

Realism and quantum mechanics

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Abstract

We consider realism as a purely metaphysical regulative principle, not subject to scientific proof. In this sense, realism can be maintained in quantum mechanics, provided one does not claim that matter is made out of elementary particles. The epistemological dualism of subject versus object is achieved by a Cartesian cut between object and subject. Once the cut is made, we speak of an exophysical description, as opposed to the concept of an endosystem, a strictly closed physical system without any concept of an observer. The cut resulting in the notion of the object always singles out the object's environment, with which the object interacts. Objects appear not in spite of but because they interact with their environment. In the intrinsically nonprobabilistic individual ontic interpretation, a quantum endosystem's intrinsic properties are represented by the commutative C^* -subalgebras of a C^* -algebra A . The exophysical description of the quantum system is generated by a context dependent fixing of a representation of A . The resulting von Neumann algebra refers to the contextual observables. The context dependence of the objects and the fact that they are entangled with their environment means that it is not realism that is refuted by quantum mechanics but atomism and the idea of context-independent objects.

Keywords: Realism. Atomism. Cartesian Cut. Environment. Contextual objects. Ontic descriptions. Epistemic descriptions.

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