COLD NUCLEAR FUSION

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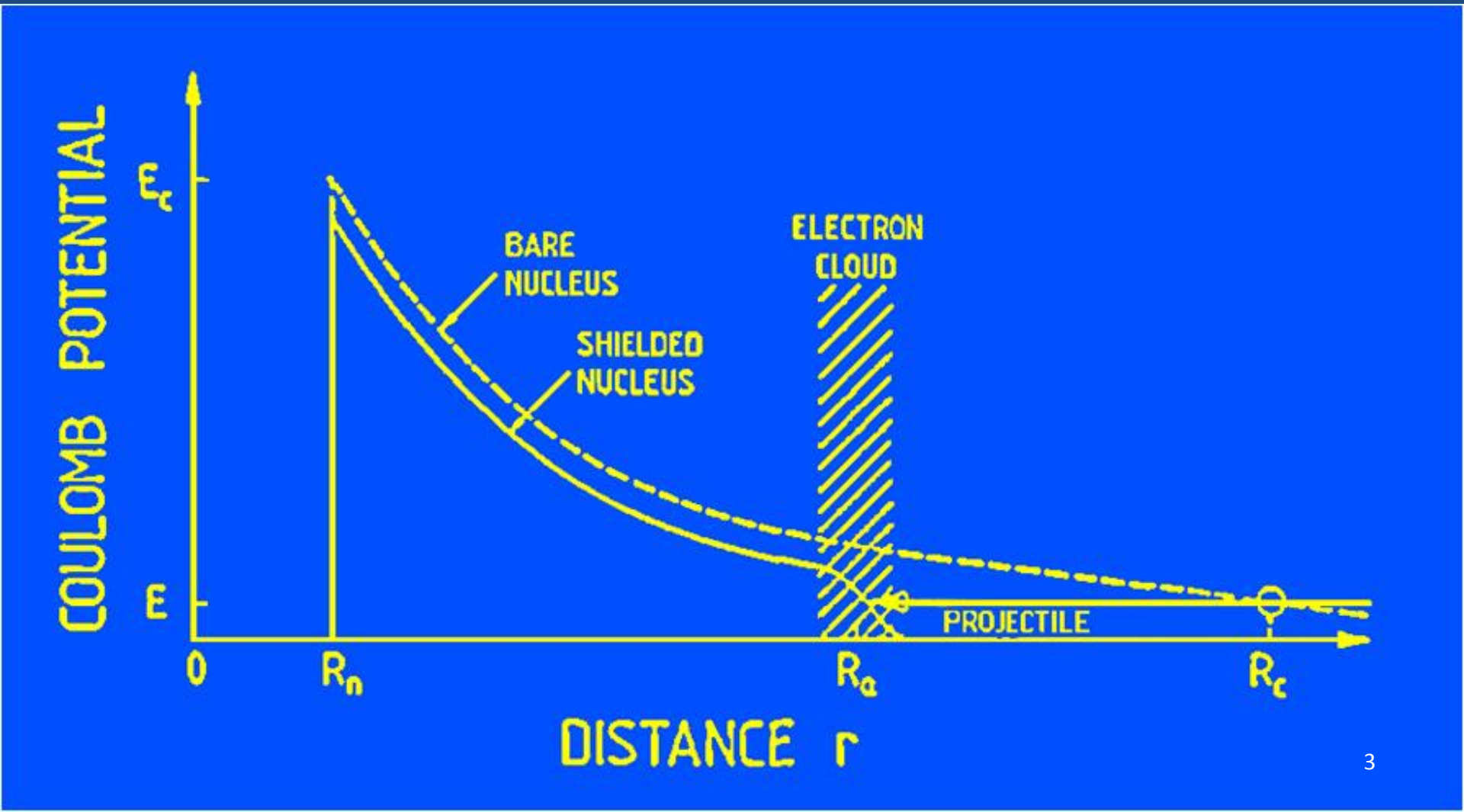
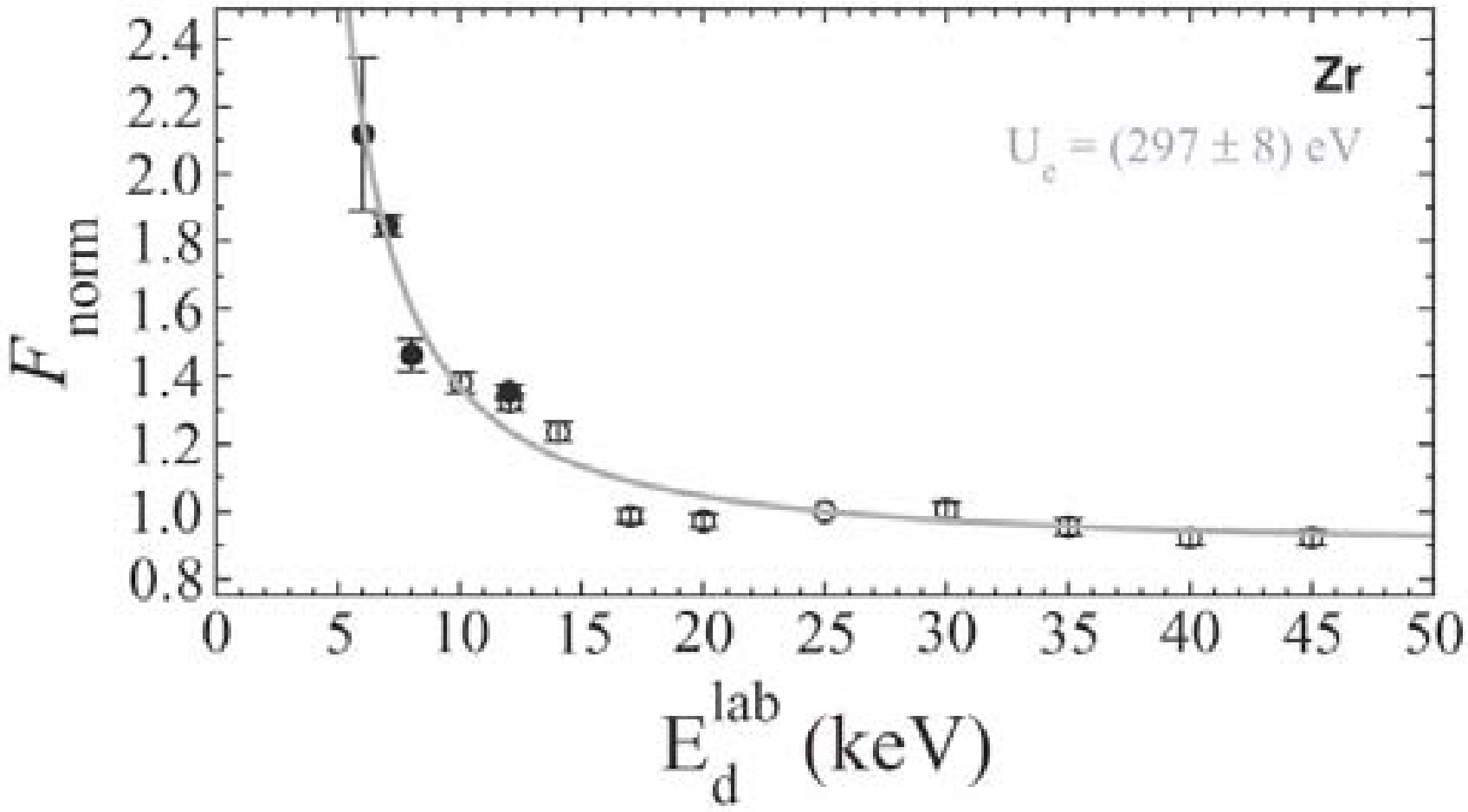
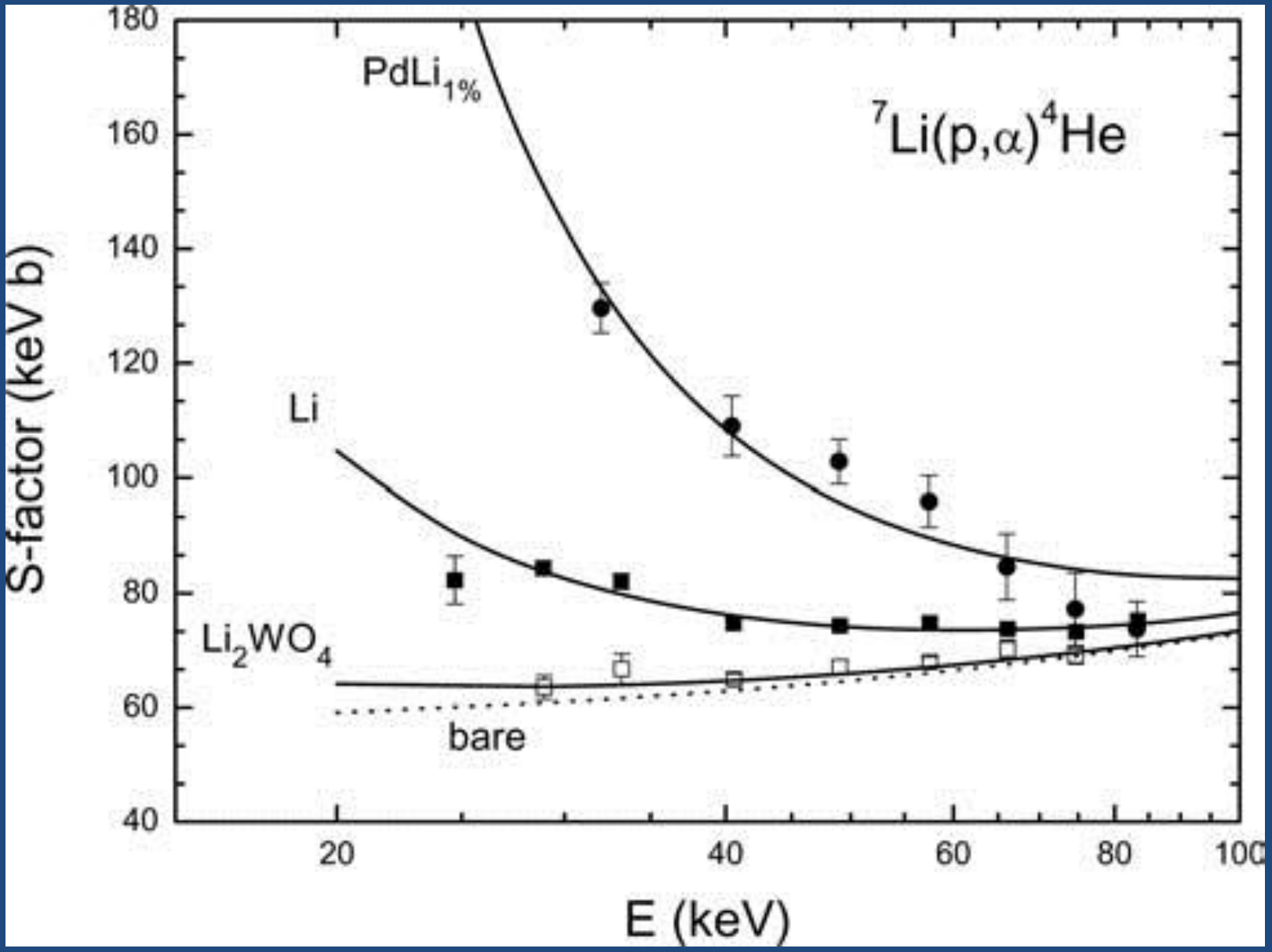
Abstract

