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### **Exploring the Lower Limits of Perfection<sup>1</sup>**

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A fascinating dialectic has emerged between the observation of “perfect liquid” behavior by the RHIC sQGP [1], and the near-simultaneous conjecture of a fundamental bound on the ratio of viscosity to entropy density  $\eta/s \geq 1/4\pi$  obtained by Kovtun, Son and Starinets (KSS) [2] via the AdS/CFT correspondence. While the existence of such a bound was anticipated by Danielewicz and Gyulassy based on simple quantum mechanical arguments [3], the possible connection to those conformal field theories with gravity duals studied by KSS and others makes the determination of the value of  $\eta/s$  for the RHIC fluid particularly intriguing. This talk will consider various approaches utilizing flow, fluctuations, heavy quark transport and detailed second-order causal hydrodynamic simulations. The self-consistency, or lack thereof, of the resulting values for  $\eta/s$  will be discussed, along with prospects for future improved measurements and theoretical analysis.

#### **References**

- [1] [http://www.bnl.gov/bnlweb/pubaf/pr/PR\\_display.asp?prID=05-38](http://www.bnl.gov/bnlweb/pubaf/pr/PR_display.asp?prID=05-38)
- [2] P. Kovtun, D.T. Son and A.O. Starinets, Phys. Rev. Lett. **94**, 111601 (2005) [arXiv:hep-th/0405231].
- [3] P. Danielewicz and M. Gyulassy, Phys. Rev. **D31**, 53 (1985).

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