Title: Uncovering a new law of physics in quantum materials		
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Research Area: Condensed Matter		
Methods: Electric, Thermoelectric, and Thermal transport experiments in Extreme Conditions of temperature and magnetic fields / Numerical modeling of the electronic interactions		

PhD track subject

One favored way to study unconventional superconductivity today is to investigate the preceding phase. Indeed, before they pair to form a superconducting state, electrons interact so strongly that they defy the standard theory of metals in a phase we call "strange metal". Recent experiments have shown that strange metals host a scattering time between electron collisions that reaches a universal value known as the "Planckian limit" [2, 3]. To determine the origin of the Planckian limit, the aim of the project will be to measure and model the transport properties of unconventional high-temperature superconductors such as cuprates or more recently discovered nickelates under extreme temperature and magnetic field conditions.

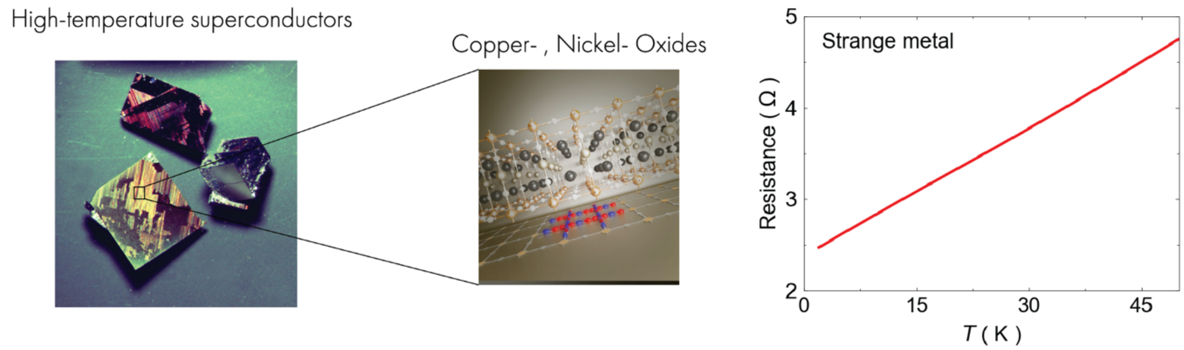

Figure - (Left) Picture of high-temperature superconducting copper oxides. (Center) Sketch of the unite cell of copper oxides. (Right) Resistance of a copper oxide sample showing the surprising characteristic of a strange metal -- the perfectly T-linear resistivity that defies the standard theory of metals.

References:

[1] Patel *et al.* Science **381**, 6659 (2023).
[2] Legros *et al.* Nature Physics **15**, 142 (2019).
[3] Grissonnanche *et al.* Nature **595**, 667 (2021).