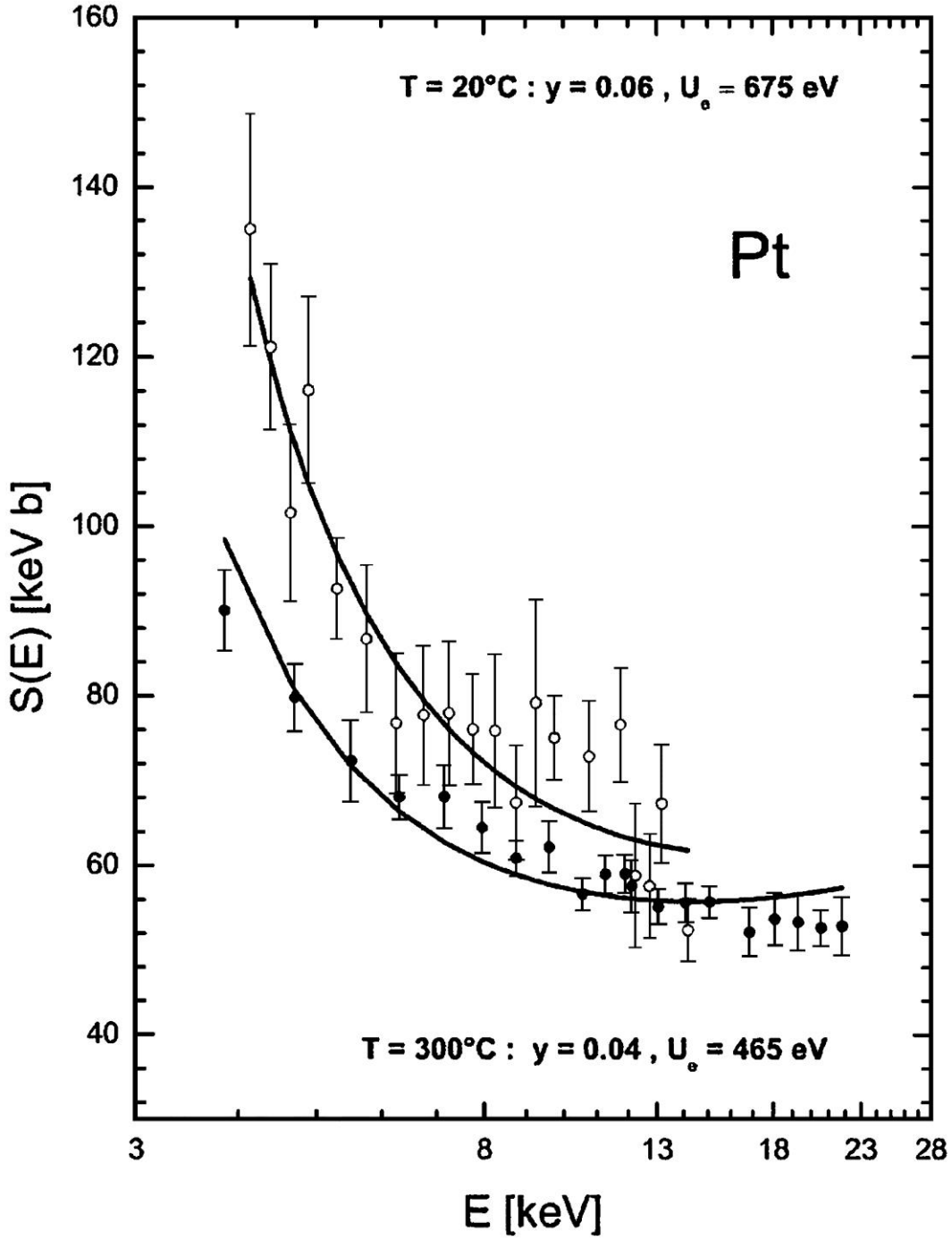
Recent accelerator experiments on fusion of various elements have clearly demonstrated that the effective cross-sections of these reactions depend on what material the target particle is placed in. In these experiments, there was a significant increase in the probability of interaction when target nuclei are imbedded in a conducting crystal or are a part of it. These experiments open a new perspective on the problem of so-called cold nuclear fusion.

