

# NEWSLETTER

*CUI – Graduate School*

No.14, April 2017

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## Editorial

*The fifth and officially last year of CUI has begun already quite successfully. Indeed, once again the graduate days were very well received and the fourth winter school took place. Importantly, the pre-proposal for the next round of the excellence initiative has been submitted. This has been the result of a concerted effort by the CUI project leaders culminating in a very good scientific concept, on which we put our hopes for the full-proposal call.*

*We wish you a pleasant reading and a productive summer term.*

*Antonio Negretti and Peter Schmelcher*

## The Graduate Days

From March 13 to March 16, 2017, the fourth edition of the Graduate Days of CUI took place.

About 80 participants attended the event, mostly PhD and Master students, and among them a few from Heidelberg and Mainz.

Given the success of the last year, the scientific course programme took place in the first three days of the event, while the practical- and soft-skills workshops took place for the entire last fourth day. Once again we obtained a very positive feedback regarding the quality of the lectures and the speakers.

In addition to the courses and workshops, on Tuesday, March 14, in the later afternoon before the colloquium, the participants had the opportunity to visit Petra III and several other laboratories in the campus Bahrenfeld.

Highlights of the two evening events were the colloquium by Prof. Elspeth Garman on Tuesday, March 14, who gave a very interesting scientific and historical over-

view of crystallography, and the talk by Dr. Marc Robaszkiewicz, Dr. Kiran Shekhar, and Dr. Kathleen Schubert on Wednesday, March 15, who provided some job perspectives in the development of security and smart devices on semiconductor-based technology.

## Winter school

This year's winter school took place in February 2017 and was attended very well. About 40 participants travelled together to Jul-

iusruh at the Baltic Sea. The scientific program featured lectures from all areas of CUI, which were given by international scientists. They were divided into basic and advanced lectures. The basic lectures, which provided an introduction to active research within CUI for participants from other fields, covered the following topics: quantum engineering with atoms, photons, and solids as well as phase transformations and self-assembly on the nanoscale.



Fig. 1. Group picture of the participants of the fourth winter school organised by our PhD students.

## Personalia

Prof. Henry Chapman (Center for Free-Electron Laser Science) has received the "Röntgenplakette" from the city of Remscheid for his pioneering research on the application of X-ray lasers for determining the structure of biological macromolecules.

Prof. Ludwig Mathey (Institute of Laser Physics and Center for Optical Quantum Technologies) has accepted the offer of a CUI W2-Professorship at the University of Hamburg.

Dr. Christian Kränkel (Institute of Laser Physics) has received the degree of Habilitation in Physics from the Faculty of Mathematics, Informatics, and Natural Sciences of the University of Hamburg.

We congratulate all of them on their achievements!



Henry Chapman



Ludwig Mathey



Christian Kränkel

dynamic light scattering and transmission electron microscopy, it was possible to separate the binding of the aromatic linkers to the particles' surface from the following aggregation: Both processes do happen on different timescales, and can be associated with a shift of the resonance frequency of the plasmon polariton of the AuNPs as shown in Fig. 2 for the p-terphenyl-4,4''-dithiol linker. The binding ligands cause a change of the environment refractive index, thus inducing a small shift of the plasmon resonance. The subsequent aggregation brings two particles (or more) close together, so their plasmons start to interact with each other resulting in a strong redshift of the spectrum. The work has been published in *Z. Phys. Chem.* **231**, 19 (2017).

## Important dates in 2017

We remind you of the following events in 2017: April 27, Science on Tap – Wissen vom Fass; October 11-13, the CUI Annual Meeting; November 4, Night of Knowledge; November 11, International Symposium in conjunction to the Hamburg Prize for Theoretical Physics 2017.

**You are welcome to:** ... send us suggestions of topics, which you would like to be mentioned in the next newsletter ([anegrett@physnet.uni-hamburg.de](mailto:anegrett@physnet.uni-hamburg.de)).

The advanced lectures focused on specialized topics such as transport in complex quantum systems, time-resolved X-ray crystallography as well as self-assembly of nanocrystals. The lectures were accompanied by a social science course on the theme of collaboration and trust across disciplinary borders as well as lively discussions on different subjects. Furthermore, every participant gave a presentation on her or his project. Besides the composition of the programme, the participants appreciated the interaction with the invited speakers, the relaxed atmosphere and the nice location at the seafront.

Gold nanoparticles (AuNPs) are a stable and easy-to-functionalize platform for different purposes such as medical imaging or sensor applications. AuNPs can be functionalized by ligand exchange, e.g., with thiols or amines.

In order to systematically study the charge transport properties of gold nanoparticle clusters, Mr. Deffner and colleagues have first studied the formation of AuNP networks and clusters, which are connected by bifunctional ligands. As a model system, two aromatic (biphenyl-4,4'-dithiol;p-terphenyl-4,4''-dithiol) and one aliphatic (1,9-nonanedithiol) linker have been chosen. Using absorption spectroscopy,

## Course programme

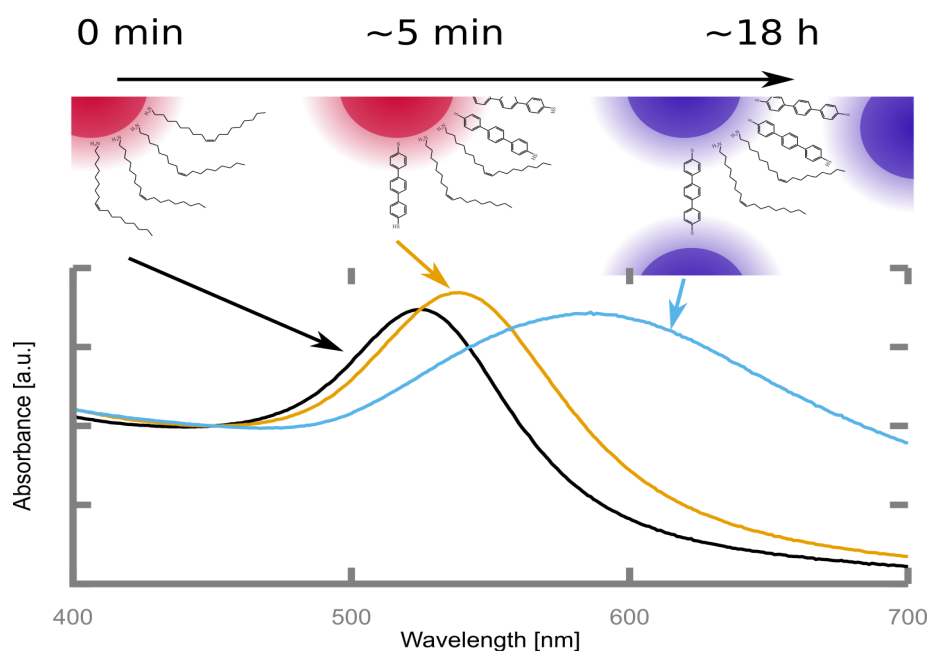
The summer term has started and the course programme with a rich variety of seminars and lectures has been prepared.

The main lecture of this summer term is *Nanoelectronics and sensing* given by Prof. Christian Klinke and Dr. Tobias Vossmeier.

The detailed programme can be downloaded at the CUI webpage.

## Research highlights

The CUI PhD student Michael Deffner together with Dr. Florian Schulz of the group of Prof. Holger Lange has investigated the impact of the cross-linkers molecular structure on the aggregation of gold nanoparticles.



**Fig. 2.** UV and visible absorption spectra of gold nanoparticles before (black curve), shortly (orange curve) and several hours (blue curve) after the addition of the linker molecules.