Argonne NATIONAL LABORATORY

... for a brighter future

Advanced Exotic Beam Laboratory (AEBL)

July 2007

U.S. Department of Energy

UChicago Argonne LLC

Office of Science
U.S. DEPARTMENT OF ENERGY

A U.S. Department of Energy laboratory managed by UChicago Argonne, LLC

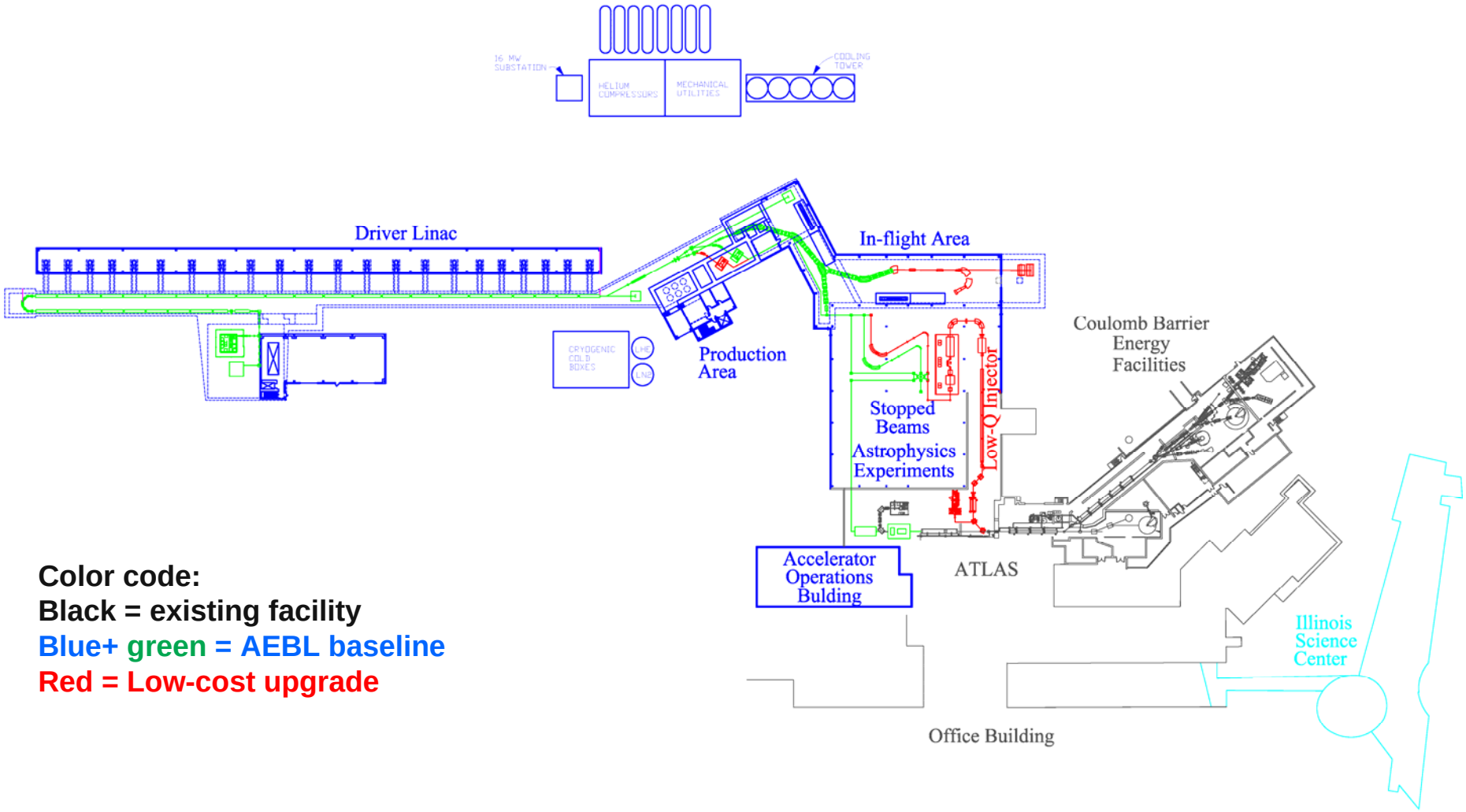
Recommendations for the 2007 NSAC Long Range Plan

