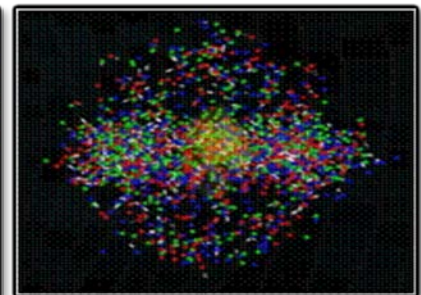
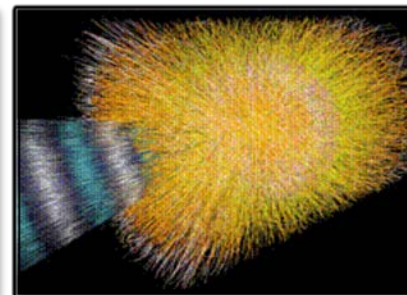
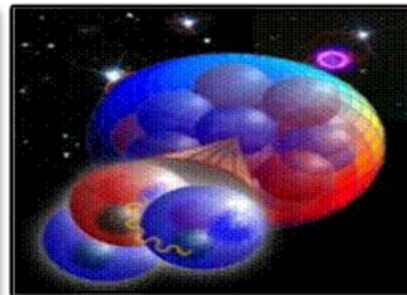
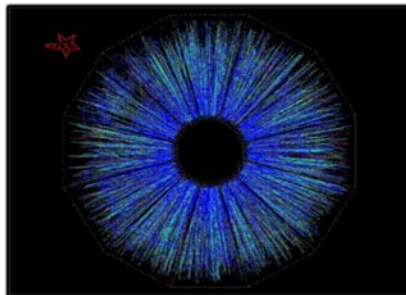




NP Intro. SciDAC-3 PIs Meeting

30 July – 1 Aug. 2014

- I. Some DOE/NP HPC News
- II. Major DOE/NP Experimental Facilities (2 of 3)
- III. NP SciDAC-3 Projects (facilities relevant!)



I. DOE/NP HPC News

a. NAS Decadal Survey of Nuclear Physics (2013)

Recommendation: *A plan should be developed within the theoretical community and enabled by the appropriate sponsors that permits forefront computing resources to be exploited by nuclear science researchers and establishes the infrastructure and collaborations needed to take advantage of exascale capabilities as they become available.* (translation: NP should prepare for exascale)

b. NSAC Long Range Plan (2014 - 2015)

(exercise announced by NSAC 4/24/2014; should be complete by ~ Oct. 2015)

NP HPC community “Town Meeting” 7/14-15/2014

-> Propose a recommendation for the LRP regarding HPC in NP, including

- New investments in SciDAC and related, to support the **expt.** NP program
- Computational NP workforce development
- Deployment of capacity computing to augment Leadership Class comp.

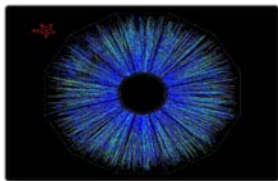
Ramp support through 5 years towards a level of \$ $\times\times$ M / yr.

II. Major DOE/NP Experimental Facilities (2 of 3)

RHIC (BNL) = Heavy Ion NP



The **Relativistic Heavy Ion Collider (RHIC)** is the only dedicated machine in the world colliding heavy ions at near light speed

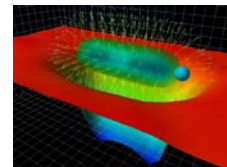


QCD phase diagram;
Quark – Gluon Plasma

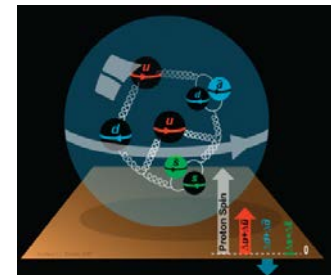
JLAB = Medium Energy NP



The **Continuous Electron Beam Accelerator Facility (CEBAF)** is the world's most powerful probe for studying the nucleus of the atom



