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The Ideas Behind the Electromagnetic Atomic Theory

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Abstract
This paper has the objective of familiarising the reader with the guidelines and the main results of Electromagnetic Atomic Theory (EAT) published in Physics Essays and Applied Physics Research and looks at the potential new approaches to developing EAT in the future.

Key words: Electromagnetic atomic theory; Complete relativity; Electron structure; Positron structure; Wave equation; Dynamic bi-Laplacian equation; Doppler effect of electromagnetic waves; Structure of the universe; Speculative fiction

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HISTORICAL INTRODUCTION

In 1981 when I was working for Olivetti, my boss asked me to study computer hard disc vibrations using the mathematic bi-Laplacian operator. During my research I asked myself: *Can I simulate the atomic nucleus with a solid sphere and study it with the bi-Laplacian operator in polar coordinates?* Hence, I was somewhat reluctant given that I was only too well aware of the complexity of the Laplacian operator in polar coordinates. Furthermore, I had become acquainted with how complicated it was to calculate the bi-Laplacian in cylindrical coordinates when I was studying the hard disc vibrations. As a result I was able to predict the immense difficulty involved in the calculation of the bi-Laplacian in polar coordinates. And, back in 1981, I deemed myself incapable of facing such a challenge. In 1998, I resigned from my job and entered a seminary so that I could study Philosophy. In 2000 I left the seminary and finally, in August 2003, began to study the atomic nucleus with the bi-Laplacian operator. I was immediately confronted with some incredibly complex calculations. I sought the assistance of the Mathematics Faculty at the University of Turin, where I met Hisao Fushita Yashima and discussed the details of the research with him. Meanwhile I also met one of my old lecturers from the postgraduate technical college. He encouraged me to work on my research by avoiding Quantum Mechanics (QM). He said: *Quantum Mechanics is a beautiful and complicated Theory, but it is totally useless. It only explains the Hydrogen spectrum, or rather ... not even that. I do not understand the physical meaning of the imaginary unit i into the formulae and into the Schrödinger equation.* Hence, I avoided QM and all the solutions containing the imaginary unit *i* yet it was, to say the least, fraught with problems. I could, of course, study the Hydrogen nucleus, the proton, but what about the complex nuclei? How could I simulate them? They were not a solid sphere: they were a set of protons and neutrons. The next few months were spent in total confusion until I noticed my physics books in the bookcase and had a brainwave: *How can a γ-ray transform itself into an electron-positron pair? These particles cannot simply be another way of the γ-ray structure?* I had finally discovered how to express the hypothesis of the problem more simply: the elementary particles (the electron and the proton) are certain e.m. standing waves, whereas the neutrons and the complex nuclei could be certain superimposing e.m. standing waves. In this way, they form solid spheres and can be studied using the bi-Laplacian operator. A few months later, when I carrying out an in-depth research into some new ideas, Santi Tofani came to my assistance. His guidance proved crucial to

me submitting my papers to International Journals. The training I had undertaken in Philosophy in the seminary also played an important role in detecting the EAT. Sometime later by considering the Dynamic bi-Laplacian Equation, I was able to calculate the Magic Numbers of atomic nucleus[1]. On the 14th of July 2009 the paper entitled: *The dynamic bi-Laplacian Equation in polar coordinates and the magic numbers of atomic nucleus*[1] was published online on the Physics Essays website. The focal point of considering electrons, many other particles, atoms and atomic nuclei as a superimposition of e.m. standing waves, is a modification of Einstein's Special Relativity. In accordance with Appendix B of Reference 1, I introduced a new postulate: an electron cannot move at speeds less than $u_0 = \alpha c/\pi$ where α is the constant of fine structure and c is the speed of light. The postulate characterizes the Complete Relativity Theory. In order to coherently develop these new ideas of Physics, I produced three other papers plus a further one which has now been submitted to Physics Essays.

The hydrogen atomic model founded on the electromagnetic standing waves[2]. This paper proposes a new electron model in three dimensions (founded on the e.m. standing waves) that can be considered as an improvement of the Orbitsphere of Classical Quantum Mechanics (CQM). The three-dimensional electron model $[\psi(r,t)=(sin(kr)/r)cos(\omega t)]$ criticizes the electric charge notion. In reality the innermost spherical nodal surface of the electron (that corresponds to the first root of $sin(kr)/r$) is surrounded by other concentric nodal surfaces (that correspond to the other roots of $sin(kr)/r$). According to Einstein's formula $E = mc^2$, the energy of the e.m. standing wave (averaged over time) in the innermost sphere, has an equivalent in mass. So the innermost sphere can be considered as a spherical particle: the electrically charged electron. In fact, the averaged energy of the e.m. standing wave of the electron outside this sphere can be considered to be generated by an equivalent electric charge stored on the particle surface. Then the electric charge would only be an ideal concept (averaged over the time period of the e.m. wave). Another important result can be achieved by considering the energy function of the electron:

$$E_0(r) = m_e c^2 \left[1 - \frac{\sin\left(\frac{2\alpha^2}{\pi r_e} r\right)}{\frac{2\alpha^2}{\pi r_e} r} \right] \qquad (1)$$

