TABASUM RAHNUMA

POSTDOCTORAL RESEARCHER · THEORETICAL PHYSICS

Korea Institute for Advanced Studies (KIAS), Seoul, South Korea • trahnuma03@gmail.com
• tabasum-ph.github.io

My research lies at the intersection of quantum gravity and scattering amplitudes, focusing on the asymptotic structure of spacetime and its connections to gravitational wave physics. I study how symmetries at the boundaries of spacetime — BMS and its extensions — encode infrared physics through soft theorems and memory effects. Recently I have developed recursive post-Minkowskian methods to construct gravitational metrics perturbatively, with applications to gravitational wave observables.

RESEARCH INTERESTS

Quantum Gravity • Asymptotic Symmetries • General Relativity • Scattering Amplitudes • Celestial Holography • Gravitational Wave Physics • Post-Minkowskian Formalisms • Flat Space Holography

COMPUTATIONAL SKILLS

Mathematica (xAct, xTensor tensor algebra packages), ROOT/RooFit (data analysis), Fortran 77, C, C++.

POSITIONS & EDUCATION

Nov 2025 – present
QUC Research Fellow
Korea Institute for Advanced Studies (KIAS), Seoul, South Korea
Research: Quantum Gravity, Asymptotic Symmetries, Scattering Amplitudes, Gravitational Wave Physics.

Oct 2024 – Oct 2025
Postdoctoral Researcher
Asia Pacific Center for Theoretical Physics (APCTP), Pohang, South Korea
Junior Research Group: Dualities in String/M-theory and Quantum Gravity.

Jul 2019 – Jul 2024
Doctor of Philosophy in Physics
Indian Institute of Science Education and Research Bhopal (IISERB), India
Thesis: "Scattering in Asymptotically Flat Spacetimes and Symmetries from Holography"
Supervisor: Dr. Nabamita Banerjee

Jul 2016 – Apr 2018
Master of Science in Physics
Utkal University, Bhubaneswar, Odisha, India
Specialisation: Advanced Particle Physics and Field Theory. Programming: Fortran 77, C, C++.

Jul 2012 – Apr 2015
Bachelor of Science in Physics (Hons.)
Gopabandhu Science College, Cuttack, Odisha, India

PUBLICATIONS

6 · 2026
Iterative Solution of the Kerr Black Hole Metric
P. H. Damgaard, H. Lee, K. Lee, T. Rahnuma
arXiv: 2605.19948 [hep-th, gr-qc]

5 · 2026
Gravitational Metric of a Star
P. H. Damgaard, H. Lee, K. Lee, T. Rahnuma
arXiv: 2603.16493 [hep-th, gr-qc]

4 · 2025
AdS S-Matrix for Massive Vector Fields
N. Banerjee, A. N. Desai, K. Fernandes, A. Mitra, T. Rahnuma
JHEP 10.1007/JHEP05(2025)094

3 · 2024
Asymptotic Symmetry Algebra of $\mathcal{N}=8$ Supergravity
N. Banerjee, T. Rahnuma, R. K. Singh
Physical Review D 10.1103/PhysRevD.109.046010

2 · 2023
Soft and Collinear Limits in $\mathcal{N}=8$ Supergravity using Double Copy Formalism
N. Banerjee, T. Rahnuma, R. K. Singh
JHEP 10.1007/JHEP04(2023)126

1 · 2022
Asymptotic Symmetry of Four-Dimensional Einstein-Yang-Mills and Einstein-Maxwell Theory
N. Banerjee, T. Rahnuma, R. K. Singh
JHEP 10.1007/JHEP01(2022)033

INVITED TALKS & CONFERENCES

Apr 2026 — **Amplitudes, Strong-Field Gravity and Resumption** [INVITED SPEAKER]
Nordita, Stockholm, Sweden
Metric of a Star: A Recursive Multipolar Post-Minkowskian Formalism

Nov 2025 — **Integrability, Duality and Related Topics 2025** [INVITED SPEAKER]
APCTP, Pohang, South Korea
Perturbative Scattering Dynamics in AdS

Aug 2025 — **2nd APCTP-INPP Demokritos Meeting** [INVITED SPEAKER]
APCTP, Pohang, South Korea
Perturbative Solutions of Einstein's Equations: Recursive Techniques and Multipole Expansions

