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Novel phase in SU(3) lattice gauge theories with many light fermions DAVID SCHAICH, ANQI CHENG, ANNA HASENFRATZ, GREGORY PETROPOULOS, University of Colorado — Our ongoing lattice studies of SU(3) gauge theories with $N_f = 8$ and 12 fundamental fermions recently resulted in the observation of unexpected phase structures. For small fermion masses, both systems possess two distinct transitions at finite temperature. The $N_f = 12$ finite-temperature transitions converge to two well-separated bulk phase transitions at zero temperature, consistent with an IR-conformal phase at weak coupling. Preliminary studies suggest that similar convergence to bulk transitions occurs for $N_f = 8$. For both systems, the novel phase between the two transitions is confining but has a very small, possibly vanishing, chiral condensate. The meson spectrum also shows unusual properties in this phase. Our results appear consistent with a scenario in which this phase is chirally broken by a higher-order (four-fermion) condensate.

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