IAEA
International Atomic Energy Agency
Atoms for Peace and Development

50th Anniversary of the Nuclear Structure and Decay Data Network

The last two decades

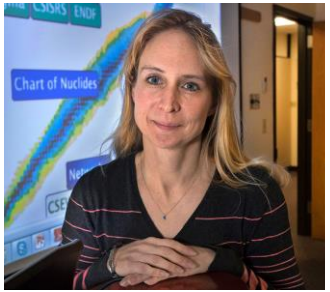
Paraskevi (Vivian) Dimitriou
Nuclear Data Section
International Atomic Energy Agency

Women at the helm

NSDD Scientific Secretary:

Vivian Dimitriou (2013+)

ENSDF Manager and Nuclear Data Sheets Editor: Libby Ricard (2016+)



Joint IAEA-ICTP Workshops cont'd

Mass chain evaluation: published

✓2012: A=211, *Nuclear Data Sheets 114, 661 (2013)*
✓2014: A=227, *Nuclear Data Sheets 132, 257 (2016)*
✓2016: A=217, *Nuclear Data Sheets 147, 382 (2018)*
✓2018: A=218, *Nuclear Data Sheets 160, 405 (2019)*
✓*2022: A=222, Nuclear Data Sheets 192, 315 (2023)*

XUNDL compilation

✓*2016, 2018, 2022*: 40 XUNDL datasets were compiled for XUNDL

IAEA Data Development Project: ENSDF analysis and checking codes

10-13 June 2014, Vienna
INDC(NDS)-0665

5-8 October 2015, Vienna
INDC(NDS)-0696

3-7 December 2018, Vienna
INDC(NDS)-0774

Objective: Address needs for further development and maintenance of ENSDF analysis and checking codes – Java-NDS, BetaShape, Uncertainty Tools, ALPHA-RaDd, new ENSDF editors (ensdf±), etc.

Specialized Workshop on Nuclear Structure and Decay Data (NSDD) Evaluations, IAEA, Vienna, 27-29 April 2015

Report: INDC(NDS)-0688

Re-fresher workshop was for advanced ENSDF evaluators

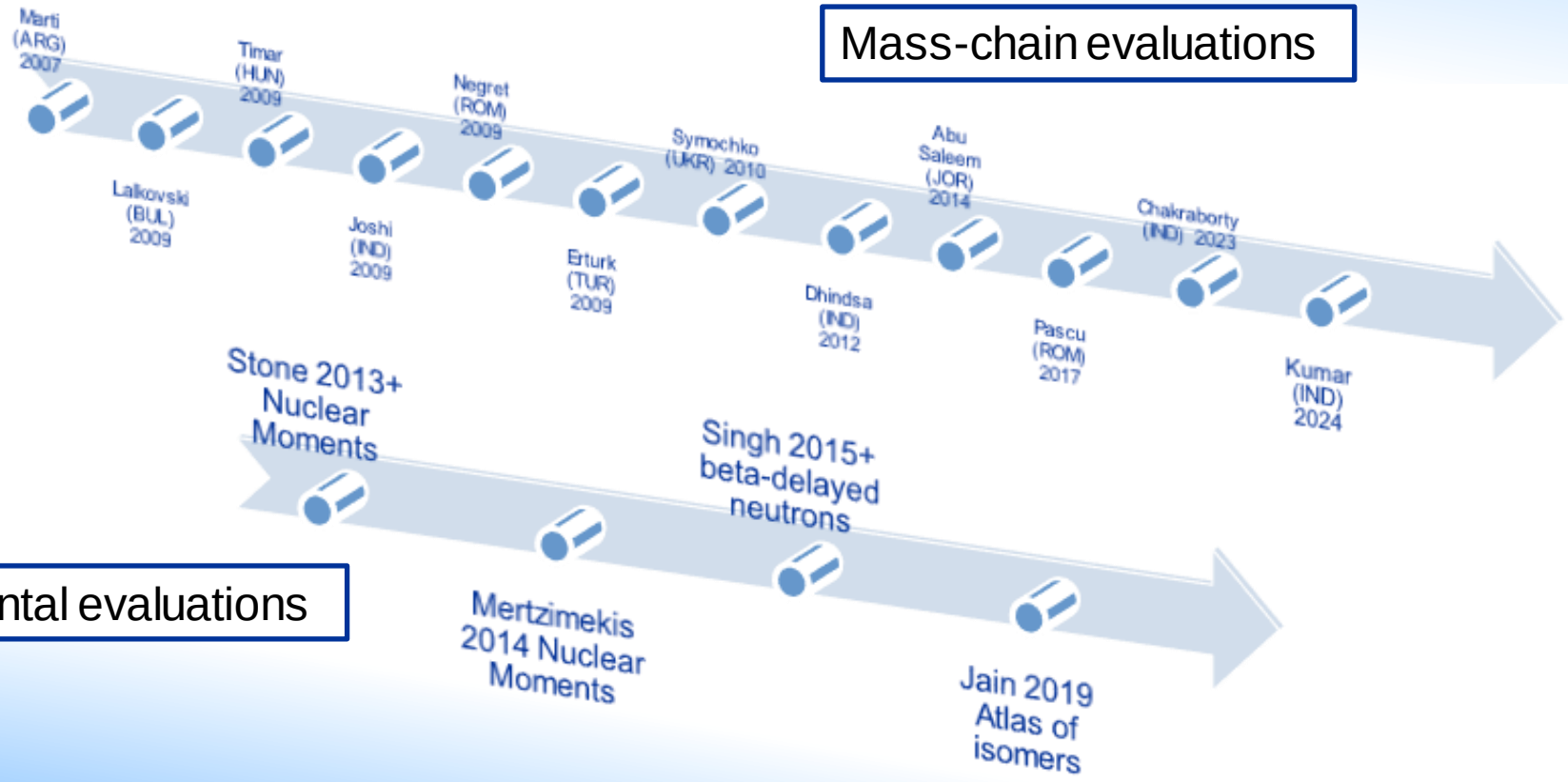
Important outcome: revision of Guidelines for Evaluators, Martin, 2021

