161th MSS-Seminar
Wednesday, March 22th, 15:30 hrs,
Room 00.156,
Cauerstraße 3, Erlangen.

Yield surfaces and residual stresses in granular and colloidal materials

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To flow or not to flow - our everyday life is filled with fluids that seem to probe the boundary of this question. In physicists' terms, they show a wide range of complex rheological characteristics that defy the usual notions of “fluid” and “solid”. Their ubiquity notwithstanding, the associated phenomena are anything but simple to describe from microscopic principles.

In this talk, we will investigate specifically the role that macroscopic geometry plays in determining the flow and deformation behavior. I will discuss how microscopic theory and some fundamental principles of continuum mechanics can inform rheological models to predict the yield surfaces that separate the flowing from the non-flowing states of a glass-forming and a granular fluid.

Looking further at the stresses that remain frozen into a glassy material long after any flow has ceased, we will see how microscopic dynamics and macroscopic geometry conspire to produce residual-stress distributions that are behind the colorful birefringence displays of many an amorphous solid. Through this I hope to convince you that nonequilibrium statistical physics, through the integration-through transients framework, helps us to define a range of qualitative features of complex-fluid flows that would be difficult to guess right in empiricial models.