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COLD FUSION AND COLD FISSION: EXPERIMENTAL EVIDENCE FOR THE ALPHA-EXTENDED MODEL OF THE ATOM

Summary

Part I: A new model of the atom.

On the basis of Thomson's, Parson's, Lewis's, Allen's and Harkins's hypotheses, a new model of the atom is advanced, characterized by the following features: 1) substantial asymmetry of the Coulomb electric and magnetic fields of electrons and protons; 2) existence of positions of stable electromagnetic equilibrium of electrons in the vicinity of nuclei; 3) the neutron is a particular bound state of the hydrogen atom; 4) the nuclei, whose dimensions are bigger than those supposed by Rutherford, are composite structures of hydrogen atoms, of period 4 (Alpha-extended model); 5) physical and chemical properties of each atom depend on the various, possible isomeric configurations,

In light of this new model, the Periodic Table of the Elements has been reconstructed.

Part II: Experimental evidence for the Alpha-extended model.

The genesis of the elements and the Alpha-extended model of the atom are shown by means of: 1) neutron synthesis, starting from a cold plasma of protons and electrons; 2) the synthesis of Deuterium, Tritium, Helium-3 and Helium-4, starting from hydrogen, ultra cold neutrons and thermal neutrons; 3) the production and decay of Helium-8; 4) the production and decay of the nuclei from 11α to 18 α ; 5) cold fusion of Iron-56; 6) Production of heavy elements by cold fusion; 7) cold fission; 8) cold fusion in metal lattices; 9) carbon isomeric configurations (allotropic forms); 10) Distribution of the scattered radiation.

Reference

(*) R.A. Monti. A brief history of the atom, cold fusion and cold fission. Proceedings of the International Conference: "What Physics for the next century?". Ischia, Italy, 29 May-1 June 1991.

PART I: A NEW MODEL OF THE ATOM.

Introduction.

Before starting to build a model of the atom, it is essential to clarify *where* to place it.

I will begin, therefore, with some elementary definitions, which I have already given. (1)

1) *Empty space* is a rational category. *Full space* is the physical reality.

2) The physical space which we experiment with is filled with a material medium, which I will keep calling ether.

I currently imagine this material medium as a fluid rather than a rigid structure, which-depending on situations - can be represented both as a *continuous medium* or a *discontinuous medium*.

Let me add that, as usual, I reserve the right to revise, limit, erase *any principle ... even though it appears sound* whenever facts and experiences convince me that it is necessary to do so and provide me with the chance to enhance my ideas and subsequent models.

Electron, proton and neutron.

As elementary constituents of an atom, I will consider- for the time being-two particles ... plus one: electron, proton ... and neutron.

These particles, and their compounds, are, then, immersed in a material medium, with which they continuously interact conforming to what I believe is the true *First Principle* of Mechanics: that of action and reaction. This is the direct expression of the rational category of causality and its physical meaning can be summarized as follows: in the Universe-as we know it-isolated systems do not exist (1).

In addition, I assume that this material medium-ether-is able to collect potential energy. It will not, therefore, be necessary to imagine that the interactions among subatomic particles only take place through the exchange of other particles. Potential energy can, in fact, be accumulated, distributing itself in a continuous way around the tridimensional structures of nuclei, atoms, and molecules.

I currently imagine the electron to be a full superconducting ring, from whose surface lines of force of the electric field diverge. While the normal zone is the place of the magnetic field generated by the displacement current which flows in the superconducting ring (2), (3).

This image immediately evokes that of a *shortcircuited photon* with a frequency so high to originate practically continuous electric and magnetic fields. We will see next if this image can be of some use.

Finally, we can easily imagine the whole as *made up of ether* under particular dynamic conditions and subsequent density.

A model of this kind is the *vortex theory* (4), (5). This theory is particularly suggestive if we consider that two vortexes rotating in opposite directions immediately account for the reconversion of a particle to the state of *wave of ether* when it collides with its own *antiparticle* (with its own *antivortex*).

According to the proposed model, an electric field and a magnetic one *overlap* in the electron. Consequently, the electric field of the electron does not certainly have spherical symmetry.

Normally, an electron constitutes a bridge between two atoms. One can imagine, therefore, that its electric field is basically bidirectional or, at least, "distortable" in order to behave like that.

Similarly, an electric field and a magnetic one overlap in the proton. Consequently, the electric field of the proton does not certainly have spherical symmetry. And consequently to the characteristics of the hydrogen bond, one can imagine that also the electric field of the proton is essentially bidirectional or, at least, distortable in order to behave like that.

Electron and proton basically differ in their inertial mass, kind of electric charge and intensity of magnetic field.

Finally, I will adopt Harkins's definition of the neutron: a proton bounded to an electron: $n \rightarrow (pe)$ (6). The neutron is stable only inside a stable nucleus.

The proton's and electron's lines of force of electric fields folds one over the other in the hydrogen atom (the hydrogen atom is neuter). But the two electric charges (negative and positive) are distinguishable. When, on the other hand,electron and proton move from hydrogen atom to neutron, the lines of force of their respective electric fields not only do they fold one upon the other, but their charges are not distinguishable.

The magnetic fields of electron and proton do not add up in the same easy way.

Efficient dimensions of electron, proton and neutron.

Coulomb attraction between electron and proton must be obviously opposed-when at a certain approaching distance-by a repulsive force which halts the coalescence between electron and proton.

Similar repulsive forces obviously exist between proton and neutron and neutron and neutron, too.

As far as maximum and minimum efficient dimensions of electrons, protons, and neutrons arc concerned, I will use the following definitions: 1) the maximum electric (magnetic) radius of an electron (proton) is the distance from the center of gravity of a free electron (proton) at which the counter-field of polarization in the ether cancels out the electric (magnetic) field of the electron (proton); 2) the minimum electric (magnetic) radius of an electron (proton) is the distance, from the center of gravity of a bound electron (proton), to the surface of the proton (electron) with which it has constituted a neutron. In other words, it is the distance towards which the attractive force between electron and proton is balanced by a repulsive force which halts coalescence; 3) the minimum radius of a neutron is the distance from the center of

gravity of a neutron at which the attractive force between neutron and proton, or between neutron and neutron, is balanced by a repulsive force which halts coalescence. For the time being, it is enough.

Thomson's forces, magnetic fields, strong and weak interactions.

According to Thomson: *In considering the forces which may exist in the atom, we must remember that we cannot assume that the forces due to the charges of electricity inside the atom are of exactly the same character as those given by the ordinary laws of Electrostatics; these laws may merely represent the average effect of a large number of such charges, and in the process of averaging some of the peculiarities possessed by the individuals may disappear. Thus it is possible... that each particle may be the origin of a force which, instead of filling the space round it, may be confined to a narrow tube of force, outside which the particle produces no effect... The only criterion we need apply to the forces inside the atom is that the properties which the atom would possess in virtue of these forces should correspond to the actual properties of the atom.* (7)

If c_1, c_2, c_3 are of the order of atomic distances, there are no experiments yet made which would distinguish between a force of $1/r^2$ and one of:

$$(1/r^2)(1-c_1/r)(1-c_2/r)(1-c_3/r)$$

and yet at atomic distances the two forces are quite dissimilar, the second changing from attraction to repulsion and back to attraction again as r passes through the values of c_1, c_2, c_3 etc. (8)

Thomson, then, supposes that: *the field of force round the positive charge, although varying inversely as the square of the distance at large distances from the atom, yet in the atom itself changes backwards and forwards between attraction and repulsion. To fix our ideas let us suppose that the expression for the force contains the factor:* $\frac{\sin cu}{cu}$

where $u = 1/r$, and r is the distance from the centre. When r is great compared with c, Sin cu/cu is unity, so that this factor does not affect the force at great distances. Inside the atom, if atomic dimensions are comparable with c, there will be a series of positions of equilibrium determined by: $cu = n\pi$ on $r = c/n\pi$ where n is an integer. (8)

Finally, if besides electric fields, one takes into consideration the existence of magnetic fields associated with the components of nuclei (protons, electrons, neutrons) and the existence-which is commonly accepted-of strong and weak interactions, it is possible to hypothesize the existence of a wide range of configurations of stable equilibrium among the different groups of these components, each of these configurations defining the structure of a particular atom.

Dimensions of the nuclei.

In his paper *The scattering of α and β particles by matter and the structure of the Atom*, (9) Ernest Rutherford considers *an atom which contains a charge + Ne at its centre, surrounded by a sphere of electrification containing a charge -Ne supposed uniformly distributed throughout a sphere of radius R*. (9) He then states that: *for distances less than 10^{-12} cm the central charge of each atom-(gold and helium, in his case)-may be supposed to be concentrated at a point* (9). He finally states that*: "the question of the stability of the atom proposed need not be considered at this stage*. (9)

Then he estimates at what distance b from the center of a nucleus with charge N = 100 the Coulomb force of repulsion halts a helium nucleus (N = 2) which is about to collide with it at the speed of 2.09 10^9 cm/s. And finally he assumes such *distance from the center*, equal to 3.4 10^{-12} cm, to be *the radius of the nucleus of charge N = 100*. (9)

Rutherford builds, therefore, his theory on the dimensions of the nucleus assuming a priori that its dimensions are *smaller than 10^{-12} cm*, playing with an exchange of words which is *authorized* by *pure geometry.* In fact, nuclei are supposed to be punctiform, and the distance from the center of a point is equal to the distance from its surface.

As a matter of fact: 1) the gold nucleus which he is actually considering is 49 times bigger than a helium nucleus (and there is still a proton left); 2) the issue of the stability of these atoms and nuclei cannot be ignored; 3) the only plausible hypothesis concerning the dimensions of nuclei is that positive nuclear charges are distributed within a volume of space which is smaller than the volume of a sphere with a radius equal to the atomic radius, estimated of the order of 10^{-8} cm.

Moreover: a) the charge of the nucleus of a gold atom is distributed on the surface-which is not necessarily spherical-of the nucleus itself, in the same way of the charge of the helium nucleus; b) what is "left" of the mass numbers (197 and 4) minus the mass of protons (79 and 2) is not there by chance: it is there, as a matter of fact, to stabilize the gold nucleus and the helium one; c) the charge which "faces" the helium nucleus in the collision is, without any doubt, smaller than the total charge of the gold nucleus.

If, then, a helium nucleus (comparable with a glass marble) travels at a speed of 2.09 10^9 cm/s versus a gold nucleus (comparable with a billiard-ball), Coulomb repulsion between the two nuclei will stop the helium nucleus even at smaller distances than 10^{-12} cm: but from the surface-not from the center-of the billiard-ball which makes up the gold nucleus.

The distance from the surface of the helium nucleus and that of the gold one does not provide information on the "radius" of the helium nucleus nor on that of the gold one.

Rutherford's hypothesis is inconsistent. And the current uncertainty on the true dimensions of atomic nuclei (10) is simply the result of the acritical acceptance of Rutherford’s wrong hypotheses.

I will assume, therefore, that the order of magnitude of the radius of the atomic nucleus is simply smaller ($\approx 10^{-9}$ cm) than the atomic radius, and that the electrons can stand in positions of stable electromagnetic equilibrium in the vicinity of nuclei.

Nucleus models.

The various nucleus models which are assumed today are all *dynamic models*, while the only *static model*-the alpha particle model-which at the beginning seemed the most adequate, has been later abandoned. I will just give here a brief review:

1) **The nucleus as "Fermi's gas".**

The nucleus is imagined to be a compound of free neutrons and protons enclosed in a sphere with radius R or volume Ω. According to Segre, this model *provides coarse, but useful information on the excited states of the nucleus*. (11) Unfortunately it does not give any information on the structure of the nucleus itself.

2) **The liquid drop model.**

The fact that the binding energy per nucleon and the density of the nuclear matter are almost independent of A, points to a certain similarity between nuclei and liquid droplets ... The average binding energy per nucleon varies from 6 to 8 Mev. (11)

Nuclear fusions and fissions show, on the other hand, that nuclei-far from resembling liquid droplets-rather look like compounds of rigid and well-defined small blocks.

3) **The shell model**.

According to the shell model, the nucleons move in well-defined orbits in a potential hole ... Without getting into the details of this complex topic, we must highlight a series of difficulties in the shell model- how can a nucleon describe an orbit in the nuclear matter? (11) It cannot.

This model undoes itself.

4) **The collective model.**

The shell model was successful in explaining a great deal of nuclear properties... However, it does not provide a complete description of the nucleus. It is particularly useful in the instance of nuclei which are made up of a complete shell together with one or more additional nucleons. In a configuration of complete shells, the nucleus is spherical The addition of one or more nucleons only introduces small distortions. On the other hand, as far as half-completed shells are concerned, the situation is different. Nuclei considerably differ from the spherical shape and the collective motions of groups of nucleons become important... Rainwater (1950) suggested that the individual particle can deform the entire nucleus and that the observed quadrupole is due to the collective distortion of various orbits. Roughly, the effect is analogous to that which is produced by a small, heavy ball rotating inside a rubber ball. The pressure produced by the centrifugal force of the small ball determines the

distortion of the rubber container. The nucleons, therefore, move in a potential which does not have a spherical symmetry any longer. We can, therefore, consider two different kinds of motion: first, a motion of the entire nucleus as if all nucleons would be in an ellipsoidal box which can rotate or even distort itself because of vibrations; second, motions of nucleons inside the box. The two kinds of motion can join each other in a more or less strong way. The mathematical development of these ideas (A. Bohr, B. Mottelson et al. from 1952 onward) makes up the basis of the collective model. (11) It is, then, a more complex variation of a model that, in itself, did not work.

These "dynamic" models, as we have seen, are far from being satisfactory. But let's examine now the essential characteristics of the alpha particle model:

5) **The alpha particle model.**

This model *was suggested by stereochemistry... the alpha particle model can be applied to light nuclei which have an equal number of neutrons and protons, as long as that number is a multiple of 4. Obviously, one can think that these nuclei are made of nuclei of* ^4He. (11)

These alpha particles are arranged in space so as to give the closest possible packing... In table 5.1 we have tabulated the configurations that probably give closest packing and the corresponding number of bonds .. The last column gives the binding energy per bond, which is remarkably constant except in the case of ^8Be. (12)

TABLE 5.1

Nuclide	Configuration	No. of bonds	Mass M (Mu)	$M - \frac{1}{4} AM_\alpha$ (mMu)	Bond energy (mMu)
He^4	–	0	4·00387	0	0
Be^8	Dumbbell	1	8·00785	- 0· 11	- 0· 11
C^{12}	Triangle	3	12·00380	7· 81	2·60
O^{16}	Tetrahedron	6	16·00000	15-48	2·58
Ne^{20}	Square pyramid	8	19·9988	20·6	2·58
Mg^{24}	Octahedron	12	23·9926	30·6	2·47
Si^{28}	Pentagonal bipyramid	16	27·9858	41·3	2·59
S^{32}	Hexagonal bipyramid	19	31·9822	48·8	2·57
A^{36}	Heptagonal bipyramid	22	35·9789	55·9	2·54
Ca^{40}	Octagonal bipyramid	25	39·9752	63·5	2·54

The most disturbing feature of this table is the lack of alpha stability of ^{8}Be (10); as well as, obviously, the fact that *the alpha particle model can only be applied to light nuclei* (11) up to $^{40}_{20}Ca$: 11α ($^{44}_{22}Ti$) and the following *do not exist*.

The most valuable feature of the alpha particle model is, on the other hand, the fact that-at last-it is a static model of the nucleus, as it is more suitable-as a matter of fact-to a rigid atom.

Let us see, now, how it can be conveniently extended.

The Alpha-extended model of the atom.

As we have just seen, the alpha particle model of the nucleus is interrupted ... because of lack of alpha particles. After $^{40}_{20}Ca$ (10 α), in fact, there is not $^{44}_{22}Ti$ (11α).

But let us examine now the two isobars 44: $^{44}_{22}Ti$ and $^{44}_{20}Ca$.

The first is unstable ($t_{1/2}$ = 47y) and, after two electron captures, changes into the second:

$$^{44}_{22}Ti\ (11\alpha) \xrightarrow{2EC} {}^{44}_{20}Ca\ (10\alpha + 4n)$$

Let us observe, now, the three isobars 48: $^{48}_{24}Cr$ (12α). Unstable ($t_{1/2}$ = 21.56h). After two electron captures changes into $^{48}_{22}Ti$.

$^{48}_{22}Ti$ (11 α + 4n). Stable (maximum abundance: 73.7%)

$^{48}_{20}Ca$ (10α + 2·4n). Stable (0.187%).

Let us imagine, now, that in agreement with the above hypotheses on atomic and nuclear structure, the electrons of an Alpha group (helium atom) are "bound" in a position of stable equilibrium in the vicinity of the corresponding protons. Let us assume, then, that because of the tridimensional packing of the Alpha groups, one of them is completely inside the nucleus and that, because of the various forces exercised by the surrounding Alpha groups, the two hydrogen atoms (Protium) which make it up, each captures its own electron.

The result is a new group which is even more neutral of the helium 4 atom (the Alpha), made up by 4 neutrons which are more strongly bounded -inside the nucleus-of the two Protium atoms and the two neutrons which make up the Alpha group.

I will call the new even more neutral group: Alpha-Zero Group (α_0).

Consequently $^{48}_{22}Ti$ can be "read" as (11 α + α_0). Stable.

Similarly, we can suppose that two Alpha groups "capture" their corresponding electrons.

$^{48}_{20}Ca$, therefore, can be read: as (10 α + 2 α_0). Stable.

By reconstructing in this way the structure of the various atoms ordered according to mass number (A), it is easy to realize that electron and proton are the primary elementary constituents of every atom, while the secondary elementary constituents are: Protium (proton + electron) P = (p + e); Neutron: (pe) = n; Deuterium: D = (P + n); D-zero: D_o = (2n); Tritium: T_1 = (D + n); Helium 3: T_2 = (D + P); T-zero: T_o = (3n); Alpha: α = (D + D); Alpha-zero: α_0 = (4n).

Moreover, it results that atoms and nuclei are composite structures of Protium, of period 4.

Finally, it follows that the different physical and chemical properties of each atom depend on the various, possible isomeric configurations of the Protium atoms which make it up.

