

Connecting Quarks with the Cosmos

High Energy Nuclear Physics/Quark-Gluon Plasma Frontier

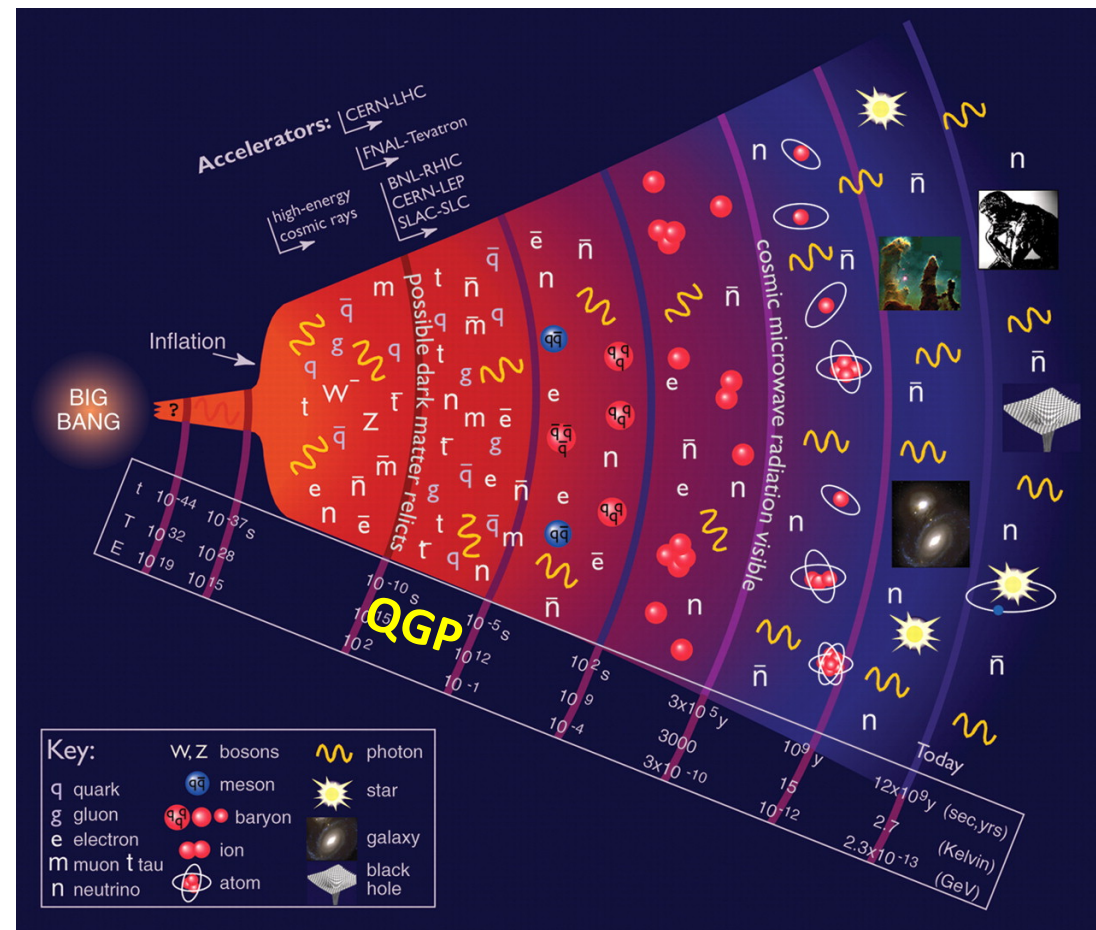
Ming Liu, P-25/Physics

- **Scientific goals:**

- Understanding the building blocks of matter in the Universe
 - Quarks, gluons...
- Connecting quarks with the Cosmos
 - Studying the properties of the matter under extreme conditions in heavy ion collisions
 - **Quark-Gluon Plasma (QGP)**

- **The research provides solid scientific foundation and training for broad fields**

- NP, cosmology and astrophysics
- Nuclear chemistry, medicine ...
- Many applied programs relevant to LANL missions
 - pRad, muRad ... @P-Division



QGP: the earliest state of the Universe that has been recreated in laboratory

Strategic Impact, Why LANL and Why Now?

- Strategic impact
 - Sustaining a culture of excellence
 - LANL's scientific leadership in the US national efforts in NPAC
 - Investing breakthrough science and engineering
 - Discovery science
 - Leading-edge instrumentation and world class facilities for NPAC
 - Attracting, inspiring and developing the best talents for LANL's future
- LANL's leading roles in major national/international nuclear physics programs
 - Discover and study QGP @RHIC
 - PHENIX experiment (1992 - 2016), great success
 - Super-PHENIX upgrade program (2016+), next step
 - Other cutting edge research conducted at major accelerator facilities – RHIC, FNAL, CERN
 - Nucleon/nuclear structure and novel phenomena
 - Dark matter particle search
 - State of the art detector technologies
 - High efficiency/high-speed particle detectors
 - Precision silicon trackers, fast scintillator/SiPM trackers in high magnetic field, GEM...
- DOE NSAC Long Range Plan Priorities (2015)
 - sPHENIX - the next generation US Flagship HENP program
 - Study the inner-working of QGP
 - Electron-Ion Collider: the next US based major NP facility

Critical to continue to support the program and train the next generations for LANL and for the nation