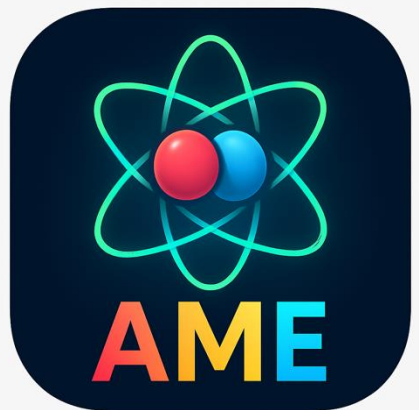


Nuclear Data: Update on AME and NUBASE

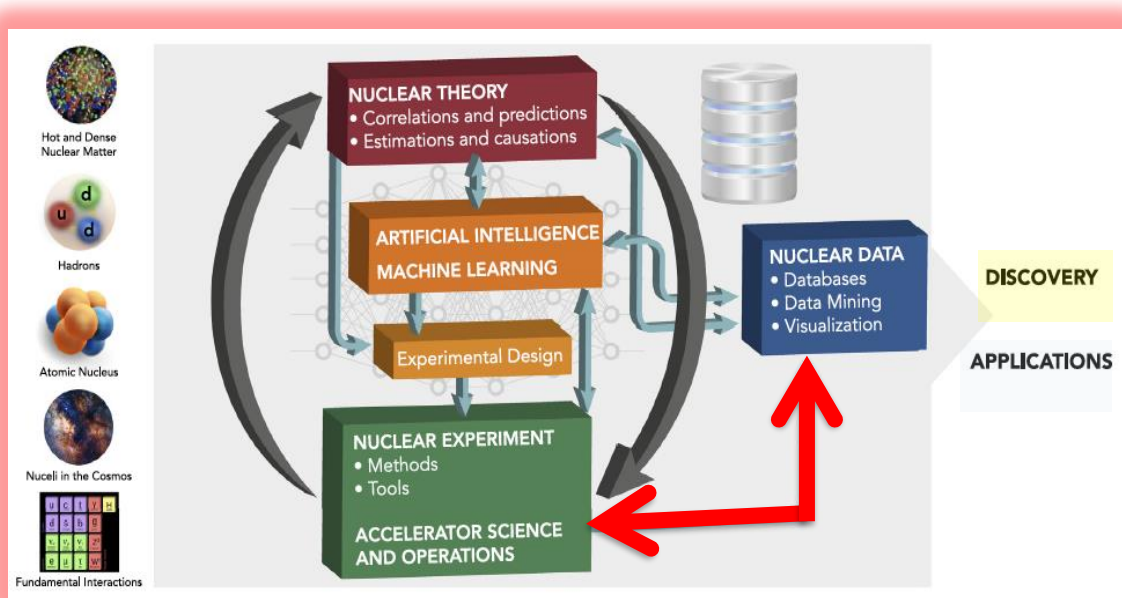


F.G. Kondev
Physics Division, Argonne National Laboratory
on behalf of the AME & NUBASE collaboration



Evaluated Nuclear Data

Value of the evaluated data



Rev. Mod. Phys. 94 (2022) 031003

⇒ **Role of Nuclear Data:** collect experimental results, assess the data and provide recommended (best) values for all nuclear properties

⇒ **Essential Requirements:** comprehensive, complete, up-to-date & reliable

- archival of all experimental data - both published and unpublished and using them in planning & executing new experiments, their analysis, interpretation & publication of the results
- resolve differences between overlapping and contradictory results
- identify needs for new measurements
- beneficial to nuclear theory development
- input to specialized astro libraries and codes
- beneficial to many other areas of science & applications, e.g. chemistry, nuclear medicine, nuclear energy, national security, etc.

