

***Bohr-Moseley atomic model refuted***  
***Atoms don't comprise nuclei and electron shells***  
***Nuclei don't comprise Z protons and (A – Z) neutrons***  
***Electron shells don't exist***  
***The compact atom consists of hydrogen atoms***  
***Their number is identical with mass number A***

**Abstract**

The main characteristics of the atomic model according to Rutherford, Bohr, de Broglie, Chadwick, Moseley, ... are:

1. A nucleus, which is made up of Z protons and (A – Z) neutrons, where A is the mass number and Z is the atomic number of the periodic table;
2. An electron cloud is located around the nucleus. The Z extra nuclear electrons are placed in shells. The electron shells are arranged according to *aufbau* rules. Similar rules exist for the arrangement of nuclear shells. There is no empirical evidence for all mentioned constituents for every element.
3. Invalidating electrodynamic laws *Bohr* claims that extra nuclear electrons don't crash into the nucleus. Later deBroglie proclaimed the dual nature of the electron. It is allegedly particle and wave at the same time... De Broglie announced that those *electron waves* must be standing waves. This is the reason for the occurrence of integer ratios, i. e. this is the reason for *quantum mechanics*. But due to its double nature an electron can jump from one orbit to another and give birth to a photon. Obviously, electron jumps are not observable. Spectral lines of different colours are observable due to a dielectric medium as the carrier of electromagnetic waves. (In parentheses we note that for some physicists not a medium is waving but space itself. This is science fiction...) Explanation of spectral lines due to atomic oscillations: We must distinguish between the Eigen frequencies of the atom and the Eigen frequencies of an electromagnetic medium that transmits the oscillations of the atom. Rydberg formula shows a difference of frequencies that represents Eigen frequencies of two coupled oscillators. For the Balmer series in the visible region the formula is as follows:

$$\nu = \nu_H \left| 1/4 - 1/m^2 \right|, \text{ where } \nu_H \text{ is the hydrogen Rydberg frequency; } m = 3, 4, 5, \dots$$

**Nuclear reactions refute the nuclear and electronic shell model:**

Uranium fission is the most convenient example to show the failure of the Bohr-deBroglie-Moseley atomic model. At the moment where uranium breaks apart, the 92 electrons crash into the fragments of the former nucleus. Nobody explained so far how a resurrection of the new orbitals of the fragments occurs... Furthermore the fragments cannot be described as neutral elements in terms of the Bohr model.

**Scattering experiments cannot be crucial for the nuclear atomic model** with such a great emptiness in the atom. Scattering experiments can be compatible with other atomic models.

Rutherford's shortcomings: Scattering theory only considers electrostatic scattering and disregards therefore the magnetic scattering effect.

Then: Most elements possess isotopes, which have obviously the same atomic

number  $Z$ . Rutherford did not consider isotope scattering experiments. According to Rutherford, the scatterings of Sn-112 and Sn-124 (for example) are identical, but this is improbable, rather an *isotope shift* can be expected. Presumably, the isotope shift is due to magnetic scattering, too.

Consequently, it is not possible to infer that the *distinctive property* for scattering is the atomic number  $Z$ .

Also Moseley cannot derive that the atomic number  $Z$  means equally the number of protons and electrons of the element.

$\beta$  plus decay refutes the Bohr model. The decay product is a positron ( $e^+$ ). It cannot originate from the electron shells! The dilemma is, that the positron also cannot originate from the nucleus because the nucleus contains only protons and neutrons.

Recall that 50% of decays are  $\beta^+$  50% are  $\beta^-$  decays.

Fermi invented in order to save the Bohr model from the danger of perishing

a *magic transubstantiation*  $p \Rightarrow n + e^+ + \text{neutrino } \nu_e$

Then (because the claim is that  $n \Rightarrow p + e^- + \text{anti-neutrino}$ ) it follows:  
 $p \Rightarrow p + e^- + e^+ + \text{neutrino} + \text{anti-neutrino}$ . This is obviously impossible.

A possible alternative interpretation: Hydrogen consists of a proton and an electron that are magnetically coupled. The proton consists of unknown subparticles. This atom is an oscillator with eigenfrequencies. See the article Elementary Permanent Ring Magnet Atomic Model

Elements that are conceived as magnetically coupled hydrogen structures (Prout's idea in 1815) and molecules that possess real hydrogen lattice bars can show the same experimental outcomes as the Rutherford-Bohr-Chadwick nuclear atomic model.

## **Rutherford's scattering experiments not crucial for the nuclear atomic model**

The father of the atomic nucleus is Rutherford.

The *Physics 2000 Colorado.edu* textbook explains:

*Rutherford's experiments consisted of shooting alpha particles at thin sheets of metal. He then measured the angles at which they came sailing out.*

*Most of the alpha particles went right through the metal without changing course at all, but a few turned a full 180 degrees and went shooting back the way they'd come.*

It is not possible to infer from the outcome of this experiment that there are a dense nucleus and extra nuclear electrons in orbitals around it.

The error made is a classical *non sequitur!*

Every beginner of the philosophy of science has learned that a set of data is interpretable by more than one theory. So Rutherford's interpretation is not the only one and therefore his experiment is not a crucial one!

The simplest objection to Rutherford's claim that scattering depends on  $Z$  is that we can set for  $Z = A/2$ ! Then scattering depends on the mass number and isotopes (same  $A$ ) probably show an *isotope shift*. Rutherford did not notice this possibility.

Below I will show otherwise that the outcome of the experiment does not imply that nuclei have charge  $Ze$  where  $Z$  is the atomic number and  $e$  is the charge of the electron.

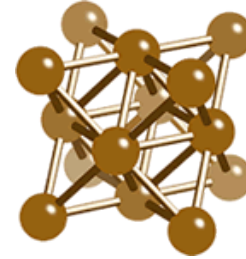
If we conceive the metal as a 3D lattice, most alpha particles can pass the lattice,

some collide with the lattice components.

Consider the lattice crossing points (the nodal points) and the lattice bars as material! The balls at the nodal points and the bars represent material hydrogen structures.

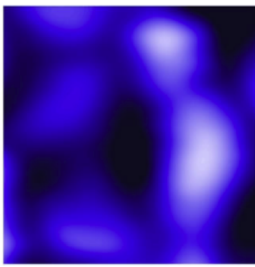
Alpha particles can pass between the bars. So it is not necessary to conceive of the atom consisting of a nucleus and orbiting electrons (or orbitals).

[http://www.marless.de/natur/st\\_bernsteen.htm](http://www.marless.de/natur/st_bernsteen.htm):  
is the source of the figure of such a lattice.



