Controllable geometric manipulation via Focused Ion Beam micromachining technique provides a promising tool for enhancing useful electrical responses relevant to future applications such as quantum information science. In this talk, I present microdevices fabricated based on topological and strongly-correlated quantum materials, which lead to enhanced topological surface states, the emergence of superconductivity, and directional-selective electrical properties. These results demonstrate that interesting electronic responses relevant to practical applications can be achieved by suitable engineering of single crystals.