Evolution

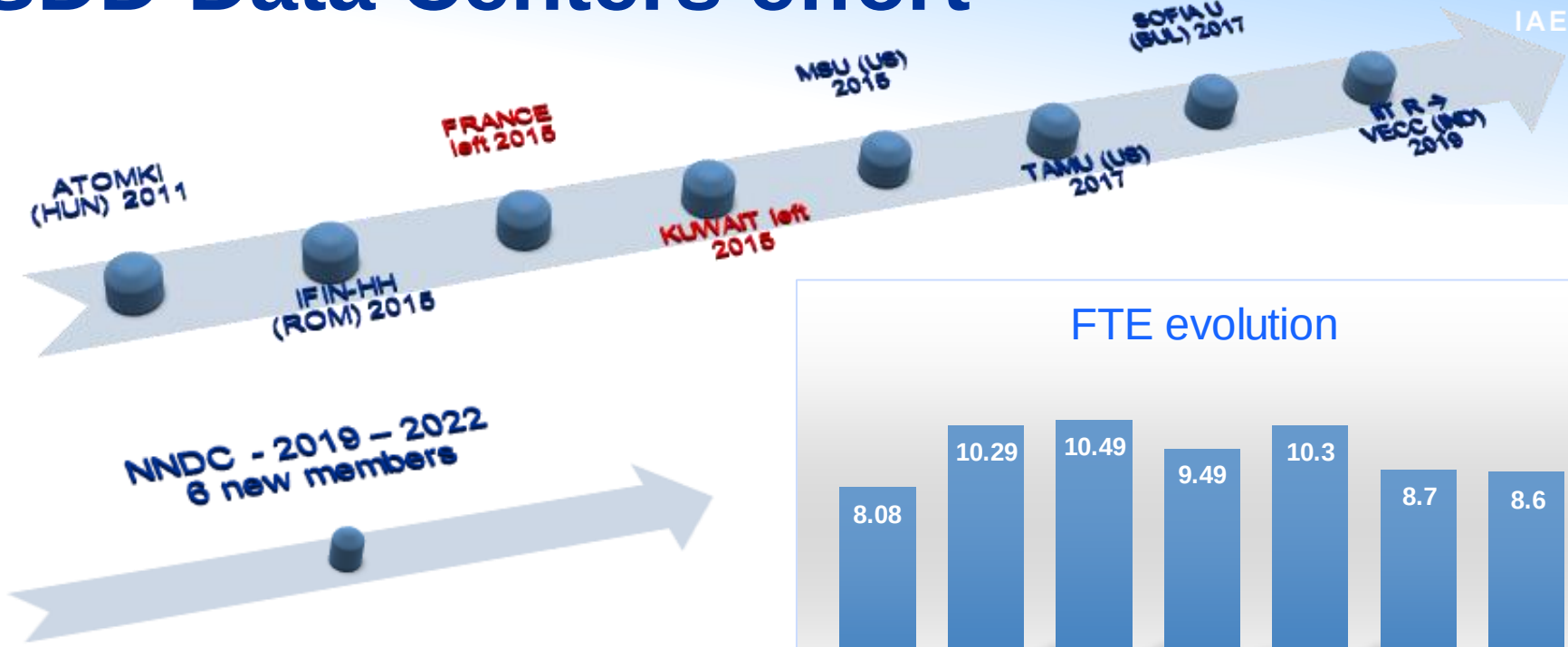
Data Center	1981	1986	1996	2008	2015	2022	2024
North America	6	6	6	6	7	8	7
Europe	6	5	4	1	2	3	3
	NL, UK, FRG, SWD, FRA, BEL	NL, FRG, SWD, FRA, BEL	NL, SWD, FRA, BEL	FRA	HUN, ROM	BUL, HUN, ROM	BUL, HUN, ROM
	WEST →						EAST
Russia	2	2	2	1	1	1	1
Japan	1	1	1	1	1	1?	1?
China	-	1	1	2	2	2	2
Kuwait	1	1	1	1	-	-	-
Australia	-	-	-	1	1	1	1
India				1	1	1	1
Total	**16**	**15**	**15**	**14**	**15**	**17**	**16**

