Nuclear Data Evaluation and its spinoffs

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What is Data Evaluation

- What is Data Evaluation
- Brief history of Data Evaluation
- Offshoots of Data Evaluation
- Some observations from Data Evaluation- Our experienes

Data Evaluation

- Standardization of Experimental data
- Published data has discrepancies
- Between different experiments and even within the same experiment
- Standardized data available in easy format
- New experiments?
- New direction to researchers?

Situation where current data does not match with previously published data. No physics explanation and later withdrawals

How to avoid such problems

Generate ENSDF file and run gtol and other codes.

A workshop in February 2020?

What is the current status on the quantum of half-life value measurements ?

How is the situation with spin & parity

A survey on whole nuclear chart (almost).

Define P value

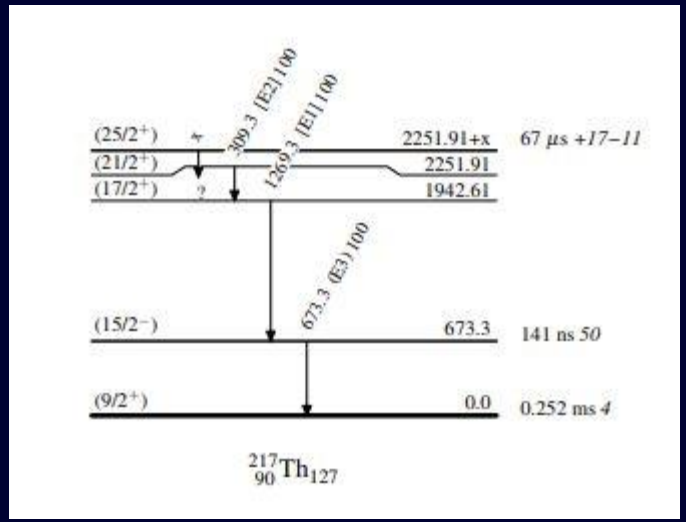
P= Number of levels whose half life is measured x 100
Total number of levels measured/observed in that nuclei

If a nuclei has 137 energy levels and if 17 out of those have their Half life values measured P = 17 x 100/137 = 12.4

For nuclei with very few levels the P values are kind of discrete.

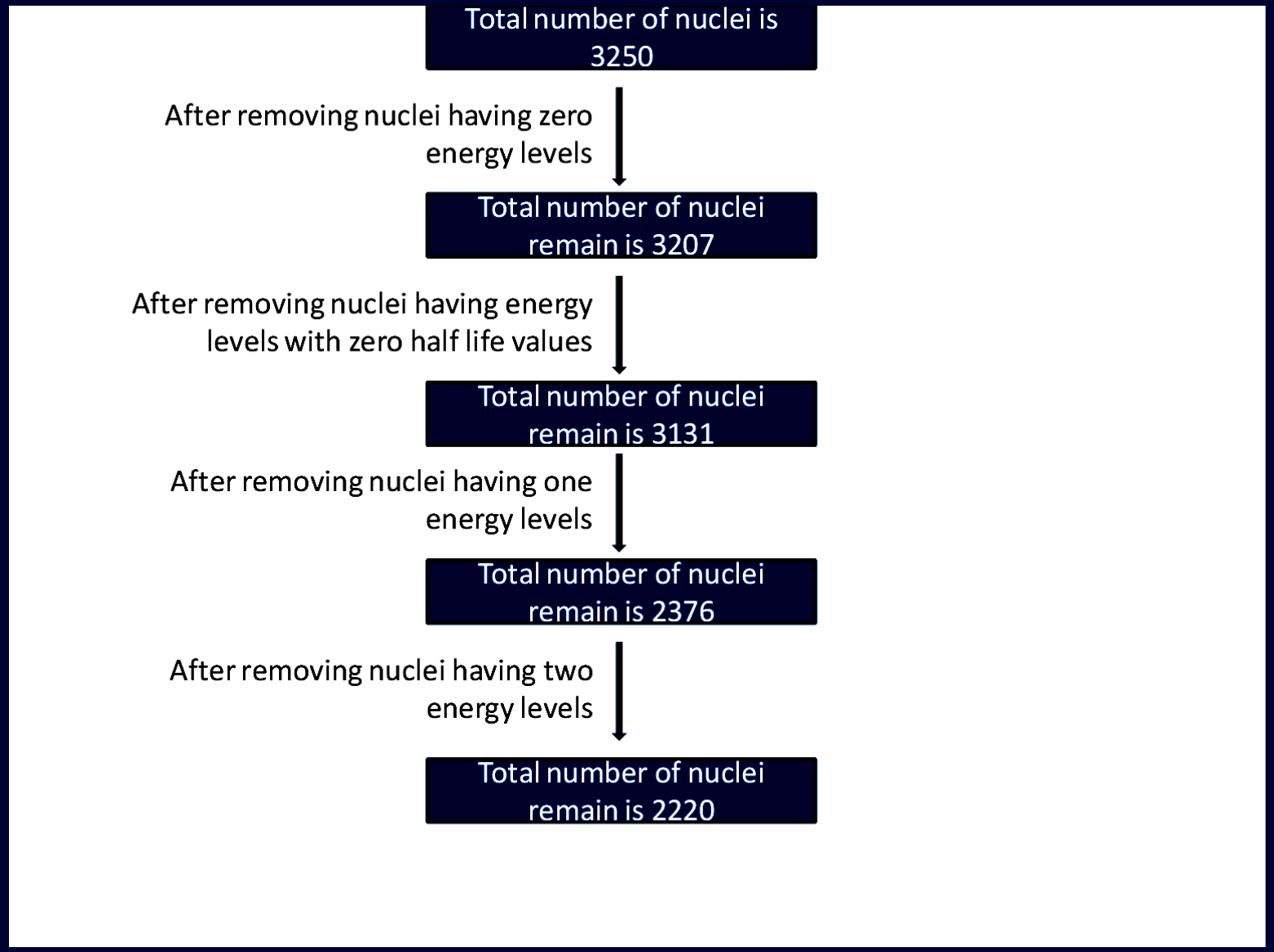
Eγ for nuclei which has only 5 levels the P values can be 20, 40 etc

