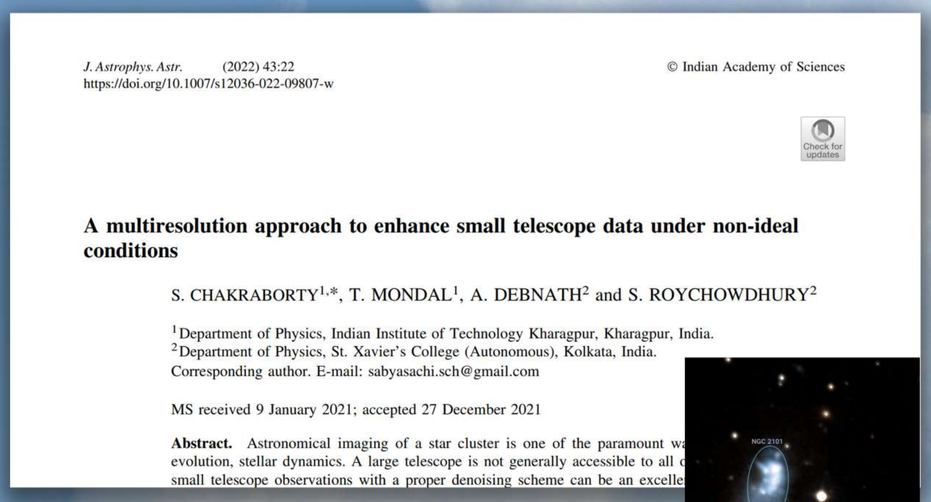
Astroparticle Physics in St. Xavier's College (Autonomous), Kolkata

NAAC Accredited A++ Ranked 8TH in NIRF 2022 under "College" Category College of Excellence; ISO 9001:2015

Postgraduate and Research Department of Physics

A multiresolution approach to enhance small telescope data under non-ideal conditions

Astronomical imaging with a large telescope is not readily accessible to all observers. Small telescope observations with an appropriate denoising scheme can be an efficacious choice. In such circumstances, under the guidance of Dr Suparna Roychowdhury, two M.Sc students of the Dept Of Physics 2018 batch— S. Chakraborty and T. Mondal —started their Master's project at Fr. Eugene Lafont observatory, St. Xavier's College, Kolkata. This research was extended beyond the Master's project work, and another student Arunothpol Debnath (B.Tech, RCC IIT) joined them to bolster the research with multiresolution analysis. Together, they captured NGC 2301 star cluster across five nights and proposed the HNSTD technique to enhance star cluster data utilising wavelet transform. The HNSTD scheme yielded a significant increment in the number of detected stars over the images processed by conventional methods. This work got published on April 2022 at J Astrophys Astron 43, 22 (2022)(https://doi.org/10.1007/s12036-022-09807-w).



J. Astrophys. Astr. (2022) 43:22 © Indian Academy of Sciences
https://doi.org/10.1007/s12036-022-09807-w

A multiresolution approach to enhance small telescope data under non-ideal conditions

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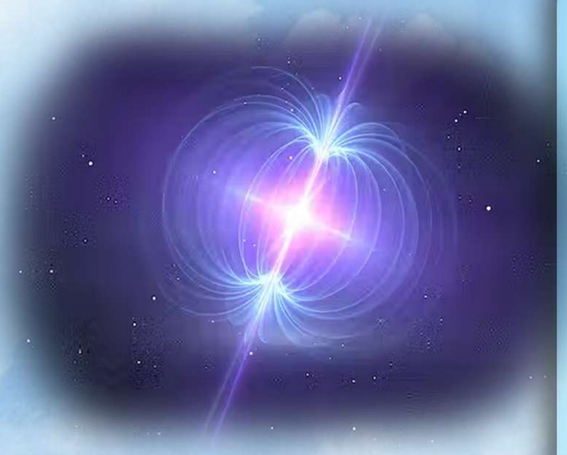
Abstract. Astronomical imaging of a star cluster is one of the paramount wa
evolution, stellar dynamics. A large telescope is not generally accessible to all o
small telescope observations with a proper denoising scheme can be an excelle



Recent Publications

Chandrasekhar limit for rotating quark stars
Ashadul Halder, Shibaji Banerjee, Sanjay K. Ghosh, Sibaji Raha
Phys.Rev.C **103** (2021) 3, 035806

Bounds on abundance of primordial black hole and dark matter from EDGES 21-cm signal
Ashadul Halder, Shibaji Banerjee
Phys.Rev.D **103** (2021) 6, 063044

Addressing γ-ray emissions from dark matter annihilations in 45 milky way satellite galaxies and in extra-galactic sources with particle dark matter models
Ashadul Halder, Shibaji Banerjee, Madhurima Pandey, Debasish Majumdar
Mon.Not.Roy.Astron.Soc. **500** (2020) 4, 5589-5602

Bounds on dark matter annihilation cross-sections from inert doublet model in the context of 21-cm cosmology of dark ages
Rupa Basu, Madhurima Pandey, Debasish Majumdar, **Shibaji Banerjee**
Int.J.Mod.Phys.A **36** (2021) 23, 2150163

Beyond-Newtonian dynamics of a planar circular restricted three-body problem with Kerr-like primaries
Shounak De, Suparna Roychowdhury, Roopkatha Banerjee
Mon.Not.Roy.Astron.Soc. **501** (2021) 713-129

