BRIEF RECAP OF CUA WORKSHOP

Jianwei Qiu & Raju Vanugopalan

Location: The Catholic University of America, DC

Time: April 25, 2017

Participants:

P. Bedaque	T. Cohen
A. Deshpande	R. Furnstahl
O. Hen	T. Horn
X. Ji	G. Miller
W. Nazarewick	J. Qiu
G. Sterman	R. Venugopalan
R. Yoshida	

Topics + Discussions

FRIB and EIC will be the two major facilities for nuclear physics in the US

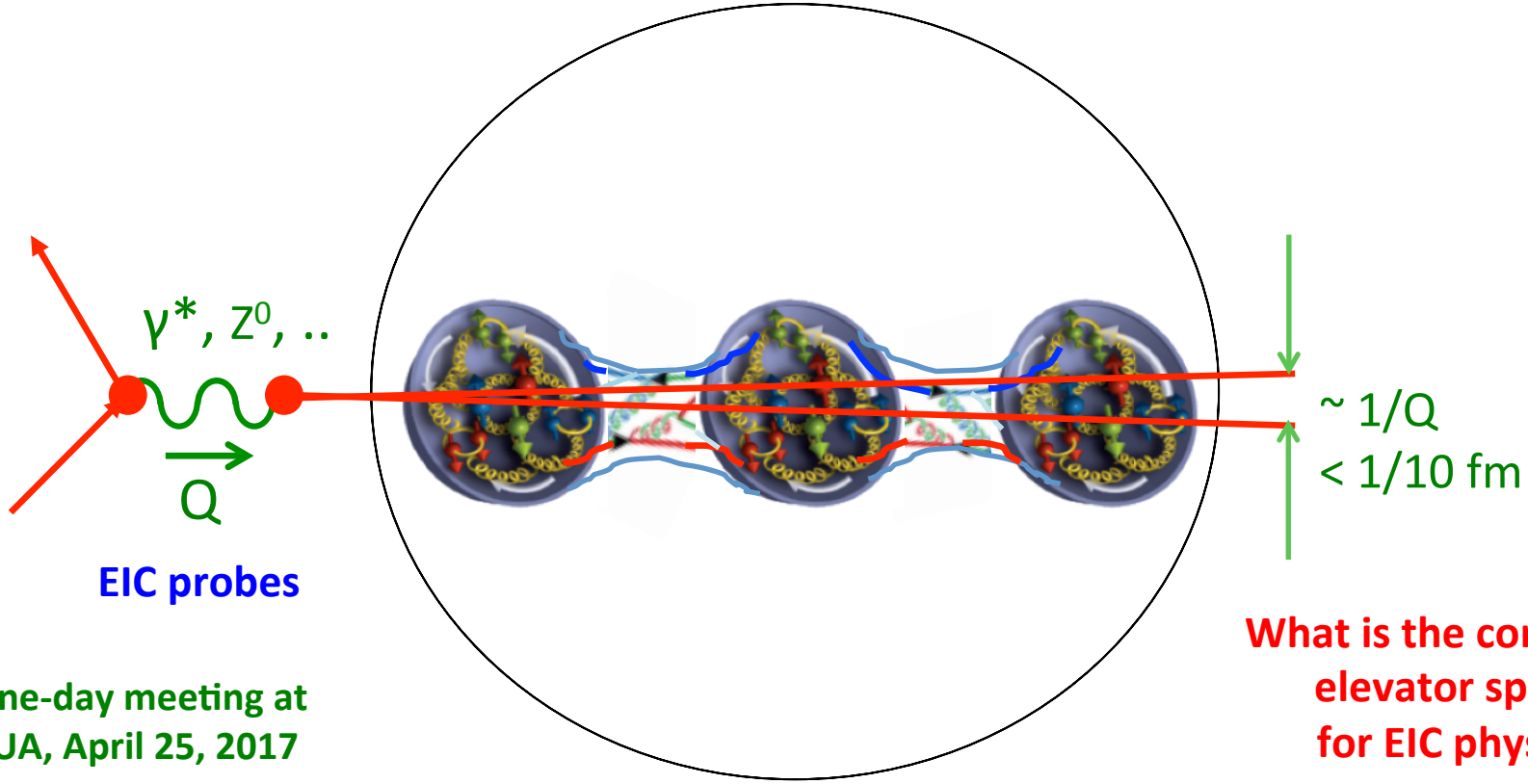
Both will study the nuclei, but, with very different probes

Questions:

Does EIC have any relevance to low energy nuclear structure community?

What EIC community can learn and benefit from the knowledge of nuclear structure?

What does the nucleus look like if we can only see quarks and gluons?



