The LBNL/UCB Nuclear Data Program

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U.S. DEPARTMENT OF ENERGY | Office of Science

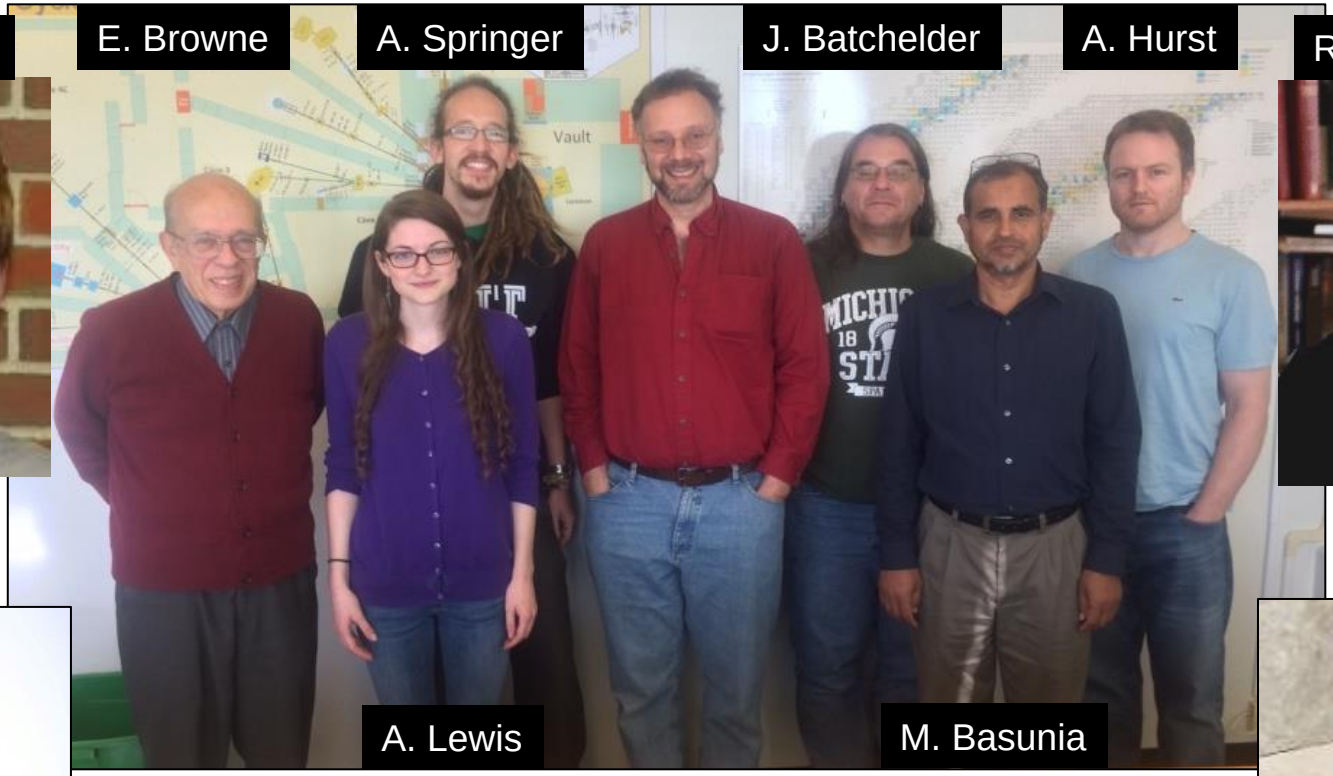
Introduction

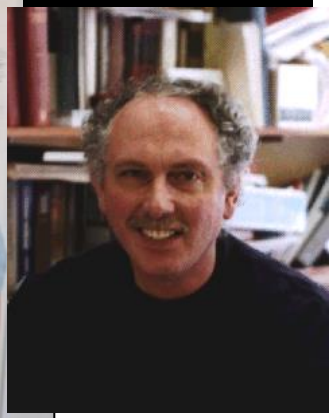
- In the past 2 years the LBNL Nuclear Data Program has undergone dramatic changes
  - Staff doubled (3 to 6)
  - A University component was added with 4 externally-supported grad students.
  - Two new data activities were added:
    - Inelastic neutron scattering (Baghdad Atlas)
    - A database of radiative strength functions (IAEA-CRP)
  - A local experimental program was added
    - Medical isotope cross section measurements @ the 88-Inch cyclotron and the High Flux Neutron Generator on campus
- Support from the program comes from an expanded set of sources
  - NP Office – USNDP
  - New NA-22 funding from the NSSC (our sponsors for this meeting)
  - New funding from Isotopes R&D program

The LBNL nuclear data group has grown into a Bay Area Nuclear Data (BAND) Group

The LBNL/UCB Nuclear Data Group*


E. Matthews




R. B. Firestone


L. Kirsch


A. Voyles

Our goal is to address the data needs of the applied nuclear science community while training the next generation of nuclear scientists and engineers in the process

