiment". Through his talk he enlighten us with different application field of computational science e.g. Weather prediction, Defense, Materials science, Molecular biology, Aerodynamics, Business etc. and focus on the importance of computational science. On the latter half of his talk he specifically discussed computational physics citing example from macroscale, mesoscale, nanoscale and subatomic label. The speed versus accuracy has been demonstrated with the help of Pasteur's Quadrant technique. His talk covers a vast area of simulation technique including Molecular Mechanics, Semi Empirical and Ab initio (Hartree-Fock, BLYP, DFT methods) by citing appropriate example of each.

## Recent advances in Astronomy and Astrophysics

Himadri Sekhar Das

Assam University, Silchar

Astronomy and Astrophysics (A&A) have come a long way in the past few years, with revelations from great astronomers, physicists, and scientists. Some of the greatest achievements in recent years include the detection of gravity waves, discovery of planets beyond our own solar system, finding super-Earth 40 light years away, Earth-like world in closest star Proxima Centauri, the landing of the first space probe Philae on a comet, detailed surface imaging of a star (Antares) for the first time other than the Sun, detecting water on the moon, etc. Recent observational evidences along with the theoretical background has been discussed in brief.

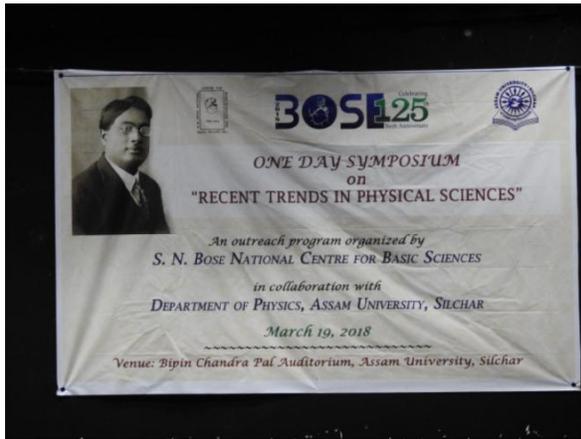
## Magnetism: Bulk to Nanostructured Materials

Kalyan Mandal

S.N. Bose National Centre for Basic Sciences, Salt Lake, Kolkata

Materials having a characteristic length (particle diameter, grain size, layer thickness or width of a conducting line on an electronic chip)  $\leq 100\text{nm}$  are usually called nanomaterials (NMs). Since atoms at surfaces have fewer neighbors in NMs, they are co-ordinatively unsaturated which lead to decrease in their stabilization in contrast to atoms present at bulk. The density of states ( $D(E)$ ) of electrons in the material also changes from a continuous function ( $D(E) \propto E^{1/2}$ ) to discontinuous delta function as it moves from bulk to nanoscale. If size becomes comparable to or less than certain characteristics length scales such as carrier mean free path, superconducting coherence length, magnetic domain wall width, spin diffusion length etc, there arises some novel properties. The electronic, magnetic, optical and chemical properties are found to be very different from those of the bulk form and to depend sensitively on size, shape and composition. Most interesting effects of size reduction are observed in the case of magnetic properties. Some of them are: giant magnetoresistance, large tunneling magnetoresistance, high coercivity and remanence, superparamagnetism, large magnetocaloric effect, spin canting, exchange bias. Therefore the change in magnetic properties due to finite size effect along with the above effects has been discussed in details.

# Few Moments from the day





# CERTIFICATE ISSUED TO THE STUDENTS



2018 **BOSE** 125<sup>th</sup>  
Celebrating  
Birth Anniversary



“BOSE-125: 125th Birth Anniversary of Prof. Satyendra Nath Bose”

ONE DAY SYMPOSIUM  
ON

**“RECENT TRENDS IN PHYSICAL SCIENCES”**

Certificate

*This is to certify that Mr/ Ms/ Dr/ \_\_\_\_\_ of \_\_\_\_\_ has participated in the ONE DAY SYMPOSIUM ON “RECENT TRENDS IN PHYSICAL SCIENCES” held on 19<sup>th</sup> March, 2018 at Assam University, Silchar. It is an outreach program organized by S.N. Bose National Centre for Basic Sciences, Kolkata in collaboration with Department of Physics, Assam University, Silchar.*

*D C Nath  
Vice Chancellor,  
Assam University Silchar*

*Atri Deshmukhya  
Co-Convenor  
Dept. of Physics, AUS, Silchar*

*Biswajit Chakraborty  
Convenor  
SNBNCBS, Kolkata*