

# Turning on the heat with spins and their transport across interfaces in heterostructures

Hari Srikanth  
Distinguished University Professor  
Department of Physics, University of South Florida, Tampa FL 33620

Spin-heat coupling plays a crucial role in both fundamental physics and various thermoelectric and thermomagnetic applications. *Can we generate localized heat using magnetic nanoparticles or 'super spins'? How can we manipulate spin transport using thermal gradients?* In this talk, I will address these questions through insights gained from our research on diverse systems, ranging from nanostructures to heterostructures. Our focus spans anisotropic nanoparticles, compensated ferrimagnets, topological systems, spin gapless semiconductors, and interfaces of 2D materials with ferrites and garnets.

The core of our research lies in the precise measurement of effective interfacial magnetic anisotropy across a wide array of magnetic materials, including bulk samples, nanoparticle assemblies, and thin film heterostructures. We also quantitatively analyze thermally generated spin currents. I will explain how we integrate both conventional and unconventional experimental techniques, such as magnetometry, RF transverse susceptibility, anomalous Nernst effect (ANE), spin Seebeck effect (SSE), and ferromagnetic resonance spin pumping (FMR-SP), to explore the fundamental physics of spin dynamics, spin-heat coupling, and thermal spin transport across interfaces.

Additionally, I will present recent findings from our ongoing projects, including tunable magnetism in core-shell nanoparticles, the influence of magnetic anisotropy on SSE and ANE, universal scaling of SSE in compensated ferrimagnets, estimation of magnon propagation length and the evidence for intrinsic Berry curvature in quaternary Weyl semi-metal Heusler alloys.



**Hari Srikanth** is a Distinguished University Professor at the University of South Florida. He received his Ph.D. in experimental condensed matter physics from the Indian Institute of Science, Bangalore and has been at USF since 2000. He is currently the Director for Florida Initiative for Emergent Low-Dimensional Quantum Materials (FIELD-QM). His research spans a wide range of topics in magnetism and magnetic materials. He has over 300 publications and has given over 200 invited talks around the world. In 2019, he was an IEEE Magnetics Society Distinguished Lecturer. Hari is a *Fellow of the American Physical Society*, *Fellow of the Institute of Physics* and a *Senior Member of IEEE*. He currently serves as an Associate Editor for *Physical Review B*. Hari has been closely involved with the MMM and INTERMAG conferences for over 20 years serving as Publication Editor, Publication Chair and on program committees. He is a recipient of an *Alexander von Humboldt Research Award* and is affiliated with University of Duisburg-Essen during his AvH visits to Europe. Hari also received a *Fulbright Scholar Award* to be a visiting professor at Nanyang Technological University in Singapore and is currently a visiting professor at IIT Bombay. Hari was a theme co-organizer for ICM 2024 in Italy and will be the Special Events Chair for the 2025 MMM in Palm Beach, FL.