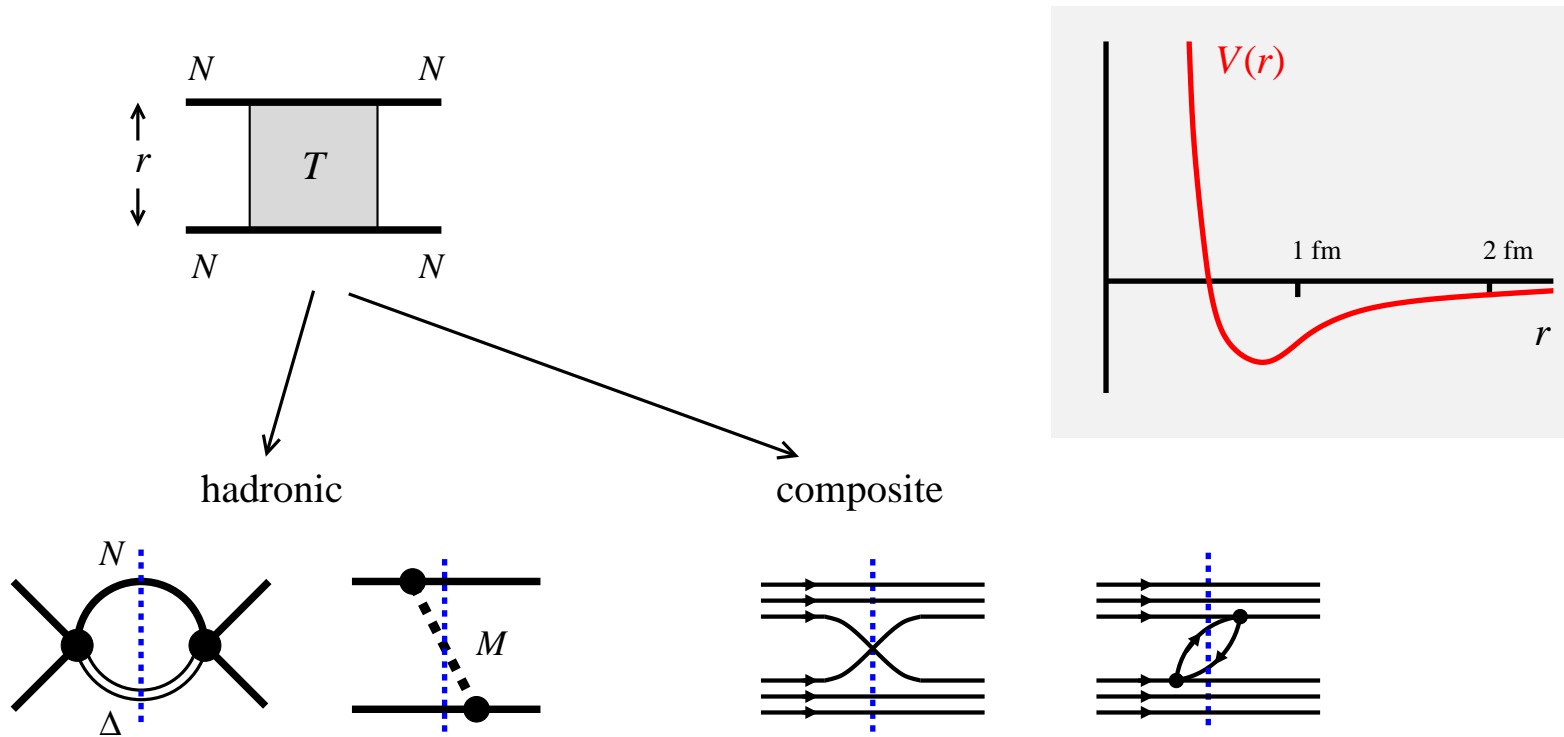


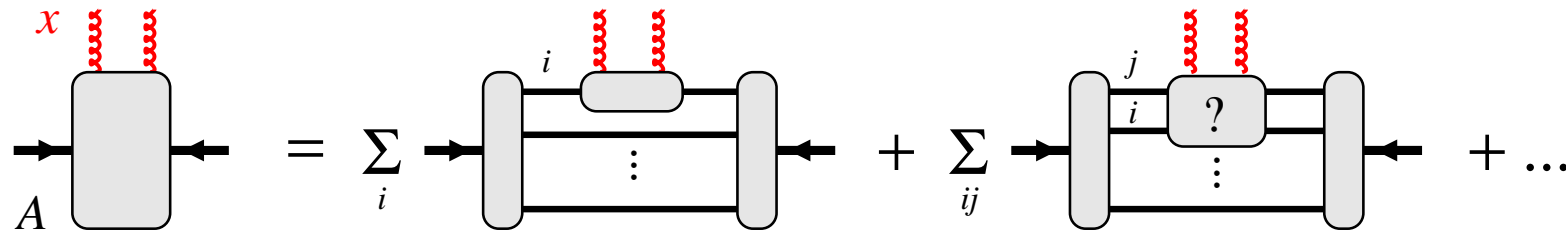
Exploring the short-range structure of NN interactions

