Introduction

This is a presentation of my 30-year-long independent research. It initiates

THE REFORM OF MODERN PHYSICS

and, due to its method, paves the way to the reform of modern science in general.
The research deals mainly with the following problems:
1- the theory of ether and its characteristics;
2- the origin of matter;
3- the nuclear structure of the atom.

Method

There was developed a new systematic method based on dialectical logic; the method involves two alternative phases - a free speculation about the object in question and its suggested mathematical description. The method takes into account all the to-date achievements, digests them and finds the true solution, thus solving problems that are beyond the reach of modern physics.

Summary of the results

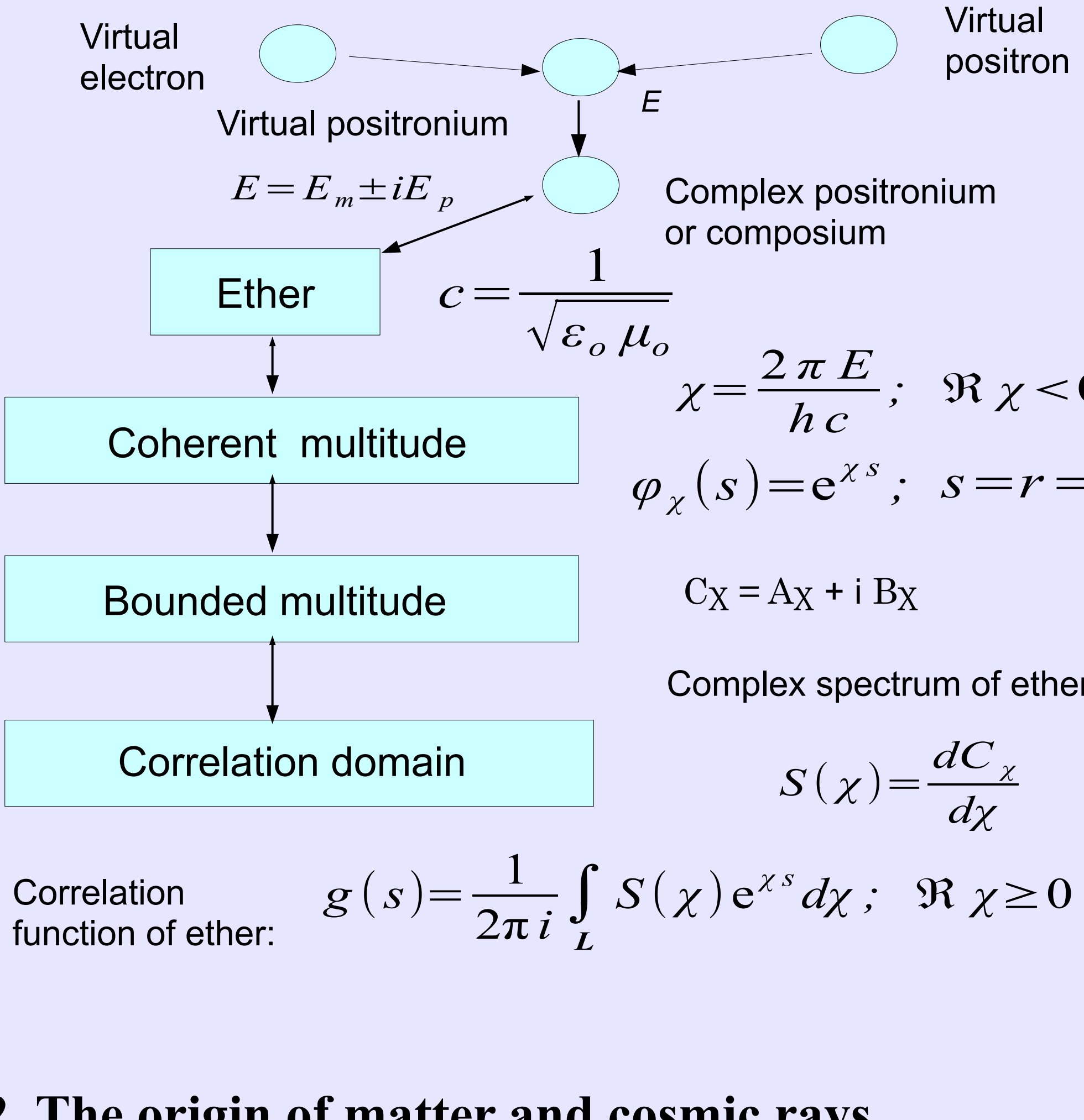
There have been discovered and obtained the following new phenomena and results:
(1) the true fundamental particles;
(2) the existence of ether, the primary physical medium;
(3) the phenomenon of spontaneous generation of mesons and neutrons in ether;
(4) the origin of cosmic rays and the Microwave Background;
(5) the real dimensions of subatomic particles;
(6) the origin of the neutrino;
(7) the essence of nuclear interaction;
(8) the nuclear structure of the atom.

