

The De Broglie-Bohm Pilot Wave Theory Via E-Infinity Cantorian Spacetime Interpretation*)

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Abstract – A condensed E-infinity Cantorian spacetime interpretation of de Broglie-Bohm pilot wave theory is attempted. We give the maize of well established interconnections between this theory and a host of fundamental theories and tested experimental facts, laboratory and astro-cosmological measurements as well as observations. The short paper highlights the insights and pioneering works of J. von Neumann, K. Menger, I. Prigogine, T. von Karman, L. Prandtl, B. Batchelor and N. Kolmogorov regarding fluid turbulence in addition to the deep theoretical investigations of S. Hawking, R. Penrose, G. 'tHooft, L. Susskind and their school relating thought experiments to sophisticated modern experimental set ups such as nondemolition quantum measurement and follow the ramifications for important deep theoretical concepts and proposals pertinent to Penrose golden mean fractal tiling universe, cosmic quantum fluctuation and primordial micro-black holes as inspired by the said pioneering efforts of S. Hawking, L. Susskind, G. 'tHooft and later on in recent times by the Author and many others.

Keywords – De Broglie-Bohm Pilot Wave, Batchelor Fluid Turbulence, T. Von Karman Vortices Street, Quantum Fluctuation, S. Hawking Primordial and Micro-Black Holes, E-infinity Cantorian Spacetime Theory, J. von Neumann Pointless Geometry, A. Connes Noncommutative Geometry, G. 'tHooft, R. Penrose Fractal Universe, Ilya Prigogine, L. Prandtl Boundary Layer Theory, K. Menger and Paul Urysohn Deductive Dimensional Theory.

I. INTRODUCTION

The work presents a comprehensive E-Infinity interpretation of de Broglie-Bohm pilot wave theory [1-5] in conjunction with elements of transfinite set theory [6-8], Cantorian geometry [8], non-commutative geometry [5] [8-10], von Neumann's pointless continuous geometry [11-12], Menger-Urysohn dimensional theory [7-8] as well as Prigogine Von Karman - Prandtl - Batchelor - Kolmogorov - El Naschie hydrodynamics [13]. In addition, we also relate the above to Penrose's golden fractal tiling universe, Hawking's vacuum fluctuation [14-16] and mini primordial black holes in the modern conception of 'tHooft, Susskind [14-16] and their school. Effort was given to relate thought experiments with actual real experiments using sophisticated modern technology such as quantum non-demolition measurements [14] [16-19].

II. THE PILOT WAVE - BACKGROUND INFORMATION

The pilot wave theory has an exceedingly interesting history and intriguing motivation which we will not cover here in any substantial way and it is sufficient for the purposes of the present paper to mention that it was developed by de Broglie and Bohm out of a deep dissatisfaction with the Copenhagen interpretation of quantum mechanics a la Bohr-Heisenberg [5-6] [8] [14] [16] and their school. For this reason, we urge the reader to consult the vast literature on the subject in order to follow the present work with relative ease [16-19].

Let us start by outlining where our E-Infinity interpretation [8] moved toward a pilot wave theory to meet somewhere in a way which we claim to achieve what the pilot wave was created to achieve namely an objective and scientifically sound and logically satisfying physical pictures that do not require invoking a conscious observer and the like of superstitions generally and rightly believed to be foreign to the spirit of real science [2] [4]

[10].

*) Dedicated to the memory of Egyptian Prof. Dr. Emeritus Nabil Makhoulf, a great engineer, great scientist and great friend who passed away recently during these strange times and strange circumstances associated with them.

The most important point in the E-infinity proposal but by no means not the only important one, is the topological relation between the zero set and the empty set on one side and the physical interpretation of the zero set and the empty set on the other side. In the highly mathematical terminology of transfinite set theory [6] this empty set is the Cobordism of the zero set [6]. In slightly more down to earth simple language, the empty set is the surface of the zero set. On the other hand we have argued previously in many publications how the zero set maybe drawn to model in an almost intuitive simple picture the pre-quantum particle and presto it follows from this move that the surface of this zero set maybe regarded advantageously as the pre-quantum wave [6]. In other words, this picture combines the pre-quantum zero set particle and the pre-quantum wave empty set to an inseparable unit of particle and wave in unique, but unheard of simple particle-wave duality [6] [17-18].

Suppose then we take measurement to find what happens realistically. Surely we will have to touch the wave particle object and since the surface is an empty set, the slightest touch converts the empty set to a non-empty set [6]. Again this is the most stringent logic and mathematics that one could envisage. Now the nearest thing to this empty set is the zero set ergo our empty set pre-quantum wave collapses into the zero set pre-quantum particle. This is neat logic and pure mathematics without any loopholes. In addition it allows for a simple elementary observed analogy of everyday experience when a soap bubble floating in the air touches a surface and is simply reduced to a drop of water [13]. Viewed that way, our E-Infinity state vector reduction is both stringent mathematical logic and a simple tangible demonstration of the collapse of a soap bubble to a real particle represented by a mundane drop of water. In addition, all this happens instantly and the wrong impression that this is illogical behavior, is indeed a wrong impression [8] [13] [17-19].

We stress that most golden mean based methods dealing with more or less the same problems outlined above may be linked directly or indirectly to a basic tenet of the de Broglie-Bohm pilot wave [2] [5-6] [12-13] but we will not discuss this in the present work and will just direct the interested reader to our previous papers particularly those dealing with hydrodynamics and turbulence models as well as fundamental papers related to the E-Infinity golden mean systems and the essence of the pilot wave theory of state vector reduction originating from the school of de Broglie-Bohm and its modern variation [5-6] [8] [17-19].