In light of what has been said above, the Periodic Table of the Elements has been reconstructed as follows (13):

PERIODIC TABLE

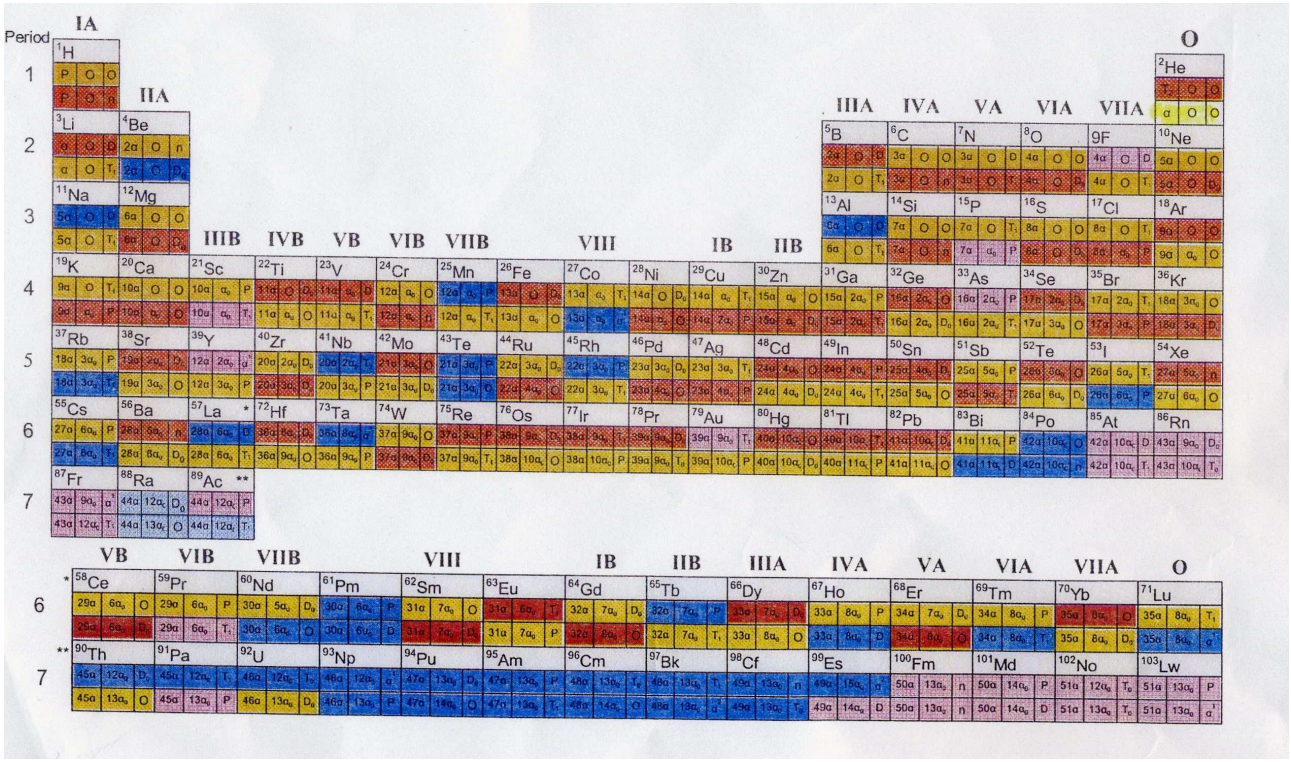
Colors:
Yellow = Maximum abundance
Orange = 2nd by abundance
Green = Stable Isotope
Light Blue = Unstable, $t_{1/2} > 1$ year
Pink = Unstable, $t_{1/2} < 1$ year

Constants

1 Mev = 1,0735355 10^{-3} u. m.a.

1 u. m.a. = 931,501567 Mev = 1,6605655 10^{-27} Kg

Elementary Constituents.
e = electron; m_e = 0.51100337 Mev.
p = proton; m_p = 938,27961 Mev.
P = Protium (p + e); m_p = 938,790601 Mev.
P_0 = neutron (pe) = n; m_n = 939.57304 Mev.
D = Deuterium; m_D = 1876,138974 Mev.
D_0 = n + p(k)e = (2n); m_{D_0} = 1876,138974 + 0,782439 = 1876,921413 Mev.
T_1 = Tritium; m_{T_1} = 2809,454646 Mev.
T_2 = Helium 3; m_{T_2} = 2809.436021 Mev.
T_0 = (3n); m_{T_0} = 2810,237085 Mev.
α = Alpha; m_α = 3728.431208 Mev.
α_0= Alpha- zero (4n); m_{α_0} = 3729,996085 Mev.



Elements and their Mass (in Mev.)

m_A = mass of the element of mass number A; $m_A = A_{u,m,a} + \Delta$; $\Delta =$ mass excess

${}^{1}_{0}n$ = (pe) = (p) + (e) + 0,78242663 Mev. = 939.57304 Mev.

${}^{1}_{1}H$ = (p + e) = P = 1 +Δ = 931,501567 + 7,289034 = 938,790601 Mev.

${}^{2}_{1}H$ = (P + n) = D = 2 + Δ = 1863, 003134 + 13,13584 = 1876,138974 Mev.

= (P) + (n) – 2,224667 Mev.

${}^{3}_{1}H$ = (D + n) = T_1 = 3 + Δ = 2794,504701 + 14,949945 = 2809,454646 Mev.

${}^{3}_{2}He$ = (D + P) = T_2 = 3 + Δ = 2794,504701 + 14,93132 = 2809,436021 Mev.

= (D) + (P) – 5,493554 Mev.

${}^{4}_{2}He$ = (T_1 + P) = α = 4 + Δ = 3726,006268 + 2,42494 = 3728,431208 Mev.

= (T_1) + (P) - 19,814039 Mev.

= (T_2) + (n) - 20,577853 Mev.

$= (D) + (D) - 23{,}84674$ Mev.

$^{5}_{2}He = (T_1 + D) = 5 + \Delta = 4657{,}507835 + 11{,}39 = 4668{,}897885$ Mev.

$= (T_1) + (D) - 16{,}695735$ Mev.

$= (\alpha) + (n) + 0{,}893587$ Mev.

$^{5}_{3}Li = (T_2 + D) = 5 + \Delta = 4657{,}507835 + 11{,}685 = 4669{,}192835$ Mev.

$= (\alpha) + (P) + 1{,}971026$ Mev.

$= (T_2) + (D) - 16{,}38216$ Mev.

$^{6}_{3}Li = (\alpha + D) = 6 + \Delta = 5598{,}009402 + 14{,}0873 = 5603{,}096702$ Mev.

$= (T_1 + T_2) - 15{,}793965$ Mev.

$= (\alpha) + (D) - 1{,}47348$ Mev.

$= (^{5}_{2}He) + (P) - 4{,}591734$ Mev.

$^{7}_{3}Li = (\alpha + T_1) = 7 + \Delta = 6520{,}510969 + 14{,}9082 = 6535{,}419169$ Mev.

$= (\alpha) + (T_1) - 2{,}466685$ Mev.

$= (^{6}_{3}Li) + (n) - 7{,}250573$ Mev.

$= (^{5}_{3}Li) + (D_0) - 10{,}695079$ Mev.

$^{8}_{2}He = (\alpha + \alpha_0) = 8 + \Delta = 7452{,}012536 + 31{,}609 = 7483{,}621536$ Mev.

$= (\alpha) + (\alpha_0) + 25{,}194243$ Mev.

$^{8}_{3}Li = (^{7}_{3}Li + n) = 8 + \Delta = 7452{,}012536 + 20{,}94699 = 7452{,}959526$ Mev.

$= (^{7}_{3}Li) + (n) - 2{,}032683$ Mev.

$= (^{6}_{3}Li) + (D_0) - 7{,}058589$ Mev.

$= (^{5}_{2}He) + (T_1) - 5{,}393005$ Mev.

$= ({}^{5}_{3}Li) + (T_0) - 6{,}470394$ Mev.

${}^{8}_{4}Be = ({}^{7}_{3}Li + P) = (2\,\alpha) = 8 + \Delta = 7452{,}012536 + 4{,}94176 = 7456{,}954296$ Mev.

$= ({}^{7}_{3}Li) + (P) - 17{,}255474$ Mev.

$= ({}^{5}_{3}Li) + (T_1) - 21{,}693185$ Mev.

$= ({}^{6}_{3}Li) + (D) - 22{,}28138$ Mev.

$= ({}^{5}_{2}He) + (T_2) - 21{,}37961$ Mev.

$= (\alpha) + (\alpha) + 0{,}09188$ Mev.

${}^{9}_{4}Be = ({}^{7}_{3}Li + D) = 9 + \Delta = 8383{,}514103 + 11{,}3480 = 8394{,}862103$ Mev.

$= ({}^{8}_{3}Li) + (P) - 16{,}888024$ Mev.

$= ({}^{8}_{4}Be) + (n) - 1{,}665233$ Mev.

$= ({}^{7}_{3}Li) + (D) - 16{,}69604$ Mev.

$= ({}^{6}_{3}Li) + (T_1) - 17{,}689245$ Mev.

$= ({}^{5}_{2}He) + (\alpha) - 2{,}46699$ Mev.

${}^{10}_{4}Be = ({}^{7}_{3}Li + T_1) = 10 + \Delta = 9315{,}01567 + 12{,}6076 = 9327{,}62327$ Mev.

$= ({}^{9}_{4}Be) + (n) - 6{,}811873$ Mev.

$= ({}^{8}_{3}Li) + (D) - 21{,}47523$ Mev.

$= ({}^{8}_{4}Be) = (D_0) - 6{,}252439$ Mev.

$= ({}^{7}_{3}Li) + (T_1) - 17{,}250545$ Mev.

${}^{10}_{5}B = ({}^{9}_{4}Be + P) = 10 + \Delta = 9315{,}01567 + 12{,}0517 = 9327{,}06737$ Mev.

$= ({}^{9}_{4}Be) + (P) - 6{,}585334$ Mev.

$= ({}^{8}_{4}Be) = (D) - 6{,}0259$ Mev.

$= ({}^{7}_{3}Li\ ) + (T_2) - 17{,}78782$ Mev.

$= ({}^{6}_{3}Li) + (\alpha) - 4{,}46054$ Mev.

${}^{11}_{5}B = ({}^{9}_{4}Be + D) = 11 + \Delta = 10246{,}51724 + 8{,}6679 = 10255{,}18514$ Mev.

$= ({}^{10}_{4}Be) + (P) - 11{,}228731$ Mev.

$= ({}^{10}_{5}B) + (n) - 11{,}45527$ Mev.

$= ({}^{9}_{4}Be) + (D) - 15{,}815937$ Mev.

$= ({}^{8}_{4}Be) + (T_1) - 11{,}223802$ Mev.

$= ({}^{8}_{3}Li) + (T_2) - 27{,}210407$ Mev.

$= ({}^{7}_{3}Li\ ) + (\alpha) - 8{,}665237$ Mev.

${}^{12}_{6}C = ({}^{11}_{5}B + P) = (3\ \alpha) = 12 + \Delta = 11178{,}0188 + 0 = 11178{,}0188$ Mev.

$= ({}^{11}_{5}B) + (P) - 15{,}956941$ Mev.

$= ({}^{10}_{5}B) + (D) - 25{,}187544$ Mev.

$= ({}^{9}_{4}Be) + (T_2) - 26{,}279324$ Mev.

$= ({}^{8}_{4}Be) + (\alpha) - 7{,}366704$ Mev.

$= (\alpha) + (\alpha) + (\alpha) - 7{,}274824$ Mev.

$= ({}^{6}_{3}Li) + ({}^{6}_{3}Li) - 28{,}174604$ Mev.

${}^{13}_{6}C = ({}^{11}_{5}B + D) = 13 + \Delta = 12109{,}52037 + 3{,}125038 = 12112{,}64541$ Mev.

$= ({}^{12}_{6}C) + (n) - 4{,}94643$ Mev.

$= ({}^{11}_{5}B) + (D) - 18{,}678704$ Mev.

$= ({}^{10}_{5}B) + (T_1) - 23{,}876606$ Mev.

$= ({}^{10}_{4}Be) + (T_2) - 24{,}413881$ Mev.

$= ({}^{9}_{4}Be) + (\alpha)$ - 10,647901 Mev.

${}^{14}_{6}C = ({}^{11}_{5}B + T_1) = 14 + \Delta = 13041{,}02194 + 3{,}019922 = 13044{,}041\ 86$ Mev.

$= ({}^{13}_{6}C) + (n)$ - 8,17659 Mev.

$= ({}^{12}_{6}C) + (D_0)$ - 10,898353 Mev.

$= ({}^{11}_{5}B) + (T_1)$ - 20,597926 Mev.

${}^{14}_{7}N = ({}^{12}_{6}C + D) = 14 + \Delta = 13041{,}02194 + 2{,}863444 = 13043{,}88538$ Mev.

$= ({}^{13}_{6}C) + (P)$ - 7,550631 Mev.

$= ({}^{12}_{6}C) + (D)$ - 10,272394 Mev.

$= ({}^{11}_{5}B) + (T_2)$ - 20,735781 Mev.

$= ({}^{10}_{5}B) + (\alpha)$ - 11,613198 Mev.

${}^{15}_{7}N = ({}^{12}_{6}C + T_1) = 15 + \Delta = 13972{,}52351 + 0{,}101514 = 13972{,}62502$ Mev.

$= ({}^{14}_{6}C) + (P)$ - 10,207441 Mev.

$= ({}^{14}_{7}N) + (n)$ - 10,8334 Mev.

$= ({}^{13}_{6}C) + (D)$ - 16,159364 Mev.

$= ({}^{12}_{6}C) + (T_1)$ - 14,848426 Mev.

$= ({}^{11}_{5}B) + (\alpha)$ - 10,9914 Mev.

${}^{16}_{8}O = ({}^{14}_{7}N + D) = (4\ \alpha) = 16 + \Delta = 14904{,}02507 - 4{,}73702 = 14899{,}28805$ Mev.

$= ({}^{15}_{7}N) + (P)$ - 12,127571 Mev.

$= ({}^{13}_{6}C) + (T_2)$ - 22,793381 Mev.

$= ({}^{14}_{7}N) + (D)$ - 20,736304 Mev.

$= ({}^{13}_{6}C) + (\alpha) - 7{,}161958$ Mev.

${}^{17}_{8}O = ({}^{14}_{7}N + T_1) = 17 + \Delta = 15835{,}52664 - 0{,}8099 = 15834{,}71674$ Mev.

$= ({}^{14}_{7}N) + (T_1) - 18{,}623286$ Mev.

$= ({}^{16}_{8}O) + (n) - 4{,}14435$ Mev.

$= ({}^{15}_{7}N) + (D) - 14{,}047254$ Mev.

$= ({}^{14}_{6}C) + (T_2) - 18{,}761141$ Mev.

$= ({}^{13}_{6}C) + (\alpha) - 6{,}359878$ Mev.

${}^{18}_{8}O = ({}^{15}_{7}N + T_1) = 18 + \Delta = 16767{,}02821 - 0{,}78303 = 16766{,}24518$ Mev.

$= ({}^{15}_{7}N) + (T_1) - 15{,}834486$ Mev.

$= ({}^{17}_{8}O) + (n) - 8{,}0446$ Mev.

$= ({}^{16}_{8}O) + (D_0) - 9{,}181844$ Mev.

$= ({}^{14}_{6}C) + (\alpha) - 6{,}227888$ Mev.

${}^{18}_{9}F = ({}^{18}_{8}O + D) = 18 + \Delta = 16767{,}02821 + 0{,}87257 = 16767{,}90078$ Mev.

$= ({}^{17}_{8}O) + (P) - 5{,}606561$ Mev.

$= ({}^{16}_{8}O) + (D) - 7{,}526244$ Mev.

$= ({}^{15}_{7}N) + (T_2) - 14{,}160261$ Mev.

$= ({}^{14}_{7}N) + (\alpha) - 4{,}415808$ Mev.

${}^{19}_{9}F = ({}^{16}_{8}O + T_1) = 19 + \Delta = 17698{,}52977 - 1{,}48738 = 17697{,}04239$ Mev.

$= ({}^{18}_{8}O) + (P) - 7{,}993391$ Mev.

$= ({}^{19}_{9}F) + (n) - 10{,}43143$ Mev.

$= ({}^{17}_{8}O) + (D) - 13{,}813324$ Mev.

$= ({}^{16}_{8}O) + (T_1) - 11{,}700306$ Mev.

$= ({}^{15}_{7}N) + (\alpha) - 4{,}013838$ Mev.

${}^{20}_{10}Ne = ({}^{19}_{9}F + P) = (5\ \alpha) = 20 + \Delta = 18630{,}03134 - 7{,}0430 = 18622{,}98834$ Mev.

$= ({}^{19}_{9}F) + (P) - 12{,}844651$ Mev.

$= ({}^{18}_{9}F) + (D) - 21{,}051414$ Mev.

$= ({}^{17}_{8}O) + (T_2) - 21{,}164421$ Mev.

$= ({}^{16}_{8}O) + (\alpha) - 4{,}730918$ Mev.

${}^{21}_{10}Ne = ({}^{19}_{9}F + D) = 21 + \Delta = 19561{,}53291 - 5{,}7331 = 19555{,}79981$ Mev.

$= ({}^{20}_{10}Ne) + (n) - 6{,}76151$ Mev.

$= ({}^{19}_{9}F) + (D) - 17{,}381554$ Mev.

$= ({}^{18}_{9}F) + (T_1) - 21{,}555616$ Mev.

$= ({}^{18}_{8}O) + (T_2) - 19{,}881391$ Mev.

$= ({}^{17}_{8}O) + (\alpha) - 7{,}348138$ Mev.

${}^{22}_{10}Ne = ({}^{19}_{9}F + T_1) = 22 + \Delta = 20493{,}03447 - 8{,}0261 = 20485{,}00837$ Mev.

$= ({}^{21}_{10}Ne) + (n) - 10{,}36448$ Mev.

$= ({}^{20}_{10}Ne) + (D_0) - 14{,}901383$ Mev.

$= ({}^{19}_{9}F) + (T_1) - 21{,}488666$ Mev.

$= ({}^{18}_{8}O) + (\alpha) - 9{,}668018$ Mev.

${}^{22}_{11}Na = ({}^{19}_{9}F + T_2) = 22 + \Delta = 20493{,}03447 - 5{,}18407 = 20487{,}8504$ Mev.

$= ({}^{21}_{10}Ne) + (P) - 6{,}740011$ Mev.

$= ({}^{20}_{10}Ne) + (D) - 11{,}276914$ Mev.

$= ({}^{19}_{9}F) + (T_2) - 18{,}628011$ Mev.

$= ({}^{18}_{9}F) + (\alpha) - 8{,}481588$ Mev.

${}^{23}_{11}Na = ({}^{22}_{10}Ne + T_1) = 23 + \Delta = 21424{,}53604 - 9{,}5296 = 21415{,}00644$ Mev.

$= ({}^{22}_{10}Ne) + (P) - 8{,}792531$ Mev.

$= ({}^{22}_{11}Na) + (n) - 12{,}417$ Mev.

$= ({}^{21}_{10}Ne) + (D) - 16{,}932344$ Mev.

$= ({}^{20}_{10}Ne) + (T_1) - 17{,}436546$ Mev.

$= ({}^{19}_{9}F) + (\alpha) - 10{,}467158$ Mev.

${}^{24}_{11}Na = ({}^{23}_{11}Na + n) = 23 + \Delta = 22356{,}03761 - 8{,}41758 = 22347{,}62003$ Mev.

$= ({}^{23}_{11}Na) + (n) - 6{,}95945$ Mev.

$= ({}^{22}_{10}Ne) + (D) - 13{,}527314$ Mev.

$= ({}^{22}_{11}Na) + (D_0) - 16{,}369344$ Mev.

$= ({}^{22}_{10}Ne) + (T_1) - 17{,}634426$ Mev.

${}^{24}_{12}Mg = ({}^{23}_{11}Na + P) = (6\ \alpha) = 24 + \Delta = 22356{,}03761 - 13{,}9306 = 22342{,}10701$ Mev.

$= ({}^{23}_{11}Na) + (P) - 11{,}690031$ Mev.

$= ({}^{22}_{11}Na) + (D) - 21{,}882364$ Mev.

$= ({}^{21}_{10}Ne) + (T_2) - 23{,}128821$ Mev.

$= ({}^{20}_{10}Ne) + (\alpha) - 9{,}312538$ Mev.

$= ({}^{12}_{6}C) + ({}^{12}_{6}C)$ - 13,93059 Mev.

${}^{25}_{12}Mg = ({}^{22}_{10}Ne + T_2) = 25 + \Delta = 23287{,}53918 - 13{,}1908 = 23274{,}34838$ Mev.

$= ({}^{24}_{12}Mg) + (n)$ - 7,33167 Mev.

$= ({}^{23}_{11}Na) + (D)$ - 16,797034 Mev.