In order to go deeper into my model of the electron (as an e.m. standing wave), we can interpret $E_0(r)$ in many ways. In fact, $E_0(r)$ is the total energy of the e.m. standing wave of the electron inside a sphere of radius r concentric with the electron. Then $E_0(r)$ can represent the potential energy of the electron at a distance r from the centre. So then its derivative could represent the field of forces in accordance with the value of the vector radius r. But we can also consider $E_0(r)$ as an integral function of the energy, at which point its derivative is the energy density of the e.m. standing wave. Moreover, there is an equivalence between the mass of the electron and its energy: $E = mc^2$. Then $E_0(r)$ is proportional to the mass of the electron inside the sphere of radius r (having the same centre as the electron), and its derivative is the mass density of the electron. Instead deriving the function $E_0(r)$ of the positron, we can (unconventionally) conclude that at the centre of the positron there is an impulse function of force. Then between the electron and the positron, both their structures are completely asymmetric. Moreover, this paper compares the properties and principles of the EAT with QM and CQM. The best physical result is the calculation of the fundamental spectral frequency of the molecular Hydrogen. The Appendix gives the details of the calculation in order to obtain the same solution for both the Wave Equation (which studies the atomic electron shells) and the Dynamic bi-Laplacian Equation (which studies the atomic nucleus). It could be that a researcher may be able to establish Cold Fusion Theory using this solution.

The Hydrogen Atomic Model Based on the Electromagnetic Standing Waves and the Periodic Classification of the Elements[3]. This paper shows the organization of the Periodic Classification of the Elements according to the fractal form of the atoms (a new Classification which differs from the current Classification for the heavy elements of VI and VII Period. See Table 1).

In the new Classification, Ytterbium can be seen as a useful element for the cold fusion tests. Furthermore, a new phenomenon appears: a new set of e.m. theoretical (albeit unsteady) wavelengths of Hydrogen spectrum. Should this phenomenon be revealed, then it would confirm the proposed EAT.

[1] The Magic Numbers are the atomic numbers of the nuclei with special properties of stability. They are: Helium (2), Oxygen (8), Calcium (20), Tin (50) and Lead (82 protons, 126 neutrons).

Table 1
New Periodic Classification of the Elements

H																												He
Li	Be																							B	C	N	O	F	Ne
Na	Mg																							Al	Si	P	S	Cl	Ar
K	Ca						Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn								Ga	Ge	As	Se	Br	Kr
Rb	Sr						Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd								In	Sn	Sb	Tc	I	Xe
Cs	Ba	La	Ce	Pr	Nd	Pm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Ti	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Th	Pa	U	Np	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lw	Ku	Ha													

The Doppler Effect according to complete relativity (Reference 4). This paper highlights the zone of the e.m. spectrum (from the γ-rays to X-rays) covered by the Doppler effect applied to the γ-ray of 1.022 MeV produced by a positron/electron superimposition. When we analyze the Doppler effect in complete relativity, we can observe an inversion of the normal behaviour: instead of an increase in the wavelength of the e.m. radiation (when the wave front moves away from the observer) we can observe a decrease in the wavelength when the p/e pair moves in relation to the relativistic observer with a ratio $\beta > 0.5774$. In addition, when the p/e pair (forming the γ-ray) moves away at round the speed of light, we can observe a blue shift due to the relativistic addition of the speeds. Furthermore, I am able to show a new way of considering the photoelectric effect. When the progressive e.m. wave of the X-ray[2] formed by an e/p pair, collides with a nucleus, then the e/p pair decomposes. But the positron cannot survive in the Cosmos because its function is multiplied by $A_0 = 0$ into the fundamental eigenvector of the Wave Equation: $R_0(r) = \frac{1}{r}\{[\sin(kr)] + A_0[\cos(kr)]\}$, obtained through the boundary conditions $R_0(r_e) = 0$ and $R_0(r \to \infty) = 0$ (being r_e = the radius of the electron). The positron can penetrate the nucleus thanks to its great internal mass and thus, excite it [the positron exists only in the excited eigenvector $R_1(r)$, $R_2(r)$ etc.. Then in the steady state of the Cosmos there are only electrons!]. Instead the electron, which has a very low internal mass, ricochets and forms the photo-electron. When the excited nucleus decays (even in successive partial steps) then the positron energy forms an e.m. progressive wave of a lower energy than the initial X-ray. The phenomenon can repeat its form into other nuclei. Which are the best materials for shielding the X-rays? Atoms with the magic nuclei: i.e. Tin has 10 isotopes, so when the nucleus of Tin captures a positron it has the maximum chance of exciting the nucleus without its becoming radioactive. For this reason, also the other magic nuclei are good materials for shielding the e.m. progressive waves: to avoid becoming radioactive when excited by X-rays these are the best nuclei. If a molecule or an alloy of the Ca Sn O type exists, then there are three magic nuclei in a small space and the X-rays can easily be decayed by the heat from an e.m. "wave-fall". Should the shield warm up, then it can be cooled by He or H_2O, two materials whose nuclei belong to the magic number type. If this simplistic reasoning proves to be correct, then my fledgling theory would have another technical confirmation.

