

Bishal Das

THEORETICAL PHYSICS | EARLY-UNIVERSE COSMOLOGY & GRAVITATION

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RESEARCH PROFILE

Theoretical-physics graduate with two MSc degrees and postgraduate training in gravitation, cosmology, and quantum field theory. My MSc research at the University of Nottingham examined single-field inflation, primordial scalar and tensor fluctuations, Mukhanov-Sasaki dynamics, and their connection with CMB observables. My current interests centre on early-Universe cosmology and quantum field theory in curved spacetime, particularly post-inflationary dynamics, particle production, and reheating.

RESEARCH INTERESTS

Early-Universe Cosmology | Cosmic Inflation | QFT in Curved Spacetime | Cosmological Perturbation Theory | Reheating and Particle Production | Gravitation

EDUCATION

MSc Gravity, Particles and Fields University of Nottingham, United Kingdom	2022-2024
MSc Physics The Assam Royal Global University, India	2017-2019
BSc Physics, Mathematics and Computer Science Gauhati University, India	2014-2017

RESEARCH EXPERIENCE

MSc Research Dissertation University of Nottingham <i>Cosmic Inflation: Background Dynamics and Quantum Fluctuations</i> Supervisor: Dr Swagat S. Mishra	2023
- Studied single-field slow-roll inflation and scalar-field dynamics in spatially flat FLRW spacetime. - Analysed quadratic, monomial, Starobinsky, and KKLT-type inflationary potentials through their slow-roll evolution. - Developed scalar and tensor perturbations in Fourier space using the Mukhanov-Sasaki formalism and Bunch-Davies initial conditions. - Worked with power spectra, spectral indices, horizon exit and freeze-out, and the tensor-to-scalar ratio. - Compared model predictions with Planck and BICEP/Keck observational constraints.	
MSc Physics Research Project The Assam Royal Global University <i>A Study of the Cosmic Singularity based on Hawking Radiation</i>	2018-2019
- Investigated spacetime singularities in the context of black-hole evaporation and Hawking radiation. - Examined possible implications for cosmic evolution and singularity theorems.	

TECHNICAL SKILLS

THEORETICAL METHODS	FLRW and Friedmann dynamics; scalar-field dynamics; slow-roll formalism; cosmological perturbation theory; Fourier methods.
PERTURBATIONS	Mukhanov-Sasaki formalism; Bunch-Davies initial conditions; scalar and tensor power spectra; spectral indices; tensor-to-scalar ratio.
PROGRAMMING	Python - scientific computation, numerical problem-solving, and basic data visualisation.
TYPESETTING	LaTeX.

DOCTORAL RESEARCH DIRECTION

Building on my MSc work on primordial quantum fluctuations, I am interested in how quantum fields evolve as the quasi-de Sitter inflationary phase ends. My intended doctoral direction focuses on particle production, inflaton energy transfer, and reheating in curved cosmological spacetime, together with how post-inflationary history affects observable early-Universe predictions.

SELECTED RESEARCH OUTPUT

B. Das | Multiversal Temporal Field Theory I: Time as a Dynamical Field 2026
Independent research manuscript / Zenodo preprint.
DOI: 10.5281/zenodo.18240343

AWARDS AND DISTINCTIONS

The OSA Best Student Paper Award | International Year of Light, IIT Guwahati 2015
Thematic-category award for the poster presentation "Beyond Black Hole and Cosmic Singularity".
Anundoram Borooah Award 2011
Awarded for excellence in Matriculation.

TEACHING AND ACADEMIC EXPERIENCE

Physics Lecturer Brahmaputra Valley Academy - Dream50, Chaygaon, Assam, India	Jan 2025-Present
Post Graduate Teacher (PGT) Physics St. Xaviers Public School, Bongaigaon, Assam, India	Aug 2024-May 2025
Physics Lecturer Protocol, Nottingham, United Kingdom	Sep 2023-Jan 2024
Cover Teacher in Physics SAAF Education, Nottingham, United Kingdom	May 2023-Sep 2023
Academic Specialist in Physics BYJU'S, Bengaluru, India	Dec 2021-May 2022
Post Graduate Teacher (PGT) Physics Modern Public Academy, Guwahati, India	Oct 2020-Dec 2021

ADDITIONAL TRAINING

NASA Transform to Open Science (TOPS) Open Science Essentials Foundations of open science, research accessibility, and reproducible scholarly practice.	Completed 18 Aug 2026
NASA Transform to Open Science (TOPS) Open Science 101 Course completed.	Completed 23 Aug 2026
Certificate in Python Programming Scientific computation, numerical problem-solving, and basic data visualisation.	2022
Postgraduate Diploma in Computer Application (PGDCA) Eduskills Computer Education One-year postgraduate diploma in computer applications.	2017-2018

LANGUAGES

English | Bengali | Assamese | Hindi