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Principles of a second quantum mechanics constructed bottom-up

This is not an interpretation of the Hilbert-Dirac quantum mechanics QMHD. It exposes the principles of a new representation of microstates called a second quantum mechanics and denoted QM2. This representation is rooted directly into the a-conceptual physical reality wherefrom it has been constructed bottom-up, conceptually and formally and in uninterrupted relation with factuality. First a qualitative but formalized representation of the general characteristics of any physical theory of the microstates is developed quite independently of the quantum mechanical formalism and outside it, under exclusively the [operational-conceptual-methodological] constraints entailed by the requirement of a consensual, predictive, and verifiable description of entities that – radically – cannot be perceived directly by human conceptors-observers. This representation is called infra-(quantum mechanics) and is denoted IQM. The specific purpose of IQM is to offer a reference-and-imbedding-structure for the construction of any acceptable theory of the microstates: Only a pre-structure of this sort could permit to overcome the thick inertial ties that immobilize the minds inside an out-dated theory that still subsists only by idolization. Indeed IQM overcomes the idolization by constructing comparability with QMHD, which endows with criteria for estimating from various and definite points of view the significance and the adequacy of each one among the main classes of mathematical representational elements from its formalism. IQM can be regarded as a first realization from a whole group of structures of a new kind, constructed inside the framework of the general Method of Relativized Conceptualization MRC and conceived in order to act as infra-(representational structures) for guiding the construction of a theory on any given domain of physical entities. By systematic reference to IQM – is worked out a preliminary critical examination of QMHD. It thus appears that: (a) QMHD is devoid of any general formal representation of the physical, individual entities and operations that it quite essentially does involve: the whole level of individual conceptualization of the microstates is lacking, massively. Inside QMHD are clearly defined exclusively abstract statistics of results of measurements on only ghostly sketched out physical entities and physical operations on these; and even these definitions themselves are found to be incomplete, or cryptic, or even inadequate. (b) The mathematical formalism from QMHD does involve – and in a quite fundamental role – a definite model of a specimen of a microstate, namely de Broglie's wave-model with a corpuscular-like singularity in its amplitude. But both this fact and its meaning remain implicit. So their consequences are not systematically recognized and made use of. This entails a catastrophic hole in the process of representation, namely absence of explicit coding rules of the observable effects of an act of quantum-measurements, in terms of a definite value of the measured quantity. From (a) and (b) it follows that QMHD is simply devoid of an acceptable representation of the quantum measurements: Such, in fact, is the idolized nowadays Hilbert-Dirac Quantum-Mechanics. The mentioned lacunae are then compensated via a radically constructive bottom-up approach that starts from local zeros of knowledge on the individual physical entities that are involved. First a new representation of the quantum measurements is elaborated for any un-bound microstate, whether devoid of a quantum-potential, or containing such a potential (while the category of bound states does not raise questions of principle from the point of view of IQM). The elaboration of this representation involves incorporation of a second central feature from Louis de Broglie's approach, beside his model, namely the guiding-rule that defines the momentum observable of the corpuscular-like singularity from the wave of a specimen of the studied microstate. The mathematical representation of predictive probability-measures on results of outcomes of quantum measurements are then constructed factually – via measurements – just as one is obliged to do for verifying the asserted predictions. Thereby this representation emerges independent of the Schrödinger equation of the problem. So the use of this equation – if it can be written and solved – is quite generally duplicated by a factual-formal procedure for establishing the predictions. This permits control of the output of the equation when gross idealizations or/and approximations are involved. And when the equation cannot be solved or even cannot be defined, this offers the possibility of a total factual replacement of its theoretical output. (Such a situation is first surprising inside a fundamental theory of mathematical physics; but finally it appears as quite consonant with the new possibilities generated by the progresses realized in informatics and in nanotechnology). Finally, around the core constituted by the mentioned new representation of the quantum measurements, is structured a very synthetic global outline of the Second Quantum Mechanics, QM2. This emerges as a fully intelligible, consensual, predictive and verifiable representation of microstates where the operational generation of conceptual-experimental data on factually generated microstates are expressed in formalized qualitative terms while the asserted verifiable predictions are expressed in terms of Hilbert-vectors.

Biography

Mioara Mugur Schachter was born in Romania, she arrived in France in 1962 from Bucharest. Her PhD thesis - of which the whole content had been elaborated before hand in Bucharest and sent to Louis de Broglie - contains the first and very elaborated invalidation of von Neumann's famous proof asserting the impossibility of hidden parameters compatible with the quantum mechanical formalism. This work was published in a volume prefaced by Louis de Broglie and published in the collection Les grands problèmes des sciences, Gauthiers Villars, Paris, 1964.Since that time, a professor of theoretical physics in France and currently president of CESEF.

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