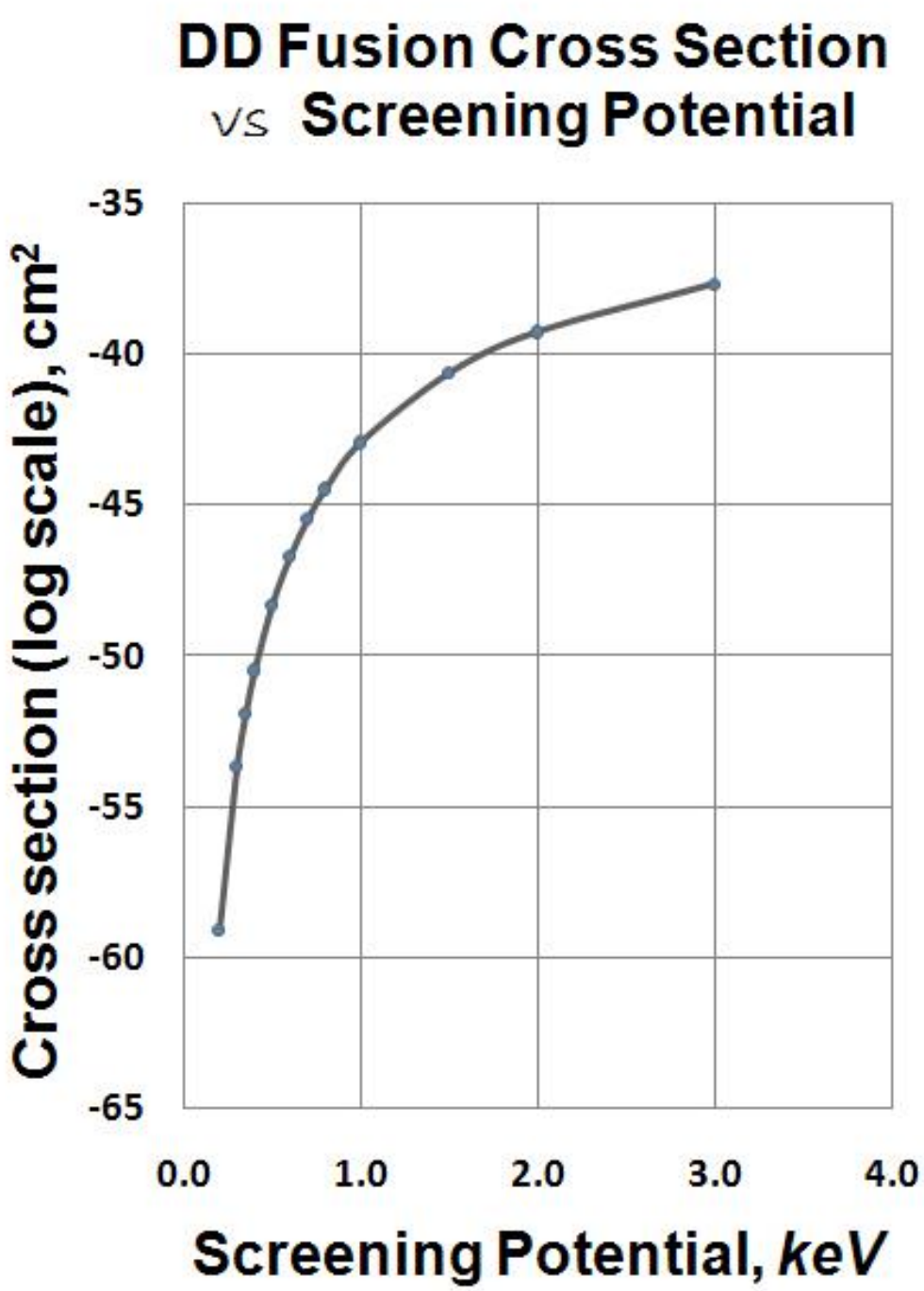
Screening potential




Zr
$U_e = (297 \pm 8)$ eV
F_{norm}
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0
5
10
15
20
25
30
35
40
45
50
E_d^{lab} (keV)


S-factor (keV b)
E (keV)
^{7}Li(p,α)^{4}He
PdLi$_{1\%}$
Li
Li$_2$WO$_4$
bare
180
160
140
120
100
80
60
40
20
40
60
80
100


T = 20°C : y = 0.06 , U$_e$ = 675 eV
Pt
T = 300°C : y = 0.04 , U$_e$ = 465 eV
S(E) [keV b]
E [keV]
160
140
120
100
80
60
40
3
8
13
18
23
28

