BULETINUL INSTITUTULUI POLITEHNIC DIN IAŞI
Publicat de
Universitatea Tehnică „Gheorghe Asachi" din Iaşi
Volumul 62 (66), Numărul 1, 2016
Secţia
MATEMATICĂ. MECANICĂ TEORETICĂ. FIZICĂ

# BEYOND THE QUANTUM PARADIGM, AN EPISTEMIOLOGICAL APPROCH

BY

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Received: January 8, 2016
Accepted for publication: April 12, 2016

**Abstract.** The quantum paradigm as a discreet method of describing the structure of the material world, fundamentally based on quantum mechanics, is in contradiction with the electromagnetic theory of light. Promoting a mechanical vision of subatomic phenomena has been a step backwards in knowledge by going back to a convoluted theory regarding the corpuscular character of light which was extended over the structure of the material world.

The complexity of the processuality of the material world as a unity between the discreet corpuscular character and the continuous electromagnetic manifestations reveal a new theory of the physical reality, in a complex epistemic vision, in which the two ontological entities are not mutually exclusive, but rather they coexist in a unified theoretical system explained by a new electrodynamic approach of the material world which reveals a spatiotemporal universe is both knowable and predictable.

**Keywords:** paradigm; quantum mechanics; processuality; electrodynamic.

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## 1. Introduction

Scientific knowledge in its development has been, and still is, marked by tension generated by the theoretical contradictions that have appeared between the various methodologies in the approach to theory, that sometimes get a conflictual character.

The current crisis in theoretical physics has been signalled by Karl Popper in his work "Quantum theory and the schism in physics": "One was to shed some light on the significance of the present crisis in physical theory: the rejection of the Faraday-Einstein-Schrodinger programme has left us without any unifying picture, without a theory of change, without a general cosmology. Instead of a problem situation within a research programme, or relative to a research programme, our fundamental problem situation arises from a schism in physics-from a clash between two research programmes, neither of which seems to be doing its job" (Popper, 1982, p. 173). This crisis does not represent just a collision between two research programs, it is not a subjective crisis. The profound significance of this crisis refers to the agnostic and indeterministic character promoted by quantum theory in the causal determinism of classical physics which looks for a unified solution for both the microcosm and the macrocosm.

In the same book Karl Popper reveals the way in which the attempt to solve this crisis was tried, and how it failed: "Einstein's and Schrodinger's inspiring programme has been attacked by quantum theorists and, according to the judgement of most physicists, has been successfully killed. But those who attacked it have made hardly any attempt to replace it by a similarly powerful programme" (Popper, 1982, p. 173).

The crisis in the current physics reveals the contradiction generated by the discreet mechanical character of quantum theory by eluding electromagnetism as a theoretical basis, without acknowledging its profound significance - the inoperant character of quantum mechanics in the processual description of the structure of the material world.

The major crisis that has manifested between the quantum and classical approaches by forcefully imposing a reductionist mechanical interpretation was in detriment to a complex processual approach in accord with the classical fundament in theoretical physics. The result of describing the structure of the material world from a quantum perspective reveals to us a microcosm of undetermined probabilism.

From the perspective of classical physics, quantum theory brings a crisis of blurring the dichotomy, the distinction regarding the corpuscular character of particles and the continuous character of electromagnetic phenomena as a fundament of their processual aggregation. The removal of this dichotomy by quantum theory has represented an enormous step backwards in knowledge and has created the confusion between the similarity or identity of the two fundamental ontological entities of matter - waves and particles.

As was presented in the published book *The End of Quantum Theory*: "The founders of the quantum theory of substance's structure have focused, in their theoretical approach, on the elaboration of the theory that would explain the structure of the material world in the context of insufficient development of the scientific knowledge, so that they had not all the theoretical instruments necessary to solve such a complex issue at that particular moment" (Hodorogea, 2008, p. 8).

The method of solving a crisis in knowledge, like the one which exists now in quantum physics has been explained by Thomas Kuhn: "The transition from a paradigm in crisis to a new one from which a new tradition of normal science can emerge is far from a cumulative process, one achieved by an articulation or extension of the old paradigm. Rather it is a reconstruction of the field from new fundamentals, a reconstruction that changes some of the field's most elementary theoretical generalizations as well as many of its paradigm methods and applications. During the transition period there will be a large but never complete overlap between the problems that can be solved by the old and by the new paradigm. But there will also be a decisive difference in the modes of solution. When the transition is complete, the profession will have changed its view of the field, its methods, and its goals" (Kuhn, 1996, p. 85). The radical solution presented by Thomas Kuhn is to fundamentally rewrite quantum theory and change the set of theoretical principles.

