

Masroor C. Pookkillath

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Centre for Theoretical Physics and Natural Philosophy (NAS), Mahidol University, Nakhonsawan Campus
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EXECUTIVE SUMMARY

I am a Postdoctoral Fellow at the Centre for Theoretical Physics and Natural Philosophy, Mahidol University, Thailand. My research focuses on gravity and cosmology. I am currently one of the emerging experts in modified gravity theory and cosmological tests of gravity theories. I have published 17 articles with more than 280 citations in total, with an h-index of 11.

My research topics: *General Relativity, Dark Energy Theories, Modified Gravity, Dark Matter, Interacting Dark Sectors, Cosmological Perturbation Theory, Testing theories of gravity, Tensions in Cosmology.*

EDUCATION

- **Ph.D. in Physics and Astronomy** September 2021
Yukawa Institute for Theoretical Physics, Kyoto University Kyoto, Japan
 - Thesis: Theoretical and Observational Constraints on the Cosmology of theories of Gravity.
 - Advisor: Prof. Antonio De Felice, Prof. Shinji Mukohyama.
- **M.Sc. Physics** September 2014
The School of Pure and Applied Physics, Mahatma Gandhi University Kottayam, India
 - Thesis: Thermodynamics of Black-holes in Massive Gravity.
 - CGPA: 8.14/10 (with Fifth rank)
- **B.Sc. Physics** March 2012
University of Calicut Ponnani, India
 - Thesis: Photometric Identification of HII Region in SDSS
 - CGPA: 3.28/4



EMPLOYMENT

- **Postdoctoral Fellow** September 2022 - Present
Centre for Theoretical Physics and Natural Philosophy, NAS, Mahidol University. Nakhon Sawan, Thailand
- **Postdoctoral Fellow** October 2021 - May 2022
Yukawa Institute for Theoretical Physics, Kyoto University. Kyoto, Japan

AWARDS AND FELLOWSHIPS

- **Mahidol University International Relation Postdoctoral Fellowship** September 2023 - August 2026
Awarded International relations division, Mahidol University, Thailand. 
 - Aims to enhance research prowess, academic recognition, and competency of the University.
 - In addition, to improve the publication index in response to the University's research strategies.
- **Monbukagakusho: MEXT Scholarship** April 2018 - September 2021
Awarded by the Japanese government. 
 - Highly competitive and prestigious comprehensive scholarship covering living expanse and tuition fees.
 - Prize given to outstanding scholars around the world who have the potential to become leaders of their country and communities.

RESEARCH GRANTS

- **Co-PI: "Cosmology and Modified Gravity Dynamics"** October 2024 - September 2025
Fundamental Fund: Funded by the National Research Agency of Thailand. 
 - One of the prestigious research grand in Thailand.
 - This fund is given by National Research Council of Thailand (NRCT) to support research consistent with the university's research mission and strategy, in response to the country's science, research and innovation development goals.
- **Co-PI: "Relativistic dynamics of alternative gravity"** October 2023 - September 2024
Fundamental Fund: Funded by the National Research Agency of Thailand. 
 - One of the prestigious research grand in Thailand.
 - This fund is given by National Research Council of Thailand (NRCT) to support research consistent with the university's research mission and strategy, in response to the country's science, research and innovation development goals.

ORAL AND POSTER PRESENTATION

[Invited Talks]

- **Interacting vector dark energy and dark matter fluid** 14 November 2024
Institute for Basics Science, Daejeon, South Korea.
- **Interacting vector dark energy and dark matter fluid** 5 December 2023
Waseda University, Tokyo, Japan.
- **Extended minimal theories of massive gravity** 23 April 2023
ICTS, Bangalore, India.
- **VCDM and Cuscuton** 12 October 2022
Department of Physics, Tokyo Institute of Technology (Invited Talk) Tokyo, Japan.
- **VCDM: Minimal theory of gravity** 15 - 18 September 2022
Workshop: "NAS Workshop 2022", Uthai Thani, Thailand.





[Contributory Talks]

- **Extended minimal theories of massive gravity** 18 - 21 January 2023
Conference: "Testing gravity 2023", SFU Harbour Center, Vancouver, Canada.
- **Minimal theory of massive gravity and constraints on the graviton mass** 2 - 4 January 2022
Conference: "11th Australasian conference on General Relativity and Gravitation", Online meeting.
- **Minimal theory of massive gravity and constraints on the graviton mass** 6 - 10 December 2021
Conference: "The 30th Workshop on General Relativity and Gravitation in Japan", Online meeting.
- **Minimal theory of massive gravity and constraints on the graviton mass** 6 - 10 December 2021
Conference: "8th Korea-Japan workshop on Dark Energy", Online meeting.
- **Reduction of H_0 tension by means of VCDM** 14 - 17 September 2021
Conference: "The JPS 2021 Autumn Meeting", Online virtual meeting by the Physical Society of Japan.
- **Minimally Modified Gravity fitting Planck data better** 7 - 11 September 2020
Conference: "The Fourth Zeldovich virtual meeting", ICRANet and National Academy of Sciences of Belarus.
- **Baryon Physics and Tight Coupling Approximation in Boltzmann Code** 25 - 29 November 2019
Conference: "The 29th Workshop on General Relativity and Gravitation in Japan", Kobe University, Japan.
- **Baryon Physics and Tight Coupling Approximation in Boltzmann Code** 2 - 6 September 2019
Conference: "Cosmo'19", RWTH Aachen University, Germany.