$= ({}^{22}_{11}Na) + (T_1)$ - 22,956666 Mev.

$= ({}^{22}_{10}Ne) + (T_2)$ - 20,096011 Mev.

$= ({}^{21}_{10}Ne) + (\alpha)$ - 9,882638 Mev.

${}^{26}_{12}Mg = ({}^{23}_{11}Na + T_1) = 26 + \Delta = 24219{,}04074 - 16{,}2124 = 24202{,}82834$ Mev.

$= ({}^{25}_{12}Mg) + (n)$ - 11,09308 Mev.

$= ({}^{24}_{12}Mg) + (D_0)$ - 16,200083 Mev.

$= ({}^{23}_{11}Na) + (T_1)$ - 21,632746 Mev.

$= ({}^{22}_{10}Ne) + (\alpha)$ - 10,611238 Mev.

${}^{26}_{13}Al = ({}^{24}_{12}Mg + D) = 26 + \Delta = 24219{,}04074 - 12{,}2076 = 24206{,}83314$ Mev.

$= ({}^{25}_{12}Mg) + (P)$ - 6,305841 Mev.

$= ({}^{24}_{12}Mg) + (D)$ - 11,412844 Mev.

$= ({}^{23}_{11}Na) + (T_2)$ - 17,609321 Mev.

$= ({}^{22}_{11}Na) + (\alpha)$ - 9,448468 Mev.

${}^{27}_{13}Al = ({}^{24}_{12}Mg + T_1) = 27 + \Delta = 25150{,}54231 - 17{,}1943 = 25133{,}34801$ Mev.

$= ({}^{26}_{12}Mg) + (P)$ - 8,270931 Mev.

$= ({}^{26}_{13}Al) + (n)$ - 13,05817 Mev.

$= ({}^{25}_{12}Mg) + (D) - 17{,}139344$ Mev.

$= ({}^{24}_{12}Mg) + (T_1) - 18{,}213646$ Mev.

$= ({}^{23}_{11}Na) + (\alpha) - 10{,}089638$ Mev.

${}^{28}_{14}Si = ({}^{27}_{13}Al + P) = (7\ \alpha) = 28 + \Delta = 26082{,}04388 - 21{,}4912 = 26060{,}55268$ Mev.

$= ({}^{27}_{13}Al) + (P) - 12{,}36837$ Mev.

$= ({}^{26}_{13}Al) + (D) - 22{,}419434$ Mev.

$= ({}^{25}_{12}Mg) + (T_2) - 23{,}231721$ Mev.

$= ({}^{24}_{12}Mg) + (\alpha) - 9{,}985538$ Mev.

$= ({}^{12}_{6}C) + ({}^{16}_{8}O) - 16{,}75417$ Mev.

${}^{29}_{13}Al = ({}^{26}_{12}Mg + T_1) = 29 + \Delta = 27013{,}54544 - 18{,}2125 = 26995{,}33294$ Mev.

$= ({}^{26}_{12}Mg) + (T_1) - 16{,}950046$ Mev.

$= ({}^{27}_{13}Al) + (D_0) - 14{,}936483$ Mev.

${}^{29}_{14}Si = ({}^{27}_{13}Al + D) = 29 + \Delta = 27013{,}54544 - 21{,}8937 = 26991{,}65174$ Mev.

$= ({}^{28}_{14}Si) + (n) - 8{,}47398$ Mev.

$= ({}^{27}_{13}Al) + (D) - 17{,}835244$ Mev.

$= ({}^{26}_{13}Al) + (T_1) - 24{,}636046$ Mev.

$= ({}^{26}_{12}Mg) + (T_2) - 20{,}612621$ Mev.

$= ({}^{25}_{12}Mg) + (\alpha) - 11{,}127848$ Mev.

${}^{30}_{14}Si = ({}^{27}_{13}Al + T_1) = 30 + \Delta = 27945{,}04701 - 24{,}4317 = 27920{,}61531$ Mev.

$= ({}^{29}_{13}Al) + (P) - 13{,}508231$ Mev.

$= ({}^{28}_{14}Si) + (D_0) - 16{,}858783$ Mev.

$= ({}^{27}_{13}Al) + (T_1) - 22{,}187346$ Mev.

$= ({}^{26}_{12}Mg) + (\alpha) - 10{,}644238$ Mev.

${}^{31}_{15}Ph = ({}^{28}_{14}Si + T_1) = 31 + \Delta = 28876{,}54858 - 24{,}4395 = 28852{,}10908$ Mev.

$= ({}^{30}_{14}Si) + (P) - 7{,}296831$ Mev.

$= ({}^{29}_{14}Si) + (D) - 15{,}681634$ Mev.

$= ({}^{28}_{14}Si) + (T_1) - 17{,}898246$ Mev.

$= ({}^{27}_{13}Al) + (\alpha) - 9{,}670138$ Mev.

$= ({}^{19}_{9}F) + ({}^{12}_{6}C) - 22{,}95211$ Mev.

${}^{32}_{14}Si = ({}^{28}_{14}Si + \alpha_0) = 32 + \Delta = 29808{,}05014 - 24{,}0927 = 29783{,}95744$ Mev.

$= ({}^{30}_{14}Si) + (D_0) - 13{,}579283$ Mev.

$= ({}^{29}_{13}Al) + (T_1) - 20{,}830146$ Mev.

$= ({}^{29}_{14}Si) + (T_0) - 17{,}931385$ Mev.

$= ({}^{28}_{14}Si) + (\alpha_0) - 6{,}591325$ Mev.

${}^{32}_{15}Ph = ({}^{31}_{15}Ph + n) = 32 + \Delta = 29808{,}05014 - 24{,}30478 = 29783{,}74536$ Mev.

$= ({}^{31}_{15}Ph) + (n) - 7{,}93676$ Mev.

$= ({}^{30}_{14}Si) + (D) - 13{,}008924$ Mev.

$= ({}^{29}_{14}Si) + (T_1) - 17{,}361026$ Mev.

$= ({}^{29}_{13}Al) + (T_2) - 21{,}023601$ Mev.

${}^{32}_{16}S = ({}^{31}_{15}Ph + P) = (8\ \alpha) = 32 + \Delta = 29808{,}05014 - 26{,}0151$ Mev.

$= ({}^{31}_{15}Ph) + (P) - 8{,}864641$ Mev.

$= ({}^{29}_{14}Si) + (T_2)$ - 19,052721 Mev.

$= ({}^{28}_{14}Si) + (\alpha)$ - 6,948848 Mev.

$= ({}^{16}_{8}O) + ({}^{16}_{8}O)$ - 16,54106 Mev.

${}^{33}_{15}Ph = ({}^{31}_{15}Ph + D_0) = 33 + \Delta = 30739,55171 - 26,3369 = 30713,21481$ Mev.

$= ({}^{32}_{14}Si) + (P)$ - 9,533231 Mev.

$= ({}^{31}_{15}Ph) + (D_0)$ - 15,815683 Mev.

$= ({}^{30}_{14}Si) + (T_1)$ - 16,855146 Mev.

${}^{33}_{16}S = ({}^{31}_{15}Ph + D) = 33 + \Delta = 30739,55171 - 26,5859 = 30712,96581$ Mev.

$= ({}^{32}_{15}Ph) + (P)$ - 9,570151 Mev.

$= ({}^{31}_{15}Ph) + (D)$ - 15,282244 Mev.

$= ({}^{30}_{14}Si) + (T_2)$ - 17,085521 Mev.

$= ({}^{29}_{14}Si) + (\alpha)$ - 7,117138 Mev.

${}^{34}_{16}S = ({}^{31}_{15}Ph + T_1) = 34 + \Delta = 31671,05328 - 29,93125 = 31641,12203$ Mev.

$= ({}^{33}_{15}Ph) + (P)$ - 10,883381 Mev.

$= ({}^{32}_{15}Ph) + (D)$ - 18,762304 Mev.

$= ({}^{31}_{15}Ph) + (T_1)$ - 20,441696 Mev.

$= ({}^{30}_{14}Si) + (\alpha)$ - 7,924488 Mev.

${}^{35}_{17}Cl = ({}^{32}_{16}S + T_1) = 35 + \Delta = 32602,55485 - 29,01373 = 32573,54112$ Mev.

$= ({}^{34}_{16}S) + (P)$ - 6,371511 Mev.

$= ({}^{33}_{16}S) + (D)$ - 15,563664 Mev.

$= ({}^{32}_{16}S) + (T_1) - 17{,}948566$ Mev.

$= ({}^{31}_{15}Ph) + (\alpha) - 6{,}999168$ Mev.

$= ({}^{32}_{15}Ph) + (T_2) - 19{,}640261$ Mev.

$= ({}^{18}_{9}F) + ({}^{16}_{8}O) - 22{,}78932$ Mev.

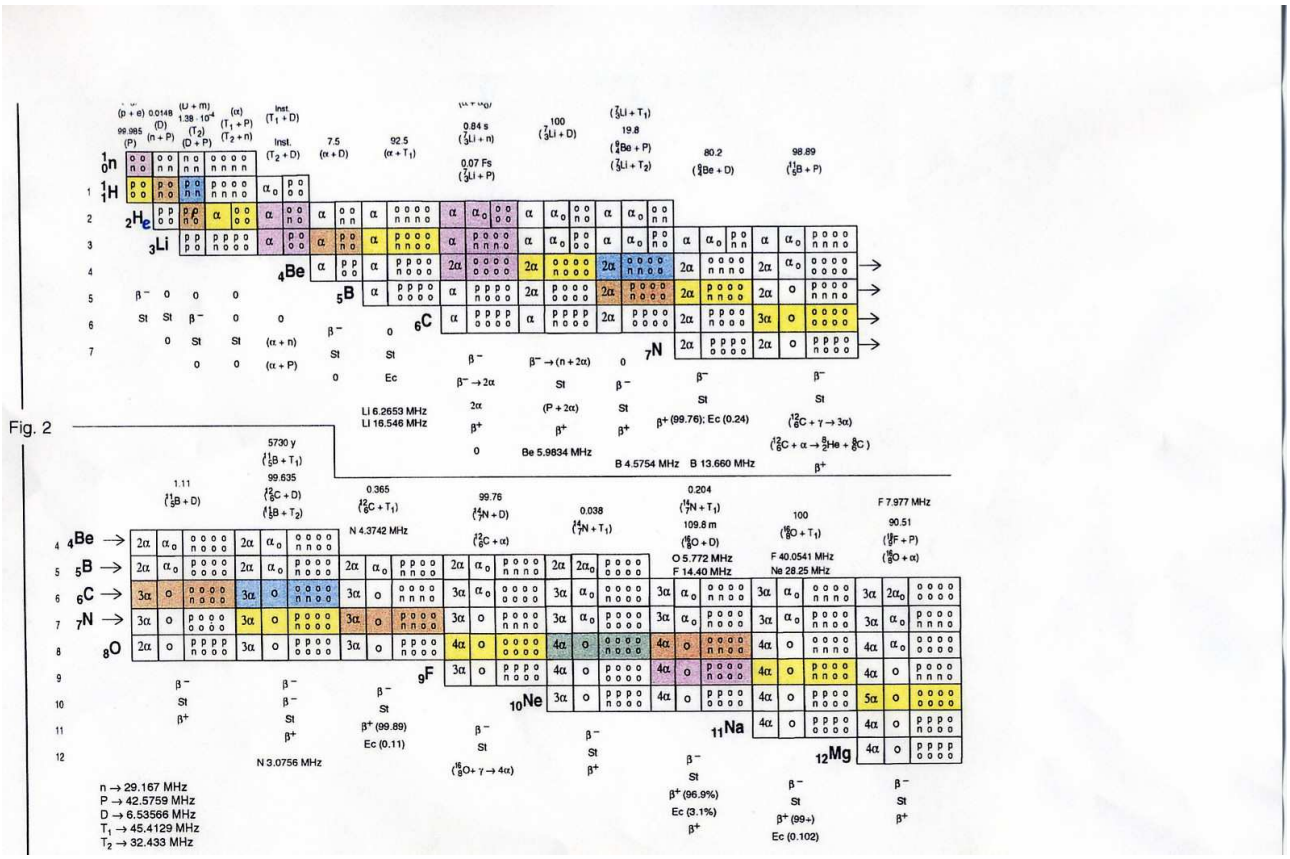


Fig. 2

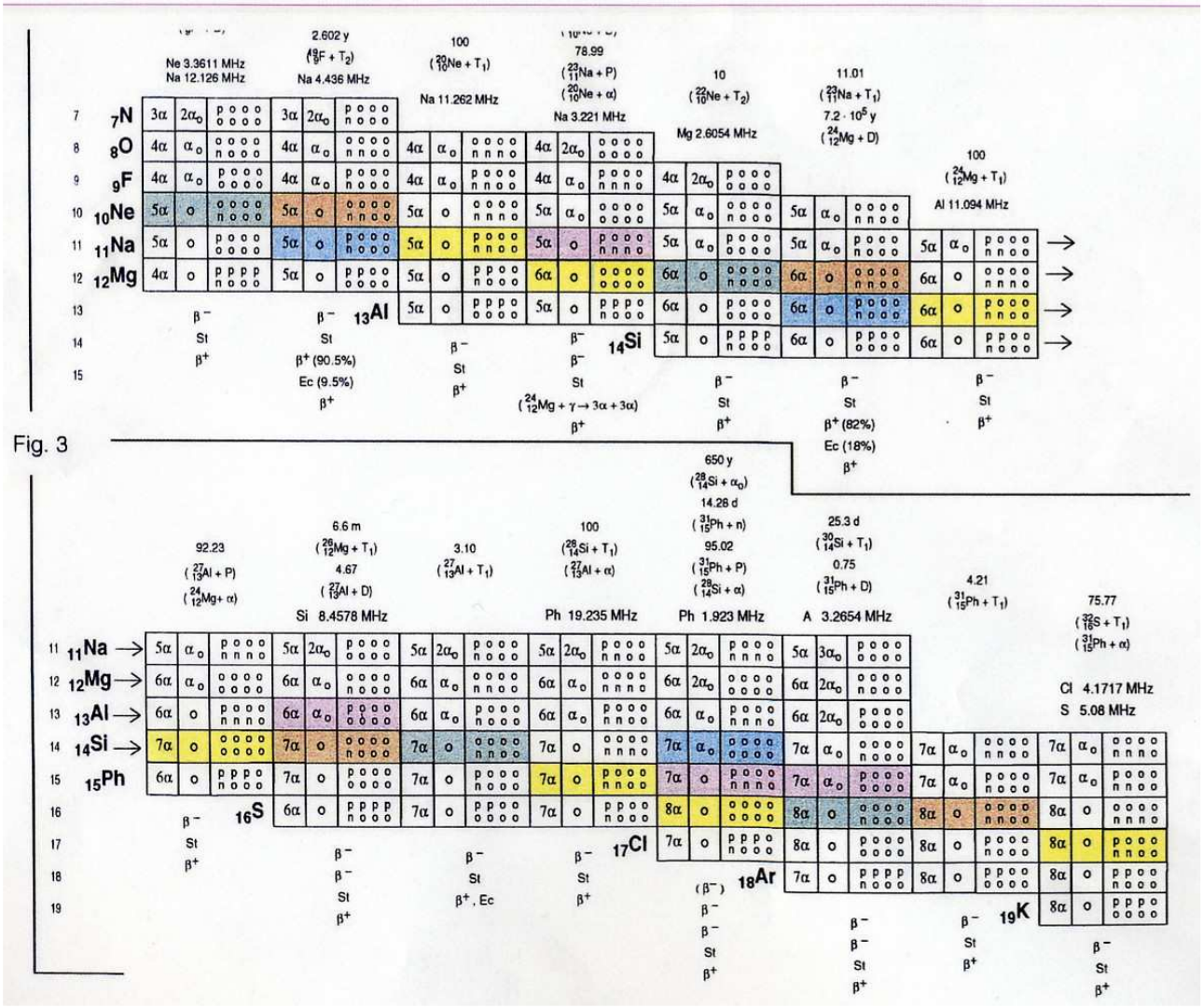

Ne 3.3611 MHz
Na 12.126 MHz
2.602 y
Na 4.436 MHz
100
Na 11.262 MHz
78.99
Na 3.221 MHz
10
Mg 2.6054 MHz
11.01
7.2 · 10^5 y
100
Al 11.094 MHz
7 7N
8 8O
9 9F
10 10Ne
11 11Na
12 12Mg
13 13Al
14 14Si
15
β−
St
β+
β+ (90.5%)
Ec (9.5%)
β+ (82%)
Ec (18%)
β+ (β−)
92.23
6.6 m
4.67
3.10
100
650 y
14.28 d
95.02
25.3 d
0.75
4.21
75.77
Si 8.4578 MHz
Ph 19.235 MHz
Ph 1.923 MHz
A 3.2654 MHz
Cl 4.1717 MHz
S 5.08 MHz
11 11Na
12 12Mg
13 13Al
14 14Si
15 15Ph
16 16S
17 17Cl
18 18Ar
19 19K
Ec

Fig. 3

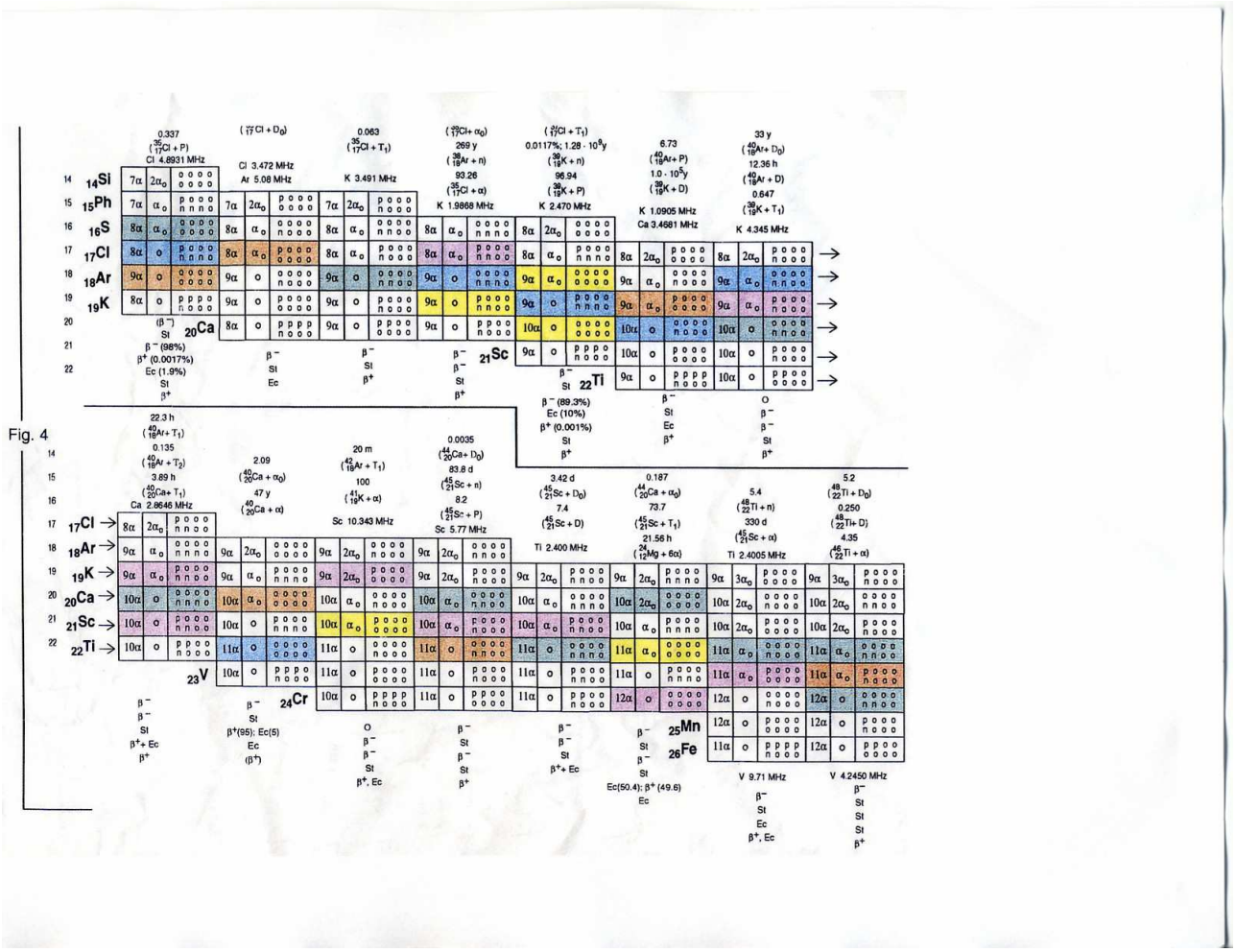


Fig. 4

I have only displayed here the structure of the elements from $^{1}_{1}H$ to $^{35}_{17}Cl$, shown in the first two of a total of 18 Tables.

