

Novel Probes of the Primordial Hot Quark Soup

Prof. Krishna Rajagopal

Department of Theoretical Physics, CERN, Schweiz

Heavy ion collisions reproduce droplets of the trillions-of-degrees-hot liquid that filled the microseconds-old universe, conventionally called quark-gluon plasma (QGP) but better thought of as hot quark soup. Over the past twenty years, data obtained via recreating this primordial liquid have shown that it is the most liquid liquid in the universe, making it the first complex matter to form as well as the source of all protons and neutrons. This colloquium will begin from Rutherford's discovery of the nucleus and the discovery of quarks and the laws that govern them, to give any Heidelberg undergraduate physics student the context needed to appreciate what we have learned about the formation and properties of primordial hot quark soup from heavy ion collisions. I will then focus on the road ahead, in particular on new probes being developed to answer questions like: How does a strongly coupled liquid emerge, given that what you will see if you can probe QGP with high resolution is weakly coupled quarks and gluons? How can we use jets to see the inner workings of QGP and answer this question? And how does the droplet of QGP ripple after it has been probed by a passing jet?