



**SPEAKER:** Marc Vrakking (Max-Born Institut, Berlin)  
**TITLE:** **Connecting Lab-Based Attosecond Science with FEL research**  
**DATE:** Thu 27/01/2011 16:30  
**PLACE:** Council Chamber

## ABSTRACT

In the last few years laboratory-scale femtosecond laser-based research using XUV light has developed dramatically following the successful development of attosecond laser pulses by means of high-harmonic generation. Using attosecond laser pulses, studies of electron dynamics on the natural timescale that electronic processes occur in atoms, molecules and solids can be contemplated, providing unprecedented insight into the fundamental role that electrons play in photo-induced processes.

In my talk I will briefly review the present status of the attosecond science research field in terms of present and foreseen capabilities, and discuss a few recent applications, including a first example of the use of attosecond laser pulses in molecular science. In addition, I will discuss very recent results of experiments where photoionization of dynamically aligned molecules is investigated using a high-harmonics XUV source.

Photoionization of aligned molecules becomes all the more interesting if the experiment is performed using x-ray photons. Following the absorption of x-rays, ejected photoelectrons can be used as a probe of the (time-evolving) molecular structure, making use of intra-molecular electron diffraction. This amounts, as some have stated, to “illuminating the molecule from within”. I will present the present status of our experiments on this topic making use of the FLASH free electron laser in Hamburg.

Future progress in this research field not only depends on the availability of better and more powerful light sources, but also requires sophisticated detector strategies. In my talk I will explain how we are trying to meet some of the experimental challenges by using the Medipix family of detectors, which we have already used for time- and space-resolved imaging of electrons and ions.