Results in detail

1. Fundamental particles and the theory of ether

There are two fundamental particles – the virtual electron and the virtual positron, having no physical properties; their interaction gives birth to *the virtual positronium* characterized by *energy*. There exists ether, the primary physical medium, consisting of virtual positroniums exchanging photons.

The logic of ether



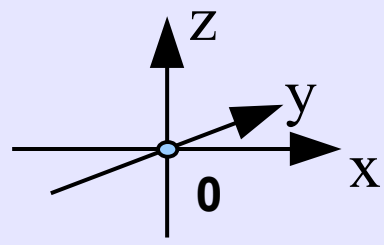
2. The origin of matter and cosmic rays

In ether there takes place spontaneous generation of mesons and neutrons; the cosmic rays and Cosmic Microwave Background are its proper radiation.

Muon

The evolution of ether leads to separation of space and time; so we introduce a spatial frame of reference with a stochastic origin characterized by the *Singularity Distribution Function* φ_o.

$$\int \varphi_o\, dq = 1;\quad \varphi_o(q) = \varphi_o(|q|);$$
$$r = |q| = \sqrt{x^2 + y^2 + z^2};$$
$$dq = dx\, dy\, dz$$



Interaction of the processes described by functions g and φ_o gives birth to the muon characterized by its mass density proportional to the function

$$w(q) = g^2 \otimes \varphi_o = \int g^2(|q_1|)\,\varphi_o(q - q_1)\, dq_1$$

The muon has no structure, which explains its weak interaction with matter.

π-meson

In the muon, the internal process acquires the form of reflection characterized by a wave function ψ(q,t), a reflection energy E_{ref} and an operator $\hat{E}_{ref}$; as a result, the muon transforms into the π-meson, characterized by the equation

$$\frac{\partial(\psi, \hat{E}_{ref}\psi)}{\partial t} = -\frac{1}{c}\left(\frac{\partial \psi}{\partial t}, W\frac{\partial \psi}{\partial t}\right);$$

$$E_{ref} = (\psi, \hat{E}_{ref}\psi);$$
$$W(q) = w_{max} - w(q).$$

The π-meson has a primitive structure determined by $\psi(q,t)$.

K-meson

Maintaining balance between the inflow and outflow of energy leads to division of reflection into time reflection (oscillation) and space reflection characterized by energy E_t and E_s, where

$$E_t = \frac{1}{2c^2}\left(\frac{\partial \psi}{\partial t}, \frac{\partial \psi}{\partial t}\right);\quad E_s = -\frac{1}{2}(\psi, \Delta\psi)$$

There arises the effect of self-control that transforms the π-meson into the K-meson characterized by the equation

$$\frac{1}{c^2}\frac{\partial^2 \psi}{\partial t^2} - \Delta\psi + \frac{W}{c}\frac{\partial \psi}{\partial t} = 0$$

The K-meson has a primitive *discrete* structure.

η-meson

The solution of the above equation requires the unification of conjugate states, which leads to the creation of a new particle, the η-meson, characterized by a set of self-conjugate functions

$$u_k(q, t) = U_k e^{\lambda_k t} + \tilde{U}_k e^{\tilde{\lambda}_k t},\ k = 1,2,\ldots,n$$

determining the parameters of its self-conjugate composiums:

$$m_k=\frac{\hbar}{c^2}\left|\Re\,\lambda_k\right|;\quad p_k=\frac{\hbar}{c}\Im\,\lambda_k;\quad \lambda=\frac{E}{\hbar};\qquad \begin{aligned} E_k&=-m_kc^2+i\,p_kc\\ \tilde{E}_k&=-m_kc^2-i\,p_kc\end{aligned}$$

The η-meson is a self-conjugate particle, its own antiparticle.

