

Winter Graduate School on Atomic Molecular and Optical Physics



Quantum Control of Mesoscopic Systems



January 4-11, 2013

at Biosphere 2 Conference Center in Arizona

ITAMP, 60 Garden Street, MS 14, Cambridge MA, 02138 Tel.# 617-495-9524
B2, 32540 S. Biosphere Road, Oracle Arizona 85623 Tel# 520-838-6200

NOTES

Welcome to the Second Winter Graduate School ITAMP/B2 Institute on Atomic, Molecular and Optical Physics.

This year's program focuses on quantum control of mesoscopic systems. We are delighted to have renowned researchers who are undisputed world leaders in this field and outstanding teachers. We are grateful for their willingness to invest the considerable amount of time required to prepare and present their lectures.

Our primary goal for this school is to enable and encourage informal interactions as well as formal discussions during the next two weeks. We hope that you will take advantage of the unique setting of the Biosphere 2 campus and its relaxed and informal environment to interact extensively with the lecturers. Most of them will be able to spend several days with us, and a primary motivation to do so has simply been to have ample time to interact with you. So, don't miss this opportunity!

We have several extracurricular activities planned. So, it's not just all work and no play. The schedule of lectures has been modified from last year to include free afternoons for the faculty and students to enjoy the outdoors, or just relax in the beautiful surroundings of the B2 Campus.

There will be poster sessions on Sunday, Monday and Wednesday. This is an opportunity for you to present your research and receive feedback from the faculty at the school, and your fellow students. On Saturday evening, after the dinner, we will have viewing of the sky with the assistance of accomplished astronomers at the University of Arizona. This is one event you would not want to miss. An outing (TBD) is scheduled for Monday afternoon. We hope to be able to arrange a tour of the GMT (Giant Magellan Telescope) mirror casting.

Enjoy!

Pierre Meystre

Hossein Sadeghpour

EVENTS

We have planned the following events during the school.

- Saturday Jan 5, 2013: After dinner telescope viewing of the Arizona sky.
- Monday Jan 7, 2013: An outing TBD: either to casting of GMT mirrors or the Desert Museum.

The Winter School is supported by the National Science Foundation through a grant to ITAMP and student travel funds from ARO and NSF.



ORGANIZERS



HOSSEIN SADEGHPOUR

ITAMP Director
Senior Scientist at the Harvard-Smithsonian
Center for Astrophysics

Research Interests:

Theoretical AMO physics, collision of cold and ultracold atoms and molecules in traps, formation of ultralong range Rydberg molecules, formation of first molecules, and heating in ion microtraps.



ITAMP began life in 1989 at the Harvard-Smithsonian Center for Astrophysics. It is the only theoretical AMO "user facility" in the United States. It hosts workshops (3-days) and topical group meetings (1-4 weeks), and visitors (short- and long-term), sponsors a speaker series called the Joint Atomic Physics and Quantum Optics Colloquium held in Harvard Physics, and a postdoctoral fellowship program. ITAMP workshops are web-cast, when possible, and beginning with this year, workshop lectures are available on the ITAMP YouTube channel. There are on average 4-5 workshops each year. A Call for Proposal to organize workshops and a list of workshops & topical groups are available at <http://itamp.harvard.edu>. The postdoctoral program has been a recognized success, placing energetic fellows into junior positions at universities and national labs.

ITAMP thrives in the larger Cambridge-area AMO physics ecosystem. It has close association with CUA (Center for Ultracold Atoms) and ITC (Institute for Theory and Computation in astrophysics). Workshops, speakers, visitors and postdoc fellows are jointly organized or shared among these institutes. The mission of ITAMP continues to be furthering the cause of theoretical AMO physics by providing resources, scientific and administrative expertise, enhancing collaborative efforts between theory and experiment, and advocating for theoretical AMO.

ORGANIZERS



PIERRE MEYSTRE

Regents Professor of
Physics & Optical Sciences
The University of Arizona

Research Interests: Quantum Optics:
Cavity quantum electrodynamics, laser and maser theory, statistical properties of radiation. Cavity optomechanics, Atomic physics: Ultracold atoms, matter-wave optics, degenerate quantum gases, Bose-Einstein condensation, nonlinear atom optics of Bose and Fermi systems. Quantum acoustics: Cavity optomechanics: beyond the ground state,

hybrid systems, quantum measurements. Sustainable energy: Solar energy production and storage, smart grid management modeling and applications at the Biosphere 2 "model city"



The B2 Institute is a think tank and research incubator that addresses scientific Grand Challenges whose solutions require the combined expertise of a broad range of scientific fields and diverse interdisciplinary talents. Building on The University of Arizona's reputation as a trailblazer in interdisciplinary research, it provides a non-traditional structure that facilitates interaction. Its current focal points include the water energy nexus, STEM education, and ultimately the development of interconnected 'Discovery Ecosystems' that will facilitate collaborations toward the solution of major problems.

The B2 Conference Center provides an ideal venue to carry out that mission through a combination of seminars, conferences, workshops, retreats, summer and winter schools, as well as other events that promote the sharing of ideas between natural and social scientists, educators, policy makers, and the general public.