IAEA-NDS seed grants (2007+)

Objective: assist in establishing ENSDF evaluation activity in new evaluators' institutes

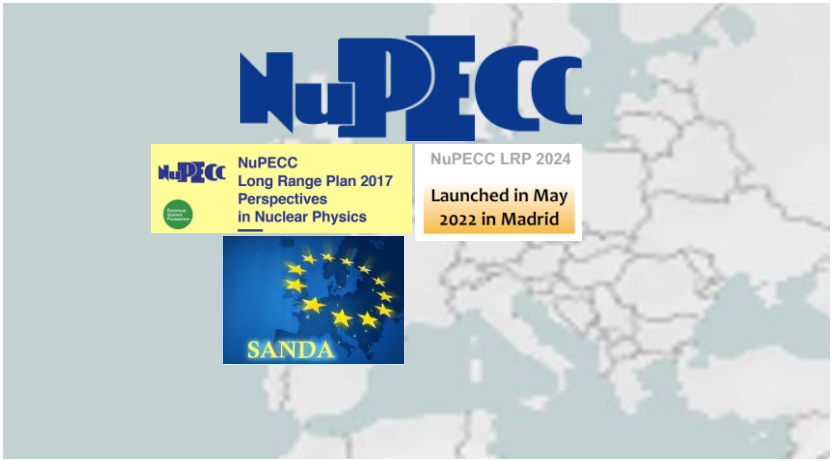


NSDD Data Centers effort



10-year recycling of mass chains: require FTE=12 (12 full-time evaluators)

Efforts to enhance NSDD network



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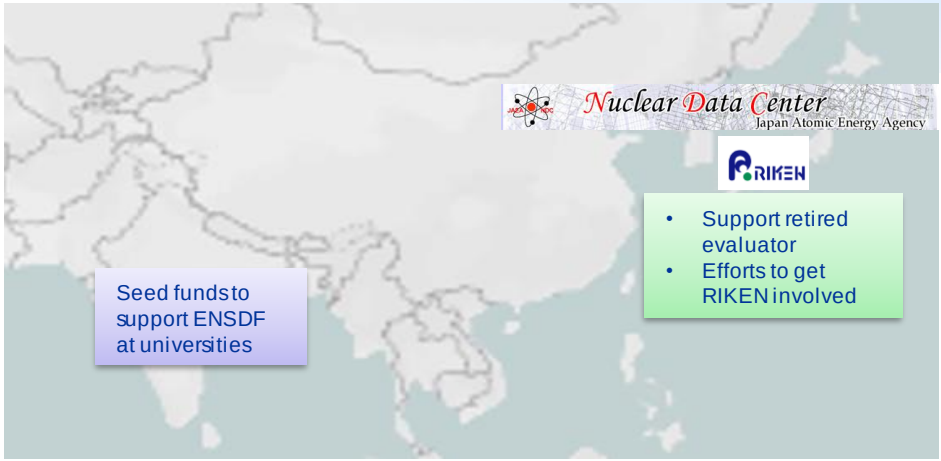


SANDA: EURATOM Project – first time ENSDF evaluations have been funded – 20 kEuros to each DC (Bulgaria, Hungary, Romania)

