“Literacy in science will enrich a person's life.” — Hans A. Bethe

Physics Department has earned the rare fame of becoming one of the oldest and largest departments of St. Xavier’s College, Kolkata. In the middle of the nineteenth century, its foundation was laid by a profound educationist and scientist Father Eugene Lafont who played a pioneering role in popularizing science in and around Kolkata. Remarkable academic contributions from some other Jesuit fathers like Fr. Verstraeten, Fr. Bonhome have enriched the department in numerous ways. Apart from the undergraduate courses (pass & honours), this department has been conducting a post-graduate course in physics since 2006. A Ph.D. programme, under the supervision of its faculty members, was initiated in the department in 2016. Since July 2018, this department has been running the B.Sc. course under the CBCS curriculum introduced by the UGC. A new choice-based syllabus for the M.Sc. course will be introduced in 2021. The faculty members of the department are highly qualified, competent and very much committed to imparting education in the best possible way. All of them have been very actively involved in research in various branches of physics and inter-disciplinary fields. They have published research articles in various prestigious journals and they have been invited to deliver lectures on their fields of study in several academic institutions.

The special papers offered by the department for the M.Sc. course in Physics are: (1) Astro-particle Physics and (2) Solid State Electronics. This course includes the teaching of sophisticated computer programming and computer interfacing using the languages of Matlab and Python.

A part of the research in astrophysics is carried out in Father Eugene Lafont Observatory (FELO) which is a twin observatory consisting of a stellar observatory with a motorized dome and a separate sliding roof observatory meant for solar observations. A social outreach initiative, named ‘Beyond the Stars’, in collaboration with the Department of Social Work and NSS was organized on 14th March, 2020 by the Xaverian Astronomical Society.

The department has a Solid-State Electronics Laboratory having many electronics based experimental units related to both analog and digital communications, fiber optics and microcontrollers. Hall effect measurements and magneto-resistance setups are also included.

The Science Academies Lecture Workshop, jointly organized by The National Academy of Sciences, The Indian National Science Academy and the Indian Academy of Sciences are held in the Department of Physics on a regular basis.

The department organizes Fr. Verstraeten Memorial lecture every year where scientists of international reputation are invited as speakers.

DEPARTMENTAL ACTIVITIES (since July 2019):

1. 7th Father Verstraeten Memorial Lecture was delivered by Prof. Raja Guha Thakurta, Chair and Professor/Astronomer, Department of Astronomy and Astrophysics UCO/Lick

Observatory of California, Santa Cruz, USA on 30th August, 2019. The topic of his lecture was "Galaxies: Dark Matter, Cannibalism, Black Holes, Gravity Waves and the Periodic Table of Elements".

2. Golden Jubilee of SXC-70 Physics Batch celebration was held on 21st January, 2020.

3. Physics Colloquium Lectures are organized on a regular basis by the department. The following lectures have been delivered since July 2019:

a. Dr. Shibaji Banerjee, Dept. of Physics, St. Xavier's College, Kolkata delivered a talk on "Dark Matter May be Strange" on 19th July, 2019.

b. Dr. Tapas K. Das, Harish-Chandra Research Institute, Allahabad delivered a talk on "Portrait of a dark face" on 9th August, 2019.

c. Dr. Rituparno Goswami, Associate Professor, School of Mathematics Statistics and Computer Science, University of KwaZulu-Natal (Westville Campus), Durban 4000, delivered a talk on "Tweedledum and Tweedledee" on 17th January, 2020.

d. Dr. Puragra Guhathakurta, Professor, Department of Astronomy and Astrophysics UCO/Lick Observatory, University of California Santa Cruz, delivered a talk on "The Andromeda Galaxy: A Testbed for Studies of Dark Matter and Galaxy Interactions" on 22nd February, 2020.

e. Dr. Oindrila Deb, Postdoctoral Researcher, Physics Department, University of Basel, Switzerland, delivered a talk on "The Birth of Topological Insulators" on 28th February, 2020.

Workshops and Faculty Development Programmes:

a) A one-day international workshop on coarse geometry was organized on 16th August, 2019 by the department of Physics in collaboration with Department of Mathematics of St. Xavier's College, Kolkata. The speaker was Dr. Atish J. Mitra of Department of Mathematics, Montana Tech (University of Montana), USA.

b) On 29th August 2019 Department of Physics conducted national workshop on "Role of DFT in predicting electronic structures and reaction pathway" in collaboration with Department of Chemistry. Prof. Swapan K. Pati of JNCASR and Dr. Anoop Ayyappan of Dept. of Chemistry, IIT Kharagpur delivered lectures in the workshop.

c) In 16th and 17th December 2019 Department of Physics along with Department of Statistics in collaboration with IUCAA centre for astronomy research and development organized a two-day national seminar on "Application of Statistics in Natural Sciences".

The invited speakers who delivered talk in the seminar were Prof. Mihir Arjunwadkar of Pune University, Prof. Saurabh Ghosh of ISI Kolkata, Prof. Supratik Pal of ISI Kolkata, Prof. Rajesh Kumble Naik of IISER Kolkata and Prof. Ayanendranath Basu of ISI Kolkata.

d) A two-day DBT sponsored Faculty Development Programme was organized on 10th and 11th January, 2020 on Experimental Physics at Graduate Level: Scopes and Challenges**.**



e) Dr. Ranjan Ray Commemoration Lecture was delivered by Dr. Ananda Dasgupta, Associate Professor, Department of Physical Sciences, IISER, Kolkata on 8th February 2020.