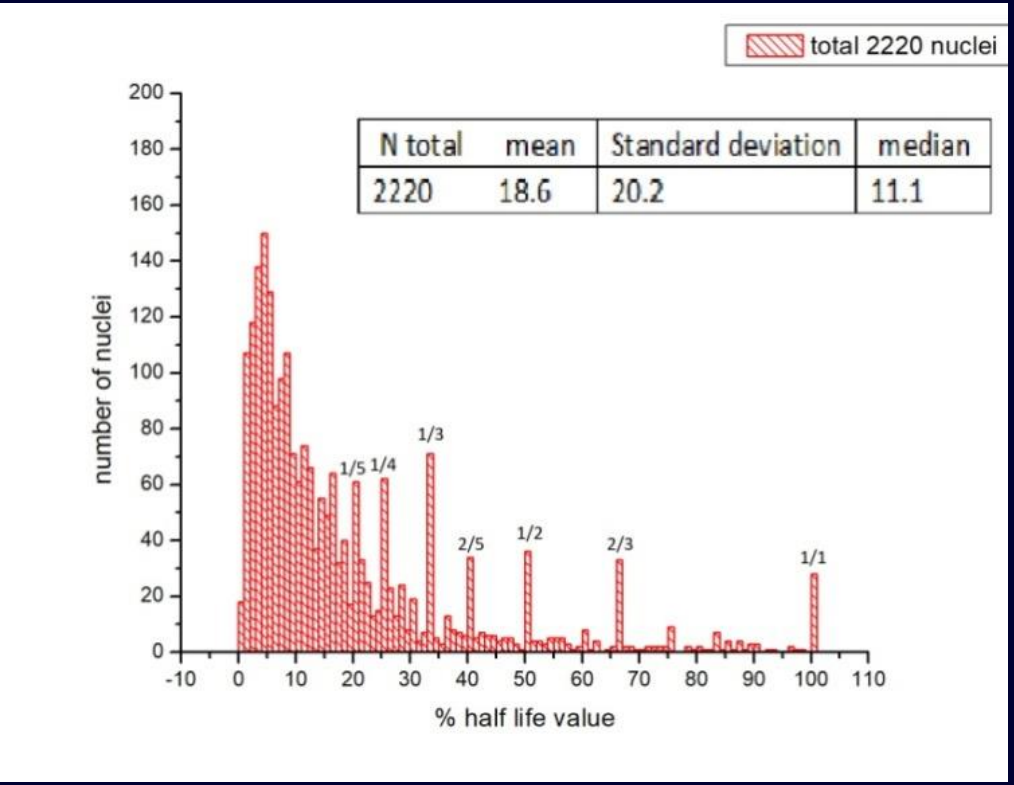
But nuclei where large number of energy levels are known the values can be in decimal numbers.



