

O 10: Overview Talk: Jascha Repp

Time: Monday 15:00–15:45

Location: TRE Phy

Invited Talk

O 10.1 Mon 15:00 TRE Phy

Overview of the development of ultrafast scanning tunneling microscopy — DOMINIK PELLER, TYLER L. COCKER, PING YU, RUPERT HUBER, and ●JASCHA REPP — Department of Physics, University of Regensburg, 93040 Regensburg, Germany

Since the early days of scanning tunneling microscopy (STM) people have tried to combine atomic-scale resolution with an ultrafast temporal resolution [1]. Recently time-dithering optical pulse pairs has minimized the deleterious effect of light-induced heating [2] and hot-electron transfer has been demonstrated with sub-molecular resolution [3]. An all-electronic pump-probe scheme [4] has allowed for a direct

observation of the relaxation of individual spins at the nanosecond timescale. Cocker et al. [5] were the first to use terahertz (THz) pulses acting analogously to voltage pulses accessing much shorter timescales. Recently, THz-STM enabled a novel, state-selective regime, in which a single electron can be selectively removed from a specific molecular orbital at combined sub-Ångstrom and sub-picosecond resolution [6].

[1] Hamers and Cahill, *Appl. Phys. Lett.* 57, 2031 (1990); Nunes and Freeman, *Science* 262, 1029 (1993) [2] Terada, Yoshida, Takeuchi and Shigekawa, *Nature Photon.* 4, 869 (2010); Yoshida et al., *Nature Nano.* 9, 588 (2014) [3] Wu and Ho, *Phys. Rev. B* 82, 085444 (2010) [4] Loth et al., *Science* 329, 1628 (2010) [5] Cocker et al., *Nature Photon.* 7, 620 (2013) [6] Cocker et al., *Nature* 539, 263 (2016).