The systematic study of the new Periodic Table has just started. It will be a long and hard task.

PART II: EXPERIMENTAL EVIDENCE FOR THE ALPHA-EXTENDED MODEL

Before developing further ideas and theories it is necessary to assess whether what has been previously maintained - subject to experimental check - proves experimentally founded.

A) First of all, I consider experimental evidence of ether:

1) The galactic redshift resulting from electric conductivity: σ_0 of ether (1);

2) The positive result of the experiments by Sagnac and Michelson-Gale (15).

3) The result of the experiment by P. Tewari on the production of energy, resulting from the interaction between rotating magnetic fields and the *real medium of space, where the 'real medium' signifies the medium that can sustain fields and can, consequently, possess energy* (16), that is: ether.

B) In what follows, the genesis of the elements and the Alpha-extended model of the atom are shown by means of:

1) **Neutron synthesis**

The first step in atom building is obviously the neutron synthesis. According to common opinion, neutron synthesis takes place inside the stars where, to make a neutron, two high-energy protons or two high-energy protons and one electron are necessary.

This assumption derives from the fact that in the Rutherford-Bohr planetary atom model the Coulomb field of electrons and protons is spherical In this case, in order to join two protons together, these must be pushed one against the other at such speed (temperature) so as to overcome ("to make a hole in") the repulsive Coulomb force field.

This is probably the reason why the theory of hot sun was taken for granted despite the fact that there was no experimental evidence for it.

In fact, it is known that, according to William Herschel, the sun was originally "cold" and "solid" and that, all of a sudden, in the second half of the nineteenth century, scientists started to believe that it had to be a *ball of incandescent gas*, only because *according to modem physicists* - those of the nineteenth century *-the solar interior had to be gaseous or at least not solid*. (17)

Nineteenth century is the century of the steam engine. For these physicists the sun becomes like a big steam engine.

Twentieth century physicists, then, considered it necessary to maintain its temperature, transforming it into a nuclear furnace, because only inside a hot sun protons could have the energy necessary to achieve the first step in the so-called proton-proton chain, constituted by the reactions: (18)

$^1H + {}^1H \rightarrow D + e^+ + \nu$; $E_{\nu max} = 0{,}420$ Mev.

$^1H + {}^1H + e \rightarrow D + \nu$; $E_{\nu} = 1{,}442$ Mev.

From this first step however, it follows that *the observation of solar neutrinos is a crucial test of our understanding of the solar interior* (19). But the observations of solar neutrinos - to begin with those of Davis up to those of SAGE - have confirmed that *after 50 years we have no experimental evidence of the existence of thermonuclear reactions in the solar interior* (20).

And I think that GALLEX is very much likely to confirm the results achieved by Davis and SAGE.

On the other hand, the hypothesis proposed by Harkins (1915) (21), Borghi

(1940) (22) and in this paper-that is, that the neutron is the "sum" of a proton and an electron, has been already tested by Borghi et al. since the '50s.

In fact, Borghi was able to achieve the neutron synthesis *starting from a cold plasma of protons and electrons* (23).

Since this paper is unpublished I will here quote only some essential parts:

We have tried to see experimentally whether there is some interaction between electric charges, other than the Coulomb one, and whether it may produce some kind of bound states between a proton and an electron, electrically neutral but different from an hydrogen atom state.

This requires that the stronger, and quicker, Coulomb interaction may be avoided to prevail, by means of an high frequency ionizing e. m. field. This field succeeds in maintaining a "cold" plasma, that is a considerable number of protons mixed and colliding with an equal number of free electrons, for a time very larger than 10^{-8} sec. This limit is suggested by the known average recombination time of the ionized hydrogen atom. The just said high frequency has been taken of the order 10^{-10} sec^{-1}, with amplitudes large enough for ionizing the low pressure pure hydrogen contained in the resonant cavities of a klystron-like oscillator. The excitation of this klystron is actually obtained by means of a bunched beam of hydrogen ions, but it is probable that this excitation could as well be made by means of a strong external microwave source. The device we used works with an anode-cathode (grounded) potential difference of about 500 V. The fact that twice in a period the free protons and the free electrons are accelerated in opposite directions by the electric field of the microwave produces a considerable number of collisions between these particles. Fig. 1A shows a block diagram of the experiment we made, and Fig. 1B a schematic section .of one amongst the oscillators we built:

Fig. 1A

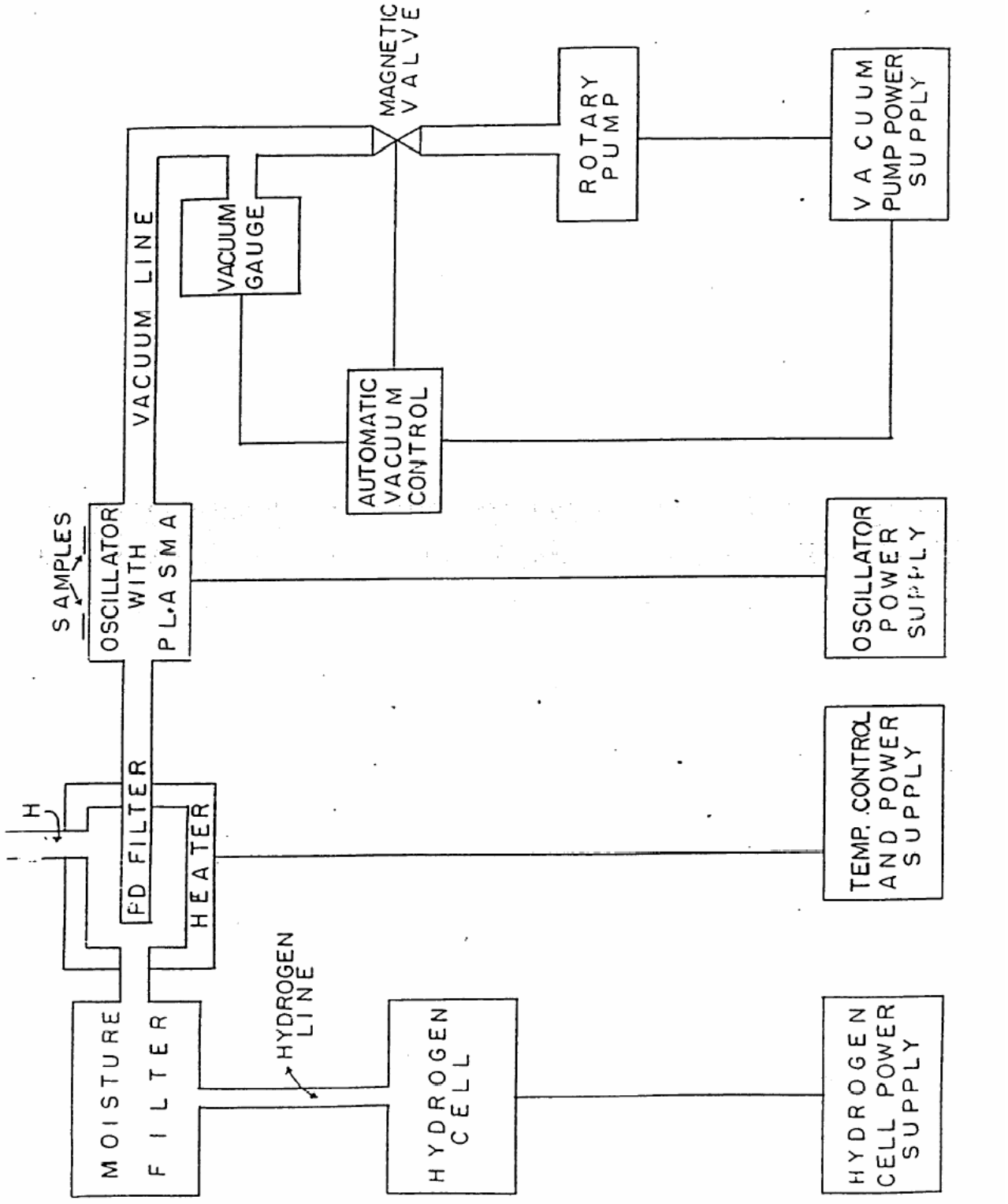
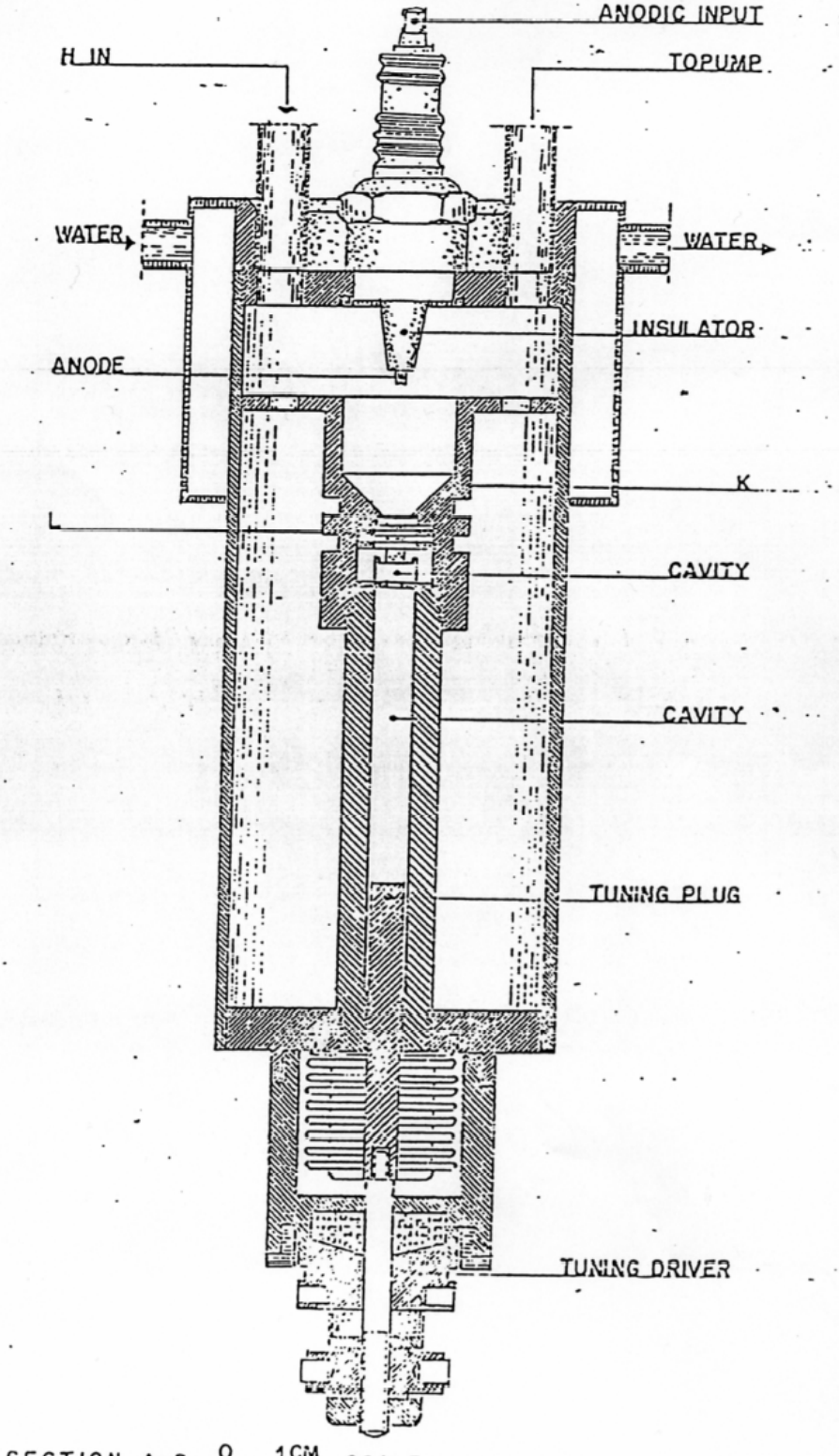

MAGNETIC VALVE
ROTARY PUMP
VACUUM PUMP POWER SUPPLY
VACUUM GAUGE
VACUUM LINE
AUTOMATIC VACUUM CONTROL
SAMPLES
OSCILLATOR WITH PLASMA
OSCILLATOR POWER SUPPLY
H
FD FILTER
HEATER
TEMP. CONTROL AND POWER SUPPLY
HYDROGEN LINE
MOISTURE FILTER
HYDROGEN CELL
HYDROGEN CELL POWER SUPPLY

Fig. 1B


ANODIC INPUT
H IN
TOPUMP
WATER
WATER
INSULATOR
ANODE
K
L
CAVITY
CAVITY
TUNING PLUG
TUNING DRIVER
SECTION A-B
0 1CM
SCALE

... The expected effect is that, because of the microwave electric field, there is a very great number of collisions between free protons and free electrons, and when some protons and electrons form the just said neutral bound states, then they behave possibly as neutrons and can cross throughout the walls of the oscillator. If it is the case, a number of sample of different elements settled outside the walls shall present a variation of their (β or γ) radioactivities, measured before and after as carefully as possible ... The results of several series of measures made during about 3 years with a great number of samples have been positive without exception ... The kind of the decay of the activated samples suggest that there is a small flux of neutrons arising from the cold plasma... of the order of 10^6 n/s...

It seems evident that no properly called fusion is responsible for the production of these neutrons with a plasma nearly at room temperature, in our case ... Thence we may conclude that this experiment seems to confirm the possibility of observing directly the assumed non Coulomb interaction between protons and electrons (23).

This experiment can be easily repeated. One of its authors, D.C Giori, is willing to give any information that may be necessary to reach this aim (24).

An improved "Borghi experiment" by C.S. Upadhyay.

C.S. Upadhyay claims to have achieved the synthesis of heavy water starting from H_2O (25).

After having read his paper, I came to the conclusion that the first and basic reaction in the process indicated by Upadhyay is the synthesis of the neutron: $p + e \rightarrow n$, followed by the reaction: $p + n \rightarrow D$ and all the others.

The method conceived and adopted by Upadhyay, called *Spin electrolysis of distilled water*, if it works, would represent a substantial improvement in the process of the synthesis of the neutron conceived and achieved by Borghi.

I suggest this experiment should be repeated.

2) **Synthesis of: D, T_1, T_2, α .**

The synthesis of Deuterium, Tritium, Helium-3 and Helium-4 can be easily obtained using Protium, ultracold and thermal neutrons.

In fact, the working with ultracold neutrons has revealed a discrepancy between the measured neutrons mean life and that expected, a discrepancy which is represented by a very high loss of ultracold neutrons.

This effect can be attributed to the fact that as soon as an ultracold neutron in bottle meets an hydrogen atom (Protium), for instance adsorbed on the walls of the bottle, this neutron forms a Deuterium atom.

The attempt to avoid this "inconvenience" by substituting hydrogen with deuterium, which "theoretically" should have resulted in a lower chance of loss, has proved

useless. This clearly means that whenever ultracold neutrons meet a deuterium atom they immediately form a Tritium atom (26).
The above mentioned inconveniences should however be considered as experimental evidence for the "ultracold fusions":
(P + n) → D, and: (D + n) → T_1, already known, as a matter of fact, since 1936 (27).
The fusion: D + n → T_1 is then followed by the decay:

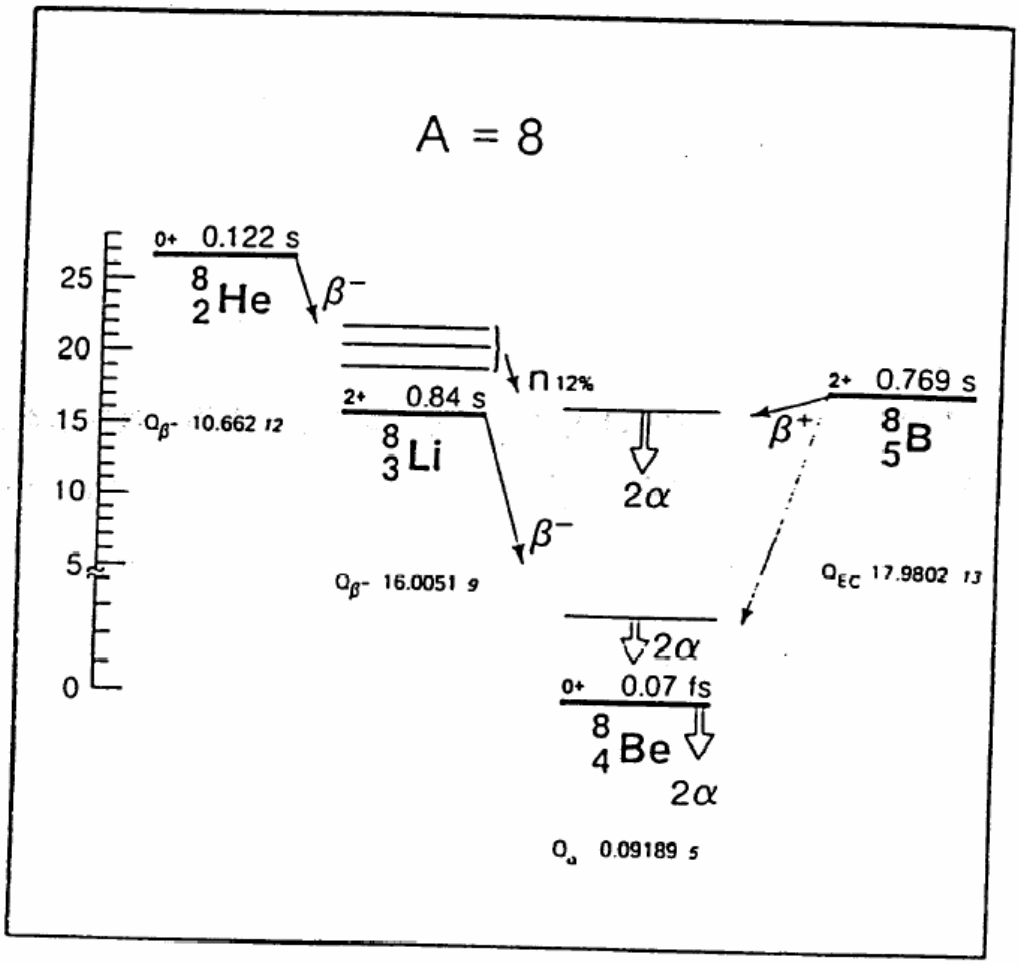
$$T_1 \xrightarrow{\beta^-} T_2 = {}^{3}_{2}He$$

The synthesis of Helium-3 can be also obtained with the reaction: D + P → ${}^{3}_{2}He$. This reaction however has been performed in the "wrong way" by bombarding a target of Polystyrene (CH) with 20 - 30 Mev Deuterons (28), whereas it should be more easily achieved by means of cryogenic methods (29).
Finally, the experimental evidence of the cold fusion: ${}^{3}_{2}He$ + n → ${}^{4}_{2}He$ is well established: Helium-3, which is commonly used in neutron detectors, "avidly absorbs" neutrons - the better the colder they are (26).

