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**Exploring electron beam induced heat and mass transport at the atomic scale**[1] CHRISTIAN KISIELOWSKI, Lawrence Berkeley National Laboratory — In recent years the performance of mid-voltage electron microscopes was significantly boosted to reach deep sub-Ångstrom resolution around 0.5 Å at 300 kV in broad beam (TEM) and focused probe (STEM) modes. Atomic resolution microscopy at voltages as low as 50 kV (and possibly below) was fostered. As a result the detection of single atoms across the Periodic Table of Elements is now possible even if light atoms are considered. After decades of striving for resolution enhancement, electron microscopy has now reached a limit that is given at a fundamental level by the Coulomb scattering process itself and by beam-sample interactions, which set a maximum dose limit that can be easily reached for soft and hard materials with the developed high-brightness electron guns. Consequently, new frontiers for electron microscopy emerge and this contribution addresses dynamic processes at the single atom level that can now be captured in time series of images at frequencies below 1 Hz reaching towards kHz. In this frequency range much of the observed atom dynamics is electron beam induced and the control of beam-sample interaction imposes constraints as well as opportunities. In this contribution it is shown that it seems feasible to exploit beam sample interactions to gain better insight into heat and mass transport in soft and hard matter at atomic resolution.

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