Introduction

Nuclear physics is a broad and diverse field of study spanning many frontiers from the complex structures of the nucleons (protons and neutrons) and their constituents of quarks and gluons to the emergence of collectivity in nuclei. The tools and techniques used to study nuclei vary across an equally expansive horizon from small accelerators to the 12 GeV JLAB upgrade and eventually to the construction of the Electron Ion Collider. Small accelerators allow the study of the strong force from the binding limits of nucleons, the evolution of nuclear shapes, and their role in the cosmos. The 12 GeV JLAB upgrade provides a globally unique possibility to access the detailed dynamics of strongly interacting matter, allowing studies of transverse partonic structure of the nucleons and nuclei, the hadronization process, correlations of partons and hadrons in the nuclear medium, and the spectroscopy of exotic states amongst others with unprecedented precision.

The main goal of the Workshop on “Correlations in partonic and hadronic interactions” was:

(a) Address unresolved issues of the physics of the transverse structure of the nucleon.
(b) Explore new venues of studies of the nuclear medium modification of QCD observables in general, and the influenced from the short-range structure of the nuclei, in particular.
(c) Discuss efforts aiming at explaining the ”proton radius puzzle”, which triggered a worldwide development of new experimental programs, and ongoing searches for new force carriers near the proton mass-scale and in exploration of their possible connection to dark matter.
(d) Support development of outstanding research programs in nuclear science based on cyclotrons for energy range 18-30 MeV.
(e) Exchange of ideas between different physics communities leading to addition of new collaborators and the coordination of efforts on studies of the partonic structure of the matter worldwide, thereby supporting the JLab12 physics program as well as the development of a strong physics case for EIC.

Workshop Organization

The workshop “Correlations in partonic and hadronic interactions” took place in Yerevan, Armenia from September 24-28, 2018 [1].
The scientific organizing committee consisted of:
H. Avakian (JLab)
A. Gasparyan (NCAT U.)
H. Matevosyan (U. of Adelaide)
B. Parsamyan (CERN)
M. Sargsian (FIU)
S. Stepanyan (JLab)

The workshop was attended by 64 participants from European and US universities, and world experts from other countries (Australia, Brazil, China, Japan). The workshop was organized into several topical sessions with 46 presentations. Talks are available at https://www.jlab.org/indico/event/280/other-view?view=standard. The scientific program is attached to this document.

Budget Justification

Funds from the JSA Initiatives Fund Program ($2500) were used to partially support expenses (registration fees for 300 Eu) of six invited speakers and two young scientists (registration fees for 200 Eu)

Invited speakers:
1) BURKARDT, Matthias, New Mexico State University, Las Cruces, USA
2) BRODSKY, Stan, Stanford, USA
3) ANSELMINO, Mauro, Torino University, Italy
4) SCHNELL, Gunar, IKERBASQUE, Basque Foundation for Science, Spain
5) FREDERICO Tobias, Instituto Tecnoligico de Aeronutica, Brazil.
6) KOTZINIAN Aram, CERN, Switzerland

Young scientists:
1) Armen Gyurjinyan, Alikhanian National Lab, Armenia
2) Roza Avetisyan, Alikhanian National Lab, Armenia

The workshop organizers are thankful to Bob McKeown for the Jefferson Lab directorate support of the workshop in the amount of $2500 (and also thankful for some support received from the ANL, UConn and University of Pavia).

Workshop Summary

The main focus of the workshop was on the coordination of efforts of different communities to study the fundamental interactions that are basic to the structure and evolution of matter, the emergent phenomena in subatomic matter organization, and in a wide range of probes accessible at different facilities worldwide.

Main topics included:

- Transverse Structure of nucleon and QCD issues associated with 3D structure.
- Partonic Structure beyond Densities.
• Essential observables, which will direct the future experimental effort.
• QCD in the Nuclear Environment.
• Physics with low energy beams of protons and neutrons.
• New Forces at the GeV-Scale and Dark Matter.

The workshop played an important role in contemplating the exchange of ideas between the various physics communities leading to the addition of new collaborators and the coordination of efforts on studies of the partonic structure of the matter worldwide, thereby supporting the physics programs of the facilities including JLAB, low energy accelerator laboratories, and eventually for EIC. Latest developments in experimental techniques common for high and low energy nuclear physics has been also discussed along with applications of societal impact and benefit including the production of medical isotopes.

Bibliography: