BINDESH **TRIPATHI**

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Research interests

I study theoretical and computational plasma physics, with particular emphasis on: instabilities and waves of fluids and plasmas, their nonlinear saturation, turbulence and transport, energy transfer and cascade processes, statistical closure models, astrophysical and geophysical fluid dynamics, astero-seismology, and magnetic dynamos. My underlying pursuit in all of these is understanding complex physical processes to build a reduced mathematical model, which I then test with massively-parallel numerical simulations generating tens of terabytes or more of data. I keep close interest on mathematical physics, Wentzel–Kramers–Brillouin theory, perturbation methods, and asymptotics.

Education

2019–now	**Ph.D. in Physics (Plasma)**	University of Wisconsin-Madison
2019–2021	**Master's degree in Physics**	University of Wisconsin-Madison
2014–2018	**Undergraduate degree in Physics**	St. Xavier's College, Tribhuwan University, Nepal

Experience/Positions

2020–now **Graduate Research Assistant** — UW-Madison, Wisconsin
Advisors: Prof. Paul W. Terry, Prof. Ellen G. Zweibel, and Dr. M.J. Pueschel

2019–2021 **Graduate Teaching Assistant** — UW-Madison, Wisconsin
Taught for four semesters introductory physics to approx. 50 students/semester, majoring in biological sciences

2018-2019 **Research Intern, Nordic Institute for Theoretical Physics (NORDITA)** — Stockholm, Sweden
Advisor: Dr. Dhrubaditya Mitra (asteroseismology and perturbation methods)

2017-2018 **Research Intern, Center of Excellence in Space Sciences India and IISER-Kolkata** — Kolkata, India
Advisors: Prof. Dibyendu Nandi (dynamos) and Prof. Soumitro Banerjee (nonlinear dynamics)

Peer-reviewed Publications

1) **B. Tripathi,** D. Nandy, and S. Banerjee, "Stellar mid-life crisis: subcritical magnetic dynamos of solar-like stars and the breakdown of gyrochronology," *Mon. Notices Royal Astron. Soc.* **506**, L50-L54 (2021). **DOI ADS**
→ **Press release by the Royal Astronomical Society, UK** (https://ras.ac.uk/news-and-press/research-highlights/magnetic-fields-implicated-mysterious-midlife-crisis-stars)
→ **Media coverage by The Independent, UK** (https://www.independent.co.uk/life-style/gadgets-and-tech/space/stars-midlife-crisis-slower-rotation-b1892036.html) and several news outlets
→ **Research results featured in news in Science magazine** (https://www.science.org/content/article/nearby-star-midlife-crisis-suggests-our-own-sun-may-lose-its-spots-again-decades, para. 7.)

2) **B. Tripathi,** "Resummed Wentzel-Kramers-Brillouin series: Quantization and physical interpretation," *Phys. Rev. D.* **105**, 036010 (2022). **DOI ADS**

3) **B. Tripathi,** A.E. Fraser, P.W. Terry, E.G. Zweibel, and M.J. Pueschel, "Mechanism for sequestering magnetic energy at large scales in shear-flow turbulence," *Phys. Plasmas* **29**, 070701 (2022). **DOI ADS**

4) **B. Tripathi** and D. Mitra, "Exact analytical solutions in inhomogeneous magnetic fields for linear asteroseismic waves," *Astrophys. J.* **934**, 61 (2022). **DOI ADS**

5) **B. Tripathi,** A.E. Fraser, P.W. Terry, E.G. Zweibel, and M.J. Pueschel, "Near-cancellation of up- and down-gradient momentum transports in magnetized shear flow turbulence due to stable modes," *Phys. Plasmas* **29**, 092301 (2022). **DOI ADS**

6) **B. Tripathi,** A.E. Fraser, P.W. Terry, E.G. Zweibel, and M.J. Pueschel, "Mode-coupling, energy transfer, and saturation of forced shear-flow turbulence," *In prep.*

7) **B. Tripathi,** A.J. Barker, A.E. Fraser, P.W. Terry, E.G. Zweibel, and M.J. Pueschel, "Nonlinear saturation mechanism of the GSF instability," *In prep.*

8) **B. Tripathi,** and D. Mitra, "Waves in magnetized polytropes," *In prep.*

9) **B. Tripathi,** A.E. Fraser, P.W. Terry, E.G. Zweibel, and M.J. Pueschel, "Cascade reduction and saturation mechanims of 3D hydrodynamic shear-flow turbulence," *In prep.*

Competitive awards/fellowships/honors

2022 **Callen Award** UW-Madison, WI
Awarded annually to an outstanding plasma theory Ph.D. student in the department of physics and the department of engineering, combined; Award funds donated by Professor Emeritus James D. Callen

2022 **Student Travel Grant awarded by the Topical Group in Plasma Astrophysics, Americal Physical Society** Spokane, WA
Awarded $1500 to participate and present talks at the Division of Plasma Physics Annual Meeting

2022 **Best student poster prize** Santa Rosa, CA
Awarded at the International Sherwood Fusion Theory Conference 2022
(http://www.sherwoodtheory.org/sw2022/index.php; https://www.sherwoodtheory.org/meeting_highlights/Highlights.2022.pdf)

2021 **Van Vleck Award** UW-Madison, WI
Awarded to an outstanding graduate student in the physics department, based on annual academic achievement; Award funds donated by Van Vleck Foundation Board of Directors
(https://www.physics.wisc.edu/department/awards/)