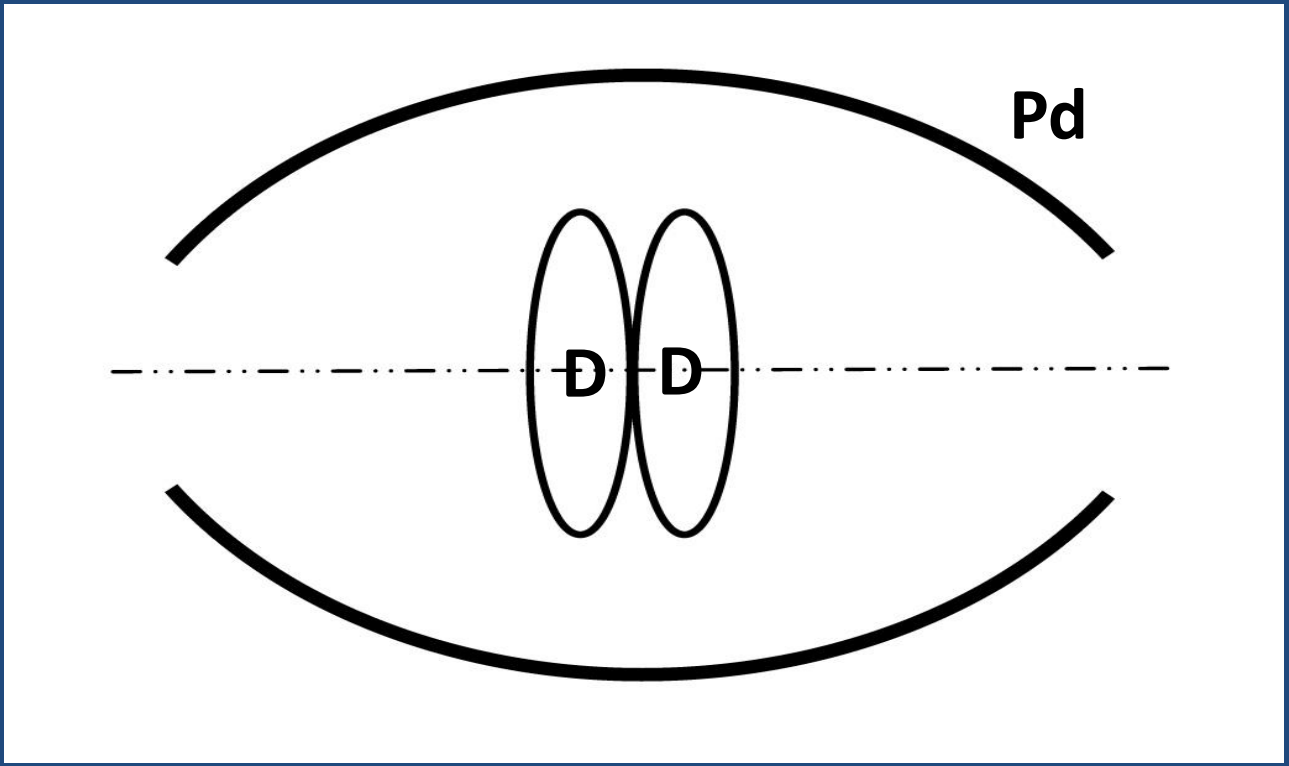

DD Fusion Cross Section
vs Screening Potential
Cross section (log scale), cm²
-35
-40
-45
-50
-55
-60
-65
0.0
1.0
2.0
3.0
4.0
Screening Potential, keV

$$\sigma(E) = \frac{S(E)}{E} e^{-2\pi\eta}$$

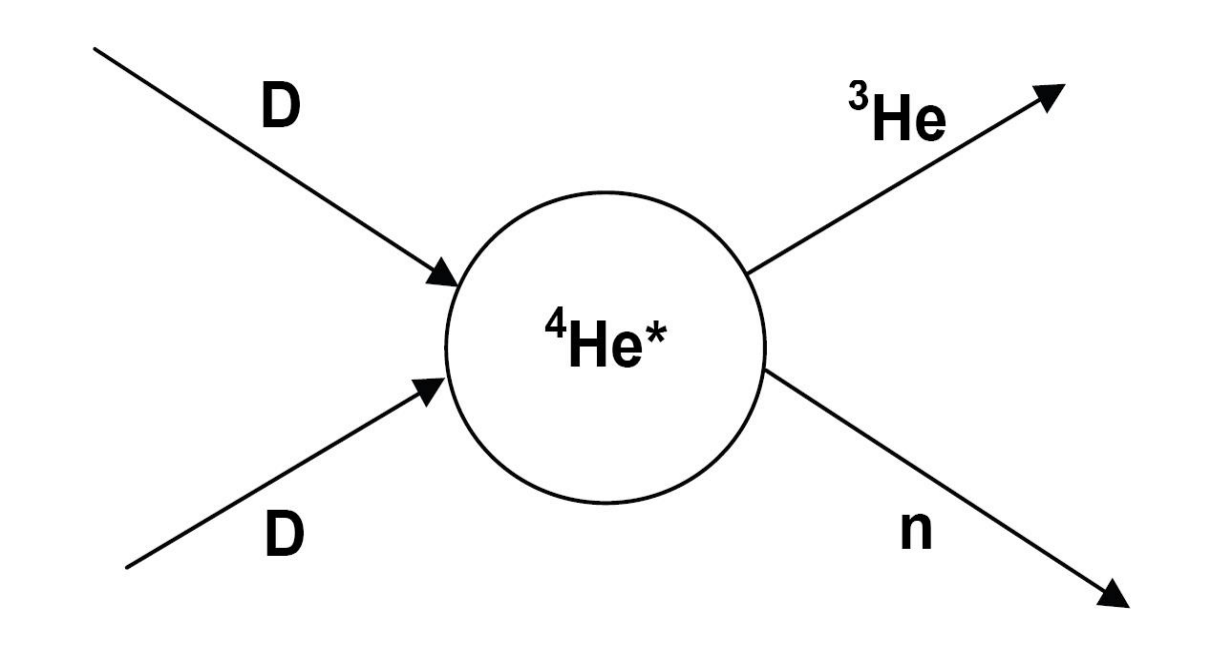
$$2\pi\eta = \frac{31.4}{\sqrt{E}}$$

It must be noted that the physical nature of the phenomenon of increasing cross section of synthesis of elements placed in the crystal lattice of conductive crystals is not yet fully revealed. Data can be well described by the introduction of only one parameter – the screening potential, which for deuterium in metals is about an order of magnitude greater than is the case for collisions of free atoms. The distance of convergence of the two deuterium atoms in one crystalline cell under these circumstances is an order of magnitude smaller than the size of a deuterium atom. The possibility of a process analogous to the well-known process of muon catalysis, when instead of muon the rapprochement of two deuterons is the effect of conduction electrons and the lattice of the metal crystal was considered [8]. In this work the calculation of DD fusion reaction rate in the crystals of palladium and platinum has been done. In the case of palladium [8], the screening potential was taken to be 300 eV, the same as in the case of zirconium [6], in the case of platinum the screening potential was taken to be 675 eV [9]. The corresponding cross sections are 2.06×10^{-54} cm^2 and 1.79×10^{-46} cm^2. A screening potential of 3 keV approximately corresponds to muon-catalysis for DDμ.

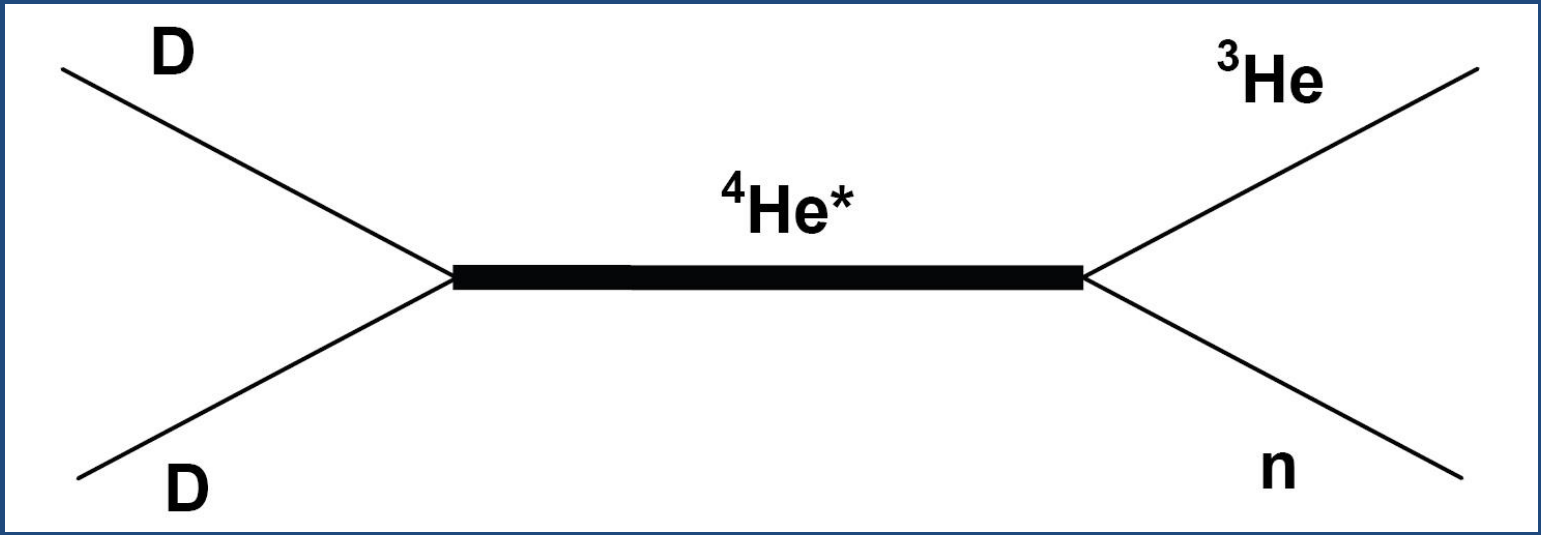
Screening potential in conducting crystals