$\alpha$  can pass the lattice  $\rightarrow$   
or  $\alpha$  collisions with the lattice  $\leftrightarrow$

### Can the Rutherford-Bohr atomic model be confirmed by *force microscopy*?



— 50 pm

University of Augsburg physicists Giessibl, Hembacher and Mannhart

*“have imaged an individual tungsten atom by atomic force microscopy and found four distinct peaks that are attributed to highly located electron clouds. A printed image width of 5 cm corresponds to a magnification of two hundred million. A world-record resolution of 77 pm is demonstrated. The electron structure originates from the quantum-mechanical nature of tungsten bonding. Tungsten develops a body centered cubic*

*crystal structure such that every tungsten atom is surrounded by eight nearest neighbor atoms, causing "arms" of increased charge density which point to the next neighbors. Four of these highly localized electron clouds are visible on surface atoms.”* "Force microscopy with light atom probes",

*www.scienceexpress.org, 10 June 2004).*

<http://www.chemlin.de/news/jun04/20040610e01.htm>

Picture is from: <http://www.sciencemag.org/scienceexpress/recent.shtml>

By no means atoms with nuclei and surrounding electron clouds can be derived from force microscopy! The picture suggests rather a lattice structure...

### **Not any evidence for nuclei that comprise $Z$ protons**

Rutherford obtained the scattering angle by assuming a repulsive Coulomb force that corresponds to nuclear charges of magnitude  $Ze$  ( $Z =$  atomic number). Some textbooks argue that Rutherford's experiment *implies* therefore a nucleus with  $Ze$  protons, because  $Ze$  can be found in Rutherford's scattering formula for the scattering angle.

This argument can be refuted:

1. Rutherford's scattering theory considers electrostatic scattering only and disregards therefore the magnetic scattering effect.

Remember that Felix Bloch obtained the experimental proof for the magnetic moment of the free neutron due to the magnetic scattering of neutrons in iron. Atomic magnetic fields affected a passing neutron through its magnetic moment.

(See Bloch's Nobel lecture)

This experiment certainly cannot yield a scattering formula with atomic number  $Z$  as the distinctive scattering property and by no means evidence for the nuclear atomic model.

One may object that Rutherford experimented with alpha particles that have no resultant magnetic moment. Counter-arguments: The possibility of ortho-He particles is not excluded, which obviously have a magnetic moment. But even if there was only a zero resultant magnetic moment for He, during collisions the magnetic moments of protons and neutrons can have interactions with the magnetic moments of the target atom.

2. Most elements possess isotopes (= same atomic number  $Z$ ). Rutherford did not consider isotope scattering experiments. According to Rutherford, the scattering of Sn-112 and Sn-124 (for example) is identical, but this is improbable, rather an *isotope shift* can be expected. Presumably, the isotope shift is due to magnetic scattering too.

Recipe:

Execute two scattering experiments with tin metal foils. The first experiment with Sn-112, the second with Sn-124 (or with other isotopes, for example with Li-6 and Li-7)).

The results of the experiments should be different.

You cannot explain the different results with  $Z = 50$  for Sn, because both Sn-112 and Sn-124 have the atomic number  $Z = 50$ !

The only possible variables are the mass numbers ( $A = 112$ ,  $A = 124$ ) and the magnetic properties of the target atoms. There is no implication for  $Z$ .

Recall here that Rutherford made scattering experiments only on gold and aluminium.

M. Fowler [fow] reports:

*“On replacing the gold foil by aluminium foil (some years later), it turned out that small angle scattering obeyed the above law (for the scattering angle, JM), but large angle scattering didn't. Rutherford correctly deduced that in the large angle scattering, which corresponded to closer approach to the nucleus, the alpha was actually hitting the nucleus. This meant that the size of the nucleus could be worked out by finding the maximum angle for which the inverse square scattering formula worked, and finding how close to the centre of the nucleus such an alpha came. Rutherford estimated the radius of the aluminium nucleus to be about  $10^{-14}$  meters.”*

Obviously, Rutherford assumed that scattering came from single encounters with nuclei due to electrostatic repulsion only. We see that the explanation of the observed scattering patterns is “theory laden”. Therefore, Rutherford's experiment is not an *experimentum crucis* for the existence of a nucleus with  $Ze$  charges.

Recall collisions in macrophysics: the decisive parameters for the repulsion are the masses of the colliding bodies, which means the number of atoms. When atoms collide, the same occurs. The repulsive forces are of *electromagnetic* origin. The cause is that atoms represent clusters of negative and positive charges and magnetic moments. It does not matter that the atom as the sum of this charges is neutral.

## Conclusion

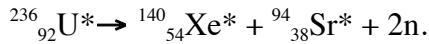
The concept of an atom with a *nucleus* that consists of  $Z$  protons whereas  $Z$  electrons surround the nucleus in shells is improbable.

Below we investigate some nuclear transmutations. When we suppose nuclei with  $Z$  protons and  $(A - Z)$  neutrons, we get other indications that the basic atomic model with a nucleus and electron shells is untenable...

## *Some inconsistencies of the Rutherford-Bohr-Moseley model*

### *Fission of heavy atoms refutes Moseley's law and the electronic shell structure of the Bohr model*

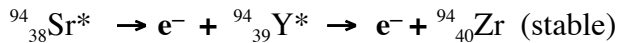
Nuclear fission:



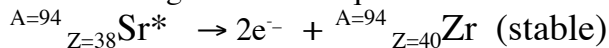
But also the reaction products Xe, Sr are unstable.

Their decay is a  $\beta$ -minus decay, i. e. an electron  $e^-$  is emitted:

Chain reaction according to textbooks:



The last alleged reaction equation one can rewrite:



It is easy to elucidate the errors made:

The  $\beta$  radiation is of such an intensity that it cannot be caused by emitted electrons from the outer electron shells. Therefore it is **assumed that nuclear neutrons emit these electrons.**

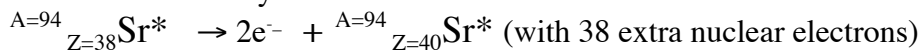
So two neutrons release two electrons:

Therefore the number of protons of the daughter element Zr increased by two and has now 40 protons. But the number of shell electrons remains unchanged:

38 for Sr and also 38 for Zr. Here the confusion begins...

The basic dogma of atomic physics asserts that solely the number of extra nuclear electrons and the electronic shell structure determines the chemistry of the elements. In our example the electronic jacket of Sr remains unchanged and therefore we have to write that the reaction product remains the element Sr and not Zr because the element Zr would possess 40 electrons.

Therefore the decay reactions must read:



The daughter element Sr is negatively charged and not stable!

If the reaction product is the stable element Zr (and not Sr), then the Bohr-Moseley atomic model is a failure!

Prout's atomic model: It consists of H-atoms only. If an unstable atom emits electrons then an ionized atom is the result, no problem...

### Conclusion:

**The Bohr model with extra nuclear electrons and Moseley's law that atomic number  $Z$  means the number of protons in the nuclei and in the electron shells collapsed.**

**Chain reactions produce hybrid phantom atoms that possess more protons than shell electrons.**

For more counter-arguments details regarding Moseley's alleged law see the [appendix Moseley's law refuted](#).