P=60.0

Full Nuclear Chart (A ≤ 260)





For all the nuclei : median of P at 11.1

It means: for 50 percent of nuclei less than 11 % levels have their half life values measured.

Peak of this distribution at **P=4**

If the spikes are “removed” the median is at mere 9.4% !!

Cases with P=absolute 0

There are 76 nuclei with NO half life value for any energy level

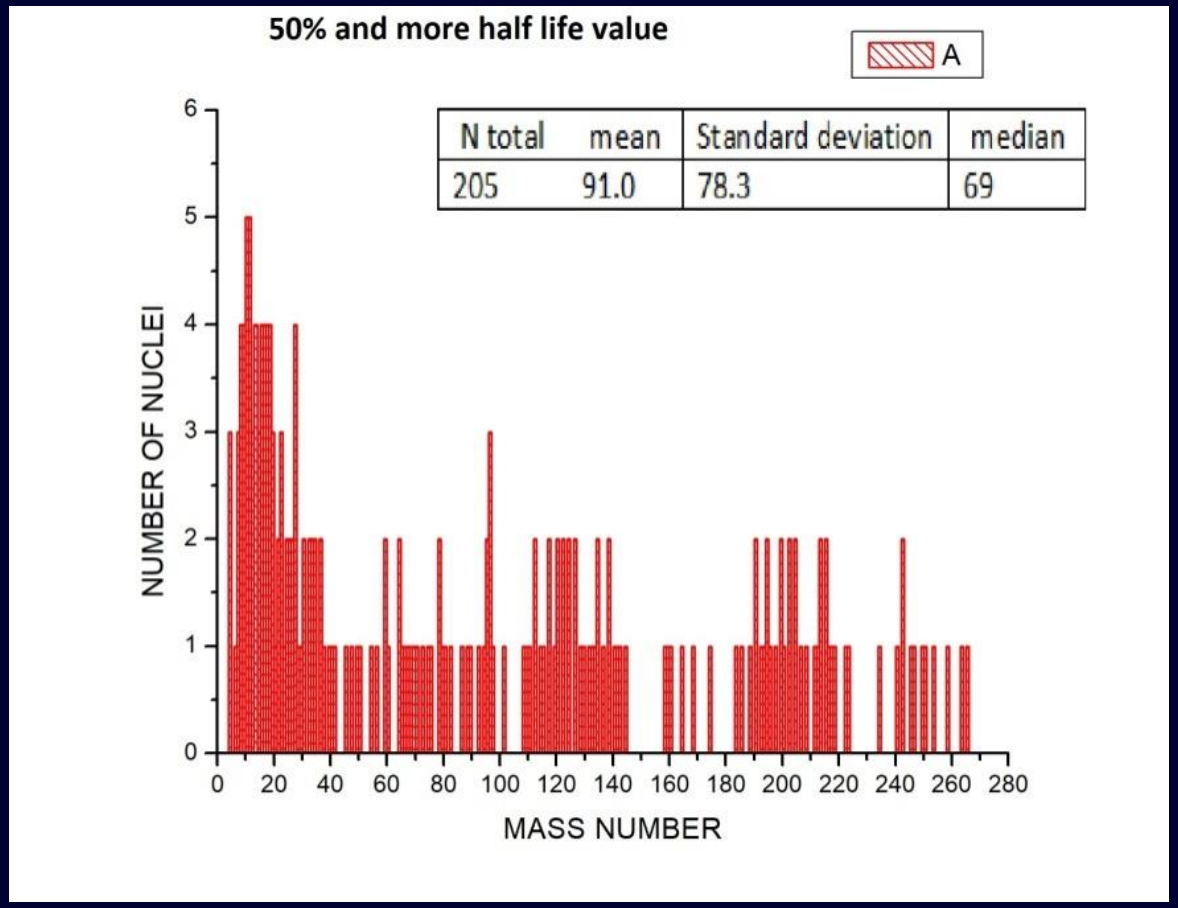
In 65 (out of 76) only ground state is observed

In 8 nuclei there is only GS + 1 excited state

In ^{170}D y and ^{239}Bk There is GS + 2 excited states

In ^{122}Ce there is GS + 7 excited states.

