13th Vienna Central European Seminar
on Particle Physics and Quantum Field Theory

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University of Vienna
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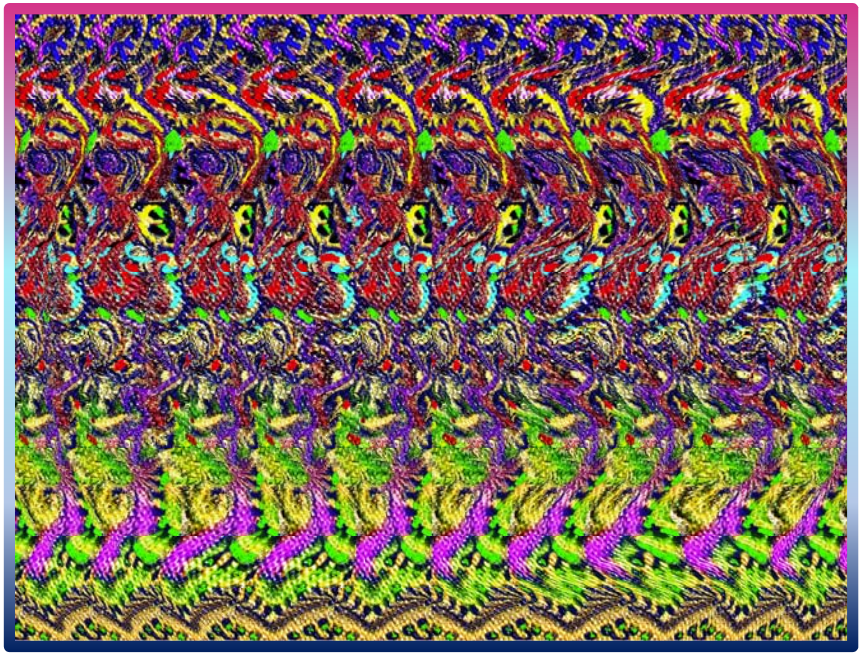

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Scalar Fields & Spontaneous Symmetry Breaking

Erik VERLINDE (University of Amsterdam)

Gravity, Information and the Dark Side of the Cosmos

In most circumstances gravity is well described by the theories of Newton and Einstein. However, there are important open questions regarding gravity at cosmological scales, especially on the nature of the observed dark matter and dark energy. At present we are witnessing a revolution in theoretical physics leading to a completely new view on space-time and gravity. Studies in string theory and black hole physics reveal a deep connection between the structure of space-time and the origin of gravity with key concepts of quantum information theory. Gravity appears as a consequence of a quantum version of the laws of thermodynamics. This means that gravity is not a fundamental force of nature, but rather an emergent phenomenon - just like temperature is an emergent phenomenon that arises from the movement of microscopic particles. This new view on gravity and space-time has particularly important implications for cosmology and naturally explains the observations in galaxies that are currently attributed to dark matter. Are we standing on the brink of a new scientific revolution that will radically change our views on the very nature of space, time and gravity?

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