Prout's atomic model: It consists of H-atoms only. Hydrogen's consist of electrons and positrons. If an unstable atom emits electrons then an ionized atom is the result, no problems...

### ***Another impossibility of the Bohr model***

Insurmountable difficulties of the electron *shell aufbau*-process for fission daughter products: The occurring daughter elements Xe and Sr of the fission

${}^{236}_{92}\text{U}^* \rightarrow {}^{140}_{54}\text{Xe}^* + {}^{94}_{38}\text{Sr}^*$  cannot manage the **resurrection** of the electron shells of Xe:  $[\text{Kr}]4d^{10}5s^2p^6$  and Sr:  $[\text{Kr}] 5s^2$ !

fission	U-235 + n	→	Xe-140	Sr-94	2n	- 6 e <sup>-</sup>
Electron shells	$[\text{Rn}] 5f^3 6d^1 7s^2$	→	$[\text{Kr}]4d^{10}5s^2p^6$	$[\text{Kr}] 5s^2$		

Now the tremendous resurrection work begins: Take for example Sr: The 9 electron shells (or orbitals) must be filled with 38 electrons in the following order:

Sr	1s	2s 2p	3s 3p 3d	4s 4p 4d 4f	5s
Z = 38	2	2 6	2 6 10	2 6	2

Forces must lift the electrons according to rules to their locations. Spins must be start.

Rules, compiled by Mark Leach [Lea]:

<b>Pauli Exclusion Principle</b>	Orbitals can contain a maximum of two electrons which must be of opposite spin.
<b>Aufbau or Build-up Principle</b>	Electrons enter and fill lower energy orbitals before higher energy orbitals.
<b>Hund's Rule</b>	When there there are degenerate (equal energy) orbitals available, electrons will enter the orbitals one-at-a-time to maximise degeneracy, and only when all the orbitals are half filled will pairing-up occur. This is the rule of maximum multiplicity.
<b>Madelung's Rule</b>	Orbitals fill with electrons as $n + l$ , where $n$ is the principal quantum number and $l$ is the subsidiary quantum number. This rule 'explains' why the 4s orbital has a lower energy than the 3d orbital, and it gives the periodic table its characteristic appearance.

## **$\alpha$ -decays, a clarification**

1<sup>st</sup> example:  ${}^{241}_{95}\text{Am} \Rightarrow {}^{237}_{93}\text{Np} + {}^4_2\text{He}^{2+} + 0,6 \text{ [MeV]} \gamma \text{ radiation}$

Written in this form, charge is not conserved. Then it is not clarified what element should be the daughter atom.

The Am nucleus ejects an alpha particle ( ${}^4_2\text{He}^{2+}$ ), it is (unreasonably) assumed that the electronic shell of  ${}^{241}_{95}\text{Am}$  remains unchanged.

Recall that the electronic shell determines the chemical properties and not the nucleus. Therefore the daughter element is not Np but Am! The number of electrons (95) remains unchanged. But the number of protons of the daughter element Am is now  $(95 - 2) = 93$ . So we must indicate it as an ion:

${}^{241}_{95}\text{Am} \Rightarrow {}^{237}_{93}\text{Am}^{2-} + {}^4_2\text{He}^{2+}$

Note that spin is conserved:  $5/2 \text{ (Am)} \Rightarrow 5/2 \text{ (Am)} + 0 \text{ (He)}$

Solution according to Prout's atomic model:  ${}^{241}_{95}\text{Am}$  consists of 241 H-atoms. One  $\alpha$ -particle splits off, the remainder is an ion with  $A = 237$ .

${}^{237}_{93}\text{Am}$  has a half life of only 73 m.

2<sup>nd</sup> example:  ${}^8\text{Be} \Rightarrow {}^4\text{He} + {}^4\text{He}$

When the Be nucleus instantly breaks into two, electrons spiral into the nuclear fragments. The electrons must know that exactly two electrons have to arrive at each  ${}^4\text{He}$  nucleus. So far there has not been a causal explanation for this process available...

What happens now? The electrons have to rise at their (probable) locations and must begin to spin. The p electron has to "orbit" because it must have an angular momentum.

It is an invalid argument that the electrons simply occupy their state of dynamical equilibrium again. Without support they cannot rise from the nucleus at their places in the electronic shells. As no such support is comprehensible, QM must suppose a resurrection of the electron shells. But this is not physics...

## **$\beta^+$ -DECAY**

Some neutral atoms undergo transmutations into other charged atoms with the same mass number A, this transmutation is accompanied by the occurrence of either  $e^-$  or  $e^+$ :

**Charges:**  ${}^A_Z\text{X}_N \Rightarrow {}^A_{Z+1}\text{X}_{N-1} + e^-$     **or**     ${}^A_Z\text{X}_N \Rightarrow {}^A_{Z-1}\text{X}_{N+1} + e^+$   
 $(0) \Rightarrow (+1) + (-1)$     **or**     $(0) \Rightarrow (-1) + (+1)$

Transformations of atomic structures cause excitations of the dielectric medium (aether). The results are gamma radiation and release of beta particles.

The ongoing processes are not explainable in terms of the Rutherford-Bohr atomic model that acts in a vacuum.

A textbook [koe] explains:

*Beta decay is the "transformation" of a neutron into a proton, with the emission of an electron for charge conservation, and an antineutrino for energy and momentum conservation. It occurs in those situations in which alpha decay would leave the*

nucleus less stable than it was before. In Beta decay, the following parameters change:

$Z \rightarrow Z + 1$	$A \rightarrow A$	$N \rightarrow N - 1$
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Another form of Beta decay occurs in which a proton changes into a neutron plus a positron and a neutrino, with parameter changes:

$Z \rightarrow Z - 1$	$A \rightarrow A$	$N \rightarrow N + 1$
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Now, here is an example for an alleged positron decay.

But with the Rutherford-Bohr model a positron decay is not explainable.

Unstable (half-life 20 m) C decays:  $^{11}\text{C}^* \rightarrow ^{11}\text{B} + e^+ + \nu_e$

Constituents according to Bohr's model:  $^{11}\text{C} : 6e + 6p + 5n$ ;  $^{11}\text{B} : 5e + 5p + 6n$

Allegedly it works as follows: 1p from  $^{11}\text{C}$  transmutes according to the formula:

Energy + p  $\Rightarrow$  n +  $e^+$  + neutrino  $\nu_e$ ,

then  $^{11}\text{B}$  has its 6<sup>th</sup> neutron, as required. An  $e^+$  is ejected.

**1<sup>th</sup> fundamental error:** At the electron shells of carbon (C) only 6 electrons ( $e^-$ ) have their domicile. But a decay product is a positron ( $e^+$ ). It cannot originate from the electron shells!

The dilemma is, that the positron also cannot originate from the nucleus because the nucleus contains only protons and neutrons.

