

The RIA Project (Rare Isotope Accelerator)

Elias Métral

<http://www.ornl.gov/ria/>

◆ **RIA will**

- **Be the world's most powerful research accelerator dedicated to producing and exploring new rare isotopes that cannot be found on earth**
- **Educate new generations of scientists**
- **Provide society with numerous opportunities to reap the benefits of discovery**

- ◆ **The key to the scientific discovery potential of the facility is its ability to provide the highest-intensity beams of stable heavy ions for the production of rare isotopes**
- ◆ **This facility would provide beams of very short-lived atomic nuclei (some with life times of less than 10 microseconds) that can be used to do scientific research that had previously been considered impossible on earth. Produced naturally in exploding supernovae and other stellar objects, such short-lived nuclei (rare isotopes) exist for only a brief time before they decay into the stable nuclei of the universe. Produced intensely in powerful accelerator facilities such as RIA, rare isotope beams can be created and used to vastly expand our knowledge of the nuclear landscape and about reactions that govern the astrophysics processes that we see in the universe**

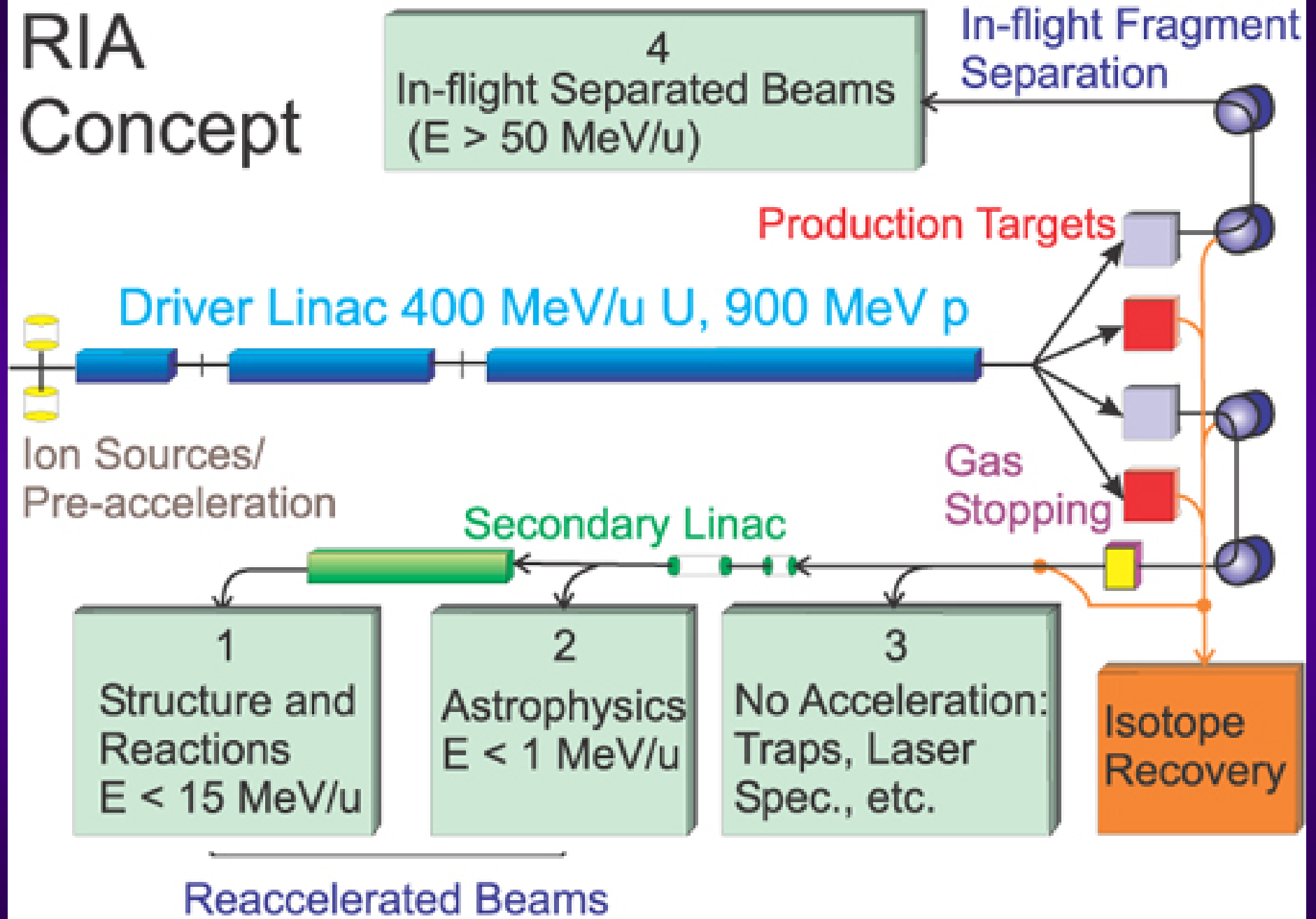
- ◆ RIA's driver accelerator will be a flexible device capable of providing beams from protons to uranium at energies of at least 400 MeV per nucleon, with beam power in excess of 100 kW
- ◆ In comparison to the 2 main competing in-flight facilities, the Radioactive Ion Beam Factory at RIKEN and the GSI upgrade, RIA has 2 advantages
 - RIA's capability for post acceleration (not included in either of the other 2 projects) will allow a wider range of studies and will include the measurement of nuclear reactions at astrophysical energies and the search for new heavy elements with long lifetimes
 - The acceleration scheme of RIA's primary-beam linac is planned to be 20-fold more efficient than either of the other facilities and, hence, able to deliver significantly more primary-beam power

