

Barnali Das

Indian Institute of Science Education and Research (IISER) Kolkata
West Bengal, INDIA, 741246
(+91) 9437942080

bd18ms201@iiserkol.ac.in
mimi.barnali.00@gmail.com
<https://students.iiserkol.ac.in/~bd18ms201/>



RESEARCH INTERESTS

My current research is focused on **Galaxy Formation and Evolution**, especially its applications to **Cosmology**. (During my BS-MS Dual Degree, I proactively applied for and was awarded with two scholarships to carry out three research projects, including projects in the field of pulsar using radio data from GMRT.)

ACADEMIC BACKGROUND

INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH (IISER) Kolkata, India	BS-MS DUAL DEGREE (Physics Major)	SGPA: 9.5/10 (CGPA: 8.23/10)
	Year: Fifth Duration: Aug 2018 - Jun 2023	(I have obtained A+ or A grades in 26 of my courses, including A+ in Advanced Mathematical Methods of Physics and Computational Physics and A in Fluid and Magneto- hydrodynamics and Quantum Mechanics)

PEER REVIEWED PUBLICATIONS

Indirect imprints of primordial non-Gaussianity on cosmic microwave background Das, B.; Ragavendra, H.V.	arXiv:2304.05941 [astro-ph.CO] submitted to <i>Phys. Rev. D</i> and under review
Demonstration of Bomb Detection Using the IBM Quantum Computer Raj, A.; Das, B.; Behera, B. K.; Panigrahi, P. K.	doi: 10.20944/preprints201902.0232.v1

AWARDS AND FELLOWSHIPS

2019 & 2021	Awarded the “National Initiative on Undergraduate Science” (NIUS) scholarship , that funded my participation in research projects (mentioned in section below).
2019	Awarded the “Undergraduate Associateship” (UGA) scholarship program at Saha Institute of Nuclear Physics, India, that fully funded my participation in the research project (mentioned in section below).
2020	Selected for the International Asteroid Search Campaign.
2020	Selected in “National Anveshika Experimental Skills Test” (NAEST) prelims.
2015	Selected among top 20 students of Odisha state in India, in YATS (Young Astronomer Talent Search) program in 2014, organised by “TATA STEEL” in collaboration with “Pathani Samanta Planetarium”, Bhubaneswar, Odisha, India. As a prize I was allowed a visit of 2 days to the Space Application Centre of Indian Space Research Organization (ISRO) in Ahmedabad.

RESEARCH PROJECTS

Duration	Project	Professor	Outcome
Jul 2022 - Ongoing	<u>Study of primordial perturbations, non-Gaussianity and their observational effects</u> I am studying models of inflation, perturbations in fields generated due to them and non-Gaussianity associated with them.	<u>Dr. Koushik Dutta & Dr. H.V. Ragavendra</u> (IISER Kolkata & Raman Research Institute, India)	1. Codes in Cosmology: https://github.com/mimi_barnali00/Cosmology 2. See section “Peer Reviewed Publications”
Aug 2022 - Nov 2022	<u>Primordial Gravity waves</u> I studied the properties of primordial gravity waves.	<u>Prof. Rajesh Kumble Nayak</u> (IISER Kolkata, India)	Independent Study Report
Jun - Jul 2021	<u>Study of properties of Millisecond Pulsars</u> I determined the binary period and its relation to the mass of the pulsar’s companion star and the eccentricity of its orbit for a sample of 200+ millisecond pulsars available in ATNF pulsar catalogue. (Funded by NIUS)	<u>Dr. Bhaswati Bhattacharyya</u> (National Centre for Radio Astrophysics, India)	Report on “ Study of the Pulsars Discovered with the GMRT High Resolution Southern Sky Survey-II ”

Dec 2019	<u>Identifying Pulsar signals from the GMRT telescope's raw data</u> I used the "PRESTO" software to detect pulsar signals from GMRT radio data. (Funded by NIUS)	<u>Dr. Bhaswati Bhattacharyya</u> (National Centre for Radio Astrophysics, India)	Report on " Study of the Pulsars Discovered with the GMRT High Resolution Southern Sky Survey "
Dec 2018 - Feb 2019	<u>Quantum Bomb detection</u> I investigated the regime of interaction free measurement in quantum physics, applied to the scenario of bomb detection.	<u>Prof. Prasanta K. Panigrahi</u> (IISER Kolkata, India)	See section "Peer Reviewed Publications"
Jul 2019	<u>Literature-review project in Astro-particle Physics</u> I covered the basics of particle physics, classical and quantum field theory. (Funded by UGA)	<u>Prof. Ambar Ghosal</u> (Saha Institute of Nuclear Physics, India)	
May 2019	<u>Determining properties of microplastics</u> I studied the effect of microplastics on the environment, especially their attractive/repulsive behaviour in the presence of nanoparticles of silver and copper compounds in various types of water.	<u>Dr. Gopala Krishna Darbha</u> (IISER Kolkata, India)	