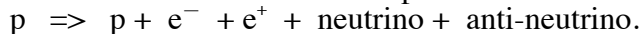
Therefore *Fermi* invented without any physical justification in order to save the Bohr model from the danger of perishing.

A *magic transubstantiation* like in religions creates the positron  $e^+$  out of the proton soul:



If  $p \Rightarrow n + e^+ + \text{neutrino } \nu_e$ , then

(because the claim is that  $n \Rightarrow p + e^- + \text{anti-neutrino}$ ):



This is obviously an ontological nonsense. This is magic, not physics.

Note a difference here:

A neutron can decay because it consists of a proton and an electron.

A proton does not consist of a neutron and a positron (plus a neutrino) therefore it can neither decay nor transmute into those parts...

**Second mistake**

There is a 6<sup>th</sup> electron in the outermost shell of the resulting  $^{11}\text{B}$  making it negatively charged! According to some authors (Bröcker B., dtv Atlas Atomphysik) the surplus electron breaks off.

Explanation with Prout's model: Prout's compact atom consists of hydrogens.

Hydrogen consist of electrons and positrons. Therefore the Proutian atom can be the source of positrons and electrons

An atomic structure with 11 hydrogens is unstable.

It undergoes a transformation in which a positron is emitted.



*$\beta$  minus decay: creation ex nihilo of a shell electron*

There are atomic transformation processes with electrons as by-products.

1<sup>st</sup> QM example



QM explanation: One neutron of the Co nucleus decays into a proton and an electron plus a neutrino.

The  ${}^{60}\text{Co}$  nucleus ejects an electron and a neutrino.

$Z \rightarrow Z+1$ , so Ni has one proton more in its nucleus.

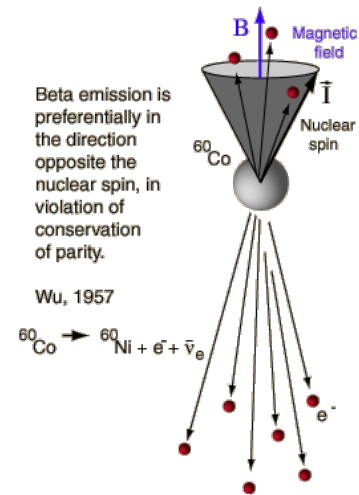
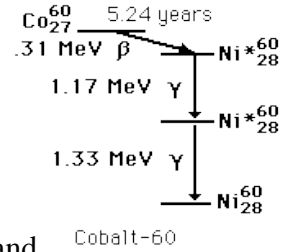
But the electron shell of Co remains unchanged:

Co:  $[\text{Ar}]3d^74s^2$  therefore it is false to write that Ni follows because Ni:  $[\text{Ar}]3d^84s^2$  possesses one electron more than Co.

Note the creation *ex nihilo* of the 8<sup>th</sup> 3d electron of Ni!

<http://hyperphysics.phyastr.gsu.edu/hbase/nuclear/betaex.html#c1>

The complete metamorphosis of  ${}^{60}_{27}\text{Co} \Rightarrow {}^{60}_{28}\text{Ni}^* + e^-$  produced 2,5 MeV gamma plus 0.31 MeV electrons.



*Bohr model fails to compute ionization energies*

Question: Ionization energy to remove the second electron of helium?

Formula:  $IP = 13.6 \text{ [eV]} Z^2/n^2$ , where  $Z$  = number of protons (here 2),  $n$  is shell number (here 1).  $IP = 13.6 \times 4 / 1 = 54.4 \text{ eV}$ . Experimental value: 24.6 !

hyperphysics:

*The fact that the second electron is less tightly bound can be interpreted as a shielding effect; the other electron partly shields the second electron from the full charge of the nucleus. Its energy can be used to model the effective shielding as follows.*

Recipe: Take for  $Z$  a reduced mass, namely  $Z = 1.34$  instead of 2.00 and you get the desired 24.6 [eV].

Shielding by electrons to calculate ionization potentials is the general recipe in order to rescue the Bohr model...

*Two months half-life of ortho-helium refutes the model atomic nucleus*

Para- and ortho-helium possess the same nuclei, so nuclei should have also the same binding energy. But ortho-helium decays soon, parahelium is stable.

<https://books.google.at/books?isbn=3642795382> -

Marko Horbatsch - 2012 - Science

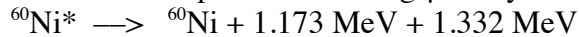
The orthohelium ground state is not allowed to decay to the parahelium ground ... flip – electron exchange – is required) and has a half-life of about two months

## **$\gamma$ -emitting excited atoms discredit the nuclear atomic model: Nuclear $\gamma$ -rays would destroy the fragile electronic shell structure**

We are taught [lbl]

*that gamma rays are a type of electromagnetic radiation that results from a redistribution of electric charge within a nucleus. A  $\gamma$  ray is a high-energy photon.*

Take for example the following  $\gamma$ -decay



where  ${}^{60}\text{Ni}^*$  denotes an excited unstable Ni atom. Interpretation with photons:

The two  $\gamma$ -photons with about 1 MeV each are high-energy bullets emitted from the nucleus. They must pass on their path the wonderfully arranged electron shell or electron wave structure made up of 28 electrons.

Wave interpretation: High-energy  $\gamma$  waves would surely destroy the fragile quantum mechanics complex of shells or orbitals. But according to current theory the Ni shell structure remains unaffected by the  $\gamma$  bombardment.

This survival of the atomic shell structure could be possible only by a wonder.

Converting  $\gamma$ -photons into positronium is the next puzzle to solve in terms of QM:

### **Conclusion**

The atomic model that consists of

- nuclear shells
- *plus* electron shells around the nucleus is untenable.

The scene for all ongoing physical processes of ruling QM is the vacuum, particles interact in this void. This ruling paradigm is also untenable.

The scene for physical processes is the intergalactic dielectric medium that represents the privileged frame of the cosmos. Current refutation of a dielectric medium as the carrier of electromagnetic waves disoriented some physicists. For them space (a relation) is waving... A category mistake.

The recent *spin crisis* concerns the problem how the spin  $\frac{1}{2}$  of the proton can be compatible with the alleged quark structure of the proton.

### ***Historical review:***

#### **The conceptual development of the nuclear atom**

#### **GEIGER'S AND MARSDEN'S SCATTERING EXPERIMENTS**

The  $\alpha$  particle bombardment of ultra thin metal foils tended to detect the structure of the atom.

Geiger wrote the first paper on this topic in 1910. [gei]

An important fact for the history of the nuclear atomic model is that Rutherford communicated this paper. Geiger desired *to express my thanks to Prof. Rutherford.*

Geiger's conclusion was *that the most probable angle through which an  $\alpha$ -particle is turned when passing through an atom is proportional to its atomic weight.* It is striking that in those times the proportionality factor of scattering was atomic weight and not nuclear charge!

