Laws of Thermodynamics and Unitary Quantum Theory

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Abstract

This article describes preliminary analysis of 1\textsuperscript{st} and 2\textsuperscript{nd} Laws of thermodynamics from Unitary Quantum Theory point of view, where particle is a wave packet of some uniform field. During motion packet periodically appears and disappears, while envelope of such a process coincides with the wave function. This theory allows \cite{1} to compute mass spectrum of many elementary particles and calculate the electron charge with accuracy of at least 1%. According to this theory energy and impulse conservation laws do not work for individual quantum particles, they appear after averaging by particles ensemble. Considering the Maxwell demon as a system of two potential barriers leads to the conclusion of violation 1 and 2 of laws of thermodynamics. Conclusion is supported by experimental data.

**Keywords:** Unitary Quantum Theory, wave packet, Laws of thermodynamics, potential barrier, wave function.

The Authors with some caution proceed the Laws of thermodynamics. Today here in Russia, as over the world, fundamental laws are out of science discussion at all. But this was not always the case, especially in Russia, where scientific society was not afraid to discuss fundamental provisions.

Journal «Socialist Reconstruction and Science» - SORENA was published in the USSR between 1931 and 1936. Its targets and objective were as follows: SORENA was intended to be the biggest and most fundamental journal of science and technology in the Soviet Union, its articles were written with the close participation of the best scientists, engineers, economists and administrators of the USSR. Magazine published guidelines for the introduction of dialectical materialism in natural and technical sciences, published theoretical articles on all general disciplines, military issues of modern technologies, organization of scientific research and technical works, and covered important news, problems and achievements of foreign scientific and technical world. In its editorial board worked such eminent scholars as A.F. Ioffe, L.K. Martens, A.N. Frumkin and others. This time magazine editor was A.N. Klushina, V. Kuibyshev ex-wife, while Managing editor was Academician N.I. Bukharin.

In 1935 magazine published two articles: M.P. Bronstein “Can energy be conserved?” (SORENA, 1935, 1, p.7 – 10) and S.P. Schubin “About energy conservation” (SORENA, 1935, 1, p. 11-13). In his article S.P. Schubin paying tribute to Bronstein's clear presentation of physical, experimental and theoretical arguments as proof of Energy Conservation Law made quite low assessment of his philosophical ideas and reviewed M.P. Bronstein’s article with following words: “Today in nuclear physics we have neither direct experimental evidence for or against Energy Conservation Law nor direct theoretical guidance that can help to decide this problem because according to relativistic theory quantum does not exist at all. But we, materialists-dialecticians, have a powerful methodological principle that help us easily face the future. It stipulates that “everything can be”. Energy Conservation Law so strongly attracted a bourgeois accountant who built the world in the image of a budget book, could break down every day. Alchemists' dream of an eternal engine has a chance to be realized in the future communist society».

In the end of 1936 after legal proceedings instituted against academicians Bukharin managing editor of magazine journal «Socialist Reconstruction and Science» was closed, issues were removed from libraries and destroyed. Among regular authors of this magazine was Anatoly Grigorievich Razumnikov, professor of Bauman Higher Technical School (MVTU) in Moscow, who published an article with criticism of thermodynamics, to our regret we could not find this article. Already in 1954 prof. Alexey Nikolayevitch Kharin told me that Razumnikov was considered the founder of modern chemical thermodynamics. No further discussion of these issues took place either in Soviet Union or Russia, moreover any discussion of thermodynamics, quantum mechanics or relativity was prohibited at all.

The Great Thermodynamics is based on five distinct
postulates. Minus First Law – statement of thermodynamic equilibrium. First Law - Energy Conservation Law that extends to all thermal process. Second Law - restricts the direction of thermodynamic processes by prohibiting spontaneous transfer of heat from less heated bodies to more heated ones. It is also formulated as the law of entropy increase (not decrease). Third Law is not postulate at all, it’s Nernst theorem of absolute zero that cannot be achieved as result of finite numbers of thermodynamic processes. Forth Law – implies that for every point in time, the same set of variables can be used for description of either homogeneous open equilibrium and non-equilibrium systems state or for homogeneous closed equilibrium systems state, slightly supplemented by the variables characterizing the chemical composition of the system. From logical point of view these 5 postulates do not represent a complete system of classical thermodynamics axioms, while statistical physics provides a rationale for thermodynamics laws and their relationship with laws of motions of micro particles from which macroscopic bodies are built. It also explores the limits of thermodynamic laws applicability, and exceptions we are going to discuss.