I have now submitted a fifth paper to Physics Essays. In this I consider a decisive experimental test: when at low energy, an electron overlaps a positron, then only a γ-ray of 1.022 MeV is generated and not two γ-rays of 511 keV. In fact, today, Physicists think that two γ-rays of 511 keV are created in the positron-electron annihilation in order to verify the conservation of momentum. But they are basing their considerations on the electron and the positron being two simple physical points with opposite electric charges. Whereas, in my opinion, only the e.m. standing waves of the electron and positron exist, and the electric charge is an equivalent concept. My demonstration makes use of the three-dimensional models of the electron and the positron, and calculates a single γ-ray of 1.022 MeV, satisfying the conservation of momentum in the positron-electron annihilation. If by accurately testing this we are able to verify this result, then the correctness of my Physical proposal will be confirmed. In this paper, I also criticize the photon concept. In fact, I consider only two e.m. standing waves (the e/p pair) that overlap and form a γ-ray (a progressive wave). Moreover, in order to study the trigonometric formula on the basis of the annihilation of a p/e pair:

$$\sin(kx + \omega t) = \sin(kx)\cos(\omega t) + \cos(kx)\sin(\omega t) \qquad (2)$$

The Complete Relativity Theory would need to be applied. In fact in Equation (2), sin(kx+ωt) is an e.m. progressive wave whose speed is the speed of light (the γ-ray); instead sin(kx)cos(ωt) and cos(kx)sin(ωt) are two still e.m. standing waves (the e/p pair).

All these articles are my fledgling attempts at a new Fundamental Atomic Theory which considers the elementary particles as e.m. standing waves. EAT provides an alternative to both the Standard Theory and the Theory of Strings. Furthermore, it perfects the MQC. Also the QM methods are questionable with many of the results being interpreted in a new way. On the other hand, Maxwell's first and fourth Equations have to be reformulated. In

[2] in EAT there aren't any photons!

fact, they contain either the electric charge density or the current density. But the electric charge is only an equivalent concept averaged over the time-period of the considered e.m. standing wave of either the electron or the positron. Finally, also the second principle of Dynamics has to be reformulated at the high energies. Actually, according to complete relativity, the electron can reach the speed of light and only increase its mass by around 430 times (not infinitely). If we supply energy to this relativistic electron, its speed cannot increase (possibly only its wavelength decreases) and any acceleration will be zero.

EAT answers the bi-millenary philosophical question:

What is matter?

Answer: *Matter is a superimposition of e.m. standing waves. All of us (and the Cosmos) are made up of e.m. radiation ... i.e. "still light"!*

BRAIN STORMING: THE POSSIBLE FUTURE

I presume that baryons and mesons could be the fundamental and excited eigenvectors of the Dynamic bi-Laplacian Equation obtained in the Introduction of Reference 1. Whereas leptons are the fundamental and excited eigenvectors of the Wave Equation as shown in the Appendix in Ref. 2. It is also interesting that the decay time of the eigenvectors decreases with their order (this is also the case in the high order eigenvectors in Solid Mechanics). Then the *strangeness* may turn out to be a type of very high order eigenvectors as revealed by the tests.

