

# ITAMP News

Harvard-Smithsonian Center for Astrophysics

FALL 2012

## Workshops, Topical Groups, & Schools

**Fundamental Science with Ultracold Molecules**, a topical group organized by R. Krems (UBC), S. Yelin, P. Rabl (IQOQI), D. DeMille (Yale), T. Tschersbul, and J. Doyle (CUA), September - October 2011.

**The ITAMP/B2 Institute Winter Graduate School on AMO Physics** co-sponsored with the University of Arizona-Biosphere 2, Tucson, January 8-20, 2012.

**Research Frontiers in Ultra-Cold Atoms and Molecules: Unequal Mass Mixtures and Dipolar Molecules**, organized by Rudi Grimm (Innsbruck) and Carlos Sa de Melo (Georgia Tech.) held April 23-25, 2012.

**Symposium on Heavy Rydberg Physics**, organized by Adam Kirrander, May 11-12, 2012.

A joint ITAMP-CFEL/ZOQ (Hamburg) workshop on **Dynamical Correlations in Quantum Matter: From Few-to Many Body Systems**, organized by Robin Santra (CFEL), Peter Schmelcher (ZOQ) and H. Sadeghpour (ITAMP), Hamburg, May 30-June 1, 2012.

A joint ITAMP-PCTS workshop: **Non Equilibrium Phenomena in Ultra Cold Atoms and Strongly Interacting Photons**, at Princeton Center for Theoretical Science, organized by A.Houck, D.Huse, Hakan Tureci, and M. Shiro (Princeton), Princeton, NJ., June 11-13, 2012.

**The Quantum Simulations topical group**, organized by Alan Aspuru-Guzik, Sarah Mostame, Matteo Mariantoni, Andrew Sornborger, June 18-22, 2012.

**Theory of Electron-Molecule Collisions for Astrophysics, Biophysics, and Low Temperature Plasmas: Opportunities and Challenges**, organized by Viatcheslav Kokoouline (Central Florida Univ.), Chris Greene (JILA), December 3-5, 2012.

**Finite temperature and low energy effects in cold atomic and molecular few-and many-body systems**, organized by Doerte Blume (Washington State) Barbara Capogrosso-Sansone (Oklahoma), and Seth Rittenhouse (Western Washington University), scheduled for March 25-27, 2013.

## ITAMP has been renewed!

The ITAMP proposal to the NSF was successful, allowing us to continue with the existing postdoctoral fellowship program, topical groups, and new initiatives. In the coming months and years, we will continue to build upon ITAMP's legacy as the

### SEND YOUR STUDENTS TO THE ITAMP/B2 INSTITUTE 2013 WINTER SCHOOL!

The ITAMP/B2 Institute Winter Graduate School on AMO Physics co-sponsored with the University of Arizona-Biosphere 2, Tucson, January 4-11, 2013.  
Visit [cfa.harvard.edu/itamp/winterschool2013.html](http://cfa.harvard.edu/itamp/winterschool2013.html)

## Two Postdoctoral Fellows joined ITAMP in 2011



### Emanuele Dalla Torre

Emanuele Dalla Torre is a jointly appointed fellow at ITAMP and the Center for Ultra-Cold Atoms (at MIT and Harvard) who arrived in 2011.

His Ph.D. work at the Weizmann Institute of Science in the group of Ehud Altman concerned the quantum phases of one-dimensional lattice bosons. Currently he is investigating low-dimensional systems driven by external noise sources.



### Mikhail Lemeshko

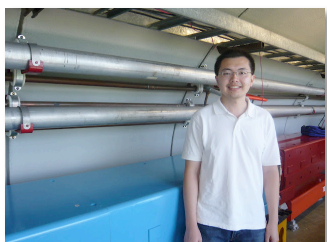
Mikhail Lemeshko was awarded an ITAMP postdoctoral fellowship in 2011. He received his PhD from the Fritz Haber Institute of the Max Planck Society, Berlin and has worked on modeling of inelastic ultra-cold and thermal collisions as well as the response of polar molecules to external fields. Mikhail was a finalist in the DAMOP Thesis Prize competition this year.

## 2012 Postdoctoral Fellows



**Chris Chan** received his Ph.D. from the University of California, San Diego working in Lu Sham's group. At ITAMP he is interested in continuing to develop the theory of novel open quantum system theories, in the context of quantum control and decoherence of qubit systems. Chris comes from Hong Kong, where he was awarded a

**Tony Lee** received his Ph.D. from Caltech, working with Michael Cross, where he worked on nonequilibrium physics with Rydberg atoms and synchronization of nonlinear oscillators.



