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Extensions of General Relativity and cosmological dark matter

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Assuming that gravity on cosmological scales is described by General Relativity (GR), observations indicate that 80% of matter is in the form dark matter. The underlying cosmological model, ΛCDM, provides a superb fit to the data on scales of around 1 Mpc or larger. However, the dark matter particle responsible is so far undetected. Moreover, galactic dynamics display an element of regularity, suggesting a fundamental description that is not easily provided by a dark matter particle. In this talk, I will present recent extensions of GR with additional degrees of freedom which are screened on smaller scales so that the success of GR is restored. These provide excellent fits to galactic data, propagate tensor mode gravitational waves at the speed of light and lead to an effective ΛCDM description on large scales reproducing observations of the cosmic microwave background and large-scale structure. I will briefly present the status of these models and discuss future directions.

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