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Strangeness in Hadronic and Nuclear Systems

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The strange quark presents many challenges and opportunities in modern nuclear physics. We first review some modern aspects of the spectroscopy of baryons involving a strange quark. In terms of baryon spectroscopy there are far less Σ and Ξ states established experimentally than are expected within quark models. Coupled with this, lattice QCD is currently better suited to studying the spectroscopy of excited hyperons than nucleons because of the heavier mass of the strange quark. This opens the possibility that lattice might actually be able to predict some states before they can be measured. We also review some remarkable recent progress in the understanding of the energies of hypernuclei starting at the quark level. One can very naturally understand the absence of Σ hypernuclei, the very small spin-orbit force in Λ hypernuclei and the binding energies of many Λ hypernuclei as well as predicting the binding energies of Ξ hypernuclei. The relevance of these phenomena to the properties of dense matter will also be discussed.