Time Variation of "Constants"

P. Dirac Nature 139 (37) 323
W. Marciano PRL 52 (84) 489

Kaluza-Klein theories: Unification of forces in an enlarged space-time of 4+N dimensions
N = 7 or 8
Mean radius of extra dimensions: $R \sim \ell_p$
Planck length: $\ell_p \sim 10^{-33}$ cm

Expanding universe $\Rightarrow \dot{R}$

$\dot{R}$ **causes time-varying fundamental constants**

$$a = \frac{e^2}{\hbar c} \sim \frac{1}{137}$$

KK-theories: $\dot{a} \sim \dot{G}$

The mass of nonfundamental particles, e.g. m_p**, may be time-dependent.**

$$\frac{d}{dt}\left(\frac{m_p}{m_e}\right) \quad ?$$