RIKEN 2015+: Scientist selected - trained by Filip Kondev – trainee has left RIKEN

NuPECC Long Range Plan
July 2017

Applications and societal benefits – WG6

NuPECC Liaisons: Ioan Ursu, Jan Dobeš, Nicolas Alamanos ; Conveners: Marco Durante – Alain Letourneau
WG6 members : Eduardo Alves, Christoph Bert, Adrien Bidaud, Nicola Colonna, Daniel Cussol, Sergey Dmitirev, Xavier Doligez, Tobias Engert, Gilles de France, Carlos Granja, Ferid Haddad, Laura Harkness-Brennan, Sebastien Incerti, Jacek Jagielski, Maelle Kerveno, Ulli Koester, Franco Lucarelli, Ismael Martel, Christian Morel, Dénes Lajos Nagy, Dana Niculae, Alan Owens, Katia Parodi, Daniel Primetzhofer, Paddy Regan, Michael Scholz, Thomas Stöhlker, Zita Szikszai, Olof Tengblad, Vladimir Wagner

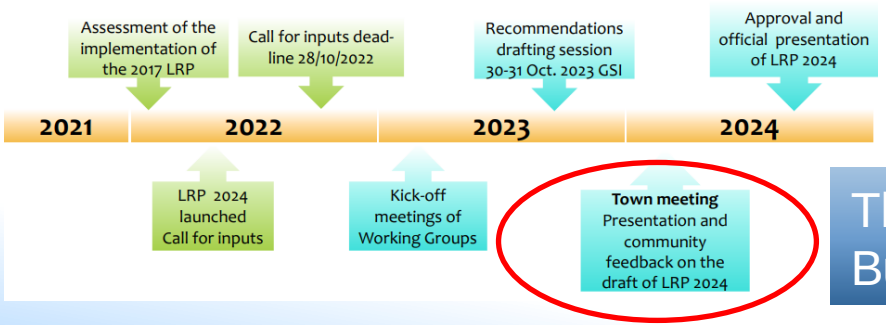
The compilation, evaluation and dissemination of nuclear data are laborious tasks that rely heavily on contributions from experts in both the basic and applied science research communities. Efforts carried out at national and international levels benefit from the coordination provided by international organisations such as the International Atomic Energy Agency (IAEA) in Vienna and the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (NEA-OECD) in Paris. The development and maintenance of nuclear data libraries, and dissemination of nuclear data to various user communities constitute major goals of the international networks associated with these agencies: the Nuclear Reaction Data Centres Network (NRDC/IAEA), the Nuclear Structure and Decay Data evaluators (NSDD/IAEA), and NEA Data Bank. The challenge facing the nuclear research and applications communities is to ensure that the new measurements performed in the European facilities are incorporated promptly into the available databases and are therefore used in both reaction modelling and evaluations that are important for energy and non-energy applications.

6. Summary and recommendations

- *Support activities related to the compilation, evaluation and dissemination of nuclear structure and decay data in Europe*
- *Maintain a high level of expertise in nuclear data evaluation to meet the requirements of a continuously developing European research and applied sciences landscape through targeted training and mentorship schemes*

NuPECC Long Range Plan 2024

- To be published in 2024 (159 contributions by >400 scientists, collaborations, infrastructures, and research institutions in Europe)
- 9 thematic areas (TWG):
  - Hadron physics; Strongly interacting matter at extreme conditions; Nuclear Structure and Reaction Dynamics; Nuclear Astrophysics; Symmetries and Fundamental Interactions; Infrastructures; Applications and Societal Benefit; Nuclear Physics Tools; **Open Science and Data**; Nuclear Science – People and Society
- TWG 9: **Open Science and Data**
  - Coordinator: Antoine Lemasson (GANIL)
  - Section on **Nuclear Data and Evaluation**: P (Vivian) Dimitriou
- Timeline:



This week in Bucharest!!!

