Mayukh Raj Gangopadhyay (Ph.D.)

Contact

The Thanu Padmanabhan
Centre For Cosmology and Science Popularization,
SGT University, Gurugram,
Gurugram 122505, Haryana India

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Research Interests

- **Cosmology:** Cosmic inflation and reheating, String Cosmology, Primordial Blackholes, Dark Matter, Dark Energy, Gravity Wave, Big bang nucleosynthesis, Cosmic microwave background,
- **High Energy Physics:** Extensions of Standard Model of Particle Physics.

Current Position

Assistant Professor (Senior Grade)(Inspire)
The Thanu Padmanabhan Centre For Cosmology and Science Popularization (CCSP), SGT University, Gurugram, India.

Previous Position

DST- INSPIRE Faculty
The Centre For Theoretical Physics, Jamia Millia Islamia, New Delhi (April, 2019- March, 2022).

Postdoctoral Experience

Research Associate
Theory Division, Saha Institute of Nuclear Physics (June,2017 - March,2019).

Education

University of Notre Dame du Lac, Notre Dame, IN, USA

Ph.D.,Physics, May, 2017

- **Thesis Title:** *"Constraints on Inflation and origin of Space-time"*
- **Thesis Advisor:** Prof. Grant J. Mathews, Ph.D.
- **Advanced Curriculum:** Phenomenology of Particle Physics, General Theory of Relativity, Quantum Field Theory I , Quantum Field theory II, Advanced Cosmology.
- **GPA:** 3.5/4.0

University of Calcutta, Kolkata, India

M.Sc., Physics, August 2009

- **Project Topic:** *"Study of Quantum Computation and Quantum Cryptography"*
- **Advisor:** Prof. Anirban Kundu, Ph.D.

- **Advanced Curriculum:** Quantum Field Theory I, Particle Physics, Astrophysics.
- **CGPA:** 4.86/6,

Presidency College, Kolkata, India

B.Sc., Physics (Major), Mathematics, Statistics (Minor) May 2007

Other Academic Positions

Visiting Researcher January 2010 to June 2010
University of Kolkata ,
Topic: "Study of singlet Higgs couplings and its decay modes at LHC."
Project Supervisor: Prof. Anirban Kundu.

Awards & Achievements

1. Associateship from **Indian Academy of Sciences**, Bangalore, 2022.
2. Associateship from **IUCAA**, Pune, India, 2022.
3. DST- INSPIRE Faculty Award for July, 2018 Application Batch from **Department of Science and Technology**, Govt. Of India.
4. **USA Department of Energy** summer fellowship for 2015, 2016.
5. Selected and awarded to attain summer school on " Mathematical General Relativity" by **MSRI, University of California, Berkeley, USA**, 2012.

Journal Publications

1. S. Basak, S. Bhattacharya,**M. R. Gangopadhyay**, N. Jaman, R. Rangarajan, M. Sami,
The paradigm of warm quintessential inflation and spontaneous baryogenesis
JCAP 03 (2022) 03, 063, [arXiv: 2110.00607 [astro-ph.CO]]

2. S. A. Adil,**M. R. Gangopadhyay**, M. Sami, M. K. Sharma,
Late time acceleration due to generic modification of gravity and Hubble tension
Phys. Rev. D 104 (2021) 10, 103534, [arXiv:2106.03093v2 [astro-ph.CO]]

3. S.Bhattacharya, S. Das, K. Dutta, **M. R. Gangopadhyay**, R. Mahanta, A. Maharana,
"Non-thermal Hot Dark Matter from Inflaton/Moduli Decay: The Momentum Distribution

and Relaxing the Cosmological Mass Bound"
Phys. Rev. D 103 (2021) 6, 063503, [arXiv: 2009.05987 [astro-ph.CO]]

4. **M. R. Gangopadhyay**, S. Myrzakul, M. Sami and M. K. Sharma,
"A paradigm of warm quintessential inflation and production of relic gravity waves"
Phys. Rev. D 103, 043505, arXiv:2011.09155 [astro-ph.CO].

5. S.Bhattacharya, K. Dutta, **M. R. Gangopadhyay**, A. Maharana, K. Singh,
"Fibre Inflation and Precision CMB Data"
Phys. Rev. D 102 (2020) 123531, [arXiv: 2003.05969 [astro-ph.CO]]

6. S.Bhattacharya, K. Das, **M. R. Gangopadhyay**,
"Probing the era of reheating for reconstructed inflationary potential in the RS II braneworld"
Class. Quant. Grav.**37** (2020) 21, 215009, [arXiv: 1908.02542 [astro-ph.CO]].