P ≥ 50

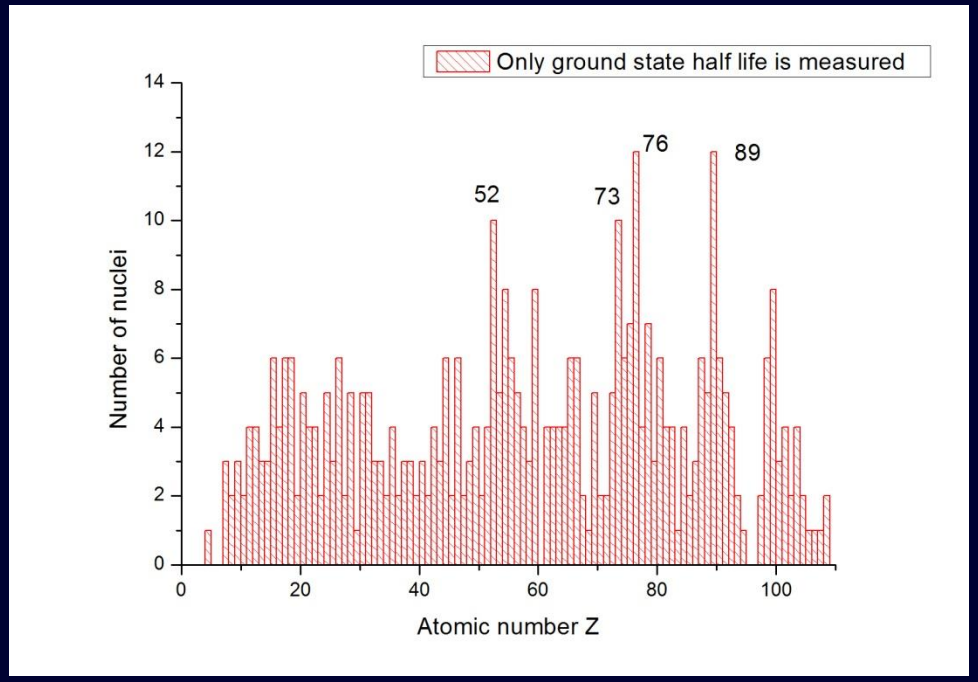


Gaps at A = 100, 150,180,230

Large concentration around low A values and A=120

403 nuclei who have only ground state half-life known.

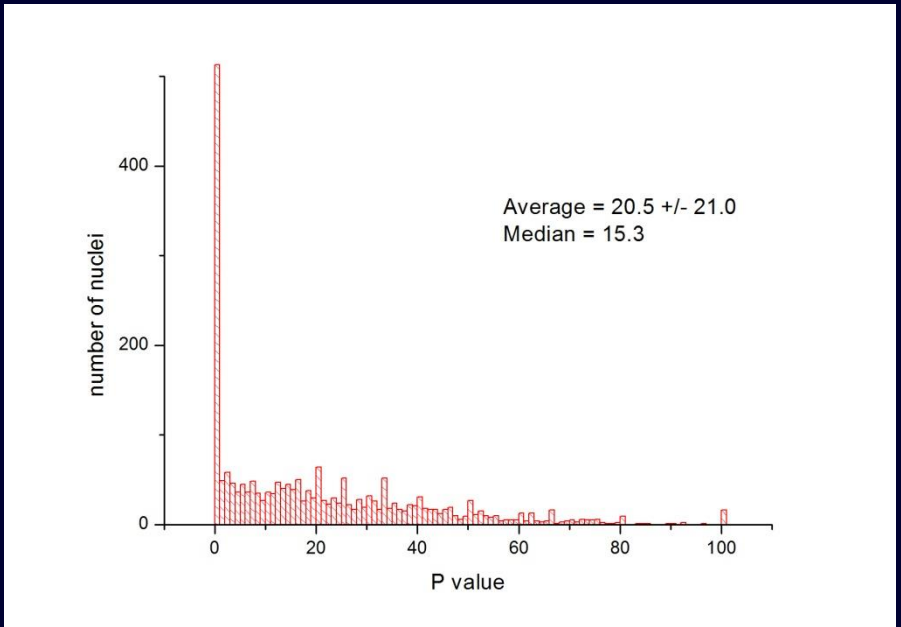
Out of 403 , 227 of them have more than 10 levels observed.



