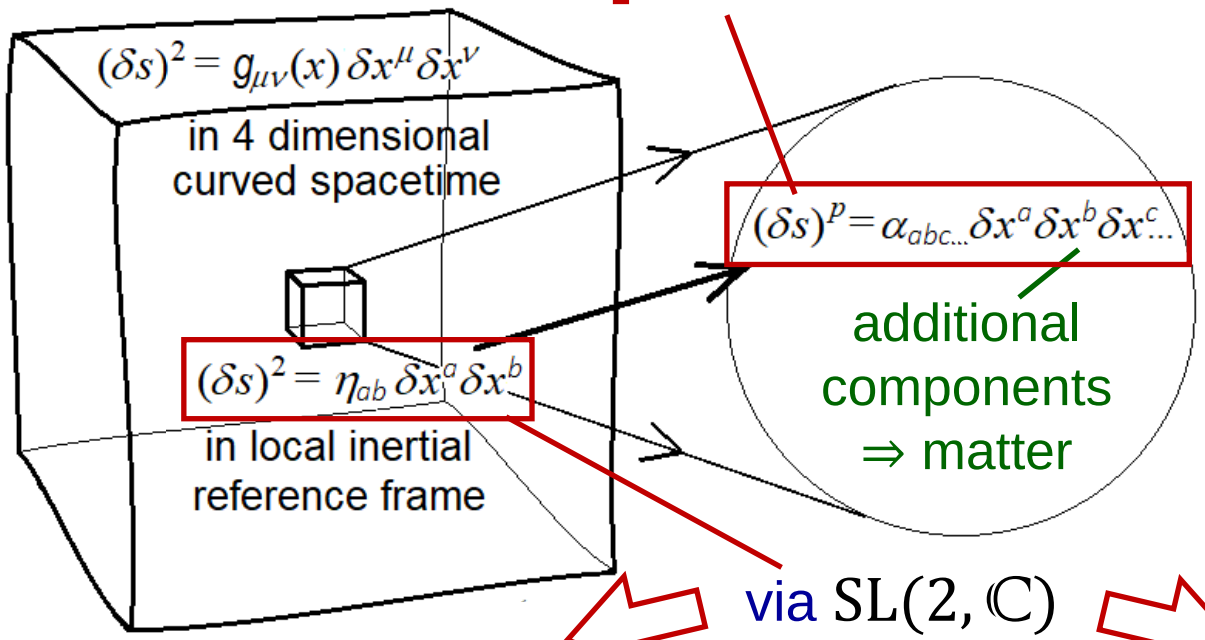
Generalised Proper Time as a Basis for the Dark Sector



via $\mathrm{SL}(2,\mathbb{C})$ Lorentz sym. of quadratic form

$\mathrm{E}_6, \mathrm{E}_7, \ldots$ symmetry of cubic, quartic,… forms

symmetry ⇩ breaking

Standard Model of Particle Physics

arXiv:1709.03877

Alternative branch:

