

## Exploring Two-Dimensional Quantum Materials with Angle-Resolved Photoemission Spectroscopy

Angle-resolved photoemission spectroscopy (ARPES) provides momentum-resolved access to the single-particle spectral function, revealing electronic band structures and many-body interactions through their characteristic spectral signatures. This information is fundamentally important because electronic structure strongly influences the optical and electronic properties of materials and provides insight into exotic quantum phenomena, including unconventional superconductivity, topological phases, Mott transitions, correlated moiré states, and emergent quasiparticles. Time- and angle-resolved photoemission spectroscopy (trARPES) extends these capabilities into the time domain, enabling access to transiently populated unoccupied states and the ultrafast evolution of electronic structures and quasiparticles. In this colloquium, I will introduce the experimental principles of ARPES and trARPES and highlight how these techniques reveal electronic structures and many-body interactions in two-dimensional quantum materials through examples from my recent research.