



筑波大学

*University of Tsukuba*

# Condensed Matter Seminar 物性論セミナー

2026年3月30日 (月), Mar 30 (Mon), 2026, 15:00-16:00

自然系学系棟D棟3階: 301号室 (Institutes of Natural Sciences Bldg. D 301)

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## **Repulsive-interaction-driven topological superconductivity in a quantum Hall-superconductor hybrid**

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Topological superconductivity (TSC) is predicted to arise when a topological state, such as surface states of topological insulators, is proximity-coupled to an s-wave superconductor. Given that a Landau level is a prototypical topological band, one might expect that coupling it to an s-wave superconductor would produce TSC. However, that turns out not to be the case in the simplest model [1,2]. In this work, we demonstrate that repulsive electron-electron interactions drive TSC in this hybrid. This is counterintuitive, as one would expect a repulsive interaction to be antithetical to superconductivity. As the strength of the interactions is increased, the system eventually transitions into a composite Fermi liquid (CFL) state, suggesting that the system can be viewed as a CFL proximity-coupled to an s-wave superconductor [3].

[1] R. V. Mishmash, A. Yazdani, and M. P. Zaletel, *Phys. Rev. B* **99**, 115427 (2019).

[2] G. Chaudhary and A. H. MacDonald, *Phys. Rev. B* **101**, 024516 (2020).

[3] K. Kudo, R. Nakai, H. Isobe, J. K. Jain, and K. Nomura, arXiv:2510.04700

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