

About Ionicioiu and Terno's article on quantum mechanics from 2011 and my “epistemologically different worlds” perspective from 2005, 2006, 2008, 2010 on quantum mechanics

Gabriel Vacariu

(Philosophy, University of Bucharest, Romania, October 2014)

1. Particular information about Ionicioiu and Terno's article (2011) and my EDWs perspective

In this short paper, in the first part, I introduce several short ideas from my articles and books from 2005 to 2010 regarding my EDWs perspective and its application to quantum mechanics. The main conclusion of these applications is that the wave and the particle really exist but in EDWs. In the second part, I investigate Ionicioiu and Terno's paper from 2011: I emphasize that I am interested not on their thought experiment (they elaborated this thought experiment) but on the conclusion of this experiment. The conclusion of their experiment is that the wave and the particle both really exist. I want to emphasize that my conclusion of the application of EDWs perspective on quantum mechanics and Ionicioiu and Terno's conclusion from their thought experiment is almost the same: the wave and the particle really exist but this existence is complementary. The difference between Ionicioiu and Terno's conclusion and my ideas is that they don't offer any detail (framework) regarding where the wave and the particle exist.

Ionicioiu is Romanian (he was working/studying in Canada in 2011) and Terno is Australian (Macquarie University, Sydney, Australia). I am Romanian and I graduated my PhD in Philosophy at University of New South Wales (Sydney, Australia) in autumn 2007. I received the official PhD degree in January 2008 from UNSW. The reviewers of my thesis were: Rom Harre (GB and USA), John Bickle (USA) and Ilie Parvu (Romania). My scholarship finished at the end of September 2007. At the end of this month I return to Romania to hold my lectures/seminars at my department from Bucharest. My thesis (as every PhD thesis) was posted on Internet in autumn 2007 by the staff from PhD office, UNSW (Australia). The difference between my thesis (autumn 2007) and my book (March 2008) is quite small. Moreover, the last chapter dedicated to physics (including the problems form quantum mechanics) is exactly the same in my thesis and my book (2008). Also, I have a paper published in 2006 in which I wrote my alternative to the quantum duality. In that paper (2006), in my thesis (autumn 2007) and my book (2008), within my “epistemologically different worlds” perspective, I introduced exactly the same solution to the wave-particle duality as was introduced later (2011) by Ionicioiu and Terno: the wave and the particles really exist, they are “complementary”, but they belong to the epistemologically different worlds. The point was that explicitly I extended Bohr's complementarity of measurement apparatus (an epistemological status) to ontological status (an ontological complementarity) firstly to the mind-brain problem and then to the organism-life, wave-particle and micro-macro entities. So, the conclusion of my EDWs perspective was that the “world”/“universe” does not exist. In my book from 2008, I applied the same solution not only to the wave-particle dualism but also to the micro-macro “levels”, mind-brain problem, and organism-life dualities.

I published five books (all in English) and I posted each of my five books (2008, 2010, 2011, 2012, and 2014) in no more than 2 months after their publication at Bucharest University Publishing Company. I posted all these books not only on my webpage from my department but also on many other websites on Internet. Also, I posted on my webpage (and other webpages) all my articles (except two papers from Synthese 2005, 2001) immediately after being published in

journals. I add that in 2002, together with Dalia Terhesiu, I published two papers in Romanian journal (Terhesiu Dalia and Vacariu Gabriel (2002), “Brain, mind and the perspective of the observer”, *Revue Roumaine de Philosophie*, 46, no. 1-2 and Vacariu, Gabriel and Terhesiu, Dalia (2002), “Brain, mind and the role of the observer”) in which we extend Bohr’s principle of complementarity to the mind-brain problem. This extension represented a movement from Bohr’s epistemological status to an ontological one.

2. My articles and books from 2005 to 2010

In this section, I introduce some paragraphs from my works from 2005, 2006, 2008 and 2010. I want to show that I published exactly the same idea as Ionicioiu and Terno in 2011, but in a complete (hyper)ontological framework, the EDWs perspective.

2.1 Paragraphs from my article from 2005: “*Mind, brain and epistemologically different worlds*” (Synthese Journal, USA, one of the best journal in philosophy of science and epistemology)

In this article, I introduced my EDWs perspective and its application to the mind-brain problem. However, in some footnotes, I indicated that my EDWs perspective can be applied to quantum mechanics. Here I show my five principles and some footnotes from my article (2005):

- (P1) Under different conditions of observation, the human subject observes epistemologically different worlds of the world (thing)-in-itself.
- (P2) As human attention is a serial process, the human subject cannot simultaneously observe epistemologically different worlds (EDWs).
- (P3) The set of judgments that describe the phenomena of each epistemological world must follow the rule of conceptual containment that is given by the conditions and limitations within the concepts of the judgments. These conditions and limitations are governed by the properties of (internal or external) tools of observation.
- (P4) In physical terms, the part-counterpart relation corresponds to human subjectivity or human experience.
- (P5) Each epistemologically different world has the same objective reality.

