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Ultrafast molecular and materials dynamics probed by attosecond coherent x-rays[1]

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The x-ray bursts generated during high harmonic generation represent the fastest strobe light in existence, fast enough to capture electron dynamics in atoms, molecules, and solids. Bright, attosecond, beams of coherent x-rays now span from the VUV to > 0.5 keV [1,2], with the prospect of reaching the hard x-ray region in the near future. Exciting applications of attosecond science and technology will be discussed, including capturing the coupled motions of electrons and atoms in molecules, high-resolution imaging, nanoscale heat transport as well as ultrafast, element-specific, dynamics in magnetic materials [3-6].

[1] Popmintchev et al., PNAS 106, 10516 (2009); Nature Photonics, to be published.
[2] Thomann et al., Optics Express 17, 4611 (2009).
[3] Siemens et al., Nature Materials, , to be published.
[4] La-O-Vorakiat et al., Physical Review Letters, , to be published.
[5] Li et al. Science 322, 1207 (2008).
[6] Murnane et al., Nature 460, 1088 (2009).

[1]In collaboration with H. Kapteyn.