

Karen Daniels – Colloquium seminar – January 20, 2022  
NCSU

Title: Granular Materials: From Quotidian to Astronomical

Abstract: Granular materials are integral to many parts of our daily lives, from the coffee beans that fuel our mornings to the coal that fuels our power plants. At first glance, these materials might appear simple: macroscopic dry, cohesionless particles which interact only by contact forces. However, they represent a complicated phase of matter neither wholly solid nor wholly liquid: a bucket of sand can be poured out, yet form a stable shape once it lands in a pile. Therefore, a crucial question is how to describe the state of a granular system in order to make accurate predictions about its future behavior: under what conditions will a given granular system remain jammed or flowing? I will talk about a series of experiments ranging from the theoretically-motivated (identifying state variables) to the practical (geological and industrial hazards) to the astronomical (rubble pile asteroids). The results of these experiments elucidate the complex behaviors which make predictions about granular materials difficult, and provide a reason to hope that statistical physics might hold the keys to explaining the observed phenomena.