3. The structure of the neutron and the H-atom

Neutron

In respect to ether excitations, the neutron is a *linear system* with *continuously* distributed parameters consistent *spatially* with ether; because of its time-space contradiction, the neutron transforms into the H-atom.

Under the influence of photon bombardment, the η-meson seeks to conform its structure with the correlation function of ether. As a result, the whole structure of the η-meson undergoes the process of organization; there forms a collective, organized reflection represented by a *linear combination* of spatial wave functions

$$F=\sum_{k=1}^{n}C_kU_k+\tilde{C}_k\tilde{U}_k$$

approximating in space the two-component correlation function of ether *G:*

$$C_k=\frac{(V_k,G)}{(V_k,U_k)},\qquad \tilde{C}_k=\frac{(\tilde{V}_k,G)}{(\tilde{V}_k,\tilde{U}_k)},\qquad G=\begin{pmatrix}g\\ g\end{pmatrix}$$

where $\{V_k\}$ are the solutions of the transposed equation. In doing that, the η-meson transforms into the neutron characterized by its correlation function

$$f(q,t)=\sum_{k=1}^{n}C_kU_k\mathrm{e}^{\lambda_kt}+\tilde{C}_k\tilde{U}_k\mathrm{e}^{\tilde{\lambda}_kt}$$

The structure of the mesons depends on the correlation function of ether alien to them. Contrary to them, the neutron itself models that function and stands, as it were, on its own feet, which explains its high stability.

H-atom

The H-atom is a linear system with *lumped* parameters, its structural function being consistent *in time* with ether; the H-atom consists of three quarks described by *real symmetric matrices,* the agents of their processes corresponding to the so-called gluons; the H-atom lacks nuclear interaction and therefore is not a real atom, but rather its *egg*.

Under the influence of photon bombardment, the continuously distributed parameters of the neutron transforms into lumped parameters thus transforming the neutron into the H-atom and space consistency with ether into time consistency.

The process of the H-atom is described by a vector differential equation

$$A\frac{d^2\boldsymbol{\Phi}}{dt^2}+B\frac{d\boldsymbol{\Phi}}{dt}+\Gamma\boldsymbol{\Phi}=0;\qquad \boldsymbol{\Phi}=\begin{pmatrix}\varphi_1\\ \varphi_2\\ \dots\\ \varphi_n\end{pmatrix}$$

The matrices A, B, Γ determine the quarks, the vector functions $\frac{d^2\boldsymbol{\Phi}}{dt^2}, \frac{d\boldsymbol{\Phi}}{dt}, \boldsymbol{\Phi}$ corresponding to so-called gluons.

