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Synthetic quantum theory in higher cohesive toposes

There are two traditional mathematical formalizations of quantum physics via quantization: "algebraic deformation quantization" and "geometric quantization". I discuss how the latter has a natural axiomatic ("synthetic") formulation in those higher toposes which are equipped with two adjoint triples of higher idempotent modalities – a joint refinement of what Lawvere had called "synthetic differential geometry" and "cohesion". This yields synthetic re-derivations of classical and of more recent results in geometric quantization, and lifts them from quantum mechanics to local ("extended") quantum field theory in higher dimension. I close by indicating examples of Chern-Simons type field theories. The example in dimension 2 recovers C-star algebraic deformation quantization as its "holographic dual"; the example in dimension 3 holographically recovers twisted equivariant K-theory. The example in dimension 7 relates to current questions in non-perturbative string theory.

(Related material is available at ncatlab.org/schreiber/show/Higher+geometric+prequantum+theory)