Footnote 28: It seems that the EDWs perspective can reveal that quantum mechanics (describing those three fundamental forces acting on the microscopic scale) and general relativity theory (describing gravitation force among large-scale objects/structures like planets, galaxies, etc.) are incompatible just because the micro-objects have other structures than macro-objects, and this means they belong to EDWs. Gravity is caused by massive objects that warp the surrounding space. Thus, gravity is a property of space. If the mass of a planet corresponds to the sum of the corresponding micro-particles’ masses, maybe we can think that the gravity of the planet corresponds to the sum of all gravities produced by all those microparticles, but because of our limits of observation it is impossible for us to draw this conclusion scientifically.

Footnote 37 At the beginning of this paper I quoted the motto that represents the framework of the Copenhagen interpretation of quantum mechanics, which includes Heisenberg’s expression “nature herself”. I now wish to point out that this expression itself is improper. As we saw above, nature herself (the noumena or real nature or ultimate reality) has no meaning from the perspective of the observer. Thus, even if I have borrowed important concepts from Bohr’s theory, I suggest that there is an error underlying the Copenhagen interpretation. (I have no space to develop this idea here but this will be the topic of a subsequent paper.) In this footnote I can (briefly) suggest the nature of the error: it is, again, the unicorn-world. Let us take the example of the wave in the box. Bohr says that the electron exists as a wave within the box. When we look for the electron, the wave function collapses at a certain location. Our measurement apparatus produces this collapse. The error in this conception is that three objects are postulated in the same unicorn-world: the wave that collapses, the electron (microscopic object) and the box (macroscopic object). To avoid this paradox, Bohr’s stratagem has been to negate the existence of the particle until that particle is observed: in that moment the wave function collapses into the electron at a certain location. Bohr’s approach represents one extreme position. The other extreme position for quantum mechanics is the many-worlds approach or multiverse (Everett, De Witt, Deutsch, etc.). Between these extremes are other approaches, but all theories presuppose the unicorn-world. The extended perspective of the observer with its hyperverse concept is beyond all

these approaches. Using macro tools of observation, someone observes the electron that belongs to one EW. In that EW, neither the wave nor the box do exist. The whole wave, as a single object in one EW, corresponds to that single particle from EOW; moreover, the box corresponds to the network of micro-particles, their functions, and the relationships among them. The continuous and deterministic wave and the discrete electron (such particle is characterized by the relationship between measurement of position and momentum – Heisenberg's Uncertain Principle) exist both at the same time, but in EDWs! The collapse of the wave or the mysterious ‘quantum jumps’ represents in fact the process through which the observer, using different tools of observation, passes from one EW to another.

In this paper, I extended Bohr’s complementarity from an epistemological status to an ontological status to the mind and brain. That is, the mind and the brain really exist but in EDWs that are complementary.

2.2 My article from 2006 “*The epistemologically different worlds perspective and some pseudo-notions from quantum mechanics*” (in English, *Analele Universității București*)

This article has these parts: “1. The unicorn-world vs. the epistemologically different worlds” “2. The EDWs perspective and some notions from quantum mechanics” with these subsections “(1) Young’s experiment and Wheeler’s delayed-choice experiment (1980) (2) Schrödinger’s cat, decoherence and the multiverse approach”. Within the EDWs perspective with the same principles, I investigated the main problems from quantum mechanics: nonlocality, Bohr’s complementarity, the main approaches from quantum mechanics (following Putnam’s article from 2005), some details from Greene book from 2004, Deutch, Tegmark and Wheeler, Dyson, etc.), etc. The conclusion of this paper is the same: the wave and the particle both exist but belong to EDWs (that are complementary) and many problems from quantum mechanics are pseudo-problems.

2.2 My book from 2008: “*Epistemologically different worlds*” (in English) (Bucharest University Publishing Company)

Section 6.9 is dedicated to “Some notions from quantum mechanics” in which I investigate Putnam’s article about the main approaches on quantum mechanics, non-locality, etc. This section has these parts: (1) Young’s experiment and Wheeler’s delayed-choice experiment (1980), (2) Feynman’s “sum over histories” framework (3) Heisenberg’s uncertainty principle and (4) Schrödinger’s cat, decoherence and the multiverse approach. The main conclusions are: the wave and the particle both exist but belong to EDWs (that are complementary) and many problems from quantum mechanics are pseudo-problems. Also the micro and macro entities exist but in EDWs.