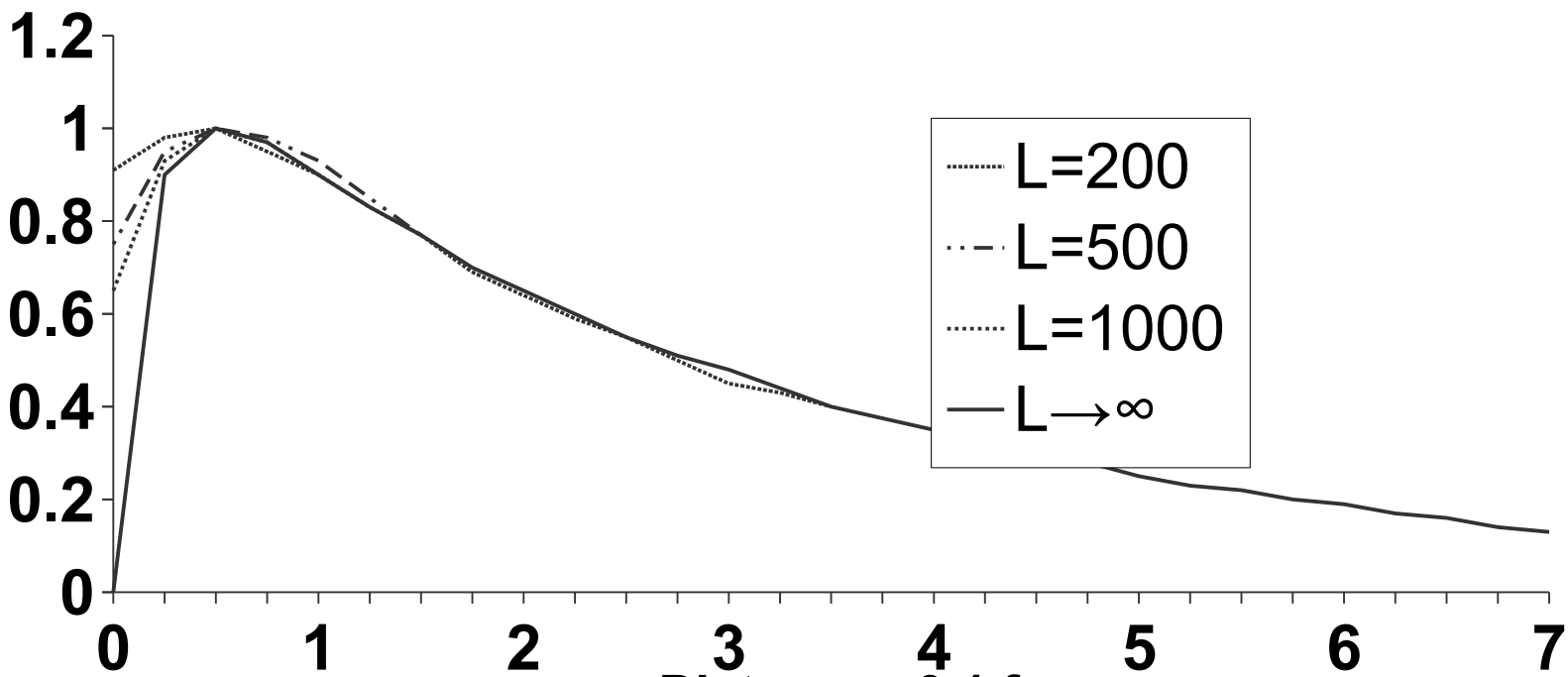
The solution of the above equation

$$\boldsymbol{u}(t)=\sum_{k=-n}^{n} T_k \boldsymbol{U}_{\boldsymbol{k}} e^{\lambda_k t};\quad a_{-k}=\tilde{a}_k,$$

may be called the structural function of the H-atom.

4. Correlation function of ether

Experimental data on cosmic rays enabled us to calculate the correlation function and characteristics of ether, as well as the dimensions of particles.



Correlation function of ether

The approximation of the correlation function and the radius of extrema:

$$g(r)\propto\exp(-\alpha_{et}r)-\exp(-\beta_{et}r);\qquad r_{et}=0.0517\ fm$$

The spectrum of ether in high energy region:

$$|S(i\omega)|^2\propto\frac{1}{(\alpha_{et}^2c^2+\omega^2)(\beta_{et}^2c^2+\omega^2)}\qquad \alpha_{et}=3.18\ fm^{-1}\qquad \beta_{et}=56.81\ fm^{-1}$$

Singularity distribution function and its variance:

$$\varphi_o(q)=\frac{2\beta_{et}^{\ 3}}{\pi^2}\exp(-2\beta_{et}|q|);\qquad \sqrt{\overline{q^2}}=1.24\times10^{-2}\ fm$$

Dimensions of particles:

Mean radius of the electron: $\overline{R_e} \approx 0.88 \times 10^{-2}\ fm$ (in modern theory $r_e \approx 2.82\ fm$).

