From Nonlinear Quantum Physics To Eurhythmic Physics

J.R. Croca

Departamento de Física Faculdade de Ciências
Centro de Filosofia das Ciências Universidade de Lisboa
Campo Grande Ed. C4
1749-016 Lisboa Portugal
croca@fc.ul.pt

Abstract. The Copenhagen indeterministic approach for understanding the quantum realm was imposed in physics at the Solvay Conference of 1927**.** As is well known there were many thinkers, out of which we can point ou,t de Broglie, Einstein and Schrödinger that always objected to this view of the word and tried to recover causality. Still, only after the important work of David Bohm and Jean-Pierre Vigier, in the early fifties the true recovering of causality took place. Indeed, the School of Lisbon, initiated by Andrade e Silva, a disciple of de Broglie, was able to devise the first experiments that could answer the question about the true nature of the quantum waves. Are quantum waves real physical entities or, on the contrary, they are mere probability waves, thus devoid of any physical reality, as claimed by the orthodox view? Recent experiments, done in Germany, tell us that quantum waves do have, in fact, physical reality. Furthermore, it was shown, not only theoretically but also experimentally, that it is possible to go much beyond the limits imposed by Heisenberg relations. These works culminated with the publication of the book, Towards a Nonlinear Quantum Physics, in 2003. In the sequence of this effort and following de Broglie research program to its natural consequences, a proposal for true nonlinear field theory which includes both classical and quantum realm was published in 2015: Eurhythmic Physics or Hyperphysics the Unification of Physics.

References

[1] Niels Bohr, Nature, **14**, (1928)580; (1928) - *Como Lectures, Collected Works*, Vol. 6, North-Holland, Amsterdam, 1985.
[2] J. von Newman, Mathematical Foundations of quantum mechanics, Princeton University Press, 1996.
[3] D. Bohm, *Quantum Theory*, Prentice-Hall, Englewood Cliffs. N.J. 1951; D. Bohm, Phys. Rev. 85, 166(1952); D. Bohm, Phys. Rev. 85, 180(1954).
[4] D. Bohm and J. Vigier, Phys. Rev. 96, 208(1954).
[5] L. de Broglie, *The Current Interpretation of Wave Mechanics: A Critical Study*, (Elsevier, Amsterdam, 1969; L. de Broglie, *Une Tentative d'Intrepretation Causale e Non Linéare de la Mécanique Ondulatoire*, Gauthier-Villar, Paris, 1957 ; L. de Broglie and J. Andrade e Silva, *La Réintrepretation de la Mécanique Ondulatoire*, Gauthier-Villar, Paris, 1971.
[6] J. R. Croca, *Towards a nonlinear quantum physics*, World Scientific, London, 2003; J.R. Croca, *Eurhythmic Physics, or Hyperphysics, The Unification of Physics*, Lambert Academic Publishing, Berlin, 2015; J. R. Croca, *Local Analysis By Wavelets Versus Nonlocal Fourier Analysis*, International Jornal of Quantum Information, Vol.5, Nos 1&2 (2007) 1-7; J.R. *Quantum indeterminism: a direct consequence of Fourier ontology, Proc. SPIE* 8832, The Nature of Light: What are Photons? V, 88320Y (October 1, 2013); doi:10.1117/12.2025291; http://dx.doi.org/10.1117/12.2025291.
[7] J.R. Croca, A. Garuccio, V. Lepori e R.N. Moreira, *Quantum-optical predictions for an experiment on de Broglie waves detection*, Found. Phys. Lett. 3(1990)557. JR Croca, *Can the existence of de Broglie's empty wave be proven experimentally*? in Microphysical Reality and Quantum Formalism, eds. A van der Merwe et al. (Kluwer Academic Publishers, 1988).
[8] J.R. Croca, A. Garuccio, M. Gatta, Milena D'Angelo, R.N. Moreira, A. Rica da Silva, *experimental evidence on the real physical existence of the subquantum waves*, Quantum Matter, Vol. 4, 2015.
[9] R. Menzel, D. Puhlmanna, A. Heuera, and W. P. Schleich, *Wave-particle dualism and complementarity unraveled by a different mode*, 9314–9319 | PNAS | June 12, 2012 | vol. 109 | no. 24; R. Menzel , A. Heuer , D. Puhlmann , K. Dechoum , M. Hillery , M.J.A. Spähn, W.P. Schleich (2013): *A two-photon double-slit experiment*, Journal of Modern Optics, 60:1, 86-94; R. Menzel, A. Heuer, D. Puhlmann, W.P. Schleich, *Wave-particle dualism and complementarity unraveled by a different mode,* PNAS 2012, **109,** 9314–9319.