

# Topological superconductivity in monolayer transition metal dichalcogenides

Ms. Yi-Ting Hsu

Department of Physics, Cornell University, USA

## **Abstract:**

Theoretically it has been long known that breaking spin-degeneracy and effectively realizing “spinless fermions” is a promising path to a topological superconductor. Yet, topological superconductors are rare to date. We propose a new strategy for realizing “spinless fermions” by splitting the spin degeneracy in momentum-space (k-space). Specifically, we identify monolayer hole-doped (p-doped) transition metal dichalcogenide (TMD)s as candidates that can materialize topological superconductors out of such k-space-split “spinless fermions”. In fact, superconductivity in electron-doped (n-doped) TMDs is by now well established experimentally. The resulting pairing, however, is unlikely to be topological since Fermi surfaces are nearly degenerate in n-doped TMDs. On the other hand, the p-doped TMDs with k-space-split “spinless fermions” remain unexplored. Employing a renormalization group analysis, we propose that the unusual spin-valley locking in the p-doped TMDs together with repulsive interactions selectively favors two topological superconducting states: an inter-pocket pairing state with Chern number  $|C|=2$  and an intra-pocket pairing with finite pair momentum. A confirmation of our predictions will open up new possibilities for manipulating topological superconductors on the device friendly platform of monolayer TMDs.