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Attosecond Time-resolved Photoemission

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With recent advances in ultrafast laser technologies featuring phase controlled few-cycle strong-field near infrared pulses as well as XUV pulses of attosecond duration, the dream of watching electronic dynamics, charge transfer, bond breaking and making, or electron ejection in real time is becoming reality. Challenges ahead in fully reaching the goal to steer and control electronic motion and the attosecond scale will be discussed. Such attosecond chronoscopy allows a novel look at a wide range of fundamental photophysical and photochemical processes in the time domain, including Auger and autoionization processes, photoemission from atoms, molecules and surfaces, completing conventional energy-domain spectroscopy. Attosecond chronoscopy raises fundamental conceptual and theoretical questions as which novel information becomes accessible and which dynamical processes can be controlled and steered. In this talk, we will focus on a few prototypical examples in the field of time-resolved photoionization, a field to which Antony Starke has significantly contributed. Examples include time-resolved Fano resonances, correlation effects and chirality in double ionization, and non-linear many-particle interferences in strong-field attosecond pulses. * Work in collaboration with I. Brezinova, S. Donsa, C. Lemell, W.-C. Jiang, H. Ni, and L. Argenti.