



# Society Activity Report 2020-21

## The Physics Society

### ❖ FLAGSHIP EVENTS OF PHYSICS SOCIETY (2020-21)

#### 1) Ranjan Roy Memorial Lecture (2020-21)

Title: Measuring the Vacuum in space.

Speaker: Prof. Richard Marchand of University of Alberta

Date and Time : 17 February, 2021 || 6 P.M-7P.M

**The Physics Society**  
St. Stephen's College

**RANJAN ROY  
MEMORIAL  
LECTURE  
SERIES**

Measuring the vacuum of space  
By Dr. Richard Marchand, Department of Physics,  
University of Alberta, Canada

In orbit around Earth there is no feeling of gravity, everything looks quiet, and when astronauts, astronauts of notorious (radioactive) activity (RVA), no one can directly hear them speak or scream, because there is no air to carry sound waves. Yet, space is far from empty and quiet, as billions of a few hundreds of kilometers, Earth is surrounded by the ionosphere, a region of plasma and neutral particles escaping from the atmosphere, and beyond, in the magnetosphere where solar wind compresses our magnetic field, and stretches it far downstream. Small changes in solar wind conditions can trigger abrupt reconfiguration of the magnetosphere, and larger events such as solar flares and coronal mass ejections can impact Earth and lead to catastrophic space weather events. Even tiny events affect communication and global positioning satellites. Considerable efforts are made to understand the complex nonlinear dynamics of our ionosphere and magnetosphere, and their interaction with the solar wind, and some of the most basic requirements for that is good monitoring of parameters such as plasma density, temperature, and velocity. This has been the object of many experimental, theoretical, and recently, computational studies over the years. In this talk, I will introduce various applications used to measure space plasma parameters including some recent work made in our group, using a combination of theory, computer simulations, and regression using machine learning techniques.

**FEBRUARY 17 • 7 PM-8 PM**

physicsstephens  
physoc.ssc  
youtube link:  
<https://youtu.be/2XaXvk5ZAo4>

ST. STEPHEN'S COLLEGE  
PHYSICS SOCIETY

THE PHYSICS SOCIETY INVITES YOU TO THE

**RANJAN ROY MEMORIAL LECTURE**

**MEASURING THE VACUUM IN SPACE**  
BY  
**Prof. Richard Marchand**  
UNIVERSITY OF ALBERTA

**17th February Time 7:00 PM**

PLATFORM : Google Meet And YouTube  
YouTube link: <https://youtu.be/2XaXvk5ZAo4>

Neelam Firdous Khan:	9682603442
Binayyak Bhusan Roy :	8017587501



**Sweep voltage probe**  
(Chalaturnyk, Marchand, Frontiers in Physics, 2019)  
Use Orbital Motion Limited theory to construct a synthetic data set.  
Train an RBF regression model.  
Apply it to the thousands of points in the scatter plot generated with IRI.

*Consider all  $\frac{N!}{n!(N-n)!}$*

Scattering of ionospheric plasma made with the IRI model

Correlation plot between model And actual data from the training set

Richard Marchand

## 2) Popli Memorial Lecture Series( 2020-21)

Title: Emergent Phenomena in Condensed Matter Physics.

Speaker: Prof. Chandan Dasgupta, IISCTS

Date : 18-20 February 2021

THE PHYSICS SOCIETY  
ST. STEPHEN'S COLLEGE

**The 25th Popli Memorial Lecture Series**  
Emergent Phenomena in Condensed Matter Physics

**18, 19, 20 February**

**Prof. Chandan Dasgupta**  
Indian Institute of Science, Bangalore & International Centre for Theoretical Sciences, Bangalore

The first two lectures of the series will provide an introduction to the theoretical description of emergent phenomena, with emphasis on the physics of phase transitions in superconductors, magnetic materials and liquid crystals. The third lecture will provide an introduction to the statistical mechanics of disordered systems such as spin glass and structural glass. New concepts required for describing phase transitions in such disordered systems will be discussed and connections to problems in other areas of science, such as biology and computer science, will be pointed out.