OTHER PROJECTS

Duration	Work experience	Program
Ongoing	I am analysing galaxy images at different wavelengths using the NASA sky view platform.	"RAD@home citizen-science research" by Prof. Ananda Hota (University of Mumbai - Department of Atomic Energy, Centre for Excellence in Basic Sciences)
Ongoing	I am analysing multiband galaxy images from the Subaru HSC survey.	"Citizen Science with Pune Knowledge Cluster"
Jun 2020	Asteroid Search Camp wherein I observed near-Earth objects and Main Belt asteroids by analysing ".FITS" images from Pan-STARRS using "Astrometrica" software.	International Astronomical Search Collaboration
Sep 2018	I used MATLAB to analyse the rotation curve of the Milky way and to research concepts of Dark Matter and modified Newtonian dynamics.	Observational Astronomy Workshop by Prof. Nirupam Roy (Indian Institute of Science) in National Students' Space Challenge organised by Indian Institute of Technology Kharagpur

SKILLS AND EXPERIENCE

IT Skills	<p>Languages: Python, Matlab, Fortran (Basic), HTML, Mathematica;</p> <p>OS/Applications: Windows, Linux, LATEX, MS-office;</p> <p>Softwares: PRESTO, Origin Pro, Astrometrica, CAMB, COSMOMC;</p> <p>Machine Learning: quadratic classifiers, PCA (Principal component analysis), LDA (Linear discriminant analysis), kPCA (Kernel Principal component analysis), KNN (K-nearest neighbors), K-means clustering, Cross validation and Bootstrap resampling methods</p>
Teaching Experience	<p>Teaching Assistant at IISER Kolkata for:</p> <ol style="list-style-type: none"> "General Theory of Relativity and Cosmology" (a 4th year BS-MS course with 60 students) "Waves and Optics" (a 2nd year BS-MS course with 200+ students) "Mathematical Methods of Physics" (a 3rd year BS-MS course with 80 students). <p>Hired by "Chegg" to be a Tutor/Expert to teach physics to international students.</p>
Leadership Experience	<p>I was a part of the logistics team of the 32nd meeting of Indian Association for General Relativity and Gravitation (IAGRG) which hosted 325 participants.</p> <p>Organized the "Utkal Divas 2021" event at IISER Kolkata for a 300+ audience.</p> <p>I was in the organizing team of the "Ek pehal Anniversary 2020" event at IISER Kolkata for 350+ spectators.</p>
Communication	I am fluent in English, Hindi, Odia and have a good knowledge of Bengali.

SEMINARS PRESENTED

- 2022 “Some Inflationary models and their ‘Potentials’” in front of research group members in IISER Kolkata, India.
- 2022 “Basics of Inflationary Cosmology” in front of research group members in IISER Kolkata, India.
- 2021 “Period of binary and Mass of the companion relation of Binary Pulsars” in front of research group members in the National Centre for Radio Astrophysics, India.
- 2021 “Aitoff plot for various characteristics of Binary Millisecond Pulsars” in front of research group members in the National Centre for Radio Astrophysics, India.
- 2021 “Pulsar timing” in front of research group members in the National Centre for Radio Astrophysics, India.
- 2021 “Millisecond Pulsars” in front of research group members in the National Centre for Radio Astrophysics, India.
- 2021 “Astronomy Paper Seminal Participation Guide and Reading Walkthrough” in front of research group members in the National Centre for Radio Astrophysics.

SCIENTIFIC OUTREACH

- I am one of the authors of IISER Kolkata’s multilingual science communication monthly magazine “Cogito137: The Thought Capsule”.
- I have a science blogging website “<https://vigyanaparichaya.wixsite.com/vigyanaparichaya>” in Odia and English and its youtube channel “<https://www.youtube.com/channel/UC7drnNHdxAhkUJcYPF3Q4pA>”.
- I am a volunteer in “Ek pehal” which is an initiative by IISER Kolkata to provide free education (in Science, English and Maths) to underprivileged young students. I also participate in the monthly outreach activities which includes demonstrating science experiments to high school kids to motivate them towards pursuing science.
- I have been a part of the social media scientific outreach team of the National Space Science Symposium (NSSS) 2022 conference.

INTERNATIONAL ASSOCIATIONS

I am a member of the “Supernova Foundation”, an International mentoring organisation, wherein I interact with more senior scientists and participate in webinars on career development.

CONFERENCES ATTENDED

- 2023 In-person workshop on the Less Travelled Path to the Dark Universe, hosted by International Center for Theoretical Sciences, India.
- 2022 The 10th KIAS Workshop on Cosmology and Structure Formation, hosted by Korea Institute for Advanced Study, Seoul, Korea.
- 2022 32nd meeting of Indian Association for General Relativity and Gravitation, hosted by IISER Kolkata, India.
- 2022 An Inaugural Conference on Current Status of Cosmology, organised by The Thanu Padmanabhan Center for Cosmology and Science Popularization (CCSP), SGT University, Delhi, India.
- 2022 The 21st National Space Science Symposium (NSSS), hosted by Center of Excellence in Space Sciences India (CESSI) and IISER Kolkata, India.
- 2019 The National Initiative on Undergraduate Science (NIUS Physics) 16.1 camp initiated by Homi Bhabha Centre for Science Education (HBCSE), Tata Institute of Fundamental Research (TIFR), India.
- 2018 The National Students' Space Challenge initiated by Indian Institute of Technology (IIT), Kharagpur, India.

REFERENCES

Dr. Koushik Dutta
Associate Professor
IISER Kolkata, India
koushik@iiserkol.ac.in

Prof. Prasanta K. Panigrahi
Director, Professor
IISER Kolkata, India
pprasanta@iiserkol.ac.in

Dr. Bhaswati Bhattacharyya
Reader-F
National Centre for Radio
Astrophysics, India
bhaswati@ncra.tifr.res.in