

410th Brookhaven Lecture, 12/21

'Hotter, Denser, Faster, Smaller . . . and Nearly Perfect: What's the Matter at RHIC?'

The collisions of two beams of heavy-ion particles — atoms stripped of their electrons — speeding around BNL's immense Relativistic Heavy Ion Collider (RHIC) have long been expected to create a "quark-gluon plasma" in which the quarks and gluons that make up the protons and neutrons in the ions would move freely in a plasma-like system. But the final particles, detectable in the four experiments placed around the RHIC ring, tend to hide information about the earlier, hotter stage. So it is a challenge to elucidate the nature of the primordial system.

What surprised scientists, however, was how strongly the quarks and gluons seemed to interact during the collision. This strong interaction makes the system produced at RHIC behave almost like a perfect fluid, one in which the hot matter formed shows a high degree of collectivity among the particles, rather than a gas, in which individual molecules move about randomly.

Evidence from the four RHIC detectors has shown that the system formed at RHIC is potentially the most perfect fluid found in nature, at least since a few microseconds after the Big Bang, a state which RHIC was built to re-create. This result is all the more amazing since the system is so small, the collisions forming over distances 100 times smaller than a proton, and forms so quickly, in times on the order of a millionth of a billionth of a billionth of a second (10^{-24} seconds). It was even interest-



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ing enough to the wider physics community to warrant first place in the American Institute of Physics' year-end review of top physics stories.

To find out more about the basic physics of the quark-gluon plasma and RHIC, with a focus on several intriguing results from RHIC's recently ended PHOBOS experiment, join Peter Steinberg, a physicist in the Chemistry Department, as he gives the 410th Brookhaven Lecture, titled "Hotter, Denser, Faster, Smaller . . . and Nearly Perfect: What's the Matter at RHIC?" Steinberg, the project manager of the recently decommissioned PHOBOS experiment, will give the lecture on Wednesday, December 21, 2005 at 4 p.m., in Berkner Hall.

Steinberg joined BNL in 1999. He received his undergraduate degree in political science from Yale University in 1992, and his Ph.D. in physics from the Massachusetts Institute of Technology in 1998, and was also a postdoc at Columbia University. Since January, he has been participating in the "Quantum Diaries" project, followed by many at the Lab and beyond, as part of BNL's participation in the World Year of Physics.

All are welcome to attend this free lecture, which is open to the public. Visitors of age 16 and over must carry a photo ID. Refreshments are served before and after the talk, and anyone wishing to join the lecturer at an off-site restaurant for dinner afterwards may contact Fulvia Pilat, Ext. 3134, pilat@bnl.gov.