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Applications of the Feynman–Hellmann theorem in hadron structure

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By considering an appropriate modification of the action, the Feynman–Hellman (FH) theorem provides an alternative technique for studying hadron matrix elements. We report on new developments in the extension of the FH technique to the study of non-forward matrix elements, where preliminary results demonstrate the feasibility of accessing relatively large momentum transfers. In the near future, these methods offer the potential to address physics topics such as the transition to the perturbative regime in the pion form factor and the possible zero crossing in the proton's electric form factor. We also present updated results on the extraction of the quark spin fractions in a range of hadrons, including contributions from disconnected operator insertions. At the quark masses studied, the results suggest a negative contribution to the total quark spin of the nucleon from disconnected insertions.

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