

Explaining Leibniz equivalence as difference of non-inertial appearances: dis-solution of the Hole Argument and physical individuation of point-events

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Abstract

" The last remnant of physical objectivity of space-time " is disclosed in the case of a continuous family of spatially non-compact models of general relativity (GR). The physical individuation of point-events is furnished by the autonomous degrees of freedom of the gravitational field, (viz, the Dirac observables) which represent -as it were -the ontic part of the metric field. The physical role of the epistemic part (viz. the gauge variables) is likewise clarified as embodying the unavoidable non-inertial aspects of GR. At the end the philosophical import of the Hole Argument is substantially weakened and in fact the Argument itself dis-solved, while a specific four-dimensional holistic and structuralist view of space-time (called oint-structuralism) emerges, including elements common to the tradition of both substantivalism and relationism. The observables of our models undergo real temporal change: this gives new evidence to the fact that statements like the frozen-time character of evolution, as other ontological claims about GR, are model dependent.

Keywords: Hole Argument
Leubniz equivalence
Structuralism
Dirac observables
Gauge variables
Non-inertial frames

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