**12: 30 PM** **Popli Memorial Lectures**

physoc.ssc physicsstephens

ST. STEPHEN'S COLLEGE  
**PHYSICS SOCIETY**  
INVITES YOU TO THE

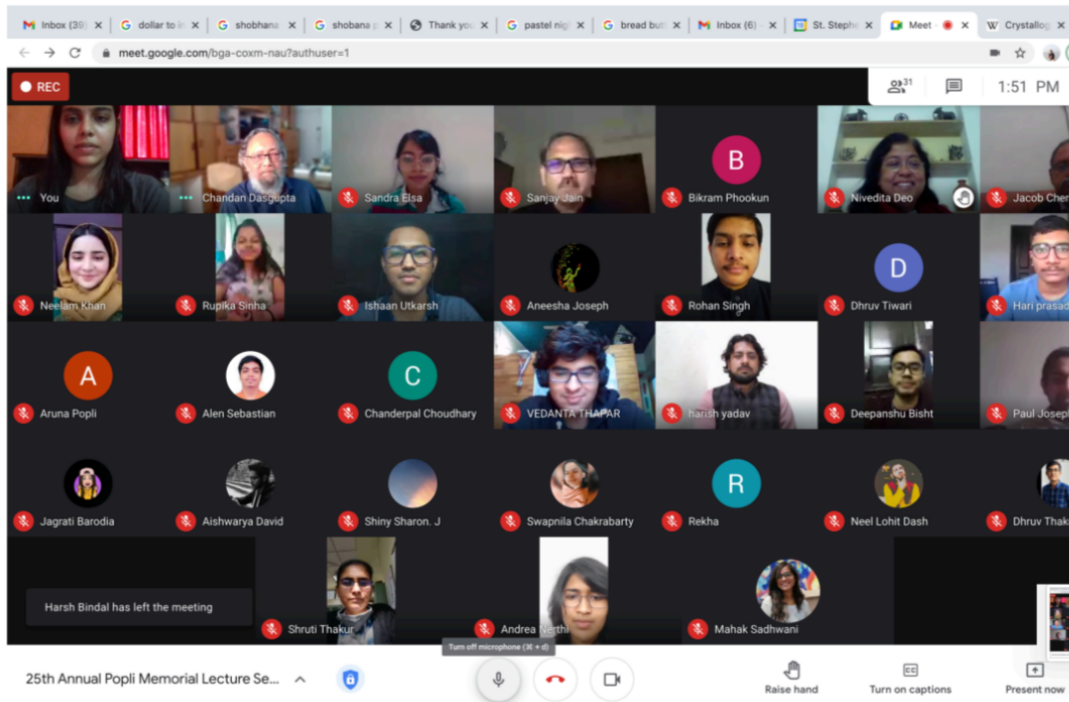
**25TH ANNUAL POPLI MEMORIAL LECTURE SERIES ON**  
Emergent Phenomena in Condensed Matter Physics  
BY  
**PROF. CHANDAN DASGUPTA**  
DEPARTMENT OF PHYSICS, INDIAN INSTITUTE OF SCIENCE, BANGALORE AND INTERNATIONAL CENTRE FOR THEORETICAL SCIENCES, BANGALORE

**18th February 19th February 20th February**

Platform : Youtube  
Time : 12.30 p.m

Youtube links:  
Day 1 : <https://youtu.be/g5CzKsYgk>  
Day 2 : [https://youtu.be/zOg\\_LGX\\_S\\_k](https://youtu.be/zOg_LGX_S_k)  
Day 3 : <https://youtu.be/shntmljVo4c>

