

Quantum Optics and Quantum Engineering for Undergraduates Symposium

as a part of the Annual Meeting of the Optical Society of America (Frontiers in Optics)

**Thursday, October 23, 2008, Rochester NY (8 a.m. – noon),
Highland J of Rochester Riverside Convention Center**

Symposium organizer: Svetlana G. Lukishova, Univ. of Rochester, USA (sluk@le.rochester.edu)

The goal of this symposium is to share the experience among universities and four-year colleges on teaching quantum optics and quantum engineering. Both lecture courses and experiments on modern applications of photon quantum mechanics for undergraduates will be discussed. This symposium will build a network in developing a series of laboratory experiments and educational methods illustrating the basic principles on which applications of quantum engineering are based, and at the same time will be understandable to a wide range of undergraduate students. **The symposium will consist of 5 invited talks and 4 contributed oral presentations. After the symposium all participants will be transported (and will be picked up back) to the University of Rochester^{*)} for a demonstration of the Quantum Optics and Quantum Information Teaching Laboratory at the Institute of Optics.**

Invited Speakers:

**8:00 a.m.– 8:30 a.m. Writing a Successful Educational Proposal to the NSF, W. W. Hein^{1,2},
D.E. McBride¹, ¹National Science Foundation, ²American Association of Physics Teachers,
USA**

Successful education proposals to DUE, like all proposals to the NSF, are evaluated on two criteria: Intellectual Merit and Broader Impacts. However, education related proposals present some unique challenges, especially on how to address Intellectual Merit.

**8:30 a.m.–9 a.m. The Challenges of Quantum Physics as Pedagogical Tools, A. G. Zajonc,
Amherst College, USA**

Arthur Zajonc is Chair of the Amherst College Department of Physics. He has also worked with Anton Zeilinger in Austria, with Walter Heitler at the Max Planck Institute for Quantum Optics, and at the Ecole Normale Supérieure in Paris. He is co-author of "The Quantum Challenge: Modern Research on the Foundations of Quantum Mechanics".

**9:00 a.m. – 9:30 a.m. Undergraduate Quantum Optics: The Challenge and the Excitement,
M. Fox, Univ. of Sheffield, UK**

The teaching of quantum optics at undergraduate level challenges a lecturer to explain a number of exciting experiments without recourse to advanced theoretical techniques. In this talk I will describe how I have approached this problem by making use of examples from my book "Quantum Optics: An Introduction" (Oxford, 2006).

**10:30 a.m. – 11:00 a.m. A Quantum Optics Laboratory for Teaching Quantum Mechanics,
E. J. Galvez, Colgate Univ., USA**

Quantum optics experiments with correlated photons have a high potential for use in quantum mechanics instruction. We have implemented a set of lab experiments with a correlated-photon setup that is offered as a laboratory section for an undergraduate course on quantum mechanics.

**11:00a.m.–11.30 a.m. Teaching Quantum Mechanics with Photon Counting
Instrumentation, C. R. Stroud, Jr. and S. G. Lukishova, Univ. of Rochester, USA**

We will describe our strategy for combining a lecture course on quantum mechanics with laboratory experiments. Funded by the NSF, four quantum optics teaching experiments have been implemented: (1) entanglement and Bell's inequality; (2) single photon interference; (3) confocal microscope imaging of single-emitter fluorescence; (4) fluorescence antibunching.

***) Bus pick up location at the Riverside Convention Center: Main St. Entrance, North Promenade Entrance (12:15 p.m.). Bus will pick up visitors from the University of Rochester back to the Riverside Convention Center at 1:30 p.m.**