In the past years, the revealed significance of the topological nature of certain superconducting states has attracted great interest in condensed matter physics because of its potential application for topological fault-tolerant quantum computation. A promising platform for topological superconductivity and emergent Majorana quasiparticles are *chiral superconductors* − bulk topological materials with finite angular momentum Cooper pairs circulating around a unique chiral axis, thereby spontaneously breaking time-reversal symmetry. Such unique properties, attractive from the viewpoints of basic and applied science, triggered tremendous efforts for searching for topological superconductivity. However, naturally occurring candidate materials are scarce and the realization of chiral superconductivity is still under intensive debate. Another aspect of the project *Constraints on the order parameter in candidate chiral superconductors from local magnetization measurements* is to reconcile experimental results with a spin-triplet order parameter, which can result in a topological chiral superconductor. Triplet superconductors are characterized by an order parameter that is odd under TRS and is manifested by superconductivity-related magnetization. Triplet superconductors are special but triplet pairing rarely exists in nature; only a few from several thousand superconducting compounds discovered so far have been identified as candidate materials. One of them is the heavy-fermion superconductor $PrOs_4Sb_{12}$, for which our preliminary results show that a search for chiral spin-triplet state must be performed deep in the superconducting state [1].

The first research task is intended to investigate the temperature dependence of the field of first flux penetration of leading candidate materials for chiral superconductivity utilizing a new innovative Hall micromagnetometry with a high spatial resolution. We propose measurements of the lower critical field H_{c1} down to temperatures as low as 0.007 K, since investigations deep in the superconducting state can validate or rule out a subset of possible superconducting order parameters. We also plan to explore effect of uniaxial stress, since unconventional superconducting order parameters are inherently connected to the symmetry of the underlying crystal lattice that can be reduced under strain.

The second goal is to verify the presence of considerable multiband effects that can put severe constraints on the order parameter(s) of a superconductor with finite angular momentum. Our preliminary results show that multiband superconductivity can give rise to multisymmetric order parameters. For a better understanding of the symmetry of the order parameter(s), we plan to study effect of electron irradiation that is sensitive test for a sign change of gap function in momentum space.

The third objective, more risky and hence recognized as an option, is to explore the theoretically predicted possibility of chiral superconductors to produce spontaneous magnetic induction at sample edges and order parameter domain walls. Measuring a spatial distribution of local magnetization over a few μm scale, we plan experiments towards direct observation of superconductivity-related time reversal symmetry-breaking fields.

We focus on the newest discoveries in the field, i.e., 4Hb-TaS_2 (T_c = 2.7 K, van der Walls material), UTe_2 ($T_c \simeq 1.7$ K, ferromagnetic fluctuations), and $CeRh_2As_2$ ($T_c \simeq 0.3$ K, nonsymmorphic symmetry) and from one side, while we are interested in canonical heavy-fermion compounds $CeCu_2Si_2$ ($T_c \simeq 0.6$ K, first-ever heavy-fermion superconductor discovered in 1979) and $PrOs_4Sb_{12}$ ($T_c \simeq 1.8$ K, first Pr-based superconductor discovered in 2002) on the other. These materials address various aspects of chiral superconductivity, except $CeCu_2Si_2$ for which unexpected deficiency of nodal quasiparticles has challenged the long-held dichotomy between simple *s*- and *d*-wave spin-singlet pairing states.

[1] J. Juraszek, R.Wawryk, Z. Henkie, M. Konczykowski, and T. Cichorek, *Symmetry of Order Parameters in Multiband Superconductors $LaRu_4As_{12}$ and $PrOs_4Sb_{12}$ Probed by Local Magnetization Measurements*. Phys. Rev. Lett. 124 (2020) 027001.