3) **Production and decay of Helium-8.**

The first experimental evidence of the existence of the α_0 group inside nuclei is given by the production and decay of ${}^{8}_{2}He$.
It is known that both the ${}^{5}_{2}He$ nucleus (α + n) and the ${}^{8}_{4}Be$ nucleus (2 α) are unstable, whereas ${}^{9}_{4}Be$ (2α + n) is stable and reaches the maximum in abundance (100%) (14), (30).
The structure of this nucleus seems to be: (α- n - α) because when it collides with α particles the "neutron bond" breaks and the bond neutron becomes "free" again (31).
Starting from ${}^{11}_{5}B$ there is, instead, the possibility to find an α_0 group inside the nucleus (the structure of ${}^{10}_{5}B$ is more likely to be: α - D - α).
In fact, if the nuclei of ${}^{11}_{5}B$ and ${}^{12}_{6}C$ are "decorticated" with γ rays (32), protons (33), etc. ..., the result is the production of Helium-8, whose nucleus supposedly has the structure: (α + 4n).
This nucleus, which is unstable ($t_{1/2}$ = 0,122 s), first undergoes two β^- decays - see Table 1 (14) - and then divides into two α particles.
Taking into account the stability of the α group, it seems, therefore, plausible that the 4 neutrons behave like a group, that is, the α_0 group, and that the two β^- decays are to be attributed to the α_0 group, which, after this process, changes back into an " α particle."

Table 1


A = 8
0+ 0.122 s
$^{8}_{2}$He
β^-
25
20
15
10
5
0
Q_{β^-} 10.662 12
n 12%
2+ 0.84 s
$^{8}_{3}$Li
β^-
Q_{β^-} 16.0051 9
2α
2+ 0.769 s
$^{8}_{5}$B
β^+
Q_{EC} 17.9802 13
2α
0+ 0.07 fs
$^{8}_{4}$Be
2α
Q_α 0.09189 5

4) **Production and decay of the nuclei from 11α to 18 α .**

The production of the nuclei from from 11α to 18 α constitutes a series of examples which show the developing of one or more α_0 groups, starting with the insertion (or the forming) of one or more α groups inside a nucleus. Let us consider the following cases:

Production:

$$(11\ \alpha) = {}^{44}_{22}Ti \qquad (34)$$

$${}^{40}_{20}Ca + \alpha \rightarrow {}^{44}_{22}Ti + \gamma$$

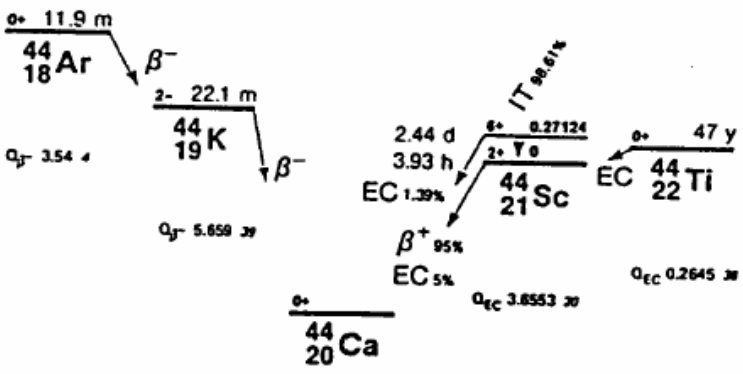
$$(10\ \alpha) + \alpha \rightarrow (11\ \alpha) + \gamma$$

Decay:

$${}^{44}_{22}Ti \rightarrow {}^{44}_{20}Ca$$

$$(11\ \alpha) \xrightarrow{2EC} (10\ \alpha + \alpha_0)$$

A= 44



Observation: Whereas the transition ${}^{44}_{22}Ti \rightarrow {}^{44}_{21}Sc$ takes place through electron capture (EC), the transition ${}^{44}_{21}Sc \rightarrow {}^{44}_{20}Ca$ takes place through β^+ emission (95%) and only by 5% through electron capture (14).

In my opinion, the "natural" channel, through which this process takes place, is constituted by a double electron capture, that is to say that the emission consists in the production of a $e^+ e^-$ couple, due to the production at high energy (with excess energy) of the isobar taken into consideration, followed by an electron capture (EC) and by the expulsion of the positron.

Production:

$$(12\ \alpha) = {}^{48}_{24}Cr \qquad (35)$$

$$\text{———————}$$

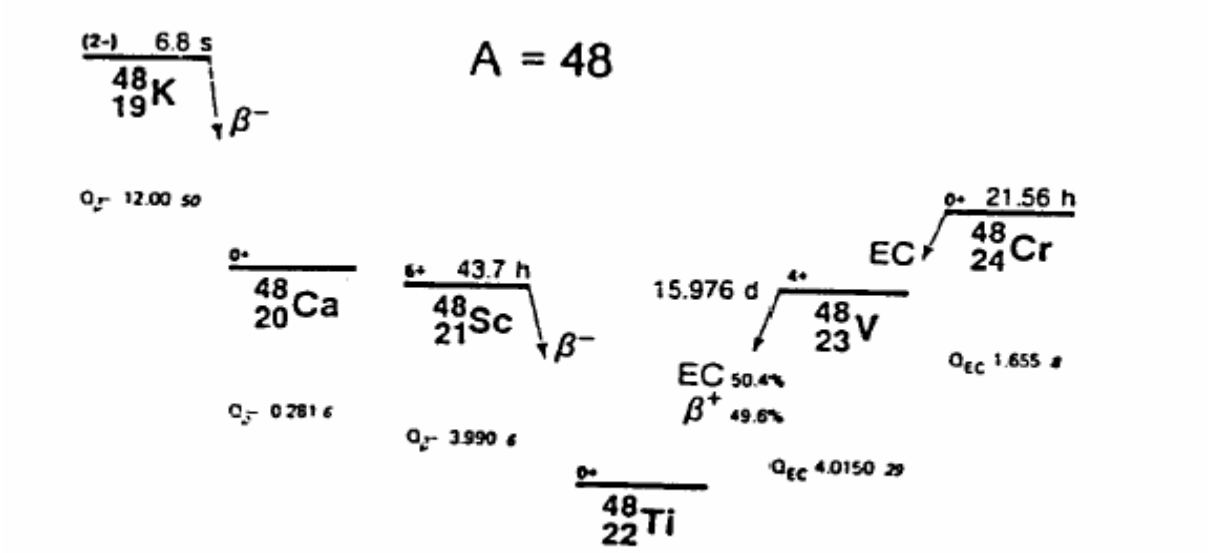
$${}^{46}_{22}Ti + \alpha \rightarrow {}^{48}_{24}Cr + 2\ n$$

$$(11\ \alpha + D_0) + \alpha \rightarrow (12\ \alpha) + 2n$$

Decay:

$${}^{48}_{24}Cr \rightarrow {}^{48}_{22}Ti$$

$$(12\ \alpha) \xrightarrow{2EC} (11\ \alpha + \alpha_0)$$



Observation: In my opinion, the β^+ emissions (49,6%) in the transitions ${}^{48}_{23}V \rightarrow {}^{48}_{22}Ti$ (14) is an anomalous channel due to the excess of the energy employed in the production of (12 α).

Production:

$$(13\ \alpha) = {}^{52}_{26}Fe \qquad (36)$$

$${}^{50}_{24}Cr + \alpha \rightarrow {}^{52}_{26}Fe + 2n$$

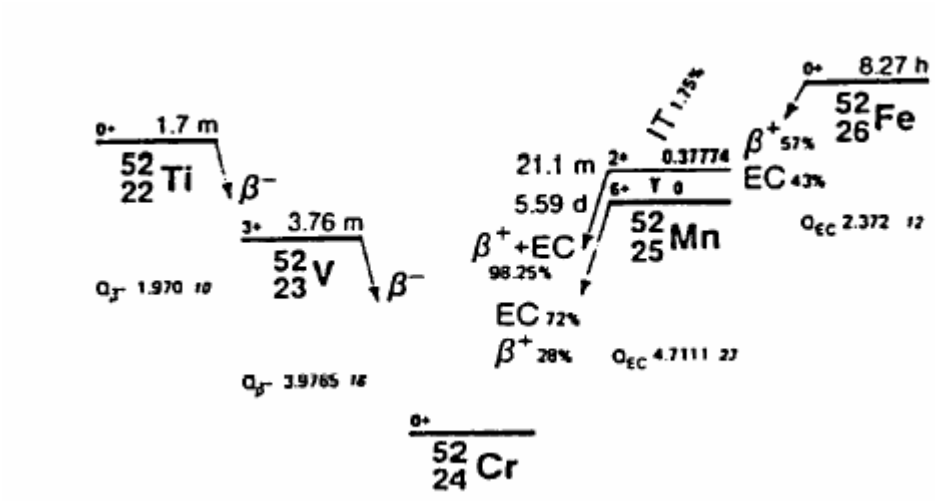
$$(12\ \alpha + D_0) + \alpha \rightarrow (13\ \alpha) + 2n$$

Decay:

$${}^{52}_{26}Fe \rightarrow {}^{52}_{24}Cr$$

$$(13\ \alpha) \xrightarrow{2EC} (12\ \alpha + \alpha_0)$$

A= 52



Observation: In my opinion, the mixture of the electron captures and β^+ emission in the transitions: ${}^{52}_{26}Fe \rightarrow {}^{52}_{25}Mn$ (EC: 43% ; β^+: 57%) and ${}^{52}_{25}Mn \rightarrow {}^{52}_{24}Cr$ (EC: 72% ; β^+: 28%) (14) should be attributed to the production at high energy of the isobars taken into consideration.

Production: $(14\ \alpha) = {}^{56}_{28}Ni$

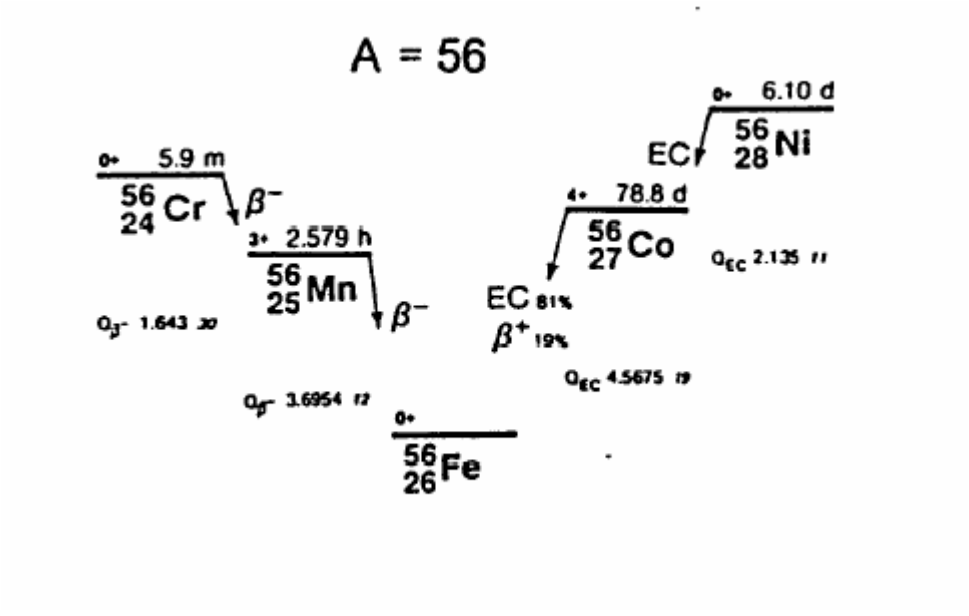
(37)

$${}^{54}_{26}Fe + \alpha \rightarrow {}^{56}_{28}Ni + 2n$$

$$(13\ \alpha + D_0) + \alpha \rightarrow (14\ \alpha) + 2n$$

Decay: ${}^{56}_{28}Ni \rightarrow {}^{56}_{26}Fe$

$$(14\ \alpha) \xrightarrow{2EC} (13\ \alpha + \alpha_0)$$



Observation: In my opinion, the β^+ emission (19%) in the transition ${}^{56}_{27}Co \rightarrow {}^{56}_{26}Fe$ is due to the kind of production (high energy of the ${}^{56}_{27}Co$ isobar (14).

Production:

$$(15\ \alpha) = {}^{60}_{30}Zn \qquad (38)$$

$$\_\_\_\_\_$$

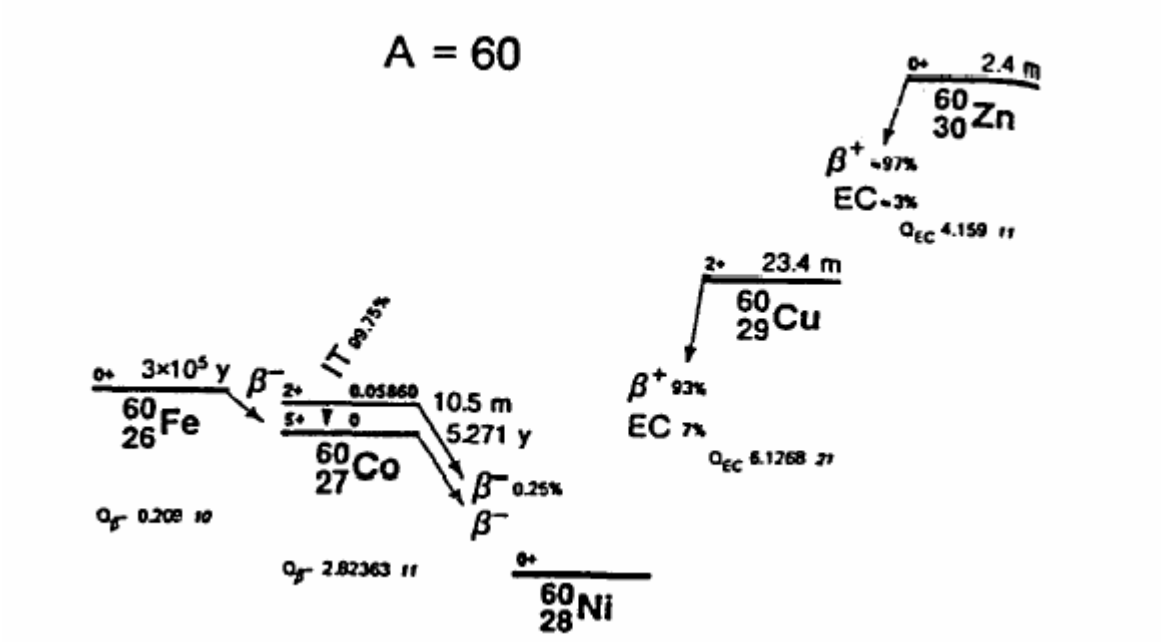
$${}^{58}_{28}Ni + \alpha \rightarrow {}^{60}_{30}Zn + 2n$$

$$(14\ \alpha + D_0) + \alpha \rightarrow (15\ \alpha) + 2n$$

Decay:

$${}^{60}_{30}Zn \rightarrow {}^{60}_{28}Ni$$

$$(15\ \alpha) \xrightarrow{2EC} (14\ \alpha + \alpha_0)$$



Observation: I think that the β^+ emission in the transitions: ${}^{60}_{30}Zn \rightarrow {}^{60}_{29}Cu$ (β^+ : 97%); ${}^{60}_{29}Cu \rightarrow {}^{60}_{28}Ni$ (β^+ : 93%) is due to the excess of energy employed in the production of ${}^{60}_{30}Zn$ and ${}^{60}_{29}Cu$ (14).

Production:

$$(16\ \alpha) = {}^{64}_{32}Ge \qquad (39)$$

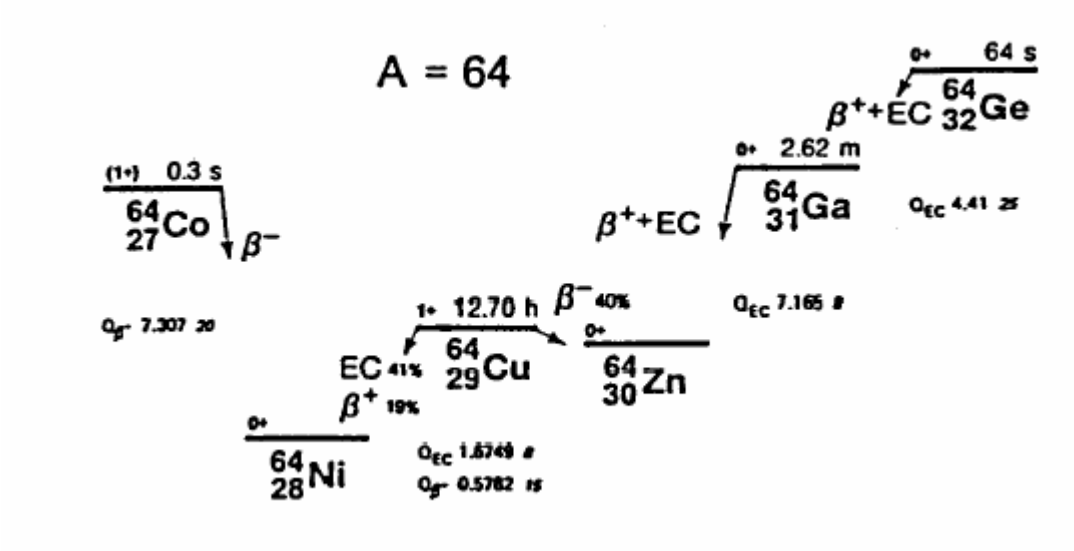
$${}^{54}_{26}Fe + {}^{12}_{6}C \rightarrow {}^{64}_{32}Ge + 2n$$

$$(13\ \alpha + D_0) + (3\ \alpha) \rightarrow (16\ \alpha) + 2n$$

Decay:

$${}^{64}_{32}Ge \rightarrow {}^{64}_{30}Zn$$

$$(16\ \alpha) \xrightarrow{2EC} (15\ \alpha + \alpha_0)$$



Observation: In my opinion, the β^+ emission in the transitions: ${}^{64}_{32}Ge \rightarrow {}^{64}_{31}Ga$; ${}^{64}_{31}Ga \rightarrow {}^{64}_{30}Zn$ are due to the excess of the energy in the production of the ${}^{64}_{32}Ge$ (14).