In the next paper on this topic Geiger and Marsden wrote [geim]:

*We are indebted to Prof. Rutherford for his kind interest in these experiments, and for placing at our disposal the large quantities of radium emanation necessary. We are also indebted to the Government Grant Committee of the Royal Society for a grant to one of us, out of which part of the expenses has been paid.*

Now Geiger and Marsden (an assistant of Rutherford) had to be grateful to their mentor and wrote:

*Professor Rutherford has recently developed a theory to account for the scattering of  $\alpha$ -particles ... the assumption being that the deflections are the result of an intimate encounter of an  $\alpha$ -particle with a single atom of the matter traversed. In this theory an atom is supposed to consist of a strong positive or negative central charge...and surrounded by electricity of the opposite sign...*

It was found out that some of the  $\alpha$  particles were deflected, some of them were scattered back toward the  $\alpha$  particle source and most of them went straight through the Au- foil that was used.

Today's concepts of the nucleus differ in one important point from Rutherford's nucleus: Rutherford obviously conceived of his neutron not as of a decaying neutral compound of proton and electron (and neutrino). Rutherford's neutron was a neutral hydrogen atom, H. Therefore Rutherford conceived of two different types of H: the nuclear H is a proton with a stationary electron, obviously near the nucleus.

The singular hydrogen atom is a proton with an exterior electron, far away from the tiny nucleus.

The starting points for Rutherford were the data of scattering on particles that occurred in experiments begun by Geiger and Marsden. Rutherford argues [rua]:

*We have seen that from an examination of the scattering of  $\alpha$  particles by matter, it has been found out that the positive charge on the nucleus is approximately equal to  $Ae/2$ , when  $A$  is the atomic weight and  $e$  is the unit charge. This is equivalent to the statement that the number of electrons in the external distribution is about half the atomic weight in terms of hydrogen...*

*It seems improbable that the electrons within the nucleus would contribute to this scattering, for they are packed together with positive nuclei and must be held in equilibrium by forces of a different order of magnitude from those which bind the external electrons. It is obvious... that the number of electrons cannot be exactly half the atomic weight in all cases. This has led to an interesting suggestion by van den Broek that the number of units of charge on the nucleus, and consequently the number of the external electrons, may be equal to the number of the elements when arranged in order of increasing atomic weight. On this view, the nucleus charges of hydrogen, helium and carbon are 1, 2, and 6 respectively, and so on for the other elements, provided there is no gap due to a missing element.*

*Bohr has taken this view in his theory of the constitution of simple atoms and molecules.*

This apt quotation involves almost the nucleus of the atomic nucleus theory and its implications for Bohr's shell model and the periodic table of elements.

Indeed, Rutherford was convinced that he had discovered the major feature of atomic structure in 1911. Without Rutherford there would not be *nuclear physics!*

## **1903: Watts discovered the proportionality of square root of frequency and atomic weight**

10 years before Rutherford and Moseley did research the X-ray spectra of the elements, the British physicist Watts published his research results in the same journal as Rutherford and Moseley later did, namely in the Philosophical Magazine in 1903 ((6) 5, 203).

Watt's findings had a broad resonance in the scientific community, Chwolson appreciated the remarkable findings of Watts and similar of Ramage and Hartley in his [chw], vol. II, p. 459. In the chapter *Spektralanalyse* Chwolson listed the following chemical groups:

I. Li, Na, K, Rb, Cs;    II. Cu, Ag;    III. Mg, Ca, Sr, Ba;  
IV. Zn, Cd, Hg;    V. Al, In, Tl, Ga.

Chwolson noticed some remarkable characteristics: For every group with increasing atomic weight the spectral lines move over to the red end of the spectrum. During the exchange from one group into the following one, a violet-shift of the spectral series was observed.

And for any group the difference of the frequency between two double-lines or between the two first lines of triplet-lines is proportional to the square of the atomic weight. Rutherford and Moseley did not mention these reports.

Rutherford's objective was to find empirical correlations that support his dogma, namely that there is a nucleus with  $Z$  protons,  $Z$  being the atomic number, and that physical properties depend on  $Z$  and not on atomic weights.

## **Appendix ⇒**

### **Moseley's law refuted**

## Appendix

### Moseley's law refuted:

**Not atomic number determines X-ray radiation but atomic mass A**

**Atoms show periodic incremental patterns**

*Atomic number Z is pointless and can be cancelled*

*Atomic nuclei with Z protons and N neutrons don't exist*

### Abstract

A is the number of hydrogen building blocks of an element and its isotopes.

X-ray radiation of elements can be explained due to the specific atomic architecture of hydrogen and helium building blocks.

According to Moseley's law, isotopes of elements (for example Ag-107 and Ag-109) would cause equal X-ray frequencies which is impossible

Nature of observed x-rays: For Moseley, excited elements emit X-rays, but in reality he measured frequencies of the dielectric aether.

Excited Eigen frequencies of the elements result in enforced oscillations of the dielectric aether that can be measured.

Till now it is a common belief that the cause of the X-rays is an removed inner electron and that an electron from an outer electron shell fills the vacancy. See my other articles where I argue that electron shells don't exist...

*From Moseley's data it is impossible to infer that atoms possess Z extra-nuclear electrons, electrons that are arranged in shells or orbitals.*

*It is also impossible to infer that there are atomic nuclei with Z protons*

*Atomic number Z is pointless and can be cancelled.*

Moseley ignored that not all isotopes ( $^{35}\text{Cl}$  and  $^{37}\text{Cl}$  for example) of an element can exhibit the same X-ray spectrum because that is due to the unique atomic number Z for the element ( $Z = 17$  for Cl).

Obviously, the number of atomic building blocks (H's) and their architecture determine frequencies and not the hypothesized proton or electron number Z!

The alkali elements have an increasing mass number but the chemical behaviour remains unchanged because their surface remains the same.

So it is assumed that this mass increase is nothing but an increase in oxygen building blocks that are chemically inactive. There is a kernel under a chemically active surface

$^{35}\text{Cl}$  and  $^{37}\text{Cl}$  as well the alkalis Na, K, Rb, Cs, ... are chemically equivalent.

For example the combinations NaCl, KCl, CsCl are possible.

When  $^{35}\text{Cl}$  and  $^{37}\text{Cl}$  are treated as isotopes and not as elements then one can also the alkalis treat as isotopes. Only their surface is chemically equivalent, their core comprises different numbers of oxygens as building blocks.

If the alkalis are treated as elements, then also  $^{35}\text{Cl}$  and  $^{37}\text{Cl}$  can be treated as elements as well as  $^{63}\text{Cu}$  and  $^{65}\text{Cu}$ .