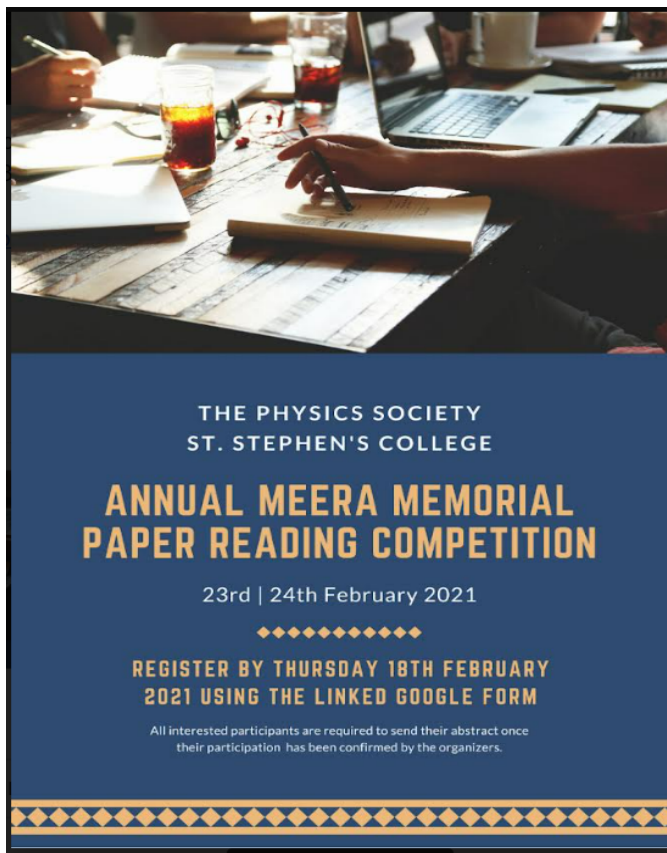
NEELAM FIRDOUS KHAN : 9882803442  
BINAYAK BHUSAN ROY - 8017587501



### 3). Meera Memorial Paper Reading Competition (2020-21)

Date: 23,24,25 February,2021

Participants: 23



### ❖ **Club sessions and talks under Physics Society**

The Society consists of three clubs, namely, the Feynman Club, Astronomy Club and Problem Solving Club. Talks under the Feynman club (called Feynman Talks) are delivered by scholars and academics in the field of Physics. Sessions in Astronomy and Problem solving Club are conducted by the student members of the society.

1. Talk 1( Feynamn's Club)  
Title : Modelling Covid-19  
Speaker : Reuel Dsouza and Binayyak Bushan Roy  
Designation: Third Year Physics students  
Date : 3rd July 2020



NAAC  
Assessment  
and  
Accreditation 2021



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# THE PHYSICS SOCIETY ST. STEPHEN'S COLLEGE

## MODELLING COVID-19

by BINA44AK AND REUEL

**MODELLING THE  
PANDEMIC ON A  
LARGE SCALE BY  
USING A MODIFIED  
SIR MODEL**

July 3 | 12:30 PM to 1:30 PM | Google Meet



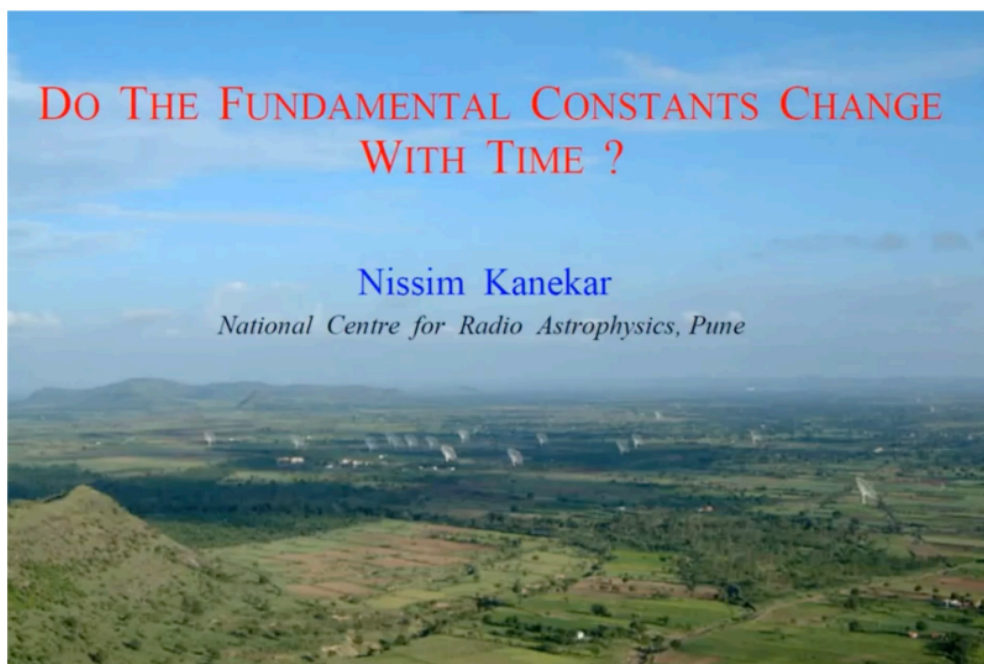
2. Talk 2 ( Feynman's Club)

