

NEWSLETTER

CUI – Graduate School
No.4, December 2013

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Editorial

Slightly more than a year has passed since the start of the excellence cluster. Since 2012 the members of our centre has constantly been growing such that currently we have 30 PhD students and 21 postdocs. During the summer we launched for the first time our online application form for the recruitment of PhD students and postdocs, which has worked very well and which is going to improve for the next calls. Our centre has already achieved important scientific results that have been published in high-impact journals and a number of awards have been assigned to members of CUI. Additionally, our PhD students have successfully organized their first winter school. Thus, a lot has happened during 2013 of which we can be proud of and we hope that 2014 will be even more successful. We wish you Merry Christmas and a Happy New Year!

Antonio Negretti and Peter Schmelcher

The Hamburg Prize for Theoretical Physics 2013

The recipient of the Hamburg Prize for Theoretical Physics 2013 is Prof. Chris H. Greene, Distinguished Professor of Physics at Purdue University (West Lafayette, Indiana, USA). The Joachim Herz Stiftung and CUI have awarded the prize this year jointly.

Prof. Greene predicted the existence of ultra long-range Rydberg molecules exhibiting many peculiar properties such as oscillatory potential energy surfaces and huge electric dipole moments. This work was performed in 2000, in collaboration with Prof. A. Dickinson and Prof. H. Sadeghpour, and finally initiated the experimental discovery of such molecules in 2008 (within the group of Prof. T. Pfau in Stuttgart).

The prize aims at strengthening and promoting research in photon science in Hamburg and to increase the international visibility of the University of Hamburg. Prof. Chris

Greene is expected to visit Hamburg for research and will give also lectures, seminars, and will have discussions with scientists at UHH. We congratulate him and we look forward to hosting him soon in Hamburg.

First winter school

Our PhD students have organized their first winter school of CUI at the Universitätszentrum Obergurgl (Austria). The school took place from December 2 to December 5, 2013.

The scientific programme covered the following topics: ultrafast spectroscopy, ultracold quantum gases, non-linear optics, microwave spectroscopy of biomolecules, X-ray and electron spectroscopy, magnetic excitations in nanostructures, and experimental techniques to monitor structure formation at the nanoscale.

The PhD students have invited both speakers from CUI as well as international scientists.

There were many opportunities for the PhD students and postdocs of CUI to interact with the invited speakers, to know each other and their research activities, and therefore to learn about the research carried out within the centre.

Besides this, there was the opportunity to relax, in particular, in such a wonderful place in the Alps as Obergurgl.

Graduate Days

Before the summer term 2014 will start, we will have from March 10 to March 12 our first CUI Graduate Days. The event will take place at the Bahrenfeld campus.

The graduate days are devoted to the education and training of Master and Ph.D. students as well as postdocs.

The goal is to offer courses that broaden the physics, chemistry, and biology knowledge of our students as well as to teach specialized techniques.

In addition to the courses, there

Personalia

Prof. Kärtner and Prof. Chapman [Center for Free-Electron Laser Science (CFEL)] have received the Synergy Grant of the European Research Council (ERC) together with Prof. Fromme (currently at the Arizona State University) and Prof. Assmann (DESY). The title of the project is *Frontiers in Attosecond X-ray Science: Imaging and Spectroscopy* and it aims to develop a compact ten-atto-second-pulsed X-ray source based on new and challenging developments. It will be used for the structural characterization of short-lived intermediates in photosynthetic systems.

Prof. Küpper (CFEL) has been awarded a Consolidator Grant of the European Research Council. This is the second individual ERC grant received by a CUI member. Prof. Küpper will develop methods to bring complex molecules and biological systems in the gas phase and then manipulate them with laser fields. The goal is to better understand the structure and dynamics of such systems.

Prof. Lichtenstein (Institut für Theoretische Physik) has received the Max-Born award 2014 of the British Institute of Physics and the German Physical Society for his important contributions to the theory of magnetisms and electron correlation in real materials.

We congratulate all of them on such outstanding awards and wish them all the best in order to achieve their scientific goals.



Franz Kärtner - Henry Chapman



Jochen Küpper



Alexander Lichtenstein

will be an industry presentation by the Philips Medical System (Hamburg), and a special colloquium, which will be presented by Prof. R. J. Dwayne Miller.

Further information on the programme and the registration can be found at the webpage of the Graduate School of CUI.

Research highlights

The CUI PhD student C. Gati of the group of Prof. H. Chapman (CFEL) together with an international team has participated in a very challenging experiment. They were able to obtain the first room temperature structure of a human GPCR (G-protein coupled receptor), by Serial Femtosecond Crystallography, using an X-ray Free-Electron Laser. The GPCRs are a family of membrane proteins, which transduce external signals (e.g., hormones) through the cell membrane into the cytosol and are consequently targets for about 30-40% of all prescription drugs on

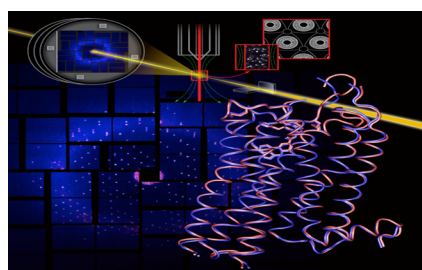


Fig. 1: Illustration of the experimental setup of the structure solution of the human serotonin (5HT2-B) receptor at ambient temperature.

the market.

This study has provided more details in the dynamics as well as in the structure of such protein receptors, and will help to better understand their physiology. The paper has been published in *Science* 342, 1521 (2013).

The CUI postdoc M. Schroer within Prof. G. Grübel's group has investigated angular cross-correlations of scattering patterns in order to reveal local symmetries present in complex liquids and amorphous structures. They applied cross-correlation analysis (CCA) to ultra-small angle light scattering data from 2D micro-

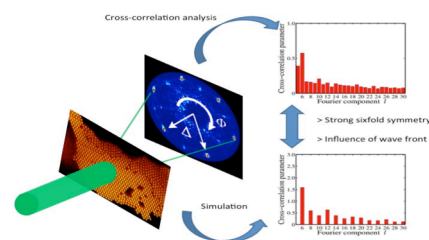


Fig. 2: Comparison of the results from experimental and simulated cross-correlation analysis data reveals structural details and the influence of the wave front curvature.

sphere films. Besides, the films have been analyzed by optical microscopy. This combined approach enables them to determine the cross-correlations from the scattering patterns and to relate it to the film structure visible from micrographs. The study shows that there are strong similarities between experimental and simulated CCA results, but also differences caused by the influence of the curved wave front.

New professors at CUI

We warmly welcome Prof. H. Lange, Prof. U. Frühling (experiment) and Prof. G. Bester (theory), who became recently professors at the UHH and new members of CUI.

We also congratulate Dr. Ralf Röhlberger who has been conferred the title of Professor and Prof. Kornelius Nielsch who has been elected member of the Board of Directors of the Material Research Society.

Finally, we warmly welcome the first Mildred Dresselhaus Guest Professor Dr. R. González-Férez (Granada, Spain).

We wish them a very good start and successful work at CUI.

Important dates in 2014

On January 16 there will be the first CUI New Year Event. Our second annual meeting will take place on March 27, while on March 28 the Colloquia of our new professors are scheduled. Finally, from 12 to 14 of November the next CUI international workshop will take place. 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).