- Unifying perspective
- Includes short-range NN correlations, nuclear modification of parton densities (EMC effect, antishadowing, shadowing), . . .
- Connects measurements with LQCD and nuclear EFT
- Next step after exploring single-nucleon structure

NN interactions: Low- and high-energy processes 2

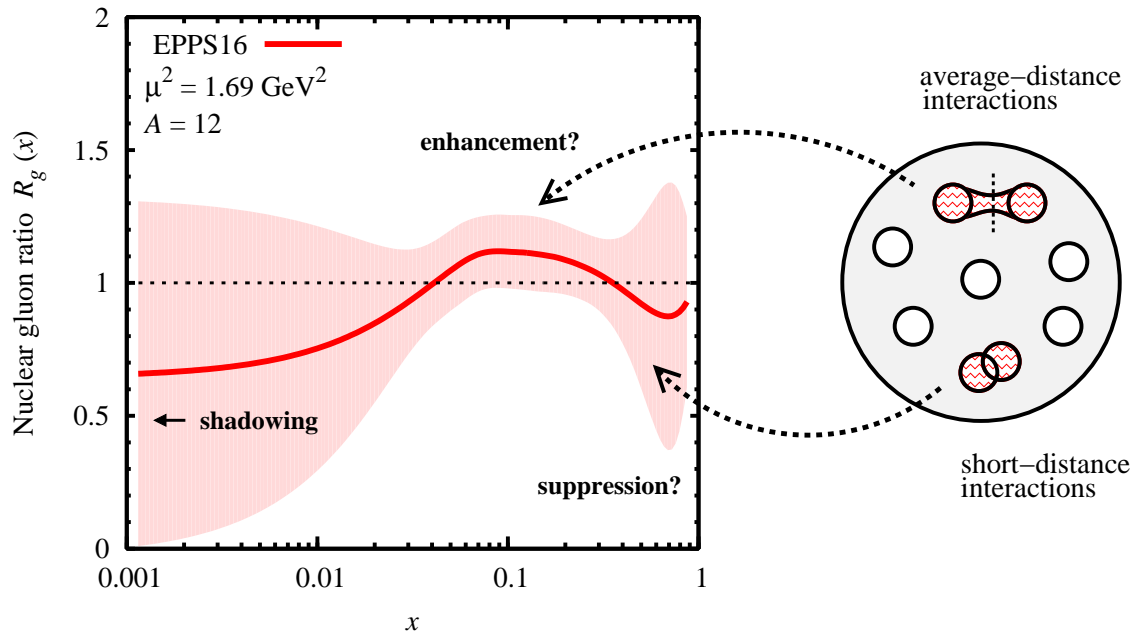


- Interactions involve non-nucleonic degrees of freedom
- Low-energy nuclear structure and reactions ($k \sim k_F$) do not resolve intermediate states: NN potential, EFT contact interactions
- High-energy processes can resolve intermediate states: Type of states “seen” depends on probe. . .



- Hard process, QCD factorization
- Nuclear matrix element $\langle A | \text{Twist-2} | A \rangle$
 - 1-nucleon contribution $\langle N | \text{Twist-2} | N \rangle$ — nucleon PDF, Fermi motion
 - 2-nucleon contribution $\langle NN | \text{Twist-2} | NN \rangle$ — nucleon interactions!Well-defined operator, scale dependence μ^2 , matching with LQCD, nuclear EFT
- Physics questions
 - How do interactions modify quarks/gluons with different x ?
 - What are the relevant distances in the NN interactions?
 - What are the relevant intermediate states? Non-nucleonic DoF!

NN interactions: Nuclear modifications



$$0.3 < x < 0.8$$

Suppression?
EMC effect

Interactions at short distances
cf. short-range NN correlations

JLab 6/12 GeV

$$0.05 < x < 0.2$$

Enhancement?
Antishadowing

Interactions at average distances

$$x \ll 0.1$$

Shadowing

Coherent interactions enabled by diffraction
Suppression effect calculable
Observed in J/ψ photoproduction on nuclei
Suggests large antishadowing

ALICE, CMS