# Generating Ontology: From Quantum Mechanics to Quantum Field Theory

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## Abstract

Philosophical interpretations of theories generally presuppose that a theory can be presented as a consistent mathematical formulation that is interpreted through models. Algebraic quantum field theory (AQFT) can fit this interpretative model. However, standard Lagrangian quantum field theory (LQFT), as well as quantum electrodynamics and nuclear physics, resists recasting along such formal lines. The difference has a distinct bearing on ontological issues. AQFT does not treat particle interactions or the standard model. This paper develops a framework and methodology for interpreting such informal theories as LQFT and the standard model. We begin by summarizing two minimal epistemological interpretation of non-relativistic quantum mechanics (NRQM): Bohrian semantics, which focuses on communicables; and quantum information theory, which focuses on the algebra of local observables. Schwinger's development of quantum field theory supplies a unique path from NRQM to QFT, where each step is conceptually anchored in local measurements. LQFT and the standard model rely on postulates that go beyond the limits set by AQFT and Schwinger's anabatic methodology. The particle ontology of the standard model is clarified by regarding the standard model as an informal modular theory with a limited range of validity.

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