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Luttinger Liquid Behavior in a Quasi-One-Dimensional Transition Metal Oxide¹

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One-dimensional solids are attractive because of their inherent simplicity. However, theory shows that even weak Coulomb interactions in one dimension lead to strong perturbations, which can cause unusual physics, such as the separation of spin and charge and simple power-law dependencies of important physical properties. In this talk, I will provide an overview of the Lithium Purple Bronze, $\text{Li}_{0.9}\text{Mo}_6\text{O}_{17}$ - a compound discovered over 20 years ago. Our recent work helps to understand the transition to superconductivity at 1.9 K as the result of a crossover to higher dimension, as predicted by theories for Luttinger Liquids. In addition, our group has shown that the introduction of defects causes Bose Metal behavior, where a lack of phase coherence leads to a metallic state instead of superconductivity. Possible physical connections to high temperature superconductors will be highlighted in the presentation.

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