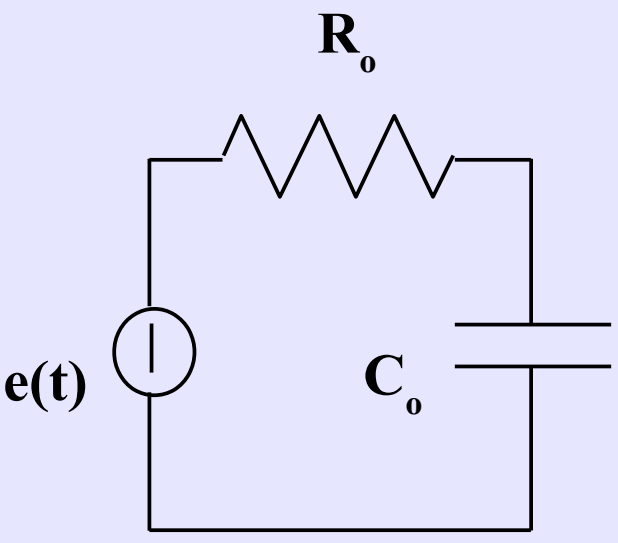
Mean radius of the neutron: $r_n \approx 0.46\ fm$ which matches to-date experimental data.

5. The essence of nuclear interaction

The essence of nuclear interaction is the conservation of energy by alternate transformation of electric energy to magnetic one and vice versa, the atom of deuterium (D-atom) being the conception of the atom, its *embryo*.

The H-atom and neutron can roughly be modeled by electric RC- and LR-circuits, respectively; in exact representation, there should be taken into account magnetic properties of the H-atom and electric properties of the neutron, modeled by inductance L_1 and capacitance C_1, respectively; the D-atom and He-atom are modeled by LCR-circuit and T-shape low-pass filter.

6. Electromagnetic models of the neutron and atoms



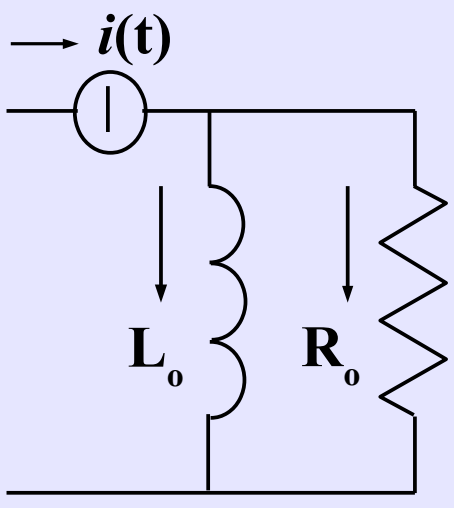
Rough model of the H-atom

The equation of the H-model

$$R_o \frac{dq(t)}{dt} + \frac{1}{C_o} q(t) = e(t)$$

Its response to pulse excitation:

$$q(t) \propto \exp\left(-\frac{t}{\tau_C}\right); \quad \tau_C = R_o C_o$$



Rough model of the neutron

Response of the neutron to magnetic excitation:

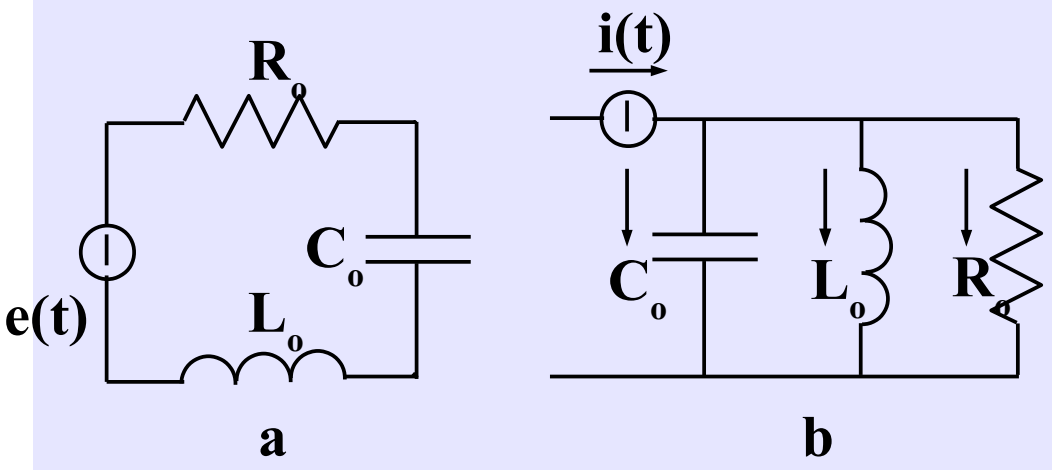
$$i_L(t) \ \propto \ \exp\left(-\frac{t}{\tau_L}\right); \ \ \tau_L = \frac{L_o}{R_o}$$

This response is similar to that of the H-atom in respect to electric excitation. These models expose the H-atom and the neutron as thoroughly dual entities, with the following relation taking place:

$$\frac{L_o}{C_o} = \frac{L_1}{C_1} = R_o^2$$

where L_1 and C_1 are the minor parameters for models in exact representation.

