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Advancing Single-Particle EM towards Atomic Resolution

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Recent advances in single-particle electron microscopy (EM) have enabled the structural elucidation of several macromolecular complexes at near-atomic resolution. These achievements have been assisted by both well-ordered molecular specimens and rapid improvements in the direct-electron-detection technology. However, substantial challenges remain as the research field pushes the single-particle EM imaging technique towards even higher resolution, especially on smaller and dynamic molecular assemblies. Facilitated by the state-of-the-art electron microscopes at the OHSU-FEI Living Lab, I have been conducting research on effective approaches to cryo-EM data acquisition and data analysis. For the data acquisition, the central aim is to record TEM images of minimally damaged molecular specimens (due to the high-energy electron beam) on the detector. For the data analysis, my goal is to extract the maximal amount of information from the data images (at very low signal-to-noise ratio) for unbiased particle 2D classification and 3D reconstruction. I will discuss my research effort in these areas in the context of structural biology studies.

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