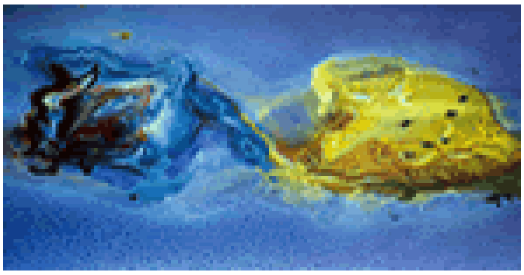

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On the order of the thermal transition in QCD as function of the number of quark flavours and their masses

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The extraction of the order of the thermal transition of QCD at zero chemical potential, with two dynamical flavours of massless quarks, has proven to be a formidably difficult task. A first order region is found in the chiral limit only on coarse lattices and employing unimproved fermion discretisations, but whether it survives in the continuum limit is yet far from being known.
This situation motivates attempts to better constrain the first-order region by studying its extension in additional parameter directions, which might allow for controlled extrapolations to the chiral limit.
The idea is based on the fact that a first-order transition in the chiral limit on a finite system represents a 3-state coexistence. Hence, if a continuous parameter is varied such as to weaken the transition, like increasing the strange quark mass or considering nonzero imaginary chemical potential, the 3-state coexistence may terminate in a tricritical point, which governs, by known critical exponents, the functional behavior of the second-order boundary lines emanating from it. Thus, if such a boundary line can be followed into the tricritical scaling regime, an extrapolation becomes possible.
We investigated to which extent one can exploit the dependence of the chiral transition on the number of light degenerate flavours N_f, re-interpreted as continuous parameter in the path integral formulation, as a means to perform controlled chiral extrapolations in the (m, N_f)-plane.

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