EIC probes

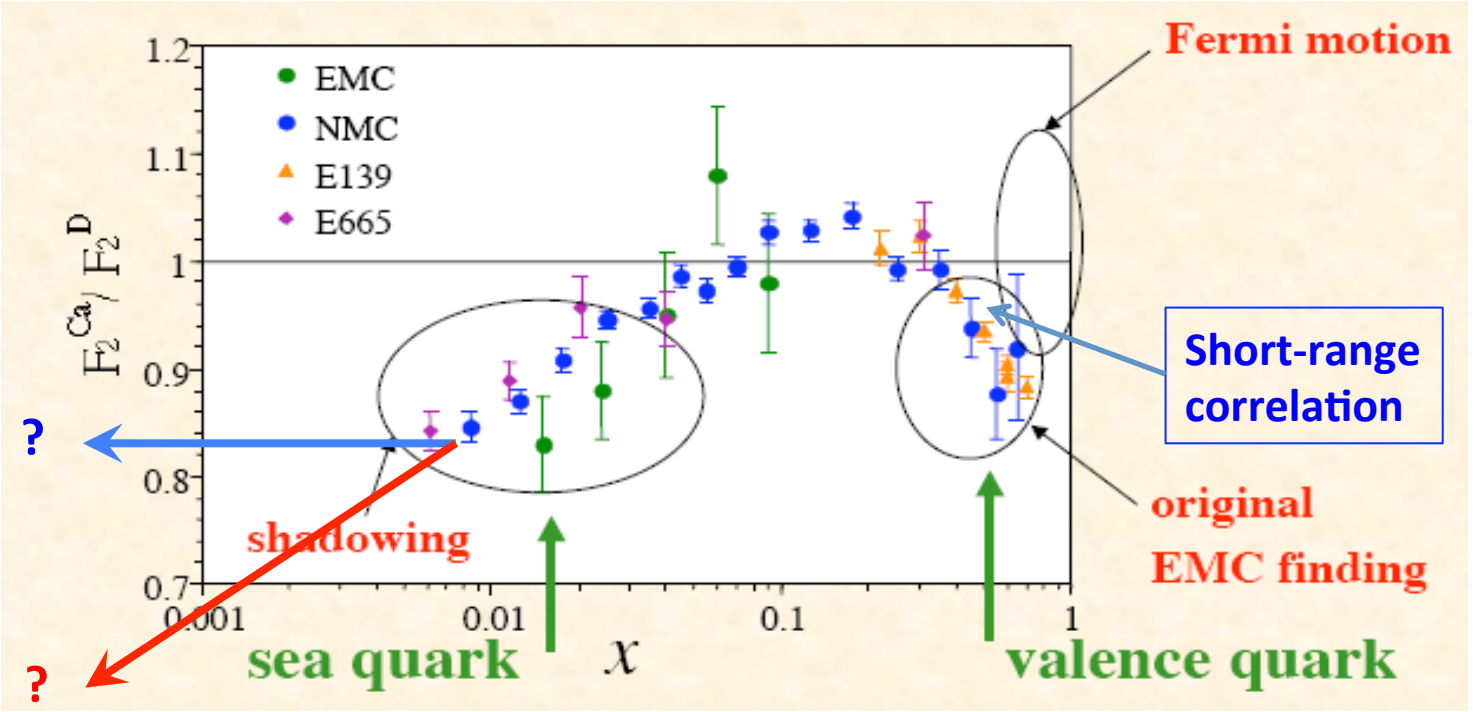
One-day meeting at CUA, April 25, 2017

What is the compelling elevator speech for EIC physics?

Topic: I

Shadowing, CGC, color correlations between nucleons, and …

Simplest measurement: structure function ratio



Questions:

- ✧ **Will the suppression/shadowing continue to fall as x decreases?**
- ✧ **How nuclear structure help determine the ratio of the structure functions?**
- ✧ **How does the range of color correlation affect the radio of the structure functions?**