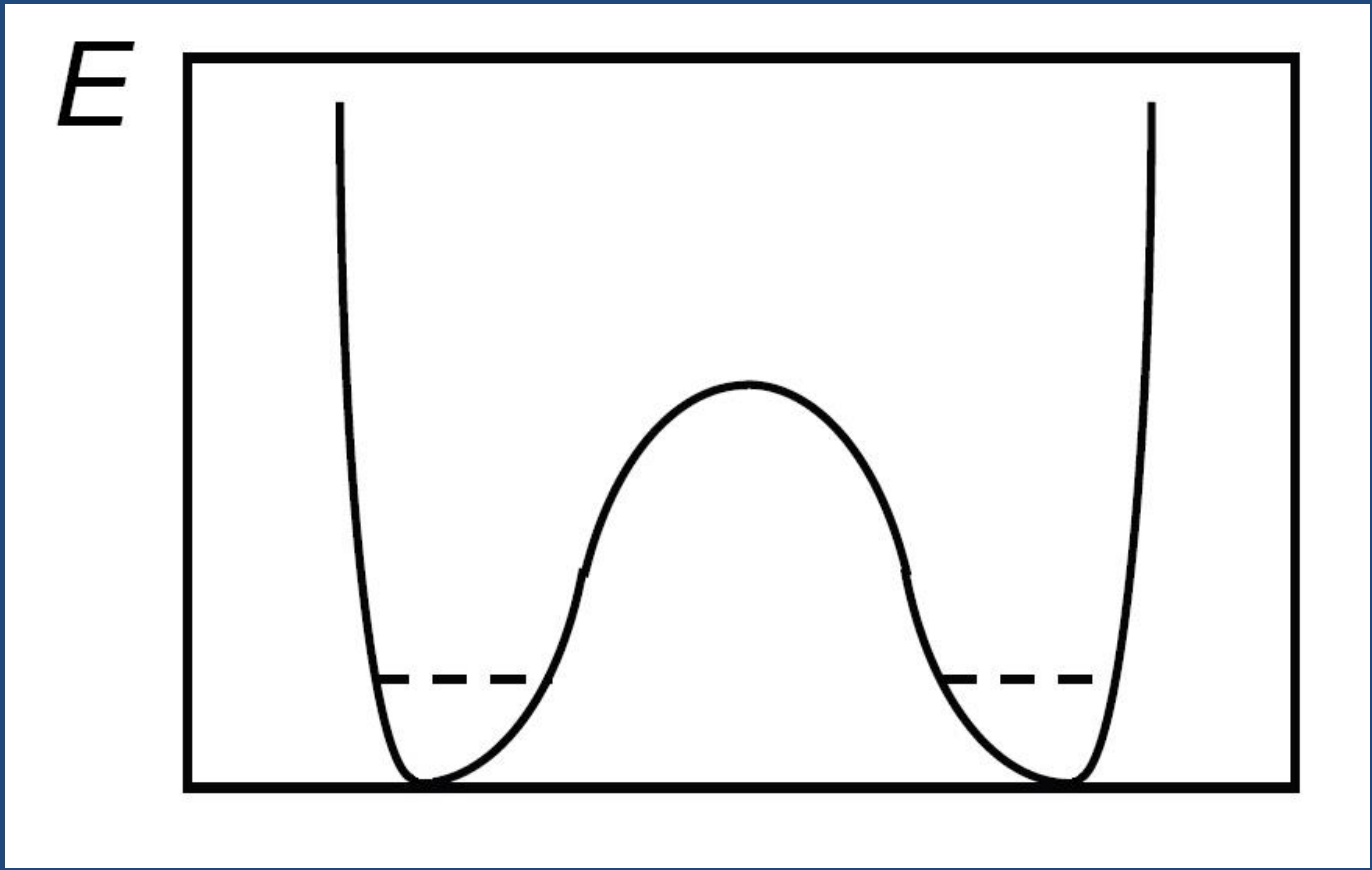
Why there are no neutrons?



"Werner Heisenberg quantum mechanics"



“Erwin Schrödinger quantum mechanics”