Production:

$$(17\ \alpha) = {}^{68}_{34}Se \qquad (40)$$

$$\frac{}{}$$

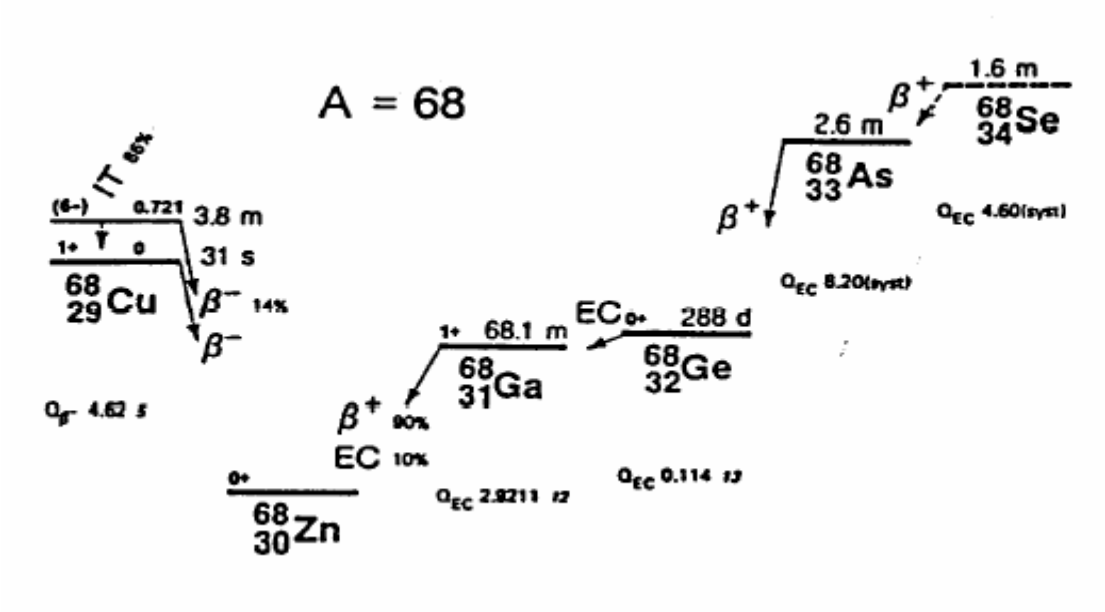
$${}^{59}_{27}Co + {}^{16}_{8}O \rightarrow {}^{68}_{34}Se + T_1 + 4n$$

$$(13\ \alpha + \alpha_0) + (4\ \alpha) \rightarrow (17\ \alpha) + T_1 + 4n$$

Decay:

$${}^{68}_{34}Se \rightarrow {}^{68}_{30}Zn$$

$$(17\ \alpha) \xrightarrow{4EC} (15\ \alpha + 2\ \alpha_0)$$



Observation: The following reaction would have been more appropriate:

$^{58}_{28}Ni + {}^{12}_{6}C \rightarrow {}^{68}_{34}Se + 2n \Leftrightarrow (14\ \alpha + D_0) + (3\ \alpha) \rightarrow (17\ \alpha) + 2n.$

I think that the β^+ emission in the transitions: $^{68}_{34}Se \rightarrow {}^{68}_{33}As$; $^{68}_{33}As \rightarrow {}^{68}_{32}Ge$; $^{68}_{31}Ga \rightarrow {}^{68}_{30}Zn$ (β^+ : 90%) should be attributed to the production "at high energy" of $^{68}_{34}Se$ (14).

Production:

$$(18\ \alpha) = {}^{72}_{36}Kr \qquad (41)$$

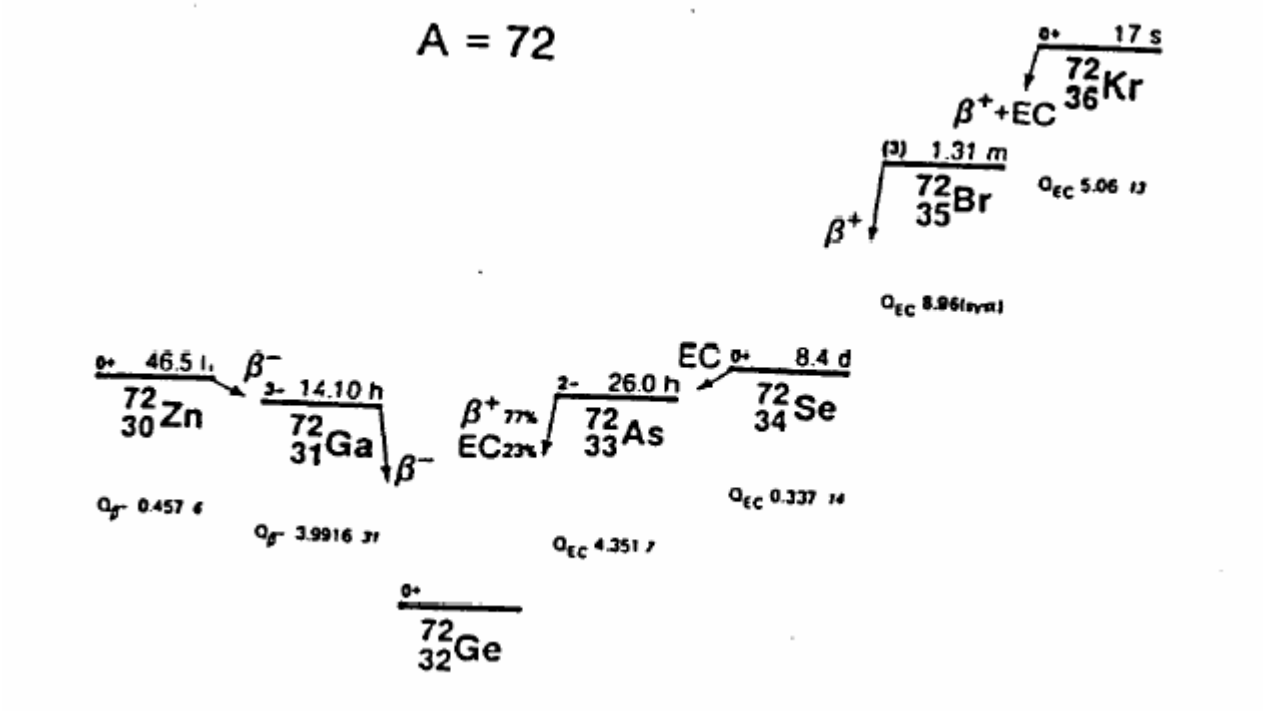
$$^{58}_{26}Ni + {}^{16}_{8}O \rightarrow {}^{72}_{36}Kr + 2n$$

$$(14\ \alpha + D_0) + (4\ \alpha) \rightarrow (18\ \alpha) + 2n$$

Decay:

$$^{72}_{36}Kr \rightarrow {}^{72}_{32}Ge$$

$$(18\ \alpha) \xrightarrow{4EC} (16\ \alpha + 2\ \alpha_0)$$



Observation: In my opinion, the β^+ emission in the transitions: ${}^{72}_{36}Kr \rightarrow {}^{72}_{35}Br$; ${}^{72}_{35}Br \rightarrow {}^{72}_{34}Se$; ${}^{72}_{33}As \rightarrow {}^{72}_{32}Ge$ should be attributed to the production at high energy of ${}^{72}_{36}Kr$ (14).

The various, possible and more appropriate reactions for the production of the nuclei (n α) can be identified by examining the new Periodic Table of the Elements (13).

5) **"Cold Fusion" of Iron 56**.

In 1964 George Oshawa et al., together with Micho Kushi (42), made a series of experiments on the transmutation of elements. These experiments were performed at normal temperature and pressure through electrochemical methods.

These scientists came to the conclusion - already reached by Kervran - that both "cold fusion" and "cold fission" were possible.

In my opinion, among these experiments the synthesis of Iron 56, starting from Carbon and Oxygen, is particularly interesting, for, as it has already been underlined, Fe can also be produced through a high energy method (see section 4,14α), which allows one to compare the results obtained with the two methods considered.

In this respect, I will here quote some passages from the report concerning this subject (43).

According to Oshawa et al. the reactions which take place in the synthesis of Iron 56 are the following:

$$2\,({}^{12}_{6}C) + 2({}^{16}_{8}O) \rightarrow 2\,({}^{28}_{14}Si) \rightarrow {}^{56}_{28}Ni \xrightarrow{2Ec} {}^{56}_{26}Fe$$

$$2\,(3\,\alpha) + 2(4\,\alpha) \rightarrow 2(7\,\alpha) \rightarrow (14\,\alpha) \xrightarrow{2Ec} (13\,\alpha + \alpha_0)$$

In their experiments George Oshawa and his associates in Japan succeeded with several methods to produce Fe from C and 0. Later, French scientists tested similar methods and confirmed the success of the transmutation. After creating the method to achieve the most efficient possible transmutation, they filed patents accordingly. The following examples show only a few methods to accomplish the transmutation from C and 0 to Fe:

Method 1: Transmutation in air (A).

Two graphite crucibles (appx. 2,5" per 5" to 6") cover each other top and bottom. The upper crucible has a 10mm hole surrounded by a ceramic ring. The ceramic ring acts as an insulator. A carbon rod (0,25" diameter) is inserted into this hole until it

reaches the carbon powder (2 to 3 g) placed at the inside bottom of the lower crucible.

The lower crucible has one or two small holes at the lower part of its side wall for air circulation. An iron base placed under the lower crucible acts as one electric pole. The carbon rod acts as another electric pole. As the carbon rod approaches the carbon powder, the electric arc arises and by performing this operation for 20 to 30 min. the carbon powder changes into Fe.

In this experiment the applied electricity is about 35 to 50 volts, and 8 to 18 amps, either A.C. or D.C.

***Method 2: Transmutation in water**.*

Using two Carbon rods (0,25" diameter), create an electric arc between them by striking one with the other in water. This operation is performed for 1 to 5 seconds. Then brown-black metallic powder falls down to the bottom of the water which contains Fe. The applied electricity is the same as in method 1.

***Method 3: Transmutation in air (B)**.*

Carbon powder is placed on a copper plate, approximately 12" long, 6" wide and 0,5" thick. This plate works as an electrical ground. A carbon rod (identical to the carbon rods used in method 1 and 2), as another electric pole, repeatedly strike the carbon powder on the plate, producing an electric arc. The carbon powder changes into Fe.

The applied electricity is the same as in the former methods.

During the above process of transmutation $^{56}_{28}Ni$ *is temporarily produced, but it disappears very soon for it is an isotope of radioactive nature. The mean life of a Ni isotope is considered approximately 0,001 second.*

In these experiments the degree of transmutation from C and O to Fe is approximately by 5% to 20% immediately, with a larger percentage of transmutation occurring gradually in the air, which has the effect of cooling the metallic powder to below room temperature.

The Fe which is produced by this transmutation is stainless. It does not rust easily; it does also react much less to heat than ordinary iron, due to its composition of 2 Si (silicon) as the formula indicates.

This iron was named G.O.S (George Oshawa Steel), according to the initials of George Oshawa, by the scientists who worked on this transmutation.

All the results of the transmutation of Fe have been carefully examined and analyzed with several methods including 1) magnetic inspection, 2)spectroscopic analysis, 3) chemical analysis, 4) examination by reagent, etc., later confirmed by authoritative testing agencies...

The above report is only a simple glance at the problem relating to the transmutation of the atom. The purpose of this report is to give a basic

understanding of the facts and possibilities of atomic transmutation at low temperature, low pressure and low energy.

In accordance with the analysis report from Japan, it is confirmed that more than 35 elements such as Si, Al, Ca, Mg, Mo, Ni, Na, K, Pt, Au, Hg and so forth, can be produced from light elements (atomic number 1 to 8). The efficiency of production depends on further technological and engineering studies (43).

It thus results that whereas the mean life of $^{56}_{28}Ni$ produced at high energy is 6,10 days, the conversion $^{56}_{28}Ni \rightarrow {}^{56}_{26}Fe$ is almost immediate (0,001 s).

This fact seems to confirm the hypothesis according to which in cold fusions and cold fissions the transitions from an unstable isotope possibly produced to the "final" stable isotope (13), takes place in much shorter time than the corresponding one in case of "high energy production".

Moreover the particular isomeric structure of Iron 56 produced by the above mentioned "cold fusion" seems to endow it with peculiar physical-chemical properties.

The instructions given by Oshawa et al. allow one to reproduce the experiments here described.

By following these instructions, the synthesis of Iron 56, starting from Carbon and Oxygen, has been recently repeated with positive, even if not definitive, results (44).

It should be noted that the elements involved- C, O, Si, Fe -have the following stable (or "almost stable") isotopes:

$^{12}_{6}C$, $^{13}_{6}C$, $^{14}_{6}C$ ($t_{1/2} = 5730y$) $\xrightarrow{\beta^-}$ $^{14}_{7}N$

(3 α), (3 α + n), (3 α + D_0)

$^{16}_{8}O$, $^{17}_{8}O$, $^{18}_{8}O$

(4 α), (4 α + n), (4 α + D_0)

$^{28}_{14}Si$, $^{29}_{14}Si$, $^{30}_{14}Si$, $^{32}_{14}Si$ ($t_{1/2} = 650y$) $\rightarrow$ $^{32}_{16}S$

(7 α), (7 α + n), (7 α + D_0) , (7 α + α_0) $\xrightarrow{2\beta^-}$ (8 α)

$^{54}_{26}Fe$, $^{56}_{26}Fe$, $^{57}_{26}Fe$, $^{58}_{26}Fe$, $^{60}_{26}Fe$ ($t_{1/2} = 3 \cdot 10^5$ y) $\rightarrow$ $^{60}_{28}Ni$

(13 α + D_0), (13 α + α_0), (13 α + α_0 + n), (13 α + α_0 + D_0), (13 α + 2α_0) $\xrightarrow{2\beta^-}$

(13 α + α_0)

It is easy then to notice that the isotopes of Si and Fe correspond to the various combinations between the isotopes of Carbon and Oxygen.

A macroscopic sample of Iron, endowed with the same chemical-physical properties, can be found in Delhi (Qutub Minar. Iron Pillar) (45).

6) Production of heavy elements by cold fusion.

The synthesis of elements by cold fusion is a general process: from Deuterium to superheavy elements (13).

In fact, it results that *in the field of the synthesis of superheavy elements,the most recent result achieved is represented by cold fusion, in which masses and bombardment energies are carefully chosen so as to minimize the excitation of newly formed nuclei.*

During these researches almost all initial ideas on the synthesis of superheavy elements have proved wrong: the nuclei of the elements which can be synthesized are deformed and not spherical, as it was believed in 1966.

In the process of fusion, we use stable nuclei ... and medium-weight projectiles and we do not use artificial, radioactive and heavy nuclei together with projectiles, as light as possible, as it was previously suggested.

The fusion must take place at the lowest possible bombardment energy, despite all previous suggestions according to which impact energy should have been over-abounding so as to 'violently' favour the process of fusion by means of a surplus of forces (46), (47).

The technique employed for the production of these nuclei may be further improved by working in cryogenics (29).

7) Cold fission.

The low energy transmutations observed by Kervran are reversible. See for example (48), (49):

$$^{27}_{13}Al \xrightleftharpoons{\pm\ ^{1}_{1}H} {}^{28}_{14}Si \quad \Leftrightarrow \quad (6\,\alpha + T_1) \xrightleftharpoons{\pm P} (7\alpha)$$

$$^{31}_{15}Ph \xrightleftharpoons{\pm\ ^{1}_{1}H} {}^{32}_{16}S \quad \Leftrightarrow \quad (7\,\alpha + T_1) \xrightleftharpoons{\pm P} (8\,\alpha)$$

$$^{39}_{19}K \xrightleftharpoons[]{\pm\ ^{1}_{1}H} {}^{40}_{20}Ca \quad \Leftrightarrow \quad (9\ \alpha + T_1) \xrightleftharpoons[]{\pm P} (10\ \alpha)$$

$$^{55}_{25}Mn \xrightleftharpoons[]{\pm\ ^{1}_{1}H} {}^{56}_{26}Fe \quad \Leftrightarrow \quad (12\ \alpha + \alpha_0 + T_1) \xrightleftharpoons[]{\pm P} (13\ \alpha + \alpha_0)$$

$$^{24}_{12}Mg \xrightleftharpoons[]{\pm\ ^{4}_{2}He} {}^{28}_{14}Si \quad \Leftrightarrow \quad (6\ \alpha) \xrightleftharpoons[]{\pm \alpha} (7\ \alpha)$$

$$^{52}_{24}Cr \xrightleftharpoons[]{\pm\ ^{4}_{2}He} {}^{56}_{26}Fe \quad \Leftrightarrow \quad (12\ \alpha + \alpha_0) \xrightleftharpoons[]{\pm \alpha} (13\ \alpha + \alpha_0)$$

$$^{28}_{14}Si \xrightleftharpoons[]{\pm\ ^{12}_{6}C} {}^{40}_{20}Ca \quad \Leftrightarrow \quad (7\ \alpha) \xrightleftharpoons[]{\pm 3\alpha} (10\ \alpha)$$

$$^{23}_{11}Na \xrightleftharpoons[]{\pm\ ^{16}_{8}O} {}^{39}_{19}K \quad \Leftrightarrow \quad (7\ \alpha + T_1) \xrightleftharpoons[]{\pm 4\alpha} (9\ \alpha + T_1)$$

$$^{24}_{12}Mg \xrightleftharpoons[]{\pm\ ^{16}_{8}O} {}^{40}_{20}Ca \quad \Leftrightarrow \quad (6\ \alpha) \xrightleftharpoons[]{\pm 4\alpha} (10\ \alpha)$$

If, on the one hand, these transmutations can be regarded as "cold fusions," on the other, they can be considered as examples of "cold fissions".

Another significant example of cold fission, described by Kervran, is the following electromagnetically induced "cold fission" (49):

$$^{206}_{82}Pb \rightarrow 2\ (^{103}_{41}Nb) \rightarrow 2\ (^{103}_{45}Rh)$$

$$(41\ \alpha\ + 10\ \alpha_0 + D_0)\ \rightarrow 2(20\ \alpha\ + 5\ \alpha_0 + T_1) \xrightarrow{2\cdot 4\beta^-} 2(22\ \alpha\ + 3\ \alpha_0 + T_1)$$

"The most important thing" - Kervran maintains - "is to note that the nucleus has divided into two parts, like a walnut that breaks along the median plane.

Therefore, in Lead-206 there must be a plane characterized by a lower resistance, for fission takes place along this plane ... It appears obvious then that the notion of mean energy per nucleon does not make any sense since it has been ascertained that nuclei are made of thick parts that always divide in the area of lower resistance" (49).

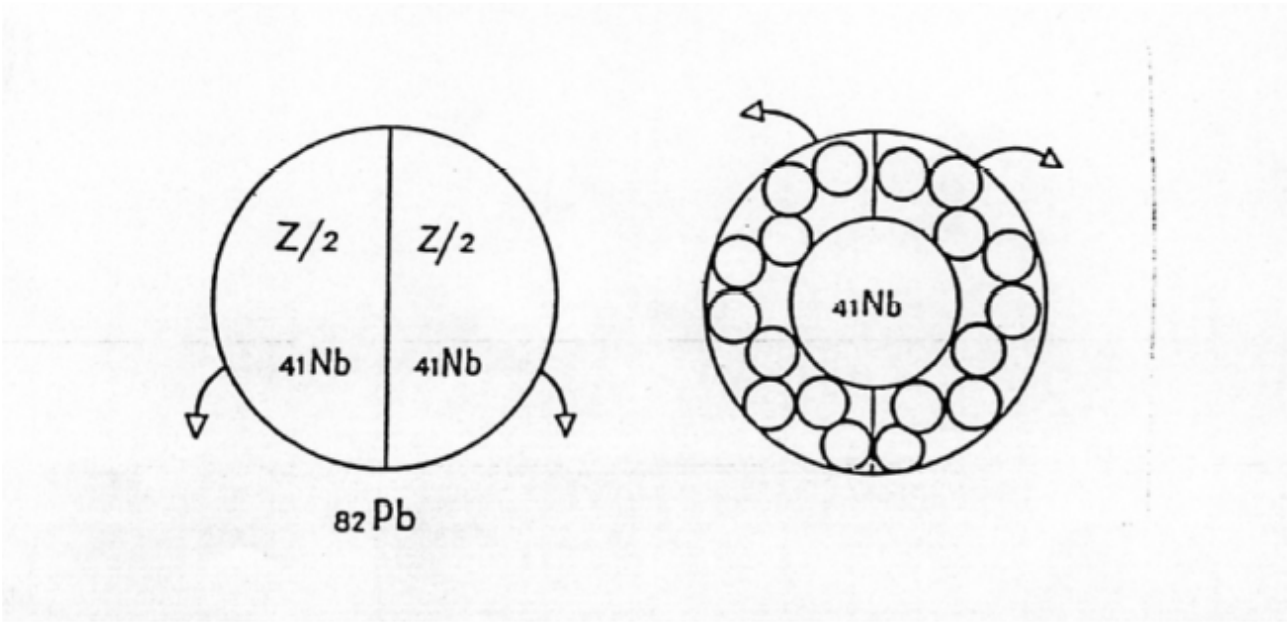


Fig. 20 - “Spontaneous fission” of lead.

