Report on the Thesis Prepared by Lorenzo Gavassino

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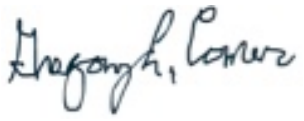
The candidate, Lorenzo Gavassino, chose to work on the hard problem of how to develop a formulation of Thermodynamics which is relativistic. This problem has a long history, and has attracted the attention of physics luminaries such as Planck and Ott. It has (fairly recently) become a very relevant problem for “multi-messenger” astrophysics/ astronomy, given the detection of gravitational waves created during the final stages of inspiral and coalescence of two neutron stars (GW170817A). Events like this are very energetic and require the use of relativistic, dissipative fluid dynamics for modeling and data extraction. However, the theoretical foundations of relativistic dissipative fluid modeling is not completely settled, with troubling issues dealing with causality and stability.

Largely staying within the confines of the Laws of Thermodynamics, the candidate has addressed these issues with originality and an obvious understanding of many branches of physics. His starting point reminds me of that of Landau and Lifschitz in their books on statistical mechanics; namely, start the discussion of a many-particle system with well-established conservation rules, such as energy, mass, and momentum, and use these numbers to build a manifold of possible thermodynamic states. With this structure formulate a workable notion of equilibrium and non-equilibrium via state functions such as entropy and energy. Notably, the candidate has (somewhat implicitly) used a modern point-of-view of conserved quantities as being generated by internal symmetries — gauge invariance, coordinate invariance, and so on.

His work is original, demonstrates an understanding of physics across a wide swath of topics, and has advanced the understanding of the role of the maximum entropy principle in the formulation of relativistic, dissipative fluids.

Summing up, I consider the doctoral thesis of Lorenzo Gavassino to be a valuable contribution and to meet the criteria prescribed by the law for a doctoral dissertation. Therefore, I request that this dissertation be admitted to a public defense.



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