Quark Confinement,
Exotic Mesons



Structure of
Hadrons

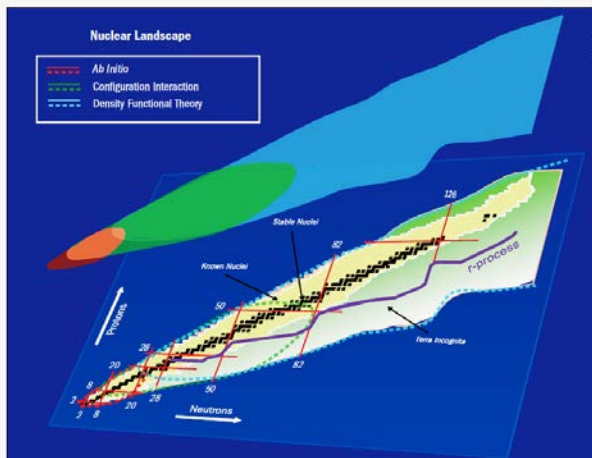
FRIB (MSU) = Low Energy NP, t.b.c.

III. NP SciDAC-3 Projects

(8/2012 – 8/2017)

(NP = lead office)

NP area expt. facility

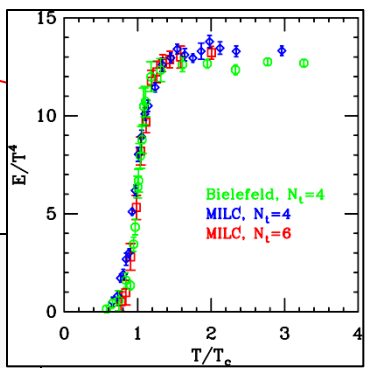
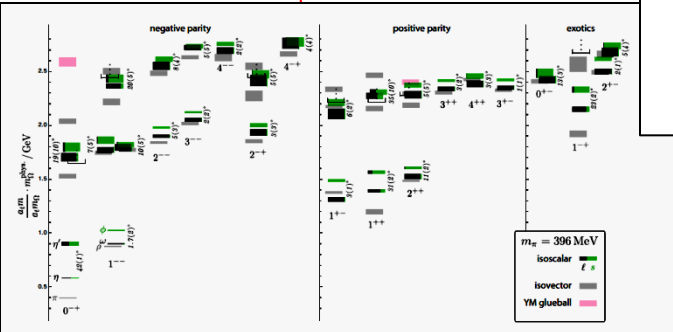


NUCLEI

CalLat

The 3 main areas of NP (4 with FIs added).

LQCD



NUCLEI (UNEDF') – **LENP** **FRIB** (MSU)

PD Joe Carlson (LANL)
co-PD sci. Witek Nazarewicz (MSU)
co-PD comp. Rusty Lusk (ANL)

LQCD (NP) – **HINP**, **MENP** **RHIC & JLAB**

PD Frithjof Karsch (BNL)
co-PD sci. David Richards (JLAB)
co-PD comp. Richard Brower (BU)