On the left, the nucleus of Lead-206 divides into two equal parts ${}^{103}_{41}Nb$; can only be explained with a median "fissure".

On the right, the "shell" structure seems impossible because it would be necessary a "heart" made of 41 protons and a "corona" of 41 protons, which should open like a shell and then assemble into a nucleus.

In 1984 Rose at al. discovered "new radioactivities" (50) and, finally, in 1986 Clerc at al. rediscovered cold fission (51) in which "clusters with $A \geq 80$ have been observed experimentally" (52).

In my opinion both "new radioactivities" and "cold fissions" can be considered as experimental evidences of the Alpha-extended model of the atom.

In fact, these new radioactivities and cold fissions are examples of a process which is opposite to that of the formation of the α_0 groups (section 4), that is: the "reconversion" of the α_0 group into " α group" through two β^- decays, as already explained in section 3.

In fact, let us consider the following examples of "new radioactivities - cold fissions" (52):

a) $^{222}_{88}Ra \rightarrow {}^{14}_{6}C + {}^{208}_{82}Pb$

$$(44\ \alpha + 11\ \alpha_0 + D_0) \rightarrow (3\ \alpha + D_0) + (41\ \alpha + 11\ \alpha_0)$$
$$\downarrow\ \beta^-$$
$$(3\ \alpha + D)$$
$$\underline{{}^{14}_{7}N}$$

b) $^{222}_{88}Ra \rightarrow {}^{14}_{6}C + \underline{{}^{210}_{82}Pb}$

$$(44\ \alpha + 12\ \alpha_0) \rightarrow (3\ \alpha + D_0) + (41\ \alpha + 11\ \alpha_0 + D_0)$$
$$\downarrow\ \beta^- \qquad\qquad \downarrow\ 2\ \beta^-,\ \alpha$$
$$(3\ \alpha + D) \quad (41\ \alpha + 10\ \alpha_0 + D_0)$$
$$\underline{{}^{14}_{7}N} \qquad \underline{{}^{206}_{82}Pb}$$

c) $^{232}_{92}U \rightarrow {}^{24}_{10}Ne + {}^{208}_{82}Pb$

$$(46\ \alpha + 12\ \alpha_0) \rightarrow (5\ \alpha + \alpha_0) + (41\ \alpha + 11\ \alpha_0)$$
$$\downarrow\ 2\ \beta^-$$
$$(6\ \alpha\ )$$
$$\underline{{}^{24}_{12}Mg}$$

d) $^{234}_{92}U \rightarrow {}^{28}_{12}Mg + {}^{206}_{80}Hg$

$$(46\ \alpha + 12\ \alpha_0 + D_0) \rightarrow (6\ \alpha + \alpha_0) + (40\ \alpha + 11\ \alpha_0 + D_0)$$
$$\downarrow\ 2\ \beta^- \qquad\qquad \downarrow\ 2\ \beta^-$$
$$(7\ \alpha\ ) \qquad (41\ \alpha + 10\ \alpha_0 + D_0)$$
$$\underline{{}^{28}_{14}Si} \qquad\qquad \underline{{}^{206}_{82}Pb}$$

e) $^{234}_{92}U \rightarrow {}^{24}_{10}Ne + {}^{210}_{82}Pb$

$$(46\ \alpha + 12\ \alpha_0 + D_0) \rightarrow (5\ \alpha + \alpha_0) + (41\ \alpha + 11\ \alpha_0 + D_0)$$
$$\downarrow\ 2\ \beta^- \qquad\qquad \downarrow\ 2\ \beta^-,\ \alpha$$
$$(6\ \alpha\ ) \qquad (41\ \alpha + 10\ \alpha_0 + D_0)$$
$$\underline{{}^{24}_{12}Mg} \qquad \underline{{}^{206}_{82}Pb}$$

f) $^{234}_{92}U \rightarrow {}^{26}_{10}Ne + {}^{208}_{82}Pb$

$$(46\ \alpha + 12\ \alpha_0 + D_0) \rightarrow (5\ \alpha + \alpha_0 + D_0) + (41\ \alpha + 11\ \alpha_0)$$
$$\downarrow 2\ \beta^-$$
$$(6\ \alpha + D_0)$$
$$^{26}_{12}Mg$$

g) $^{234}_{92}U \rightarrow {}^{100}_{30}Zn + {}^{134}_{62}Sm$

$$(46\ \alpha + 12\ \alpha_0 + D_0) \rightarrow (15\ \alpha + 10\ \alpha_0) + (31\ \alpha + 2\ \alpha_0 + D_0)$$
$$\downarrow 12\ \beta^- \qquad \downarrow 6\ EC$$
$$(21\ \alpha + 4\ \alpha_0) + (28\ \alpha + 5\ \alpha_0 + D_0)$$
$$^{100}_{42}Mo \qquad\qquad ^{134}_{56}Ba$$

h) $^{236}_{94}Pu \rightarrow {}^{28}_{12}Mg + {}^{208}_{82}Pb$

$$(47\ \alpha + 12\ \alpha_0) \rightarrow (6\ \alpha + \alpha_0) + (41\ \alpha + 11\ \alpha_0)$$
$$\downarrow 2\ \beta^-$$
$$(7\ \alpha)$$
$$^{28}_{14}Si$$

i) $^{258}_{100}Fm \rightarrow {}^{130}_{50}Sn + {}^{128}_{50}Sn$

$$(50\ \alpha + 14\ \alpha_0 + D_0) \rightarrow (25\ \alpha + 7\ \alpha_0 + D_0) + (25\ \alpha + 7\ \alpha_0)$$
$$\downarrow 4\ \beta^- \qquad \downarrow 4\ \beta^-$$
$$(27\ \alpha + 5\ \alpha_0 + D_0) + (27\ \alpha + 5\ \alpha_0)$$
$$^{130}_{54}Xe \qquad\qquad ^{128}_{54}Xe$$

In addition to these example of new radioactivities, consider now the following old radioactivities :

a) $^{244}_{94}Pu \xrightarrow{\alpha} {}^{240}_{92}U \xrightarrow{2\beta^-} {}^{240}_{94}Pu \xrightarrow{\alpha}$

(47 α + 14 α_0) (46 α + 14 α_0) (47 α + 13 α_0)

$^{236}_{92}U \xrightarrow{\alpha} {}^{232}_{90}Th \xrightarrow{\alpha} {}^{228}_{88}Ra \xrightarrow{2\beta^-}$

(46 α + 13 α_0) (45 α + 13 α_0) (44 α + 13 α_0)

$^{228}_{90}Th \xrightarrow{\alpha} {}^{224}_{88}Ra \xrightarrow{\alpha} {}^{220}_{86}Rn \xrightarrow{\alpha}$

(45 α + 12 α_0) (44 α + 12 α_0) (43 α + 12 α_0)

$^{216}_{84}Po \xrightarrow{\alpha} {}^{212}_{82}Pb \xrightarrow{2\beta^-} {}^{212}_{84}Po \xrightarrow{\alpha}$

(42 α + 12 α_0) (41 α + 12 α_0) (42 α + 11 α_0)

$^{208}_{82}Pb$

(41 α + 11 α_0)

b) $^{238}_{92}U \xrightarrow{\alpha} {}^{234}_{90}Th \xrightarrow{2\beta^-} {}^{234}_{92}U \xrightarrow{\alpha}$

(46 α + 13 α_0 + D_0) (45 α + 13 α_0 + D_0) (46 α + 12 α_0 + D_0)

$^{230}_{90}Th \xrightarrow{\alpha} {}^{226}_{88}Ra \xrightarrow{\alpha} {}^{222}_{86}Rn \xrightarrow{\alpha}$

(45 α + 12 α_0 + D_0) (44 α + 12 α_0 + D_0) (43 α + 12 α_0 + D_0)

$^{218}_{84}Po \xrightarrow{\alpha} {}^{214}_{82}Pb \xrightarrow{2\beta^-} {}^{214}_{84}Po \xrightarrow{\alpha}$

(42 α + 12 α_0 + D_0) (41 α + 12 α_0 + D_0) (42 α + 11 α_0 + D_0)

$^{210}_{82}Pb \xrightarrow{2\beta^-} {}^{210}_{84}Po \xrightarrow{\alpha} {}^{206}_{82}Pb$

(41 α + 12 α_0 + D_0) (42 α + 10 α_0 + D_0) (41 α + 10 α_0 + D_0)

c) $^{229}_{89}Ac \xrightarrow{\beta^-} {}^{229}_{90}Th \xrightarrow{\alpha} {}^{225}_{88}Ra \xrightarrow{\beta^-}$

(44 α + 13 α_0 + P) (45 α + 12 α_0 + n) (44 α + 12 α_0 + n)

$^{225}_{89}Ac \xrightarrow{\alpha} {}^{221}_{87}Fr \xrightarrow{\alpha} {}^{217}_{85}At \xrightarrow{\alpha}$

$(44\ \alpha + 12\ \alpha_0 + P)$ $(43\ \alpha + 12\ \alpha_0 + P)$ $(42\ \alpha + 12\ \alpha_0 + P)$

$^{213}_{83}Bi \xrightarrow{\beta^-} {}^{213}_{84}Po \xrightarrow{\alpha} {}^{209}_{82}Pb \xrightarrow{\beta^-}$

$(41\ \alpha + 12\ \alpha_0 + P)$ $(42\ \alpha + 11\ \alpha_0 + P)$ $(41\ \alpha + 11\ \alpha_0 + n)$

$^{209}_{83}Bi$

$(41\ \alpha + 11\ \alpha_0 + P)$

d) $^{227}_{89}Ac \xrightarrow{\beta^-} {}^{227}_{90}Th \xrightarrow{\alpha} {}^{223}_{88}Ra \xrightarrow{\alpha}$

$(44\ \alpha + 12\ \alpha_0 + T_1)$ $(45\ \alpha + 11\ \alpha_0 + T_0)$ $(41\ \alpha + 11\ \alpha_0 + T_0)$

$^{219}_{86}Rn \xrightarrow{\alpha} {}^{215}_{84}Po \xrightarrow{\alpha} {}^{211}_{82}Pb \xrightarrow{\beta^-}$

$(43\ \alpha + 11\ \alpha_0 + T_0)$ $(42\ \alpha + 11\ \alpha_0 + T_0)$ $(41\ \alpha + 11\ \alpha_0 + T_0)$

$^{211}_{83}Bi \xrightarrow{\alpha} {}^{207}_{81}Tl$ $\xrightarrow{\beta^-} {}^{207}_{82}Pb$

$(41\ \alpha + 11\ \alpha_0 + T_1)$ $(40\ \alpha + 11\ \alpha_0 + T_1)$ $(41\ \alpha + 10\ \alpha_0 + T_1)$

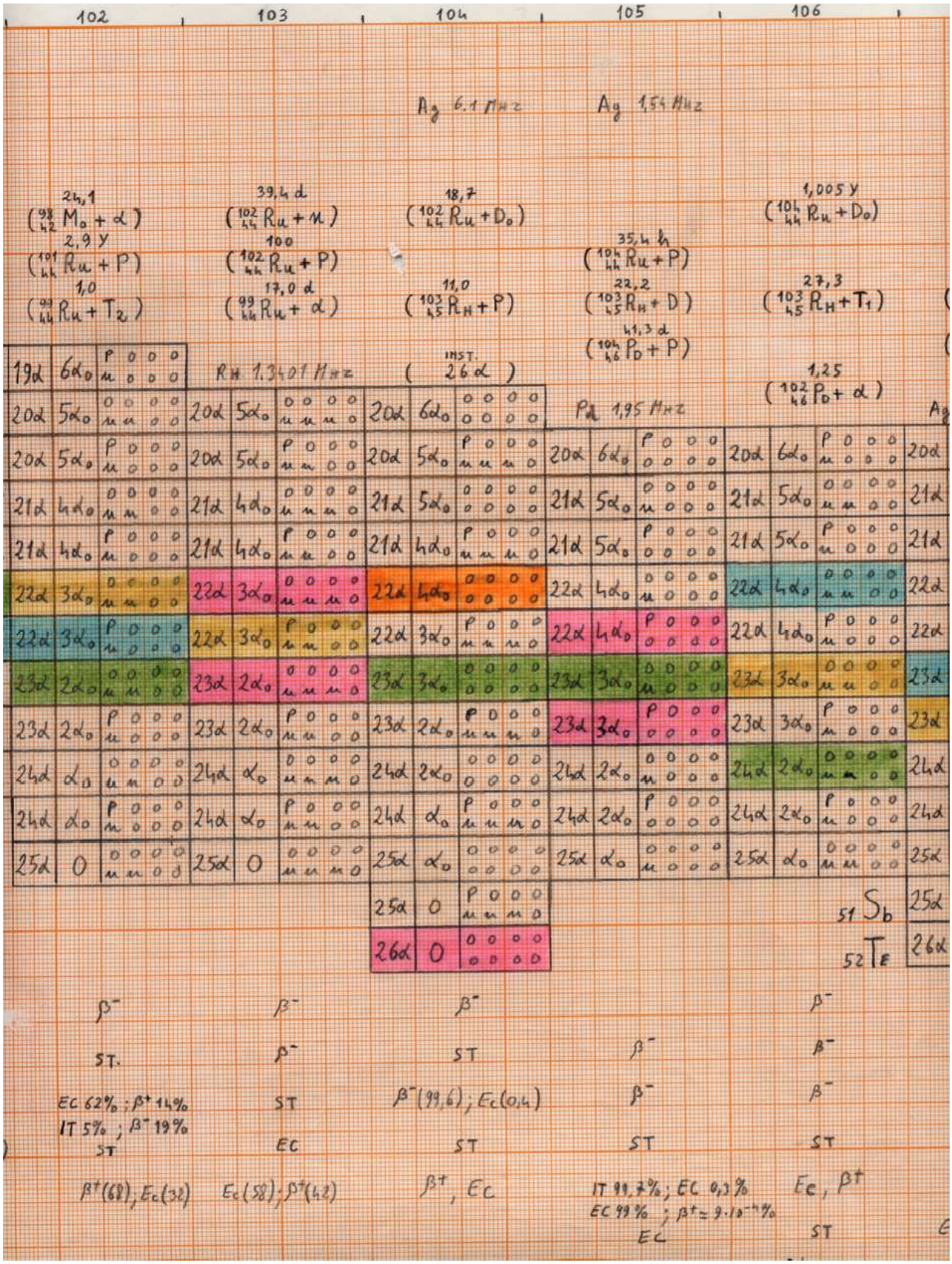
These and many other examples (13) are experimental evidence for the reversible transition:

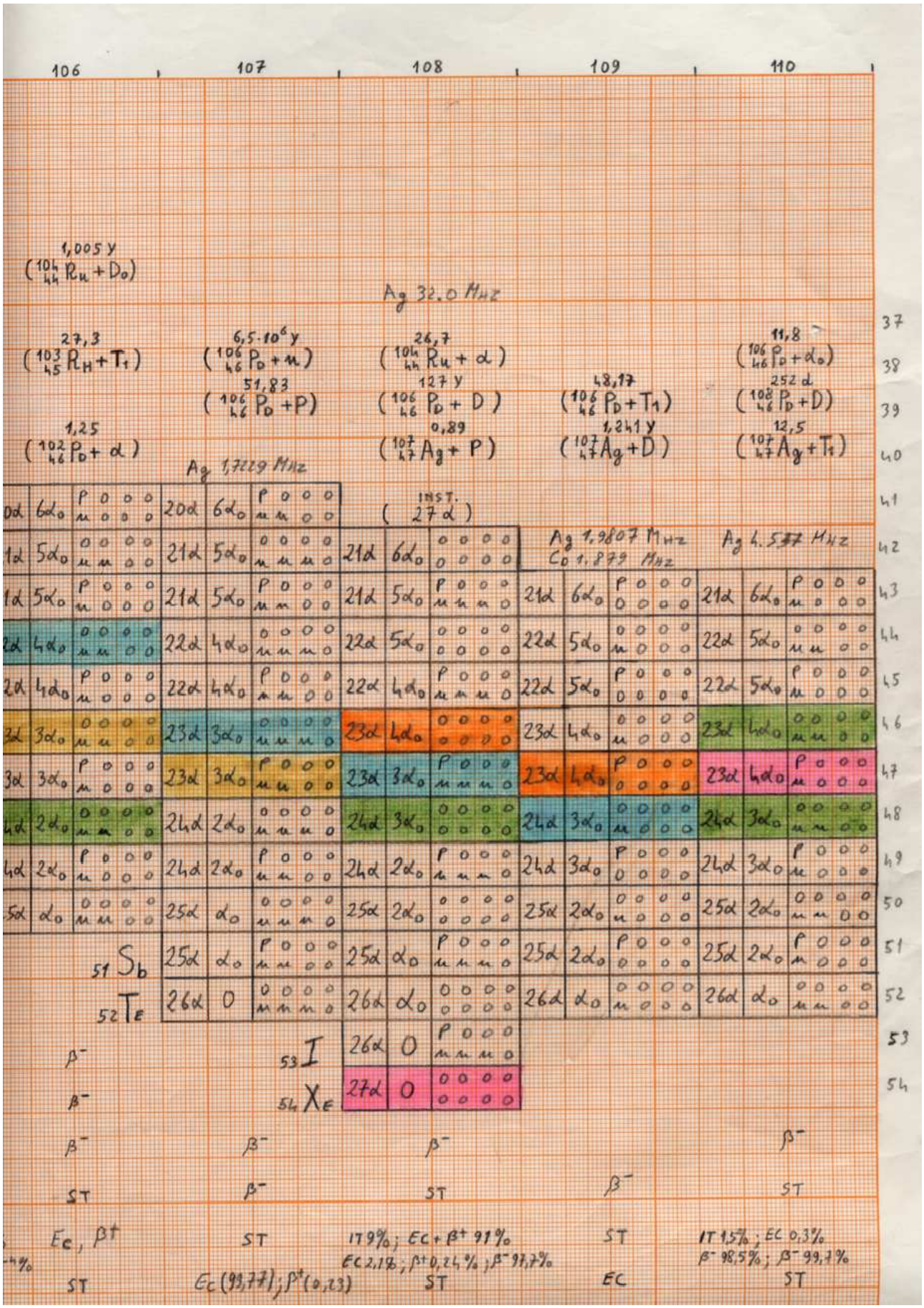
$$\alpha_0 \underset{2\ Ec}{\overset{2\ \beta^-}{\rightleftharpoons}} \alpha$$

