Paul Corkum

Paul Corkum received his B.Sc. (1965) degree in Physics from Acadia University (Nova Scotia) and completed his Master's degree (1967) and Ph.D. (1972) at Lehigh University. After a year at Lehigh as a postdoctoral researcher, he moved to the National Research Council in Ottawa. In 1990 he formed the Femtosecond Science Group within NRC's Steacie Institue for Molecular Sciences. Over the following 17 years he led the group to world leadership in the field. In 2008 he was named Canada Research Chair of Attosecond Photonics at the University of Ottawa and appointed Director of the Joint NRC/University of Ottawa Laboratory for Attosecond Science. He holds adjunct professorships at the University of Toronto, McMaster University, the University of British Columbia and Texas A&M University.

Dr. Corkum's research launched attosecond science. After studying the interaction of intense laser radiation with atoms and molecules, he and his group proposed a method for producing and measuring attosecond pulses of light. Using this revolutionary technology, they have been able to "see" electrons, image molecular orbitals, and "watch" electrons move in a molecule as a chemical reaction takes place.

Dr. Paul Corkum is a member of the Royal Societies of Canada (1995) and London (2005). He has been the recipient of the Gold Medal for Lifetime Achievement in Physics from the Canadian Association of Physicists (1996), the Einstein Award of the Society for Optical and Quantum Electronics (1999), the Golden Jubilee Medal of Her Majesty Queen Elizabeth II (2003), the Tory Medal of the Royal Society of Canada (2003), the Charles Townes Award of the Optical Society of America (2005), the Quantum Electronics Award of the Institute of Electrical and Electronics Engineers (IEEE, 2005), the Killam Prize for Physical Sciences (2006), and the Arthur Schawlow Prize for Quantum Electronics from the American Physical Society (2006). He has also been a two-time winner of the Laser and Electro-Optics Society (LEOS) Distinguished Lecturer Award between 2001 and 2003. In 2008 he shared NSERC's Polyani Award with A. D. Bandrauk and was named an Officer of the Order of Canada.

3M Lecturers

1962	**Sir Derek H. R. Barton, Imperial College**
1963	Sir Ronald Nyholm, University College
1964	F. C. Tompkins, Imperial College
1965	S. Winstein, U.C.L.A.
1966	F. A. Cotton, M.I.T.
1967	J. O. Hirschfelder, Wisconsin
1968	A. Eschenmoser, E.T.H, Switzerland
1969	**H. Taube, Stanford**
1970	S. A. Rice, Chicago
1971	F. H. Westheimer, Harvard
1972	R. G. Pearson, Northwestern
1973	W. A. Klemperer, Harvard
1974	G. Stork, Columbia
1975	R. J. P. Williams, Oxford
1976	J. A. Morrison, McMaster
1977	D. Arigoni, E.T.H., Switzerland
1978	J. Chatt, Sussex
1979	**J. A. Pople, Carnegie-Mellon**
1980	W. P. Jencks, Brandeis
1981	J. Halpern, Chicago
1982	Sir John Meurig Thomas, Cambridge
1983	R. Breslow, Columbia
1984	M. L .H. Green, Oxford
1985	**D. R. Hershbach, Harvard**
1986	**J. M. Lehn, Strasbourg**
1987	M. H. Chisholm, Indiana
1988	**R. A. Marcus, Cal. Tech.**
1989	**D. J. Cram, U.C.L.A.**
1990	D. Seyferth, M.I.T.
1991	D. A. Shirley, Berkeley
1992	K. U. Ingold, NRC
1993	H. Schmidbauer, Munich
1994	A. J. Bard, U. Texas, Austin
1996	R. Huisgen, Munich
1998	J. M. J. Fréchet, Berkeley
1999	R. W. Field, M.I.T.
2000	I. Dance, New South Wales
2001	K. C. Nicolaou, San Diego
2002	R. R. Birge, Connecticut/Syracuse
2003	D. Fenske, Karlsruhe
2004	A. Padwa, Emory
2005	N. Dovichi, Washington State
2006	K. N. Raymond, Berkeley
2007	K. Tamao, RIKEN and Kyoto University
2008	P. Corkum, NRC, Ottawa

