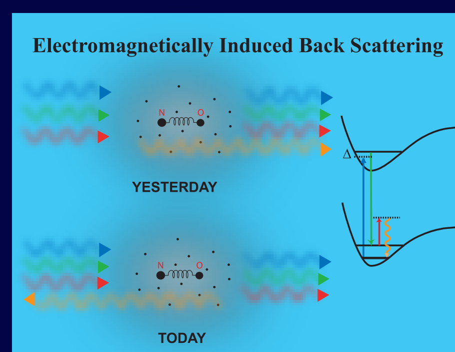
Argonne NATIONAL LABORATORY

Marlan O. Scully

QUANTUM CONTROL OF LIGHT: From Slow Light and FAST CARS to Nuclear γ ray Spectroscopy

Marlan O. Scully presently holds a joint appointment between Texas A&M and Princeton universities. His students hold top positions in universities and industries around the country (MIT, Harvard, Intel, Linde Air, etc.). He has been involved in many aspects of laser science and quantum optics. These include the first demonstration of lasing without inversion, the first utilization of coherence effects to generate ultraslow light in hot gases, and the use of quantum coherence to detect anthrax and poison gas at a distance. Scully's work on quantum coherence and correlation effects has shed new light on the foundations of quantum mechanics and yielded new insights into quantum thermodynamics. He has been elected to the National Academy of Sciences, the Academia Europa, and the Max Planck Society, and has received numerous awards, including the Arthur Schawlow prize of the APS, the Charles H. Townes Award of the OSA, the Quantum Electronics Award of IEEE, the Elliott Cresson Medal of the Franklin Institute, the Adolph E. Lomb Medal of the OSA, a Guggenheim Fellowship, and the Alexander von Humboldt Distinguished Faculty Prize.



Marlan Scully's recent work has demonstrated strong coherent backward wave oscillation using forward propagating fields only. This surprising result is achieved by applying laser fields to an ultradispersive medium with proper chosen detunings to excite a molecular vibrational coherence that corresponds to a backward propagating wave. The physics then has much in common with propagation of ultraslow light.

Applications of coherent scattering and remote sensing to the detection of bio and chemical pathogens (e.g., anthrax) via Coherent AntiRaman Scattering together with Femtosecond Adaptive Spectroscopic Techniques (FAST CARS) will be discussed.

Furthermore, the interplay between quantum optics (Dicke super and subradiant states) and nuclear physics (forward scattering of γ radiation) provides interesting problems and insights into the quantum control of scattered light.

Wednesday, December 6, 2006

3:00 p.m.

Bldg. 402, APS Auditorium • Argonne National Laboratory

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