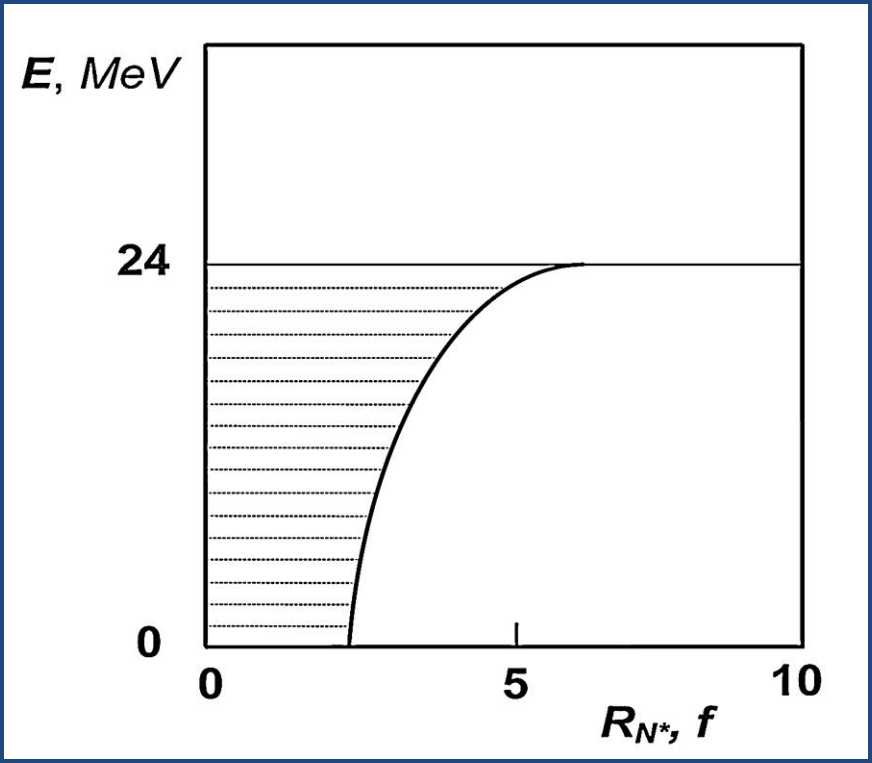


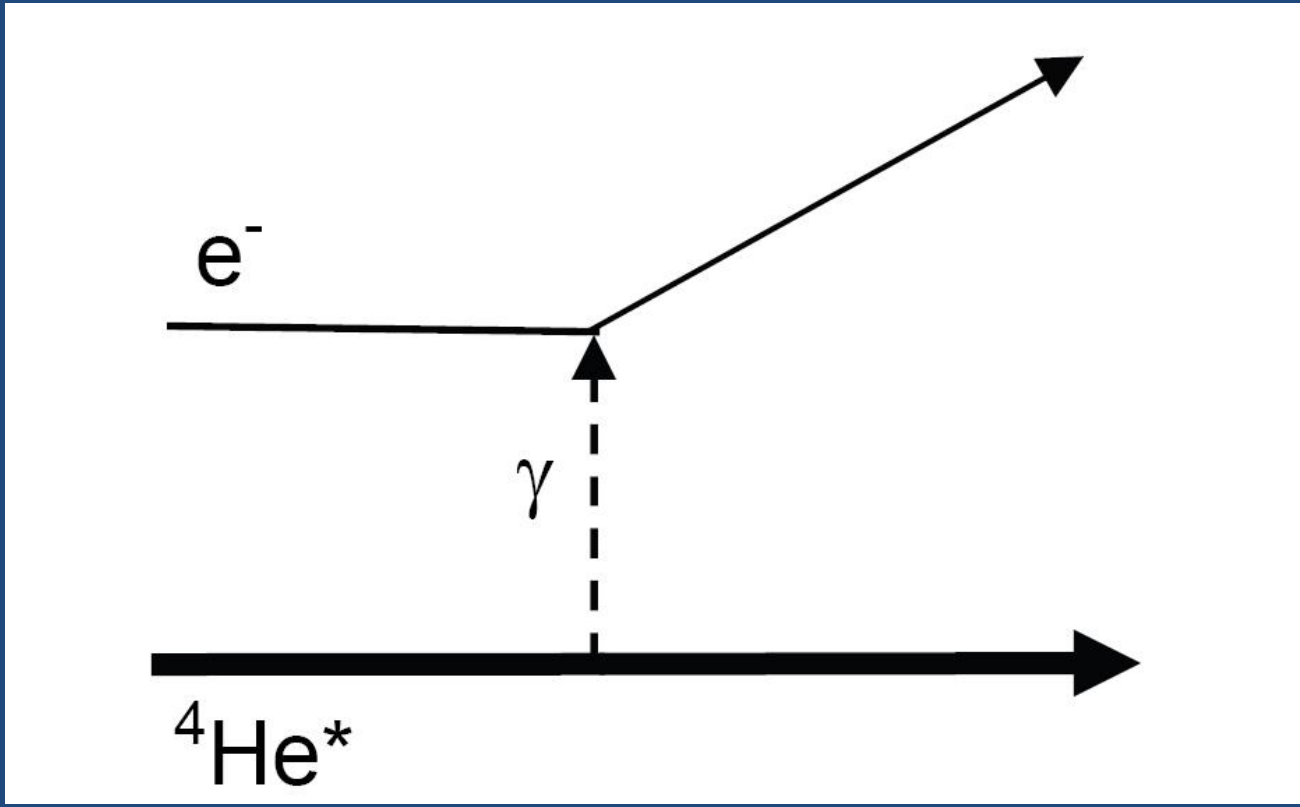
Schematic illustration of mechanism of nuclear decay frequency dependence on compound nucleus excitation energy for merging deuterons

