UCLA STROBE Seminar Series

New Direct Electron Imaging Techniques for Quantum Materials

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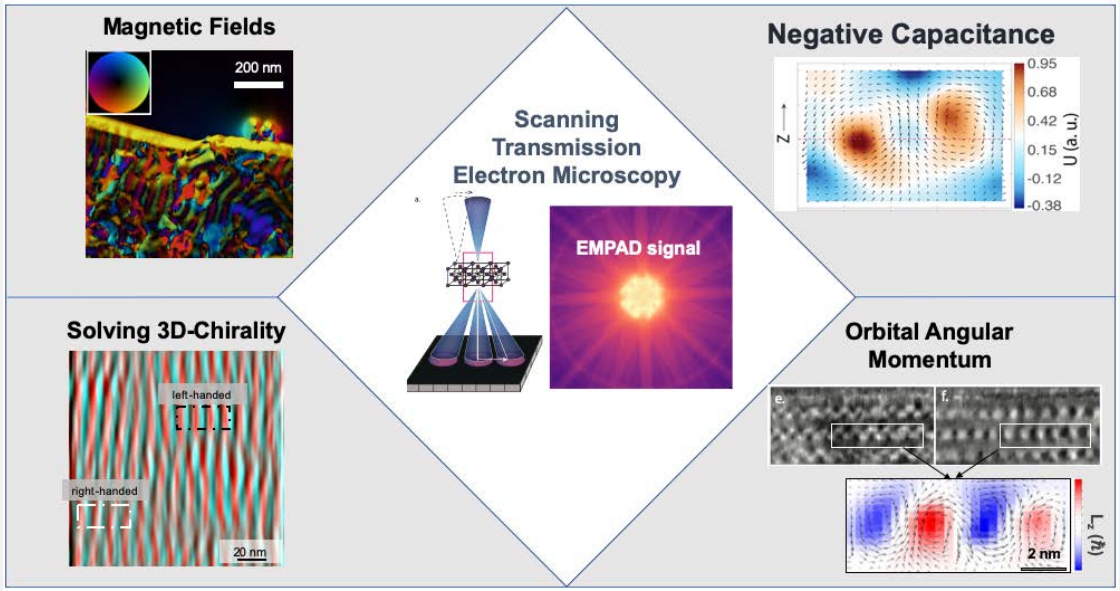
Electron microscopy is transforming the physical sciences. Aided by a new generation of direct imaging detectors, cryo-electron microscopy won the 2017 Nobel Prize in Chemistry for advancements in visualization of biomolecules. To go beyond traditional electron microscopy, new detectors must also be developed for the diffraction imaging; here, the scattered electron beam encodes a wealth of information about the structure, chemistry, electrical, optical, and magnetic properties of matter. During my PhD, I co-invented the electron microscopy pixel array detector (EMPAD), a fast, highly efficient detector designed to capture the full scattered electron information. I will highlight how the EMPAD enables new characterization techniques for imaging topological magnetic and ferroelectric structures. These approaches can be used to uncover polarization fields, orbital angular momentum and chirality of polar and magnetic textures. By developing new characterization methods in combination with theoretical predictions, new physics in emerging quantum materials can be revealed with electron microscopy at atomic resolution.



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