**United States Nuclear Structure Data Program (USNDP) and Evaluated Nuclear Structure Data File (ENSDF) at Texas A&M Evaluation Center of Cyclotron Institute**

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For more than a century, nuclear data evaluation has made important contributions to nuclear science. A search in the *Nuclear Science Reference* (NSR) database maintained at the National Nuclear Data Center (https://www.nndc.bnl.gov/nsr/) on the author "M. Curie" produces a paper titled "*The Radioactive Constants as of 1930*" [1]. The introduction to this paper states that "*the need has arisen for the publication of special Tables of the Radioactive Constants*" and continues, "*This responsibility has been assumed by the International Radium Standards Commission chosen in Brussels in 1910 (...)*". Here we have the origin of what today is known as nuclear data evaluation.

Starting with the first generation of nuclear chemists and physicists, when measurements were already producing a multitude of diverse and sometimes conflicting data, it became evident that assembling and reconciling the data from all across the published literature was a tedious and difficult task. Nevertheless, only after such a systematic analysis could the community arrive at recommended "practical standards," which could then be updated periodically to reflect the continuous improvements in knowledge and technology. Soon nuclear data evaluation became a specialized branch of research in its own right.

After the Second World War most of this activity was taken across the Atlantic and hosted by the United States Nuclear Structure Data Program (USNDP), which maintains the Evaluated Nuclear Structure Data File (ENSDF) database. While mostly undertaken by U.S. national laboratories, it has expanded to a relatively small number of university research labs, which has included the Texas A&M Cyclotron Institute since 2005. For more than a decade, the Texas A&M effort was financed by a contract with Brookhaven National Laboratory, but in 2017 it started to receive direct financing through the DOE Grant DE-FG03-93ER40773, "Cyclotron-based Nuclear Science". Moreover since May 2017 Texas A&M Cyclotron Institute has been recognized and invested as an independent ENSDF Data Evaluation Center included within the Nuclear Structure and Decay Data international network.

Between 2005 and 2015, we completed and published the following full mass-chain evaluations: the superheavy A=252 mass chain [2]; the very data-rich mid-mass chains, A=140 [3], A=141 [4], A=147 [5] and A=148 [6]; and the relatively lighter chains, A=97 [7] and A=84 [8], the latter in a large international collaboration. In collaboration with B. Singh and a group of authors from McMaster University, Canada, we also published the A=77 [9], A=37 [10], A=36 [11], and A=34 [12] mass chains. At the beginning of 2016, we published another large mass chain, A=157, in Nuclear Data Sheets [13], followed by A=158 in 2017 [14], the renewed full evaluation of A=140 in 2018 [15], and A=155 in 2019 [16]. Finally, after its initial submission in Sep. 2018, our A=153 evaluation was published at the end of 2020 [17], having been delayed by a newly elaborated peer review process. In Aug 2020 we finalized and submitted a renewed evaluation of the A=141 chain to NNDC, which was our commitment for the USNDP data effort for FY 2020.

After the last decade's critical shortage of new ENSDF evaluators, the generational crisis extended to the ENSDF reviewers as well, following the retirement of most of the senior evaluators. As a result, we were required to undertake two full mass chain reviews in 2020 and early 2021. In the last few years a more demanding quality standard for the ENSDF data has been implemented. This consists, first, of a pre-review process immediately after the first submission of a newly evaluated mass chain, which establishes whether the mass chain is accepted into the review pipeline. If accepted, the manuscript then enters the review process itself. Finally, there is an editorial review before publication. When combined with the large size of the mass chains we are responsible for, this generates typical intervals of 2-3 years or more spent by a mass chain in the publication pipeline. This explains the long publication cycles of the mass chains A=160, A=153, and A=147 submitted respectively in 2017, 2018, and 2019. Of these, A=153 has finally been published; most of the after-review work for A=160 has been completed with the mass chain ready for the final editorial review; and the after-review work for A=147 is planned to start soon.

In Sept 2020 we started the new full evaluation of the mass chain A=162, covering all publications since Nov 2007. The mass chain consists of the following isobars, in total, 17 nuclei: Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Hf, Ta, W, Re and Os. Our bibliographical searches (dated May 26, 2021) found that in the interval since Nov 20, 2007, 422 papers have been published relating to this mass chain, of which 386 are primary references (more important), and 88 are experimental (the most important). This work is in progress.

[1] M. Curie, A. Debierne, A.S. Eve, H. Geiger, O. Hahn, S.C. Lind, S. Meyer, E. Rutherford, E. Schweidler, Rev. Mod. Phys. **3**, 427 (1931).
[2] N. Nica, Nucl. Data Sheets **106**, 813 (2005).
[3] N. Nica, Nucl. Data Sheets **108**, 1287 (2007).
[4] N. Nica, Nucl.Data Sheets **122**, 1 (2014).
[5] N. Nica, Nucl. Data Sheets **110**, 749 (2009).
[6] N. Nica, Nucl. Data Sheets **117**, 1 (2014).
[7] N. Nica, Nucl. Data Sheets **111**, 525 (2010).
[8] D. Abriola *et al.*, Nucl. Data Sheets **110**, 2815 (2009).
[9] B. Singh and N. Nica, Nucl. Data Sheets **113**, 1115 (2012).
[10] J. Cameron, J. Chen, B. Singh, and N. Nica, Nucl. Data Sheets **113**, 365 (2012).
[11] N. Nica, J. Cameron, and B. Singh, Nucl. Data Sheets **113**, 1 (2012).
[12] N. Nica and B. Singh, Nucl. Data Sheets **113**, 1563 (2012).
[13] N. Nica, Nucl.Data Sheets **132**, 1 (2016).
[14] N. Nica, Nucl.Data Sheets **142**, 1 (2017).
[15] N. Nica, Nucl.Data Sheets **154**, 1 (2018).
[16] N. Nica, Nucl.Data Sheets **160**, 1 (2019).
[17] N. Nica, Nucl.Data Sheets **170**, 1 (2020).