

Nuclear PDF Outline:

Goal: to provide a brief update/summary of the following:

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What is in store for nPDFs in the future.

Where can they go 'beyond' proton PDFs ...

- **Contribute to Proton PDFs:**

- nPDFs: nuclear corrections:
 - νA scattering key for flavor differentiation
 - **BUT, that is just the beginning ...**

- **Nuclear A: new dimension to explore QCD**

- Collective phenomena:
 - SRCs; Jet quenching; Ridge effect;
 - Color Glass Condensate; ...
- Meson PDFs; e.g., π and K PDF
 - *These simpler structures might provide important clues to QCD*

- **Lattice QCD:**

- multi-faceted approach to 'solving' QCD
- New approaches go beyond just moments:
 - e.g., quasi-PDFs; light nuclei, ...

- **Extreme Kinematics**

- Push into 'corners' of kinematic region
 - Large x region ($x > 1$ for nuclei)
 - Low Q: non-perturbative region;
 - Low W: resonance region; duality descriptions?
 - Saturation/Recombination: enhanced by $A^{1/3}$

The ultimate goal: QCD is (*in a sense*) the SM's last 'untamed' component. Using a multi-faceted approach with tools from proton PDFs applied to the nuclear case, bringing in Lattice QCD, and new ideas (ML/AI or other sources), ... there is marked potential for achieving a full characterization of the QCD theory in the near future.

Current status of nPDFs: ... from PDG

