

Physicist discusses high-order harmonic generation at AAAS

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One-billionth of a billionth of a second. That's the scale – an attosecond – at which scientists seek to image and control electronic motion in matter. Its natural time scale.

The principle of [attosecond](#) science was the focus of a Sunday (Feb. 17) symposium during the annual meeting of the American Association for the Advancement of Science. University of Nebraska-Lincoln Physicist Anthony Starace was among the speakers, presenting "High-Order Harmonic Generation, Attosecond Science and Control of [Electron Motion](#)."

Starace, a George Holmes University Professor of Physics at UNL, reviewed current theoretical understanding of the "new frontier" of high-order harmonic generation and discussed the prospects for achieving the goals of attosecond science.

"Because electrons move on a scale of Angstroms (one ten-billionth of a meter), light pulses used to illuminate this motion must have high energies so that their de Broglie wavelength is sufficiently small to be able to resolve (or image) the electron motion," Starace said. "Also, because electrons move so fast, light pulses must have durations that are shorter than the typical time scale for electron motion."

De Broglie waves, a theory of [quantum mechanics](#), indicate how a wavelength is inversely proportional to the momentum of a particle.

Attosecond pulses are becoming the preferred future tools for imaging, visualizing and even controlling electrons in matter in their natural time scale. Attosecond research could eventually open new applications in a wide range of fields including nanotechnology and life sciences, based on the ultimate visualization and control of the [quantum nature](#) of the electron.

Attosecond science evolved from advances in modern laser technology that allow generation of ultra-short light pulses, or high-order harmonic generation – Starace's area of expertise.

Starace joined seven other scientists to discuss "Attosecond Science in Chemical, [Molecular Imaging](#), [Spintronics](#) and Energy Science." The AAAS annual meeting was Feb. 14-18 in Boston.

Provided by University of Nebraska-Lincoln

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