Dec 2024 — **New Frontiers in String and Field Theories 2024** [TALK]
Incheon, South Korea
Studying Gravitational Scattering using Off-shell Recursions

Jan 2024 — **APCTP Winter School on Fundamental Physics 2024** [TALK]
Pohang, South Korea
Unified Insights in Gravity: Asymptotic Symmetries in SUGRA using CCFT Techniques

Dec 2023 — **Indian Strings Meeting 2023** [POSTER]
IIT Bombay, India
Asymptotic Symmetries in SUGRA using CCFT Techniques

Dec 2023 — **10th International Conference on Gravitation and Cosmology (ICGC 2023)** [TALK]
IIT Guwahati, India
Unified Insights in Gravity: Asymptotic Symmetries and Celestial Holography

Jan 2023 — **17th Kavli Asian Winter School (KAWS)** [POSTER]
Institute for Basic Science, Daejeon, South Korea
Asymptotic Symmetries from Celestial CFT

Mar 2022 — **2022 Chennai–Southampton Workshop**
Southampton University, UK
Holography, gauge theories and black holes.

RESEARCH VISITS

Apr – May 2026 — **Niels Bohr International Academy (NBIA)**
Copenhagen, Denmark
Collaborative research on perturbative gravitational theories with Prof. Poul Henrik Damgaard.

Jan 2026 — **Gwangju Institute of Science and Technology (GIST)**
Gwangju, South Korea
Collaborative research on AdS_3 and boundary Carrollian holography.

Dec 2025 — **Université libre de Bruxelles (ULB)**
Brussels, Belgium
Asymptotic symmetries and algebra at cosmological horizons in dS spacetime.

Sep 2025 — **Korea Institute for Advanced Studies (KIAS)** [INVITED SPEAKER]
Seoul, South Korea
Recursive Techniques in Multipolar Post-Minkowskian Formalism

Feb – Mar 2024 — **Asia Pacific Center for Theoretical Physics (APCTP)**
Pohang, South Korea · Host: Prof. Junggi Yoon
Seminars delivered:
- Asymptotic symmetries using celestial CFT techniques
- A review on asymptotic symmetries in gauge and gravity theories and the duality

Mar 2024 — **Seoul National University (SNU)**
Seoul, South Korea · Host: Prof. Sangmin Lee
Research group visit and seminar presentation.

TEACHING EXPERIENCE

Jan 2020 – 2024

Teaching Assistant, Department of Physics
IISER Bhopal, India

- Mathematical Methods, 3rd year — Dr. Auditya Sharma
- Quantum Field Theory I & II, 4th year — Dr. Arnab Rudra
- General Theory of Relativity, 4th year — Dr. Nabamita Banerjee
- Newtonian and Classical Mechanics, 3rd year — Dr. Nabamita Banerjee
- General Properties of Matter, 2nd year — Dr. Nabamita Banerjee

INTERNSHIPS & PROJECTS

May – Jul 2017

Summer Project, School of Physical Sciences
NISER, Bhubaneswar, India

Measurement of strange B meson lifetime via $B_s^0 \to J/\psi + \phi$ at CMS detector. Monte Carlo simulation and data analysis using ROOT and RooFit.

Apr – Jun 2014

Summer Research Project (DST-INSPIRE)
Utkal University, Bhubaneswar, India

Optical property study of Arsenic Selenide thin film. Characterisation: XRD and UV spectroscopy.

AWARDS & FELLOWSHIPS

2019 – 2024 — Joint CSIR-UGC Junior Research Fellowship — IISER Bhopal

Dec 2018 — Eligibility for Lectureship (NET) — Joint CSIR-UGC National Eligibility Test

2016 – 2018 — IMA Scholarship — Institute of Mathematics and Applications, Bhubaneswar

2013 – 2015 — DST-INSPIRE Scholarship (1788/2012) — Dept. of Science & Technology, New Delhi

Jan 2009 — Certificate of Merit — Uranium Talent Search Examination

REFERENCES

Prof. Poul Henrik Damgaard
Niels Bohr International Academy, Copenhagen
phdamg@nbi.dk +45 30 58 96 82

Prof. Kanghoon Lee
Korea Institute for Advanced Studies, Seoul
kanghoon.lee1@gmail.com

Dr. Nabamita Banerjee
Indian Institute of Science Education and Research Bhopal
nabamita@iiserb.ac.in +91 755 269 1249