



# Isotopes Project

LAWRENCE BERKELEY NATIONAL LABORATORY

---

*Staff: C. Baglin\*, S. Basunia\*, R. Clark, R. Firestone\**

*Guests: E. Browne, Y. Ben-Dov, S.-C. Wu\*, collaborators from LLNL and Budapest*

*\* Supported from USDOE Nuclear Data Program through LBNL*

Report on USDOE Data Program Funded Activities at  
LBNL During Fiscal Year 2006

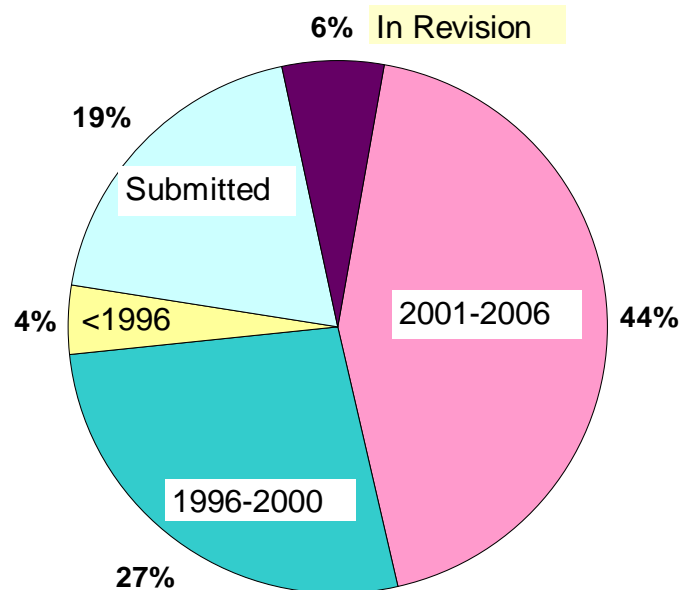
Report prepared by C.M. Baglin (Project Leader) for the USNDP Annual Meeting,  
November 7-9, 2006 at Brookhaven National Laboratory.

# Mass Chain Responsibilities, Evaluation Status, Levels of Effort

## Mass Chain Responsibility (~476 nuclides):

A=21-30, 59, 81, 83, 90-93, 166-171, 180-193 (ex. 188, 190), 210-217.

## Evaluation Status: Literature Cutoff – LBNL Chains



## FY06 Levels of Effort:

Evaluation:

Nuclides: 1.70 FTE (staff)  
0.30 FTE (guest)

(n, ) data: 0.30 FTE

Dissemination: 0.15 FTE

Research: 0.55 FTE

Management/

Coordination: 0.30 FTE

**TOTAL: 3.30 FTE**

# FY06 Accomplishments

---

## Mass Chain and Nuclide Evaluation (2.00 FTE)

- **Submitted:**

A=23, 184, 213, 216,  $^{173}\text{Pt}$ ,  $^{187}\text{Po}$ ,  $^{192}\text{At}$  (43 nuclides, including 13 priority nuclides)

- **Published:**

A=176, 181, 185, 237

- **Reviewed:** 2 mass chains (A=51, 48).

## DDEP Activity

**Coordination** of international collaboration continues but is no longer supported financially at LBNL.

## Evaluator Training Workshop Instruction:

IAEA/ICTP Workshop on *Nuclear Structure and Decay Data: Theory and Evaluation* (Trieste, Feb/Mar 2006): one lecturer (4 lectures, 10 lab. sessions).

# Accomplishments - continued

---

## Neutron Capture Data Evaluation (0.30 FTE)

- Continued Collaboration with LLNL on statistical-model calculations of photon quasi-continuum information needed to fully describe  $(n, \gamma)$  reactions at thermal energy. A paper describing calculations for Pd isotopes is in preparation.
- Participated in IAEA CRP on *Reference Database for Neutron Activation Analysis*; objective is to provide a recommended set of evaluated  $k_0$ /cross section data for use by this applied community.

## Web Page Maintenance (0.15 FTE)

- **Installed** revised versions ENSDF, XUNDL and NSR databases (needed by our web pages) as they became available.
- **Served** 255K distinct hosts who downloaded ~152 Gb data in FY06.