- **We recommend completion of the 12 GeV Upgrade at Jefferson Lab. The Upgrade will enable new insights into the structure of the nucleon, the transition between the hadronic and quark/gluon descriptions of nuclei, and the nature of confinement.**
- **We recommend construction of the Facility for Rare Isotope Beams, FRIB, a world-leading facility for the study of nuclear structure, reactions and astrophysics. Experiments with the new isotopes produced at FRIB will lead to a comprehensive description of nuclei, elucidate the origin of the elements in the cosmos, provide an understanding of matter in the crust of neutron stars, and establish the scientific foundation for innovative applications of nuclear science to society.**
- **We recommend a targeted program of experiments to investigate neutrino properties and fundamental symmetries. These experiments aim to discover the nature of the neutrino, yet unseen violations of time-reversal symmetry, and other key ingredients of the new standard model of fundamental interactions. Construction of a Deep Underground Science and Engineering Laboratory is vital to US leadership in core aspects of this initiative.**
- **The experiments at the Relativistic Heavy Ion Collider have discovered a new state of matter at extreme temperature and density—a quark-gluon plasma that exhibits unexpected, almost perfect liquid dynamical behavior. We recommend implementation of the RHIC II luminosity upgrade, together with detector improvements, to determine the properties of this new state of matter.**