III. COMMENTARY ON CHOSEN PAPERS HIGHLIGHTING THE ESSENCE OF THE DE BROGLIE-BOHM PILOT WAVE THEORY

1. Mohamed S. El Naschie, Cantorian micro-type black holes as the fundamental building blocks of space time. International Journal of Innovations in Science and Mathematics, 8(6), pp. 259-261, 2020. This paper is based on a Cantorian topological black hole fully described by a golden mean zero set Hausdorff dimension given by $\phi = (\sqrt{5} - 1)/2$ and event horizon given by the empty set Hausdorff dimension ϕ^2 . The basic idea is supplied by 'tHooft's interpretation of string theory.

2. Mohamed S. El Naschie, Golden anyons for cosmic dark energy density. World Journal of Condensed Matter Physics, 8(4), pp. 157-161, 2018. This paper is based on Nobel Laureate F. Wilczek's invention of a two dimensional exotic particles which are neither fermion nor boson. We reformulated Wilczek's idea via four dimensional fusion algebra that makes extensive use of the golden mean in the spirit of the modification of E-infinity in the light of the work of A. Connes on noncommutative Penrose geometry and von Neumann's invention of pointless continuous geometry.
3. Mohamed S. El Naschie, Fluid turbulence road to quantum Cantorian spacetime via nested solitonic golden eddies chaos implied by Batchelor's law - A possible rationale for the mysterious fine tuning of the cosmos. International Journal of Applied Science and Mathematics, 7(4), pp. 98-108, 2020. This is a profound paper based partially on work of masters of science, engineering and art starting maybe from Leonardo Da Vinci to Cambridge legendary professor George Batchelor. It also touches on the golden mean number system to explain the fine tuning of the universe and dwells on connections to the work of Kolmogorov on turbulence.
4. Scott Olsen, L. Marek-Crnjac, Ji-Huan He and Mohamed S. El Naschie, A Grand Unification of the Sciences, Arts & Consciousness: Rediscovering the Pythagorean Plato's Golden Mean Number System. Journal of Progressive Research in Mathematics, 16(2), pp. 2888-2931, 2020. The golden mean used in visible and audible art, i.e. painting and music is for sure the same number found in science be it plants, biology or quantum physics such as Hardy's quantum entanglement probability ϕ^5 . Does this mean that this is essentially a sweeping unification of art and science? This profound paper's answer to this question is yes, it does.
5. Mohamed S. El Naschie, Cellular automata based on the golden mean number system as a foundation for artificial intelligence and artificial life. International Journal of Artificial Intelligence and Mechatronics, 8(6), pp. 53-58, 2020. This paper transcends not only science and art but even life itself and even science fiction and all connected to the golden mean number system and with it we rest our case that the Rosetta stone of wisdom is the golden mean number system which was probably born in Alexandria, Egypt thanks to the Greek-Egyptian scientific collaboration very, very long ago on the shores of the Mediterranean Sea in sun flooded Egypt.

IV. CONCLUSION

The present short paper is an attempt to see the essence of the de Broglie-Bohm pilot wave theory through the eyes of the Ord-Nottale-El Naschie fractal spacetime proposal enshrined in the fractal Cantorian E-infinity theory. We give here what we perceive as a useful open minded discussion of selected seminal papers which shape the relevant discussion of the subject and we believe have shed much needed light on the relations between the pilot wave theory on the one side and the hydrodynamic research and nonlinear dynamics and deterministic chaos on the other side. The final result is believed to be a far deeper understanding of all the subjects involved with quantum measurement [1-19].

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AUTHOR'S PROFILE



Professor M.S. El Naschie was born in Cairo, Egypt on 10th October 1943. He received his elementary education in Egypt. He then moved to Germany where he received his college education and then his undergraduate education at the Technical University of Hannover where he earned his (Dipl-Ing) diploma, equivalent to a Master's degree in Engineering plus being a professional chartered engineer. After that he moved to the UK where he enlisted as a post graduate student in the stability research group of the late Lord Henry Chilver and obtained his Ph.D. degree in structural mechanics under the supervision of Professor J.M.T. Thompson, FRS. After his promotions up to the rank of full professor, he held various positions in the UK, Saudi Arabia and USA and was a visiting professor, senior scholar or adjunct professor in surrey University, UK, Cornell, USA, Cambridge University, UK and Cairo University, Egypt. In 2012 he ran for the Presidency of Egypt but withdrew at the final stage and returned to academia and his beloved scientific research. He is presently a Distinguished Professor at the Dept. of Physics, Faculty of Science of the University of Alexandria, Egypt. Professor El Naschie is well known for his research in structural stability in engineering as well as for his work on high energy physics and more recently for his work in cosmology and elucidation of the secret of dark energy and dark matter as well as for proposing a dark energy Casimir nanoreactor and a fuelless interstellar spaceship. He is the creator of E-infinity theory, which is a physical theory based on random Cantor sets and can be applied to micro, macro and mesoscopic systems. Professor El Naschie is the single or joint author of about one thousand publications in engineering, physics, mathematics, cosmology and political science. His current h-index is 83 and his i-10 index is 799 and total citations are 37326 according to Google Scholar Citation.