$$N(t)/N_0 = e^{-t\nu}$$

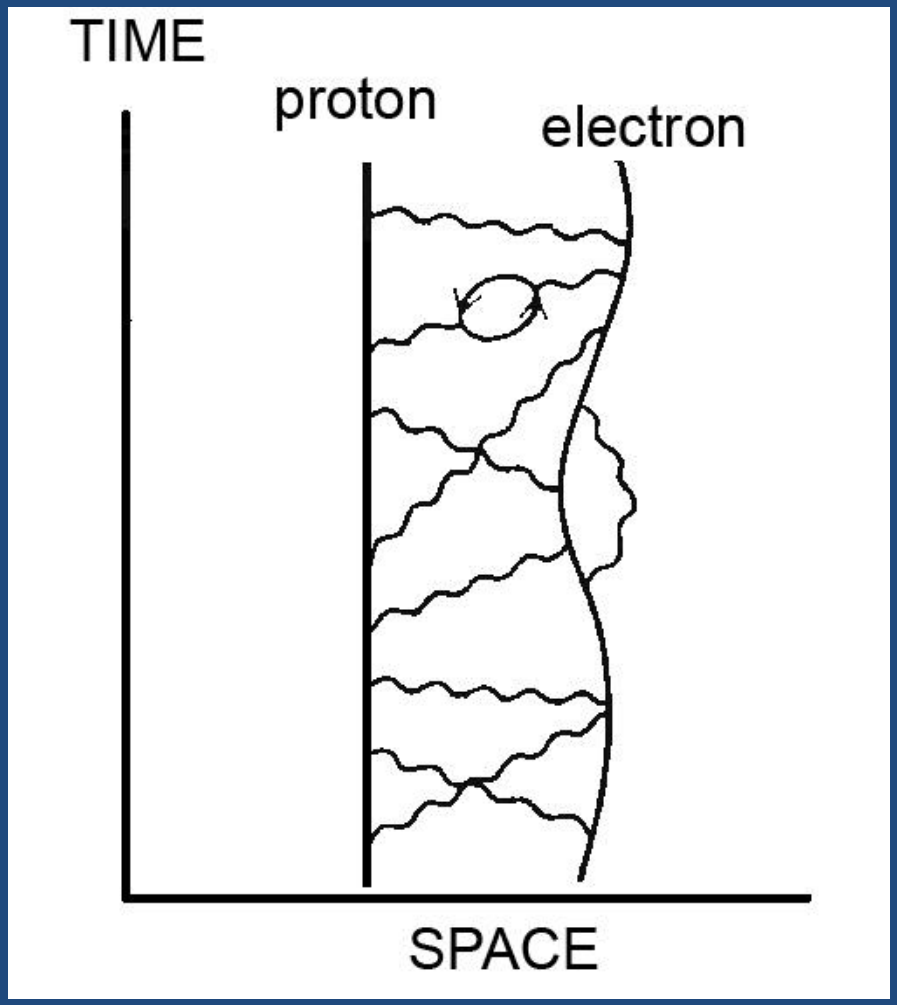
$$\nu = \nu_0 + aE + \ldots$$

New spectroscopy





Richard Feynman, Julian Schwinger, Shinichiro Tomonaga QED

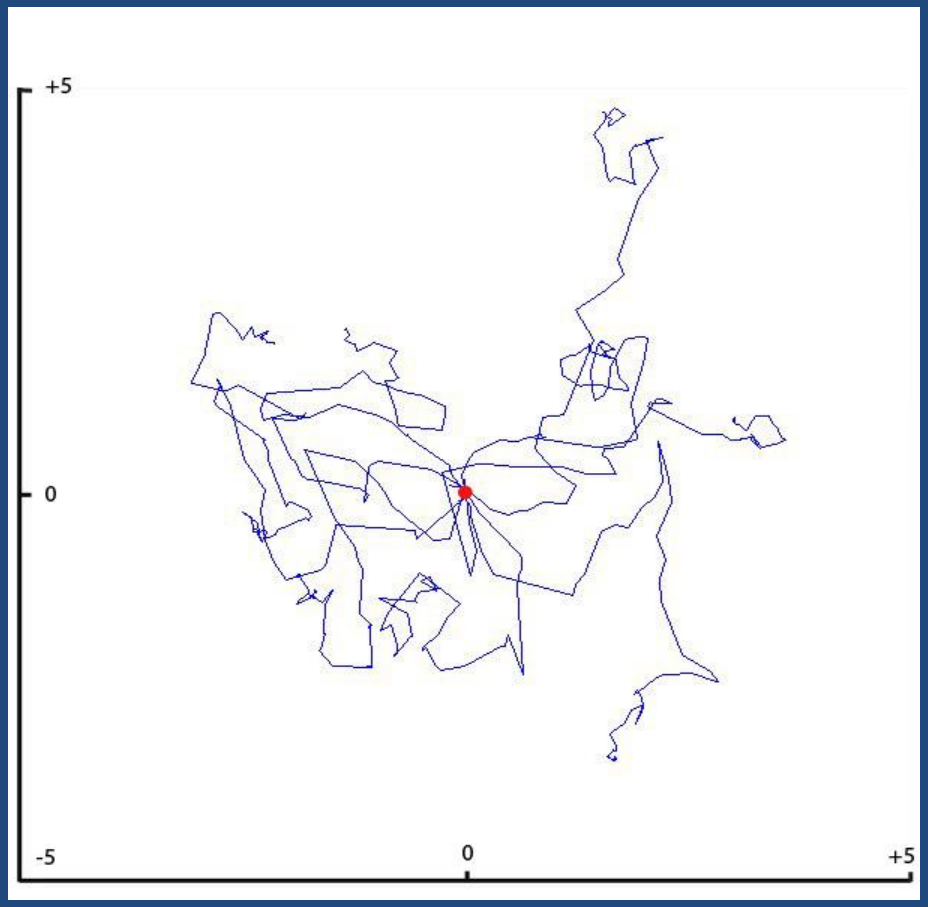


Hydrogen atom by Richard Feynman

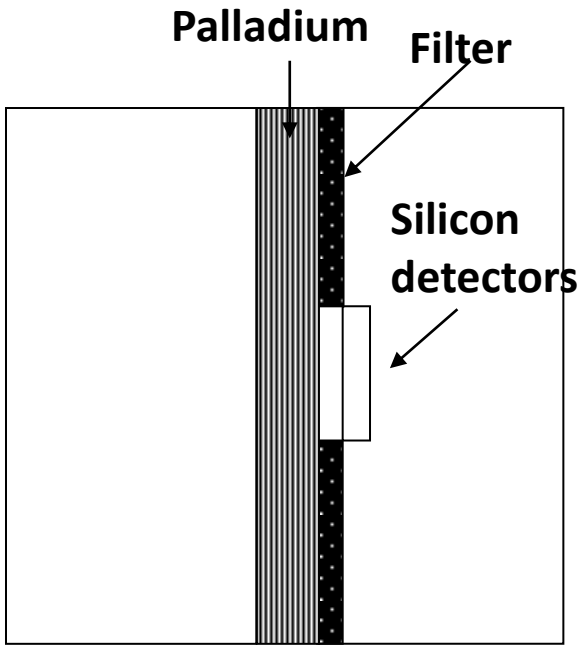
Julian Schwinger

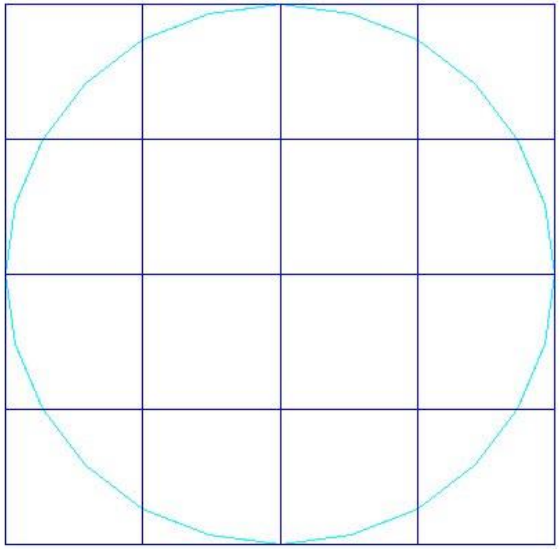
After 1989 Schwinger took a keen interest in the non-mainstream research of low-energy nuclear fusion reactions (AKA cold fusion). He wrote eight theory papers about it. He resigned from the American Physical Society after their refusal to publish his papers. He felt that cold fusion research was being suppressed and academic freedom violated. He wrote: "The pressure for conformity is enormous. I have experienced it in editors' rejection of submitted papers, based on venomous criticism of anonymous referees. The replacement of impartial reviewing by censorship will be the death of science."

