

*Séminaire AXE 1 - Sciences et Matériaux Quantiques*



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*Influences of structural changes on the emergent phases in  $Sr_2RuO_4$*

Since the discovery of a superconducting phase in  $Sr_2RuO_4$  in 1994, the nature of its order parameter has remained a central and contested question in unconventional superconductivity. While a consensus has emerged in favor of a singlet order parameter, conflicting experimental results persist regarding time-reversal symmetry breaking and the dimensionality of the superconducting state. In this talk, we discuss two complementary approaches aimed at resolving this long-standing controversy: the response of the superconducting order parameter under applied strain, and the direct characterization of the order parameter via Bogoliubov quasiparticle interference. After reviewing recent experimental progress on both fronts, we present our theoretical framework, which incorporates structural modifications from first principles to predict how the order parameter evolves under these conditions. Our theoretical modeling allows us to understand better the experimental behavior under strain and also why Bogoliubov quasiparticle interference (so far) was not able to unambiguously determine the order parameter.

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