Nuclear Data for Attribution Activities at LLNL

Dennis McNabb

CNP Group

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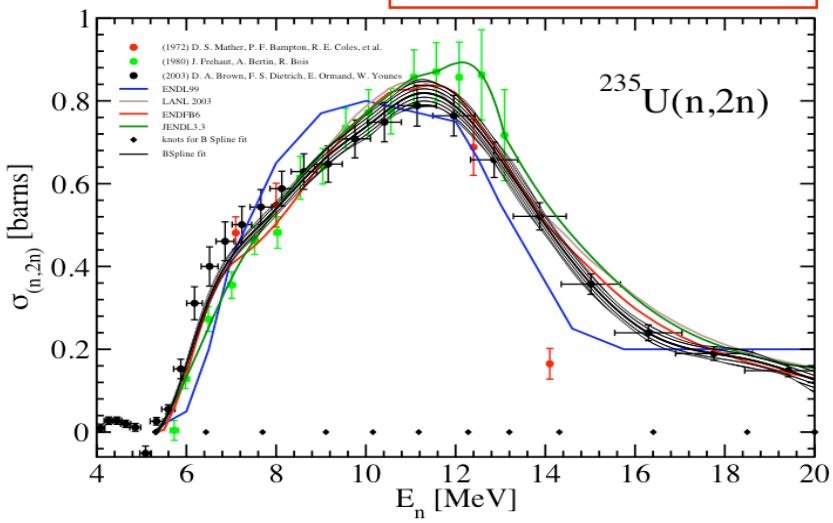
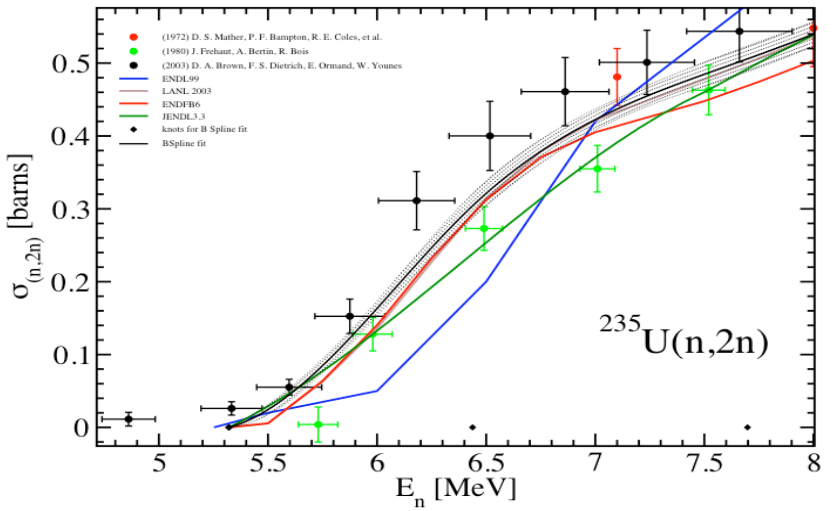
Constrained fits to evaluated data, uncertainties

- **Production and depletion of actinide isotopes**
  - **Forensic signatures**
  - **Uncertainties required**
- **Simultaneous fit to actinide cross section data**
  - **Data-driven**
    - » **Covariances included**
  - **Theoretical assumptions**
    - » **Explicit constraints**
  - **Uncertainties intrinsic**
- **Effort is 3 years, 4 FTEs**
  - **Covariances for existing data**
  - **Theoretical assumptions**
  - **New data where needed**

