Topologically protected Landau level in the vortex lattice of a Weyl superconductor

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Good ideas in science may be rejected for a while, but they have a tendency to return when the time is right. This has happened with a 20-year old conjecture that certain superconductors in a magnetic field would support a field-independent flat-band in the middle of the gap. After Gorkov, Schrieffer, and Anderson proposed this idea of a superconducting Landau level, it was dismissed because it does not survive the broadening effects of the magnetic vortex lattice in a superconductor. We have discovered a way around this, by populating the Landau levels with Weyl fermions rather than with conventional electrons. Weyl fermions come in a left-handed and in a right-handed variety and a Landau level contains only one of these two chiralities. The Landau level is protected from broadening by the vortex lattice because that needs to mix both chiralities in order to be effective. If this new twist on an old idea is borne out by experiments on Weyl superconductors, it would finally allow for quantum Hall physics to enter the superconducting domain. For example, the superconducting Landau level would have a quantized heat conductance parallel to the magnetic field.