CalLat – **LE-ME NP bridge**
FRIB & JLAB

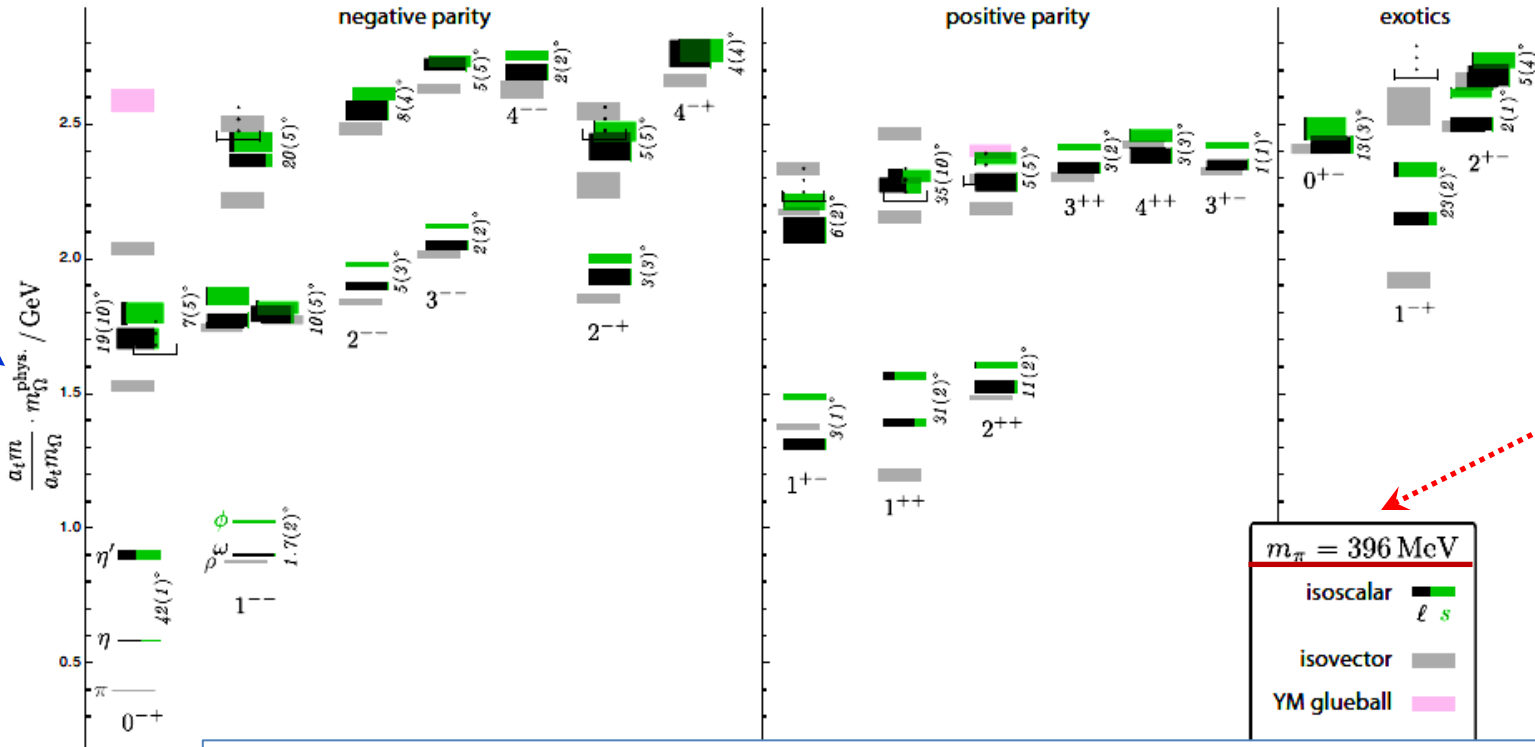
PD Wick Haxton (LBNL/UCB)
co-PD sci. Pavlos Vranas (LLNL)
co-PD comp. Esmond Ng (ANL)

5-year multisite comp. NP projects,
esp. postdoc and g.s. support.
Total 5-year funding ca. \$23M,
fm. NP, ASCR, NNSA.

MENP from LQCD e.g. (JLAB)

What strongly interacting q & $q\bar{q}$ & g mesons (q - $q\bar{q}$, q - $q\bar{q}$ - g , ...) does QCD predict that JLAB experiments will produce after the $\sim \$0.35G$ 12 GeV upgrade?
 {incl. **exotic mesons**} **Lattice QCD results:**

MC: 1) ask the right questions, 2) stomp on it



M, q.nos.; just what we need to know for expts! **Exciting future: phys $m_{u,d}$, strong decays.**

Spectrum of $I=0$ light mesons, including exotics, expected to be seen at JLAB (GlueX, post 12 GeV upgrade).
 J.J.Dudek et al, Phys.Rev. D83 (2011) 111502. **(Now running at $m_\pi = 230 \text{ MeV}$; phys = 135-140 MeV.)**

END