Heavy-quark bound states (charm- and bottom-onium) constitute valuable probes of the highly excited matter as created in high-energy collisions of heavy nuclei. A suppressed production of J/Ψ’s (relative to expectations from p-p collisions) has been suggested as a signature of the creation of a (deconfined) Quark-Gluon Plasma (QGP). However, it has been realized recently that QGP formation also facilitates the regeneration of charmonium states through recombination of charm and anticharm quarks, provided the latter are produced abundantly.

To study the evolution of charmonium states in the (putative) equilibrium phases of ultrarelativistic heavy-ion reactions we have employed a kinetic theory framework [1] incorporating in-medium properties of open- and hidden-charm states in line with recent QCD lattice calculations. Whereas at SPS energies J/Ψ suppression is the prevalent effect, at collider energies (RHIC and LHC) secondary production through c-cbar coalescence becomes the dominant production mechanism. The time evolution of the J/Ψ number as a function of proper time (Fig. 1) in central Au-Au at RHIC indicates that regeneration mostly occurs in the QGP, rendered possible due to the survival of the J/Ψ resonance up to about twice the critical temperature (as found in lattice QCD). The yield appears to chemically equilibrate at Tc. The pertinent centrality dependence (Fig. 2) reiterates the dominance of the regenerated J/Ψ’s in central collisions, with appreciable uncertainty due to in-medium charm-quark masses. Future evaluation of bottomonium production, presumably suppressed at RHIC energies, will provide a valuable test of the proposed approach.