Traineeship Talks — Structure data evaluation at LLNL

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I am one of the two LLNL trainees mentored by Libby and Chris

NNDC/BNL

Libby McCutchan (PI)

Manager of XUNDL Database
Manager of ENSDF Database
10+ years as ENSDF evaluator

Chris Morse (Co-I)

Lead on ENSDF modernization project and ENSDF evaluator

LLNL

Vincent Cheung

Expertise in nuclear data library management and radiation detection

Kay Kolos (LLNL-PI)

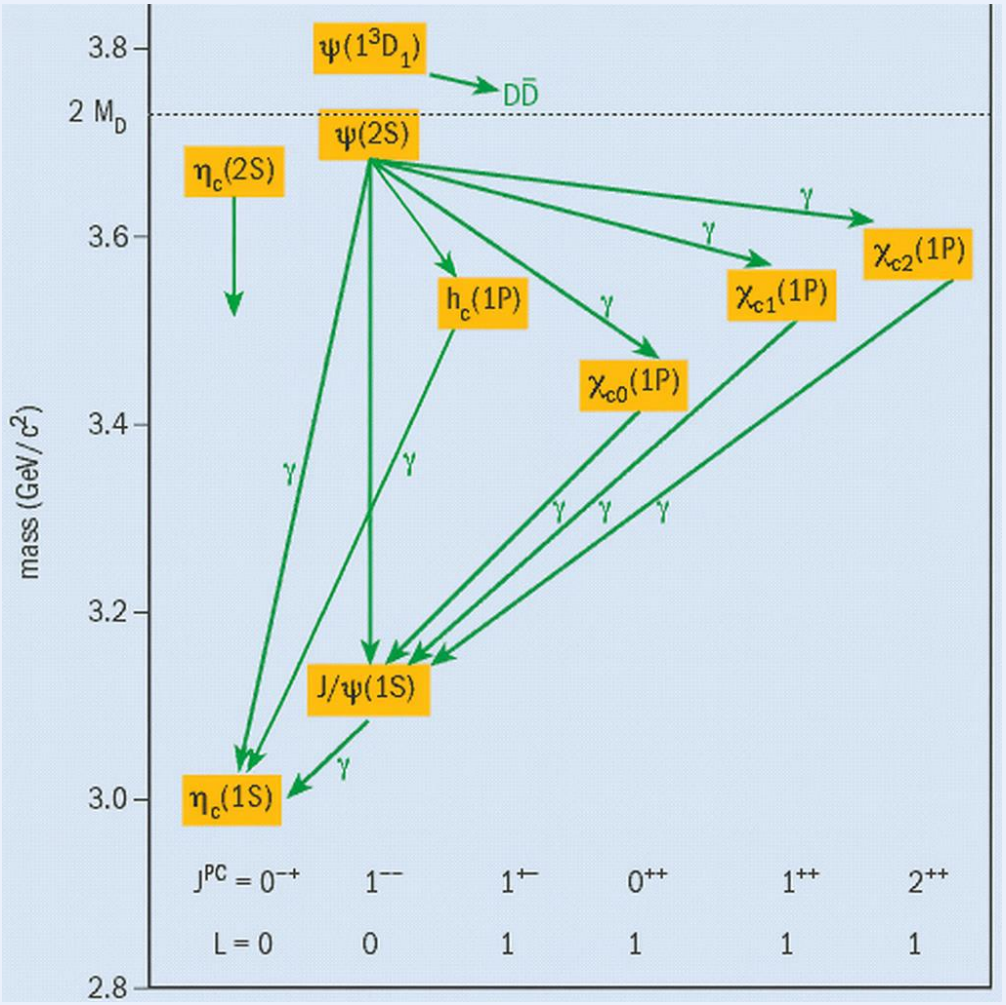
Expert in fission, nuclear decay mechanisms, and radiation studies

Anthony Ramirez

Specializes in fission (FPY), nuclear reactions and structure

My Background

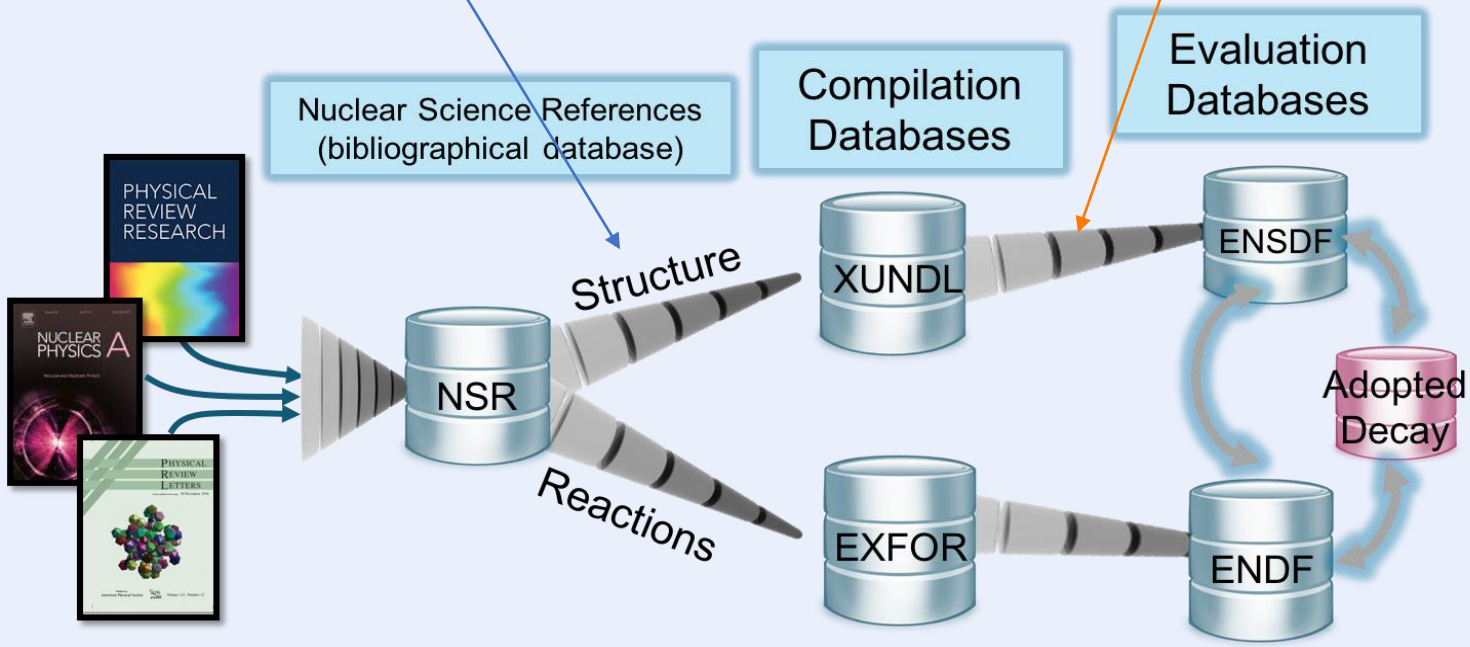
- I was trained in high-energy nuclear theory on quarkonium production and polarization.
- My first low-energy work was on RadSim, an NA-22 funded project to release an open-sourced code for radioactive source generation, radiation transport, and detector response.
- I got interested in using ENSDF for source generation and making new ENSDF.
- I am also tasked on software support for reaction data in FUDGE and GIDI+, so I am also interested in using ENSDF data to describe correlated gammas in (n,γ) reactions (MT=102).