Since the uniform circular motion of an electron is in opposition to Heisenberg's Uncertainty Principle (actually $\Delta r = 0$ and $\Delta mv = 0$), my correction to special relativity allows me to consider that when the electron tends to stop, it oscillates around the origin of the x-axis with an amplitude equal to the Bohr radius and it moves (on average) with twice the minimum speed. In this way it is still (on average). So, by only a complete relativistic effect, an electron can form a Hydrogen atomic orbital without any nucleus. This hypothesis may seem absurd but in a certain way it is possible to consider it so as to connect atoms with particles as Milan Perkovac has indicated in Figure 5 of Ref. 5. In fact in Perkovac's model of the Lecher line I think we need to reflect on the following suggestion. If the time T of propagation of the signals of current and voltage between the pair of wires in the Lecher line is equal to the time period of the e.m. wave that starts from a wire and reaches the other wire, then the e.m. fields of the e.m. wave of the signals start and arrive with the same value. In other words if δ is the gap between the pair of wires in the LC circuit (the Lecher line):

$$\delta/c = nT = 2n\pi\, sqr(\mathrm{LC}) \qquad (3)$$

Where n is an integer, then the starting values of the e.m. fields of the signals are equal to the arriving e.m. fields on the other wire. This is the same condition as the previously considered harmonic oscillator of the electron: the time period of the oscillation is twice the time period of the e.m. standing wave of the electron. Could a complete relativistic oscillation of an electron with the Bohr amplitude create a kind of mass singularity similar to a nucleus in the origin of the x-axis by the superposition (in time) of the e.m. fields of the electron at that point? In this way the electron only becomes neutral for any complete relativistic properties. And all the other elements of matter can be considered as being formed only by some electrons and be nevertheless neutral. Maybe the Laplacian and bi-Laplacian operators [used in the Wave Equation and in the Dynamic bi-Laplacian Equation] and the complete relativistic concepts could be processed together in order to generate a new global fundamental equation of Physics. Actually in order to study electrons and atomic phenomena, it is sufficient to use a second order mathematical derivative in the Wave Equation. Whereas, in order to study nuclear phenomena, we need the Dynamic bi-Laplacian Equation and its fourth order derivatives. Then the existence of the proton and other baryons is a fourth order effect of the e.m. fields, whereas the existence of the electron and leptons is only a second order effect. In accordance with my previous considerations, my paper Ref. 3 is only a first approximation work. I do not actually use Complete Relativity in order to simulate the behaviour of the e.m. standing wave of the electron that forms the Hydrogen atom. I only use certain classical concepts. Hence, the energy values of the sub-shells of Hydrogen are only first approximation values. In order to calculate the exact values of energy, the e.m. standing wave of the electron needs to be considered as oscillating around the origin of the x-axis. In order to study this new model, I think the following Complete Dynamic bi-Laplacian Equation that we obtain from Equation (4) of Ref. 6 calls for consideration.

$$D\Delta^2 u + \rho h\ddot{u} = q(r,\theta,t) \qquad (4)$$

Where $D = D(E,m)$ with E = Young's Modulus, m = Poisson's modulus, Δ^2 is the bi-Laplacian operator applied to a plate of height h and material density ρ; u is the vertical displacement of a point of the plate, and q is the dynamic external loading. If a Researcher is able to introduce Complete Relativity into the following Complete Dynamic bi-Laplacian Equation:

$$\left(\frac{h^2}{8\pi^2 m}\right)^2 \nabla^4\psi + \left(\frac{h}{2\pi}\right)^2 \frac{\partial^2\psi}{\partial t^2} = E_{EF}F_{EF} \qquad (5)$$

He/she may be able to study the scattering of relativistic e.m. standing waves in a general form. Actually, since only $r\,R(r)$ is a non dimensional function, in order to dimensionally satisfy Equation (5), the second member has to have the form: $E_{EF}F_{EF}$ (external force energy *external force). Now, for the electrical fields,

forces are conservative and there are no problems: E_{EF} is the potential energy of the external electric field in each point of the space and F_{EF} is the r-first derivative of E_{EF}. But the e.m. standing waves are also formed by magnetic fields. How can we define the magnetic external force in each point of the space using Maxwell's equations? I think that Equation (5) is an extremely important equation for confronting the right Hydrogen model in which the electron oscillates around the proton.

Furthermore, the following consideration needs to be taken into account: when an electron reaches the speed of light it can no longer increase its speed, then acceleration (and then the Newton Force $F = ma$) lacks significance. If we supply the electron with energy, then it could be that only its wavelength decreases.

A NEW VISION OF THE COSMOS

In particular periods of time, developments in science and technology have created and will create their own view of the world and define the status of human beings in the universe[7]. Also EAT discovers and proposes a new physical meaning of the universe.

