

NEWSLETTER

CUI – Graduate School

No. II, April 2016

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Editorial

More than three years ago our cluster of excellence started. This is also the typical time period it needs to complete a PhD thesis. Therefore, we are very proud that the first few students have now finished their thesis work and PhD. Christian Swoboda in the group of Dr. Guido Meier was the first to reach this important goal.

We are looking forward to many others completing this major step in their curriculum vitae with the support of CUIs educational research-oriented measures.

Antonio Negretti and Peter Schmelcher

The Graduate Days

From March 14 to March 17, 2016, the third edition of the Graduate Days of CUI took place.

About 80 participants attended the event, mostly PhD and Master students, and half of them being not members of CUI.

The scientific course programme has been split into three parallel sessions: In the morning as well as in the early afternoon we had three courses, one for each CUI research area. Compared to the previous two editions, however, this year the Graduate Days of CUI have been extended to four days. Indeed, the practical- and soft-skills workshops took place for the entire last fourth day. Given the positive feedback that we obtained by the attendees, very likely the same format will be adopted in 2017.

In addition to the courses and workshops, on Monday, March 14, in the later afternoon, the participants had the opportunity to visit Petra III and seven laboratories in the Institute for Laser Physics, the Center for Optical Quantum

Technologies (ZOQ), and the Center for Free-Electron Laser Science (CFEL).

Highlights of the two evening events were the colloquium by Prof. Boris Altshuler on Tuesday, March 15, who gave a very interesting overview of Anderson localisation both in condensed-matter as well as in ultracold atomic quantum systems, and the talk of Dr. Solveig Moré on Wednesday, March 16, who provided some insight in the world of patents, in particular, how to apply and for what, how innovations are assessed, and which job opportunities for scientists can the profession of a patent attorney offer.

Winter school

This year's winter school that took place in February 2016 was attended very well. About 50 participants travelled all the way to Todtmoos in the black forest. The scientific program featured lectures from all areas of CUI, which were given by international scientists. Half of the lectures gave an introduction to

active research within CUI for participants from other fields. The other lectures focused on specialized topics. Those covered nanoparticle formation, coherent control of ultrafast processes as well as X-ray crystallography. The lectures were accompanied by a course on ethical implications of doing science and lively discussions on different topics. Furthermore, every participant gave a presentation on her or his project.

Besides the composition of the program, the participants appreciated the interaction with the invited speakers, the relaxed atmosphere and the nice location (including outdoor activities in the snow).

New PhD representatives

We warmly welcome Ms. Lara Frenzel and Ms. Stephanie Kesgin-Schäfer as the new representatives of the PhD students of CUI. They follow the appointment of Ms. Neele Grenda and Mr. Bernhard Ruff.

We would like to thank the previous representatives, with whom we

Personalia

Dr. Christian Swoboda is the first PhD student of CUI that has (recently) obtained the doctoral degree in Physics with a thesis on mapping and control of magnetic excitations in artificial lattices.

Prof. Alexander Lichtenstein has received the NIC Excellent Project by the John von Neumann Institute for Computing (NIC) for his "Continuous Time Quantum Monte Carlo for Materials" project.

The British Crystallography Association has awarded the Lonsdale Lecture to Prof. Arwen Pearson (CFEL).

Dr. Philipp Wessels (ZOQ) has been nominated by the Körber Foundation for his participation at the Nobel Laureate Meeting, which will take place from June, 26, to July, 1, 2016, in Lindau (Germany).

The CUI postdoctoral researcher Dr. Xinxin Cheng (Max Planck Institute for the Structure and Dynamics of Matter) has been awarded a fellowship of the Alexander von Humboldt Foundation to support her research activity on exploring molecular structural dynamics, especially those related to charge transfer and photo isomerization, by using time-resolved gas-phase electron diffraction.

We congratulate all of them on such awards!



Christian Swoboda



Alexander Lichtenstein



Arwen Pearson



Philipp Wessels



Xinxin Cheng

resolved THz spectroscopy. A strong change in the optical reflectivity was measured, revealing a non-equilibrium state with the same optical properties of the equilibrium superconductor, for temperatures up to 100 K (five times the T_c). These are characterized by a gap in the real part of the optical conductivity and a $1/\omega$ divergence its imaginary part.

These results may be explained in terms of a nonlinear coupling between different vibrational modes, which would displace the molecular structure, or, alternatively, by considering the effect of a time-dependent modulation of the on-site Coulomb repulsion. Both scenarios may favor superconducting pairing by affecting the density of state at the Fermi energy and hence the T_c .

This work was published in Nature **530**, 461 (2016).

Important dates in 2016

We draw your attention to the following CUI events: October 5-7 CUI Annual Meeting in the Hotel Hohe Wacht in Hohwacht, November 3-6 German Women in Physics Conference (Deutsche Physikerinnentagung), November 10 CUI international workshop in conjunction with the Hamburg Prize for Theoretical Physics, and November 17 Science on Tap (Wissen vom Fass).

Please, mark these important dates in your agenda!

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).

worked extremely well, and wish the new ones a successful coordination of the activities of the PhD students of CUI.

Course programme

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

The main lecture of this term is *Microfluidics*, given by Prof. Martin Trebbin.

The detailed programme can be downloaded at the CUI webpage.

Research highlights

The CUI PhD student Alice Cantaluppi, together with the CUI scientist Dr. Daniele Nicoletti and other colleagues of the group led by Prof. Andrea Cavalleri of the Max Planck Institute for the Structure and Dynamics of Matter have recently discovered possible evidence of a light-induced superconducting state in the potassium-doped fulleride (K_3C_{60}), whose crystalline structure is displayed in Fig. 1-A.

This compound is a metal at equilibrium and becomes superconducting below a critical temperature of $T_c = 20$ K. Superconductivity is here mediated by intramolecular vibrational modes, but also strong electron correlation is known to play an important role in the physics of K_3C_{60} .

In their experiment, the CUI scientists excited selectively local vibrational modes of the C_{60} molecules using femtosecond laser pulses tuned to mid-infrared wavelengths (Fig. 1-B). The transient optical response was then probed by time-

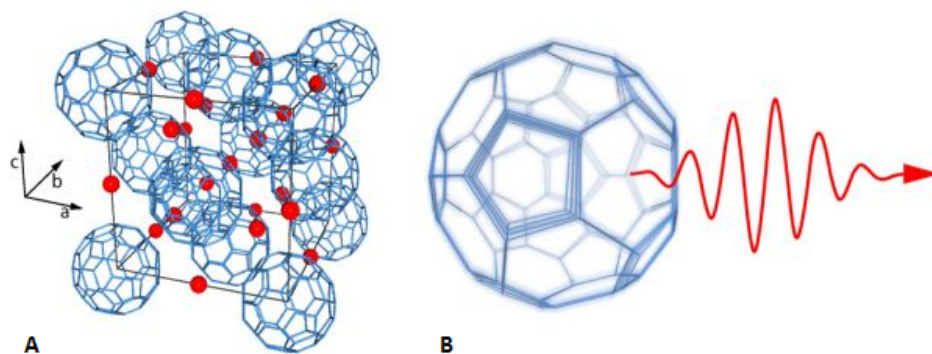


Fig. 1-A. Crystal structure of K_3C_{60} , where blue bonds link the carbon atoms in each C_{60} molecule and red spheres represent K atoms. **-B.** C_{60} molecular distortion stimulated by the mid-infrared pulses.