The complexity of the processuality of the material world as we understand it, as a unity between the corpuscular character and the electromagnetic manifestations in the diversity of their spatiotemporal manifestation reveals a new theory for the physical reality, in a complex epistemic vision, in which the two ontological entities are not mutually exclusive, but rather they coexist in a unified theoretical system which reveals a spatiotemporal universe which is both knowable and predictable.

The current crisis in theoretical physics is manifested in the conceptual basis of the character of the material world in regards to the relationship between continuous and discreet. Is the material world continuous or discreet?

In his work *Matter and Mind a Philosophical Inquiry,* Mario Bunge shows that: "Electromagnetic field theory, born in the 1830s, changed not only the ontology of classical physics but also its methodology. Indeed, consider the problem of finding data about two very different universes: Newton's, constituted by corpuscles, and Faraday's, filled with fields" (Bunge, 2010, p.180). Many physicists and epistemologists consider the universe of the material world to have a corpuscular nature, and thus discreet. In their mechanical vision they dismiss the gravitational field as a continuous manifestation of matter.

We need to understand the universe in its integrity, as a symbiotic relationship between the corpuscular existence of matter and the continuous existence of the electromagnetic and gravitational fields.

Einstein's mechanical view, which on the basis of which quantum theory was built, when referring to the structure of matter is expressed and assumed to be as a subjective theoretical option with a discreet nature."In accordance with the assumption to be considered here, the energy of a light ray spreading out from a point source is not continuously distributed over an increasing space but consists of a finite number of energy quanta which are localized at points in space, which move without dividing, and which can only be produced and absorbed as complete units" (Einstein, 1965, p.1). This assumption is the result of the subjective option generated by the theoretical principles which are the basis of quantum theory. The mechanical discreet option in describing the world promoted by the creators of quantum theory collides with the wave character of light, which is denied and excluded from the theoretical space of knowledge without a fundamentally scientific reason.

The theories of James Clerk Maxwell regarding the manifestation of the electric and magnetic fields as physical measures of the state of a continuous matter have not been completely understood, and haven't found their place in a satisfying all encompassing theory that describes the fundamental structure of matter. This was due in part to the ideas about an ether, and a tendency for a discreet mechanical interpretation of the physical phenomena, which pays tribute to Newtonian mechanics and the fact that mechanical movement, under all of its forms, is intuitively easier to understand and accept compared to the electromagnetism of electromagnetic waves.

## 2. The Quantum Paradigm

A change in paradigm is not always a revolution in knowledge, it can also be an involution. Tomas Kuhn defines the paradigm as: "universally recognized scientific achievements that, for a time, provide model problems and solutions for a community of practitioners" (Kuhn, 1996, p. 10).

Paradigm knowledge is a summary of scientific knowledge focused on the major changes in methodology that generate new solutions. It removes from scientific knowledge the construction and the finality of the theoretical description. Making the theoretical substantiation of principles to a secondary concern represents a limitation of knowledge in its entirety, and concentrates the focus on its finality. A paradigm is an abstract concept in scientific knowledge, adopted as essential syntax of scientific theories.

The validity of a theory is not based on its acceptance, which is a psychological option regarding a theory of a group of researchers or the entire scientific community. The revolutions in knowledge defined by Kuhn as paradigms represent inflexion points on the road towards knowledge.

The paradigm definition of the bivalent nature of the theory as both method and solution introduces a dilemma between the theoretic model and the theoretic solution. *Kuhn's paradigm* is in fact the scientific theory without its

fundamental principles. Removing the principles from the set of ideas that are the basis of knowledge blurs the internal coherency that is specific to scientific knowledge. The paradigm defined knowledge promoted by Thomas Kuhn does not analyze complex systems and doesn't notice the fact that the theories that propose to describe complex systems need a different type of approach. Contrary to Kuhn we consider that the scientific revolutions are based on a new set of principles that include both scientific revolution and theoretical development.

When he analyzes quantum mechanics Thomas Kuhn does not notice, in his book *The Structure of Scientific Revolutions* the complexity of this theory and the theoretical incompatibility given by the existence of the two paradigms referring to the particle and wave characters of light in the frame of the same theory generated by the wave-particle dualism. In his analysis he does not notice the fact that the theories that are supposed to describe complexities are based sometimes on subsidiary paradigms of other theories.

Thomas Kuhn does not mention the wave-particle dualism. He does refer to optical physics and its paradigms which he analyses as a problem external to quantum physics: "These transformations of the paradigms of physical optics are scientific revolutions, and the successive transition from one paradigm to another via revolution is the usual developmental pattern of mature science. It is not, however, the pattern characteristic of the period before Newton's work, and that is the contrast that concerns us here" (Kuhn, 1996, p.12).