# Accomplishments - continued

---

## Nuclear Data Related Research (0.55 FTE)

(former support from DOE Low Energy funds for such research activities was not available in FY06)

- In Collaboration with Chemical Research Centre, Budapest, Hungary, measured (n,  $\gamma$ ) cross sections for  ${}^6,7\text{Li}$ ,  ${}^{10,11}\text{B}$ ,  ${}^{13}\text{C}$ ,  ${}^{15}\text{N}$ .
- Low-energy ( $\gamma$ ,  $\gamma$ ) reactions: measured cross sections for  ${}^{197}\text{Au}$  and thick-target yields for  ${}^{64}\text{Zn}$  and  ${}^{63}\text{Cu}$ ; manuscript submitted for publication in Phys. Rev. C.
- Participated in IAEA CRP on *New Applications of Prompt Gamma-ray Neutron Activation Analysis*; contributed to final report on project.
- Commenced analysis of  ${}^{238}\text{U}({}^3\text{He},\text{tf})$  cross section data measured in collaboration with LLNL. This reaction serves as a surrogate for the  ${}^{237}\text{Np}(\text{n},\text{f})$  reaction which is of relevance to Advanced Fuel Cycle data needs, a current LBNL research priority. Continuation of such work has already received LDRD funding at LBNL for FY07 in response to a FY06 proposal (prepared using DOE Low-Energy program funding).

# FY07 Planned Evaluation - Research Link

---

Beginning in FY07, our former post-doctoral associate position has been replaced by a staff position for which effort is divided equally between ENSDF evaluation (funded at least in part by the USDOE Data Program) and nuclear data related research focused on surrogate reaction cross section measurements relevant to Advanced Fuel Cycle data needs (funded independently).

## Publications/Invited Talks

---

- 5 Nuclear Data related publications
- 4 reports
- 6 invited talks/lectures

This work was supported by the Director, Office of Science, Office of Nuclear Physics of the US Department of Energy under contracts DE-AC03-76SF00098 and DE-AC02-05CH11231.

# Publications

---

## Nuclear Data Related Publications: 5 papers

- *Nuclear Data Sheets for A=181*, S.-C. Wu, Nuclear Data Sheets **106**, 367 (2005).
- *Nuclear Data Sheets for A=185*, S.-C. Wu, Nuclear Data Sheets **106**, 619 (2005).
- *Nuclear Data Sheets for A=176*, M.S. Basunia, Nuclear Data Sheets **107**, 791 (2006).
- *Nuclear Data Sheets for A=237*, M.S. Basunia, Nuclear Data Sheets **107**, 2323 (2006).
- *Radioisotopes*, Coral M. Baglin, Kirk-Othmer Encyclopedia of Chemical Technology, John Wiley & Sons, NY, posted online 17 March 2006.

(Two additional mass chain publications are in press).

# Publications - continued

---

## Reports:

## 4 Reports

- *Summary Report: First Research Coordination Meeting on Reference Database for Neutron Activation Analysis*, R.B. Firestone and A. Trkov, INDC(NDS)-0477 920050.
- *Determination of Contaminants in Rare Earth Materials by Prompt Gamma Activation Analysis (PGAA)*, D.L. Perry, G.A. English, R.B. Firestone, G.L. Molnár and Zs. Révay, paper 241, FACSS Conference, Quebec City Canada, Oct. 9-13, 2005.
- *PGAA for the Analyses of Metal Oxyanion Materials*, D.L. Perry, G.A. English, R.B. Firestone, G.L. Molnár, and Zs. Révay, paper 242, FACSS Conference, Quebec City Canada, Oct. 9-13, 2005.
- *Use of Neutron Generators for Analytical Purposes*, N.B. Bangfi, R.B. Firestone, S. Landsberger, K.-N. Leung, J. Reijonen, Zs. Révay, M. Rossbach, L. Sajo-Bohus, F.A. Sanchez, K. Sudershan, and J.K. Yong, Report of the Coordinated Research Project on *New Applications of PGNAA*, IAEA CRP F2.30.21, 2002-2005.



# Publications - continued

---

## Invited Talks:

## 6 Talks

- *Extension of the Evaluated Gamma-Ray Activation File (EGAF) to Include Data for Neutron Activation Analysis*, R.B. Firestone, First Co-ordination Meeting on Reference Database for Neutron Activation Analysis, IAEA, Vienna, Austria, 3 October 2005.
- *Did a Supernova Kill the Mammoths?*, R.B. Firestone, KFKI Atomic Energy Research Institute, Budapest, Hungary, 7 October 2005.
- *Evidence of a Catastrophic Impact Event at the End of the Clovis Era*, R.B. Firestone, Clovis in the Southeast Conference, Columbia SC, 28 October 2005.
- *LBNL Neutron Generator Activities*, R.B. Firestone, 3<sup>rd</sup> Research Coordination Meeting for New Applications of Prompt Gamma Neutron Activation Analysis, Bariloche, Argentina, 5 Dec. 2005.
- *ENSDF – Reaction Data*, Coral M. Baglin, two 90-minute lectures at the IAEA/ICTP Workshop on Nuclear Structure and Decay Data: Theory and Evaluation held in Trieste, Feb. 2006.
- *ENSDF – Adopted Levels and Gammas*, Coral M. Baglin, two 90-minute lectures at the IAEA/ICTP Workshop on Nuclear Structure and Decay Data: Theory and Evaluation held in Trieste, Feb. 2006.