# US Nuclear Physics Long Range Plan (2015)

# - High energy nuclear physics, Ming X. Liu @P-25

- Nuclear matter under extreme condition: Quark Gluon Plasmas (QGP) physics
- Nucleon structure with quarks and gluons and QCD dynamics: novel phenomena in strong interaction
- The origin of visible mass: >99% of the visible Universe

### Hot QCD Matter – "recreate" the Big Bang in the Lab



### Cold QCD Matter – structures & dynamics of QCD



# The sPHENIX Experiment at BNL

A new opportunity to study novel QCD matter and dynamics at the Relativistic Heavy Ion Collider at BNL

### Hot QCD matter – QGP

- The DOE NP flagship heavy ion physics program (LRP2015)
  "understanding the inner workings of QGP"
- Under construction, day-1 physics 2023

#### **Novel Cold QCD matter & dynamics**

- Under active development, with detector upgrade
- Nucleon/Nucleus structures & QCD dynamics

#### Why LANL?

- A long history of leading major NP experiments, including the sPHENIX heavy quark physics program, "LANL flagship experimental capabilities" (LDRD'18)
- Unique experimental and theoretical capabilities, world-leading experts in physics
- Bring in talents & new capabilities to LANL



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ВЕАИТҮ

Los Alamos scientists are building an instrument to probe a key finitier in inicleariaid particle physics: subatomic jets of particles prochiced by the docay of *beauty* quarks; July 2019

istic Heavy Ion Collider at BNI

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