**Swati Singh** received her Ph.D. from the University of Arizona working under the supervision of Pierre Meystre. Currently she is investigating ideas in quantum measurements and decoherence with

implementations in experiments with atoms, artificial atoms and macroscopic mechanical systems. Swati will be supported jointly with UConn.

## New Long Term Visitors

**ITAMP welcomes our long-term visitors for 2012-13:**

**Doerte Blume** (Washington State Univ.)  
**Janine Shertzer** (Holy Cross),  
**Nimrod Moiseyev** (Technion)  
**Ronnie Kosloff** (Hebrew Univ.)  
**Brett Esry** (KSU)

## 2012 Winter School

A new initiative at ITAMP has been the Winter Graduate School. Exploiting the January quiet period in academia, ITAMP teamed up with the B2 Institute in Arizona to organize a two-week graduate school in AMO physics, January 8-22, 2012. This school is theme-based and for the inaugural school, the two main topics were Ultracold and Ultrafast. High caliber lecturers, including two Nobel laureates, two MacArthur Fellows and four members of the National Academy lectured at the school, which was held on the pristine campus of the B2 Institute in the foothills of the Catalina Mountains near Tucson. More than 40 students attended the school from the U.S., Europe and Asia. Particular attention was paid to recruiting students from under-represented schools. Generous support from the NSF AMOP program allowed ITAMP and B2 to facilitate the travel of a number of students to the campus. Feedback from students was gathered and used in planning for the next **Winter School on "Quantum Control of Mesoscopic Systems", from January 4-11, 2013**. The lectures can be viewed on the ITAMP YouTube channel.

## ITAMP News (In Brief)

ITAMP organized 3 workshops and topical groups in calendar year 2011, 3 workshops in the first half of 2012, and Winter School in January. During the '11-'12 academic years, ITAMP supported 19 speakers/researchers from all over the world, including two at a new seminar series (held in collaboration with Harvard's Chemistry and Chemical Biology Department). In addition, 3 long-term visitors, and more than 50 short term visitors/speakers visited ITAMP both in the Harvard Physics Department and at the Harvard-Smithsonian Center for Astrophysics. One of the long-term visitors is a shared (1/2 support) visitor with CUA. And finally, more than 250 scientists participated in the ITAMP workshops in Cambridge.

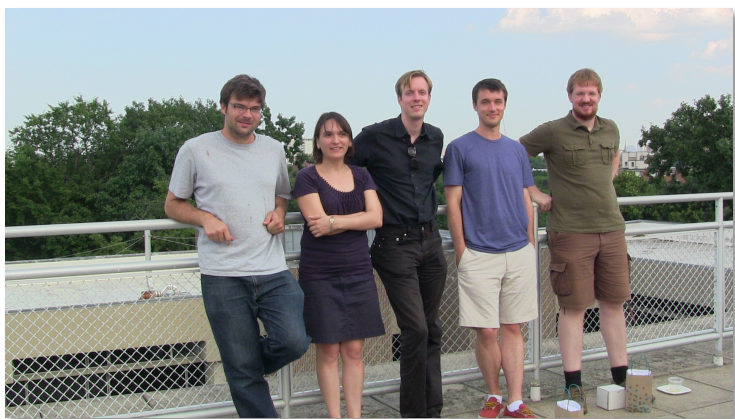
## ITAMP collaborates with HQOC

A collaboration between ITAMP and the newly formed Harvard Quantum Optics Center (HQOC, John Doyle, Director) was initiated this year through a new "Joint" Colloquium held biweekly at the Harvard Physics Department. The series was a hit and will continue this year as the "Joint Quantum Sciences Seminar". In addition, Peter Zoller visited ITAMP with joint support from HQOC.

## YouTube-ITAMP

The ITAMPhysics YouTube channel ([www.youtube.com/itamphysics](http://www.youtube.com/itamphysics)) is going strong with over 17,000 views in the last year. Recent notable uploads include talks from the joint ITAMP-CFEL workshop and the lectures from the ITAMP/B2 Winter School.

## ITAMP News



### FAREWELL TO OUR POSTDOCTORAL FELLOWS

(Pictured) L to R; Seth Rittenhouse, Elena Kuznetsova, Hendrik Weimer, Jerome Loreau, and Johannes Feist

**Barbara Capogrosso-Sansone**, an ITAMP fellow from 2008-11, is now assistant professor in the physics department at the University of Oklahoma where she continues her work on many body states of matter in ultracold atomic and molecular lattice systems.

