

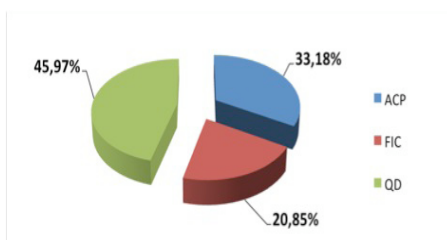
Main topics:

- Facts and figures
- The »Graduate Days«
- Best Paper Award 2009
- Student projects
- Phenomenology at the LHC
- Personalia
- Underway with PLANCK
- ALICE and the „Super“ LHC
- Ultracold atomic and molecular gases
- Carl Bender Lectures

Facts and figures

■ The number of doctoral students at the Graduate School continues to grow. As of May 2009, a total of 211 students were registered. Broken down into the three branches of the School, we have 70 students currently doing research in Astronomy and Cosmic Physics, 97 in the branch Quantum Dynamics and Complex Quantum Systems and 44 in the branch Fundamental Interactions and Cosmology. The percentage of female students lies on average at 20%, with most female doctoral students working in the branch of Astronomy and Cosmic Physics with a total of 33%.

In addition to these students, the Graduate School has its first 18 examination candidates, who have successfully completed their degrees and are the first Graduate School alumni. ◀



Distribution of students in the three branches: Astronomy and Cosmic Physics, Fundamental Interactions and Cosmology, and Quantum Dynamics and Complex Quantum Systems

The »Graduate Days«

■ The coming »Graduate Days« will take place in autumn from the 5th to the 9th October 2009. One of the highlights of the »Graduate Days« is the Hans Jensen Lecture, which this time will

Editorial

The semester is moving onto a close, and it is once again time to give you some news on the Graduate School. We are delighted to note that by now, a number of students have completed their degrees, and the results are extremely good. We are proud of this and at the same time encouraged by the active participation of our members in the events of the School! We are also pleased to inform you of the winners of the „Best Paper Award“, which we have decided to make for the first time this year for scientific publications in the previous year. Finally, we take pleasure in introducing some of our new colleagues.

To all of you, staff, students and alumni alike, we wish you lots of fun in reading this edition of our newsletter. Do keep in mind that you are warmly welcome to provide contributions, give us feedback and make suggestions for improvements.

Peter Schmelcher

be held by Frank Wilczek from MIT, USA on „Majorana fermions - from romance to reality“. The lecture programme this time will also contain one soft skills course together with sets of lectures on various topics in both theoretical and experimental physics.

Once again, we will host an industry lecture. This time, an important topic in today's economy, „Energy - a key to competitive advantage“ - will be presented by one of our sponsors. ◀

Best Paper Award 2009

■ The HGSFP is pleased to announce that two of its students share the „Best Paper Award“ for papers published in 2008. They are Thomas Greif, for his paper on „The first galaxies: assembly, cooling and the onset of turbulence“, and Stephan Middelkamp, for his paper on „Interaction-induced trapping of magnetically insensitive Bose-Einstein condensates“.

The prize of 1000 EUR will be split between the two winners. ◀

Student projects

■ Students of the Graduate School have once again created independent projects. The biggest and most successful one is the Winter School taking place in the Austrian Alps in the first week of January. It is a great opportunity for detailed discussions and exchange on physical research as well as for skiing. The third Winter School is currently organized and will be open for registration soon.

A second event being planned at the moment, is a weekend course on sustainability to be held in autumn in Franconia (Franken). Anybody who would like to participate or suggest new projects or workshops or other means to improve graduate education in the HGSFP

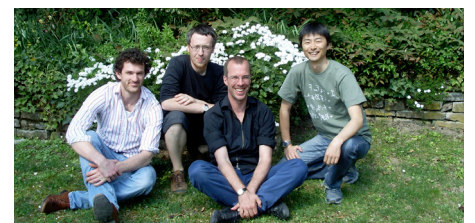
is warmly welcome to come to our student meetings (in room 306 of the *Physikalisches Institut* at 5.30 pm on the first Thursday of every month) or to contact the students' representatives, Patrick Plötz (ploetz@thphys.uni-heidelberg.de) and Michael Henke (michael.henke@kip.uni-heidelberg.de) ◀

Phenomenology at the LHC

■ Just in time for LHC data taking, we again have a high-energy phenomenology effort in Heidelberg. Tilman Plehn's group focusses on weak-scale and TeV-scale physics. This ranges from Standard Model Higgs searches to more general aspects of supersymmetry or TeV-scale gravity at the LHC and other current and future experiments.

In recent years, we have learned that models of electroweak symmetry breaking and largely theory motivated ultraviolet extensions of the Standard Model should be considered solutions to the same problem. In addition, if dark matter really resides at the weak scale, we need to expand the main task of the LHC from finding something like a Higgs boson to producing Higgses as well as dark matter particles, and carefully studying models which link the two. Obviously, this also means combining LHC data for example with experimental dark matter results or searches for electric dipole moments.

