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The Meaning of Quantum Mechanics as a Principle Theory

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In the context of information-theoretical reconstructions of quantum mechanics, Einstein's distinction between constructive and principle theories is typically believed to support arguments against realist (or ψ-ontic) interpretations of quantum mechanics. For instance, one argues that since such interpretations have neither the explanatory power of a principle theory, nor the explanatory power of a constructive theory, they must be rejected as explanatorily defective. Realist interpretations typically have a representation-based metasemantics, i.e., they explain why quantum terms have the semantic values they are taken to have by appeal to the very semantic rules that assign those values to the terms. In this sense, realist interpretations make metasemantics easy. The question addressed in this paper is whether information-theoretical reconstructions can keep easy metasemantics despite their rejection of realist interpretations.
After reviewing a couple of arguments advanced by proponents of information-theoretical reconstructions against realist interpretations, I consider in some detail the following answers to that question:
1. Adopt some version of a ψ-epistemic interpretation of quantum mechanics, according to which the nature of the quantum state is such that although it does not represent physical reality, it does represent our knowledge of (or information about) it.
2. Re-conceive the nature of fundamental physical reality. For instance, this may be considered not mechanical, but informational, or as not consisting of objects, but (informational) structure all the way down.
3. Transfer the easy metasemantics of the general principles to quantum mechanics by reconstruction. If such transfer is possible, then quantum mechanics is said to acquire a precise meaning in virtue of the first principles.
4. Give up easy metasemantics. Reconstructed quantum mechanics can be taken as a non-Boolean probability theory, rather than a theory that describes physical reality. Its meaning then must be determined by something else than semantic rules.
My discussion will be focused especially on options 2 and 4. In particular, I argue that it is precisely as a consequence of considering the implications of 2 that one is led to endorse 4. However, I also argue that giving up easy metasemantics is avoidable. Quantum mechanics, reconstructed from general principles, may be considered as a probability theory without blocking easy metasemantics.

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