Located in the beautiful Catalina Mountains foothills, the B2 Conference Center comprises a fully networked Campus Village of 28 Santa Fe-style casitas holding 106 double-capacity sleeping rooms and a number of double-occupancy offices. Complete with in-suite kitchens, living areas, and high-speed internet access, the 3-5 bedroom casitas are all in easy walking distance and provide the perfect place to unwind and socialize in-between or after meetings.

ITAMP/B2 Institute Winter Graduate School on AMO Physics January 4-11, 2013											
	Thurs	Fri	Sat	Sun	Mon	Tues	Wed	Thurs	Fri		
	3	4	5	6	7	8	9	10	11		
8:00-9:00 AM		BREAKFAST	BREAKFAST	BREAKFAST	BREAKFAST	BREAKFAST	BREAKFAST	BREAKFAST	BREAKFAST	BREAKFAST	BREAKFAST
9:00-10:00 AM		Meystre/Steinke	Kimble	Calarco	Schwab	Rabitz	Teufel	Rabitz	Teufel	Stamper-Kum	Rabl
10:10-11:10 AM		Meystre	Girvin	Kimble	Rabitz	Girvin	Rabitz	Romero-Isart	Rabitz	Romero-Isart	Geraci
11:15-12:15 PM		Clerk	Calarco	Girvin	Teufel	Romero-Isart	Stamper-Kum	Rabl	Meystre		
12:15-1:15 PM		LUNCH	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
1:30-4:30 PM	4:00 PM Registration	AFTERNOON BREAK	AFTERNOON BREAK	AFTERNOON BREAK	OUTING	AFTERNOON BREAK	AFTERNOON BREAK	AFTERNOON BREAK	AFTERNOON BREAK	AFTERNOON BREAK	
4:30-5:30 PM		Clerk	Clerk								
5:30-6:30 PM	RECEPTION & DINNER	Kimble	Schwab	Schwab		Rabl	Romero-Isart	Geraci			
6:30-7:30 PM		DINNER	DINNER	DINNER	DINNER	DINNER	DINNER	DINNER	DINNER	DINNER	
7:30-9:30 PM		Calarco	STAR PARTY	Clerk	OUTING	Stamper-Kum	Geraci	Teufel			
8:30-....			Star Party	Poster	Poster		Poster				

LECTURERS



TOMMASO CALARCO

Professor of Quantum Information Processing
University of Ulm
Chairman of the Scientific Advisory Board of
CHIST-ERA.
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Research Interests: Foundations of quantum science; complex quantum systems, networks, and simulators; light-matter interfaces; tailored quantum states of matter.

LECTURERS



DAN STAMPER-KURN

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Research Interests: Atomic physics, Bose-Einstein condensation and ultra-cold atoms, cavity quantum electrodynamics, precision and quantum measurements, studies of microscopic and macroscopic quantum phenomena.

LECTURERS



AASHISH CLERK

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Research Interests: Quantum electromechanical and optomechanical systems; quantum noise in electronic systems; quantum transport, decoherence, and interactions in nanoelectronic systems; superconducting devices and qubits.

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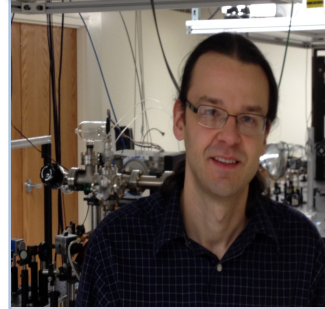


KEITH SCHWAB

Professor of Applied Physics
Caltech
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Research Interests: Quantum electro-mechanics, nanostructures for quantum optics and atomic experiments, nanoscience, ultra-low temperature physics, quantum-limited measurements.

LECTURERS



ANDREW GERACI

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Research interests: Ultra-sensitive force measurements, laser cooling and trapping of dielectric objects, cavity-optomechanics, experimental gravitation, Casimir forces, hybrid cold-atom / micro-electromechanical systems, and quantum information science.

LECTURERS



JOHN TEUFEL

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Research interests: Quantum behavior of mechanical systems, optomechanics, microelectromechanical systems (MEMS),

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STEVE GIRVIN

Professor of Physics & Professor of Applied Physics
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Research Interests: Quantum many-body physics, and quantum and classical phase transitions, particularly in disordered systems; other areas of theoretical condensed matter theory such as the superconductor-insulator transition, the vortex glass transition in high T_c superconductors, Anderson localization, Coulomb blockade in mesoscopic device physics, and quantum spin chains.

LECTURERS



JEFF KIMBLE

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Research Interests: Quantum networking with atomic ensembles, optomechanics, quantum optics

LECTURERS



PETER RABL

Senior Scientist
IQOQI, Innsbruck
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Research Interests: theoretical analysis of quantum manipulation techniques for coherent AMO and solid state systems for the implementation of quantum computing and simulation ideas under realistic conditions.

LECTURERS



HERSCHEL RABITZ

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Research Interests: Molecular dynamics, biophysical chemistry, chemical kinetics, and optical interactions with matter.

LECTURERS



ORIOLO ROMERO-ISART

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Research Interests: Quantum mechanics, quantum optics, superconductivity, atomic physics.