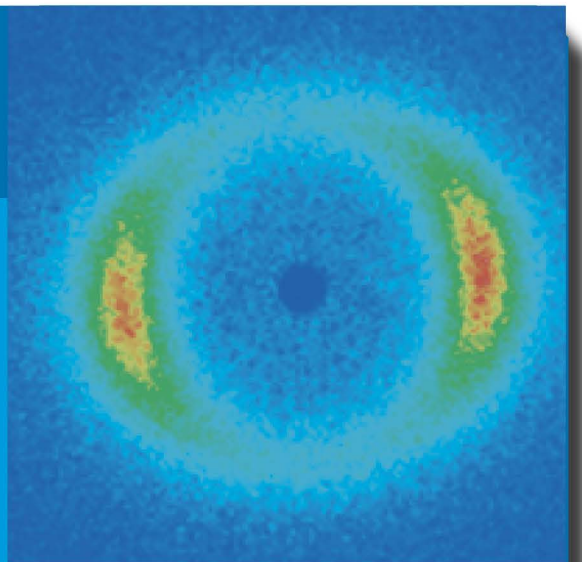


Center for Neutron Science **Seminar**

Dr. Scheffold is a chair "Soft Matter and Photonics" in experimental physics at the University of Fribourg, Switzerland. He is a Swiss/German national who studied at the University of Konstanz (Germany) and the Weizmann Institute of Science (Israel, with Prof. Jacob Klein). He obtained his doctorate in 1998 from the University of Konstanz for research carried out at the Institute Charles Sadron (Strasbourg, France) and Konstanz with Prof. Georg Maret. He has been a visiting fellow for several months at UC Los Angeles (2009) and Brisbane University (2014). His research focuses on the optics of complex systems, dynamic light scattering and diffuse light propagation, the dynamics, aggregation and phase behaviour of colloidal systems and the fabrication and characterisation of soft materials. He currently serves as a member of the Swiss National Research Council and as the chairman of the board of the technology company LS Instruments AG, Fribourg. In 2014 he became a founding member of the Swiss National Center for Competence in Research "Bioinspired Materials" with headquarters in Fribourg.

Rheology, Structure and Internal Dynamics of Soft Colloids Across the Glass and the Jamming Regimes

We investigate structural, dynamical and rheological properties of moderately polydisperse emulsions and microgel colloids across an extended range of volume fractions ϕ , encompassing fluid and glassy states up to jamming. In this talk, I will present results from rheometry, light scattering and DWS, tweezer microrheology and 3D fluorescent microscopy measurements. For volume fractions around $\phi=0.6$ we identify multiple signatures of the glass transition, analyzing both dynamical and structural quantities, highlighting a connection between the dynamic slowing down and growing dynamical and structural correlation lengths [1]. We also study the local non-linear response by performing active microrheology in the glass applying a force on a probe particle embedded in the emulsion [2]. At higher densities $\phi>0.64$, at and above the jamming transition, we observe a sharp increase of the shear modulus probed by rheometry and DWS [3,4]. The glassy regime and the transition toward a dense amorphous phase is well described by a simple predictive model of linear shear elastic modulus taking into account entropic and elastic contributions to the free energy [3]. While the elastic deformation of jammed and compressed emulsion droplets is fairly well understood [3], this is not the case for dense assemblies of 'fuzzy' polymer microgel spheres [4]. To study the density profile and shape of soft microgels 'in-situ', we employ dSTORM superresolution microscopy [5,6]. As we demonstrate this allows us to monitor 'live' the change in microstructure across the volume phase transition when particles are swelling and deswelling. Moreover, we can observe shape changes, such as faceting and weak interpenetration, in dense and highly overpacked microgel systems up to effective volume fractions of 300% [6].



Dr. Frank Scheffold

Department of Physics

University of Fribourg



DATE:

October 4, 2017

TIME:

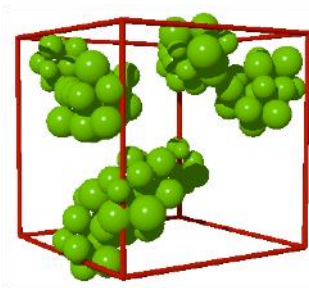
11:00 a.m.

LOCATION:

366 Colburn Lab

**UNIVERSITY OF
DELAWARE.**

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Visualization of typical locally favoured structures (LFS) observed by confocal microscopy in an emulsion glass at $\phi=0.6$, from ref. [1]

