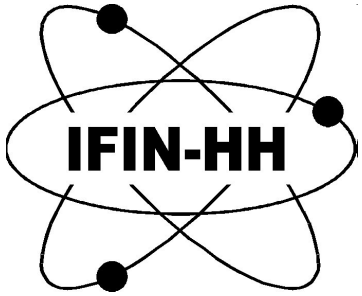

Lecture I.4
Nuclear Structure Observables

Alexandru Negret

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Outline

- The ENSDF database – generalities
- The structure of the database
- How to access the information
- The Chart of nuclides
- XUNDL, NSR

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ENSDF – general information

The Evaluated Nuclear Structure Data File

- Hosted by Brookhaven National Laboratory, USA. Freely available.
- Maintained by a network of evaluators (~30 people). Generally, each mass chain is evaluated once every few years. Sometimes the nuclei are updated individually. The mass chain updates are published in Nuclear Data Sheets.
- Purely experimental. Theoretical information included sometimes as comments.

ENSDF – structure

For each nucleus:

- Adopted Levels, Gammas
- Decay datasets
  - Decay dataset 1
  - Decay dataset 2
  - …
- Reaction datasets
  - Reaction dataset 1
  - Reaction dataset 2
  - …

^{152}Sm

- ADOPTED LEVELS, GAMMAS
- 152PM B- DECAY (4.12 M)
- 152PM B- DECAY (7.52 M)
- 152PM B- DECAY (13.8 M)
- MUONIC ATOM
- 152EU EC DECAY (13.537 Y)
- 152EU EC DECAY (9.3116 H)
- 252CF SF DECAY
- INELASTIC SCATTERING
- 150ND(A,2NG)
- 150SM(T,P)
- 150SM(T,PG)
- 151SM(N,G) E=THERMAL
- 151SM(D,P)
- 152SM(G,G')
- 152SM(N,N'G)
- COULOMB EXCITATION
- 153EU(T,A)
- 154SM(P,T)
- 154SM(12C,14C)
- 155GD(N,A)

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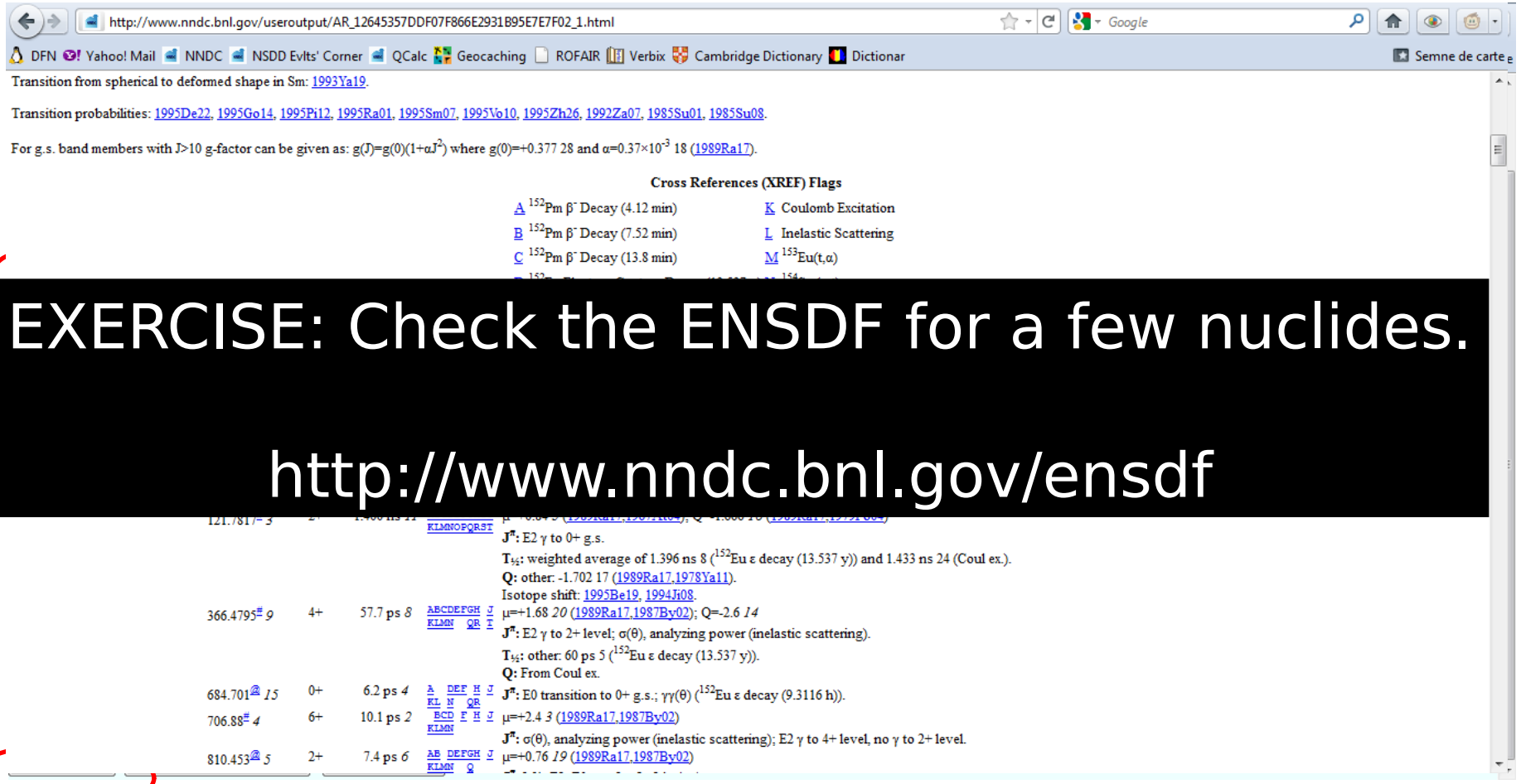
ENSDF

