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Atemporal Reinterpretation of Quantum Mechanical Representation

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Various methodological problems of conceptual reinterpretation of quantum mechanical representations on the basis of atemporal superposition of states of quantum microscopic objects are considered. To be carried out, the comparative analysis of historical aspects of the origin of quantum paradoxes in micropartial systems and the genesis of the principle of atemporal functionals. Adequacy of quantum chronophysics is verified as a component of quantum theory. Trivial solutions of the canonical Schrödinger equations from a chronoquantum aspect are derived. Moderna temporal approaches are considered in the problem of violation of causality in the physical pattern of the world.

« The author is now writing treatises on quantum mechanics although none speak about the basic ideas which have generated it. They probably prefer the term "quantum mechanics" to "wave mechanics" which may now seem to them a representation of an inexact or useless physical explanation . Meanwhile, wave mechanics and the wave equations deduced from it remain the basis of all mathematical development of modern quantum theories.6 Without them, there would be no treatises on quantum mechanics »

L. de Broglie - INTERPRETATION OF WAVE MECHANICS

For the application of discrete chronoquantum principles in quantum mechanics, it is useful review the historical background. In the beginning of the 20th century there was a problem analyzing the laws governing blackbody radiation *(perfect radiator).* Application of physical laws to stationary electromagnetic waves in blackbody have shown the presence of practically unlimited variations in them.

$n\,[E\,(kT)] \to \infty \Rightarrow E \to \infty.$

Analytically, this corresponds to the formula,

$\rho(\upsilon)\, d\upsilon = \text{const}\,(\upsilon^2/c^2)\, kT\, d\upsilon$, (1)

Where $\rho(\upsilon)$ = spectral density; υ = frequency; c = velocity of light. From (1) an ultraviolet catastrophe for an integrated denseness of energy of radiation follows

$U(E) = \int \rho(\upsilon)\, d\,\upsilon = \text{const}\,(kT/c^3) \int \upsilon^2\, d\upsilon \to \infty;\ \upsilon(0\ldots\infty)$. (2)

Here, the presence of variants in temporal digitization creates problems in quantum mechanical interpretations. The surface of a blackbody can contain a set of atomic emitters of various frequencies. Long wavelength, low-frequency resonators (atoms or molecules) are represented by the laws of classical physic. It is obvious in this case that quantization is unimportant, and the energy is functionally close to the statistical temperature of the surface of a blackbody. Yet high-frequency short-wave oscillators will have an energy exceeding the average level and to be realized as emitters, their energies must be at a minimum. This circumstance can be explained by reason of dimensionality and considering,

$f(\lambda)\, d\lambda = \text{const}\ \varphi(\lambda)\ V\, d\lambda$. (3)

Equality (3) means, that a quantity of free eigentones in some volume in the wavelength interval, $\{\lambda, \lambda+d\lambda\}$ is proportional to V and d λ. The left-hand part of (3) is dimensionless, hence $[V\, d\lambda] = L^4$, $\Rightarrow [\varphi(\lambda)] = L^{-4} = \lambda^{-4}$. Under the theorem of a uniform distribution of energy kT on degrees of freedom we obtain a denseness of energy, it is trivial in association to the phase of electromagnetic oscillations

$\rho(\lambda)\, d\lambda = \text{const}(1)\ kT\, \lambda^{-4}\, d\lambda;\ \lambda = c\, t;\ \rho(t)\, dt = \text{const}(2)\ kT\, t^{-4}\, dt$. (4)

Here it is necessary to make only one additional logical pitch, having assumed, that there is some fundamental temporal distance, bounding from below a phase of any oscillations of a physical nature [5-6]. It is natural, that under the given restriction and the considered oscillations of an electromagnetic field in concavity of blackbody that gives formula (4)

$\rho(t) = const(2)\ kT \sum t^{-4} \Delta(t)$. (5)

If formulas (5) and (2) are compared, it is clear that temporal digitization substitutes for divergent integrals in concurrent series. This allows, not only avoiding ultraviolet catastrophe, but also introduces interesting corollaries in the relevant approximate expression,