Experiment to detect termalization

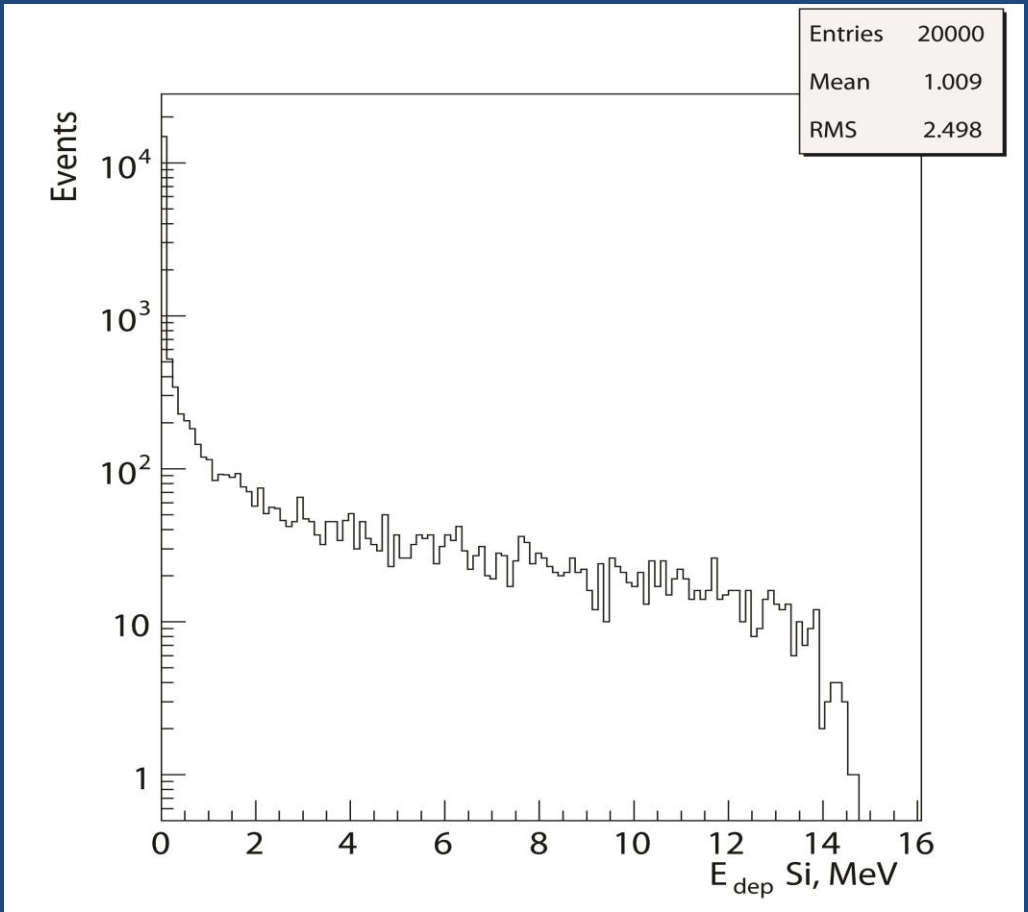


Example trajectories of 10 emitted electrons with energy of 60 keV. Electrons emitted isotropically from a single point in palladium. Dimensions are in micrometers.

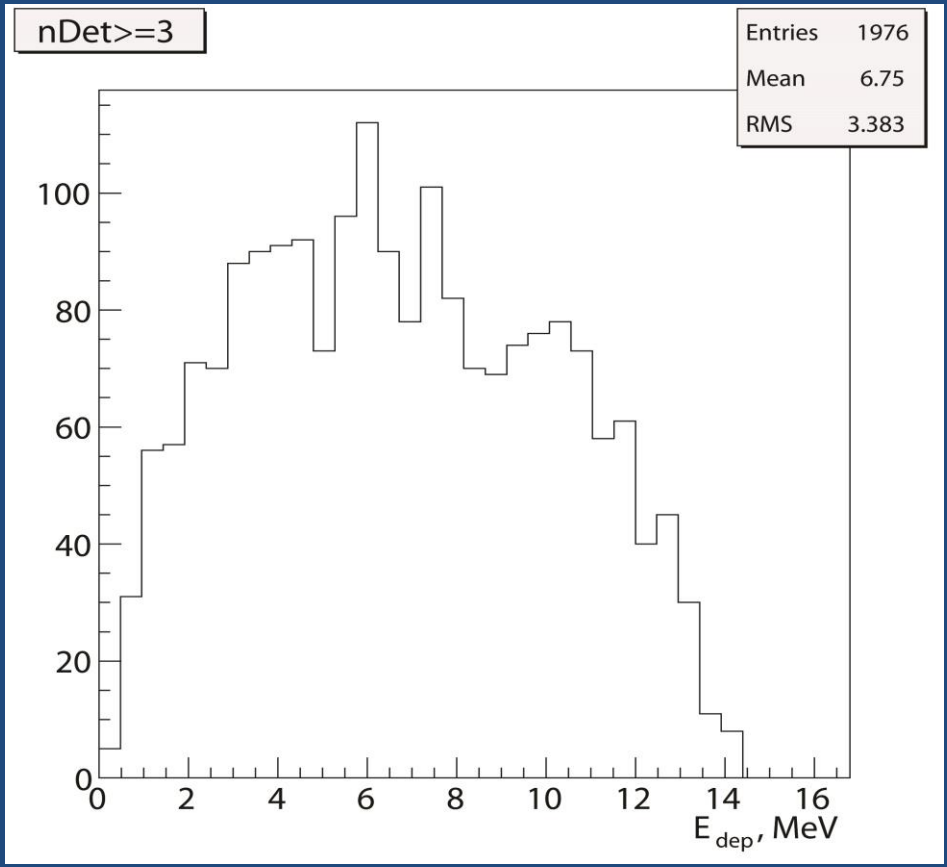




Schematic diagram of the proposed experimental setup

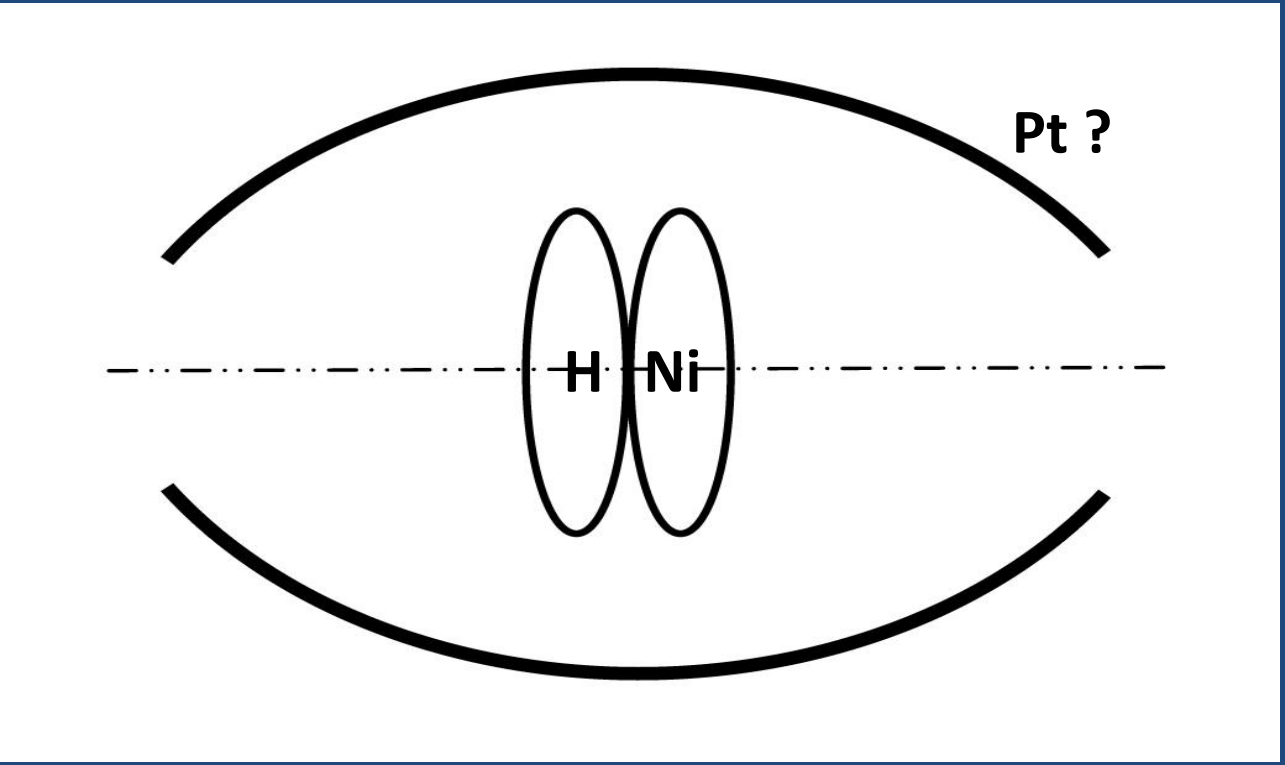


The release of energy emission of 60 keV electrons from detectors located on the one side of palladium



Released total energy for 60 keV electrons for the one-side geometry for the case when 3 or more detectors produced signals above 100 keV.

Andrea Rossi physics ?



Thanks for your attention!

Спасибо за внимание!