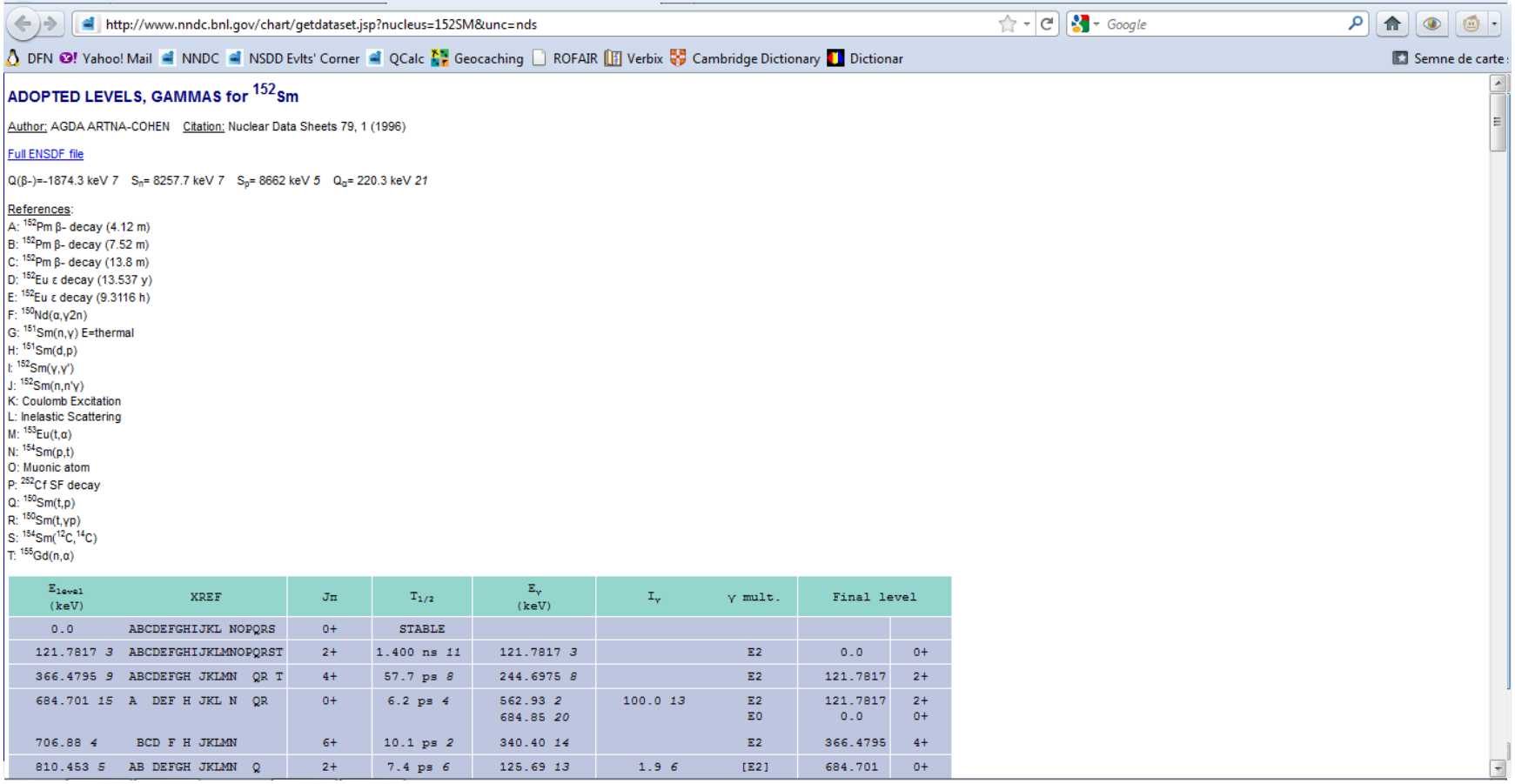


EXERCISE: Check the ENSDF for a few nuclides.

http://www.nndc.bnl.gov/ensdf

The Chart of Nuclides

The Adopted Levels, Gammas are available also in a graphical form:



http://www.nndc.bnl.gov/chart/getdataset.jsp?nucleus=152SM&unc=nds

DFN Yahoo! Mail NNDC NSDD Evlts' Corner QCalc Geocaching ROFAIR Verbix Cambridge Dictionary Dictionar Semne de carte

ADOPTED LEVELS, GAMMAS for ^{152}Sm

Author: AGDA ARTNA-COHEN Citation: Nuclear Data Sheets 79, 1 (1996)

Full ENSDF file