Spin (&Parity) data on nuclear chart.

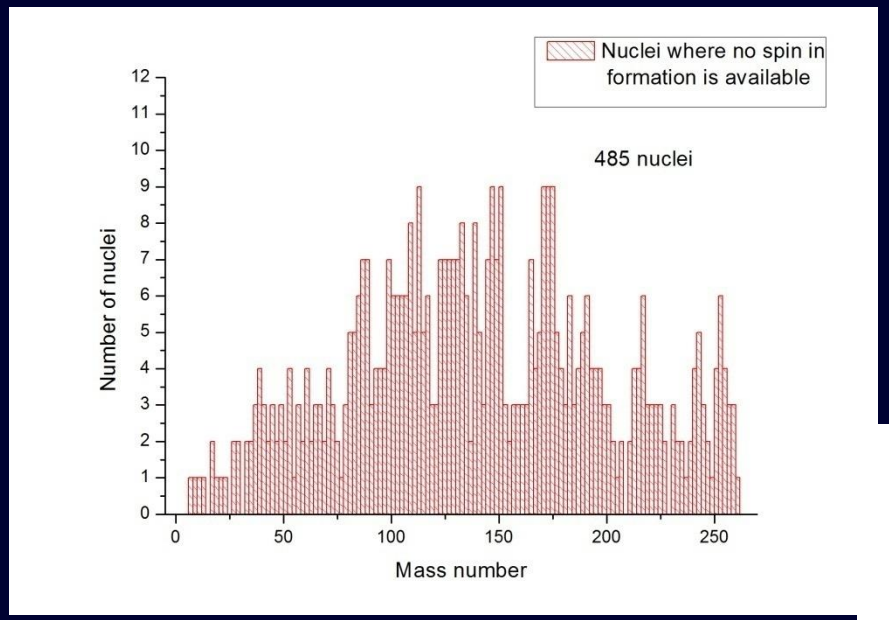
485 Nuclei where there are more than 3 levels but NO **(CONFIRMED)** SPIN information for any level.

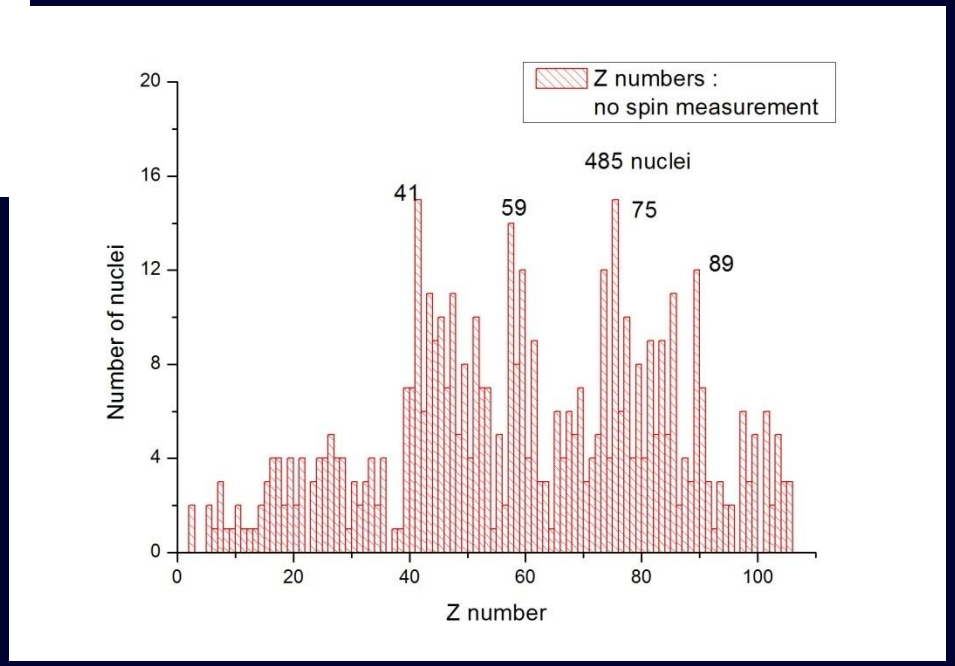
Of these 298 nuclei have more than 10 energy levels known.



