

Title: Gravitational Aether as a solution to the cosmological constant problem

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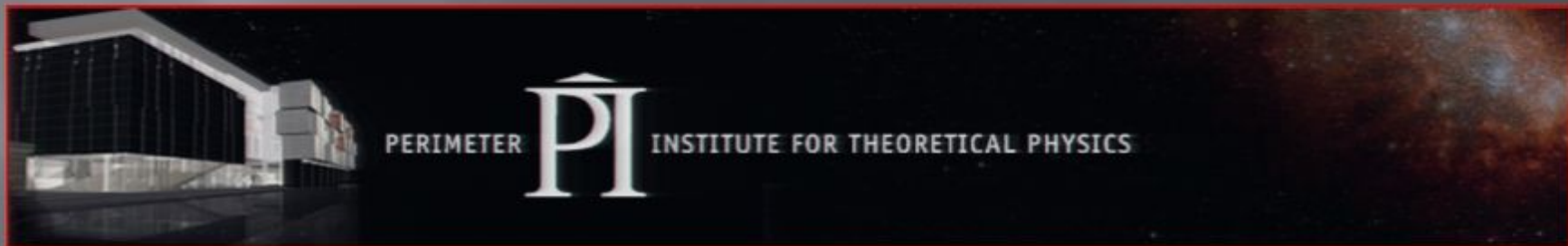
Abstract:

PASCOS meeting, June 2008, Perimeter Institute

GRAVITATIONAL AETHER

AS A SOLUTION TO THE COSMOLOGICAL CONSTANT PROBLEM

Niayesh Afshordi

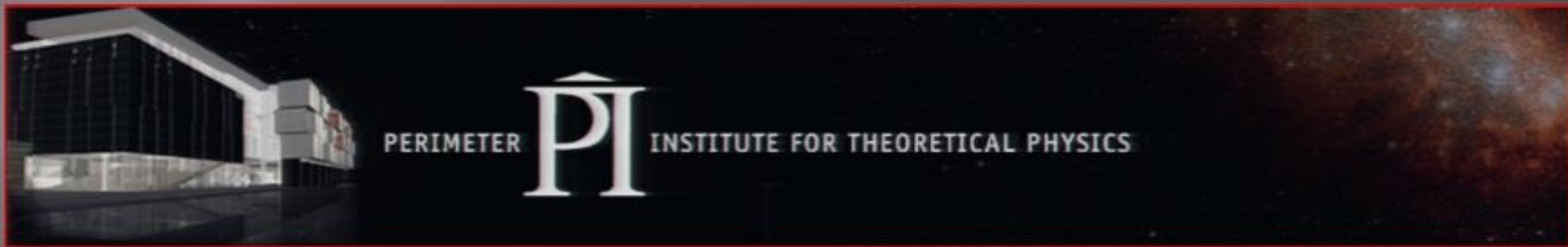


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Cosmological constant problem

□ Einstein Equation

$$G_{\mu\nu} = T_{\mu\nu}$$

space-time curvature:
 $(10^{-3} \text{ eV})^4$

vacuum energy density :
 $\gtrsim \pm (100 \text{ GeV})^4$
+ excitations

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Only known solution: Landscape + Anthropic*

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□ Ly- α +WMAP3 (Seljak, Slosar, McDonald 2006):

$$G_N/G_R = 0.73 \pm 0.04$$

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- ▣ Cuscuton ($c_s = \infty$) : does not propagate information (Afshordi, Chung, Geshnizjani 2007)

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- Aether follows the velocity of non-relativistic matter

solar system tests

- Even vortical modes follow the velocity of dense objects

$$\mathbf{u}_{\text{in}} = \mathbf{u}_{\text{out}} \rho_{\text{out}} / \rho_{\text{in}} \ll \mathbf{u}_{\text{out}}$$



