

Rethinking the Formal Methodology (I): Wave-Vortex Essence of the Substance

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Abstract

An approach/methodology proposed to basic problems, alternative to standard formalism. Elm particles' physical essence and types of interactions interpreted within wave-field peculiarities. The problems with de Broglie wave and particles' double slit interference discussed. The possibility to a causal representation of quantum phenomena is shown. Physical models of basic hadrons, their internal structure and static fields' configurations proposed. The values of mass, spin, magnetic moments of n , p hadrons defined within modeling. Causal interpretation to β decay presented. The tremendous penetrating peculiarity of neutrino discussed. Structural schemas to ${}^4_2\text{H}_e$, ${}^{12}_6\text{C}$ nucleons are proposed.

Keywords: Standard Model, Proton, Neutron, Nuclear Structure

1. Critical Remarks

Blind sages touching the elephant, have concluded, "The trees are here!"

(From Indian parable)

Author tries to show that we have been engaged with the "forest's theory" for a long time, whereas there is an elephant only...

Ancient philosophers have put forward the "Main Issue" with comprehensive formulation, "From what kinds of primordial substances and by which principles exists the material world?" The statement of the problem has essentially changed by time; in the language of contemporary physics, it sounds as follows: "By which minimal quantity of natural constants and on the basis of what equations is it possible to describe all kinds of physical phenomena?" There are no principal contradictions between two statements. Meanwhile, these are significantly different by meaning and in content that we shall examine in attempts to comprehend where from arises present unprecedented complexities in disputable sections of physics. Author is inclined to see the explanation of current difficulties within previous serious misconceptions at the basic level. He proposes some retreat and rethinking of a traversed path, by simplest reasoning: such audit may give a chance only, and no harm, as it is impossible to lose what is known. We cannot exclude possible mistakes of deserved pioneers and ignore the necessity of revising the past way sometimes, which is natural at any research. We start with some remarks concerning to known "*Copenhagen's Interpretation*", introduced at the beginning of past century as a revolutionary approach, in context of comparison. We shall look at some points only since the issue was widely discussed among prominent luminaries long ago. To judge the significance of introduced methodology let us begin with known facts:

1. A key postulate of quantum mechanics (QM), a probable/statistical interpretation of Schrödinger's equation (SE), was accepted with majority of opinions (i.e. politically and not on the objective arguments!)

Hence, it is right to look at the mentioned interpretation as situational, "ad-hoc" approach only, i.e. as a subject, which needs further clarification, and not as a doubtless "basic principle". The mentioned interpretation is mainly justified with its certain productivity. With careful observation, we can guess that it is an obvious misunderstanding to attribute results of any theory to a conditional name, or to its declarative interpretation. Nevertheless, **the productivity of QM may evidence its quantitative accordance to reality only, and not its intuitive/verbal interpretation, which can be any!** The issue gets trivial solution with logical viewpoint. Taking into consideration that SE is based on the Hamilton/Laplace operators that are generalized, causally defined relations (differential, in math meaning), we can assert; **corresponding causal interpretation of SE and quantum phenomena should exist** (the possibility of imaginary representation of quantum phenomena as cause-effect, consecutive chains). This type of description totally differs from nowadays-accepted formal methodology based on the abstract, math reasoning. It corresponds to human's natural ability of thinking, by means of images and actions that can make physics a comprehensive-realistic science. Here we need to remember that: **the SE is deduced with generalization of de Broglie wave-particle dual properties and optics' geometry, by cause-effect,**

quantitative reasoning. Hence, it is right to look at the “workability” of SE as an evidence of correctness of the way and principles of its deduction (and not to its arbitrary interpretation!) In Schrödinger’s deep confidence, SE should have corresponding causal representation that he resolutely attempted to bring to colleagues’ awareness. However, majority decided how to interpret it and the author was accused for “naive-realistic” ideas (!) [1]. SE **definitely means to look at the localized elm particle as a standing wave packet, by logic of its deduction.** Therefore, realistic thinkers have tried to prove the concept. The approach has been recognized as “wrong” due to not being successful to prove it mathematically. The statistical/probable interpretation of QM has been introduced then, with the formal recipes and instructions of new methodology.

