



Isotopes Project

LAWRENCE BERKELEY NATIONAL LABORATORY



R.M. Clark (Group Leader), **C.M. Baglin***, **M.S. Basunia***, **R.B. Firestone*** (3.2 FTE)

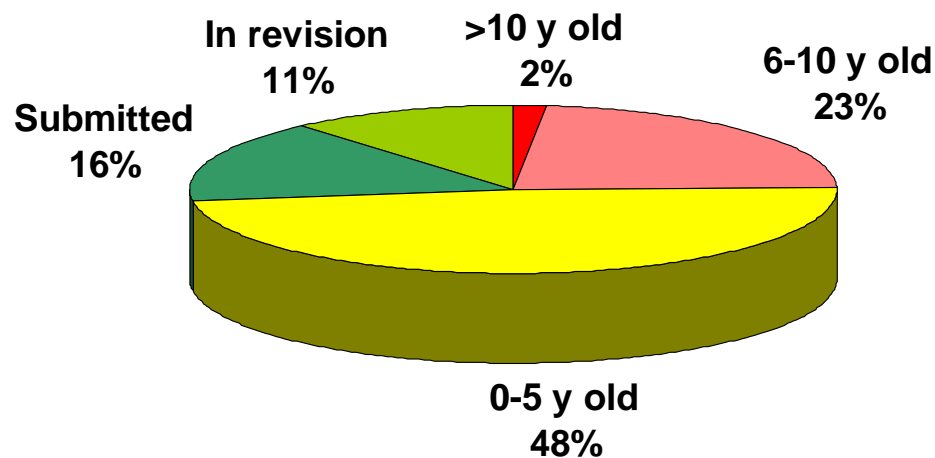
Guests: Y. Ben-Dov, E. Browne, S.-C. Wu*

*Structure/decay data evaluators supported at LBNL by US Department of Energy
~2.3 FTE staff supported by Nuclear Data Program

Responsibility:

A = 21-30, 59, 81, 83,
90-93, 166-171, 180-
193 (ex. 188,190),
210-217 (~480
nuclides).

Status of LBNL Nuclides:



Report on FY2007 activities prepared by C.M. Baglin for the USNDP Annual Meeting, .
7-9 November 2007 at Brookhaven National Laboratory.

Collaborators:

Active collaborations with:

- Institute of Isotope and Surface Chemistry and Budapest Reactor, Hungary
- Lawrence Livermore National Laboratory
- Decay Data Evaluation Project (DDEP) participants
- IAEA CRP participants
- NRC Negev, Israel

FY07 Accomplishments:

A. NUCLEAR STRUCTURE AND DECAY DATA EVALUATION

- **Mass Chain and Nuclide Evaluations (~2.0 FTE; includes 0.2 FTE from guest):**

Submitted: A=24, 81, 169 (resubmission), 187, ^{172}Hg (45 nuclides).

Published: A=23, 213, 216, 232 (36 nuclides).

Reviews Performed: A=38, 191.

- **Decay Data Evaluation Project (DDEP) Participation:**

Coordination of program and general editorial oversight for collaboration continues at LBNL, but without financial support.

- **Neutron Capture Data Evaluation (~0.4 FTE)**

a) **Collaboration with LLNL:**

Continued collaboration with LLNL on statistical-model calculations of photon quasi-continuum information needed for complete description of (n,γ) reactions at thermal energy. A paper describing calculations for Pd isotopes has been submitted.

b) **Participation in IAEA CRP on *Reference Database for Neutron Activation Analysis***

Continued participation in the above IAEA CRP; its objective is to provide recommended sets of evaluated k_0 and cross section data for use by this applied community. Initial comparison of data from three sources has been completed.

FY07 Accomplishments (continued):

B. NUCLEAR STRUCTURE DATA DISSEMINATION (~0.1 FTE)

Web Page Maintenance (~0.1 FTE)

Installed revised versions of ENSDF, XUNDL and NSR databases (needed by our numerous web pages) as they became available. **Upgraded** server security. **Served** 248K distinct hosts who downloaded ~162 Gb data in FY07.

