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**Dissertation Award in Nuclear Physics Talk: Relativistic viscous hydrodynamics and heavy-ion collisions**

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With the recent start of the heavy ion program at the Large Hadron Collider (LHC) at CERN, a new era is beginning, of precision investigation into the behavior of deconfined, strongly-interacting matter – the Quark-Gluon Plasma (QGP). Already, the Relativistic Heavy Ion Collider (RHIC) at Brookhaven has produced a wealth of data, providing much new insight. A striking revelation was that collision system appeared to behave like an almost perfect (i.e., very small viscosity) fluid, indicating the creation of a strongly-coupled QGP. Indeed, such hydrodynamical models represent the state-of-the-art in understanding the bulk evolution of a relativistic heavy-ion collision system. In this talk, focused on work done for my dissertation, I introduce these models, based on relativistic viscous hydrodynamics. In particular, I describe the use of such models to extract transport properties of the QGP – specifically the shear viscosity – as well as to make predictions for the results of heavy ion collisions at the LHC. Indeed, with first results from the LHC having come last November we can compare these predictions with data, which turn out to agree surprisingly well. This affirms our current understanding and gives confidence that we can continue to make progress in quantitatively characterizing the physics of strongly interacting matter at extremely high temperature.