Recent highlights from the STAR Experiment

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Understanding the QCD phase structure and the possible existence of a critical point remains one of the central goals of the heavy-ion program at RHIC. In this talk, we will present recent STAR results across multiple observables that probe different aspects of the hot and dense matter created in Au+Au collisions. These include two-particle transverse momentum correlations and event-by-event fluctuations of $< p_T >$, net-proton cumulants up to fourth order, identical pion femtoscopy, and baryon-strangeness correlations. We will also discuss femtoscopic measurements of baryon-baryon pairs which offer insight into hyperon-nucleon and hyperon-hyperon interactions and the possible formation of strange dibaryon states. Together, these results provide complementary probes of the system's evolution across a wide energy range ($\sqrt{s_{NN}}$ = 3–200 GeV), offering new constraints on the QCD equation of state and the location of the critical point.