Under proper conditions, the H-atom and the neutron merge into the atom of deuterium (D-atom). Its process is modeled by two circuits shown below - for electric and magnetic excitations, respectively.

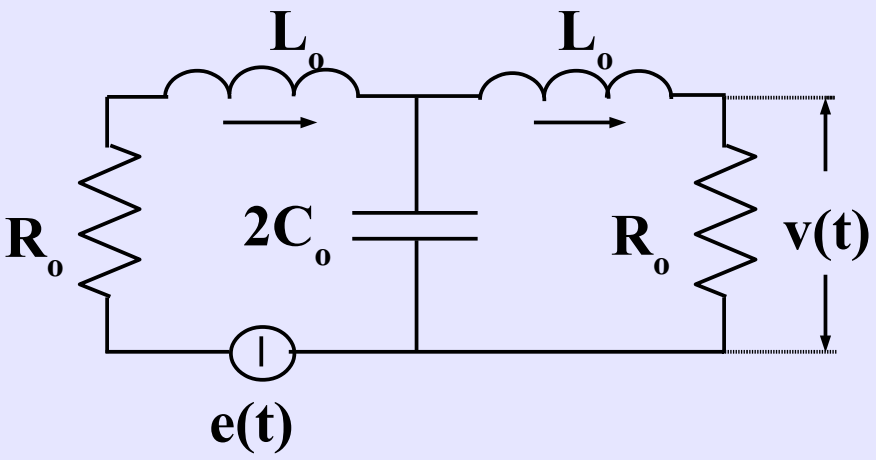


Rough models of the D-atom:
(a) electric excitation,
(b) magnetic excitation

Each of these models contains only three components as compared with four ones in total of their constituents. It is the evidence of higher structural efficiency of the D-atom resulting in a more efficient mode of energy conservation. Indeed, its pulse response damping factor is half of those of its components:

$$i(t) \;\propto\; e^{-\alpha t}\left(\cos\sqrt{3}\,\alpha t-\frac{1}{\sqrt{3}}\sin\sqrt{3}\,\alpha t\right);\quad \alpha=\frac{R_o}{2L_o}$$

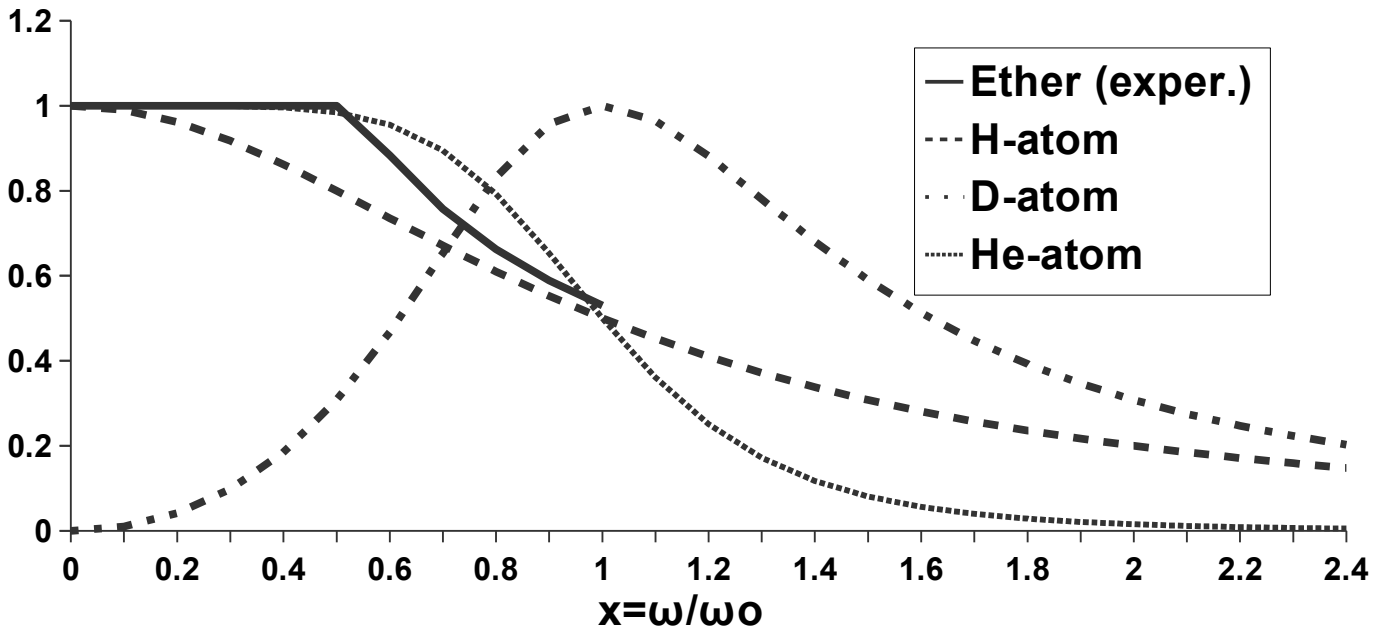
Under proper conditions, D-atoms unite in pairs giving birth to He-atoms. The He-atom is receptive to both electric and magnetic excitations. Its model has a characteristic symmetry. That makes it the first physical model of ether and the foundation of the nuclear structure in general. Its pulse response:



