The power of the boundary: Creating quantum spin helices, quantum skyrmions, and measuring one-dimensional topological superconductivity without relying on Majorana modes

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Manipulating the boundary of low-dimensional spin systems can grant full control about topological excitations in this kind of quantum matter. I will discuss the creation and the stability of quantum spin helices and quantum magnetic skyrmions in one- and two-dimensional quantum systems, indicate their possible application to quantum information processing, and outline upcoming theoretical and experimental challenges. Boundaries of electronic topological phases play an elemental role as well, yet differently, by accommodating zero-energy boundary modes. I will further describe how to detect one-dimensional topological superconductivity in circular systems, i.e., without the presence of (Majorana) boundary modes, by using multidimensional spectroscopy.

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