Observing dynamics with atomic spatiotemporal resolution

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The progress in the development of ultrafast structural probes during the last twenty years has been tremendous. Current ultrafast imaging techniques provide the temporal and spatial resolutions required for the stroboscopic observation of atoms in motion. With an effective brightness only one hundredfold below that of the brightest femtosecond X-ray source on earth (LCLS, Stanford), ultrabright femtosecond electron diffraction has revealed atomic level views of photo-induced reactions and phase transformations [1] to culminate with the first "molecular movie" in a labile organic system [2]. This latter study illustrates the potential of ultrashort electron bursts for capturing, with atomic resolution, the key structural changes governing chemical reactivity and biological function. I will present a brief overview of the growing field of ultrafast structural dynamics alongside with recent advances done in the design of ultrafast electron guns at the University of Waterloo, which will soon enable monitoring dynamical processes with sub-30 femtosecond temporal resolution [3].

References:

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