of the QCD phase transition in the early Universe when hadrons formed from unconfined quark-gluon matter, or in high-energy heavy-ion collisions, where one expects a very hot and dense deconfined quark-gluon plasma to be created. Here it is inevitable to employ a dynamical treatment of the transition from short-distance (perturbative) regime of partons to the long-distance (non-perturbative) domain of hadrons. We extend here previous work [8] and present a universal approach to the dynamic transition *between* partons and hadrons based on an effective QCD field theory description and relativistic kinetic theory.

Our concept is the following: we start from a gauge-invariant Lagrangian formulation that embodies both fundamental partonic and composite hadronic degrees of freedom. It is explicitly dependent on the space-time scale $L = \sqrt{r^2}$ at which the physics is "probed". The scale dependence is however not external, but the variation of the scale is governed by the dynamical evolution of the physical system under consideration. The field equations of motion can be cast into evolution equations for the real-time Green functions of the various particle species, and by following the space-time evolution we can trace the conversion from partonic to hadronic degrees of freedom in full 7-dimensional phase space, as it is driven by the dynamics. This effective field theory approach recovers QCD with its scale and chiral symmetry properties at short distances or high momentum transfers, but yields at low energies the formation of symmetry breaking gluon and quark condensates including excitations that represent the physical hadrons.

It is important to explain in more detail the physical basis of our approach: we assume that the vacuum state in QCD can be visualized as a "color dielectric medium" [9] chracterized by some collective color-singlet fields that correspond in the long-wavelength limit to the gluon and quark condensates, and incorporate phenomenologically the complex structure of the physical vacuum as order parameters. Specifically, the underlying hypothysis [10, 11] is that the *long-distance* (non-perturbative) gluon self-interactions generate an effective *scalar gluon condensate field* χ which is self-interacting through some potential V constructed [14] on the basis of the symmetry properties of the QCD Lagrangian. As a consequence of symmetry constraints, the scalar field χ must in addition couple through the potential V to an effective *pseudoscalar quark condensate field* U, a feature which is also suggested by lattice QCD studies [6], indicating that the confining and chiral symmetry breaking "phase transitions" are in some way related and occur approximately at the