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Hyperons, Delta Baryons, and Deconfined Quarks in Neutron Star Cores[1] WILLIAM SPINELLA, Computational Science Research Center Department of Physics, San Diego State University, FRIDOLIN WEBER, Department of Physics, San Diego State University Center for Astrophysics and Space Sciences, University of California, San Diego — Many solutions to the so-called "hyperon puzzle" rely on determinations of the meson-hyperon coupling constants that stiffen the neutron star equation of state, pushing the appearance of hyperons to higher densities. In our work we investigate the effect a similarly enhanced set of meson-hyperon couplings has on the appearance of hyperons, delta baryons, and deconfined quarks in the neutron star core. To this end we model hadronic matter using the relativistic mean field approach with density dependent meson-baryon coupling constants, and deconfined quark matter with a three-flavor nonlocal variant of the Nambu-Jona-Lasinio model. The scalar meson-hyperon coupling constants are fit to hypernuclear potentials at saturation density, while the vector meson-hyperon coupling constants are extracted from a recent theoretical study. Our results indicate that delta baryons could be highly favored over hyperons and appear at very low densities, and that hyperons, deltas, and deconfined quarks could all potentially coexist in the cores of ~ 2 solar mass neutron stars.

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