

**Plenary Talk**

PLV V Wed 9:00 HS 1+2

**Watching Ultrafast Processes in Single Molecules using Synchrotrons and X-Ray Free-Electron Lasers** — ●TILL JAHNKE —  
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Recording "real-time movies" of ultrafast dynamical processes in molecules has been a driving force across numerous disciplines in the fundamental sciences over the recent decades. More recently, techniques targeting single gas-phase molecules with coincident single-particle detection have emerged. For instance, Coulomb explosion imaging uses ultrashort light pulses to fragment molecules, revealing their geometry through the breakup pattern. Electron emission patterns measured in coincidence provide additional insights into ultra-

fast processes. X-ray free-electron lasers (XFELs) excel at exploring the ultrafast time regime. These light sources are especially suited for time-resolved studies using pump-probe schemes, by adding, e.g., synchronized ultrashort UV pulses. Intriguingly, this time domain can also be accessed with synchrotron light sources (which produce light pulses with durations on the order of several 100 picoseconds) by employing coincident momentum imaging with so-called COLTRIMS reaction microscopes. This talk will offer an introduction to the topic and highlight the current state-of-the-art in related experiments. It will showcase various examples, spanning from "relatively slow" dynamics, such as photo-induced molecular rearrangements occurring over several hundred femtoseconds, to the attosecond regime (and beyond) of electronic processes in molecules.