FY 2025 Annual Report

Unit Name

Nonlinear and Non-equilibrium Physics Unit

Professor Mahesh M Bandi

Collaborations

Dr. Joseph Samuel, International Centre for Threoretical Sciences, India, Topological Hydrodynamics

Dr. Andres Concha, Universidad Adolfo Ibañez, Santiago, Chile, Topological Hydrodynamics

Dr. Luiza Angheluta, University of Oslo, Norway, Topological Hydrodynamics

Dr. Robert Ecke, Los Alamos National Laboratory, USA, Granular Mechanics

Dr. Antonio Celani, International Centre for Theoretical Physics, Trieste, Italy, Spider-ant predator-prey interactions.

Dr. Meta Virant-Doberlet, National Institute of Biology, Slovenia, Spider-ant predator-prey interactions.

Dr. Shreyas Mandre, University of Cambridge, UK, Interfacial surfactant spreading dynamics.

Research Personnel

Chien-chia Liu, Staff Scientist

Christian Vaquero-Stainer, Postdoctoral Scholar

Soumen Das, Postdoctoral Scholar

Eric Cereceda Lopez, Postdoctoral Scholar

Anup Kumar, Postdoctoral Scholar

Anup Kumar, Research Unit Technician

Aditya Singh, OIST Student

Jack Featherstone, OIST Student

Sayan Mitra, OIST Student

Yuliya Osika, OIST Student

Diala Joy Edde, OIST Student

Ilhem Nadia Rabehi, PhD Student

Veronika Leonie Bachleitner, PhD Student

John Derek Featherstone, PhD Student

Irina Korshok, PhD Student

Andrew Kai Lockrow, Research Intern

Renuka Nediyara Anil, Research Intern

Scholarly Contributions and Creative Productions (by Faculty)

Journal Article

1. Bandi, M. M.; Das, T.

Spatially Resolved Fast Dynamics Reveal the Aggregation Mechanism in Two-Dimensions. Soft Matter 2026.

2. Bandi, M. M.; Jack, M. W.

   Extreme Value Statistics of Peak Residential Electricity Demand: Effect of Aggregation and Moving-Average Smoothing. Sustainable Energy, Grids and Networks 2025, 42.

Presentation at Conference

1. Bandi, M. M.; Aoki, K. M.

   Simulation Method for Granules with Particle-Contact Friction. The Physical Society of Japan 2025 Annual Meeting 2025.

2. Bandi, M. M

   When friction remembers: Preisach hysteresis in Granular Matter. Unifying Concepts in Glass Physics December 2025. Raman Research Institute, Bengaluru, India.

3. Bandi, M. M.

   When friction remembers: Preisach hysteresis in Granular Matter. Hard Problems in Soft Earth Geophysics. Kavli Institute of Theoretical Physics, University of California at Santa Barbara, January 2026.

4. Bandi, M. M.

   When waves meet vortices: A topological twist in water. January 2026. SMALS Conference Series, University of California at Santa Barbara.

5. Bandi, M. M.

   When waves meet vortices: A topological twist in water. August 2025. CNLS Colloquium, Los Alamos National Laboratory, USA

6. Bandi, M. M.

   Spectrum of wind power fluctuations. August 2025. SFI Colloquium, Santa Fe Institute, USA

7. Bandi, M. M.

   When waves meet vortices: A topological twist in water. September 2025. Condensed Matter Seminar, University of Pennsylvania.

8. Bandi, M. M.

   When waves meet vortices: A topological twist in water. June 2025. Condensed Matter & Fluid Dynamics Seminar, International Centre for Theoretical Sciences, Bengaluru, India.

9. Bandi, M. M.

   When waves meet vortices: A topological twist in water. May 2025. Condensed Matter Seminar, TIFR Centre for Interdisciplinary Sciences, Hyderabad, India.

Scholarly Contributions (by Unit Members)

Name of Unit Member	Type	Title	Outlet	Publisher	Year Pub
Soumen Das	Journal Article	Role of kinematic constraints in the time reversal symmetry breaking of a model active matter	PNAS	National Academy of Sciences	2025
Hirokazu Maruoka	Journal Article	Data-driven discovery of self-similarity using neural networks	Physical Review E	American Physical Society	2025