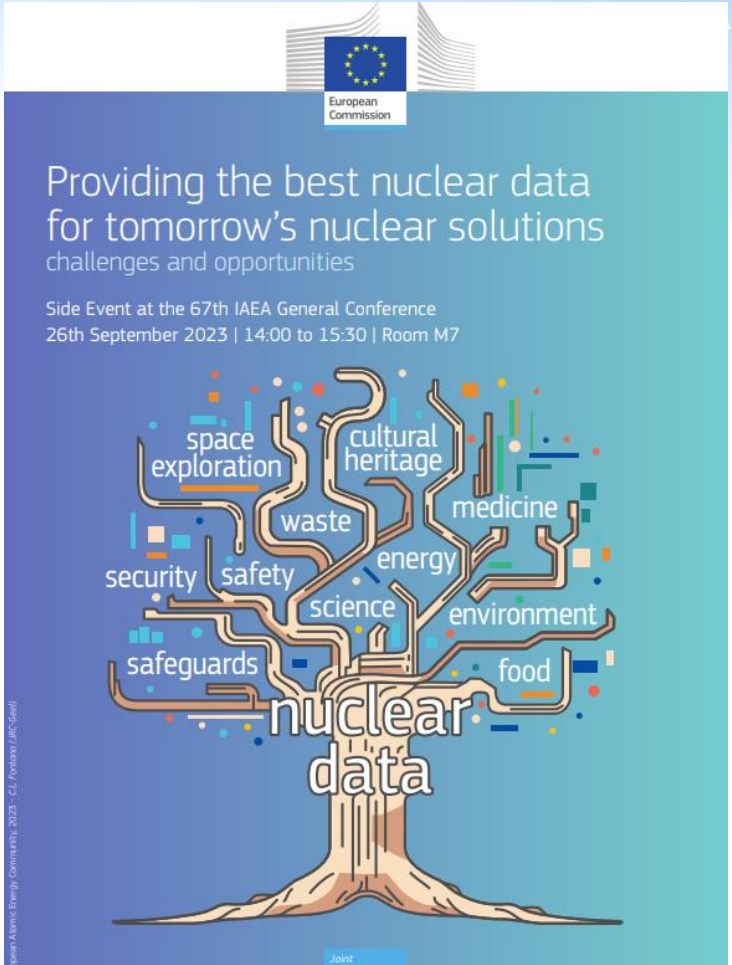
Consultants' Meeting on Needs for a Comprehensive European Plan to acquire and curate Nuclear Data

- 25-27 April 2023, IAEA
- Guest (remote) presentation: Keith Jankowski (US DoE)
- Report: INDC(NDS)-0875; https://conferences.iaea.org/event/347/
- Some key recommendations:
  - establish priorities for nuclear data measurements and evaluations for applications that will be addressed by **a comprehensive European nuclear data programme** - the priorities should be based on existing priority lists maintained by the different stakeholders
  - establish a **sustainable source of funding of measurements and data evaluation, including well-defined career paths in nuclear data** that will involve national funding agencies and the European Commission (EC) (EURATOM and all other relevant EU work programmes)
- Proposed action:
  - Consider **organizing a side event at the IAEA General Conference 2023** to highlight the importance of nuclear data programmes for basic sciences, nuclear energy development and other applications worldwide