Rough model of the He-atom

$$v(t) \;\propto\; e^{-2\alpha t}+e^{-\alpha t}\left(\frac{1}{\sqrt{3}}\sin\sqrt{3}\,\alpha t-\cos\sqrt{3}\,\alpha t\right)$$

Spectral characteristics of the above atoms and ether are compared below.

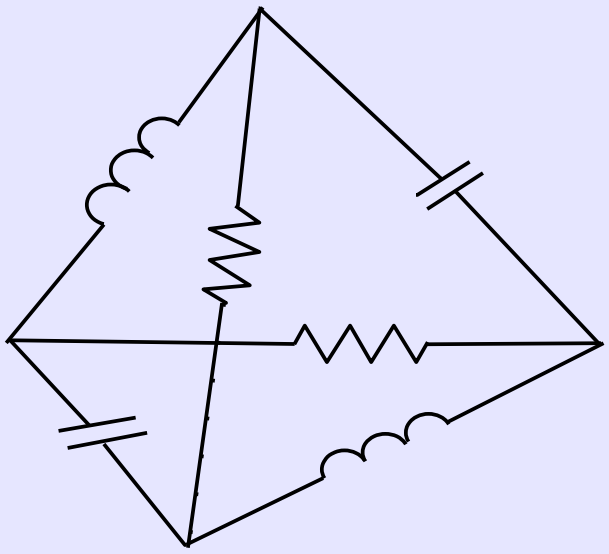


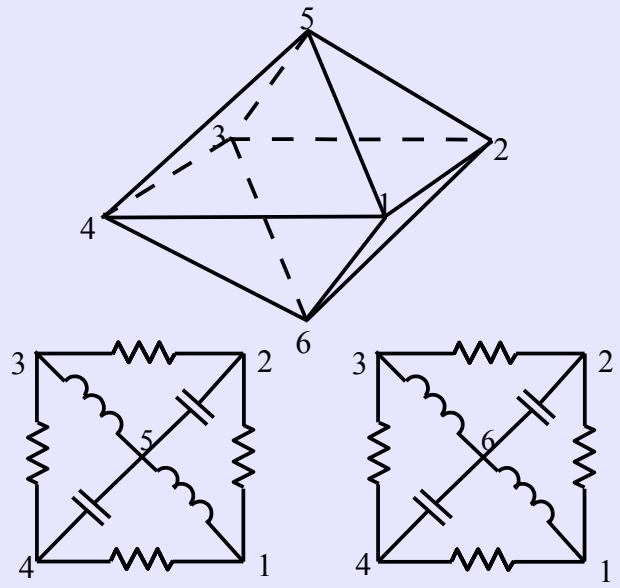
Spectral functions of the atoms

The spectrum of the H-atom follows the spectrum of ether beyond the cut-off energy; the spectrum of the D-atom is of resonance character; the spectrum of the He-atom outlines in rough the spectrum of ether, including its cut-off region.