Argonne has chosen a path forward for an advanced exotic beam facility that

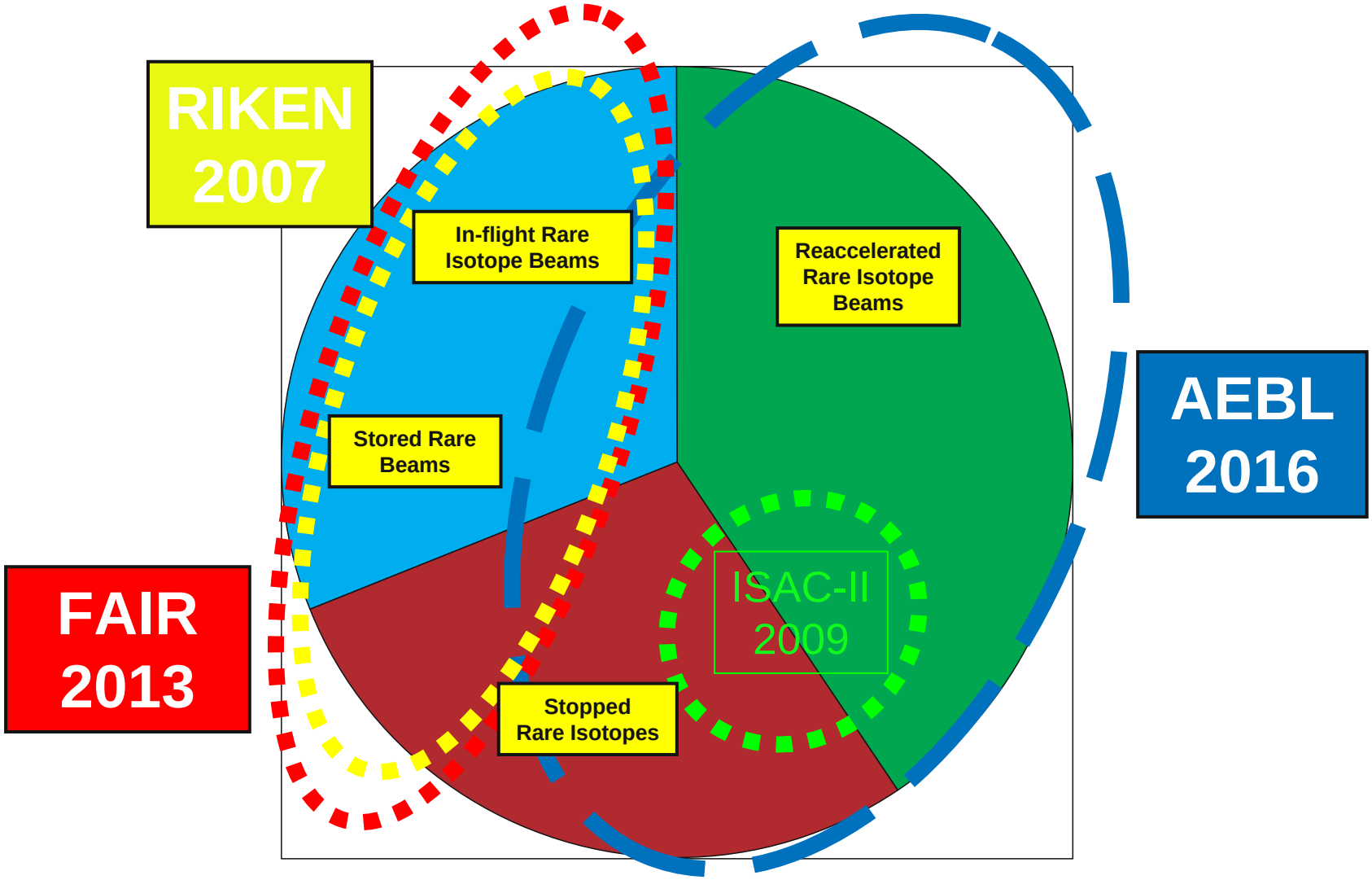
- Complements the major investments in Europe and Japan in fast-beam fragmentation facilities by focusing on unique reaccelerated exotic beams. The facility will provide the full capabilities of stopped, reaccelerated and in-flight beams.
- 200 MeV/u superconducting linac driver will provide higher yields of all isotopes
- With reaccelerated beams based on gas-stopping and ISOL, vastly exceeds the capabilities of all reaccelerated beam facilities.
- Provides the higher reaccelerated beam energies needed to do transfer reactions well (single-particle structure and pairing).
- Can be built for about ½ the cost of RIA (~$550 M) by capitalizing on existing Argonne strengths and facilities.

The Advanced Exotic Beam Laboratory (AEBL) at ANL – 200 MeV/u, 400 kW



Color code:
Black = existing facility
Blue+ green = AEBL baseline
Red = Low-cost upgrade

