

# “Study of Novel Quantum Materials in Extreme Conditions”

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Monday, February 5th, 2024 at 4:00pm

Hammond Auditorium (Engineering 120)

## Abstract

The development of modern technologies in all fields highly relies on the properties of materials. The vast majority of materials' properties can not be fully understood with only classical physics or a single atom's behavior. Instead, it involves the understanding of collective motions of excitations with strong correlations using quantum physics, which redefines these materials to be “quantum materials”.

This talk will be developed with an introduction to the big picture and grand challenges that need to be addressed by physicists in each of these three families of quantum materials, i.e. unconventional superconductors, quantum spin liquids, and topological materials. Then I will dive into the details of how we tackle these questions using thermal transport [1-7], electrical transport [8], torque magnetometry [9,10], and thermoelectric measurements [11] at extremely low temperatures and strong magnetic fields, with a highlight on my past research and future research plans.

[1] **L. Chen**<sup>\*</sup>, M.-E. Boulanger<sup>\*</sup> et al., *PNAS* **119**, e2208016119 (2022)

[2] M.-E. Boulanger<sup>\*</sup>, **L. Chen**<sup>\*</sup> et al., arXiv:2310.15892

[3] Ashvini Vallipuram<sup>\*</sup>, **L. Chen**<sup>\*</sup> et al., arXiv:2310.10643

[4] **L. Chen**<sup>\*</sup>, É. Lefrançois<sup>\*</sup> et al., arXiv:2309.17231

[5] **L. Chen** et al., arXiv:2310.07696

[6] **L. Chen** et al., *Appl. Phys. Lett.* **114**, 251904 (2019)

[7] **L. Chen** et al., *Appl. Phys. Lett.* **113**, 061902 (2018)

[8] L. Chen et al., Scattering rate in the electron-doped cuprate  $\text{Nd}_{2-x}\text{Ce}_x\text{CuO}_4$ : an angle-dependent magnetoresistance study in the Planckian regime, *in preparation*

[9] **L. Chen** et al., *Phys. Rev. Applied.* **9**, 024005 (2018)

[10] Z. Xiang, **L. Chen** et al., *Nat. Phys.* **102**, 054503 (2020)

[11] **L. Chen** et al., *Phys. Rev. B* **102**, 054503 (2020)

## Biography

Dr. Chen is originally from China and received her B. S. degree from Peking University of China in 2014. Then she went to graduate school at the University of Michigan, Ann Arbor and got her PhD degree in 2020. She is currently a Prize Postdoc Fellow at the Institut Quantique of Université de Sherbrooke in Québec, Canada.

Dr. Chen's research lies in the field of three-dimensional quantum materials. She investigates the thermal, electrical, and magnetic properties of various novel quantum materials, such as unconventional superconductors, quantum spin liquids, and topological materials at extremely low temperatures and strong magnetic fields. She is interested in understanding physics phenomena in quantum materials as well as designing new experimental techniques to further advance her research.