



ICFO COLLOQUIUM PAUL CORKUM 'Probed Quantum Systems from the Inside on the Attosecond Time Scale'

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April 06, 2018

Friday, April 6, 2018, 12:00. ICFO Auditorium

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Department of Physics, University of Ottawa; Director, NRC Attosecond Science Program, Steacie Institute for Molecular Sciences, National Research Council of Canada

Paul Corkum (OC, FRS, FRSC, FRSP) graduated from Lehigh University, Bethlehem, PA, in 1972 with a Ph. D. in theoretical physics. In 1973 he joined the staff of the National Research Council of Canada where he built one of the world's most famous groups working on the interaction of very short light pulses with matter. Corkum is best known for introducing many of the concepts of how intense light pulses interact with atoms, molecules and solids, and then confirming the concepts experimentally. He was the first to show how to make and measure an attosecond pulse and how this new technology could be used to image

atomic-scale structure.

Corkum holds a Canada Research Chair at the University of Ottawa and directs the Joint NRC/University of Ottawa Attosecond Science Laboratory. He is a member of the Royal Societies of London and of Canada and also a foreign member of the US National Academy of Science and of the Austrian Academy of Science.

Among his awards are the Canadian Association of Physicists' Gold Medal for Lifetime Achievement in Physics (1996); the Royal Society of Canada's Tory Award (2003); the Optical Society's Charles H. Townes Award (2005); the IEEE's Quantum Electronics Award (2005); the American Physical Societies' Schawlow Prize (2006) and the ACS Zewail Award (2010); the Royal Photographic Society's Progress Medal (2013) (the society's highest honour); and the Optical Society of America's Charles Ives Award (2014) (the society's highest award.).

In 2013, Corkum received both Israel's Harvey Prize for Physical Sciences and Saudi Arabia's King Faisal International Prize for Science (Physics). In 2015, he shared the Russian Academy of Sciences Lomonosov Gold Medal for outstanding achievements in the natural sciences & humanities (the Academy's highest award) and was named a Thomson Reuters Citation Laureate, for researchers whose work is -- "of Nobel class" and likely to earn the Nobel someday.

Attosecond pulses are generated by electrons that are extracted from a quantum system by an intense light pulse and travel through the continuum under the influence of the electric field of the light. Portions of each electron wave packet are forced to re-collide with its parent ion after the field reverses direction. Upon re-collision, the electron and ion can recombine, emitting soft X-ray radiation that can be in the form of attosecond pulses. This highly nonlinear process occurs in atoms, molecules and solids and offers unique measurement opportunities - for measuring the attosecond pulse itself; the orbital(s) from which it emerged; and the band structure of material in which the wave packets moved.

Attosecond pulse generation is a form of photoelectron spectroscopy but "in reverse". It differs from conventional spectroscopy with an external source because the re-collision electron does not interact with core levels. Thus, we gain different information if we probe materials internally or conventionally with attosecond pulses. I will discuss the attosecond pulses that are created and the spectroscopy that arises.



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