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Scale invariance and strong dynamics as the origin of inflation and the Planck mass

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Classical scale invariance represents a promising framework for model building beyond the Standard Model. However, once coupled to gravity, any scale-invariant microscopic model requires an explanation for the origin of the Planck scale. In this talk, I will present a minimal example for such a mechanism and show how the Planck mass can be dynamically generated in a strongly coupled gauge sector. I will consider the case of hidden SU(N) gauge interactions that link the Planck scale to the condensation of a scalar bilinear operator that is nonminimally coupled to curvature. The effective theory at energies below the Planck mass contains two scalar fields: the pseudo-Nambu-Goldstone boson of spontaneously broken scale invariance (the dilaton) and a gravitational scalar degree of freedom that originates from the Rˆ2 term in the effective action (the scalaron). I will discuss the effective potential for the coupled dilaton-scalaron system at one-loop order and demonstrate that it can be used to successfully realize a stage of slow-roll inflation in the early Universe. Remarkably enough, our predictions for the primordial scalar and tensor power spectra interpolate between those of standard Rˆ2 inflation and linear chaotic inflation. For comparatively small gravitational couplings, one thus obtains a spectral index n_s ˜= 0.97 and a tensor-to-scalar ratio as large as r ˜= 0.08.

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