

Physics of the Nucleon Sea Quark Distributions*

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Abstract

Sea quark distributions in the nucleon have naively been expected to be generated perturbatively by gluon splitting. In this case, there is no reason for the light quark and antiquark sea distributions to be different. No asymmetries in the strange or heavy quark sea distributions are predicted in the improved parton model. However, recent experiments have called these naive expectations into question. A violation of the Gottfried sum rule has been measured in several experiments, suggesting that $\bar{u} < \bar{d}$ in the proton. Additionally, other measurements, while not definitive, show that there may be an asymmetry in the strange and antistrange quark sea distributions. These effects may require nonperturbative explanations. In this review we first discuss the perturbative aspects of the sea quark distributions. We then describe the experiments that could point to nonperturbative contributions to the nucleon sea. Current phenomenological models that could explain some of these effects are reviewed.

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