

What is “quantum” about quantum systems?

Reasoning about non-classical information flow

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In this talk I adopt the semantic (or “logical”) approach to information, which is one of the standard approaches within philosophy of information. In the semantic-logical tradition, information can be true or false, and is always “about” something: propositions have “informational content”, e.g. a physical system may carry information about some other system. I thus consider semantic information as objectively present in physical systems, and indicate its temporal/dynamic and spatial/epistemic dimensions: information flows (changes in time, due to informational actions, such as measurements) and is local (i.e. concentrated at spatial locations, where it is available to potential observers). From this point of view one is interested in studying the nature of information present in quantum physical systems, and to compare it to its classical counterpart. I argue that (contrary to the claims of traditional quantum logic) the difference between the quantum and classical case can be best explained in terms of *different dynamics of information*, and not in terms of different “logics” of “static” (propositional) information: the way that information gets *updated* (through measurements) makes all the difference.

The views presented in this talk are supported by my joint work in [1, 2] with A. Baltag, on a dynamic-logical approach to the foundations of quantum physics.

[1] A. Baltag and S. Smets, “Complete Axiomatizations for Quantum Actions”, International Journal of Theoretical Physics, to appear.

Available at <http://www.vub.ac.be/CLWF/SS/IQSA.pdf>

[2] A. Baltag and S. Smets, “What can Logic learn from Quantum Mechanics?”, paper presented at the ECAP05 workshop on quantum information.

Available at <http://www.vub.ac.be/CLWF/SS/ECAP.pdf>