東京理科大学
TOKYO UNIVERSITY OF SCIENCE

第38回　物理工学科セミナー

日時：11月24日（火）15:00－16:00
場所：葛飾キャンパス研究棟８Ｆ第2セミナー室

Speaker：Shravan Pradeep (Assistant Professor)
Affiliation: OIST (Geomimicry Unit, Okinawa Institute of Science and Technology)

Title： Emergent Mechanics in Earth-Mediated Complex Matter

Abstract：

Earth materials, much like living organisms, have evolved over millions of years, developing distinctive mechanical and transport properties. How does nature engineer soil with specific functions? What general principles govern the emergence of macroscopic soil properties, and how can they guide the development of multifunctional soft materials? My research addresses these questions by recasting soil as a hierarchical class of soft matter, revealing how microscopic interactions give rise to mesoscale structures and macroscopic mechanics. I will discuss three studies that progressively incorporate greater complexity, both in the systems examined and the multiscale methods employed, to illustrate this framework. First, I will show how tuning grain-scale surface chemistry controls macroscopic shock-absorbing behavior in dense particulate suspensions using a model system. Second, I will present a geo-inspired “Soft Earth” system, an idealized model soil, that exhibits an interaction-controlled brittle-to-ductile failure transition. Finally, I will describe a multiscale framework coupling flow, friction, and adhesion in natural muds to explain their unique gripping and lubrication behavior, properties famously harnessed by Major League Baseball in the “rubbing mud” used to prepare every game ball. Together, these studies illustrate how reimagining soil as a class of complex soft matter can yield design principles for adaptive, sustainable, and resilient materials, with potential applications spanning climate-resilient soils, precision agriculture, and planetary terraforming.）

世話人：住野　豊