In the interpretation of the structure of scientific revolutions promoted by Thomas Kuhn based on paradigms, symbolic concepts in the evolution of knowledge, the unity and solidity of science seems to lose its meaning. "If normal science is so rigid and if scientific communities are so close-knit as the preceding discussion has implied, how can a change of paradigm ever affect only a small subgroup? What has been said so far may have seemed to imply that normal science is a single monolithic and unified enterprise that must stand or fall with any one of its paradigms as well as with all of them together. But science is obviously seldom or never like that" (Kuhn, 1996, p.49).

The monolithic unity of scientific knowledge must be comprehended in the theoretical principles that are the basis of knowledge which must include the theoretical solutions.

## 3. The Critique of Quantum Theory

We ask ourselves the obvious question: how did we end up with the corpuscular interpretation of light seeing as the electromagnetic theory had confirmed its validity and had been unanimously accepted as Einstein himself said in his article "Concerning an Heuristic Point of View Toward the Emission and Transformation of Light" (Einstein, 1965, p.1) from 1905, article which can be considered the starting point for the author which would become one of the

most fascinating personalities of the scientific community, and who left his mark on the development of modern physics by attempting to explain the field-matter interaction. "The wave theory of light, which operates with continuous spatial functions, has worked well in the representation of purely optical phenomena and will probably never be replaced by another theory. It should be kept in mind, however, that the optical observations refer to time averages rather than instantaneous values. In spite of the complete experimental confirmation of the theory as applied to diffraction, reflection, refraction, dispersion, etc., it is still conceivable that the theory of light which operates with continuous spatial functions may lead to contradictions with experience when it is applied to the phenomena of emission and transformation of light" (Einstein, 1965, p.1).

From this quote we can see that Einstein does not dispute the wave theory of light as it has been confirmed by the diffraction, reflection, refraction, and dispersion experiments but suggests a contradiction between the continuous character of light as a manifestation of electromagnetic radiation and the proposed discreet character of the structure of matter. The error in the interpretation results from not understanding correctly the structure of matter, more precisely the continuous character of the internal energy of the structure of matter which gives us the laws by which the structure is achieved. The erroneously simplistic vision and the logical extrapolation - the discreet character of mass, which imposes by necessity a discreet character for the internal energy of matter - has contributed to the development of quantum theory on flawed fundamental principles.

Albert Einstein expresses without doubt a simplistic, discreet, mechanical vision of electromagnetic phenomena "It seems to me that the observations associated with blackbody radiation, fluorescence, the production of cathode rays by ultraviolet light, and other related phenomena connected with the emission or transformation of light are more readily understood if one assumes that the energy of light is discontinuously distributed in space" (Einstein, 1965, p.1). There are many physicists that consider that the majority of phenomena in physics can be explained and reduced to mechanical models. This idea explains the apparently illogical return to a mechanical model in describing the structure of matter. A simplistic solution was adopted, one which is inadequate for the complexity of the material world that we want to describe in a scientific manner.

In my opinion, presented in the book The End of Quantum Theory as well as other articles, I have shown the artificial character of quantum theory as a formal construct of a virtual reality based on principles adapted from the theoretical system.

The theoretical principles substantiate theories, they are not adjustable parameters which we can modify in our cognitive process in order to insure internal coherency. Our theoretical constructs are not a substitute for the real

world, or mental projection of reality mediated by scientific knowledge do not become reality itself.

The excessively mathematic description does not add to the knowledge and does not legitimize it. To some extent it limits the access to those that are unfamiliar with the mathematical description, and in actuality it forcefully imposes an inadequate theoretical set of formulas.

The unilaterality and simplism of thought of Thomas Kuhn is given by his strictly methodological approach to the analysis of scientific knowledge. The grand scientific revolutions are based on the restructuring of theoretical principles which implicitly generate specific methods of theoretical development and "fundamental paradigms". The quantum paradigm obscures the fragility of the theoretical fundaments of quantum mechanics, referring to its atemporal and indeterministically agnostic character.

Mario Bunge is situated, as other epistemologists are, on mechanical principles that originate in the antique way of thinking that has been perpetuated until our times under various forms."All material things are either elementary, such electrons and quarks, or systems of such. In other words, things do not come in arbitrary amounts, and they cannot be divided into arbitrary parts. Thus, the ancient atomists were basically right" (Bunge, 2010, p.41).