7. R. Adhikari, **M. R. Gangopadhyay**, Yogesh,
"Power Law Plateau Inflation Potential In The RS II Braneworld Evading Swampland Conjecture"
Eur. Phys. J. C80 (2020) 9, 899, [arXiv: 2002.07061 [astro-ph.CO]].

8. E. O. Pozdeeva, **M. R. Gangopadhyay**, M. Sami,A. V. Toporensky, S. Y. Vernov,
"Inflation with a quartic potential in the framework of Einstein-Gauss-Bonnet gravity "
Phys. Rev. D102 (2020) no.4, 043525, [arXiv: 2006.08027 [gr-qc].

9. R. Adhikari, **M. R. Gangopadhyay**, Yogesh,
"Lower tensor to scalar ratio in a SUGRA motivated inflationary potential"
Gravit. Cosmol. 28, 1 (2022), [arXiv: 1909.07217 [astro-ph.CO]]

10. S.Bhattacharya, **M. R. Gangopadhyay**.
"A study in non-canonical domain of Goldstone inflation."
Phys. Rev. D101 (2020) 2, 023509 [arXiv: 1812.08141].

11. **M. R. Gangopadhyay**, G. J. Mathews, P. Olsen,
" Thermodynamic potential for quark-gluon plasma with finite quark masses

and chemical potential ",
J. Phys. Comm. 4 (2020) 2, 025004, [arXiv: 1710.11072].

12. **M. R. Gangopadhyay**, G. J. Mathews, K. Ichiki, T. Kajino,
"Explaining low-l Anomalies in the CMB Power Spectrum with Resonant
Superstring Excitations during Inflation."
Eur. Phys. J. C 78 (2018) 9, 733, [arXiv:1701.00577].

13. S. Bhattacharya, K. Dutta, **M. R. Gangopadhyay**, A. Maharana.
"Confronting Kähler moduli inflation with CMB data."
Phys. Rev. D 97 (2018) 123533, [arXiv:1711.04807].

14. **M. R. Gangopadhyay**, G. J. Mathews.
"Constraints on Brane-world inflation from the CMB power spectrum: revisited."
JCAP 1803(2018) no.03, 028, [arXiv:1611.05123].

15. M. Bastero-Gil, S. Bhattacharya, K. Dutta, **M. R. Gangopadhyay**.
"Constraining warm inflation with CMB Data."
JCAP 1802(2018) no.02, 054, [arXiv:1710.10008].

16. N. Sasankan,, **M. R. Gangopadhyay**, G. J. Mathews, M. Kusakabe.
"Limits on Brane-world and Particle dark radiation from Big Bang Nucleosynthesis and the CMB."
Int. J. Mod. Phys. E Vol. 26, No. 7 (2017), [arXiv:1706.03630].

17. N. Sasankan, **M. R. Gangopadhyay**, G. J. Mathews, M. Kusakabe.
"New observational limits to the dark radiation in brane cosmology."
Phys. Rev. D 95,083516 (2017), [arXiv:1607.06858].

18. G. J. Mathews, **M. R. Gangopadhyay**, P. Garnavich , B. Rose , K. Ichiki, T. Kajino, D. Yamazaki.
"Constraints on the birth of the universe and origin of cosmic 'Dark' flow."
Int. J. Mod. Phys. A 30 1545022 (2015), [arXiv:1508.01214].

19. G. J. Mathews, **M. R. Gangopadhyay**, K. Ichiki, T. Kajino.
"Possible evidence for Planck-scale resonant particle production during
inflation from the CMB power spectrum."

Phys. Rev. D 92, 123519 (2015), [arXiv:1504.06913].

Manuscript Communicated

1. **M. R. Gangopadhyay**, J. C. Jain, D. Sharma and Yogesh,
"Production of Primordial Black Holes via Single Field Inflation and Observational Constraints,"
In communication with Eur. Phys. J. C., [arXiv:2108.13839 [astro-ph.CO]].

2. **M. R. Gangopadhyay**, H. A. Khan, Yogesh,
"A Case Study of Small Field Inflationary Dynamics in the Einstein-Gauss Bonnet Framework in the Light of GW170817"
In communication with Eur. Phys. J. C. [arXiv: 2205.15261 [astro-ph.CO]]

3. **M. R. Gangopadhyay**, N. Kumar, A. Mukherjee, M. K.Sharma,
"Composite pseudo Nambu Goldstone Quintessence"
In communication with Physics Letters B [arXiv: 2205.15249 [astro-ph.CO]]

4. M. Correa, **M. R. Gangopadhyay**, N. Jaman, G. Mathews,
"Primordial Black-Hole Dark Matter via Warm Natural Inflation
In communication with Physics Letters B [arXiv: 2207. 10394 [gr-qc]].

