# Unconventional transition to topological superconductivity in a self-organized magnetic ladder

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In bulk materials magnetism and superconductivity are regarded to be conflicting phenomena. Their coexistence in nanoscopic heterostructures, however, can lead to emergence of novel states of matter – a topological superconducting phase being one prominent example. We show that magnetic atoms arranged into nanowires [1,2] or ladders [2] on top of conventional superconductor develop their helical ordering which selfsustains the topologically nontrivial phase of itinerant electrons, hosting the Majorana boundary modes. Furthermore, we predict an *unconventional transition to topological phase without any gap closing* due to discontinuous mismatch ($\pi$-shift) of the helical ordering between the legs of magnetic ladder proximitized to superconductor. The underlying mechanism is generic, and could be generalized to different dimensions, and to different forms of topological order, potentially opening up new perspectives for designing the topological matter.

**References:**

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