

Analyzing charge distributions and their excitations using fast electrons

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The resolution of modern transmission electron microscopes suffices to probe the atomic structure of matter. Scanning transmission electron microscopes equipped with energy-dispersive X-ray spectrometers or electron energy loss (EEL) spectrometers are capable of identifying the type of atoms that are probed by the finely focused electron beam. In this talk I will introduce techniques that go beyond the identification of atomic species. I will, on the one hand, introduce the technique of inline electron holography to probe the distribution of charges, electrostatic potentials and fields in matter. I will also present very recent developments in monochromated electron sources and EEL spectroscopy instrumentation that allow us to also characteristic excitations of the electronic structure of matter to be probed.