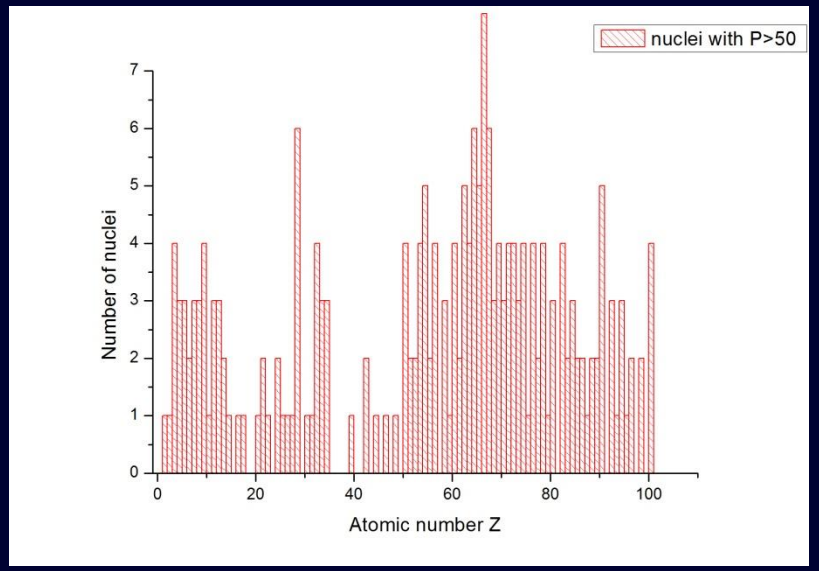
2220 nuclei

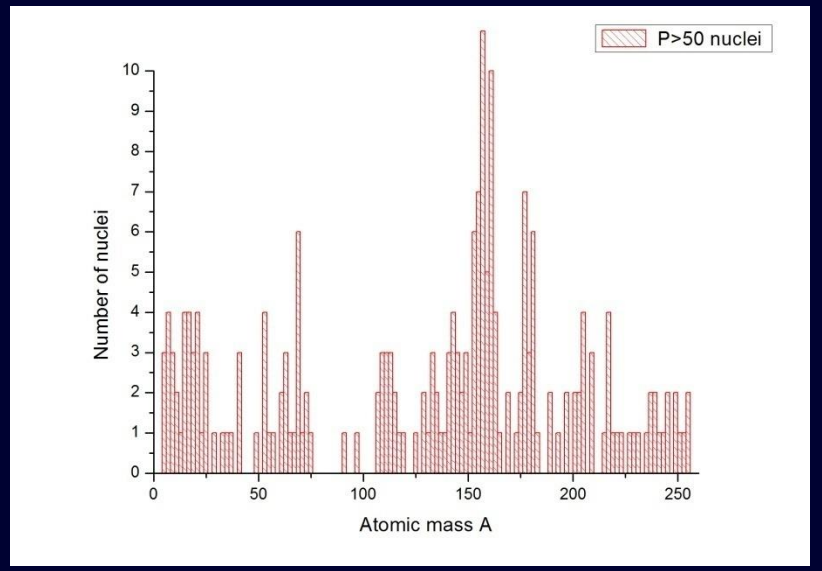
Mass range	Average	Median
1-50	29.1 ±23	26.0
51-100	17.8 ±17.2	14.3
101-150	17.7 ± 19.3	12.0
151-200	21.0 ± 22.2	14.3
201-260	21.5 ±23.0	16.3


Nuclei where no spin in formation is available
485 nuclei
Number of nuclei
Mass number
0
1
2
3
4
5
6
7
8
9
10
11
12
0
50
100
150
200
250


Z numbers :
no spin measurement
485 nuclei
41
59
75
89
Number of nuclei
Z number
0
4
8
12
16
20
0
20
40
60
80
100

215 nuclei have P value more than 50





Data evaluation : led to a new measurement and refinement of data
Standardization of measured values

Discussions after data evaluation have led to some ideas about possible experiments

It has helped in making Nuclear Physics, richer

ACKNOWLEDGMENTS

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Thank You.