2.3 My book from my book 2010 “*Mind, life matter in the hyperverse*” (in English)

Chapter 7: EDWs perspective and 71. Particles and waves, 7.2 Gravity and Newton vs. Einstein, quantum gravity, Smolin, black holes, hyperspace, etc. The conclusions are: the wave and the particles both exist but belong to EDWs; also the micro and macro entities exist but in EDWs. The main conclusions are: the wave and the particle both exist but belong to EDWs (that are complementary) and many problems from quantum mechanics are pseudo-problems. Also the micro and macro entities exist but in EDWs.

2.4 The section from my book Vacariu 2014: “*Few words about quantum mechanics*” and I refer to Ionicioiu and Terno’s paper from (2011).

I would like to analyze only the paper written by Ionicioiu and Terno (2011) on Wheeler's delay experiment in quantum mechanics. In this article, these two physicists consider – as everybody - that the classical concepts of ‘particle’ or ‘wave’ (as in ‘wave-particle duality’) do not translate perfectly into the quantum language.” (Ionicioiu and Terno 2011, p. 1) More exactly, “‘photons’ show an inconsistent behavior: in an open interferometer waves obey a particle statistics and in a closed interferometer particles behave like waves, showing interference. Consequently, the properties “wave” and “particle” become meaningless.” (Ionicioiu and Terno 2011, p. 3) Therefore, they introduce a *Gedanken experiment* related to Wheeler’s delayed-choice experiment for redefining Bohr’s notion of complementarity in terms of quantum mechanics framework. As I showed in Vacariu (2008) and Vacariu and Vacariu (2010), within the unicorn world, many things in quantum mechanics become meaningless. Avoiding technical details, I emphasize another phrase written one page later: “from a classical perspective there is still an ontological tension between the observed interference and the detection of individual photons, one by one, by clicks in the detectors.” (p. 4) The expression “ontological tension” seems to be taken from my first two books (2008, 2010)!¹ As I showed in my books many times, since the particle and the wave both exist but belong to the EDWs, then there is indeed an “ontological tension”: the particle and the wave cannot exist both in the same world, the unicorn world. However, their conclusion is contrary to the EDWs perspective: the “particle” and the “wave” are not real properties but mirror “how we ‘look’ at the photon”. (Ionicioiu and Terno 2011, p. 4) In their experiment, the authors show that using a single “experimental setup”, we can observe the complementarity of phenomena. “Our result suggests a reinterpretation of the complementarity principle – instead of complementarity of experimental setups (Bohr’s view) we have complementarity of experimental data.” (Ionicioiu and Terno 2011, p. 4) Within the EDWs perspective, at the first view, Bohr’s complementarity is “complementarity of experimental data”, i.e., complementarity of EDWs. However, at a closer look, the EDWs are not “complementary”! As I wrote in my books, the EDWs are complementary only for the human observer who can change the conditions of observation, but in reality, the entities and their interactions from one EW do not exist for entities and their interactions that belong to another EW.² For instance, the microparticle does not exist for the wave or the planet and vice versa. Therefore, it is not about “complementarity” but about EDWs. Their conclusion is the following: “Discussing the delayed-choice experiment, Wheeler concludes: ‘In this sense, we have a strange inversion of the normal order of time. We, now, by moving the mirror in or out have an unavoidable effect on what we have a right to say about the *already* past history of that photon’ [5]. We disagree with this interpretation. There is no inversion of the normal order of time – in our case we measure the photon *before* the ancilla deciding the experimental setup (open or closed interferometer). It is only after we interpret the photon data, by correlating them with the results of the ancilla, that either a particle- or wave-like behaviour emerges: *behaviour is in the eye of the observer*.” (Ionicioiu and Terno 2011, p. 4)³

*It seems as if Ionicioiu and Terno created their experiment within the EDWs perspective!*⁴ However, their conclusion lacks precisely the EDWs perspective: “behavior” is not “in the eye of the observer”, the particle and the wave really exist but in EDWs.⁵ Moreover, quantum mechanics has had great problems even since it appeared and nobody has been able to come with a solution. As I showed in my books from 2008 and 2010, these problems (and many others) are in fact pseudo-problems created through the mixture of entities/phenomena that belong to the EDWs. This is the reason nobody has been able to solve them.

¹ It is quite strange two physicists to use this philosophical expression “ontological tension”. I read many books written by physicists but I have never read this philosophical expression in any book written by a physicist. Quite strange! I used similar expressions in my books to show the ontological problems between the wave and the particles in quantum mechanics.

² It is exactly the same situation for those two observers A (in the train) and B (on the ground) regarding Einstein’s theory of special relativity.

³ In my book (2008), I rejected Wheeler’s delayed experiment. I am lucky I published my books several years before Ionicioiu and Terno published their paper. However, I posted my books on Internet after 2-3 months of being published by the company publisher.

