



From Quantum Control to Tests of Fundamental Physics

June 11 - 16, 2017

Chair

Marianna Safronova

Vice Chair

Dietrich Leibfried

Salve Regina University

100 Ochre Point Avenue
Newport, RI, US

Conference Description

The Atomic Physics Gordon Conference has a long history of bringing together top researchers and future leaders in the fields of atomic, molecular, and optical physics, and of reporting exciting recent breakthroughs. The conference always features a great deal of lively and informal discussions between students, young speakers, and senior researchers. Equally important as the presentations are the discussions outside the lecture hall, where ideas are generated, collaborations form, and new connections are made.

The Atomic Physics Gordon Conference moves with the frontiers of atomic physics, relating this discipline to the other branches of the physical sciences whenever possible. The 2017 conference session themes include quantum degenerate gases, quantum information science, quantum optics, cold molecules, few- and many-body physics, precision measurements, atomic clocks, tests of fundamental symmetries in nature, searches for dark matter with atomic systems, and connections to condensed-matter, particle, and gravitational physics.

While we expect that a number of senior scientists will attend the 2017 conference, we also anticipate that, as in previous years, it will attract a large number of younger participants. We especially encourage the participation of graduate students and postdocs, and we anticipate that some financial support for these researchers may be available. A highlight of the Atomic Physics conference has been a pair of lively and stimulating poster sessions, and we encourage participants to share their work in this way again next summer. The beautiful setting of Salve

Regina University affords many opportunities for informal scientific conversations, as well as afternoon activities both on-campus and in the city of Newport, Rhode Island.

Related Meeting



This GRC will be held in conjunction with the "Atomic Physics (GRS)" Gordon Research Seminar (GRS). Those interested in attending both meetings must submit an application for the GRS in addition to an application for the GRC. Refer to the [associated GRS program page](#) for more information.

Conference Program

Sunday	
2:00 pm - 9:00 pm	Arrival and Check-in
6:00 pm - 7:00 pm	Dinner
7:30 pm - 7:40 pm	Introductory Comments by GRC Site Staff / Welcome from the GRC Chair
7:40 pm - 9:30 pm	Dark Matter Searches Discussion Leader: Dmitry Budker (University of Mainz, Germany / University of California, Berkeley, USA)
7:40 pm - 8:05 pm	Dmitry Budker (University of Mainz, Germany / University of California, Berkeley, USA) "Searching for Ultralight Dark Matter with Atomic Spectroscopy and Magnetic Resonance"
8:05 pm - 8:10 pm	Discussion
8:10 pm - 8:40 pm	Andrei Derevianko (University of Nevada, Reno, USA) "Laboratory Cosmology: Ultralight Dark Matter and Precision Measurements"
8:40 pm - 8:50 pm	Discussion
8:50 pm - 9:20 pm	Derek Jackson Kimball (California State University, East Bay, USA) "Exotic Spin-Dependent Interactions: Gravitational Dipole Moments, Transient Signals, and Precessing Ferromagnetic Needles"

9:20 pm - 9:30 pm	Discussion
Monday	
7:30 am - 8:30 am	Breakfast
9:00 am - 12:30 pm	Tests of Fundamental Physics Discussion Leader: Jun Ye (JILA, NIST, University of Colorado Boulder, USA)
9:00 am - 9:30 am	Jun Ye (JILA, NIST, University of Colorado Boulder, USA) "Mastering Quantum Coherence for Fundamental Physics – From Atomic Clock to Electron EDM"
9:30 am - 9:35 am	Discussion
9:35 am - 10:10 am	Jason Hogan (Stanford University, USA) "Precision Atom Interferometry for Fundamental Physics"
10:10 am - 10:20 am	Discussion
10:20 am - 10:50 am	Coffee Break
10:50 am - 11:30 am	Holger Mueller (University of California, Berkeley, USA) "Testing Sub-Gravitational Forces on Atoms from a Miniature, In-Vacuum Source Mass"
11:30 am - 11:40 am	Discussion
11:40 am - 12:20 pm	David Demille (Yale University, USA) "Probing the Standard Model and Beyond with Measurements of Parity and Time-Reversal Violation"
12:20 pm - 12:30 pm	Discussion
12:30 pm - 1:30 pm	Lunch
1:30 pm - 4:00 pm	Free Time