If we have a look at the process of origin of Energy Conservation law, we will see that it comes from Newton’s equations only (detailed in [1, page 19]), while properties of space and time arise as its consequence. Since almost all equations and phenomena of classical physics are described by and strictly derived from Newton’s mechanics, the First law in ordinary non-quantum life remains inviolable. But for example, according to Unitary Quantum Theory (UQT), that will replace standard quantum mechanics as we expect, the law of energy and momentum conservation for a single particle does not valid, while Conservation Laws themselves become apparent after averaging by particles ensemble. It is evident from non-invariance of the equation of particles motion translations by coordinate and time. Newton’s equations are invariant to space-time translations: neither the equations nor the physical state of the system changes at replacement \( x \rightarrow x + a; \ t \rightarrow at \) where \( a \) — some fixed values. It's quite understandable as properties of the particle are constant and do not vary with coordinates and time changes.

According to Unitary Quantum Theory space-time translations do not exist for both the basic expression of the wave function and the oscillating charge equation, as well as conservation laws that appear only after ensemble averaging. Intuitively, it is also understandable, because the wave packet that describes the particle, as it moves through space, changes, even disappears. In UQT wave function differs from the standard wave function of quantum mechanics by the presence of some factor from a running structural function:

\[
\Phi(r, t) = f(r - vt) \exp \left( i \frac{E}{\hbar} t - i \frac{P}{\hbar} \right)
\] (1)

Structural function of wave packet sets to zero de Broglie wave in all space except its domain of existence, and this explains the absence of ether where otherwise wave can spread. No wave at all. All problems associated with the reduction of the wave function disappear immediately. We should underline that de Broglie wave is simply geometric location of the maximal points of a packet in motion, and appears as a result of the sum of partial waves (harmonic constituents), that is why it can be seen in every diffraction experiment, since all equations are linear. And now simple square of wave function takes special significance instead of the square of wave function modulus, and thus the phase does not disappear but become valuable [1-4].

Soon after computation of thin structure constant value, an oscillating charge equation was created, first it was simply postulated [1, 5-7] and applied to the problem of the interaction of Deuterium with each other to describe the process of cold nuclear fusion. At the same time, the main task of breaking extremely high Coulomb barrier banning nuclear reactions at very low energies can be solved intuitively quite easily: if particle approaches a repellant potential in a phase where the charge is small and continues to decrease, such particle can break barrier.

Being postulated for the first time in [1, 5-7] equation of motion of a particle with an oscillating charge has the form:

\[ m \frac{d^2r}{dt^2} = -2Q \text{grad} U(r) \cos\left( \frac{mr^2}{2\hbar} \right) - \frac{mr dr}{\hbar dt} + \varphi_0 \] (2)

where \( m, \ Q, \ r \) mass, charge and particle vector radius, \( U(r) \)-external potential, \( \varphi_0 \) initial phase.

As soon \( \mathbf{E} = -\text{grad} \ U \), and besides electromagnetic field magnetic one should be taken into account also, and we should consider Lorentz force as well \( \mathbf{F} = \frac{Q}{c} (\mathbf{v} \times \mathbf{H}) \). Values \( \mathbf{E} \) and \( \mathbf{H} \) in electromagnetic wave are equal, for small energies \( \frac{\mathbf{v}}{c} \rightarrow 0 \) and force \( \mathbf{F} \) can be neglected.

Factor 2 in (2) is required for the correct transition to the equation of classical mechanics and arises because the average charge will be 2 times smaller. Computational solution of classical quantum problems gives the same results asconventional quantum mechanics [6, 10]. Later [5-9] this equation was «obtained» from Schrödinger’s equation and it became clear that probably mass or specific charge were oscillating. However, to be simple, we will continue to use the term oscillating charge. Many years ago, A. Poincaré found out that if particle charge and mass were increased or decreased by the same value, this would not affect somehow the equations of motion and this effect could not be detected experimentally.

From simple physicspoint of view, it’s evident that if
a particle approaches a potential barrier in a phase where its charge is very low (it can be assumed that the phase is such that the packet has disappeared), particle can tunnel through the barrier (Figure 1). If there is another barrier at half de Broglie wavelength, particle will also pass it through (Fig.2). Thus, particles that passed through two barriers would have the same speed and phase. If reduce distance between barriers, the higher energy will have particle that passes barriers, in other words, there two barriers will separate particles with specific energies and phases. Note that in conventional quantum mechanics, according to [4, 13], this effect should occur also, but as far as we know, it has not been experimentally confirmed.

And now it becomes more interesting. If a quantum particle falls into a potential pit, then numerical integration of such an equation for a harmonic oscillator gives four types of solution that can be classified as follows:

1) damped oscillations with amplitude going to zero; at that particle sometimes passes into “phantom” state, i.e. from wave packet point of view particle is diffused all over the Universe;

2) irregular oscillations limited over a long period of time, i.e. (basing on preliminary computational analysis) quasi-stationary;

3) oscillations with monotonically increasing amplitude. In some cases, these oscillations can leap abruptly at the end of a certain time interval into an infinite trajectory with the sine argument, and yet the charge of the particle go to zero. One can say, that in this case there is a sudden transition of a particle into a state of «ghost»;

4) almost immediately after the initial moment particle transfers into the state of «ghost» without, preliminary oscillations.