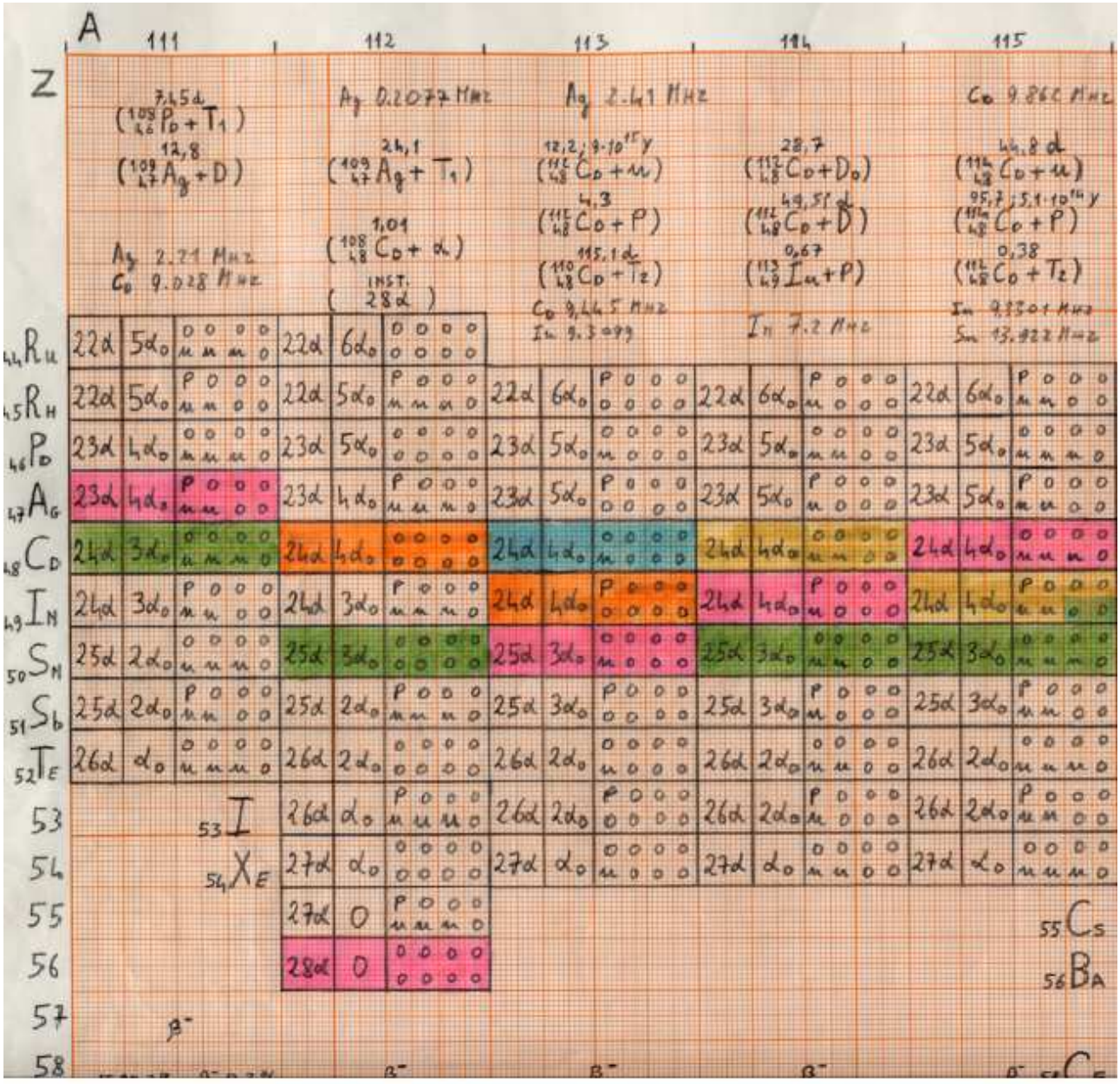
8) **Cold fusion in metal lattices.**

According to the Alpha-extended model of the atom, in experiments similar to those by Fleischmann and Pons (53) ${}_{46}Pd$ (6 stable isotopes) does not only act as a catalyst of the D-D reactions. More generally, this must be true for other metals characterized by many stable isotopes: ${}_{20}Ca$ (6), ${}_{22}Ti$ (5), ${}_{30}Zn$ (5), ${}_{32}Ge$ (5), ${}_{40}Zr$ (5), ${}_{42}Mo$ (7), ${}_{44}Ru$ (7), ${}_{48}Cd$ (7), ${}_{50}Sn$ (9), ${}_{52}Te$ (8), ${}_{56}Ba$ (7), ${}_{60}Nd$ (7), ${}_{62}Sm$ (5), ${}_{64}Gd$ (7), ${}_{66}Dy$ (7), ${}_{68}Er$ (6), ${}_{70}Yb$ (7), ${}_{72}Hf$ (5), ${}_{74}W$ (5), ${}_{76}Os$ (6), ${}_{78}Pt$ (5), ${}_{80}Hg$ (7).

Taking into account the fact that from deuterium all secondary elementary constituents of an atom can be obtained - that is: P, n, D, D_o, T_1, T_2 T_0, α, α_0^- it is easy to notice that the simplest reactions, for instance, those between Palladium and Deuterium, are more than 80 (see: A 102-115) (13).


102
103
104
105
106
Ag 6.1 MHz
Ag 1,54 MHz
24,1 ($^{98}_{42}Mo + \alpha$)
2,9 y ($^{101}_{44}Ru + P$)
1,0 ($^{99}_{44}Ru + T_2$)
39,4 d ($^{102}_{44}Ru + \kappa$)
100 ($^{102}_{44}Ru + P$)
17,0 d ($^{99}_{44}Ru + \alpha$)
18,7 ($^{102}_{44}Ru + D_0$)
11,0 ($^{103}_{45}Rh + P$)
35,4 h ($^{104}_{44}Ru + P$)
22,2 ($^{103}_{45}Rh + D$)
41,3 d ($^{104}_{46}Pd + P$)
1,005 y ($^{104}_{44}Ru + D_0$)
27,3 ($^{103}_{45}Rh + T_1$)
1,25 ($^{102}_{46}Pd + \alpha$)
Rh 1,3401 MHz
INST. (26α)
Pd 1,95 MHz
51 Sb
52 Te
β⁻
ST.
EC 62% ; β⁺ 14%
IT 5% ; β⁻ 19%
ST
β⁺(68), Ec(32)
β⁻
ST
EC
Ec(58); β⁺(42)
β⁻
ST
β⁻(99,6); Ec(0,4)
ST
β⁺, Ec
β⁻
β⁻
ST
IT 99,7%; EC 0,1%
EC 99% ; β⁺ = 9·10⁻⁴%
EC
β⁻
β⁻
ST
Ec, β⁺
ST


106
107
108
109
110
1,005 y
(104 44 Ru + D0)
Ag 32,0 MHz
27,3
(103 45 Rh + T1)
6,5·10^6 y
(106 46 Pd + n)
26,7
(104 44 Ru + α)
11,8
(106 46 Pd + α0)
51,83
(106 46 Pd + P)
127 y
(106 46 Pd + D)
48,17
(106 46 Pd + T1)
252 d
(108 46 Pd + D)
1,25
(102 46 Pd + α)
0,89
(107 47 Ag + P)
1,241 y
(107 47 Ag + D)
12,5
(107 47 Ag + T1)
Ag 1,7229 MHz
INST.
(27α)
Ag 1,9807 MHz
Co 1,879 MHz
Ag 4,57 MHz
51 Sb
52 Te
53 I
54 Xe
β⁻
β⁻
β⁻
ST
β⁻
β⁻
ST
β⁻
ST
β⁻
ST
Ec, β⁺
ST
ST
17,9%; EC + β⁺ 91%
EC 2,18; β⁺ 0,24%; β⁻ 91,7%
ST
IT 1,5%; EC 0,3%
β⁻ 98,5%; β⁻ 99,7%
ST
Ec (99,77); β⁺ (0,23)
ST
EC
ST



It is therefore extremely difficult to find the way out of this labyrinth of reactions (54), (55).

In order to limit the number of reactions, it is better to use monoisotopic electrodes and to analyze the atomic and isotopic composition of the electrodes before and after the occurring of the reactions between Palladium and Deuterium.

Generally speaking, the nuclear reactions between polysotopic metals and Deuterium (cold fusion in metal lattices) can be better performed by using cryogenic methods (adsorption, cooling, electromagnetic shocks).

9) **Carbon isomeric configurations (allotropic forms).**

An experimental evidence of the "rigid" structure of atoms is given by the Carbon atom.

In fact, it is known that *the four bonds of Carbon are equal and directed according to the vertexes of a regular tetrahedron ... In hundreds of molecules containing an atom of carbon, joined to different atoms by means of four simple bonds, it has been observed that the experimental values of the bond angles are almost always by 2° around the value 109° 28', which is typical of the tetrahedral 'orbital' ... An even more astonishing result, relating to the meaning of the conception of the Carbon atom, according to which its bonds form a regular tetrahedron, is given by methylethylenes. The representation of the carbon - carbon double bond, in which one edge belongs to two regular tetrahedron in the same time, shows that the tetrahedral value of the angle between simple and double bond is by 125° 16'.*

Both in isobuthene and tetramethylethylene, the experimental value of this angle, determined by means of electronic diffraction, is 124° 20'± 1°, whereas that of the

Cl_2 C = O phosgene angle, determined through microwave method, is 124°3' (56).

In fact that "the planetary atom is irremediably inconsistent with chemical and stereochemical evidence" had already been underlined by Parson (57), Thomson (58) and Allen (59).

Moreover, research chemists know that the qualities of an atom "in its nascent state" - that is, that which results from the breaking of some chemical bond - are very different from those of the same atom, when this is for instance "drawn" from a sample of "purified atoms".

In the case of carbon, the fact that its physical and chemical qualities depend on its possible and various isomeric configurations is confirmed by the Chemical Vapor Deposition technology (CVD), used for the production of diamonds: *This process starts with a mixture of hydrogen gas and methane or other hydrocarbon, such as acetylene, inside a vacuum system. Heating the mixture to about 2200°C with microwaves or a hot filament breaks up both the hydrogen and hydrocarbon gas molecules, and carbon atoms, begin to condense on a plate of silicon or other material that is put in the chamber. A diamond film made of countless tiny diamond grains slowly builds up on this substrate. Over the past 5 years, researches in Japan and the United States have developed several related CVD methods, but having enough atomic hydrogen seems to be the key to all of them. The best results come from the mixtures that contain about 99% hydrogen to 1% methane.*

In some way, that is still not completely understood, the hydrogen prevents the carbon atoms from forming graphite and pushes instead the system toward a diamond structure (60).

Some researchers, employed by General Electric, were able to produce isotopically pure diamonds and could notice that the qualities of these "monoisotopic diamonds" were absolutely different; for example: the thermal conductivity of a

monoisotopic diamond composed of Carbon-12 is by 50% higher than the already "optimum" conductivity of a "common" diamond.

On the other hand, a monoisotopic diamond composed of Carbon-13 is expected to be "harder" than "normal" diamonds (61).

The different physical and chemical behaviours of an atom depend on the various and different compositions and spatial arrangements of its electrons, protons and neutrons.

In the above mentioned case, the different allotropic forms of carbon (diamond and graphite) are due to the fact that the isomeric configuration of a "diamond atom" is different from the isomeric configuration of a "graphite atom".

It seems that the tetrahedral bond formed by 4 hydrogen atoms and the "presence" of hydrogen "force" the carbon atom to take and maintain the isomeric configuration of a "diamond atom" until diamond is created: the carbon atoms "in their nascent state", which are formed once carbon is "freed" from its bonds with hydrogen and when hydrogen is present, create diamonds any time they "meet".

In the end, the macroscopic properties of diamond radically change according to whether there is "one neutron more or one neutron less" in the "diamond atom".

I am convinced that this is only the first of a long series of examples.

This opinion has been recently confirmed by the experimental results told me by Dr. S.K. Dixit (62).

In the Rasasastra Department (Alchemy) it is normal practice to obtain different isomeric configurations of atoms and molecules, characterized by different physical and chemical properties, from the most "common" configurations. The same atom or molecule is given a specific name according to the various isomeric configurations which prove useful in the medical field.

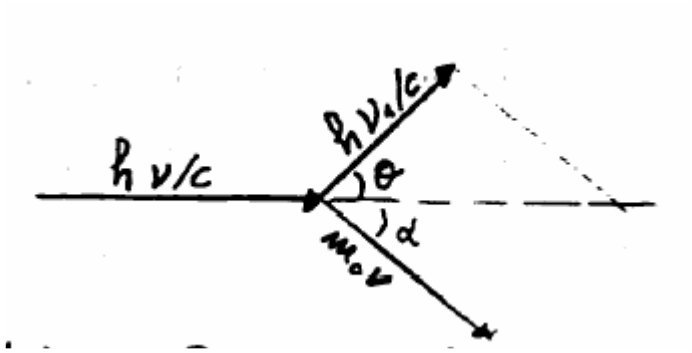
10) **Distribution of the scattered radiation**.

When a beam of polarized X rays is scattered by matter, "the photographs show two types of asymmetry in the direction of ejection of the photo-electrons: a) Lateral asymmetry. There is a strong concentration of photo- electrons ejected nearly in the direction of the electric vector of the plane polarized radiation performing the ejection. b) Longitudinal asymmetry. Stereoscopic examination of the photographs shows one-sixth of the photo-electrons ejected with a component opposite to the beam, one-third ejected approximately at right angles to the beam and one-half ejected with a component along the beam" (63).

Whereas the presence of a defined lateral asymmetry clearly shows that the X rays behave like an electromagnetic wave, the presence of a longitudinal asymmetry led Compton to the hypothesis that the photo-electrons ejected in the above three directions (opposite, normal and along the beam) result from elastic collision between weakly-bound electrons and electromagnetic waves, whose amplitude is so small that they can be defined as a single particle, that is: the "photon" (64).

To these three directions it corresponds a variation of frequency of the X rays emitted that can be easily "classically" calculated (15) as follows.

If (ν , λ) are the initial frequency and wave-length, (ν_1 , λ_1) are the final ones, m_0 is the mass of the electron, c is the speed of light, σ is the angle between incident radiation and scattered radiation, v is the photo-electron speed and h is Planck's constant, we have that:



$$h\nu = h\nu_1 + \tfrac{1}{2}\, m_0 v^2$$

$$m_0^2 v^2 = \left(\tfrac{h\nu}{c}\right)^2 + \left(\tfrac{h\nu_1}{c}\right)^2 - 2\left(\tfrac{h\nu}{c}\right)\left(\tfrac{h\nu_1}{c}\right)\cos\theta \quad \Rightarrow$$

$$v = [\, 2h(\nu - \nu_1) / m_0 \,]^{1/2} \Rightarrow m_0 2h(\nu - \nu_1) = \tfrac{h^2}{c^2}[(\nu^2 + \nu_1^2) - 2\nu\nu_1\cos\theta\,] \Rightarrow$$

$$\tfrac{2 m_0 c^2}{h}(\nu - \nu_1) = (\nu - \nu_1)^2 + 2\nu\nu_1 - 2\nu\nu_1\cos\theta \Rightarrow \text{since } (\nu - \nu_1)^2 \text{ can be ignored:}$$

$$(\nu - \nu_1) = \tfrac{h\nu\nu_1}{m_0 c^2}(1 - \cos\theta\,), \text{ from which it follows in wavelength:}$$

$$\lambda_1 = \lambda + \tfrac{h}{m_0 c}(1 - \cos\theta\,) \qquad (1)$$

This simple relation has been experimentally verified in the cases: $\sigma = 45°,\ 90°,\ 135°$, corresponding to the different directions of the "weakly- bound" photo-electrons ejected; the presence of the unchanged frequency peak (see figure 2), instead, corresponds to electrons so "strongly bound" to the nuclei that one must suppose that in relation (1) m_0 should be substituted at least with the value: $M \cong 12 \cdot 1840\ m_0 \cong 22.000\ m_0$, which corresponds to the whole mass of the carbon atom. In this case, in fact, Compton's displacement becomes irrelevant.

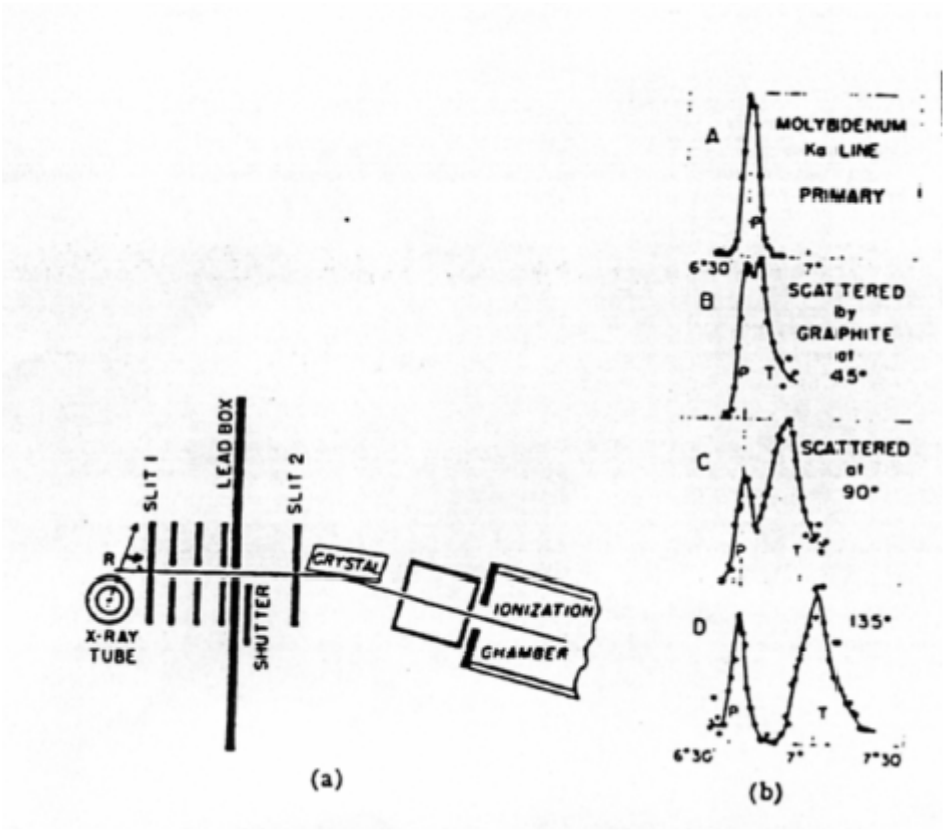


Figure 2. (a) Schematic arrangement of the apparatus for determination of the spectrum of the scattered X rays. (b) Experimental results.

What must be underlined of these experiments is the fact that in every case the electron is supposed to be "bound" to the nucleus in various, possible positions of stable equilibrium, around the nucleus. Positions around which it can perform small or large oscillations until it may be expelled according to the bond energy and the frequency of the incident radiation.

Consequently, I think that the scattering of X rays and, more generally, the scattering of electromagnetic radiation by the atoms takes place in accordance with the Alpha-extended model of the atom.

Conclusion.

In this paper I have suggested a series of hypothesis, relating to the structure of atoms and to the nuclear reactions of cold fusion and cold fission.
Each of them can be subjected to experimental test.

In some cases positive experimental tests have already been done by many researchers: they should only be repeated.

I think that the topics here reported are worth considering, and I hope that this will be done as soon as possible.

Roberto A. Monti

Bologna, April 19th, 1991.

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