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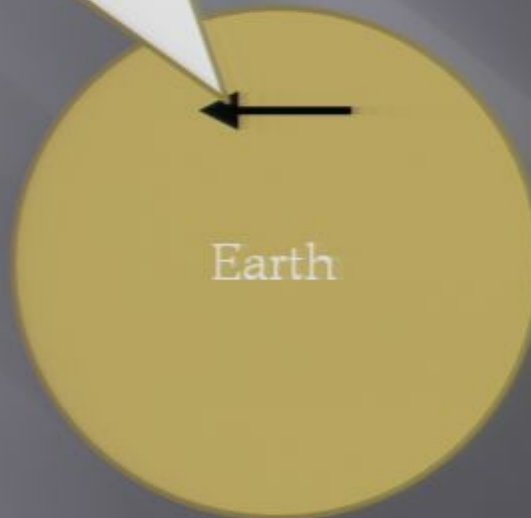
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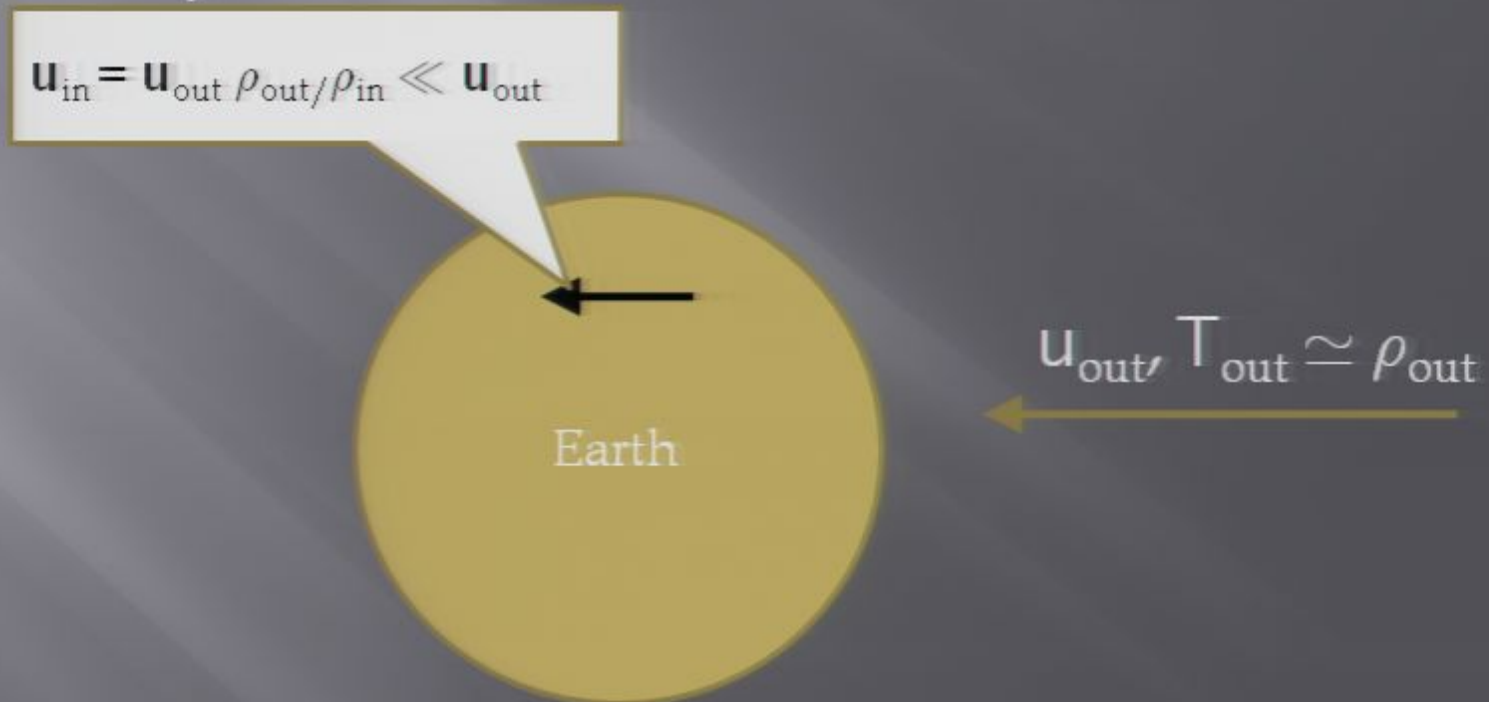
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A yellow circle representing Earth. A yellow arrow points from the center of the circle towards the right.

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→ As long as internal pressure is negligible, we reproduce GR with a renormalized G_N

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 - Gravity waves ??, need an action for the theory

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Minimal coupling to gravity

→ does not address the cosmological constant problem

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- ▣ Inflationary scenarios are only slightly modified
- ▣ Could we tie black hole formation and late-time cosmic acceleration? How about an action?