3:00 pm - 4:00 pm	<p>Power Hour</p> <p><i>The GRC Power Hour is an optional informal gathering open to all meeting participants. It is designed to help address the challenges women face in science and support the professional growth of women in our communities by providing an open forum for discussion and mentoring.</i></p> <p>Organizer: Marianna Safronova (University of Delaware, USA)</p>
4:00 pm - 6:00 pm	Poster Session
6:00 pm - 7:00 pm	Dinner
7:30 pm - 9:30 pm	<p>Quantum Information and Networks</p> <p>Discussion Leader: Gerhard Rempe (Max Planck Institute of Quantum Optics, Germany)</p>
7:30 pm - 7:55 pm	<p>Gerhard Rempe (Max Planck Institute of Quantum Optics, Germany)</p> <p>"Cavity QED: The Toolbox for Quantum Networks"</p>
7:55 pm - 8:00 pm	Discussion
8:00 pm - 8:35 pm	<p>Tracy Northup (University of Innsbruck, Austria)</p> <p>"Quantum Nodes Based on Trapped Ions in Cavities"</p>
8:35 pm - 8:45 pm	Discussion
8:45 pm - 9:20 pm	<p>Hannes Pichler (ITAMP, Harvard University, USA)</p> <p>"Quantum Computing with a Single Atom Based on Time-Delayed Feedback"</p>
9:20 pm - 9:30 pm	Discussion
Tuesday	
7:30 am - 8:30 am	Breakfast
8:30 am - 9:00 am	Group Photo
9:00 am - 12:30 pm	<p>Precision Measurements</p> <p>Discussion Leader: Piet Schmidt (Physikalisch-Technische Bundesanstalt (PTB) / University of Hannover, Germany)</p>

9:00 am - 9:30 am	Piet Schmidt (Physikalisch-Technische Bundesanstalt (PTB) / University of Hannover, Germany) "Laser Spectroscopy of Atoms and Ions for Precision Measurements"
9:30 am - 9:35 am	Discussion
9:35 am - 10:10 am	Nils Huntemann (Physikalisch-Technische Bundesanstalt, Germany) "171Yb+ Single-Ion Clocks for Tests of the Einstein Equivalence Principle"
10:10 am - 10:20 am	Discussion
10:20 am - 10:50 am	Coffee Break
10:50 am - 11:30 am	Andrew Ludlow (National Institute of Standards and Technology, USA) "Optical Lattice Clocks and the Quantum Metrology of Time"
11:30 am - 11:40 am	Discussion
11:40 am - 12:20 pm	Thomas Udem (Max Planck Institute of Quantum Optics, Germany) "Precision Spectroscopy of Atomic Hydrogen"
12:20 pm - 12:30 pm	Discussion
12:30 pm - 1:30 pm	Lunch
1:30 pm - 4:00 pm	Free Time
4:00 pm - 6:00 pm	Poster Session
6:00 pm - 7:00 pm	Dinner
7:30 pm - 9:30 pm	Quantum Gases Discussion Leader: Nathan Lundblad (Bates College, USA)
7:30 pm - 7:55 pm	Nathan Lundblad (Bates College, USA) "BEC Research in Microgravity"
7:55 pm - 8:00 pm	Discussion

8:00 pm - 8:35 pm	Gretchen Campbell (Joint Quantum Institute, University of Maryland / National Institute of Standards and Technology, USA) "Studying Superfluidity with Ultracold Atom Circuits"
8:35 pm - 8:45 pm	Discussion
8:45 pm - 9:20 pm	Francesca Ferlaino (University of Innsbruck, Austria) "Dipolar Quantum Physics with Highly Magnetic Erbium Atoms"
9:20 pm - 9:30 pm	Discussion
Wednesday	
7:30 am - 8:30 am	Breakfast
9:00 am - 12:30 pm	Quantum Control Discussion Leader: Jeff Kimble (California Institute of Technology, USA)
9:00 am - 9:30 am	Jeff Kimble (California Institute of Technology, USA) "Quantum Matter Built from Single Atoms and Photons"
9:30 am - 9:35 am	Discussion
9:35 am - 10:10 am	Antoine Browaeys (Institut d'Optique Graduate School, CNRS, France) "Experimental Many-Body Physics Using Arrays of Individual Rydberg Atoms"
10:10 am - 10:20 am	Discussion
10:20 am - 10:50 am	Coffee Break
10:50 am - 11:30 am	Cindy Regal (JILA, University of Colorado Boulder, USA) "Interfering and Entangling Single Neutral Atoms"
11:30 am - 11:40 am	Discussion
11:40 am - 12:20 pm	Vladan Vuletic (Massachusetts Institute of Technology, USA) "Spin Squeezing in an Optical-Clock-Transition Atom"
12:20 pm - 12:30 pm	Discussion
12:30 pm - 1:30 pm	Lunch

