

Crystallization and Jamming in Soft Matter under Driving –
Colloidal Suspensions, Granular Media, Foams, and Complex Plasmas

February 11 – 22, 2008

It was the purpose of this workshop to bring together researchers who work on different soft-matter model systems. The focus was on driven systems in the dense regime where crystallization or jamming occurs. The workshop lasted two weeks as planned and had more than 80 participants with between 30 and 50 in residence at any given time. The participants came from 11 different countries: Denmark, France, Germany, India, Italy, The Netherlands, Slovenia, Sweden, Switzerland, United Kingdom, United States.

While there was the expected division between first and second week, all four fields were represented over the entire time of the workshop. Many participants met each other for the first time or became acquainted with other fields only at this workshop. Having two conference dinners, one each week, helped further to create a relaxed atmosphere for open discussions. In addition, the traditional wine-and-cheese parties should be mentioned here as wonderful opportunities to discuss in the nice atmosphere of the Lorentz Center.

There were one to two broader review talks of one hour length per day as well as a few half-hour talks. The review talks were given by the invited speakers who gave a basic introduction in order to bridge the gaps between the communities. Several shorter talks were grouped into symposia and panels that covered a topic either across the fields (crystallization, rheology, crystallization in 2D, soft matter under microgravity) or for a specific field (granular solid state, crystallization in colloidal suspensions) in greater depth. Short (up to 5min) clip talks were scheduled just before the lunch breaks in order to introduce the poster presentations. The experience with these clip talks was very good for the audience and satisfying for the presenters; the distribution of the clip talks between the two weeks was a little bit uneven following the demand.

The talks covered both introductions and current topics in all the fields so the workshop gave a good overview of soft-matter research in general and pointed to interesting questions for researchers in the individual fields. Experimental issues discussed broadly were the application of light-scattering techniques (best known for colloids) in foams and granular media, and the benefit of experiments under microgravity for phase transitions. Adequately, the safe arrival of the European Columbus module at the International Space Station could be celebrated during the workshop.

The interactions among participants triggered during the workshop range from continued discussions, future mutual visits and planned joint proposals to fully established collaborations. Interactions within and across fields included in detail the following topics: compaction in the framework of energy landscapes (granular/colloid), statistical fabric tensor applied to concentrated colloidal suspensions under macroscopic confinement (granular/colloid), comparison of experiments and simulations on the global equation of state (granular), cage dynamics in driven granular media (granular/colloid), compaction and creep of powder and colloids (granular/colloid), transport coefficients and continuum modeling of granular flows (granular), glassy dynamics in complex plasmas (colloid/plasma), statics and dynamics at defects in 2D crystals (colloid/plasma), soft interaction potential for colloids and bubbles (colloid/foam), modelling of yield stresses (colloid/foam), crystallization in two dimensions (foam/plasma), lane formation and shear banding (colloid/plasma), aggregation dynamics with long range interactions (granular), monodisperse particle (granular/plasma), colloidal Rayleigh-Taylor instability (colloid), similarities and differences for the Rayleigh-Taylor instability in granular and colloidal matter (granular/colloid), crystalline structures of foam bilayers (colloid/foam), difference between dry and wet granular media (granular).

Concerning the topic of arrest transitions in dense systems there was frequent and often lively debate during and after the sessions. A central result of the panel discussion in the second week was that crystallization transitions are generally better understood or agreed upon than transitions into disordered states: It was interesting to realize that people from different communities would initially not even agree on the existence of well-defined transitions to be understood. It was the special environment of the Lorentz Center that allowed for enough discussion time and also room for larger and smaller groups to clarify such differences in great depth. We see the long-term benefit of the workshop in more coherent discussions between the fields and a number of formal collaborations in the near future.

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