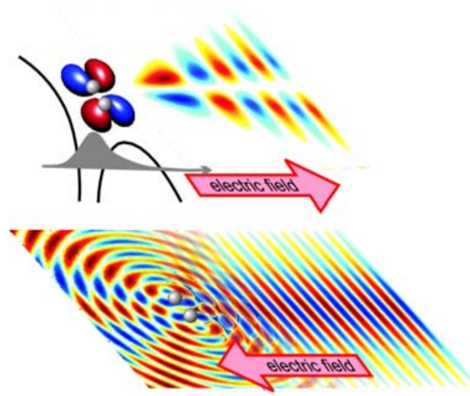
Western

The UNIVERSITY *of* WESTERN ONTARIO

The 3M University Lecturer in Chemistry 2008

PAUL CORKUM

National Research Council
Ottawa, Ontario
Canada



Prof. Corkum will present three lectures:

Monday, October 27th, 2008
4:00 p.m.
Auditorium A - University Hospital
3rd floor
(off hallway between
Dental Sciences & University Hospital)

Lecture 1
Ultrafast Lasers: The Basics

Femtosecond laser pulses are a natural tool for chemistry, because molecules vibrate and dissociate in femtoseconds. Now that we have reached the attosecond time scale many chemists worry that, since the nuclei are frozen, there is nothing of interest to chemistry to measure. In other words, are attosecond pulses simply too short?

In my first lecture I will introduce the basic concepts of femtosecond technology and describe how this has led to attosecond electron and XUV pulses. I will conclude the lecture by pointing to one unique use of attosecond technology for chemistry—measuring molecular images.

Contact

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Tuesday, October 28th, 2008
4:00 p.m
Auditorium A - University Hospital
3rd floor
(off hallway between
Dental Sciences & University Hospital)

Lecture 2
Controlling Molecules with Intense Light Pulses

The interaction of low intensity light with molecules is well understood. As the intensity increases, so does complexity. One might expect high intensity light-molecule interactions to be hopelessly complex. However, this is not true. A new simplicity emerges. Through the laser induced dipole force, light assumes control over the molecule. Since we control the light, we also control the molecule. I will show how to align gas phase molecules in space, to spin them (like a child's top), to accelerate them or to stretch them.

If we increase the intensity a bit more, the molecule ionizes. For small molecules and infrared light, tunnelling describes ionization very accurately. Scanning the molecule's alignment, we have created a "molecular STM". Measuring the angle dependent electron distribution, we gain all information on the electron orbital from which the electron tunnelled.

Refreshments will be served 15 minutes prior to the talks outside the lecture room.

Wednesday, October 29th, 2008
4:00 p.m.
Auditorium A - University Hospital
3rd floor
(off hallway between
Dental Sciences & University Hospital)

Lecture 3
Molecular Imaging: Merging Control with Attosecond Methods

Like chemistry, at its core, attosecond science is all about electrons. This lecture concentrates on how the interplay between light and an ionizing electron allows molecules to be imaged. I will describe two methods. (1) Imaging a molecular orbital (the Dyson orbital) using "Orbital Tomography" (actually electron interferometry) and (2) measuring nuclear positions with Laser Induced Electron Diffraction. The same technology allows us to see both a molecule's electrons and nuclei.

Returning to the worry of many chemists that attoseconds are just too fast for chemistry, no matter how the debate unfolds, imaging orbitals (something considered impossible only a few years ago) and nuclear positions will be important. Individual images taken with a "shutter speed" of attoseconds, can be combined to make true movies of chemical dynamics. I predict that soon attosecond technology will become a standard tool of chemistry.

Our website: http://www.uwo.ca/chem/