Nuclear Physics Properties & Astrophysics

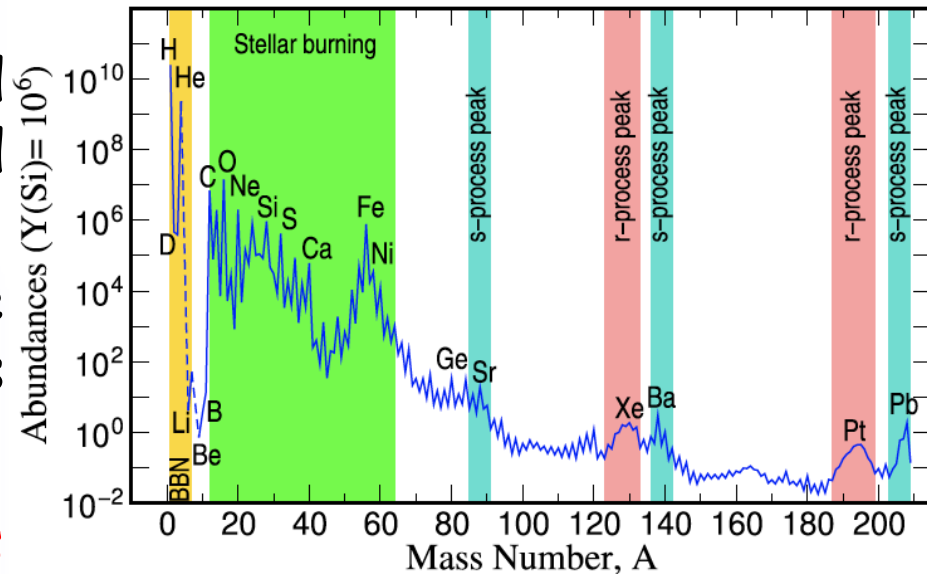
⇒ major goal of Nuclear Astrophysics is to understand the Stellar Evolution of Stars & the Origin of Elements

- needs comprehensive nuclear data for **ALL** known and **MANY** unknown nuclei in their ground states and excited, long-lived isomers

⇒ mass is the key nuclear property - defines the nuclear decay (Q values) & reactions phase spaces (reaction probabilities)

- influences many other nuclear properties: **half-lives** ($T_{1/2}$), **decay modes and their branching ratios (BR)**, **delayed particle emissions** ($P_{\beta-n}$, $P_{\beta+p(\alpha)}$), **reaction cross sections** (σ), etc.

- impact on theoretical models and astrophysics network calculations



J. Cován *et al.*, Rev. Mod. Phys. **93** (2021) 015002

AME & NUBASE

⇒ provide the evaluated (recommended) values for atomic masses, various decay and reaction Q values & other basic nuclear properties ($T_{1/2}$, $J\pi$, decay modes and BR) for all known (and a few unknown) nuclei in their ground and isomeric ($T_{1/2} > 100$ ns) states

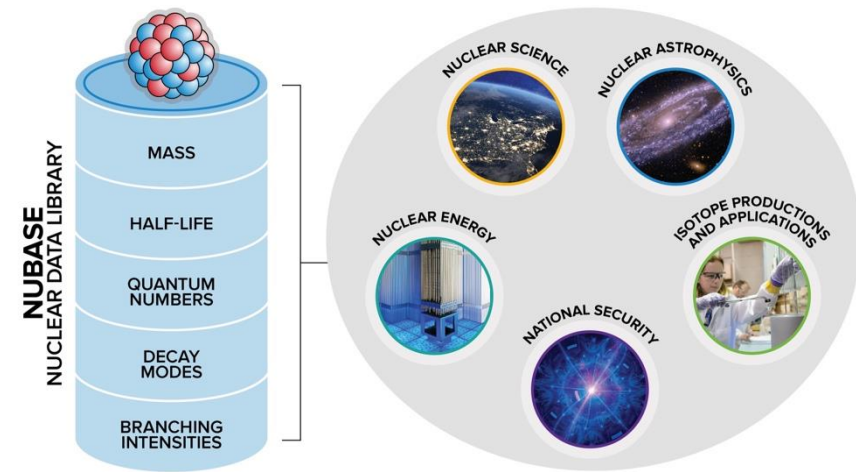
- historically contributed by A. Wapstra (since 1948), G. Audi (since 1985) & others
- since 2006 a collaboration effort between ANL, IJCL & IMP
- followed a 4 years publication interval - 2012, 2016, 2020 ...

⇒ latest libraries **AME2020** & **NUBASE2020** released in March 2021

- coordinated by **M. Wang (IMP)** & **F.G. Kondev (ANL)**
- recommended data for **3558** ground states and **1983** isomers

⇒ currently working on the next libraries **AME2026** & **NUBASE2026** that will be released in the fall of 2026

- coordinated by **W. Huang (IMP)** & **F.G. Kondev (ANL)** with contributions from R. Chakma (ANL), M. Wang (IMP) & S. Naimi (IJCL)



Nuclear Data write up

⇒ Who is involved

- F.G. Kondev & R. Chakma (ANL), W. Huang & M. Wang (IMP), S. Naimi (IJCL)

⇒ What we plan to cover

- relatively short write up - up to 1 page
 - ▣ brief introduction to AME & NUBASE
 - ▣ coverage - masses, J^π , $T_{1/2}$, decay modes and their branching ratios for ground states & excited isomers (with $T_{1/2} > 100$ ns) - emphasis on recommended data and their uncertainties

⇒ Time frame

- will have a discussion at the ongoing collaboration meeting @Orsay (May 11-16)
- envision to complete the task by the end of June 2026