- ◆ In comparison to the main ISOL (Isotope-Separator-On-Line) competition, ISAC and TRIUMPH, RIA has higher primary-beam power and a more flexible combination of ion sources, which will provide higher intensities and a wider variety of rare isotopes
- ◆ RIA is the only operating or planned facility that will employ both the fast (in-flight) fragmentation method and the ISOL method in order to optimize the production of each nuclear species
- ◆ With RIA, the U.S. will maintain a world leadership position in nuclear physics for decades

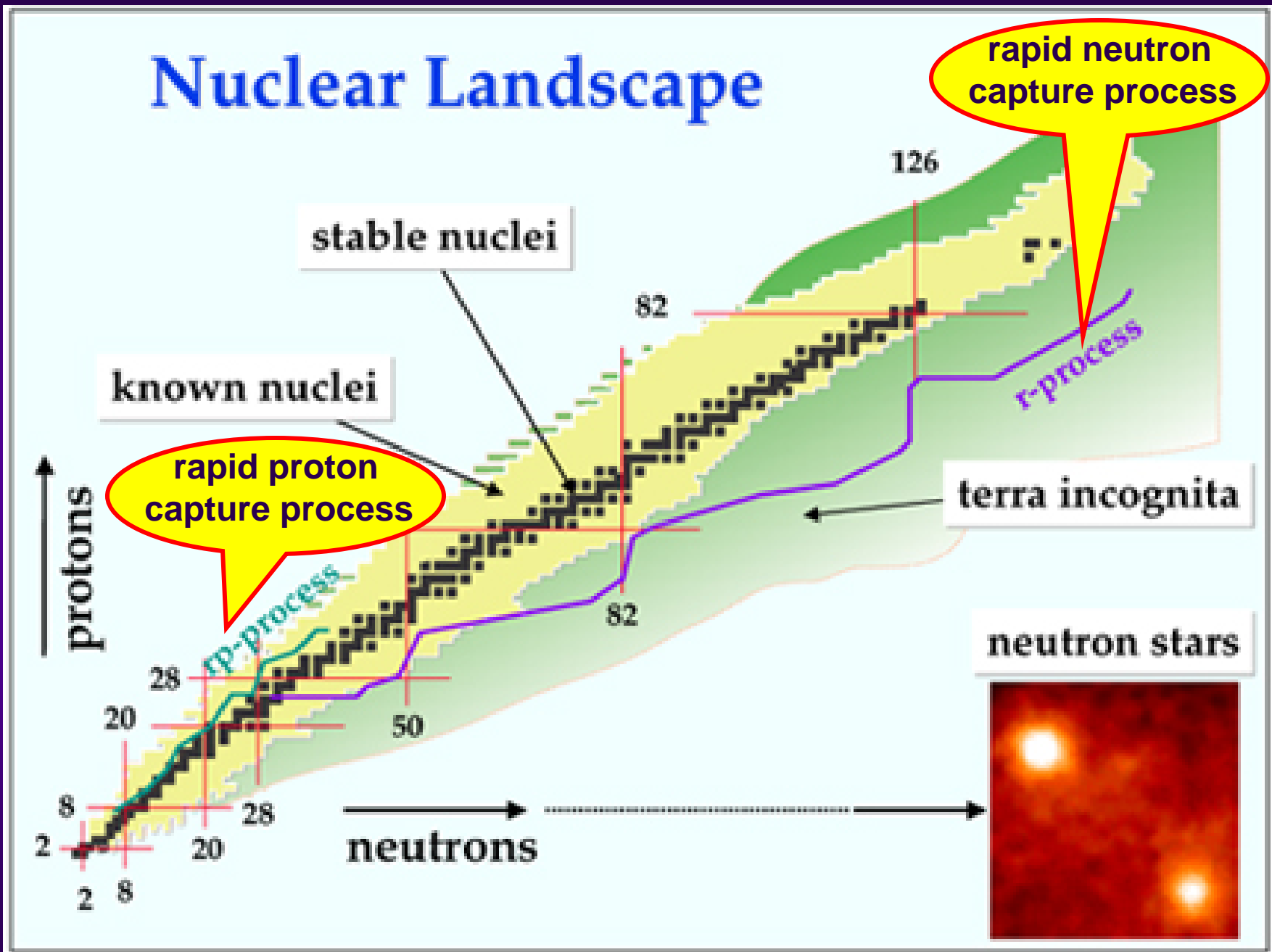
- ◆ The scientific case for RIA has been developing for more than a decade, and many community workshops, studies, and white papers articulate the science that the facility will enable. In its 2002 Long Range Plan, the Department of Energy / National Science Foundation Nuclear Science Advisory Committee (NSAC) endorsed RIA as the highest priority for new construction, noting that RIA will greatly extend new avenues of study on 3 of the basic questions of nuclear physics:
 - What is the structure of nucleonic matter?
 - What is the nuclear microphysics of the universe?
 - What is to be the new Standard Model?

- ◆ RIA was ranked 3rd (in a tie with 2 other projects) among 28 high-priority Facilities for the Future of Science, that were included in the Department of Energy's (DOE) 20-Year Outlook plan released in November 2003

RIA Concept



Nuclear Landscape



ISOL Task Force Report to NSAC