If you would like to learn more about our phenomenological hopes and fears for the exciting years to come, you can find Tilman Plehn's group (see below) in Philosophenweg 16. ◀





Matthias Weidemüller



André Schöning

Personalia

■ In this edition of our newsletter, we profile Matthias Weidemüller and André Schöning. Matthias Weidemüller has joined us as Professor of Experimental Physics at the „Physikalisches Institut“, where he holds the Chair for Quantum Dynamics of Atomic and Molecular Systems. After studying Physics and Philosophy in Bonn, Munich and Paris, he attained his doctorate at the Max Planck Institute for Quantum

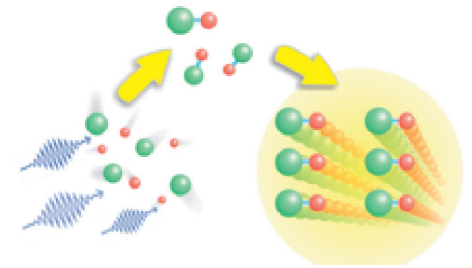
Optics under the supervision of Prof. T.W. Hänsch. He spent two years at the University of Amsterdam, working on trapped atomic hydrogen and Bose-Einstein condensates, before joining the Max Planck Institute for Nuclear Physics in 1997 in Heidelberg, where he later became head of the “Laser Cooling Group”. From 2003 to 2008 he was Full Professor at the University of Freiburg.

André Schöning joins Heidelberg as Professor of Experimental Physics at the „Physikalisches Institut“. After studying in Hamburg, and working at DESY and CERN, he joined the ETH in Zürich in 1999. His field of research is high energy physics beyond the Standard Model, including searches for supersymmetry and the Higgs boson.

We welcome both as active members of the HGSFP. ◀

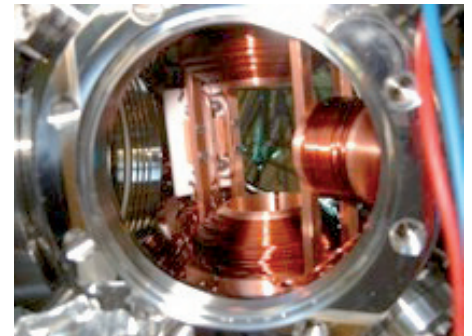
Ultracold atomic and molecular gases

■ The group around Matthias Weidemüller experimentally explores the quantum physics of ultracold atomic and molecular gases and aggregates at different levels of complexity. In Heidelberg, the activities focus on few- and many-body quantum physics with highly-excited ultracold atoms (“Rydberg gases”) and mixed quantum gases, dipolar quantum gases made out of heteronuclear molecules in conjunction with the quest for chemistry without entropy, atom traps as targets for low energy heavy-ion collisions, and methods of coherent control using shaped femtosecond laser pulses. ◀



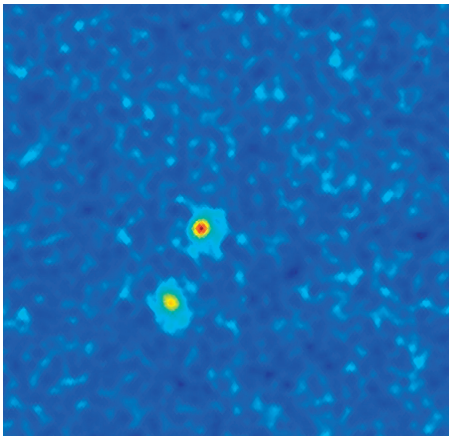
Above: Schematic presentation of the formation process of an ultracold gas of molecular dipoles

Below: View into the vacuum chamber where an ultracold Rydberg gas is confined. The electrons of the atoms extend over several hundreds of nanometers, and the atoms interact over macroscopic distances.



Underway with PLANCK

■ In preparation of the European PLANCK satellite mission, which will observe the cosmic microwave background, Björn Malte Schäfer, a junior research group leader at the Graduate School, and J.C. Waizmann have simulated data processing pipelines and designed filters for searching the data set for clusters of galaxies.



Above: A pair of galaxy clusters at a redshift of 0.1, extracted from simulated PLANCK data

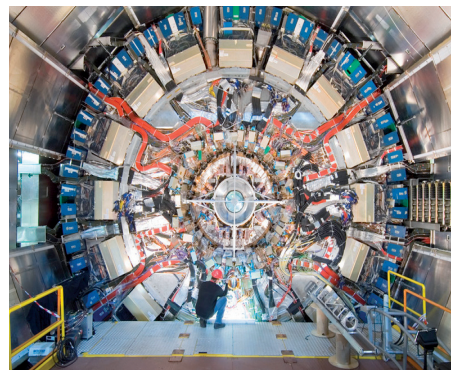
The clusters leave a spectral imprint in the CMB by the Sunyaev-Zel’dovich effect, which is an exciting new experimental technique. The cluster sample will be used to derive cosmological parameters, in particular the density of dark energy.

Björn Malte Schäfer has his office at the „Astronomisches Rechen-Institut“, Mönchhofstr. 12-14. ◀

ATLAS and the „Super“ LHC

■ The study of the fundamental forces between matter and the search for new elementary particles, e.g. the predicted Higgs particle or the supersymmetric partners of the Standard Model particles, are the main research interest of many high energy physicists world-wide. Several international collaborations of physicists have been formed to study particle collisions with large-size detectors at the Large Hadron Collider (LHC) at CERN.

The group of André Schöning has recently joined the ATLAS collaboration to study proton-proton collisions at the highest center of mass energies of up to 14 TeV. The new group will take part in the operation of the detector and the data analysis, and engage in the development of new detector components for the next upgrade of the accelerator to the “Super-LHC”, that is planned for the next decade. ◀



Above: View of the ATLAS detector at CERN

Carl Bender Lectures

■ In autumn 2009, Carl Bender will give another set of lectures in the series on mathematical physics, this time addressing non-linear systems such as waves and shocks. We hope to see you there! ◀

You’re welcome:

... to send us suggestions of topics which you would like to be mentioned in the next newsletter: info@gsfp.uni-heidelberg.de