We shall emphasize following obvious-subjective action in this crucial event: **defining something as “impossible/unacceptable” since we did not manage to do it (!)** Such unprecedented decision has met a deep protest of known coryphées, who continued their efforts of building a realistic science, remaining in dramatic minority. With Einstein’s confidence, **the division of mater and el. charge from field as different kinds of realities, after establishment of $W=mc^2$ seems unnatural** [2]. He has insistently attempted to complete his **Unified Field’s Theory** working in full isolation from the community (for the last 30 yrs of his life!) Meantime, de Broglie has managed to explain one key quantum phenomenon within cause-effect principle: a two-slight interference of particles (**de Broglie-Bohm theory**). Mentioned solution proved the rightness of Schrödinger’s viewpoint. **De Broglie-Bohm theory shows the principal possibility of cause-effect interpretation of the quantum phenomena.** Nevertheless, such important result remains yet “invisible” in community. A new ideology was accepted there, as having no alternative, since certain results had been achieved already and it gave a wide opportunity for math manipulations, in author’s view. Meantime,

The cause-effect interpretation of quantum phenomena may open an opportunity to build physics on general principles and to complete it on a unique conceptual basis. The formal methodology ignores/excludes the mentioned opportunity.

2. QM methodology is not enough adequate quantitatively

Let us demonstrate first the subjective/uncritical character of applying operations in below example. The wave function in stationary SE for freely moving particle (external field’s potential $U=0$, a particle moves along x , with speed and energy; $v=const$, $w=mv^2/2$) given as:

$$\psi = A \exp\left[-\frac{i}{\hbar} \sqrt{2mW} x\right] + B \exp\left[\frac{i}{\hbar} \sqrt{2mW} x\right] \quad (1.1)$$

Here A , B are certain constants, remaining in QM as obscure. The complex conjugate function is introduced in next step:

$$\psi\psi^* = |\psi|^2 = |A|^2 \quad (1.2)$$

However, QM **doesn’t give an answer/argument; where from and why ψ^* appears there?** It means an unjustified operation takes place here (even, from formal viewpoint) which just looks as necessary (?) to link the solution (1.1) with the eq. (1.2). Moreover, a new concept is introduced and a new supposition is accepted then:

$$|A^2| = \frac{dw}{dv} = \rho \quad (1.3)$$

Where: ρ is declared as the “density of probability” (the probability of finding the particle in the elementary volume). Below expression is accepted then as the measureless “unit of probability”:

$$\int_v |\psi|^2 dv = \int_v |A|^2 dv \equiv 1 \quad (1.4)$$

We would notice that measureless numbers arise in descriptions of real phenomena as ratios of physical values to basic ones, having the same kinds. Passage from real/physical to relative values assumes initial definition of their kinds and basic measures, which is possible if we are clearly aware of the nature of studied objects and physical essence of phenomena. The introduced relative unit (1.4) “suspends in the air”; it stays as cognitively dark category, since QM initially speaks nothing about physical nature of wave function. Therefore, the necessity of “choosing” its interpretation/affiliation, as well as for definition of basic measures and borders of its existence/action arises further (which was done in QM by votes, arbitrary actions and unexplainable instructions, as we saw above).

3. A QM methodology has internal inconsistencies

Let us examine following example. The quantum objects may be presented as “particles” or “waves”, and not as “waves and particles” at the same time, with interpretation of de Broglie’s duality principle (DP), accepted in QM. The freely moving particle is described there with wave function (1.1) in accordance to it. In fact, we deal with a “particle” that generates a “wave” at its movement, which are indivisible from each other. The QM recognizes the mentioned indivisibility as well. However, it becomes verbal/psychological declaration only, since the QM allows presenting/describing one kind of object, and not two types together (“wave” and “particle”) as it is in reality. I.e. **the QM accepts two kinds of objects, existing together at the same time, and it allows describing one of them only** (?) Reader will see further that the mentioned arbitrary rule causes serious misconceptions and confusions. We would bring to readers’ attention also that, in fact, DP becomes disturbed in quantum el. dynamics (QED). The moving particle is presented there as in permanent interaction with the virtual photon, as the process of alternating radiation/absorption of it by particle. Thus, the described objects become two kinds, vs. QM’ rule. We will show further that success and productivity of QED are particularly related to its silent departure from mentioned unexplainable recipe.

