

# Sashwat Tanay

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[INSPIRE-HEP](#), [Google Scholar](#)

## EMPLOYMENT

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| <b>Lecturer in Teaching and Research</b>                                     |              |
| Universidad de Ingeniería y Tecnología (UTEC), Lima, Peru                    | 2025-present |
| <b>Postdoctoral Fellow</b> LUX, Paris Observatory - PSL University           | 2023-2025    |
| <b>Adjunct Instructor</b> University of Mississippi                          | 2022-2023    |
| <b>Teaching and Research Assistant</b> University of Mississippi             | 2016-2022    |
| <b>Junior Research Fellow</b> Tata Institute of Fundamental Research, Mumbai | 2013-2015    |

## EDUCATION

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| <b>Ph.D. (Physics)</b> University of Mississippi   | 2016-2022 |
| <b>Advisor:</b> Prof. Leo C. Stein   |           |
| <b>Dissertation:</b> Post-Newtonian Dynamics of Eccentric, Spinning Binary<br>Black Holes and the Associated Gravitational Waveforms |           |
| <b>B.Tech. (Mechanical Engineering)</b> Indian Institute of Technology (IIT) Ropar   | 2009-2013 |

## AWARDS & FELLOWSHIPS

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| PSL Postdoctoral Fellowship, Paris Observatory - PSL University             | 2023-2025 |
| FGSA Travel Award for Excellence in Graduate Research, APS (\$500)          | 2022      |
| Graduate School Honors Fellowship, Univ. of Mississippi (\$12,000 in total) | 2016-2020 |
| Junior Research Fellowship, Tata Institute of Fundamental Research, Mumbai  | 2013-2015 |

## RESEARCH INTERESTS

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A total of **10 research papers** (published and in prep.), plus 1 set of **lecture notes**, supplemented by computer codes on [GitHub](#).

• Gravitational waves (GWs) • Post-Newtonian (PN) dynamics of binary black holes (BBHs) • Quasi-normal mode (QNM) ringdown of black holes (BHs) • Hamiltonian dynamical systems • Extreme mass ratio inspirals (EMRIs)

## TEACHING EXPERIENCE

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| <b>Phys 211</b> Instructor of record  | Summer 2023 |
| (Adjunct Instructor, Univ. of Mississippi; <a href="#">course website here</a> & <a href="#">lecture notes here</a> ) |             |
| • Developed and taught a calculus-based undergraduate physics course  |             |
| • Created course material (including lecture notes), delivered lectures and assessed student performance              |             |
| <b>Phys 221, 222, 223, 224</b> Undergrad physics lab courses  | 2016-2022   |
| (Teaching Assistant, Univ. of Mississippi)  |             |
| • Taught undergraduate physics lab courses. Conducted lab sessions, and graded assignments                            |             |

## MENTORING

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Supervision of 3 mentees have resulted in 3 research papers (one published and two in prep.), and that of a 4<sup>th</sup> mentee into an undergrad thesis.

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| <b>Tom Colin</b> (postgrad, Ecole Normale Supérieure, Paris) led to Publications (1) & (2)    | Oct 2023-present  |
| <b>Manuel Alva</b> (undergrad, Universidad Nacional de Trujillo, Peru) led to Publication (2) | Nov 2023-present  |
| <b>Rickmoy Samanta</b> (postdoc, ISI Kolkata) led to Publication (4)                          | Sep 2021-Sep 2022 |
| <b>Pranav Kasetty</b> (undergrad thesis co-advisor, IISc Bengaluru)                           | Oct 2021-Apr 2022 |

## TECHNICAL SKILLS

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- Analytical calculations, approximate perturbative solutions of differential equations, numerical computing
- Machine learning & data in Python with scikit-learn, Keras, and TensorFlow
- **Computer:** Mathematica (xAct), C/C++, Python, Fortran, Matlab, Jekyll (web development), Bash, [GitHub profile](#)

## PROFESSIONAL SERVICE

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| <b>Referee</b> Physical Review & Physical Review Letters | Feb 2023-present |
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## LANGUAGES

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**Fluent:** English, Hindi   **Elementary:** French (A1-A2)