**Moseley's claim that atomic numbers determine the number of protons is pointless. It is the number of hydrogen's that (or mass number) that determines the atoms...**

### ***Fame of Moseley***

*Soon after Rutherford's landmark experiment of discovering the proton in 1911, Moseley subjected known elements to x-rays. He was able to derive the relationship between x-ray frequency and number of protons. When Moseley arranged the elements according to increasing atomic numbers and not atomic masses, some of the inconsistencies associated with Mendeleev's table were eliminated. The modern periodic table is based on Moseley's Periodic Law (atomic numbers)*  
<http://www.wonderwhizkids.com>

Moseley was Rutherford's student. The following quotation of Rutherford's comment [rub] on the work done by Moseley shows *paternal benevolence*:

*The importance of the atomic number in fixing the properties of an atom was shown by the remarkable work of Moseley on the X-ray spectra of the elements. He showed that the frequency of vibration of corresponding lines in the X-ray spectra of the element depended on the square of a number, which varied by unity in successive elements. This relation received an interpretation by supposing that the nuclear charge varied by unity in passing from atom to atom, and was given numerically by the atomic number. I can only emphasise in passing the great importance of Moseley's work, not only in fixing the number of possible elements, and the position of undetermined elements, but also in showing that the properties of an atom were defined by a number which varied by unity in successive atoms. This gives a new method of regarding the periodic classification of the elements, for the atomic number, or its equivalent the nuclear charge, is of more fundamental importance than the atomic weight.*

Then Rutherford mentioned that *several researches* in the Cavendish Laboratory at Cambridge *are in progress... to test the accuracy of this relation*, meaning the question *whether the atomic number of an element is the actual measure of its nuclear charge...* among these researchers was Chadwick. See [giu] for Moseley's original drawing, where K and L are the K or L series of characteristic radiation.

The alleged physical significance of Moseley's law:

Atomic number  $Z$  is the number of protons of nuclei and also the number of electrons in the extra nuclear electron shells. The number of neutrons of nuclei is  $N = A - Z$ , where  $A$  is mass number.

Moseley corrected the positions of cobalt and nickel in the periodic table according to x-ray spectrum. Co should precede Ni. The former sequence, namely Ni, then Co was justified by increasing atomic weights

Obviously Moseley could not investigate isotopes that were discovered a short time before his tragic death in World War I.

Let us investigate the right places in the periodic table of Co and Ni when the nickel isotopes are concerned. The two Ni isotopes of significance are Ni-58 and Ni-60. Obviously, Ni-58 and Ni-60 must possess different Eigen frequencies whereas Moseley considered only one frequency for all Ni isotopes.

But it is impossible to combine two frequencies into one that follows from the formula  $\nu = k (Z - 1)^2$  where for Z the number 28 works! If chemical properties of Co and Ni ascertain the order Co, Ni, then follows for the re-numeration:

Co is # 27, Ni has numbers 28a and 28b!

Same considerations for Cl-35 and Cl-37 as like for Cu-63 and Cu-65.

The second claim is that Moseley has put also Te-I (tellurium and iodine) *in their correct chemical order – the reverse of the order based on increasing atomic weights.*  
[rub]

For Te and I there is the following order:

Te with #52a and #52b for Te-126 respective Te-130, then I-127 with #53.

Of course these numbers have nothing to do with the amount of protons in the nuclei. This would be a fallacy.

Only the number of the building blocks of these atoms gives a physically meaningful significance. These numbers are the numbers of hydrogen building blocks. This are the mass numbers A.

As it will follow from my article *All Elements Consist of Hydrogen* that the building block of all elements is hydrogen, a thesis that postulated Prout in 1815.

[For the periodic table element numbers Z are superfluous, they don't have any physical importance.](#)

Not convinced? Then carry out a crucial experiment: Take Ni-58 and Ni-60 atoms. Bombard them with alpha particles. Then count the fragments. The bombardment of Ni-58 should deliver 28 protons, 28 electrons and 30 neutrons and Ni-60 should deliver 28 protons, 28 electrons and 32 neutrons, respectively.

## Moseley's law

Moseley showed that for X-ray frequencies of the elements the relation  $\nu = k (Z - 1)^2$  holds. For the so called K lines the proportion is:

$$\nu = \nu_{Ry} (= \text{Rydberg frequency } 3,29 \cdot 10^{15}) (1-1/4) (Z - 1)^2 = (3/4) \nu_{Ry} (Z - 1)^2$$

Now we rewrite Moseley's formula for an mass number dependency A when Z is exactly A/2 for monoisotopes or when  $Z = A/2$  for the predominant isotope: Examples: Ca-40, Ne-20, Si-28, S-32, Mg-24.

$$\nu = (3/4)(1/4) \nu_{Ry} (A - 2)^2 \qquad \nu = (3/16) \nu_{Ry} (A - 2)^2$$

The scope of the formula for atomic mass is only to show that the square root of the frequency increases with atomic mass. Therefore we conclude that also for isotopes greater masses have greater Eigen frequencies!

The terms  $(A - x)^2$  that holds for Moseley's law for some elements are listed in the table. Regarding elements with isotopes the predominant isotopes are listed, isotopes with minute occurrences neglected.

Remarks: There are columns (groups) of elements with periodic vibratory behaviour.

In a column mass steps from above are  $\Delta m = 4$  mass units. That means that the

[addition of a He-4 building block changes X-ray frequencies according to a rule:](#)

The expression for mass dependence of frequency is  $(A - x)^2$  where  $x = 2, 3, 6, 7$ , for the specific column.

For the isotopes Cl-35, Cl-37, Ni-58, Ni-60, Cu-63, Cu-65, Zn-64, Zn-66, Zn-68, Ag-107, Ag-109 etc. frequency measurements are necessary.

Moseley's recipe does not work because, for example, atomic number  $Z = 18$  for Cl does not deliver two frequencies for the isotopes each. The same holds for the silver isotopes...

Law-like X-ray frequency dependencies on mass number  $A$ .

$$\nu = (3/16) \nu_{Ry} (A - x)^2 = K (A - x)^2 ; K = 1 \text{ for the graph!}$$

**There are 4 vertical periodic groups** according to term  $(A - x)^2$  with  $x = 2, 3, 6, 7$ . Obviously, there is a separating line between elements with even and odd mass numbers  $A$ .

atom	$(A - 2)^2$	atom	$(A - 3)^2$	atom	$(A - 4)^2$	atom	$(A - 5)^2$
Ne-20	$18^2$	Na-23	$20^2$	Cl-35	$31^2$	Cl-37	$32^2$
Mg-24	$22^2$	Al-27	$24^2$				
Si-28	$26^2$	P-31	$28^2$			Sc-45	$40^2$
S-32	$30^2$						
		K-39	$36^2$			Ni-58	$53^2$
Ca-40	$38^2$						
Increment of mass $\Delta m = 4$	Increment of $(A - 2) = 4$	Increment of mass $\Delta m = 4$	Increment of $(A - 3) = 4$				

atom	$(A - 6)^2$	atom	$(A - 7)^2$	atom	$(A - 8)^2$	atom	$(A - 9)^2$
Ar-40	$34^2$						
Ti-48	$42^2$	V-51	$44^2$				
Cr-52	$46^2$	Mn-55	$48^2$				
Fe-56	$50^2$	Co-59	$52^2$				
Ni-60	$54$	--		Cu-63	$55^2$	Cu-65	$56^2$
		Y-89	$82^2$				
Increment of mass $\Delta m = 4$	Increment of $(A - 6) = 4$	Increment of mass $\Delta m = 4$	Increment of $(A - 7) = 4$				

