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From bound nucleons to the free neutron

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The lack of a neutron target has resulted in a decades-long effort to understand the free neutron structure in order to test SU(6) symmetry breaking mechanisms. Approaches to address this open question traditionally extract the free neutron structure from proton + deuterium DIS data (and various other reactions such as jet production or W charge asymmetries).

Here we present a novel approach to extracting the free neutron structure by utilizing all available structure functions of nuclei (from deuterium to lead), while consistently accounting for partonic medium-modifications in atomic nuclei. Using such a wide span of nuclei provides a large lever arm that allows us to precisely constrain the neutron structure function, even at high-x.

We also discuss extracting the free neutron structure from A=3 nuclei, as proposed by the MARATHON collaboration, and the theoretical uncertainties associated with such an extraction. We present a complimentary approach to extracting the free neutron structure from A=3 nuclei with a convolution model.

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