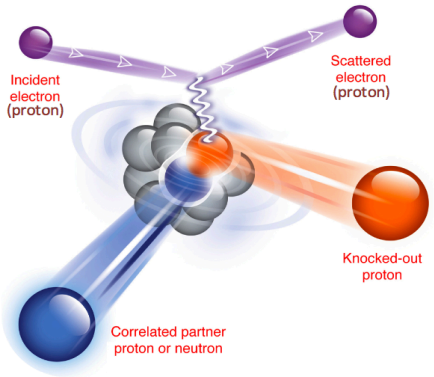
Topic: II

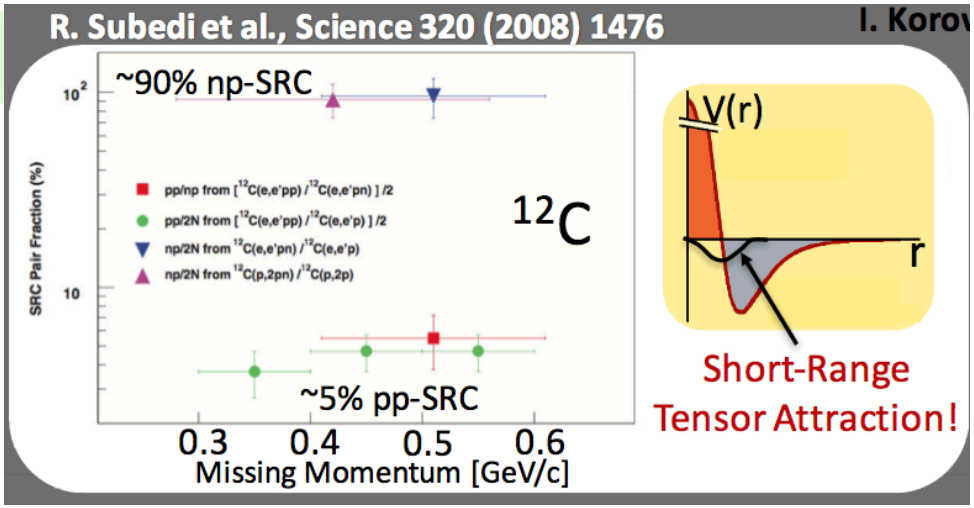
The EMC effect and parton distributions at large x

connections between the Jlab 12 GeV and nuclear structure physics

What can the collider environment of an EIC add?

Breakup the pair =>
Detect both nucleons =>
Reconstruct 'initial' state





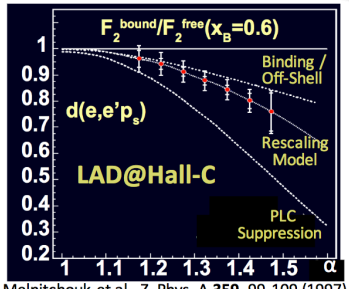
Tagged Structure Functions (JLab12)

Internal structure of SRC nucleons?

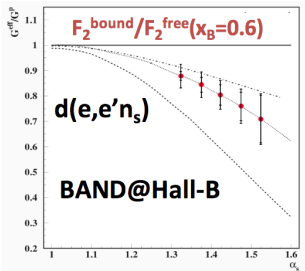
Focus on the deuteron:

(2) Infer its momentum from the recoil partner.

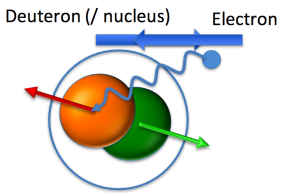
(1) Perform DIS off forward going nucleon.

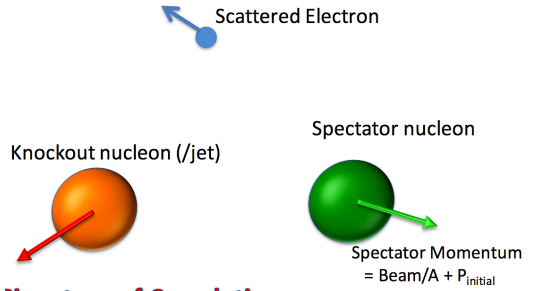


Melnitchouk et al., Z. Phys. A **359**, 99-109 (1997)



Collider Concept…





Signature of Correlations:
Spectator momentum > beam momentum

Nuclear fragmentation region should be much cleaner

Topic: III

Probing short range (spin dependent?) N-N correlations at EIC

Measurements of Transition Generalized Parton Distributions

see for instance arXiv:1512.03111, Miller et al.