⁴ Ionicioiu is a Romanian physicist who works in Canada and Terno is Australian physicist at one university in Sydney (Australia). I am Romanian and in 2008 I got one of my PhD degrees at University of New South Wales in Sydney. What coincidences! (However, for some UNBELIEVABLE “coincidences” between my ideas and a professor of philosophy from a German university, see Appendix 2 of this book)

⁵ In this context, I emphasize that quite many people do not understand correctly and completely my EDWs perspective just because it is a completely new framework of thinking and not just few ideas. (This footnote is related with the topic from the next appendix.)

Some details about Ionicioiu's presentation on quantum mechanics ("delayed-choice experiments") from 15th October 2014 at Department of Philosophy, University of Bucharest (Romania)

On 15th October 2014, the physicist Radu Ionicioiu (Faculty of Physics, University of Bucharest) had a presentation within CELFIS meetings at Department of Philosophy, University of Bucharest (Romania). The title of his presentation was: "*Complementarity: from wave-particle duality to delayed-choice experiments*". The main ideas of his presentation in which I was interested was those from the article written by Radu Ionicioiu and Daniel R. Terno (2011): "Proposal for a quantum delayed-choice experiment" from *Physical Review Letters* 107, 230406". The authors of this article elaborated a thought experiment and the conclusion of this thought experiment is that the wave and the particle are complementary empirical data (not only Bohr's measurement apparatus being complementary).

After Ionicioiu's presentation (15.10.2014 at my department), I was the last person asking him few questions. (1) In his article (2011) and his presentation from my department, there is a contradiction: in one part of this article, the wave and the particles are considered complementary empirical data, but in the end of the article/presentation, the wave and the particle are in the eyes of beholder (classical Bohr's interpretation). I asked him how he solved this contradiction. He recognized this contradiction, and he claimed that he has no solution to it because the "reality", "universe" is quite strange. Moreover he added that he "does not know how the world is". Then I asked Ionicioiu about the notion "ontological tension" between wave and particle that appears in their paper from 2011. Specifying that this is his notion, he recognized also he could not explain it to me. Finally, in a very short summary of that discussion, I told him that exactly the main conclusion from their thought experiment in that paper 2011 can be found in my book from 2008. Immediately he said "You accuse me of plagiarizing your ideas!" My reply was "I didn't say this. I just specified that exactly the conclusion from your article appeared in my book from 2008!" He mentioned that he would read my book from my webpage.

I mention again that all my books and articles can be founded at my webpage: http://filosofie.unibuc.ro/cv_gabriel_vacariu/. I posted all my books and articles immediately (1-2 months later) after being published.

Bibliography

- Ionicioiu Radu and Terno R. Daniel (2011), "Proposal for a quantum delayed-choice experiment", *Physical Review Letters* 107, 230406
- Terhesiu Dalia and Vacariu Gabriel (2002), "Brain, mind and the perspective of the observer", *Revue Roumaine de Philosophie*, 46, no. 1-2
- Vacariu, Gabriel and Terhesiu, Dalia (2002), "Brain, mind and the role of the observer", in *Philosophy of Consciousness and Cognitive Science*, Angela Botez and Bogdan Popescu (Eds.), Cartea Romaneasca.
- Vacariu Gabriel (2004) "Brain, mind and epistemologically different worlds", *Revue Roumaine de Philosophie*, 48, no.1-2
- Vacariu Gabriel (2005), "Mind, brain and epistemologically different worlds", *Synthese Review*: 143/3: 515-548.
- Vacariu Gabriel (2006), "The epistemologically different worlds perspective and some pseudo-notions from quantum mechanics", *Analele Universitatii Bucuresti*

- Vacariu Gabriel (2008), *Epistemologically Different Worlds*, (in English) University of Bucharest Press
- Vacariu Gabriel and Vacariu Mihai(2008), "The "I" as an epistemological world" (PDF), *Analele Universitatii Bucuresti*
- Vacariu Gabriel and Vacariu Mihai (2009), "Physics and Epistemologically Different Worlds", *Revue roumaine de philosophie*, vol. 53, 2009, nr. 1-2 (ISI)
- Vacariu Gabriel and Vacariu Mihai (2010), *Mind, life and matter in the hyperverse*, (in English) Editura Universitatii din Bucuresti
- Vacariu Gabriel (2011) *Being and the hyperverse*, Editura Universitatii din Bucuresti
- Vacariu Gabriel (2012) *Cognitive neuroscience versus the hyperverse*, Editura Universitatii din Bucuresti
- Vacariu Gabriel (2014) *More troubles with cognitive neuroscience. Einstein's theory of relativity and the hyperverse*, Editura Universitatii din Bucuresti
- Vacariu Gabriel (2014) *Epistemologically Different Worlds - The new paradigm of thinking*, Editura S.C. Datagroup-Int S.R.L. (English, Germany, Romanian)