A multiresolution approach to enhance small telescope data under non-ideal conditions
S. Chakraborty, T. Mondal, A. Debnath, **Suparna Roychowdhury**
J.Astrophys. Astr. **43** (2022) 22

Propagation of axial and polar gravitational waves in Kantowski–Sachs universe
Sucheta Datta, Sarbari Guha
Phys.Dark Univ. **34** (2021), 100890

Dynamical conditions and causal transport of dissipative spherical collapse in *f(R,T)* gravity
Sarbari Guha, Uttaran Ghosh
Eur.Phys.J.Plus **136** (2021) 4, 460

Density Perturbation and Cosmological Evolution in the Presence of Magnetic Field in fR Gravity Models
Samarjit Chakraborty, Sarbari Guha
Adv.High Energy Phys. **2022** (2022), 5195251

Mesuring the height of the lunar mountains

Height of any mountain can be measured using simple trigonometry. In 2016, few M.Sc. (physics) students of St. Xavier's College (Autonomous), Kolkata measured the heights of few significant lunar mountains (*e.g.* Montes Apenninus, Montes Alpes etc.) under the supervisions of **Dr. Shibaji Banerjee, Dr. Suparna Roychowdhury** and **Mr. Bappaditya Manna**.

CSIR Major Research Project: "Universal thermodynamics in modified theories of gravity"
Dr. Sarbari Guha

On the gravitational entropy of accelerating black holes
Sarbari Guha, Samarjit Chakraborty
Int. J. Mod. Phys. D **29** (2020) 2050034

How appropriate are the gravitational entropy proposals for traversable wormholes?
Samarjit Chakraborty, Sarbari Guha, Rituparno Goswami
Gen.Rel.Grav. **54** (2022) 5, 47

An investigation on gravitational entropy of cosmological models
Samarjit Chakraborty, Sarbari Guha, Rituparno Goswami
Int. J. Mod. Phys. D **30** (2021) 2150051

Thermodynamics of FRW Universe With Chaplygin Gas Models
Samarjit Chakraborty, Sarbari Guha
Gen.Rel.Grav. **51** (2019)158

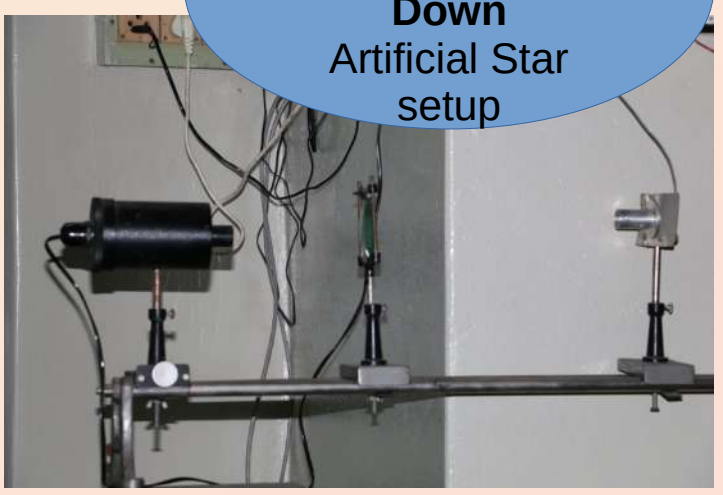
Evolution of FRW universe in variable modified Chaplygin gas model
Samarjit Chakraborty, Sarbari Guha, D. Panigrahi
*arXiv:***1906.12185** [gr-qc] 27 Jun 2019

A Lab under the Sky

Father Eugene Lafont Observatory, Housed on the roof of SXC houses a 14” Celestron CGE Pro within a large motorized semicircular dome.

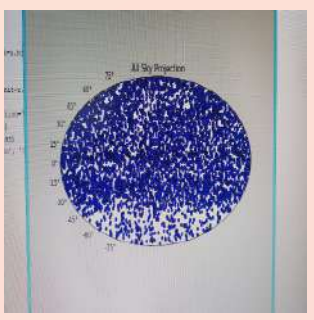
Telescope being trained for nightly observations .

Up
Solar constant measurement
Down
Artificial Star setup



The lab continued service in the Lockdown period

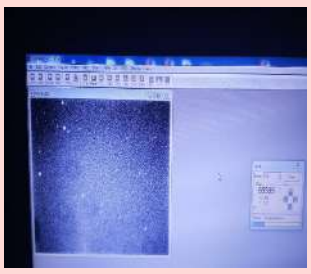
Examining the new photometer attachment for the telescope



Remote classes Aries, Nainital

Remote classes JESCOL, Bangalore

Students use the RRCC for receiving lab Instructions, Image / Data Analysis and Computing for Astrophysics.



St. Xavier's College Reaches Out to You
(Outreach Programme)

Objectives:

- *Public outreach programmes for school students from rural areas to introduce them to the basics of astronomy by visiting them as well as inviting them to St. Xavier's College to get a hands to experience of using a telescope in the observatory*
- *To increase the interest of students in astronomy and astrophysics from their childhood ages*
- *To bring the opportunity for people to connect with the fascinating world of astronomy*

1. *Solar Observation Programme at FELO, 2020*

2.School Visit Programme (For Students & Teachers) at FELO on 20 June, 2019

3. PRAYAS Camp on 19-21 June, 2016

4.Outreach Programme of Xaverian Astronomical Society on March, 2020

Activities

- *Night Sky Observation & Stargazing sessions*
- *Lectures on interesting Astronomical topics*
- *Model making sessions*
- *Observations of different celestial events*