Title : Do fundamental constants change with time?

Speaker : Prof. Nissim Kanekar

Designation: Professor and DST Swarnajayanti Fellow at the NCRA,  
TIFR, Pune, India.

Date : 21st August 2020



3. Talk 3 ( Feynman's Club)

Title : How close are pure states to thermal states?

Speaker : Prof. Suvrat Raju

Designation: Professor, ICTS, TIFR, Bengaluru, India.

Date : 28th August 2020



## How close are pure states to thermal states?

by

**Prof. Suvrat Raju**

ICTS, Bengaluru

**Abstract**

The microcanonical ensemble for a system in quantum mechanics is described by a density matrix. This density matrix involves entanglement between the system itself and an external bath. What if we consider a pure state of the system with the same energy, but one that is not entangled with a bath at all? A surprising fact would be described that for almost all observations, almost all such pure states are "exponentially close" to the microcanonical ensemble. The significance of this simple result would be discussed for some questions, including the black hole information paradox and broader discussions about thermalization.

**Date:** Friday, 28th August 2020.

**Online Platform:** Google Meet (Link will be shared soon.)

**Time:** 12:30 PM

#### 4. Talk 4 ( Feynman's Club)

Title : Many-body localization: Breakdown of ergodicity in quantum matter

Speaker : Prof. Arijeet Pal

Designation: Dept of Physics and Astronomy, University College,

London Date : 4th September 2019

## Many-body localization: Breakdown of ergodicity in quantum matter

by

**Prof. Arijeet Pal**

Dept. of Physics & Astronomy, University College London

**Abstract**

Thermodynamics applies to an enormous range of physical systems, from distant stars in the universe to electrons in materials on earth. The fundamental assumption that allows thermodynamics to hold is known as "ergodicity", which means that physical systems lose the memory of their initial conditions over time. Until recently, it was believed that nature is fundamentally ergodic and hence thermodynamics always applies. However, this now turns out to be wrong. A new state of matter was recently discovered which violates ergodicity and this has overturned the conventional understanding of the statistical physics of many particles. The strange nature of this novel state is encoded in subtle quantum correlations between distant particles known as "entanglement". In this talk, an overview of some of the developments in this fascinating phenomenon will be given.

**Date:** Friday, 4th September 2020.

**Online Platform:** Google Meet (Link will be shared soon.)

#### 5. Talk 5 ( Feynman's Club)

Title : Quantum Computers for Physics, Chemistry, Biology and more



Speaker : Prof. R Vijayaraghavan

Designation: Professor, TIFR.

Date : 09th October 2020






## Quantum computers for physics, chemistry, biology and more



**R. VIJAYARAGHAVAN**

Quantum Measurement and Control Laboratory  
Department of Condensed Matter Physics  
& Materials Science  
**Tata Institute of Fundamental Research  
Mumbai**





PhD students:

Suman Kundu  
Sumeru Hazra  
Kishor Salunkhe  
Anirban Bhattacharjee  
Gaurav Bothara

Alumni:

