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Properties of strongly interacting matter from first principles

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Quantum Chromodynamics (QCD) is the fundamental theory describing the interactions between the ultimate building blocks of matter, namely quarks and gluons. At temperatures as high as trillions of degrees Kelvin and zero net baryon density, first principle Lattice QCD calculations have shown that a smooth crossover transition occurs between hadronic matter and a new state of matter called the quark-gluon plasma. A remaining question in QCD is whether criticality may appear at large baryon densities. In this talk I will review the status of lattice QCD simulations of strongly interacting matter at zero and finite density. I will also discuss ways to push our investigations to larger baryon densities, to support the forthcoming experimental program at Brookhaven National Laboratory.