Physics Colloquium

Soumya Mohapatra

"Dynamics of the Quark-gluon Plasma Produced in Relativistic Heavy-ion Collisions"

The Quark-Gluon Plasma (QGP) is a phase of nuclear matter that occurs at temperatures of ~1012 Kelvin. In this phase, the degrees of freedom are not colorless hadrons but deconfined quarks and gluons. In nature, the QGP existed in the early universe a few microseconds after the Big Bang, when the temperature of the universe was above the deconfinement temperature. Tiny droplets of the QGP can be created in modern particle accelerators, such as the Large Hadron Collider, by colliding large (heavy) nuclei at relativistic energies. The QGP fireball produced in such "heavy-ion" collisions expands explosively and finally cools down and hadronizes. Analysis of data from heavy-ion collisions indicates that the QGP behaves as a near perfect fluid, for which the ratio of the shear-viscosity to entropy density is close to $\hbar/4k_B$: the conjectured lower bound of viscosity. In this talk, I will discuss how our understanding of the dynamics of the QGP produced in heavy-ion collisions has evolved in the last decade; what questions have been answered and what puzzles still remain. I will also discuss recent measurements that show signatures of QGP formation in smaller colliding systems – namely proton-nucleus and proton-proton collisions – where the QGP production was not expected.

Soumya Mohapatra *got his undergraduate degree in Engineering Physics from the Indian Institute of Technology at Bombay, followed by MS and PhD degrees in physics from Stony Brook University. During his PhD Soumya worked on the ATLAS experiment at the Large Hadron Collider. His research involved analyzing data from heavy-ion collisions to study the properties of the Quark-Gluon Plasma (QGP) produced in such collisions. After obtaining his PhD he joined Nevis Laboratories at Columbia University in 2013 as a Post-Doctoral research scientist. He is currently an Associate Research Scientist at Nevis Laboratories. His recent focus has been study of smaller collision systems – proton-proton and proton-lead – to determine if QGP formation occurs in such smaller systems.*

Physics Faculty and Search Committee Candidate

Thursday, February 7th in LL 316 at 4:10

Refreshments available at 3:45