*Camera shy: H. Zaneb (G), N. Fajardo (UG)

Evaluation/Compilation/Dissemination Activities

- ENSDF evaluation activities:
  - Completed: A=21, 22, 26, 183.
  - In process for publication: A=57 (in collaboration with Negret), 59, 193, 170, 171.
  - Nuclide updates: ^{23}O, ^{167}Re, ^{169}Re, ^{196}Os, and ^{215}U.
- XUNDL compilation activities:
  - 44 papers comprising 97 data sets
- EGAF activities (including PRC publication):
  - ^{2}H, ^{6,7}Li, ^{9}Be, ^{10,11}B, ^{12,13}C ^{14,15}N, ^{16,17,18}O, ^{56}Fe, ^{180}W, ^{185}Re
- Horizontal evaluation/dissemination activities
  - Inelastic neutron scattering SQL database (LBNL-100725 - http://nucleardata.berkeley.edu)
  - β-delayed proton emission (in collaboration w/Nesaraja)
- Database development activities
  - ENSDF2XML translator /XML development (LBNL-1004483)
- Coordinated Research Project Activities
  - 20469/R0 – “Updating the photonuclear Data Library and generating a reference database for Photon Strength Functions”

Publications since the last NSDD meeting

- 32 peer reviewed publications/conference proceedings and meeting reports. Highlights include:
  - Capture gamma-ray work:
    - 3 first-author articles by A.M. Hurst – ^{180}W: PRC 92, 034615 (2015), Methodology NIMB 362, 38 (2015), Capture-gamma libraries EPJ accepted (2017). ^{139}La: PRC submission planned for Summer 2017.
    - 3 first-author PRCs by R.B. Firestone - ^{16,17,18}O and ^{2}H: PRC 95, 014328 (2017), ^{6,7}Li, ^{9}Be,^{10,11}B,^{12,13}C, and ^{14,15}N: PRC 93, 054306 (2016), ^{PR}C 95, 014328 (2017)
    - Student-led: ^{186}Re:D.A. Matters *et al.,* PRC 93, 054319 (2016)
  - Radiative Strength function related work (select):
    - ^{137,138,139}La: B.V. Kheswa *et al.,* PRC 95 (4), 045805 (2017). ^{92}Mo: G.M. Tveten *et al.,* PRC 94, 025804 (2016), ^{73,74}Ge: T. Renstrøm *et al.*, PRC 93, #6, 064302 (2016), ^{242,243}Pu: T. Laplace *et al.,* PRC 93, 014323 (2016), 74Ge: R. Massarczyk *et al.,* PRC92, 044309 (2015), ^{197,198}Au: F. Giacoppo *et al* PRC91, 054327 (2015).
  - Other work:
    - ^{106}Cd g-factors: N. Benczer-Koller *et al.,* PRC 94 (3), 034303.
    - HFNG electron suppression: C. Waltz *et al.,* ARI 125, 124-128 (2017)

All our experimental activities address an identified data need and leverage externally-supported student labor

- ^{56}Fe(p,pγ) discrete/continuum structure using GRETINA (Michael Jones & Leo Kirsch).
  - Supporting CIELO ^{56}Fe evaluation
  - UC Student lead – Leo Kirsch
- ^{64}Zn(n,p)^{64}Cu and ^{47}Ti(n,p)^{47}Sc cross sections using the UC High Flux Neutron Generator (HFNG)
  - Called for by *S.M. Qaim* at NDNCA workshop
  - UC Student lead – Andrew Voyles
- ^{35}Cl(n,p) cross section with the HFNG (Fratoni, Batchelder)
  - Called for by molten salt reactor community
  - UC Student lead – S. Chong
- ^{54}Fe(p,α) and ^{56}F(p,α2n) @ the 88-Inch cyclotron
  - Called for by LANL-IPF (Nortier, Engle)
  - Student leads – Andrew Voyles (UC), Alex Springer (KIT)
- ^{90}Zr(d,α2n) & ^{86}Sr(p,n) @ the 88-Inch (Qaim, Engle)
  - Students leads: Haleema Zaneb (Lahore), Voyles (UC)

Evaluator training activities

- Shamuzzaoha Basunia has taken the lead on training two new nuclear structure evaluators
  - A.M. Hurst
    - Joint work on A=26
    - 3 single-nuclide evaluations in progress based on (n,γ) papers and XUNDL compilations
  - J.C. Batchelder
    - A=186
    - β-delayed proton horizontal evaluation
  - Three undergraduate XUNDL compilers
    - M. Trudel, S.A. Chong, H. Zaneb.
- A new reactions evaluator is being trained by Lee Bernstein jointly with BNL/NNDC (D. Brown) and KAPL (D. Barry)
  - Amanda Lewis
    - Inelastic neutron scattering (incl. new OM)