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Autore	Bachmann Maja D
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Sommario/riassunto	This thesis presents pioneering work in the relatively new field of focused ion beam (FIB) sculpting of single crystals to produce bespoke devices and enable the investigation of physics that cannot be studied in bulk samples. It begins with a comprehensive and didactic account of how to achieve this sculpting, revealing the ‘tricks of the trade’ of state-of-the-art FIB microstructuring. In subsequent chapters, the author presents ground-breaking results obtained from microstructures of the delafossite oxide metal PdCoO2 and the heavy fermion superconductor CeIrIn5. In these elegant, forefront experiments, a new form of directional ballistic transport in the ultra-pure delafossites is described and explained. Furthermore, a new way to spatially modulate superconductivity induced by strain is demonstrated with electrical transport measurements that agree well with predictions based on thermoelastic finite element simulations.