Mayukh Raj Gangopadhyay (Ph.D.)

Contact

303, Centre For Theoretical Physics,
Jamia Millia Islamia,
New Delhi 110025, India

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Research Interests

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

Current Position

DST- INSPIRE Faculty at Centre For Theoretical Physics, Jamia Millia Islamia, New Delhi (April, 2019- Present).

Postdoctoral Experience

Postdoctoral Research Associate in 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.

JOURNAL PUBLICATIONS:

1. 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]]

2. **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].

3. 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]]

4. 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]].

5. 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]].

6. 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].

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

8. **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].

9. **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].

10. 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].

11. **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].

12. 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].

13. 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].

14. 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].

15. 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].

16. 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].

Conference Proceedings:

1. G. J. Mathews, **M. R. Gangopadhyay**, K. Ichiki, T. Kajino.
Fourteenth Marcel Grossmann Proceedings, [arXiv:1604.03174].

2. G. J. Mathews, **M. R. Gangopadhyay**, N. Sasankan, T. Kajino.
AIP Conf. Proceedings, OMEG17, [arXiv:1711.04873].

3. G. J. Mathews, M. Kusakabe, **M. R. Gangopadhyay**, T. Kajino, N. Sasankan.
EPJ Web Conf. 184(2018) 01011.

Presentations

- Astrophysics Seminar 2013, University of Notre Dame, USA.
Title: Lovelock Gravity and Inflation.
- PHENO 2014, University of Pittsburgh, USA.
Title : Prediction of Dark Flow from Landscape Multiverse.
- General Relativity and Gravitation: A Centennial Perspective, 2015, Pennsylvania State University,USA.
Title : Planck-Scale Resonant Particle Production during Inflation.

- PHENO 2015, University of Pittsburgh, USA.
  Title : Planck-Scale Resonant Particle Production during Inflation.
- Astrophysics Seminar 2015, University of Notre Dame, USA.
  Title : Constraints on Inflation and origin of Space-time.
- 2015 Annual Fall Meeting, Prairie Section, University of Notre Dame, USA.
  Title : Limiting Cosmic 'Dark' Flow from the Landscape Multiverse.
- HEP Colloquium 2017, IOP, India.
  Title: Constraints on Brane-World in the Era of Precision Cosmology.
- Aspects of Early Universe Cosmology, 2017, SINP, India.
  Title : Possible Evidence of Resonant Superstring Excitations during Inflation.
- Post Planck Cosmology, 2017, IUCAA, India.
  Title : Constraining RS Brane world in the Era of Precision Cosmology.

- STSS Seminar 2017, SINP, India.
  Title: Theories of Early Universe In The Era of Precision Cosmology.
- SUSY17, TIFR, India.
  Title : Constraining Warm Inflation From Observations.
- Workshop on High Energy Physics Phenomenology (WHEPP, 2017), IISER, Bhopal.
  Title : Confronting Dark Radiation From Observations.
- STSS Seminar 2018, SINP, India.
  Title: Constraining Warm Inflation From Observations.
- Theory Seminar 2018, PAMU, ISI, Kolkata, India.
  Title: Cosmological Inflation: Warm or Cold?
- DAE-BRNS HEP Symposium 2018, IIT- Madras (Chennai), India.
  Title: Kähler Moduli Inflation In The Light Of Planck Data.
- IAGRG 2019, BITS- Hyderabad, India.
  Title: A Study In Non-canonical Domain of Goldstone Inflation.
- Cosmology Workshop, ICTS, India.
  Title: A Study In Non-canonical Domain of Goldstone Inflation.
- CTP Seminar 2019, CTP, JMI, New Delhi, India.
  Title: Cosmological Inflation: Warm or Cold?
- DAE-BRNS HEP Symposium 2020, NISER, Odissa, India.
  *Title:*Non-thermal hot dark matter from inflaton/ moduli decay

CONFERENCES & SCHOOLS

- 2009 LHC and New Frontiers of Particle Physics, University of Calcutta, Kolkata, India.
- 2009 Seminar on Foundations of Space and Nano Sciences, KCCSNS, Kolkata, India.
- 2009 Preparatory School on Theoretical High Energy Physics (IIT, Chennai, India), Dept. of Science and Technology, Govt. of India.
- Summer school on Mathematical General Relativity, 2012, MSRI, University of California, Berkeley, USA.
- 2014, 2015 Phenomenology Symposium, University of Pittsburgh, USA.

- General Relativity and Gravitation: A Centennial Perspective, 2015, Pennsylvania State University,USA.
- 2015 Annual Fall Meeting, APS Prairie Section, University of Notre Dame, USA.
- Aspects of Early Universe Cosmology, 2017, Saha Institute of Nuclear Physics, India.
- Post Planck Cosmology: Enigma, Challenges, and Visions, 2017, IUCAA, Pune, India.
- Conference On Supersymmetry And The Unification Of Fundamental Interactions (SUSY17), TIFR, India.
- Workshop on High Energy Physics Phenomenology (WHEPP, 2017), IISER, Bhopal, India.
- Cosmological Structure Formation (2018 GIAN), CTP, JMI, Delhi, India.

- DAE-BRNS HEP Symposium 2018, IIT- Madras, Tamil Nadu, India.
- IAGRG 2019, BITS- Pilani (Hyderabad Campus), Telangana, India.
- Cosmology - The Next Decade" (Workshop) 2019, ICTS, Bengaluru, Karnataka, India.
- Workshop on High Energy Physics Phenomenology (WHEPP, 2019), IIT, Guwahati, India.
- DAE-BRNS HEP Symposium 2020, NISER, Odissa, India.

Awards & Achievements

- Selected and awarded to attain summer school on " Mathematical General Relativity" by MSRI, University of California, Berkeley , USA, 2012. The only Physics graduate student to get selected for the school.
- Travel Award for "Phenomenology Symposium" , University of Pittsburgh, USA in 2014 and 2015.
- USA Department of Energy summer fellowship for 2015, 2016.
- DST- INSPIRE Faculty Award for July, 2018 Application Batch from Department of Science and Technology, Govt. Of India.

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.

- **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) Ongoing.

JOURNAL REVIEWER

Physica Scripta (IOP Publications), Classical and Quantum Gravity(IOP Publications).

RESEARCH GRANT

- Co-PI of **Core Research Grant(CRG/ 2020/004347)** awarded by SERB, Department of Science and Technology. (Ongoing)
- Research grant provided by Department of Science and Technology, Government of India under the Grant Agreement number **IF18-PH-228 (INSPIRE Faculty Award)**.

COMPUTER SKILLS

- **Cosmology Packages Used**: CAMB, CLASS, MONTEPYTHON, COSMOMC, MODECHORD, MULTINEST, POLYCHORD, MULTIMODECODE, LATTICEEASY, GABE.
- **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. **Toshitaka Kajino**
   Professor, Division of Theoretical Astronomy — Phone: (+81)422343740
   National Astronomical Observatory, Japan. — E-mail: kajino@nao.ac.jp

3. **Koushik Dutta**
   Associate Professor — Phone: (+91)9830242960
   Deparment of Physical Sciences — E-mail: koushik.physics@gmail.com,
   Indian Institute of Science Education and Research (IISER), Kolkata.