$\mathrm{SL}(p,\mathbb{C})$ on p^{th} order form

symmetry ⇩ breaking

‘hidden QCD’ dark sector

non-Abelian gauge groups

non-compact for dark energy

compact for dark matter

arXiv:2209.06162

Independent gauge sectors

⇕

interact via gravity of classical GR

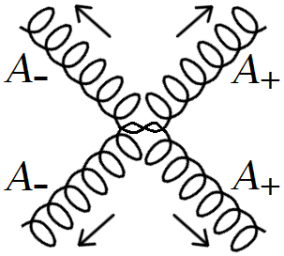
David Jackson

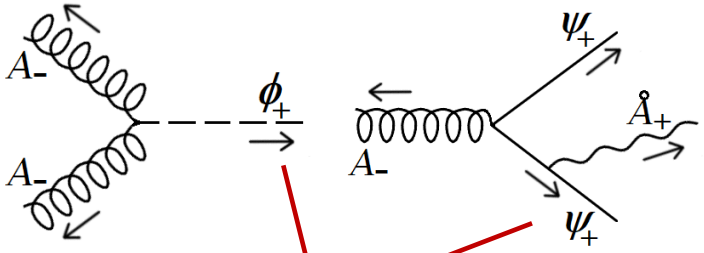
Cosmology from Home, July 2023

Non-compact gauge group $\mathrm{SL}(p-2,\mathbb{C})_D$

A_+ positive and A_- negative K.E. states

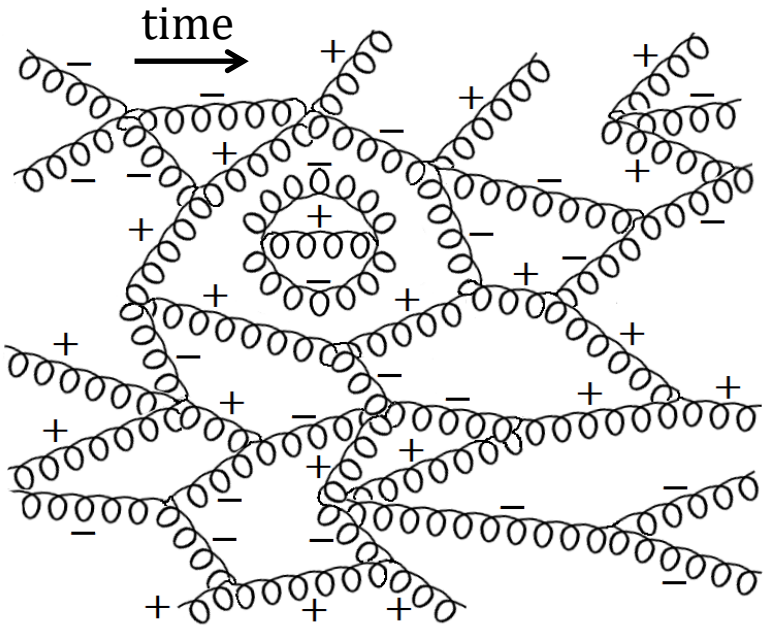
create out of vacuum:

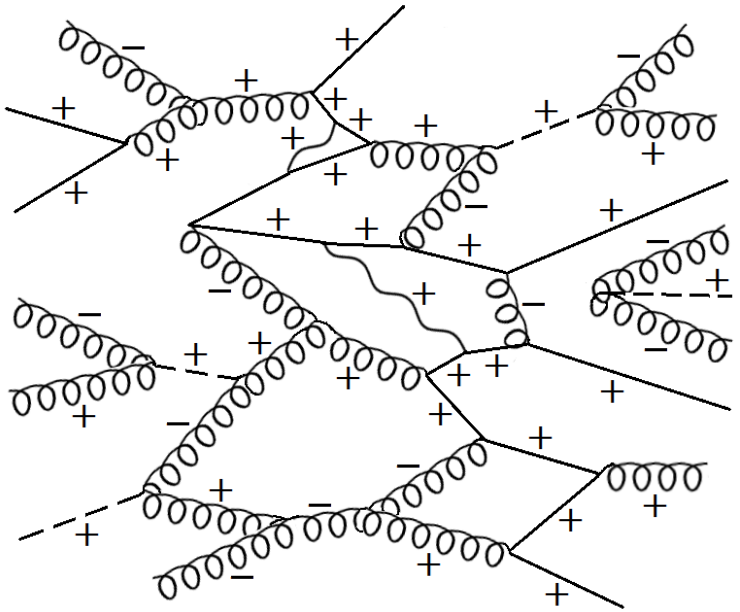




However, M_+ matter states also in dark sector vacuum → asymmetric perturbation

Raging vacuum sea of states:





By sym., $\pm$ contributions cancel

Gravitationally benign:

$\rho_V = 0, \quad p_V = 0$

for vacuum: $p_V = w_V \rho_V$, with $w_V = -1$

Small residual gravitational effect:

$\rho_V > 0, \quad p_V < 0$

Many features desired for Dark Energy:

macroscopic spatial and temporal uniformity (since from vacuum)

can have ultra-low $\rho_V > 0$ with source of $p_V < 0$ $(w_V = -1)$

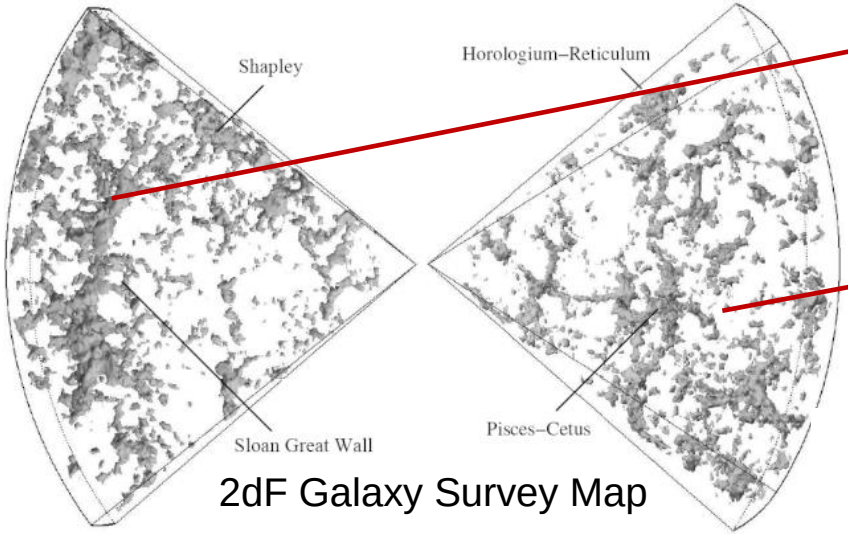
only 'seen' gravitationally (in dark sector with DM candidate)

based on fundamental theory (unifying basis: generalised proper time)
(with a visible SM matter branch)

Possible very early universe inflationary phase with:

$\rho_V \ggg 0$, $p_V \lll 0$ and $w_V = -1$

leaving observable signals in cosmic wall/web/void structures



2dF Galaxy Survey Map

cf. 'Cosmological Collider' and 'Cosmological Bootstrap'

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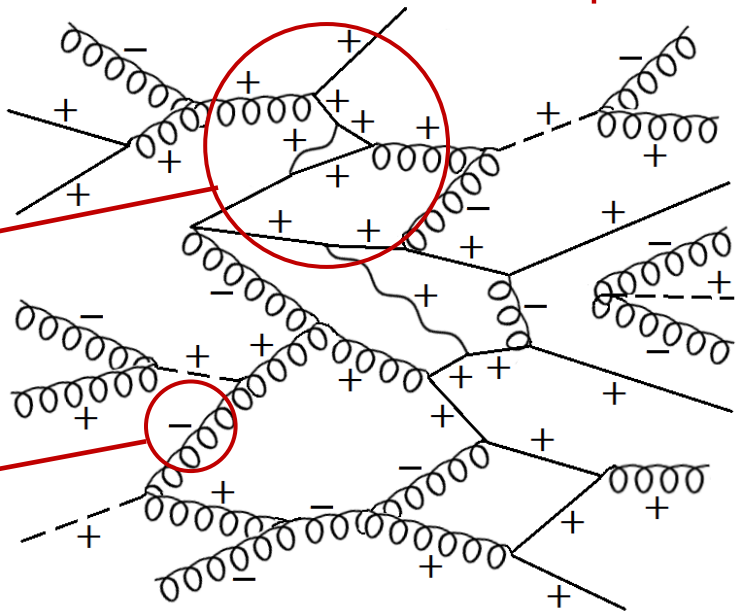

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