

January 23, 2023 – Speaker: Nidhi Pashine

Time: 2:00-3:00 PM

Location: Klaus 1116 E&W

Title: Harnessing disorder to create novel functionality in materials

Abstract: Unlike crystalline solids, disordered materials live in a complex and rugged energy landscape with multiple local energy minima, each corresponding to a different state with its own set of properties. In this multitude of possibilities, the challenge is to identify states that have unusual and desirable behavior. For e.g., a jammed packing of granular particles, a quintessential disordered system, has well defined bulk properties that depend on, among other factors, the interparticle interactions. Here I present “particulated” granular metamaterials - flexible tessellations filled with a small number of particles in each cell. By limiting inter-particle interactions to individual cells of a larger system, we create a material with a rich and complex mechanical response that is unlike conventional granular packings. Another feature of disordered systems is that they are often out-of-equilibrium and evolve over time. Such a material has a memory of its history which affects its properties, including its response to external perturbations. By controlling the external forces acting on a system, we can direct a material's evolution to modify its behavior in a favorable way. We can train a material to modify and tune its elastic properties in the non-linear as well as the linear regimes without having to control the material at the microscopic level. Disordered systems thus have the potential to be the basis for creating broad classes of materials with specific functionality.

Bio: Nidhi Pashine is a postdoctoral associate in the School of Engineering and Applied Sciences at Yale University. She obtained her Ph.D. in Physics in 2021 from the University of Chicago. Nidhi is a soft matter experimentalist whose interests include mechanical metamaterials, granular systems, robotic soft materials, and memory and training in materials.



A dark grey event poster for a colloquium. At the top left is a yellow and white circular logo with diagonal lines. To its right is the Georgia Tech logo and the text "Georgia Institute of Technology School of Physics". Below this is "SCHOOL OF PHYSICS COLLOQUIUM" in yellow. The main title "HARNESSING DISORDER TO CREATE NOVEL FUNCTIONALITY IN MATERIALS" is in yellow. Below that, the date "MONDAY, JANUARY 23, 2023", time "3:00 TO 4:00 PM", and location "KLAUS 1116 EAST&WEST" are listed in white. A yellow button at the bottom left says "COFFEE AND PASTRIES SERVED". On the right, there is a circular portrait of Dr. Nidhi Pashine with a yellow border, and below it, the text "DR. NIDHI PASHINE" and "YALE UNIVERSITY" in white. There are decorative white dot patterns in the top right and bottom left corners.