Conference Proceedings

1. G. J. Mathews, **M. R. Gangopadhyay**, K. Ichiki, T. Kajino.
"Evidence for Planck-scale resonant particle production during inflation from the CMB power spectrum."
Fourteenth Marcel Grossmann Proceedings, [arXiv:1604.03174].

2. G. J. Mathews, **M. R. Gangopadhyay**, N. Sasankan, T. Kajino.
"Big Bang Nucleosynthesis, the CMB, and the origin of matter and space-time."
AIP Conf. Proceedings, OMEG17, [arXiv:1711.04873].

3. G. J. Mathews, M. Kusakabe, **M. R. Gangopadhyay**, T. Kajino, N. Sasankan.
"Primordial nucleosynthesis: constraints on birth of the universe."
EPJ Web Conf. 184(2018) 01011.

4. S. Bhattacharya and **M. R. Gangopadhyay**,
"Goldstone Inflation in Non-canonical Settings,"
Springer Proc. Phys. **261**, 343-349 (2021)

5. **M. R. Gangopadhyay** and S. Bhattacharya,
"Constraining Kähler Moduli Inflation from CMB Observations,"
Springer Proc. Phys. **261**, 315-322 (2021)

Teaching Experience

- **Instructor:**
  1. Course Instructor of **Nuclear** & **Particle Physics (32C)**, **Quantum Mechanichs** *II* **(22C)**, **Quantum Mechanichs** *I* **(11C)**, M.Sc Physics, Department of Physics, Jamia Millia Islamia.

  2. Invited instructor at the **"Cosmology: A New Addition To The Precision Physics "** School organised by Department of Theoretical Phyics, University of Madras, India from 7^{th} to 11^{th} January, 2019.

  3. Invited instructor in the Summer school, **Physics Training and Talent Search (PTTS' 18)** held at National Institute of Technology, Surathkal, India.

  4. Summer **Physics laboratory classes, Physics I** & **II tutorials** for undergraduates, 2014-2016 at University of Notre Dame.

  5. Preparatory class for the **Physics subject GRE**, Summer, 2016 at University of Notre Dame.

- **Teaching Assistant:**
  Graduate Level: Quantum Field Theory, General Theory of Relativity, Electricity & Magnetism, Electrodynamics, Cosmology.

  Undergraduate Level: Cosmology, Thermal Physics, Electricity & Magnetism, Medical Physics.

Mentoring Experience

- **M.Sc Thesis Advisor:**
  1. Jatin K. Jaiswal (M.Sc, JMI) Completed.
  2. Amiy A. Upadhyay(M.Sc, JMI) Completed.
  3. Hussain A. Khan (M.Sc, JMI) Completed.
  4. Rittwik Maity (M.Sc, JMI) Completed.
  5. Sayan Das (M.Sc, JMI) Completed.
- **M.Sc. Summer Project**
  1. Jayesh Jain (M.Sc., NIT, Surathkal) Completed.
  2. Devanshu Sharma (M.Sc., SVNIT) Completed.

Journal Reviewer	Physical Reviw D (APS), Physica Scripta (IOP Publications), Classical and Quantum Gravity(IOP Publications), Physics of the Dark Universe(Elsevier), Symmetry (MDPI), Journal of Cosmology and Astroparticle Physics(IOP Publications).
Journal Editor	Editor of the special issue on Primordial Blackholes to be published in Galaxies.
Research Grant	• Co-PI of **Core Research Grant(CRG/ 2020/004347)** awarded by SERB, Department of Science and Technology. (Ongoing)
Computer Skills	• **Cosmology Packages Used**: CAMB, CLASS, MontePython, CosmoMC, ModeChord, MultiNest, PolyChord, Multimodecode, LatticeEasy, CosmoLattice, AlterBBN. • **Particle Physics Packages Used**: SoftSUSY, SuperIso, SPheno. • **Other Packages**: Extensive use of Mathematica, Grace, Matlab. • **Languages Used**: Extensive use of Fortran, C, C++ and limited use of Python.
References	1. **Grant J. Mathews (PhD Thesis Adviser)** Professor and Director, CANDU Phone: (+1)5746316919 Department of Physics E-mail: gmathews@nd.edu University of Notre Dame, USA. 2. **Koushik Dutta** Associate Professor Phone: (+91)9830242960 Deparment of Physical Sciences, IISER, Kolkata, India. . E-mail: koushik.physics@gmail.com, 3.. **Toshitaka Kajino** Professor & Director, Phone: (+81)422343740 International Research Center for Big-Bang Cosmology and Element Genesis, Beihang University, China. E-mail: kajino@buaa.edu.cn