

## Scientific report: **Cold Atoms Meet Condensed Matter (CATCOM 2006)**

CATCOM 2006 took place from March 27 to March 30, 2006. There was a total of 76 participants (29 professors, 31 postdocs, and 16 PhD students). 29 of the participants were affiliated with German research institutions, 35 with European ones outside of Germany, and 12 participants came from the U.S. or Japan. We had to turn down a considerable number of potential participants: there were about twice as many applications as open slots.

The main focus of the conference was on the interface between the very active research field of ultracold atoms and - more generally - atomic and molecular physics with condensed-matter physics. In the last couple of years, a very fruitful exchange of ideas and concepts has taken place between both fields. For instance, cavity QED experiments have been realized with Cooper-pair boxes replacing single atoms, while quantum phase transitions have been studied in a perfectly tunable system with cold atoms in optical lattices. Further examples include active cooling techniques adopted from laser-cooling which are now applied to cool nanomechanical resonators into the quantum limit of zero or just a few phonons, or the realization and study of Bose-Einstein condensates on a microchip. A number of recent theoretical proposals have also considered combinations of cold atoms and molecules or ion-trap configurations with solid-state devices like single-electron boxes or with nanomechanical resonators.

We had invited 17 speakers, all of which accepted our invitation without hesitation. Two of them [P. Zoller (Innsbruck) and R. Schoelkopf (Yale)] were unable to attend the workshop but were replaced by speakers from the group [P. Rabl] or by an outstanding alternative [J. Doyle (Harvard)]. All of the invited speakers are internationally leading experts in their field and gave excellent talks. Nobel-laureate W. Ketterle (MIT) and R. Grimm (Innsbruck) gave fascinating accounts of their experiments on pairing phenomena in ultracold quantum gases. J. Reichel (ENS Paris) and C. Zimmermann (Tübingen) reported on progress in atom-chip experiments, and D. Bouwmeester (Santa Barbara), K. Schwab (Cornell), and K. Karrai (LMU München) talked on various aspects of cooling of mechanical degrees of freedom. S. Haroche (ENS, Paris) provided an authoritative introduction to cavity-QED experiments with Rydberg atoms while S. Girvin (Yale) reported on cavity-QED theory and experiment in superconducting structures. In the area of cold atoms the most recent advances with Fermions in optical lattices and with two-dimensional Bose-Einstein condensates were reported by T. Esslinger (ETH Zürich) and J. Dalibard (ENS, Paris).

The invited talks were complemented by a (small) number of contributed talks and the poster session. Because of the high scientific standing of most of the participants, the poster session had a very high level as well. Out of the 16 PhD students that participated, 2 gave talks, and most of the others presented posters.

The talks, discussions, and posters at CATCOM 2006 demonstrated that the field is developing rapidly and has great prospects. In particular, it brings together scientists from areas which had been separated for a long time and thus opens many really new areas of research beyond the traditional directions.

To conclude: in our opinion, CATCOM 2006 was a great success: S. Girvin (Yale) called it “one of the best conferences I ever attended”. This success was made possible by the superb infrastructure of the MPIPES and the excellent and always friendly support of Claudia Pönisch.