The mechanical vision is a temptation, easily accessible to our minds as well as an obstacle in the understanding of the complexity of the material world as a wave structure in its entirety. Electromagnetic energy is not arbitrary. It has a spatiotemporal description completely defined by intensity, frequency, phase, polarity and spatial temporal repartition.

Mario Bunge's interpretation in regards to energy is a simplistic one considering energy as a property of matter and not matter itself. "Moreover, some properties too are quantized. For example, the energy of an atom in a stationary state cannot take arbitrary values: it can only be in one in an infinite denumerable set" (Bunge, 2010, p. 56).

Energy in the atomic architecture represents the structure, it is the bond that links elementary particles, it configures and determines the movement of particles on perfectly defined trajectories and defines the properties of the structure of matter.

The atomic structure in general and the structure of the material world in its entirety mean energy, mean the dynamics of elementary particles. On this point the atomic structure and the celestial structure find themselves in the same processual dynamic description. Corporality in the structure of the universe of the material world from the microcosms to the macrocosms, related to the space that it occupies is tiny. The paradigm shift in the description of the material world is represented by accepting energy under all its forms of manifestation, especially of electromagnetic energy and a defining element of the processuality of material existence.

If we interpret quantum theory as the ultimate report to the real world that presumably it describes, as a general trait we can say that the probabilistic interpretation, the quantum indeterminism is not found in the precisely defined properties of all substances.

Jon Bell tells us in his book "*Speakable and unspeakable in quantum mechanics*" about the obscure fundamental character of quantum mechanics: "As for technical mistakes, our theorists do not make them. And they see at once what is important and what is detail. So it is another feature of contemporary progress …. This progress is made in spite of the fundamental obscurity in quantum mechanics. Our theorists stride through that obscurity unimpeded ... sleepwalking?

The progress so made is immensely impressive. If it is made by sleepwalkers, is it wise to shout 'wake up'? I am not sure that it is. So I speak now in a very low voice" (Bell, 1987, p.170).

It must be shown that Einstein, even in 1906, has critiqued the way in which Plank has constructed, from a formal point of view, his constant by considering it inconsistent from a physical point of view. Still in subsequent situations where he had to take a position on this he said that this inconsistency does not represent a reason to dismiss quantum theory in its entirety. I believe that from a subjective point of view we must see Einstein's position, since as he was involved in finding a theoretical solution for the atomic structure he might have been following: "*Se non è vero, è bene trovato*" (*If it's not true, at least it's well invented*) and, in the absence of another possibility, has accepted without criticism the only theoretical solution available at that time.

Considering all of this, from the point of view of a severe critique, we can conclude that Plank's constant is theoretically incompatible from the point of view of the formal development by using in its development two mutually exclusive theories (one based on the continuous character of energy and one on its discreet character) which demonstrates the existence of an internal contradiction which is unacceptable and points out the lack of theoretical coherency in the way the fundamental constant of quantum mechanics was found.

This is why we consider as founded Paul Marmet's criticism of the ensemble of modern physics: "The contradictions found in modern science are so *absurd* that most physicists assume that somebody must certainly have solved them long ago. The degree of indifference of most physicists about these contradictions is phenomenal" (Marmet, 1993, p.11).

Considerable efforts have been made to sustain and present quantum theory as the only and irreplaceable theory of the atomic structure so it is very difficult, or maybe impossible for those that are involved in education, and not only them, to recognize that their scientific convictions regarding quantum theory are absurd and must be replaced.

In our opinion a theory based on obscure principles assumed to be indeterministic and atemporal cannot represent a starting point for a credibly

valid theoretical system. It maintains in its development the indeterministic character and despite the apparent progress quantum mechanics must be replaced by a deterministic theory appropriate for the classical spirit, compatible with the wave character of light. Progress in quantum theory must be understood as one of circumstance and short termed compared to the old existing theories regarding the representation on the microcosm. In its entirety scientific knowledge is a theory based on indeterministic principles and at the same time a convoluted theory since it comes back to a corpuscular representation of the world compared to the wave representation.

## 4. The Necessity for an Electromagnetic Foundation Regarding the Structure of the Material World

Quantum theory is in essence a theory of states of discreet energy oscillations regarding the structure of the material world, in contradiction with the electromagnetic theory of the world which represented a continuous description of electromagnetic radiation and the basis for the electrodynamic theory of matter as a continuous theory. In the conceptual development of quantum theory the next explanatory step after the discreet definition of the energy states of the structure of matter is done by discussing the photoelectric effect as a discreet fundamental basis for quantum theory and as the explanation for the interaction between matter and the electromagnetic radiation (light) that has s an effect electron emission. This narrow mechanical vision of the phenomena has represented a regress in knowledge by returning to a convoluted theory regarding the corpuscular character of light. The electromagnetic interaction is viewed as a collision and the long distance interaction with the gravitational field is ignored without denying the long distance universal attraction and implicitly the continuous character of universal attraction.

