Abstract Submitted
for the APR18 Meeting of
The American Physical Society

Does Gravitational Collapse Occur? Insight from the Laws of Thermodynamics. PIERRE-MARIE ROBITAILLE, Ohio State Univ - Columbus — Combining the virial theorem with the kinetic theory of gases, astrophysics has advanced the idea that a gaseous assembly of atoms, like hydrogen, can gravitationally collapse, provided that the mass under consideration is greater than the Jeans Mass. Such an idea is opposed to the laws of thermodynamics. In the laboratory, gases expand to fill the void. Gravitational collapse violates the first law, as a system cannot do work upon itself and thereby increase its own temperature. The idea also stands in violation of the second law, as no external agent exists to ensure compression, and as kinetic theory does not allow for dissipation of energy into a heat sink, given that all collisions must be elastic, by definition. Finally, the expression, T= GMm/5kr (T=temperature, M=mass, m=proton mass, r=radius, G=gravitational constant and k=Boltzmann's constant) and its analogues, stands in violation of the zeroth law of thermodynamics. Temperature is an intensive property by definition. It cannot be made to depend on two properties, M and r, which, in combination, do not result in an intensive property. As a consequence, the formation of gaseous stars is not supported by the laws of thermodynamics. Star formation should involve condensation reactions and the associated emission of photons.

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Date submitted: 29 Nov 2017 Electronic form version 1.4