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Topological order and topological entropy in classical systems CLAUDIO CASTELNOVO, University of Oxford, CLAUDIO CHAMON, Boston University — We show that the concept of topological order, introduced to describe ordered quantum systems which cannot be classified by broken symmetries, also applies to classical systems. Starting from a specific example, namely that of a toric code, we show how to use pure state density matrices to construct corresponding thermally mixed ones that retain precisely half the original topological entropy, a result that we generalize to a whole class of quantum systems. In particular, we suggest that classical topological order is likely to arise from the presence of frustration in magnetic systems. Finally, we discuss some of the characteristic properties of classical systems exhibiting topological order, and we argue how the latter may be related to a display of glassy behavior.

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