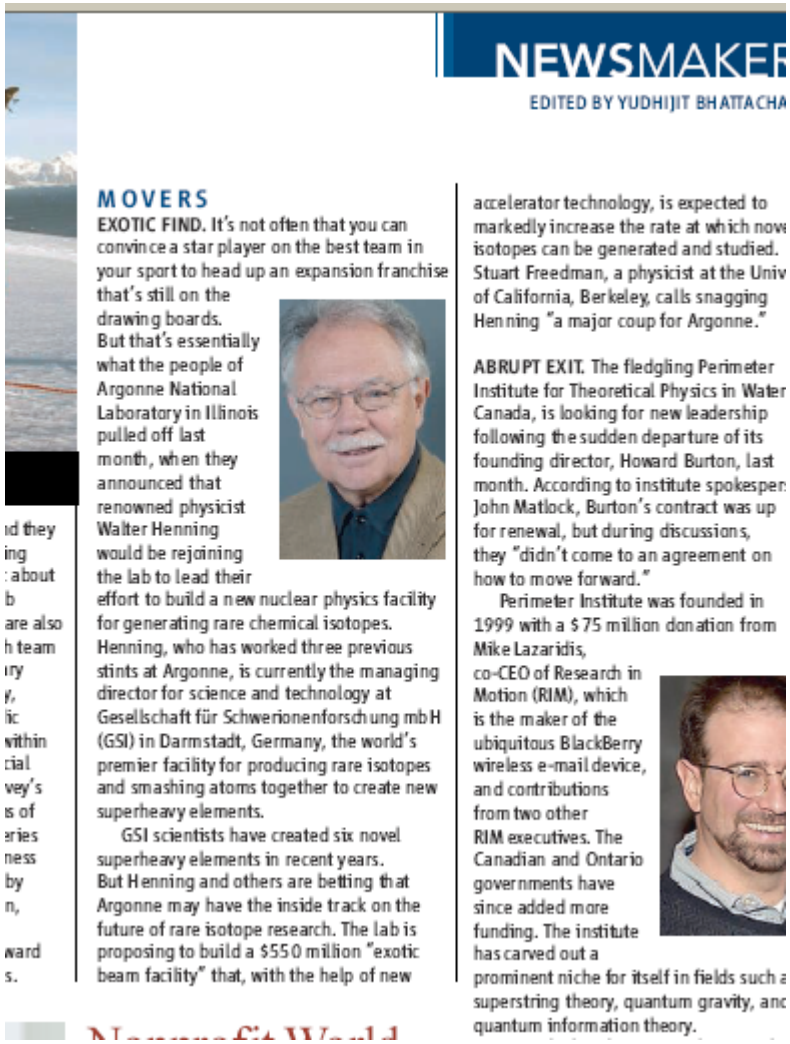
How the suite of international facilities addresses the full program of rare isotope science



News

- Walter Henning is returning to Argonne in August as the Director of our Advanced Exotic Beam Laboratory project.

- The Lab is ramping up public awareness of the project
  - Science
  - Tribune
  - Sun Times
  - Local Papers



NEWSMAKER

EDITED BY YUDHIJIT BHATTACHA

MOVERS

EXOTIC FIND. It's not often that you can convince a star player on the best team in your sport to head up an expansion franchise that's still on the drawing boards. But that's essentially what the people of Argonne National Laboratory in Illinois pulled off last month, when they announced that renowned physicist Walter Henning would be rejoining the lab to lead their effort to build a new nuclear physics facility for generating rare chemical isotopes. Henning, who has worked three previous stints at Argonne, is currently the managing director for science and technology at Gesellschaft für Schwerionenforschung mbH (GSI) in Darmstadt, Germany, the world's premier facility for producing rare isotopes and smashing atoms together to create new superheavy elements.

GSI scientists have created six novel superheavy elements in recent years. But Henning and others are betting that Argonne may have the inside track on the future of rare isotope research. The lab is proposing to build a $550 million "exotic beam facility" that, with the help of new accelerator technology, is expected to markedly increase the rate at which nove isotopes can be generated and studied. Stuart Freedman, a physicist at the Univ of California, Berkeley, calls snagging Henning "a major coup for Argonne."

ABRUPT EXIT. The fledgling Perimeter Institute for Theoretical Physics in Water Canada, is looking for new leadership following the sudden departure of its founding director, Howard Burton, last month. According to institute spokespers John Matlock, Burton's contract was up for renewal, but during discussions, they "didn't come to an agreement on how to move forward."

Perimeter Institute was founded in 1999 with a $75 million donation from Mike Lazaridis, co-CEO of Research in Motion (RIM), which is the maker of the ubiquitous BlackBerry wireless e-mail device, and contributions from two other RIM executives. The Canadian and Ontario governments have since added more funding. The institute has carved out a prominent niche for itself in fields such a superstring theory, quantum gravity, anc quantum information theory.

News

- The DOE Office of Nuclear Physics has announced at the Nuclear Science Advisory Committee meeting last week that the Funding Opportunity Announcement for a Facility for Rare Isotope Beams will be released around January 2008.

- By this time in 2008 a site decision will have been made.

- The AEBL team is working to prepare for the FOA proposal development.