

Abstract for an Invited Paper  
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**Seeking ways to measure atomic dynamics in real time<sup>1</sup>**

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Although it is straightforward to visualize and calculate the time-dependent motion of atoms in molecules and electrons in atoms, making experimental movies of this motion is quite a different matter. I will discuss some momentum-imaging experiments which yield experimental information on the timing of rearrangements in light molecules. If the transient state of the system is initiated using a single collisional pulse, an intrinsic clock must be used. For example, the diffraction of electrons ejected from the K-shell of an atomic constituent of the molecule takes a “picture” of the molecule, and the correlation between the momentum vector of the photoelectron and the subsequent fragmentation pattern can be used to estimate the time scale for the latter process. If the transient state is created with a short laser pulse, an external clock (pump-probe) with a resolution of a few fs is possible. Even shorter times can be observed by using *in situ* electron scattering from the molecular ion. Examples from double ionization of hydrogen and other light molecules by short laser pulses will be discussed.

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