where the issue of hadronization arises. Since the strength of our statistical real-time description lies in resolving the details of the space-time structure, situations where parton cascades undergo interactions with an environment would be the interesting to investigate. Let us give three examples:

a) In *deep-inelastic lepton-nucleus scattering* the primary quark struck by the photon can travel and reinteract before hadronizing, and produce a cascade of secondary partons that differs from a parton shower in vacuum. The secondaries are themselves potential candidates for hard re-interactions, and can lead to a specific A (atomic number) dependence for the final-state hadron production. Clearly, here it is essential to keep track of the parton-hadron conversion at each point in time and space, because partons that reinteract will not be able to hadronize before they approach the free-streaming regime.

b) In *high-energy nucleus-nucleus collisions* [51] ($\sqrt{s}/A \gtrsim 200$ GeV) the parton density of the highly Lorentz-contracted nuclei is very large already in the initial state, and is further increased by the materialization and multiplication of partons [24]. Therefore multiple scatterings of partons can easily lead to a large number of simultanously-evolving cascades that also can interact with each other. In order to resolve such an intertwined structure of parton interactions, the space-time dynamics of the system *must* be taken into account. Again, here a microscopic space-time description of parton-hadron conversion is crucial to resolve the details of such an intertwined structure of parton interactions and the following hadron formation process, depending on the local densities of surrounding parton and hadron matter.

c) The *QCD phase transition* from a hot, deconfined quark-gluon plasma to excited hadron matter as occurred in the early Universe [37] is of long-standing theoretical interest. Lattice QCD calculations to date can only investigate the critical behaviour in the vicinity of the transition temperature. Moreover, a dynamical evolution of the system deviating significantly from thermal equilibrium is not achievable. In view of the future experimental programs at RHIC and LHC, it will soon become possible to recreate the QCD phase transition in the laboratory [52], and to investigate its dynamics in the real world. It is clear that the conversion of a quark-gluon plasma into hadrons is a much more complicated process than the hadronization of final-state partons in free space (as in e^+e^- annihilation), or dilute systems (as in hadron-hadron collisions). In heavy-ion collisions the transition is