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Approaching relativistic Quantum Theory via Probability Conservation[1] MAIK REDDIGER, Texas Tech University, Department of Physics and Astronomy & Department of Chemistry and Biochemistry, BILL POIRIER, Texas Tech University, Department of Chemistry and Biochemistry & Department of Physics and Astronomy — The mathematical intractabilities of relativistic quantum theory are seldom traced back to outstanding conceptual problems in the foundations of quantum mechanics. This is surprising, since conceptual problems indicate a lack of proper understanding, thus impeding attempts to give a theory a firm mathematical foundation. Indeed, several scholars have raised doubts whether one of the primary objects of quantum mechanics, the wave function, deserves its privileged status, trying instead to formulate the theory in terms of a probability density function and a velocity vector field. Taking probability conservation as a fundamental postulate, these two quantities will satisfy the continuity equation. Their time evolution is then determined by other dynamical equations and constraints. This perspective on relativistic quantum theory motivates an in-depth study of the general relativistic continuity equation, granting insights into aspects of a rigorous quantum theory on curved spacetimes – even before introducing further dynamical equations and quantities. This poster shows some of those results for the 1-body theory. Our work is part of the ongoing greater discussion pertaining to whether one can reconcile quantum phenomena with the axioms of Kolmogorovian probability theory.

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