

Quantum Space-Time and Matter

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Fundamental research in Mathematical Physics is attempting the ultimate reductionism: Building a Theory of Everything, from which all other physical theories (and thus everything?) should follow. It is likely that interdisciplinary input is needed in order to make progress in this quest. We will briefly and critically assess some current attempts towards reaching this goal. A basic limitation is quantum entanglement, which states that even if we know everything there is to know about an entangled system as a whole, we, on principle, know nothing on its parts. Entanglement appears e.g. in spin chains, which are relevant to condensed matter theory as well as to mathematical approaches to quantum field theory, as I shall briefly explain. I will end with some recent ideas for performing computations in four-dimensional quantum field theories using two-dimensional methods.