

Patterns and partners for chiral symmetry restoration

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The nature of chiral symmetry restoration and the identification of its correct pattern in terms of $O(4)$ and $U(1)_A$ restoration are central problems for our present understanding of the QCD phase diagram, which are not fully settled in lattice simulations. We will present a theoretical analysis based on Ward Identities which sheds light on this issue and where partner degeneration is systematically studied and connected with physical processes for the full scalar/pseudoscalar $U(3)$ meson nonets. Model-independent results are derived, which in addition allow to understand the temperature dependence of lattice screening masses through particular quark condensate combinations. Their realization in $U(3)$ Chiral perturbation Theory for the hadron sector will also be described. Special attention will be paid to the role of the thermal $f_0(500)$ state to describe lattice data for the scalar susceptibility through thermal corrections to its pole parameters generated from unitarized pion scattering.

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