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The Frustration of being Odd

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A central tenant in the classification of phases is that boundary conditions cannot affect the bulk properties of a system. In our works, we show striking, yet puzzling, evidence of a clear violation of this assumption. We study some exactly solvable spin chains, mappable to free fermions, in a ring geometry with an odd number of sites. In such a setting, even at finite sizes, we are able to calculate directly the spontaneous magnetizations that are traditionally used as order parameters to characterize the system's phases. We find that boundary conditions can destroy local order, change it, and even induce a new quantum phase transition.

Main references: <https://iopscience.iop.org/article/10.1088/1367-2630/aba064> <https://arxiv.org/abs/2002.07197>

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