November 22, 1999

For a Fiscal Year 2002 construction start and operation in Fiscal Year 2007, the Rare-Isotope Accelerator facility's projected cost is about \$500 million.

Breaking News (1/2)

- ◆ RIA Day in Washington, D.C. May 11, 2005

24 members of the RIA Users Organization (including 7 students), representing 11 states, met in Washington, D.C. on May 11, 2005 to participate in the meeting organized by the RIAUO Executive Committee. An important component of this Users meeting was the delivery of a letter from the RIA Users to the U.S. Congress. The purpose of the letter was to “secure the funding for RIA that is required to move forward with the needed R&D, site selection, and conceptual design activities”

- ◆ The letter (<http://riagroup.nscl.msu.edu/signup.php?cntry=us>) was signed by 500 U.S. scientists from 34 states. In addition, about 250 scientists from abroad, representing 32 countries, also signed the letter of support (<http://riagroup.nscl.msu.edu/signup.php?cntry=other>) or expressed their interest in individual letters and written statements. Those are impressive numbers demonstrating the high scientific hopes of the community at large for RIA

Breaking News (2/2)

- ◆ **In the letter it was said that ...**”For FY 2006, an investment of \$25 M will be needed to move forward with the needed R&D, site selection, and conceptual design activities”...
- ◆ From the presentation by **W. Nazarewicz** at PAC05, the total cost is estimated now at ~\$1000 M...