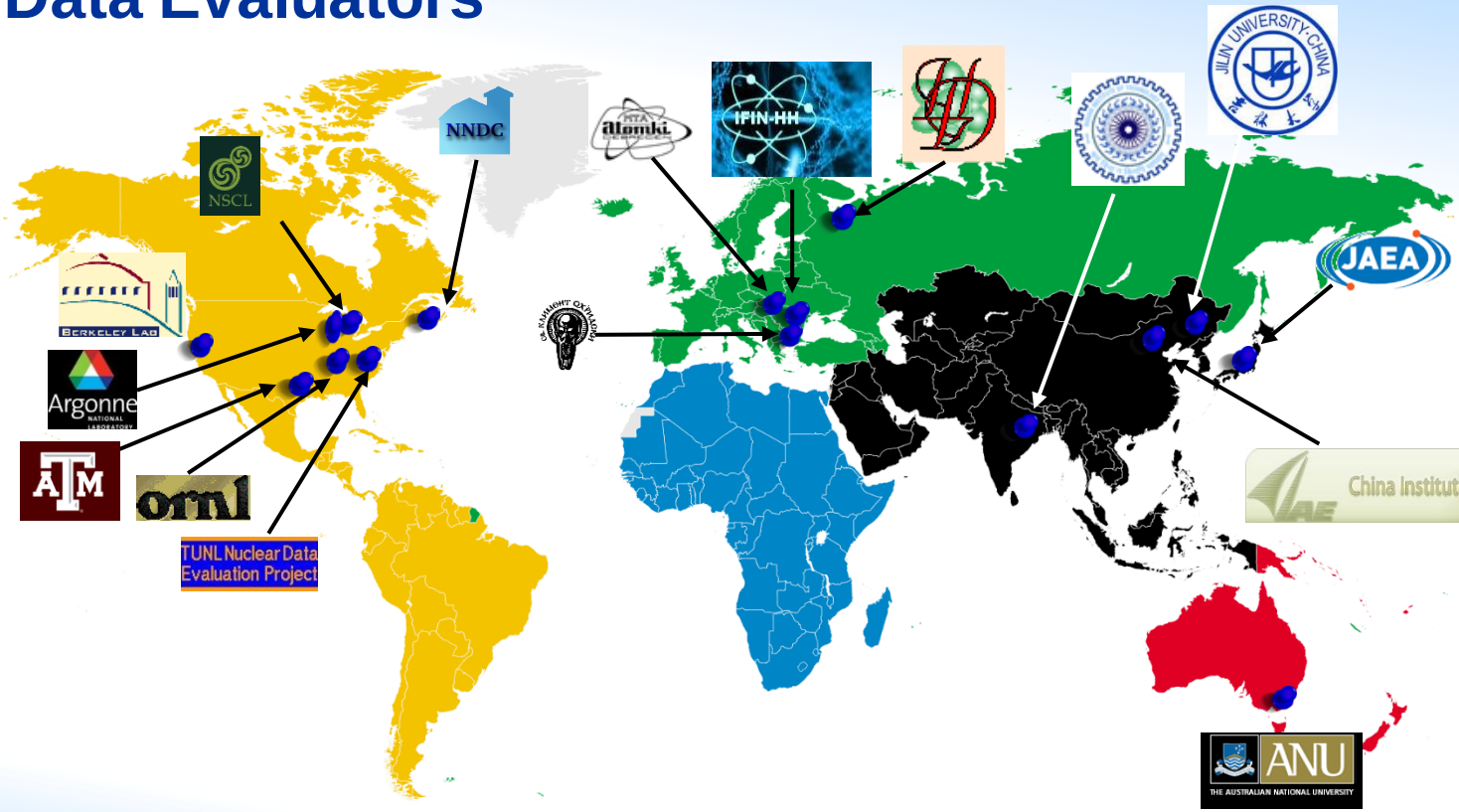
IAEA 67th General Conference – Side Event

Providing the best nuclear data for tomorrow's nuclear solutions

- 26 September 2023, IAEA
- Lead organiser: Joint Research Center – EC (Arjan Plompen)
- Facilitated and supported by IAEA/Nuclear Data Section
- https://www-nds.iaea.org/index-meeting-crp/GC67-SideEvent/
- Innovation, research and development for tomorrows' nuclear solutions
  - Yolanda Benito (CIEMAT, Director General)
  - Heloise Goutte (CEA, Scientific Director for Energy)
  - Michael Fleming (OECD-NEA, on behalf of the DG)
- Opportunities, challenges and ways forward for nuclear data
  - Arjan Koning (IAEA) – Introducing nuclear reaction and decay data
  - Arjan Plompen (JRC-EC) – European perspective
  - Keith Jankowski (USDoE) – United States perspective
  - Tokio Fukahori (JAEA) – Japanese perspective
  - Wenming Wang (CIAE) – Chinese perspective