The theory that we propose regards a wave structure of matter which becomes theoretically compatible with the wave character of light and consequently a representation where the interaction between electromagnetic waves and matter is possible.

The means for theoretical expression at the beginning of the 20th century were insufficient for a spatiotemporal description of the atomic structure. Since they couldn't develop a model for the structure of matter which could be theoretically compatible with the wave character of light, quantum theory has taken a simplistic mechanical approach and applied this model to both the atomic structure and light. Because it could not generalize the corpuscular character of light and couldn't deny its electromagnetic structure it took a dualist solution. Light, in the process of propagation, has a wave character and in the moment of interaction with matter it takes a corpuscular character. They can't explain this transformation. The conceptual fundamental problem referring to the dualism is that in a unified theoretical system there

cannot be two theories that are mutually exclusive. It is difficult to understand how we returned to the corpuscular conception of light after wave theory has been completely explained and phenomena like interference and diffraction have been experimentally validated.

Quantum theory explains the passing of an electron from one orbital to another as a result of the action of light over matter. This concept of the photon-matter interaction has been taken and used on a large scale to explain chemical structures. In a simplistic analysis we can accept this explanation because it follows the path from cause to effect. If we do an in-depth analysis of this process we can see that from the point of view of the analysis of the way in which this transformation is achieved quantum theory doesn't tell us anything about how this transformation takes place. Any process of change takes place in spatiotemporal coordinates. Transitions, defined as passing from one state to another, implicitly presume temporality (a duration for the process) that quantum theory does not explain. The atemporal characteristic of quantum theory reveals the limits for a profound temporal analysis. Jon Bell expresses himself firmly in favour of finding a solution in his book "Speakable and unspeakable in quantum mechanics", regarding the theoretical unification of the physical world: "The quantum phenomena do *not* exclude a uniform description of micro and macro worlds ... system and apparatus. It is *not* essential to introduce a vague division of the world of this kind" (Bell, 1987, p. 171).

He is on the side of those who believe in the theoretical unification by adopting a quantum vision of the macrocosm and considers de Broglie's concept of coexistence of waves and particles as a first step towards a unified theory an erroneous assumption.

Quantum theory has generated a theoretical schism and an antagonistic relationship between the microcosm and the macrocosm generating two worlds artificially separated without the introduction of criteria and limits based on theory. The thesis of theoretical unity of the physical world from the microcosm to the macrocosm in a unified theoretical system can still be achieved in the sense of reinterpretation of the microcosm and the description of the atomic and molecular structure in agreement with processual deterministic principles and the rigor of classical physics. This is the subsequent purpose of the theory that we want to implement.

## 5. Conclusions

Most epistemologies involved in debates on quantum theory avoids a position trenchant on dualism, determinism or discreet energy, realizing that such a position would conflict with the initial set of assumptions that are based and would require his conceptual reformulation. Their attitude is one of denial of quantum theory but a reinterpretation epistemological quantum concepts, they do not propose to change the paradigm of quantum but remains within it.

The epistemological debate on the theoretical foundations of quantum theory, should not be regarded as a problem outside of physics but as a major theme of his essence dichotomy between scientific knowledge and the epistemic is one such formal boundaries being mostly teaching theoretical knowledge the integration of the two parts must be understood in its complexity and entirety.

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## O NOUĂ PERSPECTIVĂ EPISTEMIOLOGICĂ PRIVIND PARADIGMA CUANTICĂ

(Rezumat)

Paradigma cuantică ca o metodă discretă de descrie a structurii lumii materiale, în mod fundamental bazată pe mecanica cuantică, este în contradicție cu teoria electromagnetică a luminii. Promovarea unei viziuni mecaniciste a fenomenelor subatomice a fost un pas înapoi în cunoaştere, prin revenirea la o teorie involută în ceea ce priveşte caracterul corpuscular al luminii, care a fost extins nepermis asupra structurii lumii materiale. Complexitatea procesualității lumii materiale ca o unitate între caracterul corpuscular discret şi manifestările electromagnetice continue dezvăluie o nouă teorie a realității fizice, într-o viziune complexă epistemică, în care cele două entități ontologice nu se exclud reciproc, ci mai degrabă ele coexistă într-un sistem teoretic unificat explicitat printr-o nouă abordare electrodinamică a lumii materiale care dezvăluie un univers spațiotemporal care este în acelaşi timp cognoscibil şi predictibil.