4. The “Point-like” representation of objects contradicts to reality

The mentioned point is important to comprehend as one of the main problems of formal methodology, as well as the priority of suggested approach. The QM has developed in analogy to Newtonian physics; therefore, some of idealized concepts have uncritically passed into it. The issue is about the concept of “material point” that is principally not compatible to reality. However, it’s used in classical physics with strong restriction: the own sizes of moving objects should be insignificant compared to distances in studied phenomena. We deal with restricted distances in microcosm not having enough criteria that objects of study are too small in relation to these. Therefore, initial acceptance of objects as “insignificantly small” is unjustified (we do not have enough experimental

knowledge of them as in classical physics). The second point is more important. We lose any opportunity to comprehend the physical essence of quantum objects by declaring them as “point-like”. We just have closed for ourselves the way to their realistic description, initially accepting them as “something that is not subject to representation with sizes, images and actions”; by the same, the abstract math reasoning only remains as the single tool of analysis.

5. The statistical interpretation of phenomena contradicts to facts

We will look at one obvious example only, from many similar. The statistical distribution of atomic electrons is accepted in QM as “clouds of probability” within above interpretation of wave function (1.1.2.) The emission of photons is interpreted as consequence of electrons’ passage from one probable/average parameter into the other. It follows; the emitted single photon should have certain deviation in parameters, which means a spectral line of single photon will have no exact place on the screen but an average. Hence, a spectral picture should lose sharpness with decreasing intensity close to fluctuation level. As known however, a spectral picture does not depend on intensity, which shows that emitted photons have strongly determined parameters. An obvious question comes out then: how does exact/determined photon arise from “cloud of probability” (?) However, reader should know that natural questions are not subject of QM, by definition. Therefore, the answer to such questions remains only one, “our formulas show it”. It actually means, “God has made our world as it is” because our formulas are constructed as artificial models of reality, and not as natural derivatives from basic concepts, with accepted methodology. Thus, we have the right to assert; the probable/statistical interpretation of phenomena and rejection of cause-effect principles actually prohibit the cognitive study of the subjects.

6. The conceptual-cognitive representation of phenomena is absent in formal methodology. The “composition/construction” of the quantitative descriptions are accepted as the final task of theory

R. Feynman has truly formulated the mentioned point [3] that we have seen in previous content as well. Depicted reality means “to harness a cart ahead the horse”, from logical viewpoint. It explains why realistic thinkers could not accept the new approach, and how they appeared to be in deeper opposition. Einstein demanded at his time, **to build physical theories on conceptual basis**, and, **to use concepts connected to reality** [2, 4]. It simply means to grasp the essence of studied phenomena initially and not to input hypothetical objects at each difficult case (see: “**Occam’s Razor**”). However, majority has seen unlawfulness of these demands, and Einstein got the “corresponding” stamp as well (see: **Einstein’s operationalism**). Modern theories have been developed then as a specific genre of creation, having no borderlines between reality and fiction. It has brought to a loss of objective criteria as well (estimation of work’s significance on the “indisputable” opinions, quantity of citations, by “brand” etc, and not on the workable results corresponding to reality, i.e. politically and not essentially). It has caused hard polarization between main types of scientists: “thinkers by own brains”- “intransigent rebels” as a rule, and respectable scientists, “followers of holy instructions” in majority, as natural. Professor **R. Santilli** impressively depicts nowadays reality [5]. Numerous unclear approaches and unsubstantiated doctrines have been introduced into disputable sections as consequence. Described way of building “Basic Science” is unable to withstand elementary logical criteria. It has been decided then to look at the logical requirements as