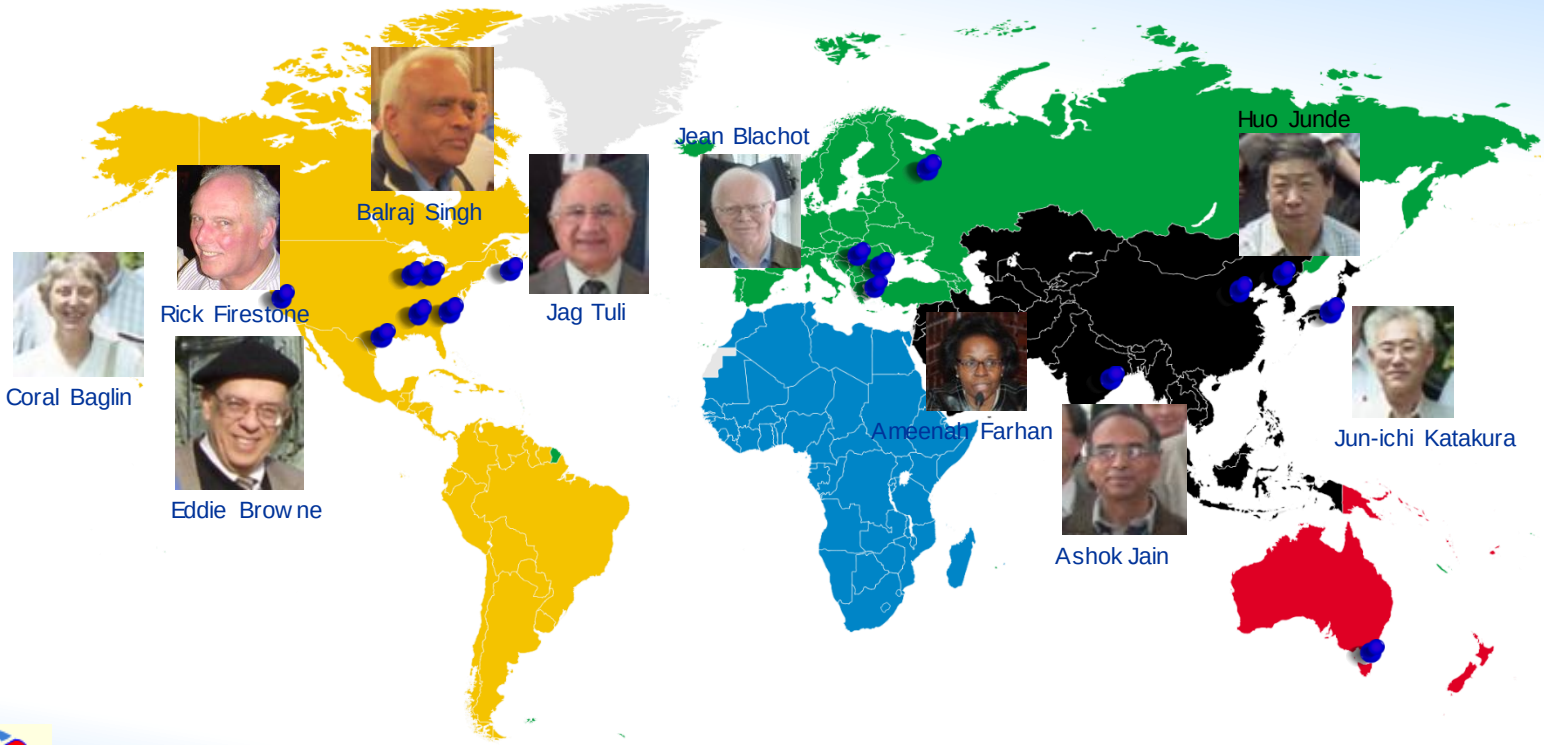


International Network of Nuclear Structure and Decay Data Evaluators



2024:16 Data Centres + IAEA-NDS

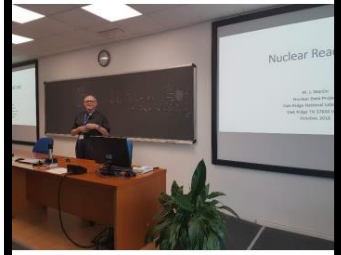
Retirements since 2009



2024:16 Data Centres + IAEA-NDS

Since 2009: Loss of 3 pillars of the network

Murray J. Martin



It is with great sadness that we have to inform you that our dear colleague and friend, unwavering supporter of and dedicated contributor to the NSDD network Murray John Martin passed away on 9 March 2022.

Murray Martin was born on June 22, 1935, in Regina Saskatchewan, Canada. After obtaining an M.A. in experimental physics from the University of Saskatchewan in 1959, he moved to McMaster University in Hamilton, Ontario to pursue his Ph.D. degree in theoretical physics. Following his graduation in 1962, Murray accepted a job with the Nuclear Data Project led by Katherina Way in Washington, D.C. In 1964 the Data project was moved to the Physics Division at Oak Ridge National Laboratory (ORNL) where Murray spent his professional career until his retirement in 1997. He eventually became head of the group and Editor-in-Chief of the journal Nuclear Data Sheets. After retirement, he continued to work part-time as a consultant to the Data Project (ORNL).

Murray's numerous achievements include the Guidelines for Evaluators and the seminal work on the logft tables for beta decay which are still widely used to date.

Murray was a kind and thoughtful person, who offered his wisdom generously and cared for his colleagues and students deeply. He will be sorely missed.

Edgardo (Eddie) Browne Moreno

We are very sorry to inform you that Eddie Brown passed away on 14 May 2022.

