

## Editorial

Welcome to the fifth issue of the annual SFB TR6 Gemeindebrief. This newsletter is a forum to present the recent research highlights and scientific activities of the collaborative research centre SFB TR6. It is directed both to researchers in the network and to other scientists interested in the physics of colloidal dispersions. The newsletter also includes a short personalia section and information about SFB TR6 and soft matter conferences, schools and workshops.

Those who want to know more about the SFB TR6 are invited to visit our web page: [www.sfb-tr6.de](http://www.sfb-tr6.de)

Hartmut Löwen, Brigitte Schumann and Antonia Kühnemund

## Spektrale



From 15.07.2011-14.08.2011 the Spektrale exhibition was organized from the Mainzer Wissenschaftsallianz in conjunction with Mainz, being the city of sciences 2011. Its focus was on the relation between arts, light and colour. The SFB TR6 was represented on the Spektrale by a demonstration experiment on colloidal light scattering by Thomas Palberg.

## New assistant secretary in the SFB TR6

Since November 2010, Antonia Kühnemund is also working for the SFB TR6 in the secretary. She will help Ms. Schumann as a student assistant.



One of the main activities of the SFB TR6: The summer school in Cargèse (Corsica) from September 27th to October 8th (2010)

## New Cooperation of the SFB TR6 with a Japanese core-to-core soft matter program



The SFB TR6 has signed a cooperation contract with a Japanese core-to-core program on the topic "soft matter in non-equilibrium" which is coordinated by T. Ohta (Kyoto). This will facilitate a scientific exchange between Japanese soft matter scientists and the SFB TR6.



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### The SFB TR6 Summer School



The SFB TR6 Summer School "Physics of colloidal suspensions and granular media" was organized by E. Clément, G. Maret and H. Löwen in Cargèse (Corsica) from September 27th to October 8th (2010). The idea of this summer school was first to bring together the colloid and the granulate communities. In fact, there are many similar problems of phase transitions in these two areas of physics. The second purpose was to establish a forum for young researchers to learn about fundamental topics in these areas. The summer school was a great success: about



78 applications were received. 27 internationally recognized scientists from both areas were presenting lectures. Most of the lecturers from the colloid field were researchers from the SFB TR6.

### Workshop on Dynamics in Viscous Liquids in Rome 2011



T. Voigtmann

The third international workshop on Dynamics in Viscous Liquids was organized with support from the SFB TR6 and the Accademia Nazionale die Lincei, in Rome, by Emanuela Zaccarelli, Thomas Voigtmann and Giorgio Parisi. The workshop was held from March 30 to April 2, 2011, in the villa of the Italian Academy of Sciences close to Vatican City. The aim of this workshop was to bring together colloid scientists with researchers working on the glass transition in general. Several SFB TR6 scientists were among the invited speakers including M. Fuchs, M. Laurati, J. Horbach, F. Weysser, Ch. J. Harrer, P. Keim, C. Dalle-Ferrier. The workshop had a large attendance of 164 researchers (from 18 countries) 21 of them from the SFB.

### Lekkerkerker Meeting on 10.06.2011

The SFB TR6 supported the symposium "Phase transitions and interfaces in colloidal suspensions" in honour of **Henk. N. W. Lekkerkerker** on the occasion of his 65th birthday. This meeting which was held in Amsterdam on June 10th 2011 had a strong SFB attendance including: M. Dijkstra, J. K. G. Dhont (invited speaker), A. Imhof, A. van Blaaderen, S. Egelhaaf, H. Löwen, G. Nägele, A. Petukhov, D. Vanmaekelbergh, G. Vroege, H. H. Wensink and the former SFB project leaders R. Klein, T. Schilling and M. Schmidt.

### Young Researcher Meeting Utrecht



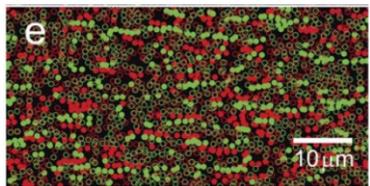
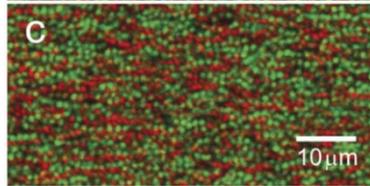
The second Young Researcher Meeting of the third SFB funding period was held in Utrecht from April 18th to 19th and was organized by R. van Roij. About 25 young SFB scientists were together to present their own research.