**Seth Rittenhouse** departs ITAMP to become an assistant professor in physics at Western Washington University.

**Johannes Feist** is leaving for Madrid to take a postdoctoral position under an ERC (European Research Council Grant) with Francisco Garcia-Vidal. He'll be concentrating on plasmonics.

**Hendrik Weimer** will be joining the group of Luis Santos in Hannover.

**Adam Kirrander** spent the past year at ITAMP continuing work on Rydberg atoms and spectroscopy. He is joining the University of Edinburgh as a Lecturer in the School of Chemistry where he will continue his studies on photochemistry and ultrafast dynamics. Adam organized a very successful two-day mini-symposium on heavy Rydberg atoms.

**Jerome Loreau**, an ITAMP affiliate, will be returning to Belgium after several years of work with Alex Dalgarno on collisions for astrophysical and ultra-cold applications.

**Elena Kuznetsova**, an ITAMP affiliate, will be leaving for a Research Scientist position at the Institute of Applied Physics, Nizhny Novgorod, Russia. During her past 5 years at ITAMP, Elena has worked on many topics related to quantum computing and quantum optics, especially involving polar molecules.

**Roman Kreams** (UBC) spent a sabbatical year at ITAMP.

**Paola Cappellaro**, an assistant professor at MIT's Research Laboratory of Electronics, and an ITAMP postdoctoral fellow from 2006-9, was a "2012 AFOSR Young Investigator" recipient.

## Workshop Updates

**Topical Group on Fundamental Science with Ultracold Molecules** (Fall 2011): A three-week topical group was hosted at ITAMP in Sept.-Oct. 2011 on Fundamental Science with Ultracold Molecules. This TG was hugely popular: for each week, selected groups of people attended along the three main themes (many-body, precision measurements and calculations, and cold chemistry). ITAMP was at its busiest ever, as literally every desk space in ITAMP offices was occupied. Local participation from CUA, physics and chemistry was high.

**A workshop on Unequal Mass Mixtures and Dipolar Molecules** in April 23-25, 2012 brought together theory and experiment in AMO, condensed matter and nuclear physics under one roof to ponder novel many-body quantum phases, thermodynamics and out of equilibrium phenomena with mass-imbalanced ultracold molecular species. The existence of long-range dipolar interaction in such ultracold molecules offer additional levers for control of interactions in few-body Efimov and many-body correlated physics. The workshop was organized by Rudi Grimm (Innsbruck) and Carlos A.R. Sa de Melo (Georgia Tech).

**The workshop on "Dynamical Correlations in Quantum Matter: From Few- to Many-Body Systems"** (May 30 - June 1, 2012) was the first collaboration between ITAMP and the growing AMO physics community in Hamburg, Germany. This workshop was co-organized with the Center for Optical Quantum Technologies (ZOQ) and the Center for Free-Electron Laser (CFEL) at the University of Hamburg. It covered topics on ultracold atomic and molecular physics on the few- to many-body level that relate to the emergence of their nonequilibrium dynamics as well as attosecond and femtosecond dynamics in atoms, molecules and clusters. The presentations from this workshop are available on the ITAMP YouTube channel.

An interesting consequence of high Rydberg excitations in ultracold gases is the opportunity to form ion pair states, in which electrons can hop from one center to another. Such "heavy" electron systems have yet to be realized. A two-day symposium at ITAMP on **Heavy Rydberg Physics** (May 2012) brought together practitioners from physics, chemistry and astrophysics to discuss different realization schemes for forming such exotic pair states.

### Departing Staff:

**Lisa Bastille**, ITAMP's Administrator for 7 years, has accepted another position here at the Harvard College Observatory. She was instrumental in managing numerous visitors, coordinating workshops for ITAMP, and facilitating a variety of review committees and advisory boards. We wish her well in her new endeavors.



**ITAMP  
Staff, Students & Visitors  
Postdoctoral Fellows Farewell  
Gathering**

**Winter School 2012  
January 8-20  
B2 Institute  
University of Arizona**



**AMO THEORY INPUT WANTED**

Have an idea for a workshop you want to organize? Have some sabbatical time? Would you like to bring a group of people together? ITAMP can help make it happen.

**Contact us:**  
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Our website is: [itamp.harvard.edu](http://itamp.harvard.edu)

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