Tanay Roy

**Indian Collaborators:**  
Kedar Damle  
Sai Vinjanampathy  
Mandar Deshmukh  
Anil Shaji

Feynman Club  
St. Stephen's College, Delhi  
Oct 9, 2020

Visiting Scientists

Dr. Nicolas Gheeraert  
Dr. Madhavi Chand

Scientific Officer  
Meghan Patankar

**Intl. Collaborators**  
A. A. Clerk  
J. Aumentado  
N. Roch  
K. Murch

5th Feynman Lecture by Dr. Nissim Kanekar

6. Talk 6 ( Feynman's Club)  
Title : Fast, small - yet still in control: the mechanics of insect flight  
Speaker : Prof. Sanjay P Sane  
Designation: NCBS, TIFR, Bengaluru, India.  
Date : 06th November 2020





## **Small, fast - yet still in control: the mechanics of insect flight**

**Sanjay P. Sane**

**National Centre for Biological Sciences  
Tata Institute of Fundamental Research  
Bangalore, INDIA  
sane@ncbs.res.in**



6th Feynman Lecture by Prof. Sanjay P Sane

7. Talk 7 ( Feynman's Club)  
Title : Studying Physics in the 21st Century  
Speaker : Prof. Bikram Phookun  
Designation: Professor, St.Stephen's College, Delhi.  
Date : 08th January 2021

**Studying Physics in the 21st Century**

by

**Prof. Bikram Phookun**

Department of **Physics**, St. Stephen's College

**Abstract**

In the **21st century**, with the explosion of artificial intelligence, many human occupations are likely to be taken over by computers. What will this do to the practice of **physics**? The answer is far from clear, but a few speculations will be made in the talk, and some tentative advice will be offered on how to prepare for the new reality.

**Date:** Friday, 8th January 2021.

**Online Platform:** Google Meet (Link will be shared soon.)

**Time:** 12:30 PM

7. Talk 7 ( Feynman's Club)



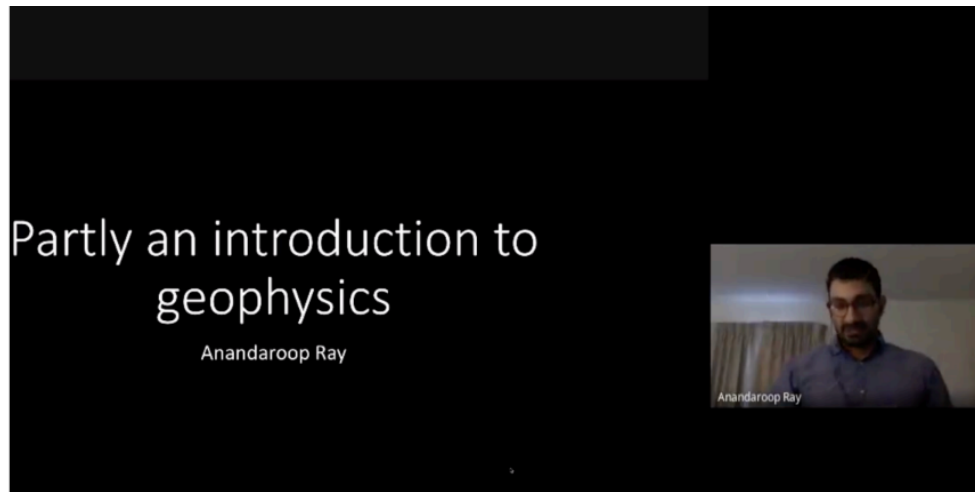


Title : Partly an introduction to geophysics

Speaker : Anandaroop Ray

Designation: Senior Geophysicist at Geoscience Australia.

