P.H. Bucksbaum

Observing Structure and Motion in Molecules with Ultrafast Strong Field and Short Wavelength Laser Radiation

The term “molecular movie” has come to describe efforts to track and record Angstrom-scale coherent atomic and electronic motion in a molecule. The relevant time scales for this range cover several orders of magnitude, from sub-femtosecond motion associated with electron-electron correlations, to 100-fs internal vibrations, to multi-picosecond motion associated with the dispersion and quantum revivals of molecular reorientation. Conventional methods of cinematography do not work well in this ultrafast and ultrasmall regime, but stroboscopic “pump and probe” techniques can reveal this motion with high fidelity. This talk will describe some of the methods and recent progress in exciting and controlling this motion, using both laboratory lasers and the SLAC Linac Coherent Light Source x-ray free electron laser, and will further try to relate the data to the goal of molecular movies.

Philip H. Bucksbaum is the Marguerite Blake Wilbur Chair in Natural Science at Stanford University, with appointments in the Physics, Applied Physics, and Photon Sciences departments. He also directs the Stanford PULSE Institute, and the Chemical Sciences Division at the SLAC National Accelerator Laboratory. He received his undergraduate degree from Harvard University in 1975 and his Ph.D. from the University of California, Berkeley, in 1980. He was a member of the technical staff at Bell Telephone Laboratories in the 1980s, and was a Professor of Physics at the University of Michigan from 1990-2006 before joining the Stanford faculty. He is a Fellow of the American Physical Society and the Optical Society of America, and a member of the National Academy of Sciences.

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