Q(β-)=-1874.3 keV 7 S_n= 8257.7 keV 7 S_p= 8662 keV 5 Q_α= 220.3 keV 21

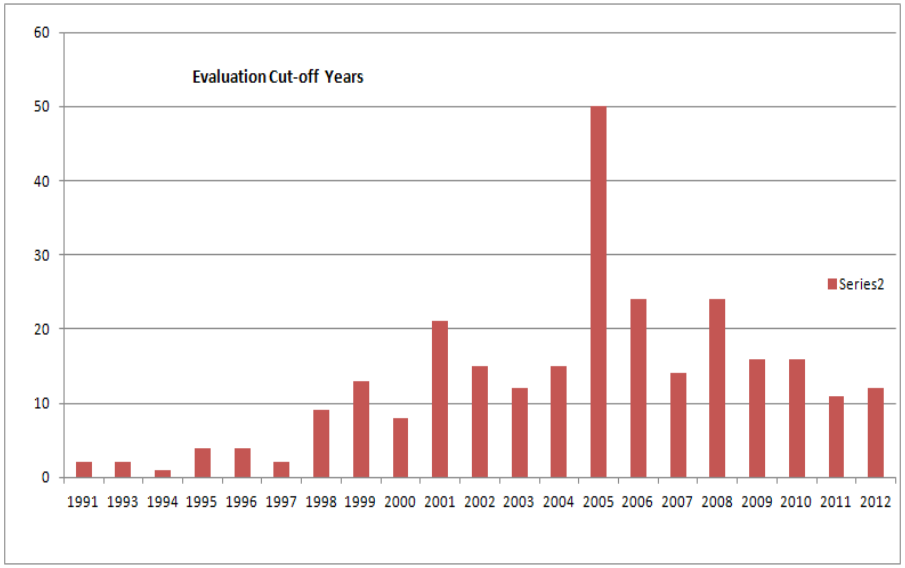
References:
A: ^{152}Pm β- decay (4.12 m)
B: ^{152}Pm β- decay (7.52 m)
C: ^{152}Pm β- decay (13.8 m)
D: ^{152}Eu ε decay (13.537 y)
E: ^{152}Eu ε decay (9.3116 h)
F: ^{150}Nd(α,γ2n)
G: ^{151}Sm(n,γ) E=thermal
H: ^{151}Sm(d,p)
I: ^{152}Sm(γ,γ')
J: ^{152}Sm(n,n'γ)
K: Coulomb Excitation
L: Inelastic Scattering
M: ^{153}Eu(t,α)
N: ^{154}Sm(p,t)
O: Muonic atom
P: ^{252}Cf SF decay
Q: ^{150}Sm(t,p)
R: ^{150}Sm(t,γp)
S: ^{154}Sm(^{12}C,^{14}C)
T: ^{155}Gd(n,α)