St. Xavier's College (Autonomous), Kolkata
Department of Physics
Presents
Dr. Ranjan Ray
Commemoration
Reminiscences
Lecture by Dr. Ananda Dasgupta
IISER Kolkata

Father Principal named the Physics computer centre as ‘Dr. Ranjan Ray lab for Computational Physics’, as a mark of respect to a legendary professor of the department, Dr. Ranjan Ray, who passed away 20 years ago.

Research Activities:

1. Samarjit Chakraborty and Sarbari Guha. *Thermodynamics of FRW universe with Chaplygin gas models, General Relativity and Gravitation*. Vol. 51, issue 11 (2019) pp. 158.

2. Sarbari Guha and Samarjit Chakraborty. *On the gravitational entropy of accelerating black holes*. International Journal of Modern Physics D, Vol. 29, No. 5 (2020) pp. 2050034.

3. Atasi Chakraborty, Arup Chakraborty, Soma Ghosh and Indra Dasgupta. *Theoretical analysis of pressure induced spin crossover phenomenon in a di-nuclear*. Fe(II) molecular complex., (2020), J. Phys. Condensed Matter, 32, 165802.

doi.org/ 10.1088/1361-648X/ab6044

4. Duyang Zang , Sujata Tarafdar , Yuri Yu. Tarasevich , Moutushi Dutta Choudhury, Tapati Dutta. *Evaporation of a Droplet: From physics to applications*. Physics Reports (2019), https://doi.org/10.1016/j.physrep.2019.01.008.

5. Ankita Ghosh, Sudeshna Sircar, Tajkera Khatun, Tapati Dutta, and Sujata Tarafdar. *Tree-like crack patterns in clay dried in a uniform DC electric field*. *Mater*. Res. Express 6 (2019) 026305

6. Sanchayan Dutta, Sugata Sen, Tajkera Khatun, Tapati Dutta and Sujata Tarafdar. *Euler Number and Percolation Threshold on a Square Lattice With Diagonal Connection Probability and Revisiting the Island-Mainland Transition*. Front. Phys. 7:61., doi: 10.3389/fphy.2019.00061 (2019)

7. Archishna Bhattacharyya, Pratyusha Nandi, Somasri Hazra and Tapati Dutta. *Memory of rheological stress in polymers using Fractional Calculus*. arXiv:2001.06620v1 [cond-mat.soft] 18 Jan 2020

8. Madhurima Pandey, Debasish Majumdar, Ashadul Halder, Shibaji Banerjee. *Mass and Life Time of Heavy Dark Matter Decaying into IceCube PeV Neutrinos*. Phys. Lett. B, 797, 134910 (DOI: 10.1016/j.physletb.2019.134910)
arXiv:1905.08662 (21 May, 2019).

9. Ashadul Halder, Shibaji Banerjee, Madhurima Pandey, Debasish Majumdar. *γ-Rays from Dark Matter Annihilation in Milky Way Satellite Galaxies: An Analysis with Particle Dark Matter Models for 45 Dwarf Spheroidals*. arXiv:1910.02322 (5 October, 2019).

10. Pabitra Mandal, Sankha Aditya and Subhankar Ghosh. *Optimization of Rare Earth (Er^{3+}) Doping Level In Lead Zinc Phosphate Glass Through Judd-Ofelt Analysis*. Mater. Chem. Phys., 2020 (18th march)

11. Pabitra Mandal, Swarup Chowdhury and Subhankar Ghosh. *Spectroscopic characterization of Er^{3+} doped Lead Zinc Phosphate Glass via Judd-Ofelt analysis*. Bull Mat Sc, 42 (2019) 99 (27th March) https://doi.org/10.1007/s12034-019-1806-4

12. Gayatri Banerjee, Souvik Das, Subhankar Ghosh. *Optical Properties of Cu2ZnSnS4 (CZTS) Made By SILAR Method*. AEM 2018, Materials Today: Proceedings 18 (2019) 494–500

13. Subhankar Ghosh. *Scientific Activities of Fr. Alphonso De Penaranda: A Jesuit Priest in the late Nineteenth Century*. Indian Journal of History of Science, 54.2 (2019) 215-217 DOI: 10.16943/ijhs/2019/v54i2/49664

14. Triloki Prasad, Subhankar Ghosh and Asis Goswami. *Walking Pattern Of Sighted Volunteers With Open Eye And Closed Eye Conditions*. JODYS, July 2019

15. Triloki Prasad, Shaunak Guha, Koyena Bose, Subhankar Ghosh and Asis Goswami, *Arduino based Randomized Audio Source Generator for testing Spatial Orientation Ability of Visually Impaired Persons*, International Journal of Advanced and Innovative Research, Vol 8, Issue 5, May 2019.

16. Dr. Subhankar Ghosh has obtained a **Design Patent** (GOI): dated 15.05.2019, No. 305795 for "Audio game Set for the Visually Challenged" in collaboration with RKMVERI, Belur Math.

Webinars Organized by the Department of Physics:

a) On 14th August 2020, Dr. Sayan Basu of University of Pretoria and SARAO, South Africa, delivered an online talk on the topic entitled "*A Slice of Heavens – Rising Above the Pandemic*". It was followed by a students' presentation organized by Xaverian Astronomical Society.

b) On 30th September 2020, Dr. Srubabati Goswami, FNA, Senior Professor at Theoretical Physics Division, Physical Research Laboratory (PRL), India, delivered an online talk in the National Webinar organized by the department on the topic entitled "*Neutrinos: From Impossible Dreams to Unreachable Stars*".

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