Atomic-scale imaging of symmetry-broken electronic states in kagome superconductors

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Kagome metals have emerged as a vibrant playground in quantum materials, where geometric frustration, strong electronic correlations, and nontrivial band topology intertwine to produce a wide range of emergent phenomena. The kagome superconductors AV_3Sb_5 (A = K, Rb, Cs) and, more recently, $CsCr_3Sb_5$ have triggered intense theoretical and experimental efforts to understand unusual electronic states, including density-wave order, unconventional superconductivity, and time-reversal symmetry breaking.

In this talk, I will first provide a brief introduction to the rapidly developing field of kagome metals. I will then present atomic-scale imaging experiments on AV_3Sb_5 and $CsCr_3Sb_5$, where we uncover a cascade of symmetry-broken electronic states that would be obscured by spatially averaged probes. We observe clear signatures of spontaneous rotational symmetry breaking in the electronic structure, revealing an intrinsic tendency toward electronic unidirectionality in this material family. In $CsCr_3Sb_5$, spatially resolved measurements further uncover distinctive features of a novel density-wave state that emerges as a precursor to superconductivity. Together, these results reveal a rich landscape of intertwined electronic orders in kagome superconductors and demonstrate how nanoscale imaging provides essential insight into symmetry breaking and emergent phenomena in strongly correlated quantum materials.