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High-Temperature Criticality in Strongly Constrained Quantum Systems[1] CLAUDIO CASTELNOVO, CLAUDIO CHAMON, Boston University Physics Department, CHRISTOPHER MUDRY, Paul Scherrer Institut, PIERRE PUJOL, Ecole Normale Superieure de Lyon — The exotic nature of many strongly correlated materials at reasonably high temperatures, for instance cuprate superconductors in their normal state, has lead to the suggestion that such behavior occurs within a quantum critical region where the physics is controlled by the influence of a phase transition down at zero temperature. Such a scenario can be thought of as a bottom-up approach, with the zero temperature mechanisms finding a way to manifest critical behavior at high temperatures. Here we propose an alternative, top-down, mechanism by which strong kinematic constraints that can only be broken at extremely high temperatures are responsible for critical behavior at intermediate but still high temperatures. This critical behavior may extend all the way down to zero temperature, but this outcome is not one of necessity, and the system may actually order at low temperatures. We provide explicit examples of such high-temperature criticality when extra strong interactions are added to quantum Heisenberg, transverse field Ising, and some lattice bosonic models.

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