**Selected scientific results**

**Lane formation in driven mixtures of oppositely charged colloids**

T. Vissers, A. Wysocki, M. Rex, H. Löwen, P. Royall, A. Imhof and A. van Blaaderen, *Soft Matter* 7, 2352-2356 (2011)



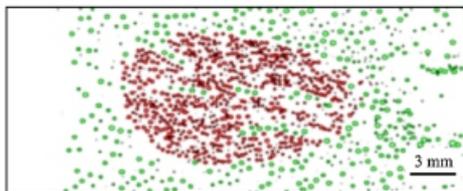
In a collaboration of scientists from Düsseldorf and Utrecht, real-space experiments and computer simulation were compared for lane formation of charged colloids in electric fields. The results demonstrate a continuous increase in the fraction of particles in a lane in the case that oppositely charged particles are driven by an electric field. This behavior is accurately captured by Brownian dynamics simulations. By studying the

fluctuations parallel and perpendicular to the field the mechanism is identified that underlies the formation of lanes.

**Kinetics of Fluid Demixing in Complex Plasmas: Role of Two-Scale Interactions**

A. Wysocki, C. R ath, A.V. Ivlev, K. R. S utterlin, H. M. Thomas, S. Khrapak, S. Zhdanov, V. E. Fortov, A. M. Lipaev, V. I. Molotkov, O. F. Petrov, H. L owen, and G. E. Morfill, *Phys. Rev. Letters* 105, 045001 (2010)

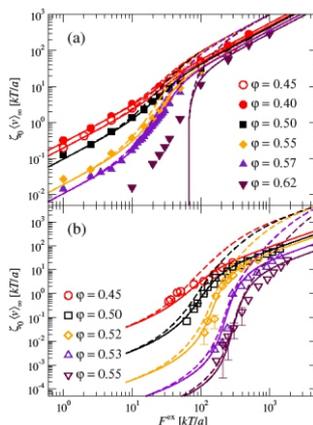
This paper highlights the link between charged colloids and dusty plasmas. Using experiments and combining theory and computer simulations, binary complex plasmas are shown to be a particularly good model systems to study the kinetics of fluid-fluid demixing at the "atomistic" (individual particle) level, similar as colloid-polymer mixtures. The essential parameters of interparticle interactions in complex plasmas, such as the interaction range(s) and degree of nonadditivity, can be varied significantly, which allows systematic investigations of different demixing regimes.



**Schematic models for active nonlinear microrheology**

Gnann, M.V., I. Gazuz, A.M. Puertas, M. Fuchs and T. Voigtmann *Soft Matter* 7, 1390–1396 (2011)

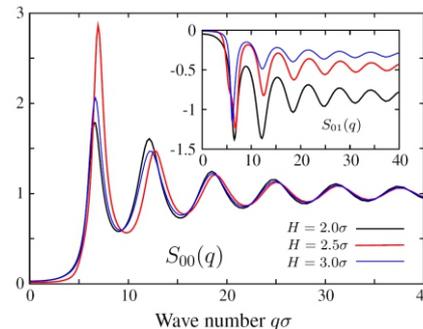
The nonlinear active microrheology of dense colloidal suspensions was analysed using a schematic model of mode-coupling theory. The model describes the strongly nonlinear behavior of the microscopic friction coefficient as a function of applied external force in terms of a delocalization transition, which is visible in Brownian dynamics simulations of a system of quasi-hard spheres and experimental data on hard-sphere-like colloidal suspensions.



**Glass Transition in Confined Geometry**

S. Lang, V. Botan, M. Oettel, D. Hajnal, T. Franosch and R. Schilling, *Phys. Rev. Lett.* 105, 125701 (2010)

Extending mode-coupling theory, a microscopic theory for the glass transition of liquids confined between two parallel flat hard walls was elaborated.



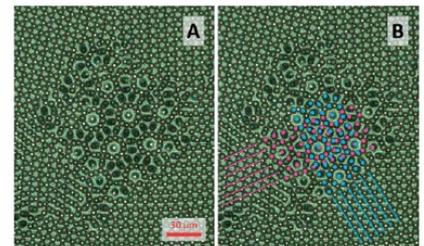
The theory contains the standard mode-coupling theory equations in bulk and in two dimensions as limiting cases and requires as input solely the equilibrium density profile and the structure factors of the fluid in confinement. The phase diagram as a function of the distance of the plates

for the case of a hard sphere fluid was evaluated and an oscillatory behavior of the glass transition line as a result of the structural changes related to layering was obtained.

