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Cosmology in Minkowski space

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Theoretical and observational challenges to standard cosmology such as the cosmological constant problem and tensions between cosmological model parameters inferred from different observations motivate the development and search of new physics. A less radical approach to venturing beyond the standard model is the simple mathematical reformulation of our theoretical frameworks underlying it. While leaving physical measurements unaffected, this can offer a reinterpretation and even solutions of these problems. In this talk, I will perform metric transformations to cast our Universe into different geometries. Of particular interest thereby is the formulation of cosmology in Minkowski space. Rather than an expansion of space, spatial curvature, and small-scale inhomogeneities and anisotropies, this frame exhibits a variation of mass, length, and time scales across spacetime. As applications of this reframed cosmological picture, the naturalness of the cosmological constant is reinspected and promising candidates of geometric origin are explored for dark matter, dark energy, inflation, baryogenesis, and as explanation of current observational tensions. Implications of such candidates include enhanced redshifts to distant galaxy clusters and a mass bias with cluster masses inferred from gravitational lensing exceeding those inferred kinematically or dynamically.

Auteur principal: LOMBRISER, Lucas (University of Geneva)

Orateur: LOMBRISER, Lucas (University of Geneva)