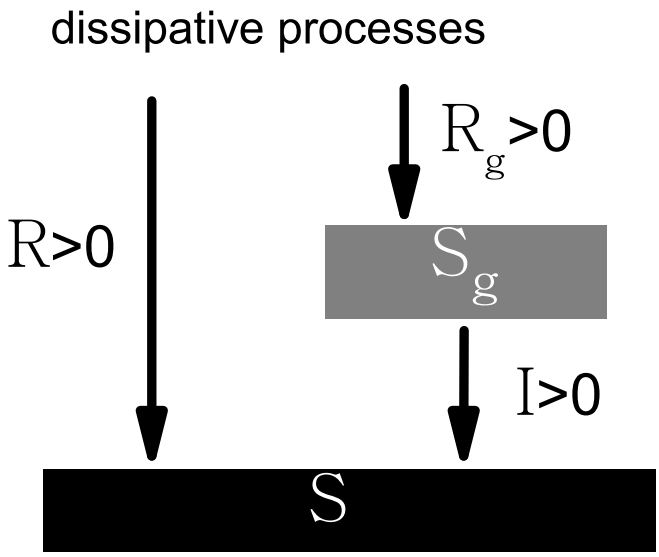
57th MSS-Seminar

Wednesday, Feb. 26th, 15:30, Nägelsbachstr. 49b

MSS

Granular solid hydrodynamics, a wide-range continuum-mechanical theory of granular media

Mario Liu
Uni Tübingen, theoretische Physik



Two-stage irreversibility: Dissipative processes produce either granular entropy S_g, or directly, true entropy S. Eventually, S_g is also converted to S.

A unified continuum-mechanical theory has been until now lacking for granular media, some believe it could not exist. Derived employing the hydrodynamic approach, GSH (for granular solid hydrodynamics) is such a theory, though as yet frequently a qualitative one. The behavior being accounted for include:

(1) static stress distribution, clogging;
(2) elasto-plastic motion: loading and unloading, approach to the critical state, angle of stability and repose;
(3) rapid dense flow: the μ-rheology (or MiDi-model), Bagnold scaling and the stress minimum;
(4) elastic waves, compaction, wide and narrow shear band.
(5) more unconventional experiments such as shear jamming, creep flow, visco-elastic behavior and nonlocal fluidization.

Some illustrative examples will be presented in the talk.

With all these phenomena ordered and related, explained and accounted for, our hopes are that GSH may be employed as a unified framework for coming to terms with macroscopic granular physics -- even if some tuning should prove necessary when further experiments are considered.