Date : 12th March 2021





## ❖ Other Sessions

DATE	EVENT	TOPIC	PRESENTER
07-08-2020	Orientation	Introduction to the new verticals	Astronomy Club Executive Council
22-08-2020	Discussion	Introduction to Sky Viewing	Neel Lohit Dash
24-08-2020	Discussion	Introduction to Computational Astronomy and Data Analysis	Binayyak Bushan Roy & Neel Lohit Dash
21-08-2020	Discussion	Introduction to Radio Astronomy	Rahul Mallikarjun
09-09-2020	Discussion	N-Body Problem	Binayyak Bushan Roy
11-09-2020	Discussion: Stellar Dynamics Problem	Astronomy with Python: CSV Files	Neel Lohit Dash
12-09-2020	Data Analysis Session	HR Diagram and Color Magnitude Graphs	Neel Lohit Dash
15-09-2020	Data Analysis Session	Introduction for First Years	Neel Lohit Dash

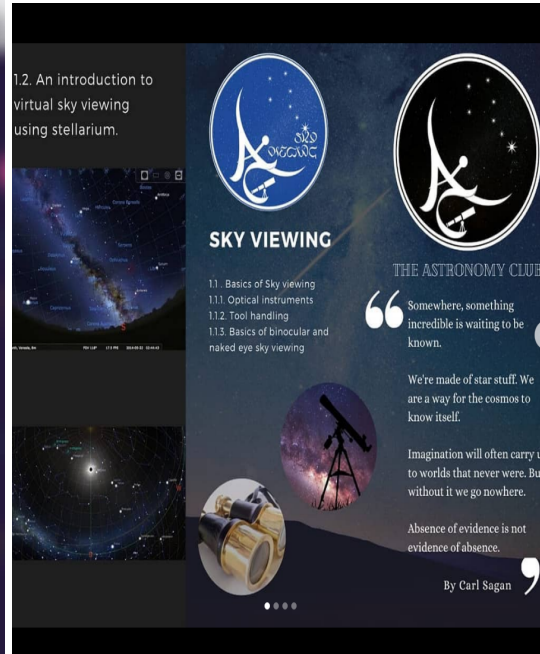


26-09-2020	Discussion: Stellar Dynamics Problem	Three-body problem	Aleena Sibi & Samuel John
03-10-2020	Discussion: Stellar Dynamics Problem	Sable orbits	Aleena Sibi & Samuel John
05-10-2020	Discussion	N-Body Problem	Binayyak Bushan Roy
19-10-2020	Discussion	N-Body Problem	Binayyak Bushan Roy
11-10-2020	Data Analysis Session	Doubt Session	Aleena Sibi & Samuel John

17-01-2021	Radio Astronomy	Simulating a Radio Antenna	Rahul Mallikarjun & Neel Lohit Dash
24-01-2021	Sky Viewing	Introduction to Sky Viewing	Chaitanya Varma
30-01-2021	Data Analysis Session	HR Diagram, Stellar Classifications, Colour Magnitude Diagram, CSV files, Wien's Law and Black-body Radiation, Spectral Types, FITS files	Neel Lohit Dash
05-02-2021	Stellar Dynamics	Introduction for First Years	SY Stellar Dynamic-members
19-02-2021	Stellar Dynamics	Precession of the Perihelion of Mercury	Neel Lohit Dash
21-02-2022	Stellar Dynamics	Basic session	SY Stellar Dynamics members
28-02-2021	Stellar Dynamics	Non-dimensionalising	Sandra Elsa Sanjai
05-03-2021	Collaboration with JRG	Type 1A Supernova as a Cosmological Probe	Binayyak Bushan Roy & Neel Lohit Dash




## Supporting Document proofs for above sessions



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1

INTRODUCTION TO

# RADIO ASTRONOMY

FRIDAY  
21st August 2020  
04:00 PM



Feynman Club-Journal Reading Group and Astronomy Club  
Presents


## TYPE IA SUPERNOVA AS COSMOLOGICAL PROBE

AND DISCUSSION ON  
LATE-TIME OBSERVATIONS OF CALCIUM-RICH  
TRANSIENT SN 2019EHK REVEAL A PURE  
RADIOACTIVE DECAY POWER SOURCE

BY  
*Binayyak Bhushan Roy*  
&  
*Neel Lokit Dash*

FRI, MARCH 05 | 12:30 PM TO 01:30 PM  
SAT, MARCH 06 | 02:00 PM TO 03:00 PM

over Google meet



## DATA ANALYSIS

FRIDAY  
15TH JANUARY 2021  
12:30 PM