Eddie joined the Isotopes Project at Lawrence Berkeley National Laboratory (LBNL) in the mid-1970s. He was one of the Principal Authors of the Table of Isotopes, 7th Edition, 1978, as well as prime author of the Table of Radioactive Isotopes, 1986, a book containing re-evaluated decay schemes of all known radioactive nuclei. These monumental works are still used and cited by nuclear scientists worldwide. He was one of the founding members of the Decay Data Evaluation Project, based in BNM-CEA/LNHB, Saclay, France.

Eddie evaluated a huge number of mass chains for the Evaluated Nuclear Structure Data file (ENSDF), and actively participated for almost 40 years as a key member of the International Nuclear Structure and Decay Data Network under the auspices of the IAEA and with the support from the U.S. Nuclear Data Program of the DOE.

Eddie was an extremely friendly and caring person with a great sense of humor. He was always welcoming to visitors at the Isotopes Project and willing to offer his advice to students and colleagues. He will be dearly missed.

In Memoriam

Balraj Singh (1941 - 2023)

Our dear colleague, mentor, teacher, and friend, Balraj Sing, passed away on 9 October 2023.

Balraj completed his PhD at the University of Toronto in 1971 with Dr. Harry Taylor. The title of Multipole Mixing of Gamma Transitions in ^{134}Ba and ^{102}Ru". He then held post-doctoral fellowsh University of Toronto (1974-1976), and McGill University (1976-1978). He was a Research Scie (KISR) from 1978 to 1984. In 1985 he moved back to Canada to start the Nuclear Data Progra Hamilton, Ontario. He remained at McMaster University until his retirement in 2013. From the r Lawrence Berkeley National Laboratory where he worked with some of the nuclear data giants Eddie Browne. After his retirement, he continued working for Brookhaven National Laboratory (

In reality, Balraj never retired. For almost five decades he worked tirelessly on mass chain eval projects. As a nuclear data evaluator, Balraj was the single most prolific evaluator in the history of Nuclear Data Sheets and E of the international network of Nuclear Structure and Decay Data evaluators (NSDD). A total of 80 published mass chains out is 27% of all the mass chains; a feat only Balraj could accomplish.

In addition to data evaluation, in 1998 Balraj initiated the nuclear structure and decay compilation effort by establishing the (XUNDL). He also inspired and supervised the development of several of the analysis and utility codes that are currently used mass chain evaluations, more than any other ENSDF evaluator and contributed 6538 out of a total of 10584 datasets to the X database. Aside from the sheer volume, his work has always been appreciated for its high quality and comprehensiveness.

By actively engaging in meetings and passionately contributing to discussions on a wide range of topics, including nuclear ph procedures and policies, he played a pivotal role in advancing various aspects of nuclear structure and decay data evaluation.

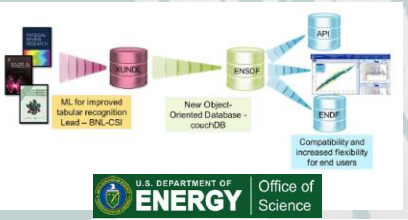
He trained numerous students at McMaster University and supervised compilation and evaluation exercises at several of the I to introduce mass chain evaluation as an exercise at the workshop has led to five publications of mass chains in Nuclear Data workshop participants.

Yuri Khazov - 2014

Shaofei Zhu - 2021

2024: 17→16 NSDD centres + IAEA

Outlook



U.S. DEPARTMENT OF ENERGY | Office of Science

- Funding opportunity to increase nuclear data evaluator workforce
  - Capacity for international applicants too

European Commission

APRENDE

Additional FTE=0.5 (BUL)

中国原子能科学研究院 CHINA INSTITUTE OF ATOMIC ENERGY

CNNC 中核集团

New recruits – start training in 2024

Outreach

Quest to find new ENSDF evaluator
Japan Physics Society Conference 2024

Seed funds to support ENSDF at India universities

?

Argentina: Outreach activities in discussion

Conclusions I

- The first 50 years of the NSDD network have been productive in spite of an evolving shortfall in evaluators and a growing lack of funding
- This is largely due to the formidable performance and dedication of a key number of “pillars” of the network

Challenges and opportunities

- Modernized ENSDF, new format, analysis tools, and approaches (ML/AI, etc.)
- International cooperation is beneficial for all parties
- But still all depends on availability of skilled and properly funded workforce

Conclusions II

- Bottom-up approach (training, seed funds, outreach, etc.) can only take us so far
- It is time for top-down decisions and actions (funding opportunities, career paths, long-term nuclear data programs)

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Thank you!