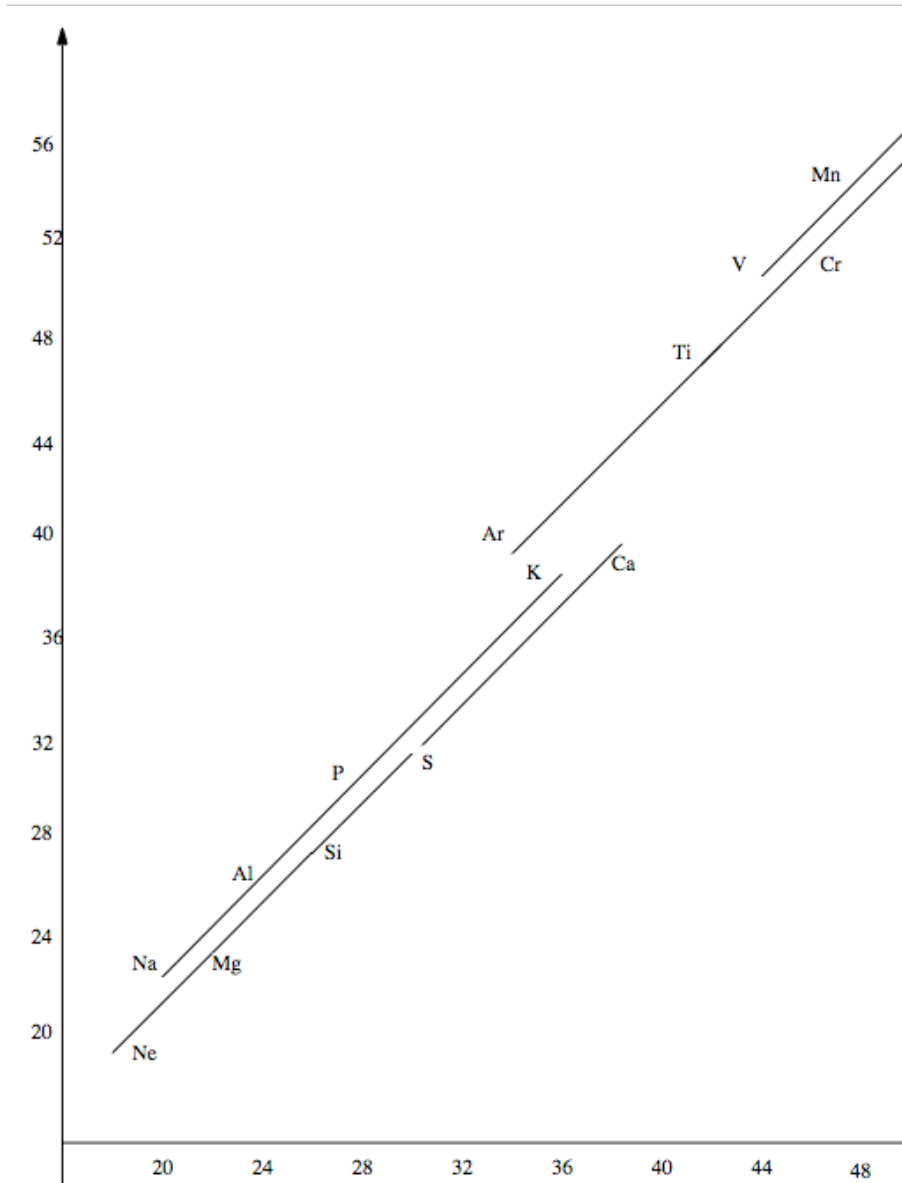
**Isobars:** Take Ca-40, Ar-40 and K-40. All of them possess 40 hydrogen building blocks but show different ionization energies due to different atomic architecture. Therefore each specific atomic architecture possesses also its own Eigen frequency!

X-ray frequencies for comparison: Ar-40:  $\nu = (3/16) \nu_{Ry} (A - 6)^2 \propto 34^2$

$$\text{Ca-40: } \nu = (3/16) \nu_{Ry} (A - 2)^2 \propto 38^2$$

The table can be continued... Till Cu-63 and Cu-65 we have even umbers for frequencies. Zr possesses 3 isotopes of about equal "weight". Now odd numbers must be introduced.





Concerning elements with approximate equal mass numbers  $A$  of isotopes, one striking result of Moseley's experimental result is Ag. It consists of 0.52 % Ag-107 and 48% Ag-109. Atomic number of Ag is 47. According to Moseley's measurement  $(Z - 1) = \sqrt{\nu / (3/4) \nu_{Ry}} = 46,6$ , therefore  $Z = 47,6$  instead of 47! See [mei]

Obviously, the number of atomic building blocks (H's) and their architecture determine frequencies and not the hypothesized proton or electron number  $Z$ ! (Same arguments hold for Pd.)

Z- values according to atomic structure:

$$\text{Ag-107: } (Z - 16) = \sqrt{\nu / (3/4) \nu_{Ry}} = \sqrt{\nu} = (3/16) \nu_{Ry} (A - 16)^2 / (3/4) \nu_{Ry} = (1/2) \cdot (A - 16) = 91/2 = 45,5 \quad \rightarrow Z = 46,5$$

$$\text{Ag-109: } (Z - 17) = \sqrt{\nu} / (3/4) \nu_{\text{Ry}} = \sqrt{\nu} = (3/16) \nu_{\text{Ry}} (A - 17)^2 / (3/4) \nu_{\text{Ry}} = (1/2) \cdot (A - 17) = 92/2 = 46 \quad \rightarrow Z = 47$$

So Moseley's law holds only for atomic number 47, that is Ag-109. For Ag-107 the atomic number would be 46,5 but there are only even atomic numbers. Moseley cannot predict the corresponding X-ray frequency. Isotopes refute Moseley's law!

$$\text{Frequency relation Ag-109 / Ag-107} = 92^2 / 91^2 = 1.0221$$

$(A - 16)^2$	$(A - 17)^2$
Ag-107 = $91^2$	Ag-109 = $92^2$
Z = 46,5	Z = 47

Unfortunately Moseley died in world war II and therefore could not research isotopes.

Because Moseley's formula does not distinguish for isotopes and its mass shift, this formula holds therefore no in the entire range.