a kind of philosophical category that are “unseemly and trivial” for the leading science (which can be even “harmful”!)¹ Most scientists, trained in such spirit, already seriously believe in the possibility to explain at last, “How God created the world” within symbols and math formulas only, excluding natural language and thought. The abstract mathematics (i.e. our “work-tool”!) has become priority in result, which may even “show us” the necessary direction of research. It is difficult therefore to imagine how the desired “Final Theory” will look. Judging from dominating **Standard Model** it will be a big collection of sophisticated equations completed with numerous “calibrating”, “normalizing” functions and factors, experimentally and empirically introduced. A limited quantity of individuals will be able “to understand” it (mastering the tremendous volumes!) We also cannot guess what purpose such theory may serve to (other than demonstrating the “merits” of scientists). It will be just craftiness to talk about “cognitive significance”, since similar categories are accepted as “unscientific” at the beginning. Reader can judge that “Final Theory” will be useless also from technological viewpoint, by simplest reasons. **The absence of common view and actual inability of researchers to formulate the purpose of their job are the obvious/alarming symptoms of deep confusion of modern physics**, in author’s opinion. The formal methodology actually has brought to certain impressing results at the beginning (QED etc.) Nevertheless, huge technical problems and gnoseological fog quickly have arisen against physicists. Several speculative-formal theories and accompanying tremendous experiments, with unclear goals, periodically have been developed afterwards (as ongoing LHC project² etc). Thus, modern physics actually has gone in trivial way of “test-error” for unlimited math exercises, and not in any consistent direction. Much of objective criticism and unanswered questions permanently proceed from large group of realistic thinkers, reflecting the present crisis. Numerous “reviewers” and “moderators” are engaged on “neutralizing” these at different levels, applying ready stamps, under noble purpose of “protecting the truth from heresy!” As we see, **the formal methodology actually welcomes uncritical compositions and it resolutely prohibits natural way of thinking**. It corresponds to “amputation of brains”, by Einstein’s definition, which may reliably stop any progress of science. Is the depicted reality a result of simple misunderstanding, manifestation of group’s ambition in a worse scenario, or more serious circumstances are covered here? We do not undertake to speculate on this direction, recalling just that similar situations have taken place in science history enough often, by explainable reasons. In author’s view, the current reality of modern physics is far incompatible with scientific spirit and undeclared honesty. It may call only a regret of true thinkers who can hope on future in such case. **The present crisis of physics requires general revision of methodology, the statements of problems and accepted criteria of significance of disputable subjects**. We attempt to do it in the scope of this work, particularly.

¹ There is no exaggeration here. The physical theory accepts the “math modeling of reality” without any conceptual paradigm, within present ideology (see, for example, **Kuhn, T.S., “The Structure of Scientific Revolutions”**, University of Chicago Press, 1962. ISBN 13: 9780226458083)

² The opening of “Higgs Boson” has been announced at present. Reader can judge the significance of the event with mastering the article.

2. Compatibility of the approach to existing theories

The proposed approach is an attempt to present the picture of reality of disputable subjects in possible-complete form, in author's view and in his ability. There is no initial intent to prove or reject any existing approach concerning the issue. It is right to look at this work in context of critical overview of several existing theories based on different methodological principles. **The main criterion of selection was the compliance of results to established facts** (leaving aside various interpretations and large terminology accompanying these). The approach demands revision and rejection of misinterpretations, unreasonable instructions, intuitively accepted beliefs/doctrines, and not the existing facts, actual results. We can assert therefore that it satisfies to "**Correspondence Principle**" in the extent by which comparable works conform to established facts. Proposed changes mainly have cognitive-psychological character that always has played painful and huge-resistive role. The problem aggravates more as the proposed approach has already been examined. It has got a final verdict "wrong" and main ideologists have decided, "The page is closed!" (1.1.1.) However, similar situations also happened in science history. We hope therefore, that presented work may be perceived in right meaning and significance with time. **Disputable areas of physics may get the unique conceptual basis, which gives real opportunity to separate valuable approaches and results from existing plenty of unnecessary**, in author's confidence.

3. Basic principles

We present key points of the approach with some substantiation:

1. Quant of Electromagnetic Field (QEF) is a unique base of substance

a). Representations of the photon and localized particle (electron) with their known properties as kinds of QEF manifestations presented in [6]

We present some additional arguments confirming the concept.

b). The existence of unique couple of universal constants c , h confirms the concept. There are no experimental evidences to existence of other constants with similar significance (let's say $c_1, c_2...c_n, h_1, h_2...h_n$). There are no principal arguments excluding their existence as well. Hence, their uniqueness in fact points at the unique nature of the basic substance.

c). Similar physical characters and properties of different elm particles and their equality (such as existence and equality of spin, el. charge) obviously evidence the unique nature of all known kinds of particles. Otherwise, the mentioned similarity/equality becomes unclaimed, unexplainable coincidence (that actually seems in the Standard Model!)

d). Known possibility of mutual transformations of all kinds of elm particles (by accepted terminology) into each other (within conservation laws) directly confirms their unique essence (independent from our ability to prove it theoretically; as mentioned, the math proofs may look more significant than existing facts in formal methodology!)

e). The electromagnetic, wave-field nature of basic substance derives from Einstein's $W=mc^2$, $W=h\nu$ equations (to be discussed). Many of researchers have been working on this direction (as example: [7, 8].) We will refer to Feynman's phenomenal intuition as well on the issue. He has seen identical results in different kinds of formal theories as weighty evidence to uniqueness of basic laws and principles of the nature [3, 9]