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Hirokazu Maruoka	Journal Article	Droplet impact on elastic substrates: force scaling crossover	Nature Communications	nature communications	2026
Hirokazu Maruoka	Journal Article	Prigogine's temporalization of physics: two agnostic attitudes of physicists		Annals of the Japan Association for Philosophy of Science	2025
Christian Vaquero-Stainer	Journal Article	From fluttering to drifting: Inertialess sedimentation of an achiral particle		Physical Review Fluids	2026
Hirokazu Maruoka	Journal Article	Early-stage impact dynamics in dense suspensions of millimeter-sized particles		Physics of Fluids	2025
Aditya Singh	Poster Presentation at Conference	Standing Waves in a spinning fluid	StatPhys29		
Jack Featherstone	Poster Presentation at Conference	Predatory trapping by widow spiders	StatPhys29		2025
Hirokazu Maruoka	Poster Presentation at Conference	The experimental observation of the elastic response on the impact-induced hardening of the suspension	StatPhys29		
Aditya Singh	Presentation at Conference	Standing Waves in a spinning fluid	JPS 2025		2025
Keiko M. Aoki	Presentation at Conference	Investigation of physical properties of smectic liquid crystals using constant shear-normal stress molecular dynamics simulation	Japanese Liquid Crystal Conference 2025 September 10th - 12th		2025
Chien-chia Liu	Presentation at Conference	Self-Organized Waves in Quasi-Two-Dimensional Turbulence	Physical Society of Japan 80th Annual Meeting		2025
Christian Vaquero-Stainer	Presentation at Conference	Marangoni-Driven Spreading of a Non-Volatile Liquid on an Immiscible Fluid Interface	18 ACFM, Seoul, Korea		
Hirokazu Maruoka	Presentation at Conference	Dynamics of Marangoni flow on the air-liquid interface in Glycerol-Fatty Acid system	Physical Society of Japan Annual Meeting 2025		
Christian Vaquero-Stainer	Presentation at Conference	Marangoni-Driven Spreading of a Non-Volatile Liquid on an Immiscible Fluid Interface	BAMC Exeter, UK		
Chien-chia Liu	Presentation at Conference	Self-organized waves in quasi-two-dimensional turbulence	RIMS Symposium "Turbulence and eddies"		2025

Honors, Awards & Fellowships

Term 2 2018 - Ongoing	Fluid Dynamics Research (FDR) Prize, 流体力学研究（FDR）賞, 2018, Japan Society of Fluid Mechanics [Fiscal Year: 2018-04-01]

Honors, Awards & Fellowships [By Unit Members Only]

Term 3 2025 - Term 3 2025	Jack Featherstone, Poster prize for biological physics topic, Poster prize for biological physics topic, 2025, StatPhys29, N/A [Fiscal Year: 2025-07-01]

Other Institutional Service

Term 3 2024 - Term 3 2025	Chair, Mathematical Sciences Faculty Search Committee, (University) [Fiscal Year: 2024-07-01]

Outreach Activities [For Unit Members Only]

Term 2 2026	Hirokazu Maruoka, OIST Seed program Miyazaki Nishi SSH visit, OIST [Fiscal Year: 2025]
Term 2 2026	Chien-chia Liu, Miyazaki Prefecture Miyazaki Nishi SSH 2-Days Program, 2nd Day [Fiscal Year: 2025]
Term 1 2025	Jack Featherstone, Hirokazu Maruoka, Tottori Prefecture Yonago Higashi SSH Visit [Fiscal Year: 2025-12-17]
Term 1 2025	Jack Featherstone, Hokkaido Prefecture Sapporo Asahigaoka SSH Visit [Fiscal Year: 2025-12-02]
Term 1 2025	Hirokazu Maruoka, OIST Seed program Odawara SSH visit, OIST [Fiscal Year: 2025]
Term 1 2025	Aditya Singh, OIST Seed program Odawara SSH visit, OIST [Fiscal Year: 2025]
Term 3 2025	Jack Featherstone, Onna x OIST Children's School of Science, OIST [Fiscal Year: 2025-08-06]
Term 3 2025	Yuliya Osika, Dowango High School visit to OIST [Fiscal Year: 2025]
Term 2 2025	Aditya Singh , OIST Seed program Miyazaki Nishi SSH visit, OIST [Fiscal Year: 2024]
Term 2 2025	Yuliya Osika, Tokyo Ochanomizu High School visit to OIST [Fiscal Year: 2025]
Term 2 2025	Dr. Hirokazu Maruoka, OIST Science Fetival, OIST [Fiscal Year: 2024]

Workshops and Seminars [Organized and Hosted by Faculty/Units]

Speaker Name(s)	Title	Location	Date
Dr. Joseph Samuel	The Geometric Phase and the Spin-Statistics Theorem: spinning particles as ribbons	OIST	2026-03-24
Prof. Mahendra Verma	On the Absence of the Ultimate Regime in Turbulent Thermal Convection	OIST	2025-09-29
Prof. Smarajit Karmakar	Annealing Amorphous Solids using Oscillatory Shear and Active Dopants and Memory Formation	OIST	2025-05-20
Dr. Meta Virant-Doberlet	Biotremologist dreaming to be an insect: A brief introduction to a hidden world of vibrational communication	OIST	2025-02-25
Prof. Antonio Celani	"Decoding behavior: optimization and inference of decision-making processes"	OIST	2025
Prof. Jun Zhang	"Table-top Experiments Inspired by Geophysical Phenomena"	OIST	2025