Abstract Submitted
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Basing quantum theory on information processing[1] HOWARD BARNUM, Los Alamos National Laboratory — I consider information-based derivations of the quantum formalism, in a framework encompassing quantum and classical theory and a broad spectrum of theories serving as foils to them. The most ambitious hope for such a derivation is a role analogous to Einstein's development of the dynamics and kinetics of macroscopic bodies, and later of their gravitational interactions, on the basis of simple principles with clear operational meanings and experimental consequences. Short of this, it could still provide a principled understanding of the features of quantum mechanics that account for its greater-than-classical information-processing power, helping guide the search for new quantum algorithms and protocols. I summarize the convex operational framework for theories, and discuss information-processing in theories therein. Results include the fact that information that can be obtained without disturbance is inherently classical, generalized no-cloning and no-broadcasting theorems, exponentially secure bit commitment in all non-classical theories without entanglement, properties of theories that allow teleportation, and properties of theories that allow "remote steering" of ensembles using entanglement. Joint work with collaborators including Jonathan Barrett, Matthew Leifer, Alexander Wilce, Oscar Dahlsten, and Ben Toner.

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