## INVITED TALKS & LECTURES

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| University of the Chinese Academy of Sciences   | Sep 2025 |
| Max Planck Institute for Gravitational Physics Potsdam (ACR Seminar)                            | Sep 2025 |
| Max Planck Institute for Gravitational Physics Hannover (Gravitational Wave Group Meeting)      | Jun 2025 |
| University of Mississippi (Department Colloquium)   | Apr 2025 |
| IHES, Paris-Saclay University (Amplitudes and Gravitation Seminar-IHES/IPhT)                    | Jan 2025 |
| York University, Toronto (Department Colloquium)  | Dec 2024 |
| Institut d'astrophysique de Paris, Sorbonne University (GReCO seminar)                          | Jan 2024 |
| IISER Pune (Physics Seminar)  | Jan 2024 |
| Paris Observatory, Paris Sciences et Lettres (PSL) University (LUTH Seminar)                    | Sep 2023 |
| Missouri University of Science and Technology (Department Colloquium)                           | Aug 2023 |
| Northwestern University   | Jul 2023 |
| University of Illinois Urbana-Champaign (lecture workshop; lecture notes <a href="#">here</a> ) | Jun 2022 |
| Montana State University (Relativity, Astrophysics and Space Science Seminar)                   | Apr 2022 |
| Max Planck Institute for Gravitational Physics Potsdam (ACR Seminar)                            | Jun 2021 |
| Simon Fraser University (Cosmology Seminar)   | Sep 2020 |

## OUTREACH & SERVICE

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- Contributor on Wikipedia (English & French) including various articles on physics; see [here](#) and [here](#)
- Public talk in French (Journée du LUTH), Paris Observatory (2024)
- Public Talk on Astronomy - Univ. of Mississippi (2023)
- Judge at The Speaker's Edge Competition 2022 - Univ. of Mississippi
- Organized STEM Summer Camp - Univ. of Mississippi (2018, 19)
- Organized Spooky Physics Night - Univ. of Mississippi (2016, 17, 18)
- YouTube videos on [research](#) and [popular science](#)

## PUBLICATIONS AND RESEARCH ARTICLES

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1. T. Colin, **S. Tanay**, and L. Bernard. Solutions of spinning, eccentric binary black holes at 2<sup>nd</sup> post-Newtonian order, *in prep.* 2024
2. T. Colin, **S. Tanay**, M. A. Morales, and L. Bernard. Orbit-averaged dynamics of spinning binary black holes in a Hamiltonian framework at 2<sup>nd</sup> post-Newtonian order, *in prep.* 2024
3. V. Witzany, V. Skoupý, L. C. Stein, and **S. Tanay**. Actions of spinning compact binaries: Spinning particle in kerr matched to dynamics at 1.5 post-newtonian order. *Phys. Rev. D*, 111:044032, 2024, [arXiv:2411.09742](#)
4. **S. Tanay**. Towards a more robust algorithm for computing the Kerr quasinormal mode frequencies, 2022, [arXiv:2210.03657](#) (to be submitted)
5. R. Samanta, **S. Tanay**, and L. C. Stein. Closed-form solutions of spinning, eccentric binary black holes at 1.5 post-Newtonian order. *Phys. Rev. D*, 108(14):124039, 2023, [arXiv:2210.01605](#)
6. **S. Tanay**. Integrability and action-angle-based solution of the post-Newtonian BBH system (lecture notes), 2022, [arXiv:2206.05799](#)
7. **S. Tanay**, G. Cho, and L. C. Stein. Action-angle variables of a binary black hole with arbitrary eccentricity, spins, and masses at 1.5 post-Newtonian order. *Phys. Rev. D*, 107(26):103040, 2021, [arXiv:2110.15351](#)
8. G. Cho, **S. Tanay**, A. Gopakumar, and H. M. Lee. Generalized quasi-Keplerian solution for eccentric, nonspinning compact binaries at 4PN order and the associated inspiral-merger-ringdown waveform. *Phys. Rev. D*, 105(6):064010, 2022, [arXiv: 2110.09608](#)
9. **S. Tanay**, L. C. Stein, and J. T. Gálvez Gherzi. Integrability of eccentric, spinning black hole binaries up to second post-Newtonian order. *Phys. Rev. D*, 103(6):064066, 2021, [arXiv: 2012.06586](#)
10. **S. Tanay**, A. Klein, E. Berti, and A. Nishizawa. Convergence of Fourier-domain templates for inspiraling eccentric compact binaries. *Phys. Rev. D*, 100(6):064006, 2019, [arXiv:1905.08811](#)
11. **S. Tanay**, M. Haney, and A. Gopakumar. Frequency and time domain inspiral templates for comparable mass compact binaries in eccentric orbits. *Phys. Rev. D*, 93(6):064031, 2016, [arXiv:1602.03081](#)