### **Coster's attempt to rescue Moseley's wrong interpretations**

Coster investigated the slopes of Moseley's X-ray term curves. The plots show  $\sqrt{T/R}$  against atomic number A where T is the term value, R is the Rydberg constant.

The curves are straight lines,

*“but upon closer examination the slope of the curves does not remain entirely unchanged throughout the whole periodic system. First of all this slope in general increases more or less with increasing atomic number due to relativity and spin effect”.*

Coster considered L-, M-, N-, and O-curves that are not relevant for our consideration of the fundamentally erroneous atomic model of QM.

Coster did not understand that the experimental outcome for Ag, namely 46,6 instead of 47, is not only “in error”. Here the error is a primordial **systematic error**: There are Ag-107 and Ag-109, each with its own Eigen frequencies that depend on atomic structure.

The two different Eigen- frequencies cannot depend on one number, namely that of the alleged number of protons and extra nuclear electrons.

Concerning experimental values Coster refers to Siegbahn. The exactitude of Siegbahn's measurements was according to A. Gullstrand “a thousand times greater than that attained by Moseley”. (Source: Presentation Speech, Nobel Price for Siegbahn, 1925)

So the experimental outcomes of Siegbahn that Coster mentioned are the best available. Alone for Ag they refute Moseley's law and its interpretation in terms of the Rutherford-Bohr atomic model.

## Moseley's formula also does not fit experimental data

See:

ON MOSELEY'S LAW FOR X-RAY SPECTRA  
By Horace Scudder Uhler 1917  
SLOANE PHYSICAL LABORATORY. YALE UNIVERSITY  
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1091182>

Moseley's law does not hold exactly over the entire range. In the case of the  $L_{\beta_1}$  series for which 46 wave-lengths from arsenic ( $N=33$ ,  $\lambda=9.449 \text{ \AA}$ ) to uranium ( $\lambda=0.720 \text{ \AA}$ ) are given, another smooth curve of departure is obtained, the extreme deviations being +13.35%, -3.06%, and +5.84%, corresponding to As, Nd, and U, in the order named.

/

<http://www.physics.ox.ac.uk/history.asp?page=moseley> = Moseley's graph

## Moseley's findings were interpreted in terms of the Bohr model

Because of the high energy of the X-ray photon the corresponding quantum jump must also represent that energy. In terms of the Bohr model this is only possible when the jump goes on between the innermost shells of the atom.

A Textbook (Bill Graham 2002, P221 Modern physics Part 2.) explains: *This energy transfer promotes low lying electrons, leaving vacancies subsequently filled by higher lying electrons with the consequent emission of a photon (X-ray).*

*There may be several sequential transitions before the atom is restored to its ground state configuration... Assuming 2, 8, 18 represent the shielding of electrons by inner lying electrons then these electrons are grouped in shells.*

*~ 2e- n=1 K shell*

*~ 8e- n=2 L shell*

*~ 18e n=3 M shell.*

Therefore the shielding of electrons is necessary to calculate the series of jumps. Surprisingly the incoming X-ray photon does not disturb any of the electrons of the shielding layers...

From Moseley's data it is impossible to infer that atoms possess  $Z$  extra-nuclear electrons, electrons that are arranged in shells or orbital's. Also impossible to infer that there are atomic nuclei with  $Z$  protons.

The QM model is capable to explain only some phenomena. Moseley's experiment is not a crucial one for the existence of  $Z$  extra-nuclear electrons or for  $Z$  protons in the nuclei.

Moseley's experimental data can only show that a physical property of the elements, namely a frequency due to radiation, depend on atomic mass number  $A$  and on its specific atomic architecture.

## ***Despair of QM***

<http://chemistry.stackexchange.com/questions/6929/understanding-moseley-s-law-from-the-rydberg-type-equation>

### *Understanding Moseley's law from Rydberg-type equation?*

*To explain the characteristic X-ray emission peaks for various elemental targets, a formula was developed which was similar in construct to the Rydberg equation for H-atom as derived by the Bohr-model.*

$$\tilde{\nu} = R (1/n_f^2 - 1/n_i^2)(Z - \sigma)^2$$

where  $\tilde{\nu}$  is the wavenumber,  $\sigma = 1$  for the  $K_\alpha$  line.

My question is: Although Bohr model is wrong in light of the modern quantum mechanical concept of atomic structure, why does the energy for transition (and X-ray emission) of complicated atoms with complicated screening effect be represented by a simple adjustment of the Z factor in the Rydberg equation with the value of R used in case of H atom?

Why isn't there a need of complicated corrections (instead of simple subtraction of an experimentally obtained  $\sigma$  to predict the X-ray wavelength?

### **Answer:**

Though the Bohr model is oversimplified, the Rydberg equation itself is a good approximation (I wonder if it can be derived using the more accurate orbital model).... – [Nicolau Saker Neto](#) Nov 20 '13 at 13:08

## ***An alternative to the QM interpretation of Moseley's findings***

When two waves of different frequency are superposed, two new waves occur with frequencies equal to the sum and the difference of the original frequencies.

We regarded the hydrogen atom and the aether as two music instruments that have an interplay. The series of Lyman, Balmer etc. are scales of tones. Excited atoms generally have an interplay with the aether.

The first "tone" of the Lyman series is  $\nu(H_\alpha) = \nu_{\text{Rydberg}} (1 - 1/4)$ , we interpret the first term as Eigen frequencies of the H-atom, the second term as the Eigen frequencies of the aether.

Moseley's law can be expressed for the so called  $K_\alpha$  lines of the elements:

$$\text{Frequency} = \nu(K_\alpha) = \nu_{\text{Rydberg}} (Z - 1)^2 (1 - 1/4)$$

For example sulfur, S:  $Z = A/2 = 16$  ;  $(Z - 1)^2 = 15^2$

$$\nu(K_\alpha) = \nu_{\text{Rydberg}} 15^2 (1 - 1/4) \text{ Hz}$$

This expression can be interpreted as a difference of frequencies (in acoustics this means a difference tone).

This indicates that the physical cause for the frequency difference is a coupled oscillation.

There are the two oscillators that are coupled: on the one hand the excited atom and on the other hand the dielectric medium (aether) that is the carrier of all electromagnetic radiations.

Example for Na ( $Z = 11$ ):

$$\nu(K_{\alpha}) = \nu_{\text{Rydberg}} (100)(1 - 1/4)$$

The hydrogen atom H produces in its Lyman series the first tone

$$\nu(H_{\alpha}) = \nu_{\text{Rydberg}} (1 - 1/4), \text{ which frequency is } 1/100 \text{ of the}$$

$\nu(K_{\alpha})$  frequency of Na!

X ray spectra can also be interpreted as Raman shifting of incident ray!

**See the following articles:**

**Neutrons are decaying hydrogen's**

**Neutrino is a stop gap of QM**

**-al elements consist of hydrogen**

**Metallic bonding**

**QM cannot explain intensities of H-spectrum**

.....

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