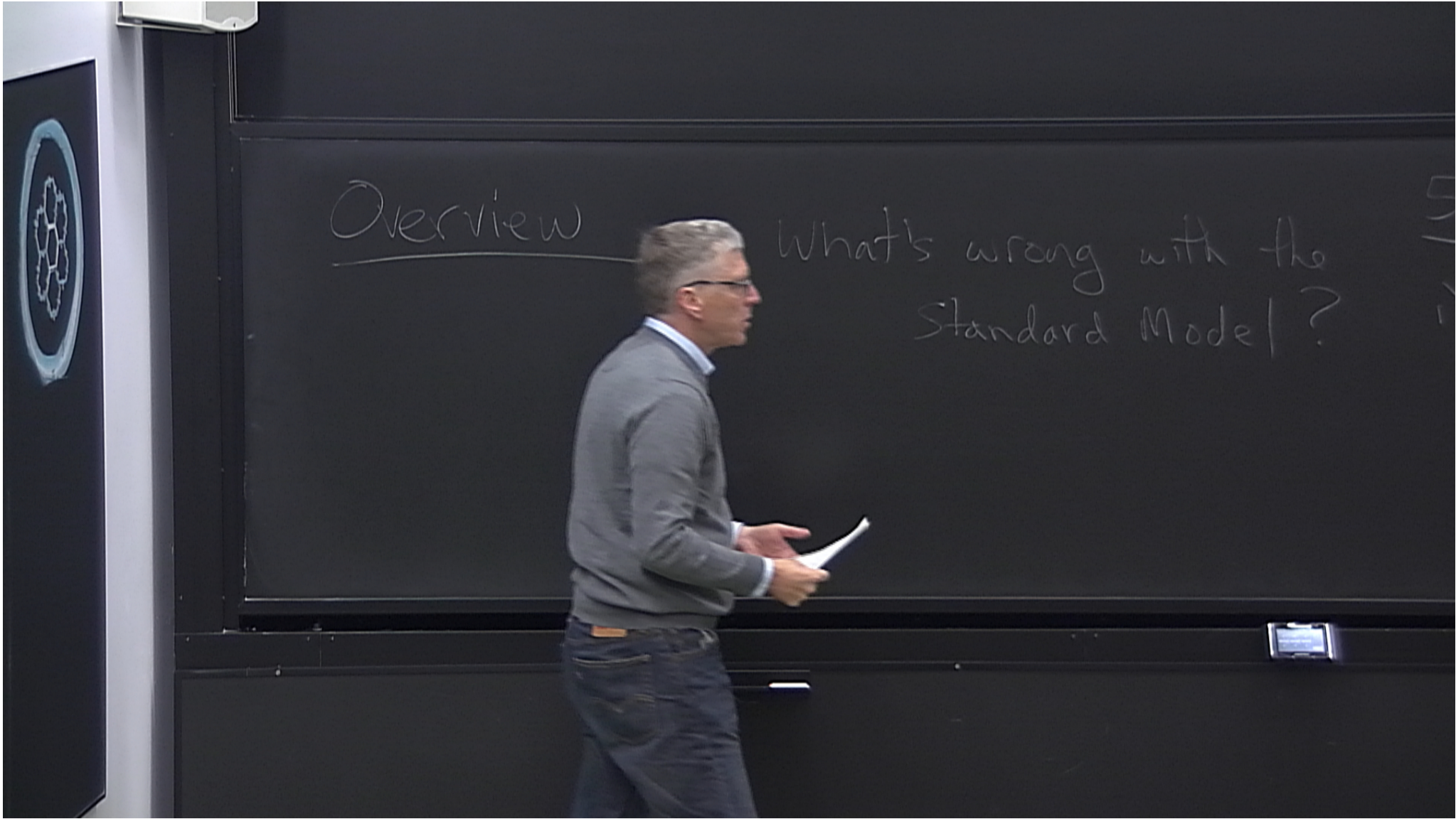


Title: PSI 2015/2016 Explorations in Particle Theory - Burgess - 1

Date: Apr 11, 2016 09:00 AM

URL: <http://pirsa.org/16040020>

Abstract:



What's wrong with the Standard Model?

5 Observations that do not work:

1) ν oscillations

2) Dark Matter?

3) Dark Energy?

} $\sim 25\%$ not in the SM.
} $\sim 70\%$

works:

4) Primordial Fluctuations

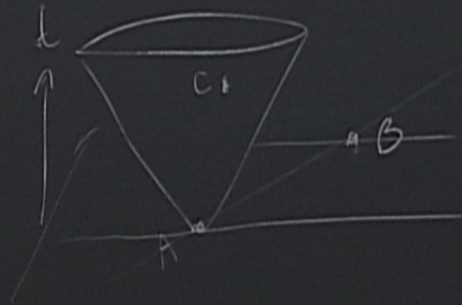
5) Baryogenesis

} initial conditions

not in the SM,

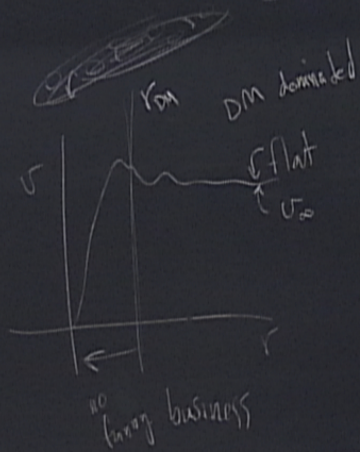
Relativity of simultaneity:

Causality:



nothing moves faster than light

Dark Matter



Circular orbits:

$$\frac{v^2}{r} \approx a = \frac{GM(r)}{r^2}$$

$$v^2 = \frac{GM(r)}{r}$$

$$M = \int_0^r dx x^2 \rho(x)$$

$$v^2 \text{ indep of } r \\ \rightarrow \rho(r) \approx \frac{1}{r^2}$$

(Standard Model + GR)

2) Dark Matter?

3) Dark Energy?

~25%

~70%

not in the SM.

$$v_{\infty}^4 \propto L$$

Tully-Fisher relation

Plot $v(r/R_D)$ for many galaxies. then find v_{DM}/v_D depends only on L

For small L $v_{DM} < v_D$

For large L $v_{DM} \approx v_D$

} can be summarized by v for which (MOND)

$$a(r) = v^2/r \approx 10^{-10} \text{ cm/s}^2 = a_0$$

not in the
SM,

2) X-rays in hot gas

$$ra = \frac{GM(r)}{r}$$

$$\frac{1}{p} \frac{dp}{dr} = -a(r) \rightarrow \frac{d \log p}{d \log r} + \frac{d \log T}{d \log r} = -\frac{r m_w}{T} a(r)$$

$$p = nT = \frac{\rho T}{m_w}$$

$T \sim r$ independent

$$p \sim r^{\alpha} \quad \alpha = -2 \rightarrow -1$$