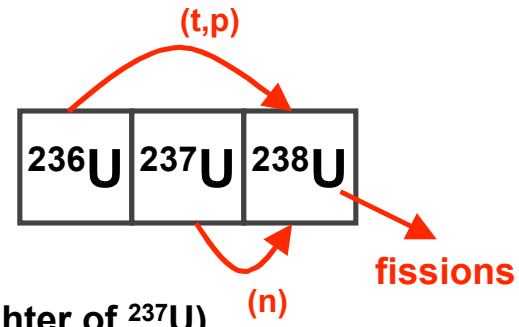
Work by David Brown

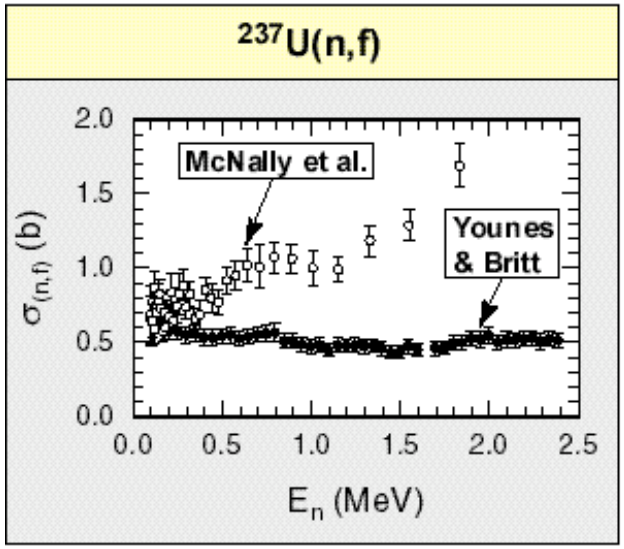


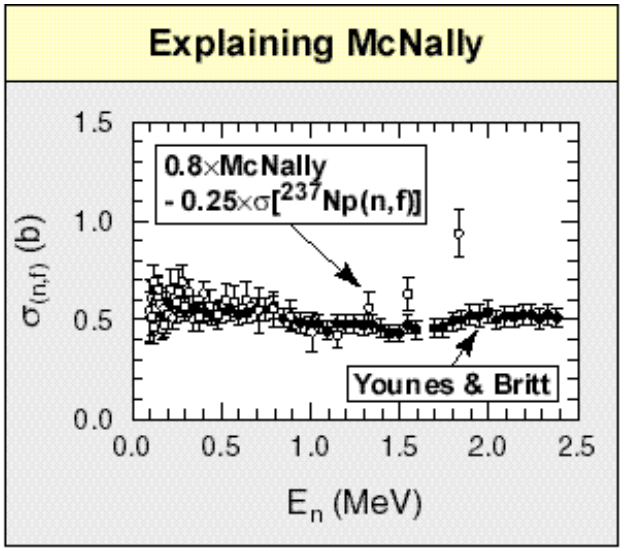


New fission data very helpful

- Hard to measure $^{237}U(n,f)$ because $T_{1/2}(^{237}U)$ = 6.8 days
  - Fission data on short-lived isotopes often non-existent
  - Theory is not reliable
- Solution: (t,p) reaction to fission nucleus
  - Correction for angular momentum transfer
- Our result for $^{237}U(n,f)$:
  - Is consistent with critical-assembly results
  - Explains McNally results as contamination from ^{237}Np (β-daughter of ^{237}U)
  - Publications: W. Younes and H. C. Britt, Phys. Rev. C 67, 024610 (2003) and Phys. Rev. C 68, 034610 (2003).







McNally data:

1974 bomb shot "Heroic effort"

Inconsistent w/ systematics & integral exp.