In other words, there are only four possible solutions: with increasing or decreasing energy, stationary and vanishing particles (going into the ghostly state). All
Let’s consider some theoretical situation. For example, we have closed volume with free electrons partitioned by certain plate with the following parameters: plate consists of two very narrow potential barriers with width is about few Angstroms and the distance between barriers several times more than their width. It is important: half of the De Broglie wavelength should go into these barriers and De Broglie wavelength should correspond to the maximum number of free electrons in the distribution curve. It’s not so difficult to do. As UQT shows [1, 4-6, 8], such plate will play the role of Maxwell’s Demon because: two barriers will be abnormally permeable only for particles with half wavelength equal distance between barriers (Figure 2).

This follows not only from UQT [1-6] but from conventional Quantum Mechanics also [13]. Thus, only electrons with similar energy and phase will be able to pass through such plate. Therefore, with decrease of distance between barriers in second chamber after the wall the temperature is rising as barrier system will pass through only electrons with higher energy. Incidentally, if this chamber will have reflective walls, it is possible to set distance between them to initiate oscillating process and realize «maternity house» [1] decision, which will cause increase of tension between walls and can be useful. We should note the great outlook of systems with two potential barriers using for energy of the future, as it will allow to accumulates a lot of particles with the same energy and phase.

Thus, consideration of Maxwell Daemon variant results in violation of 1st and 2nd Laws of Thermodynamics, and we cannot find any argument for their rescue. A group of engineers led by Professor Thibody in American University of Arkansas not only developed, but also successfully tested a scheme that could detect heat motion (Brownian motion of atoms) of graphene and subsequently convert it to electric current, and bring down the 1st and the 2nd Laws of Thermodynamics [12]. But for proper analyses of these process, we still do not have enough experimental data.

Chemical catalysis and catalysts are a great mystery of modern science [1-4, 8]. The number of catalytic theories equal the number of chemical catalytic processes. There is an opinion among chemical catalysis specialists that if there is no reaction, it is simply because no appropriate catalyst has been found. Even Michael Faraday dealt with these problems. He considered sponge platinum as catalyst role in modern catalytic chemistry should be examined. InProcesses except initial conditions now depend on phase also.

Probably exactly this universal idea of possibility of energy generation in the pit is requisite for development of a general theory of catalysis [8]. We should recall the remarkable words (1954) of the well-known Russian specialist in physical chemistry Professor A.N. Kharin, who always said in his lectures: “The problem of chemical catalysis is the most obscure in modern physical chemistry and will not be solved until physicists discover some new mechanism that explains the energy that can lower the reaction barrier.” We hope that we may be making timid first step in the right direction [1-4, 8].

The universal mechanism of heterogeneous catalysis, for example, in ammonia synthesis, is as follows: usually nitrogen is almost an inert gas, molecule of Nitrogen enters the catalyst causeway (cavity) of several tens of Angstrom, under some initial conditions Nitrogen starts to oscillate with energy growth, implementing Maternity Home solution as in common potential pit [1, page 41]. If generated energy will exceed energy of nitrogen molecular bond, then the atomic nitrogen at the exit of the caverns is immediately picked up by protons, forming ammonia, and cavern is ready for new transformations. Nowadays we have some hard confirmations of this phenomena. Professor A. Startsev studied Hydrogen sulfide decomposition in the Institute of Chemical Kinetics and Catalysis of RAS, Novosibirsk [11] He found that Hydrogen sulfide decomposed on catalyst to Sulfur and Hydrogen with energy release and could be reverse synthesized to Hydrogen sulfide from Sulfur and Hydrogen on another catalyst with energy release again. As we know he could not publish these results many years as is contradicted First Law of Thermodynamics!!! At the same time American scientist Adam J. Rondinone (Oak Ridge National Laboratory) on catalyst (copper and fullerene) without energy consumption, transformed carbonated water into ethyl alcohol. There are a lot of patents for catalytic decomposition of water to oxygen and hydrogen with energy consumption almost 20 times less than energy generated by hydrogen combustion!!! If all this can be fulfilled, it could change the entire automotive industry and civilization [1, page 90].

All of this is a direct violation of the Energy Conservation Law in terms of Gibbs’ chemical thermodynamics! By modern definition, catalyst does not add extra energy to the process that it catalyzes. But experiments have shown that catalysts add energy! And this example of catalytic chemistry is not unique. Catalytic chemists every time face excessive heat emission, however, continue to ignore this fact just not to be referred to as “ignorant” in elementary thermodynamic calculations. We sure that catalyst role in modern catalytic chemistry should be reviewed, as it has been done in [2-5, 8]. But the official science doesn’t believe it yet. The UQT admits that it has taken the first steps in right direction.
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References


