

Gauge Gravity and the Unification of Natural Forces

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Abstract

Physics seems to tell us that there are four fundamental force-fields in nature: the gravitational, the electromagnetic, the weak, and the strong force-field (or interactions). But it also seems to tell us that gravity cannot possibly be a force-field, in the same sense as the other three are. And yet the search for a grand unification of all four force-fields is today one of the hottest pursuits in it. Is this the result of a simple confusion? This paper aims at clarifying this situation by doing the following: (i) examine the conception of unification of force-fields; (ii) review the gauge-field program in view of the above examination; (iii) review the various attempts at a gauge theory of gravity; and (iv) articulate the nature of 'gauging' and using it to explain the difference between gravity and the other force-fields.

Keywords: gauge field, gauge symmetry, Yang-Mills fields, general relativity, fundamental force-fields, Einstein-Cartan theory

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