

# Macro-Quantum Emergent Gravity

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The big questions are

1. How does inflation work in the creation of the universe?
2. Why is the entropy low in the early universe?
3. What is dark energy and dark matter?
4. Why is the electron stable? (implication for Ken Shoulders EVOs)
5. What is the Galactic Halo? Why is the stellar rotation curve flat in a wide region?
6. What is causing the gravity anomaly in the two NASA Pioneer space probes?
7. What makes the gamma ray bursts?
8. Why the universal slope of the Regge paths of the hadronic resonances?

I suppress indices as much as possible for brevity in e-mail. When I am forced to use them, a,b,c in tangent fiber, u,v,w in base space, with  $I = \text{Kronecker delta } \delta^a_a$  in the global aligned frame in flat Minkowski space-time. This frame is physical i.e. all non-rotating inertial detectors are on globally flat timelike geodesics where the geodesic deviation tidal curvature tensor field is identically zero in that limiting case.

The Einstein-Cartan tetrad is

$$e = I + B$$

I = identity

When the substratum warp field  $B = 0$  identically, the tangent fiber is aligned with the base space in the "convenient" global frame. Of course Diff(4) transformations in this globally flat  $B = 0$  everywhere-when limit will misalign the fiber with the base describing inertial forces on globally flat non-geodesic detectors. These inertial forces, that are

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locally equivalent, to gravity cannot exist without non-gravity electrical forces. In this  $B = 0$  limit the geodesic deviation tidal tensor field AKA Cartan-Einstein curvature 2-form is identically zero.

$$B \sim L_p^2 \text{Grad argPSI}$$

Goldstone phase of vacuum ODLRO is argPSI, Grad is 4D.

In terms of Cartan's exterior derivative  $d$  with  $d^2 = 0$

argPsi is a 0-form

$$B \sim L_p^2 d \text{argPSI}$$

$dB \neq 0$  only because of multiple connectivity, i.e. singularities in argPSI that make  $B$  closed but not exact despite the notation  $d \text{argPSI}$ . See John Baez's book, on Gravity and Knots for example. The cohomology is non-trivial like vortex lines in superfluid helium which is, like the Higgs Ocean post-inflationary vacuum, a macro-quantum condensed system of real quanta rather than, as in our problem of emergent gravity, virtual zero-point quanta.

Technically  $H^1$ , the first cohomology group of the local macro-quantum ODLRO order parameter PSI is larger than the trivial identity group that describes a simply-connected manifold.

PSI = LOCAL post-inflation order parameter (a complex-numbered scalar field in a 4D real manifold)

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