**Transient Moire rotation patterns in thin colloidal crystals**

A. Reinm uller, H.-J. Sch ope, T. Palberg, *Soft Matter* 6, 5312-5315 (2010)

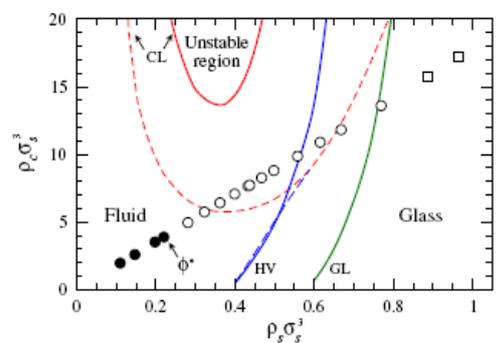
A high resolution optical microscopy study on low salt charged sphere suspensions settling under gravity reveals the formation of AB-stacked triangular layers via different transient structures. In particular, metastable triangular Moire rotation patterns (formally corresponding to a 1x1 R a super structure with rotation angles  $\alpha \approx 27.8^\circ$  and  $\alpha \approx 38.2^\circ$ )



**Ultrasoft Colloid-Polymer Mixtures: Structure and Phase Diagram**

B. Lonetti, M. Camargo, J. Stellbrink, C. N. Likos, E. Zaccarelli, L. Willner, P. Lindner and D. Richter, *Phys. Rev. Lett.* 106, 228301 (2011)

Binary mixtures of ultrasoft colloids and linear polymer chains were investigated by small-angle neutron scattering and liquid state theory in a collaboration between J ulich and D usseldorf.



The experimental data can be described by employing recently developed effective interactions between the colloid and the polymer chains, in which both components are modeled as point particles in a coarse-grained approach, in which the monomers have been traced out. Quantitative, parameter-free agreement between experiment and theory for the pair correlations, the phase behavior and the concentration dependence of the interaction length is achieved.

**Editorial Details**

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**New researchers in the SFB TR6 since 2010**



In March 2011, **Jürgen Horbach** assumed a professor position at the university of Duesseldorf on Theoretical soft matter science. In the first funding period of the SFB TR6, he was principal investigator of the project A5 before he left Mainz to the DLR (Cologne). Being now back to the SFB roots he will continue his collaboration with SFB scientists.

Since 1. July 2011, **Michael Schmiedeberg** is heading an Emmy-Noether-junior-researcher-group in the Physics department of the Heinrich-Heine-University Düsseldorf. He will do research on colloids on structured substrates and therefore will closely collaborate with the SFB TR6.



**prizes and honors**



**Georg Maret** was awarded with the Gentner-Kastler-Prize of the German Physical Society for his extraordinary work on colloidal soft matter. He was also honored with a Koselleck-Project from the German Science Foundation.

**Hartmut Löwen** received an interdisciplinary ERC Advanced Investigator Grant in order to explore the link between charged colloids and complex plasmas with G. Morfill.



**Pavlik Lettinga** finished his habilitation and obtained his venia legendi at the physics department of the University of Düsseldorf.



**Kurt Binder** was elected as member of the Leopoldina (German national Academy of Sciences, Halle)



**Special among SFB TR6 guests**

- 09/2010 **J. Chakrabarti (Kolkata)** visited Düsseldorf
- 10/2010 **C. Crause-Thibierge (Saclay)** visited Düsseldorf
- 10/2010 **S. Komura (Tokyo)** visited Düsseldorf
- 11/2010 **P. Royall (Bristol)** visited Düsseldorf
- 02/2011 **A. Fery (Bayreuth)** visited Mainz
- 03/2011 **S. Sengupta (Kolkata)** visited Mainz
- 04/2011 **H. R. Jiang (Tokyo)** visited Mainz
- 05/2011 **K. Elder (Oakland)** visited Düsseldorf
- 06/2011 **S. K. Das (Bangalore)** visited Mainz
- 06/2011 **W. van Megen (Melbourne)** visited Mainz

**Calls of SFB members to other universities**



**Joseph Brader** assumed a professorship financed by the Swiss national funds at the University of Fribourg (Switzerland).

**upcoming CODEF III**



The 3rd International Conference „CODEF III, “Colloidal Dispersions in External Fields” will be held on 20.3.-23.3.2012 in the Gustav-Stresemann-Center Bonn (Bad Godesberg), Germany. Invited speakers include **A. Böker** (Aachen), **C. Bechinger** (Stuttgart), **D. Bonn** (Paris), **K. Dholakia** (St. Andrews), **S. Dietrich** (Stuttgart), **W. Irvine** (New York), **G. Jackson** (London), **R. von Klitzing** (Berlin), **T. Ohta** (Kyoto), **W. Poon** (Edinburgh), **T. Squires** (Santa Barbara) **C. P. Royall** (Bristol), **A. V. Ivlev**



(Garching) and speakers from the SFB TR6. The progress of the conference consisting will be published in a special issue of the Journal of Physics: Condensed Matter. On <http://www.sfb-tr6.de/> you will find a registration link. The registration deadline is 06.01. 2012.

**CODEF III 2012**  
**“Colloidal Dispersions in External Fields”**

held on

**20.03. - 23.03.2012**

in the

Gustav-Stresemann-Center Bonn  
(Bad Godesberg), Germany

Europäische Tagungs- und Bildungsstätte Bonn

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