$\rho(t) = const(3)\ (c^3 t^2)^{-1}\ E(0)\{\exp[E(0) / kT] – 1\}^{-1}$; $E(0) = h(e)\ h(t)\ \upsilon$;
$const(3)\ h(e)\ h(t)\ (c\ t)^{-3}\ \{\exp[h(e)\ h(t) / kT] – 1\}^{-1}$. (6)

Now we have a foundation for comparison before entering t(min) of operation h(t). For this purpose it is necessary to recollect that M.Plank schematized the material centres, considering them as linear harmonic oscillators. Having an electrocharge, similar oscillators could interreact with an electromagnetic field, being in states in which their phase is the whole multiple of some initial temporal distance. Further, given a minimum temporal scale we shall compare with the concept of a chronoquantum*,* of magnitude h(t), as included in expression (6).

The following important stages of development of discrete representations is the quantum photoeffect. It is corpuscular - an undular dualism and orbital quantization. The classical theory of a photoeffect features an absorption or generation of a quantum (quantum of an electromagnetic field) with the help of the elementary equations having a trivial analog in,

$p = h\ \upsilon / c$; $\upsilon = 2\pi\ c / \lambda$; $p = 2\pi\ h(e)\ h(t) / \lambda$. (7)

From formula (7) follows that the energy of an electromagnetic wave of a given frequency varies in portions, hυ in time h(t). It is similar to what happens to atomic emitters in the cavity of a blackbody. Thus it is possible to apply it to electromagnetic waves, considering the new point of view of a paradoxical wave – corpuscle duality. According to the principle of de Broglie, circumscribing the wave-corpuscle structure of a substance, it can be noted, that

$t / h(t) = 2\pi\ h(e) / m\ v^2$ (8).

From equation (8) it is possible to deduce, that the undular nature of a substance is exhibited as a characteristic of temporal distance, comparable with the magnitude of a chronoquantum. This conclusion can be made a principle of chronodualism, considering that the shape of the material is defined by its level of temporal localizations in some spurious subspace of events.

If we extend the model of discrete energy emitters to atomic structures, electrons radiate quantums only at particular interorbital passages. The phase of radiation is thus represented by

$t = h(e)\ h(t) / [E(i) – E(j)]$; (9)

Where E(i) and E(j) - orbital energy states. In the ground state with the least possible energy, the atomic system can be stable for long periods since the phase of radiation will be obviously a smaller minimum phase of the multiple of the duration of a chronoquantum passage. So it is possible to explain not only the digitization of generated portions of electromagnetic radiation, but also the stability of atoms. The phase of such radiation will be functionally dependent on the quantum's product and also charges and masses of the nucleus and electron [4,5].

The following stage in the generalization of quantum principles, its distribution in an equation for an undular psi-function of the particle propelled in an external field can be quantized. An equation for waves in free space is given with stationary phase values and with the solutions relevant to equation (8). For atomic structures in an exterior Coulombian field of a nucleus, the phase of waves varies from point to a point. In the case of slowly varying fields and phase, they will be determined by formula (8) with varying impulse p(r):

p(r) = {2m [E - U(r)]} 0.5; (10)

Where E and U(r) - the complete and a potential energy. It is known, that in Schrödinger the equation

$\Delta\psi + 8\pi^2 m h^{-2} (E - U) \psi = 0$ (11)

it is possible to determine a wave equation with $p^2\psi$ input of impulse p(r). Solutions of equation (11) determine the sense of quantization rules as associated waves in the field driving an electron. At a minimum of potential energy U~0 for a linearized problem of driving a microscopic object on the restricted site of a probability trajectory, equation (11) passes into

$d^2\psi / dq^2 + \text{const } E\psi [h(e) h(t)]^{-2} = 0$, (12)

Where the q-generalized quasilinear coordinate. From the well known Fourier analysis, the solutions of equations of an aspect of (12) are logarithmic functions of the type

$\psi = \psi(0) \sin\{\text{const } q E^{0,5}[h(e) h(t)]^{-1}\}$. (13)

Taking into account boundary conditions of an interval of driving: ψ =0 at q=q(0) it is obtained:

$\text{const } q(0) E^{0,5} [h(e) h(t)]^{-1} = i+1$. (14)

