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The Role of Strangeness in Nuclear Matter

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No study of the properties of dense matter, especially in connection with neutron stars, can be complete without a deep understanding of how strangeness modifies the equation of state. In finite nuclei we have extensive experience of Lambda hyperons, with JLab and KEK, in particular, currently contributing important new data. In most models, the Lambda hyperons enter the baryon population at roughly twice nuclear matter density but beyond this point there is little consensus. Some models would see Sigma hyperons enter soon, while in others the Cascade would enter first. Whether what comes next is a kaon condensate, quark matter, superconducting quark matter or something else is extremely model dependent. We will review recent progress, starting from the quark level, which offers a unified approach to the in-medium effective interactions between hyperons and nucleons as well as nucleons, at densities up to several times nuclear matter density. This same approach also allows for a consistent theoretical treatment of the transition to quark matter.