György Wolf: What neutron stars say about the properties of strong interaction

The existence of neutron stars provide us with a challenge and a possibility to study strong interaction, too. At the center of neutron stars the densities can reach 6-8 times the normal nuclear densities, and these densities cannot be studied in terrestrial experiments. Therefore, it provides us with constraints for the properties of the cold, dense strongly interacting matter. The existence of quark matter inside the heaviest neutron stars has been the topic of numerous recent studies, many of them suggesting that a phase transition to strongly interacting conformal matter inside neutron stars is feasible. Here we examine this hybrid star scenario using a soft and a stiff hadronic model, a constituent quark model with three quark flavours, and applying a smooth crossover transition between the two. Within a Bayesian framework, we study the effect of up-to-date constraints from neutron star observations on the equation-of-state parameters and various neutron star observables. Our results show that a pure quark core is only possible if the maximum mass of neutron stars is below › 2.35 M№ However, we also find, consistently with other studies, that a peak in the speed of sound, exceeding 1/3, is highly favoured by astrophysical measurements, which might indicate the percolation of hadrons at › 3 − 4n0.