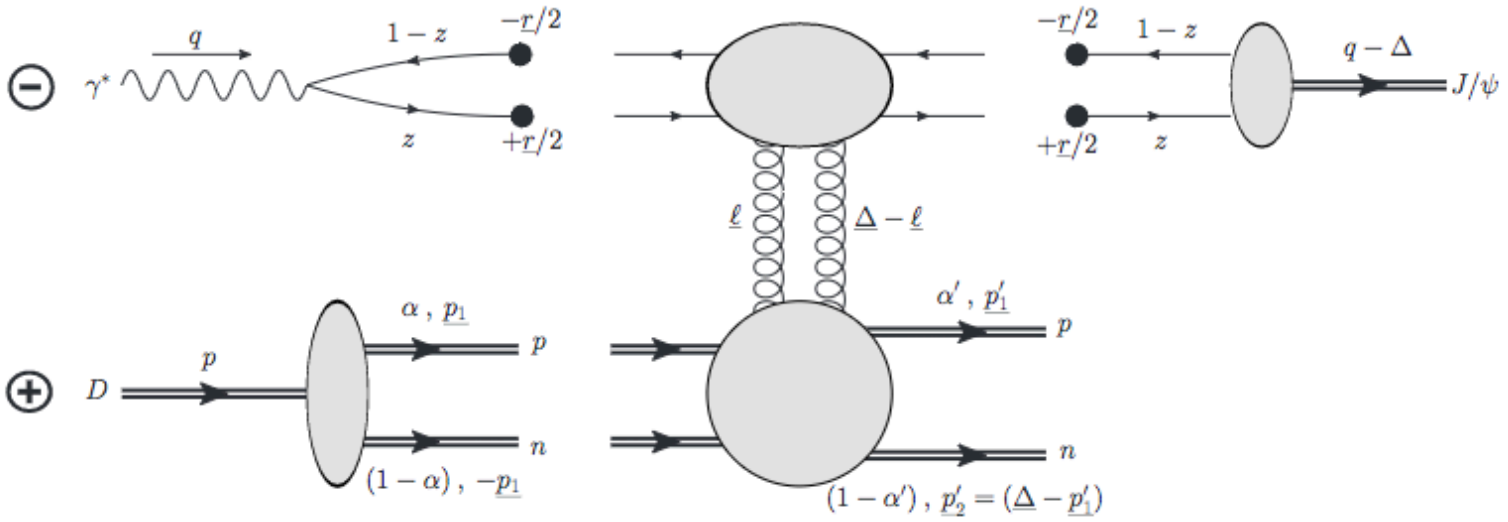


FIG. 2. Illustration of the factorization (34) of the cross-section into the wave functions of the virtual photon, vector meson, and deuteron, times the scattering of the dipole on the NN system.

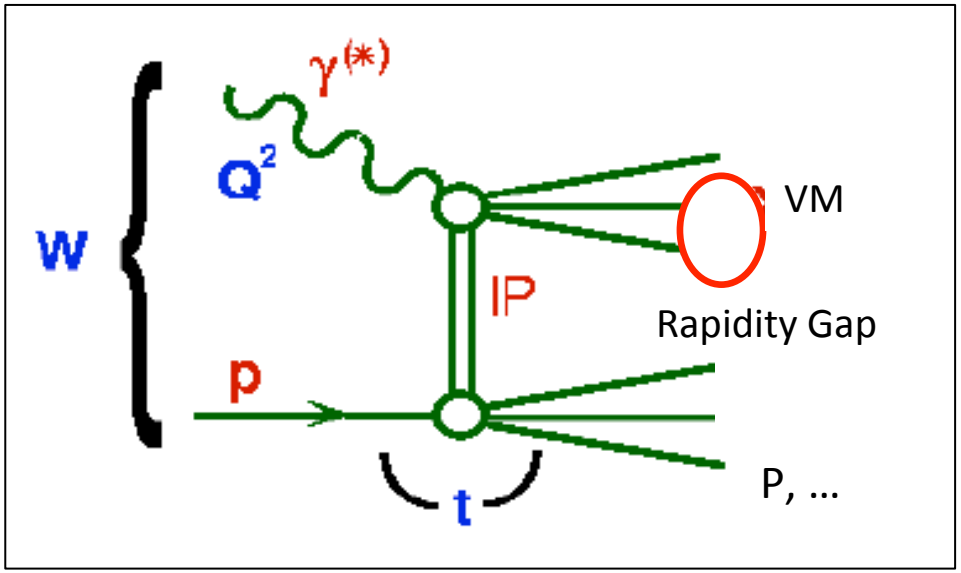
Topic: IV

"Ballistic" transport versus evaporation

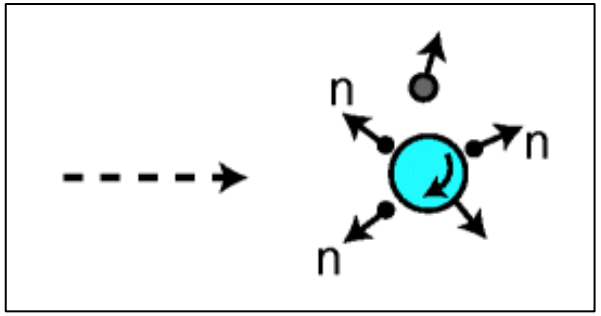
Control over many-body exclusive nuclear final states at an EIC requires a deeper understanding of nuclear reactions (break-up and correlations)

See for example arXiv:1411.0887

"Ballistic transport"



"Evaporation"



Important for e+A event generators (nuclear dynamics through FLUKA)

Sophisticated application of nuclear structure computations can help identify "centrality triggers" for rare QCD processes

In diffractive/exclusive processes, the energy transferred to nuclei can be on the ~ 10 MeV scale even if the electron has an energy of a TeV in the nuclear rest frame…

Topic: V

Significant progress in understanding aspects of nuclear structure on the lattice

Playing an important role in FRIB physics

What are possible inputs into lattice computations from an EIC, and vice versa?

New development on lattice calculations of PDFs, GPDs, …

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Look forward to a productive workshop!