Equation of state of dense matter and consequences for neutron stars

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There is currently tremendous interest in the role of hyperons and other exotic forms of matter in neutron stars. This is particularly so following the measurement by Demorest et al. [1] of a star with a mass almost 2 solar masses. Given that we know of no physical mechanism to stop the occurrence of hyperons at matter in beta–equilibrium above roughly 3 times nuclear matter density, we discuss the constraints on the possible maximum mass when hyperons are included in the equation of state [2]. The discussion includes a careful assessment of the constraints from low energy nuclear properties as well as the properties of hypernuclei. The model within which these calculations are carried out is the quark-meson coupling (QMC) model, which is derived starting at the quark level [3]. It is therefore also natural to extend considerations to the possible effect of unconfined quarks.