2020 **Best Teaching Assistant Award** UW-Madison, WI
Awarded for the spring semester 2020, based on teaching excellence in the physics department
(https://www.physics.wisc.edu/department/awards/)

2016 **Best Student Award in a winter course on "Hydrodynamic Stability and Dynamo Theory"** Warangal, India
For excellent performance in presentations, class tests, and assignments during a graduate level 2-week long course

2013 **Champion of Nepal Physics Olympiad** Kathmandu, Nepal
Selected by the Nepal Physical Society to represent Nepal in the International and Asian Physics Olympiads

Successful Computing Allocation Requests Co-authored

2021, 2022, 2023 **Gyrokinetic Plasma Microturbulence and MHD Simulation in Fusion and Basic Plasmas**
—Contributed to the proposal, but the PI was the lead author;
—Resources awarded: 13 million CPU-hours (in 2021), 19 million CPU-hours (in 2022), 82 million CPU-hours (in 2023); XSEDE and ACCESS supercomputing resources;
—PI: P.W. Terry, Co-PIs: **B. Tripathi**, S.-W. Tsao, T. Jitsuk, M.J. Pueschel

Invited Talk(s)

2022 Oct **A New Mechanism for Sequestering Magnetic Energy at Large Scales in Shear-Flow Turbulence** Spokane, WA
64^{th} Annual Meeting of the APS Division of Plasma Physics,
https://meetings.aps.org/Meeting/DPP22/Session/JI01

Seminar(s)

2023 Jan **A New Mechanism for Sequestering Magnetic Energy at Large Scales in Shear-Flow Turbulence** Virtual
Nordic Dynamo Seminar at Nordic Institute for Theoretical Physics, Sweden,
https://indico.fysik.su.se/event/8021/

Selected contributed presentations/conferences

2022 Oct **Mode coupling, energy transfer, and saturation models of Kelvin-Helmholtz-instability-driven turbulence**
64^{th} Annual Meeting of the APS Division of Plasma Physics, **Contributed talk**, Spokane, WA
https://meetings.aps.org/Meeting/DPP22/Session/TO03.5

2022 Apr **Transport reduction in forced shear layers due to stable modes** **Poster presentation**, Santa Rosa, CA
International Sherwood Fusion Theory Conference 2022, Poster here

2021 Nov **Transport in Stellar Interiors** **Workshop**, Santa Barbara, CA
Kavli Institute of Theoretical Physics

2021 Nov **Stable-mode-mediated nonlinear saturation, transport, and small-scale dissipation in MHD Kelvin-Helmholtz turbulence**
63^{rd} Annual Meeting of the APS Division of Plasma Physics, Poster here **Poster presentation**, Pittsburg, PA

2021 Aug **Stable-mode-mediated turbulence saturation and small-scale dissipation in MHD Kelvin-Helmholtz unstable flows**
International Sherwood Fusion Theory Conference 2021, Slides here **Contributed talk**, Virtual meeting

2020 Nov **Modeling shear-flow driven forced MHD Turbulence** **Contributed talk**, Virtual meeting
62^{nd} Annual Meeting of the APS Division of Plasma Physics, Slides here

2020 Nov **Surface Signatures of Subsurface Magnetic Fields** **Contributed talk**, Virtual meeting
62^{nd} Annual Meeting of the APS Division of Plasma Physics, Slides here

2019 Mar **Solar Helicity Workshop, Nordic Institute of Theoretical Physics** **Contributed talk**, Stockholm, Sweden
Participated in a month-long program, and presented a talk Slides here

2018 Aug **Origin and Recovery From Grand Minima Mediated via Noise in Solar Magnetic Cycles** **Contributed talk**, Vienna, Austria
Focus meeting in International Astronomical Union's 30^{th} General Assembly; Slides here

2018 Feb **Origin and Recovery from Grand Solar Minima** **Poster presentation**, Jaipur, India
International Astronomical Union Symposium, IAUS 340, Poster here

Professional Service

2022–now **Peer-reviewer for Physical Review Letters**
Reviewed article and wrote a co-referee report

2022–2023 **Physics Department Colloquium Committee Member** UW-Madison
Served as a student representative on faculty committee, https://www.physics.wisc.edu/department/committee/

2021–2022 **Organizing Committee Member of Peer Mentoring Program** UW-Madison
Assisted in ideating, implementing, and executing the Peer Mentoring Program, under the auspices of the Physics Graduate Student Council, while also peer-mentoring incoming graduate students in both the academic years 2020–2021 and 2021–2022; https://pgsc.physics.wisc.edu/pm/

Teaching Experience

2019–2021 **Teaching Assistant (TA), Introductory calculus-based physics for undergraduates majoring in biological sciences**
Taught for four semesters, with responsibilities of organizing discussion classes for approx. 50 students each semester, and leading laboratory sessions, office hours, and grading class assignments and exams; Recognized three times with "Excellent" rating—the highest among six possible ratings—and once with "Very Good," by the TA coordinator, based upon course instructor's and students' evaluations; Best TA award in Spring 2020 among all TAs in the physics department

2014–2017 **Private tutor to high-school students, Physics Olympiad trainer through Nepal Physical Society and several high schools**
I would be happy to discuss more about these memorable years if asked.

Olympiads

2014	**Competed in the Asian Physics Olympiad**	Singapore
2013	**Competed in the International Physics Olympiad**	Copenhagen, Denmark
2013	**Champion in the Nepal Physics Olympiad**	Kathmandu, Nepal
2012	**Ranked 6^{th} in the Nepal Physics Olympiad**	Kathmandu, Nepal