

Bottom-up view from an ultrafast electron microscope: Thinking and building science cases from molecular perspectives

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With growing pace and scale of scientific enterprise, we are entering a new era of making observations and running experiments, accessing a much greater breadth and depth of scientific knowledge. The top-down perspectives that capture the statistical mean-field behavior so far accurately describing our sensory experience can now be supplemented with a bottom-up view based on molecular perspectives. The development of ultrafast electron microscope is one of such movements in modern instrumentation, driven out of need to understand the noncanonical behavior of matters at the bottom of lengthscale, an emerging frontier of nanoscience and technology. In this presentation, I will highlight two cases of applications of such a technology being developed at MSU: the emergent quantum phenomena in complex materials and particle-specific molecular dynamics. The last part of talk will briefly cover the basic ideas behind a femtosecond electron microscope: its challenges, limitations, and future opportunities.