CeCoIn$_5$ has many similarities to the high-temperature superconducting cuprates, including crystal structure, transport properties, and unconventional superconductivity. **Here, intense pulsed magnetic fields up to 73 T reveal another common feature of the two systems, providing a vital clue to the mechanism for the unconventional superconductivity.** Ultra-high magnetic fields are essential in these Hall effect measurements of pure and doped CeCoIn$_5$ to reach the high-field limit in which the gradient of the Hall resistivity – the Hall coefficient $R_H$ – can be demonstrated to be field-independent over a wide range of magnetic fields.

When plotted as a function of doping (Figure inset), the carrier densities extracted from the high-field Hall coefficient reveal the delocalization of electrons at a transition between Fermi surfaces of different volume. This is a *quantum phase transition* (QPT) driven by carrier concentration. Other measurements suggest that the change in Fermi-surface volume is not accompanied by broken symmetry. **A model invoking fractionalization of spin and charge is able to account for the phenomena manifested in the high-magnetic-field Hall effect.**

*QPTs without a broken symmetry are proposed to be the mechanism of high-temperature superconductivity. This experiment is the first in a material closely related to the cuprates, for which existing magnetic fields are able to unambiguously access the high-field regime, a situation that is not achievable in measurements on the cuprates.*

**Facilities used:** 73T and 65T magnets at the Pulsed Field Facility; SCM1 dilution refrigerator at the DC Magnet Facility