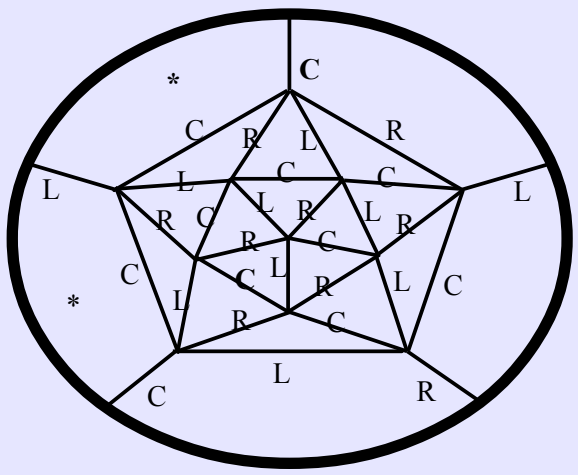
7. Nuclear structure

The nuclear structure evolves by shells, D-atom being its basic element; there are seven shells: He-shell (2-shell), octahedral shell (8-shell), icosahedral shell (18-shell), double-icosahedral shell (36-shell) and three inverse shells of 18, 8 and 2 D-atoms; additional neutrons perform inter-shell interaction; the electron shells are the integral components of the nuclear structure.



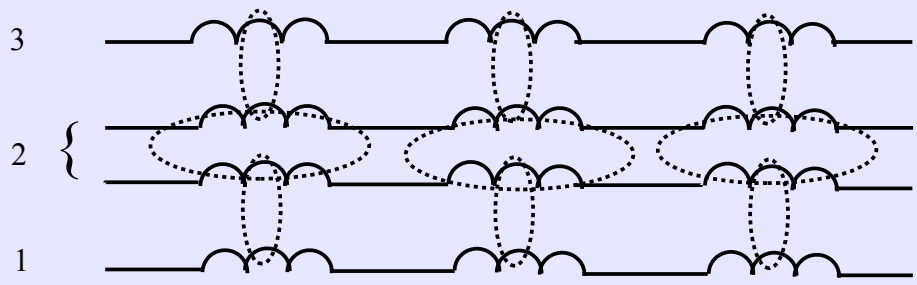


Tetrahedral shell



Icosahedral shell

Octahedral shell



Interaction of the 18-shells:
1- the internal 18-shell;
2- the central 36-shell;
3 – the external 18-shell.

The atom with an atomic number m consists of m D-atoms, is represented by a network with m degrees of freedom and, when excited, emits m -neutrinos.

The vector differential equation of the m-atom and its response:

$$\boldsymbol{L}\frac{d^2\boldsymbol{Q}}{dt^2}+\boldsymbol{R}\frac{d\boldsymbol{Q}}{dt}+\boldsymbol{D}\boldsymbol{Q}=0;\qquad \boldsymbol{L}=\left(L_{ik}\right),\quad \boldsymbol{R}=\left(R_{ik}\right),\qquad \boldsymbol{D}=\left(D_{ik}\right),\quad D_{ik}=C_{ik}^{-1};\qquad \boldsymbol{Q}=\begin{pmatrix}Q_1\\Q_2\\\dots\\Q_m\end{pmatrix}$$

$$\boldsymbol{f_m}(t)=\sum_{k=-m}^{m}F_{mk}\boldsymbol{A_k}\exp(\lambda_k t)\ \rightarrow\ g_n(s)=\sum_{k=-n}^{n}S_k\exp(\chi_k s)$$

It is the m-representation of both the structural function of H-atom and correlation function of ether; it achieves its perfection in ^{238}U atom, where $m\rightarrow n$, $t\rightarrow s$/c, $f_m\rightarrow g_n$.

1. Igor S. Makarov. *A Theory of Ether, Particles and Atoms. Second Edition.* Open University Press, Manchester, UK, 2010. Order: Amazon.com, ISBN-13: 9781441478412 .
2. Igor S. Makarov. *Reforming Modern Science by Metascience.* Arhive of Reform Science Center, 2010.
3. The same works online: 1 - http://kvisit.com/S2uuZAQ; 2 - http://kvisit.com/S98a2AQ.