1:30 pm - 4:00 pm	Free Time
4:00 pm - 6:00 pm	Poster Session
6:00 pm - 7:00 pm	Dinner
7:00 pm - 7:30 pm	Business Meeting <i>Nominations for the Next Vice Chair; Fill in Conference Evaluation Forms; Discuss Future Site and Scheduling Preferences; Election of the Next Vice Chair</i>
7:30 pm - 9:30 pm	From Few to Many-Body Physics Discussion Leader: Ana Maria Rey (JILA, University of Colorado Boulder, USA)
7:30 pm - 8:00 pm	Alexander M. Cruickshank Lecture: Ana Maria Rey (JILA, University of Colorado Boulder, USA) "Quantum Spin Dynamics, Coherences and Entanglement in Systems with Long-Range Interactions"
8:00 pm - 8:05 pm	Discussion
8:05 pm - 8:40 pm	Doerte Blume (Washington State University, USA) "From Two-Body to Few-Body to Many-Body Physics: Selected Cold Atom Examples"
8:40 pm - 8:50 pm	Discussion
8:50 pm - 9:20 pm	Tilman Esslinger (Institute for Quantum Electronics, ETH Zurich, Switzerland) "A Biased Approach to Quantum Gases"
9:20 pm - 9:30 pm	Discussion
Thursday	
7:30 am - 8:30 am	Breakfast
9:00 am - 12:30 pm	Trapped Ions and Their Applications Discussion Leader: Christian Ospelkaus (University of Hannover / PTB Braunschweig, Germany)

9:00 am - 9:30 am	Christian Ospelkaus (University of Hannover / PTB Braunschweig, Germany) "Quantum Information Processing and New Ideas for Precision Spectroscopy with Trapped Ions"
9:30 am - 9:35 am	Discussion
9:35 am - 10:10 am	Christian Roos (Institute for Quantum Optics and Quantum Information, Austrian Academy of Sciences, Austria) "Simulating Quantum Ising Models with Trapped Ion Strings"
10:10 am - 10:20 am	Discussion
10:20 am - 10:50 am	Coffee Break
10:50 am - 11:30 am	Eric Hudson (University of California, Los Angeles, USA) "Hybrid Traps, Molecular Ions, and Radioactive Qubits"
11:30 am - 11:40 am	Discussion
11:40 am - 12:20 pm	Tania Mehlstaubler (Physikalisch-Technische Bundesanstalt (PTB), Germany) "Friction and Nonequilibrium Dynamics in Ion Coulomb Crystals"
12:20 pm - 12:30 pm	Discussion
12:30 pm - 1:30 pm	Lunch
1:30 pm - 4:00 pm	Free Time
4:00 pm - 6:00 pm	Poster Session
6:00 pm - 7:00 pm	Dinner
7:30 pm - 9:30 pm	Cold Molecules Discussion Leader: Tanya Zelevinsky (Columbia University, USA)
7:30 pm - 7:55 pm	Tanya Zelevinsky (Columbia University, USA) "New Developments in Cold and Ultracold Molecules"
7:55 pm - 8:00 pm	Discussion

8:00 pm - 8:35 pm	Chin Wen Chou (National Institute of Standards and Technology, USA) "Preparation and Coherent Manipulation of Pure Quantum States of a Single Molecular Ion"
8:35 pm - 8:45 pm	Discussion
8:45 pm - 9:20 pm	Martin Zeppenfeld (Max Planck Institute of Quantum Optics, Germany) "Polyatomic Molecules at Cold and Ultracold Temperatures"
9:20 pm - 9:30 pm	Discussion
Friday	
7:30 am - 8:30 am	Breakfast
9:00 am	Departure

Contributors

 Gordon Research Conferences	 Carl Storm Underrepresented Minority Fellowship	
		
		
		
		