In Reference 2 we obtain the following result: the global effect of the superimposition of an infinitive number of "virtual" particles [spread over the interval of x, $[-a_0, a_0]$ (where a_0 is the Bohr radius)], forms a new global e.m. standing wave extended over all the x-axis. Since the considered global one-dimensional e.m. standing wave has about the same physical characteristics as the e.m. standing wave of the electron, then the e.m. standing waves seem to be able to structure themselves into some kind of fractals. Hence, also the atoms and the Cosmos can assume a fractal form.

In addition, the Cosmos can be formed by parallel worlds. The hypothesis of there being some existing and permeating parallel worlds originates from the following Equation (6) which is a mathematic model of the annihilation of two still e.m. standing waves (the second member) in an e.m. progressive wave moving at the speed of light (the first member). Thus, the following trigonometric formula:

$$\sin(kx+\omega t) = \sin(kx)\cos(\omega t) + \cos(kx)\sin(\omega t) \qquad (6)$$

has to be modified by the complete relativity theory. In Equation (6), the first member is a progressive wave, solution of the Maxwell Equations. Then Equation (6) is valid for each e.m. wave which moves at the speed of light, whereas the two standing waves in the second member are solutions of the Wave Equation and are still. On the other hand Equation (6) is a well known trigonometric formula. Hence, we can always form two e.m. standing waves from a progressive e.m. wave. Now, thanks to the Doppler effect, a p/e pair can form all the e.m. progressive radiations from the γ-rays to the X-rays[4]. On the other hand the electron is at the foundation of the structure of matter. But, what happens in the case of the UV-rays, the light, the infra-red, … ? It is reasonable to assume that they have the same structure as in Equation (6). Actually they satisfy Maxwell's Equations and the Wave Equations. Consequently for every kind of radiation, some particles analogous to the electron and positron exist. These particles can build some structures which are analogous to matter which permeate matter. We can think of finite numbers of parallel worlds which co-exist and form us and the Cosmos. Now, the radio waves can have wavelengths of either a meter or a kilometre. Thus, each radio wave can form two e.m. standing waves (a kind of particle) with a radius of either metres or kilometres! In reality both the e.m. progressive and the standing waves have the same wavelengths (of course we have to consider the relativistic contractions of the lengths) and so we can verify that the radii of the particles are half the correspondent wavelengths of the e.m. progressive waves.

Nowadays EAT has still to be evaluated by the scientific community. Should it gain approval, the new world view it proposes will contribute in defining the status of human beings in the Cosmos. However, it will also serve to develop the elements of fantasy in Speculative Fiction and Narrative Time[8].

REFERENCES

[1] Bellotti, Giuseppe (2009). The Dynamic Bi-Laplacian Equation in Polar Coordinates and the Magic Numbers of Atomic Nucleus. *Physics Essays*, *22*(3), 268-287. DOI: 10.4006/1.3141024

[2] Bellotti, Giuseppe (2011). The Hydrogen Atomic Model Founded on the Electromagnetic Standing Waves. *Physics Essays*, *24*(3), 364-378. DOI: 10.4006/1.3601519

[3] Bellotti, Giuseppe (2012). The Hydrogen Atomic Model Based on the Electromagnetic Standing Waves and the Periodic Classification of the Elements. *Applied Physics Research*, *4*(3), 141-151. DOI: 10.5539/apr.v4n3p141

[4] Bellotti, Giuseppe (2012). The Doppler Effect According to Complete Relativity. *Physics Essays*, *25*(3), 315-319. DOI: 10.4006/0836-1398-25.3.315

[5] Perkovac, Milan (2012, May 21-25). Maxwell's Equations for Nanotechnology. MIPRO, 2012 *Proceedings of the 35th International Convention* (pp. 429-436). Opatija, Adriatic Coast, Croatia. ISBN: 978-1-4673-2577-6 INSPEC Accession Number: 12865384

[6] Dym, C. L., & Shames, I. H. (1973). *Solid Mechanics*. New York: McGraw-Hill Book Company.

[7] Nesterov, Vladimir (2011). Information in the Structure of the Universe. *Advances in Natural Science*, *4*(2), 1-6. DOI: 10.3968/j.ans.1715787020110402.200

[8] Lwin, S. M. (2011). Narrative Time and Speculative Fiction: Reflection of Social Conditions in Temporal Implications. *Studies in Literature and Language*, *2*(3), 11-17. DOI: 10.3968/j.sll.1923156320110203.002