Abstract Submitted
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**How T-symmetry decides the laws thermodynamics**[1] SHANE MOFFET, None — The "arrow of time" is synonymous with the second law of thermodynamics. For the first time simulations show T-symmetry (the symmetry of transforming $t$ to $-t$) is required for entropy to reach its true maximum value. Moreover, preserving the symmetry is required to preserve the zeroth law. The simulations use an Ising-like model attributed to Creutz. Additional degrees of freedom flip binary spins deterministically rather than with Monte Carlo techniques. It is analytically demonstrable that the added quanta satisfy or violate T-symmetry, depending on the particle interactions. Thus we see for the first time the laws of thermodynamics are only valid when T-symmetry is preserved. This provides theoretical confirmation for neutral kaon decay and testable predictions for electric dipole moment experiments. Because low-entropy states still evolve to states of higher entropy when T-symmetry is violated, but only reach the true maximum when it is satisfied, the simulations constitute a new solution of Loschmidt's Paradox: entropy increases only in the future, despite the time-reversal invariance of classical mechanics. The coarse-graining solution to the paradox from the Ehrenfests is unneeded in this more fundamental approach.

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