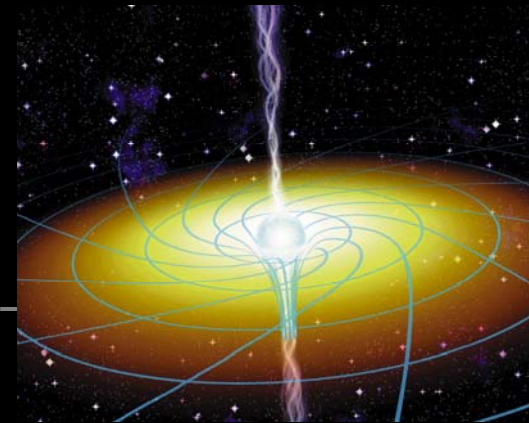


Theory Seminar

Monday, March 7, 2011 2:10 PM 831 Pupin Hall

THE PRINCIPLE OF RELATIVE LOCALITY

We propose a deepening of the relativity principle according to which the invariant arena for non-quantum physics is a phase space rather than spacetime. Descriptions of particles propagating and interacting in spacetimes are constructed by observers, but different observers, separated from each other by translations, construct different spacetime projections from the invariant phase space. Nonetheless, all observers agree that interactions are local in the spacetime coordinates constructed by observers local to them. This framework, in which absolute locality is replaced by relative locality, results from deforming momentum space, just as the passage from absolute to relative simultaneity results from deforming the linear addition of velocities. Different aspects of momentum space geometry, such as its curvature, torsion and non-metricity, are reflected in different kinds of deformations of the energy-momentum conservation laws. These are in principle all measurable by appropriate experiments. We also discuss a natural set of physical hypotheses which singles out the cases of momentum space with a metric compatible connection and constant curvature.



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