

Abstract: Reinventing the Quark-Gluon Plasma - Living Through a Paradigm Shift

The term “paradigm shift” was invented by the scientific historian Thomas Kuhn to describe a fundamental change in the concepts of a field of science. Such a shift occurred, in miniature, in the search for the quark-gluon plasma. A millionth of a second after the Big Bang, the entire universe was a quark-gluon plasma, a state of matter too hot for ordinary protons and neutrons to exist. In 2005, scientists working at Brookhaven National Laboratory succeeded in creating tiny flecks of quark-gluon plasma by colliding the nuclei of gold atoms at very high energies. .They discovered that this matter, contrary to expectations, exhibited all the properties of a liquid. That is, the hottest, densest matter ever studied in the laboratory flowed with less internal friction than any other fluid. These observations led to the announcement of “the perfect liquid” and its surprising connection to black holes and string theory. My talk will describe that discovery and subsequent developments.