E_{level} (keV)	XREF	Jπ	$T_{1/2}$	E_γ (keV)	I_γ	γ mult.	Final level	
0.0	ABCDEFGHIJKL NOPQRS	0+	STABLE					
121.7817 3	ABCDEFGHIJKLMNOPQRST	2+	1.400 ns 11	121.7817 3		E2	0.0	0+
366.4795 9	ABCDEFGH JKLMN QR T	4+	57.7 ps 8	244.6975 8		E2	121.7817	2+
684.701 15	A DEF H JKL N QR	0+	6.2 ps 4	562.93 2 684.85 20	100.0 13	E2 E0	121.7817 0.0	2+ 0+
706.88 4	BCD F H JKLMN	6+	10.1 ps 2	340.40 14		E2	366.4795	4+
810.453 5	AB DEFGH JKLMN Q	2+	7.4 ps 6	125.69 13	1.9 6	[E2]	684.701	0+

Status of ENSDF

In January 2013:

- Nuclides: 3174
- Datasets: 17638
  - Adopted datasets: 3174
  - Decay datasets: 4110
  - Reaction datasets: 9503
- Size: 202MB



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XUNDL

EXperimantal Unevaluated Nuclear Data List

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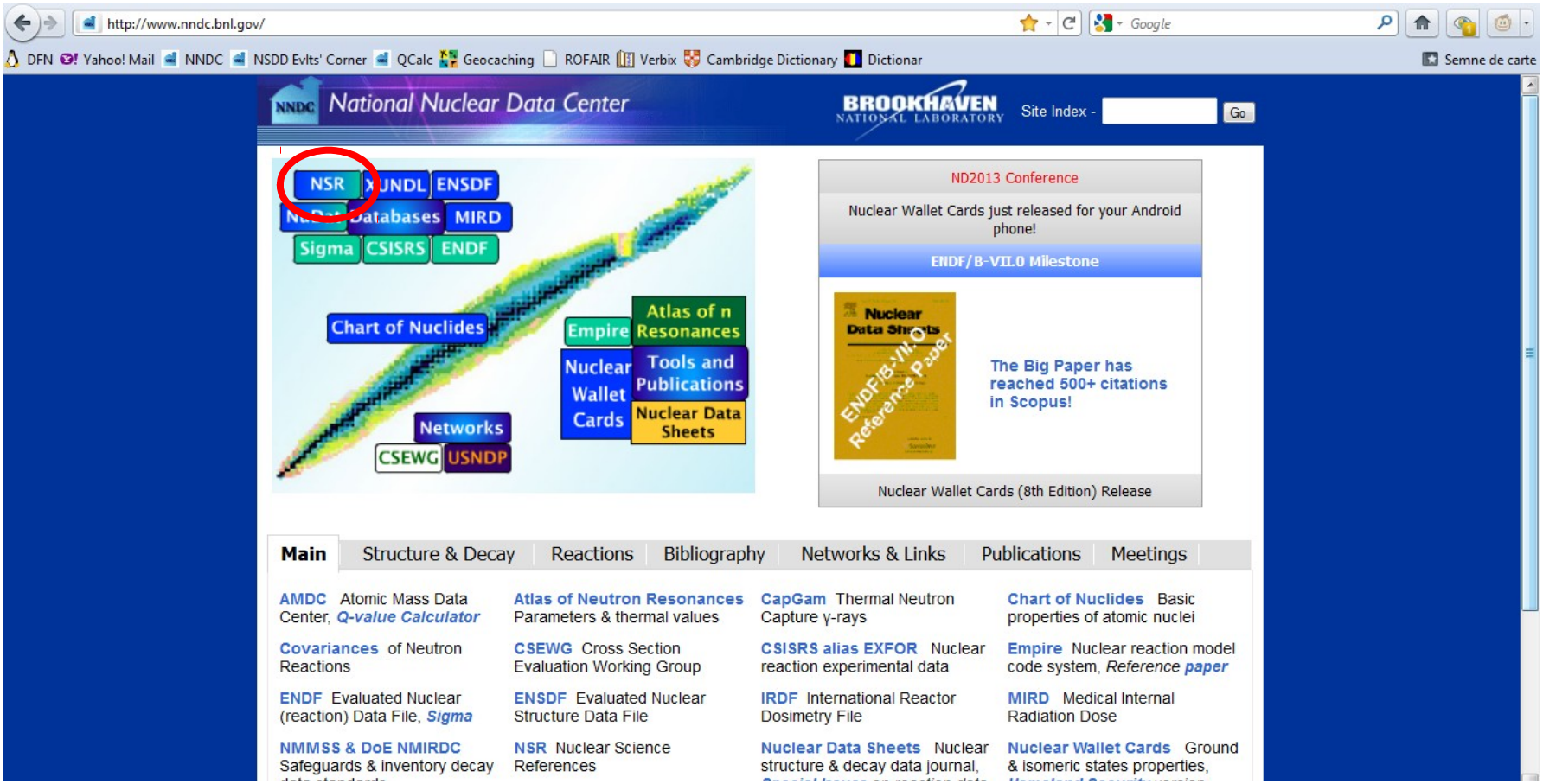
NSR

Nuclear Structure References



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Citation of ENSDF

152 Sm: A. Artna-Cohen, Nucl. Data Sheets 79, 1 (1996)

Data from AR_15964E03AE2E816F31D9047712EA87D3_1.ens

Download: AR_15964E03AE2E816F31D9047712EA87D3_1.ens **View:** Levels: PostScript level schemes in the Nuclear Data Sheets style
Bands: PostScript band drawings in the Nuclear Data Sheets style

^{152}Sm

Adopted Levels, Gammas

Published: 1996 Nuclear Data Sheets.