C. NUCLEAR DATA RELATED RESEARCH

a. Measurements of Cross Sections for Advanced Fuel Cycles:

Completed analysis of $^{238}\text{U}(^3\text{He},\text{tf})$ cross section data measured in collaboration with LLNL; first author on paper submitted to Phys. Rev. C. This reaction serves as a surrogate for the $^{237}\text{Np}(n,\text{f})$ reaction which is of relevance to Advanced Fuel Cycle data needs, a current LBNL research priority. The work benchmarked the experimental procedures at LBNL using a previously-measured reaction, with a view to employing the surrogate technique to obtain vital (n,f) cross section data for cases where direct experimental measurements are not feasible. Next, we plan to use $^{232}\text{Th}(^3\text{He},\text{tf})$ to benchmark the 1-10 MeV equivalent n energy range.

LBNL LDRD funding for this project provides partial support for one of our structure evaluators, enabling retention of evaluation capability while addressing laboratory research priorities.

b. 2.5 MeV n Scattering and Capture Cross Sections:

Feasibility study for measurements using LBNL neutron generator.

Accomplishments (continued)

c. Low-energy (α,γ) Cross Section Measurements

Measurement of alpha-induced cross sections for ^{197}Au and thick-target yields for ^{64}Zn and ^{63}Cu : published in Phys. Rev. C 75, 015802 (2007).

New Initiative

Topical Evaluation – N~20 “Island of Inversion” Nuclides

Collaboration with McMaster and NNDC. Objective: to provide updated evaluations in ENSDF and on the web for nuclides in or near this region of current research interest.

Publications/Invited Talks

- 4 mass chain publications
- 3 nuclear data related publications
- 3 invited talks

This work was supported by the Director, Office of Science, Office of Nuclear Physics of the US Department of Energy under contract DE-AC02-05CH11231

Publications/Invited Talks

Nuclear Data Related Publications: 7 papers

- *Nuclear Data Sheets for A=232*, E. Browne, Nuclear Data Sheets **107**, 2579 (2006).
- *Nuclear Data Sheets for A=23*, R. B. Firestone, Nuclear Data Sheets **108**, 1 (2007).
- *Nuclear Data Sheets for A=213*, M.S. Basunia, Nuclear Data Sheets **108**, 633 (2007).
- *Nuclear Data Sheets for A=216*, S.-C.. Wu, Nuclear Data Sheets **108**, 1057 (2007).
- *Table of Radioisotopes*, M.-M. Bé, V. Chisté, C. Dulieu, E. Browne, C. Baglin, V. Chechev, N. Cozmenco, R. Helmer, F. Kondev, D. MacMahon, K.B. Lee, Bureau International des Poids et Mesures Monographie BIPM-5, Vol. 3 (2006).
- Contributions from R.B. Firestone to *Database of Prompt Gamma Rays from Slow Neutron Capture for Elemental Analysis*, IAEA Scientific and Technical Information Publication 1263, ISBN 92-0-101306-X (March, 2007).

Publications/Talks

- *Measurement of cross sections for alpha-induced reactions on ^{197}Au and thick-target yields for the (α, γ) process on ^{64}Zn and ^{63}Cu* , M.S. Basunia, H.A. Shugart, A.R. Smith, E.B. Norman, Phys. Rev. C **75**, 015802 (2007).

Invited Talks: **3 Talks**

- *For the Best Nuclear Data Who Do You Call?*, E. Browne, Colloquium - Spring 2007, Nuclear Engineering Department, University of California, Berkeley, California, 2 April 2007.
- *Neutrons, Nuclear Structure, and the Death of the Mammoths*, R.B. Firestone, Z. Révay, T. Belgya, A. West, Paper NUCL136, 234th ACS National Meeting, Boston MA, August 2007.
- *Nuclear Data for the Skeptic*, E. Browne, TUNL Seminars – Fall 2007, 20 September 2007.