Expression (14) defines requirements for digitization of the nonrelativistic energy of a microscopic object as a gang of i-quantum numbers:

E = const (i+1) 2 [h (e) h (t)]-2. (15)

Thus, sequential application of basic postulates of quantum mechanics reduces to an original modification of trivial solutions of canonical Schrödinger equations. It, in turn, corresponds to a new principle energy, as a determination of energy levels on a sequence of events. Hence, spectral energy of microparticles in temporal boundaries can transit with the most probable magnitude:

$E(0) = \text{const } [h(e) h(t) q(0)^{-1}]^2$. (16)

It is necessary to note, that though values of zero-point energy at quantum microparticles essentially depend on the character of fields of forces at zero thermodynamic temperature, there exists an interval with terrain clearance probability of localization of events, both in temporal and spatial scale.

In due time Verner Heisenberg had been offered another variant of quantum theory in which is included a principle of observability. In the given variant, quantum mechanical magnitudes can be submitted as a population of all probable amplitudes of passage from one quantum state to others. Thus the transition probability is proportional to the quadrate of the module of amplitude. In such representation each magnitude has a matrix expression, a defining initial and terminating state of the microsystem. In discrete physics these functional parameters are comparable with the so-called chronomatrix, relevant to a population from imaginary space of indications of events. For a case history it is useful to recollect, that the theory of undular appearances of an interference and a diffraction of light was designed long before the exposition of the nature of light with the help of Maxwell's electromagnetic equations. Initially it was considered, that a light source emits certain waves, and intensity of light is proportional to a quadrate of the parameter, defining the undular character of the process. Discretization of abstract undular process allows specifying its basic regularities without taking into account an actual physical field. It is completely stated in the modern paradigm of physics where the wave function of a particle is not bound to physical fields, and represents the formal entry of the resulting probability of the observed process. Thus, wave function (13) gives a more complete description of admissible expositions of an arbitrary microsystem than reference state [1-3].

Analyzing possibilities of interpreting the composition of quantum mechanical paradoxes, it is possible to use, first of all, manifold modifications of the principle of complementarities. In the classical plan of an imaginary experiment of V.Heisenberg considered indeterminacy of coordinates and impulses together with time and energy as

$\Delta q \sim const\ h(e)\ h(t) / p; \Delta q\ \Delta p \sim const\ h(e)\ h(t); \Delta E\ \Delta t \sim const\ h(e)\ h(t).$ (17)

The indeterminacy principle is a special case and concrete expression *of a common principle*. In this case the key indeterminacy of some quantum mechanical magnitudes is a corollary of the application of classical quantum theory to the exposition of microscopic objects, in addition to their traditional exposition in physics.

Predictions of quantum theory are fundamentally probabilistic and are ambiguous identifications from the point of view of causality. Fequently there is conceptual confusion by nonprofessional physicists. So, the predictions of classical physics also are based on probability because of the complexity in determining an initial state and the subsequent evolution of multiparticle systems. In quantum theory, indeterminacy in essence follows from quantum mechanical properties and a classical exposition, as the probability characteristics of the laws of the Universe. Incompleteness of representation in quantum theory is cancelled by the representation of a psi-function in initial and in subsequent moments. However, an analog of classical determinism is inappropriate here, since for actual composite structures (for example, macroscopic rigid bodies) identification of initial wave functions is practically impossible, as well as velocity coordinates. Can there exist a new approach to the often-considered problem of violation of causality in the modern physical pattern of the world?

So, we cannot trace a trajectory of separate particles and the metamorphosis of a psi-function of composite quanta. This implies that causality both in the classical and in the Bohr sense is broken, but in more precise атемпоральном sense it can be observed. From maximum full particulars in an initial state, the unique terminating state can be obtained on a given chronoquantum interval. Basically the semantic content of the term "state" and the relativistic chronoquantum physics concept of "state" is compared, not only on a set of quantum mechanical parameters, but its localization in temporal space as indicated in [7]. Thus, without calling into question the completeness of the classical quantum mechanical explanation of reality, the assumption is made, that the introduction of a new principle in quantum chronophysics will allow delving more deeply into the nature of an existential discretization of the world.

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