Q_{β^-}=-1874.3 *7* S_n=8257.7 *7* S_p=8662 *5* Q_α=220.3 *21* 1995Au04

History

Date	Type	Author	Citation	Cutoff Date	Comments
16-Jul-2007	Errata	J. Tuli			Fixed typo in comment
	Full evaluation	Agda Artna-Cohen	Nuclear Data Sheets 79, 1 (1996)	1-Jul-1996	

^{152}Sm levels

Calculations, systematics:

Analysis of scattering and fission cross sections of ^{152}Sm(^{16}O,^{16}O) and ^{152}Sm(^{16}O,^{16}O'): 1995Iz01.

β decay of 1+ states: 1993Dz04.

Charge density, $\langle r^2 \rangle$, isotope shift: 1995Fr22, 1995Gu09, 1992Ot02, 1987Ri05.

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Exercise: use the NNDC website

- Which is the energy, spin and parity of the first excited level in ^{57}Fe?
- Who is the first author of the latest article published on ^{75}Kr?
  - We are going to run an experiment where we will observe the beta decay of ^{199}Tl. Which should be the strongest gamma transition we will see?
  - Who is the author of the latest evaluation of A=84?
  - We are running an experiment at ISOLDE implanting 34Mg ions on a foil for a few hours while measuring the gamma rays. Which nuclei will we be able to study?

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Summary

- The ENSDF database – generalities
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