We present a brief description of QEF as a candidate of basic substance:

2. The QEF has a wave-vortex, dynamic nature, presenting itself a circularly polarized, restricted wave flow (quantum wave packet)

The existence of spin for known kinds of elm particles, without exception, evidences the vortex-dynamical nature of QEF. The interpretations of spin for the electron and photon within named concept is presented in [6]

3. The QEF manifests in two possible physical forms:

a). As propagating stable quantum wave packet (photon, γ - quanta)

b). As localized/standing wave-vortex, unstable mainly, and stable in few special cases, showing general and individual peculiarities (kinds of localized elm particles/antiparticles, stable/unstable)

4. The Mass and pseudo static fields ("charges") arise in localized QEF aftermaths of interferential redistribution of wave energy

Origins of mass, spin, static electric/magnetic fields ("charges") for the electron are interpreted within the concept in [6]

5. All kinds of QEF interactions have electromagnetic nature

We represent their possible kinds of manifestations as below:

a). Mutual interactions of none localized QEFs (photons)

b). Interactions of none localized QEFs with pseudo static fields of localized QEFs (It causes absorption/emission of photons etc)

c). Interaction of localized QEFs within their pseudo static fields (These are analogues of Coulomb and Lorentz's forces defining atomic orbital structures, binding energy in atomic nucleons, nuclear structures, etc)

d). Interaction of localized QEFs in the range of their mutual coverage (mostly corresponding to accepted "weak interaction")

e). Internal interactions in QEF (causes propagation of photon, origin of mass, "charges", mag. momentum of localized particles, stability and decay of particles, phenomenon of gravity, breaking of symmetry (?)) These are subjects of modern formal theories, such as QED, Standard Model etc.)

f). Simultaneous actions of above-mentioned kinds of interactions mostly take place with QEFs. The unique, electromagnetic nature of forces and interactions in microcosm (excluding gravity) is shown within formal-quantitative reasoning (*Glashow, Weinberg, Salaam, Swinger* and others). Numerous theorists recognize it, having different views at the other problems. The attempts to create a unified theory continue.

4. Methodology

Applied methodology significantly differs from formal, accepted at disputable sections. The hypertrophied role and some mystification of the mathematics in the research have been shown in previous content. We will present a brief explanatory to definitions of "realistic methodology" vs. "formal", for perception of work by readers having standard education. We understand the "math reasoning" as quantitative logic tool, which is based on abstract conservation laws. We consider it as an important component of realistic methodology that includes other inevitable/necessary tools as well, such as the "induction", "deduction", "supposition", "syllogistic compositions/conclusions", etc. **As a "tool" and "component", the math reasoning cannot have priority and guide us solely** (as any other tool!) As known, the quantitative analysis often yields a variety of results that incompatible with the physical reality (as any "tool" it may have unclaimed

applications!) Hence, *in “realistic methodology” the “math reasoning” must work within comparison to other “tools” of study, under mutual control and restrictions* (it means, we should comprehend the subjects of study and counting in principle).

We present key points of approach as below:

1. We have looked at the established facts as indisputable basic arguments (we are forced to emphasize it, vs. formal methodology!)

2. We have accepted cause-effect relations as the basic laws of nature, describing QEF (Maxwell’s quantized wave equations) [6]

3. The basic natural constants are considered two: c , h , reflecting dynamical and quantitative characteristics of QEF, experimentally established. Measureless constants π , $a \approx 1/137$, appearing in descriptions of QEF, are conditioned by its wave-vortex, dynamic nature; these are possible to deduce at the conceptual basis (π known from geometry, a deduced as wavy peculiarity [6])

4. All kinds of properties and peculiarities of quantum objects are conditioned and are possible to represent with four basic constants, mentioned in previous point (such particles’ mass, sizes, kinds’ of energy, its “charge”, spin, mag. momentum etc)

5. We combine the causal/quantitative reasoning with imaginary representation of objects/actions in analyzing process

6. We exclude operations/reference with supposed objects that are not confirmed experimentally as kinds of realities (the “ether”, “physical vacuum”, “quarks”, “gluons”, “graviton”, “dark energy/mater” etc)

7. We looked at the possibility of representing numerous established facts in the frame of common concept and methodology as the main evidence of reliability/significance of the presented approach

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