[Poster Presentation]

- **Reducing the H_0 tension with generalized Proca theory** 3 - 6 September 2020
School: "Vienna Summer School 2020 on Gravitational Quantum Physics", University of Vienna.
- **Baryon Physics and Tight Coupling Approximation in Boltzmann Code** 13 - 22 January 2020
School: "The 14th Kavli Asian Winter School on Strings, Particles and Cosmology", Tohoku University, Japan.

PUBLIC OUTREACH

- **Watching the expanding Universe** 27 January 2024
Public outreach talk
◦ Public Lecture organized by Nakhon Sawan province local government, Thailand. 
- **Meet a scientist** 25 August 2023
Interaction with high school students
◦ Phayuha Pittayakhom School, Nakhon Sawan province.
◦ Organized by Nakhon Sawan NAS MANA Camp, Centre for Theoretical Physics and Natural Philosophy, Mahidol University. 
- **On the edge of what we know?** 29 May 2023
Public outreach talk
◦ Public Lecture organized by Café Física & Public Forum, Centre for Theoretical Physics and Natural Philosophy, Mahidol University. 
- **Understanding our Universe: Current status** 27 June 2022
Outreach talk addressing undergraduate students
◦ Organized by MES Ponnani College, Ponnani, India. 

- **Classical Dynamics**

20 - 23 July 2023

Lecture series for fresh undergraduate students

- NAS Basic Camp, Centre for Theoretical Physics and Natural Philosophy, Mahidol University.

- **Introduction to symbolic algebra for Gravity and Cosmology**

1 - 3 March 2022

A lecture series on symbolic computational tools Mathematica for graduate students

- Centre for Theoretical Physics and Natural Philosophy, Mahidol University.

WORKSHOPS & CONFERENCE ORGANIZED

- **Workshop: "Gravity 2025: New Horizon of Black Hole Physics"**

27 - 31 January 2025

Yukawa Institute for Theoretical Physics, Kyoto University, Japan.



- Key responsibilities: No major responsibilities, but involved in editing website and suggesting invited speakers.

- **Conference: "CosmoGravitas: 1st International Conference on Cosmology and Gravitation"**

10 - 14 June 2024

Centre for Theoretical Physics & Natural Philosophy, Nakhon Sawan, Thailand.



- Key responsibilities: preparing the proposal including budget for the funding agency, inviting leading experts, scheduling the event, reviewing the contributory talks and posters.

- **Workshop: "Gravity 2023: Dawn of field theoretic approach"**

18 - 20 June 2023

Yukawa Institute for Theoretical Physics, Kyoto University, Japan.



- Key responsibilities: preparing the proposal including budget for the funding agency.

- **Workshop: "Gravity: Current challenges in black hole physics and cosmology"**

20 June - 1 July 2022

Yukawa Institute for Theoretical Physics, Kyoto University, Japan.



- Key responsibilities: preparing the proposal including budget for the funding agency, inviting leading experts in my research domain.

SYNERGISTIC ACTIVITIES

- **Journal Refereed:** The European Physical Journal C, MDPI Mathematics, MDPI Symmetry, MDPI Axioms

- **Examiner:** Assessing undergraduate students at Mahidol University on presenting research works.

- **Orientation:** Reading research papers, at *Mahachulalongkornrajavidyalaya University*, a public Buddhist university, Ayutthaya Province, Thailand.

SKILLS

- **Operating System:** Linux, Windows

- **Programming Languages:** Python, Julia, C, Groovy

- **Packages:** GSL, NumPy, SciPy, JAX(Beginner)

- **Cosmology Tools:** CLASS, MontePython

- **Other tools:** Mathematica, xAct, Maple, Experience in Cluster Computing

REFERENCES

1. **Antonio De Felice**

Associate Professor, Yukawa Institute for Theoretical Physics

Kyoto University, Japan.

Email: antonio.defelice@yukawa.kyoto-u.ac.jp

Relationship: PhD Advisor

2. **Shinji Mukohyama**

Professor, Yukawa Institute for Theoretical Physics

Kyoto University, Japan.

Email: shinji.mukohyama@yukawa.kyoto-u.ac.jp

Relationship: Collaborator

3. **Kazuya Koyama**

Professor of Cosmology, Institute of Cosmology & Gravitation

University of Portsmouth, Portsmouth, UK.

Email: kazuya.koyama@port.ac.uk

Relationship: Collaborator