

## **ICTS String Seminar**

- Title : Transport and hydrodynamics in almost the chiral limit
- Speaker : Derek Teaney (State University of New York)
- Date : Wednesday, August 05, 2020
- Time : 05:00 pm (IST)
- Abstract : First I will briefly review lattice data on the QCD phase transition, which shows that real world QCD at the physical pion mass is close enough to the chiral limit that the  $O_4$  phase transition describes several features of the QCD crossover. Next I describe the appropriate hydrodynamic theory in the spontaneously broken chiral limit, where the pions must be included in the list of hydrodynamic fields, and the theory is a prototype for non-abelian superfluids more generally. In the real world the mass of the pion is finite, and thus theory is superfluid like at short distances, but normal fluid like at long distances. The superfluid modes can be integrated out by evaluating the appropriate hydrodynamic loop, leaving calculable corrections to the transport parameters of the normal fluid. Alternatively, one can develop a kinetic equation for the soft pion modes, which can be used to evaluate these corrections. I discuss how these corrections scale near the chiral critical point. Finally, I point out a few problems that normal-fluid hydro simulations have in describing the observed soft pion yields in heavy ion collisions. I suggest that the superfluid theory can help to resolve these residual discrepancies with the otherwise remarkably successful hydro model.



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<https://www.youtube.com/channel/UCw9LdPQ5t7Q7muD0qzn70TA>