What was done during the last year of traineeship

XUNDL Compilations
- Extract and vet experimental data from publications
- Use tools and codes for data extraction and conversion

ENSDF Evaluations
- Evaluate reaction and decay datasets
- Evaluate Adopted Levels and Gammas



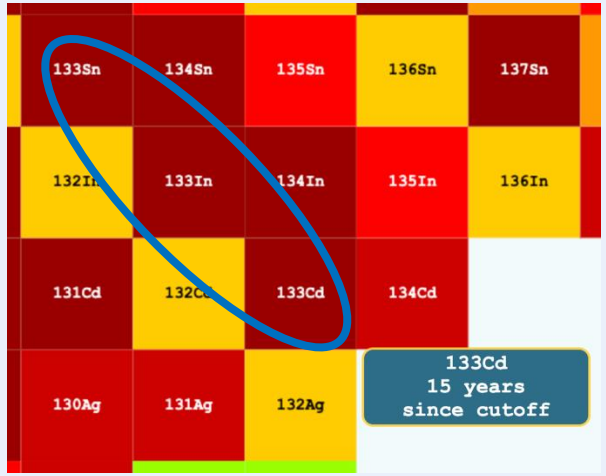
XUNDL Compilations

- I was trained to compile
  - Mass measurements (as level energies)
  - A, EC+B+, B-, IT decay datasets
  - General Reaction datasets
- Tools used include
  - 80-column editor
  - Excel2ENSDF
  - Tabula

- Compiled 21 publications or 34 datasets.

ENSDF Evaluations

- I started merging datasets in XUNDL into ENSDF for the 3 nucleus on the neutron-rich side of A=133
- Quantities evaluated include
  - J,T
  - %B-N, %B-2N
  - Level Energy
- These evaluations are submitted



133Cd	$T_{1/2}$	Accept?
2003ARZX	57 ms 10	N
2005KR20	57 ms 10	N
2010OH02	> 408 ns	N
2015LO04	64 ms 8	Y
2022PH01	61 ms 6	Y
Average	62 ms 5	

133Cd	%B	%B-N	%B-2N	Accept?
2003ARZX	100	?		N
2005KR20	100	?		N
2010OH02	?	?	?	N
2015LO04	?	?	?	N
2022PH01	100	86 (7)	6 (2)	Y
Average	100	86 (7)	6 (2)	

Status of A = 134 evaluation (last cut-off: 2004 Jul)

	$_{64}$Gd	$_{63}$Eu	$_{62}$Sm	$_{61}$Pm	$_{60}$Nd	$_{59}$Pr	$_{58}$Ce	$_{57}$La	$_{56}$Ba	$_{55}$Cs	$_{54}$Xe	$_{53}$I	$_{52}$Te	$_{51}$Sb	$_{50}$Sn	$_{49}$In	$_{48}$Cd
Adopted																	
Reaction																	
Decay																	

- Anthony and I are evaluating this mass chain together.
- We started from the edges, where either
  - new experiments are compiled and adopted as evaluations as they are the first measurements made to study the nuclides, or
  - there are no new measurements made from last cut-off.
- We then move to inwards to merge new measurements with existing datasets before we perform the adopted levels and gammas evaluations

complete

in progress

to be started

Related work benefited from being an ENSDF trainee

- One of the goal for the traineeship is to propagate nuclear data evaluation knowledge within LLNL and beyond as embedded evaluator.
- I provide support to LLNL experimental effort to understand existing data in ENSDF or XUNDL
  - Understanding beta feedings using BrIcc
  - Vetting other's work (sometimes in foreign language)
- I also support describing correlated gammas in reaction data
  - Translating structure data from ENSDF to GNDS format
  - Disseminating the data as next generation of Properties of Particles (PoPs)

What I look forward to this FY

Short-term

- A = 134 completion and publication
- JSON Editor testing and feedback

Long-term

- Learn the process of ENSDF to ENDF Decay Sublibrary conversion
- Continuing to be an embedded evaluator at LLNL