Geometrical Structures of Space-Time in General Relativity

Ignacio Sánchez Rodríguez

July 2007

Abstract

Space-Time in general relativity is a dynamical entity because it is subject to the Einstein field equations.

From the point of view of differential geometry, the space-time is a manifold with a Lorentzian metric. The space-time metric provides different geometrical structures: conformal, volume, projective ...

A deep understanding of the geometrical structures has consequences on the dynamical role played by geometry. We explain these geometrical structures, establishing relationships among them and clarifying the meaning of associated geometrical magnitudes.

Recently, some of my research[1] have been taken into consideration for one of the lines of thought about quantum gravity.[2] This poster is a set of my latest reflections and conclusions about the applications of my work to physics.

[1] Ignacio Sánchez-Rodríguez, *"Intersection of G-structures of first or second order"*. Kowalski, Oldrich (ed.) et al., *Differential geometry and its applications. Proceedings of the 8th International Conference, Opava, Czech Republic, August 27-31, 2001.* Opava: Silesian University at Opava. Math. Publ. Vol. 3, 135-140 (2001).

I. Sánchez Rodríguez, *"On the intersection of geometrical structures"*. M. A. Cañadas-Pinedo, (ed.) et al., *Lorentzian Geometry-Benalmádena 2001.* Publicaciones de la Real Sociedad Matemática Española. Vol. 5. 239-246 (2003).

[2] John Stachel, *"Structure, individuality and quantum gravity"*. French, Steven, (ed.) et al., *The Structural Foundations of Quantum Gravity.* Clarendon Press, Oxford, 2006.

J. Stachel, *"Prolegomena to any future Quantum Gravity"*. ArXiv:gr-qc/0609108 v1, 23 Sep 2006.