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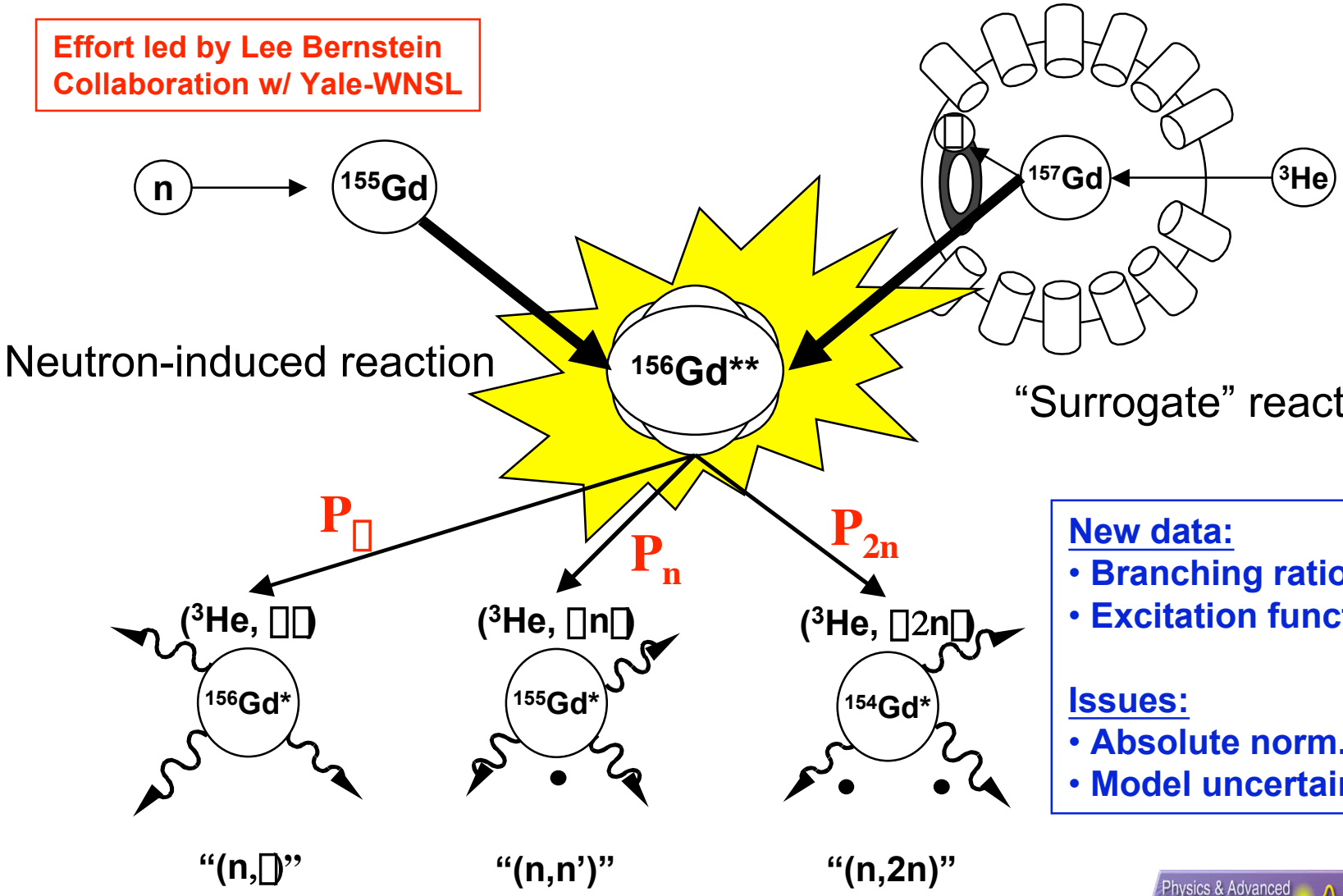
Experimental effort: Extend technique to other channels

Effort led by Lee Bernstein
Collaboration w/ Yale-WNSL



New data:
- **Branching ratios**
- **Excitation functions**

Issues:
- **Absolute norm.**
- **Model uncertainties**

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Game plan for obtaining new data

- **Currently developing experimental techniques for dealing with actinide targets at Yale/WNSL using ^{238}U**
- **Ramping up theoretical/modeling effort to understand corrections:**
  - **Angular momentum of incident channel**
  - **Direct processes**
- **Additional experiments to validate the technique**
- **Experiments on actinide targets**
- **Large set of new fission cross data based on surrogate technique**
  - **Extending results up to 20 MeV with new level density models**