On the physical foundation of geometry

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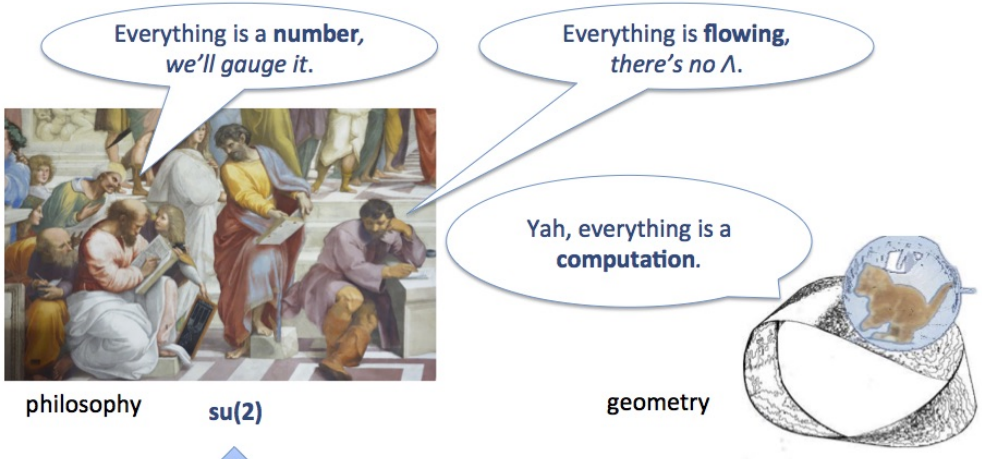
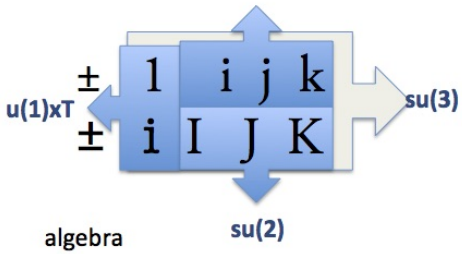
a Connection Algebrodynamics Theory





Gravity: conformal and coincident.
Matter: geometrised and relativised.
Paradigm: "Don't panic."

physics

Theory

1. Assume a scalar field ϕ.

   Incorporate global Lorentz symmetry with $\eta_{\mu\nu}$: scalar gravity (Gunnar Nodström 1912-1913, Einstein-Focker 1914).

2. Assume a gauge field A_μ.

   Incorporates local Lorentz symmetry (Utiyma 1956, etc etc).

We're done. It remains to calculate the implications.

The two assumptions determine the spacetime structure, the gravitational interaction, the dark sector, and the origin of the universe.

Take-home from yesterday

Phenomenology with spin current

The full ambidextrous action

$$I = \int \mathbf{D}\phi^I \wedge \mathbf{D}\phi^J \wedge \left(g_+{}^+\boldsymbol{F}_{IJ} - g_-{}^-\boldsymbol{F}_{IJ}\right) - \int \star\lambda - \int \mathbf{D}\phi^I \wedge \boldsymbol{t}_I - \int \boldsymbol{A}^{IJ} \wedge \boldsymbol{O}_{IJ}\,,$$

When ${}^\pm\boldsymbol{O}^i = \sqrt{\kappa}{}^\pm O \star \mathbf{e}^i \neq 0$, we obtain...

- Coupling between effective DM and material spin current

$$\dot{\hat{\rho}} + 3H\left(\hat{\rho} + \frac{2\beta}{\kappa\tau^2}\right) = \frac{6\beta}{\kappa\tau^3} - \frac{{}^+O + {}^-O}{2\gamma\tau^2}$$

- New effect in the Friedmann equations
  $\Omega \equiv \frac{\kappa}{2\gamma}\left({}^+O + {}^-O\right)$, $\Sigma \equiv \frac{\kappa^{3/2}}{\alpha\gamma^2{}_\phi}\left(g_+{}^-O - g_-{}^+O\right)$

$$3\alpha H^2 + 3H\Omega + \frac{3}{4}\frac{\Omega^2}{\alpha} = \kappa\left(\rho + \hat{\rho}\right) + 3\beta\tau^{-2}\,,$$

$$3\alpha H^2 + 2\alpha\dot{H} + 2H\Omega + \frac{\Omega^2}{4\alpha} + \dot{\Omega} + \frac{\Sigma}{\sqrt{\kappa}} = -\kappa p + \beta\tau^{-2}\,.$$

Thus: essentially 1 new parameter in the dynamical sector. On the topological sector: consult Stylianos Papadopoulos.

Geometrization vs. Unification. The Reichenbach–Einstein Quarrel about the *Fernparallelismus* Field Theory

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This study reconstructs the 1928–1929 correspondence between Reichenbach and Einstein about the latter's latest distant parallelism-unified field theory, which attracted considerable public attention at the end of the 1920s. Reichenbach, who had recently become a Professor in Berlin, had the opportunity to discuss the theory with Einstein and therefore sent him a manuscript with some comments for feedback. The document has been preserved among Einstein's papers. However, the subsequent correspondence took an unpleasant turn after Reichenbach published a popular article on distant parallelism in a newspaper. Einstein directly wrote to the Editorial Board complaining about Reichenbach's unfair use of off-the-record information. While Reichenbach's reply demonstrates a sense of personal betrayal at Einstein's behavior, his published writings of that period point to a sense of intellectual betrayal of their shared philosophical ideals. In his attempts to unify both electricity and gravitation, Einstein had abandoned the physical heuristic that guided him to the relativity theory, to embrace a more speculative, mathematical heuristic that he and Reichenbach had both previously condemned. A decade-long personal and intellectual friendship grew fainter and then never recovered. In addition to Giovanelli, 2016a, this study, relying on archival material, aims to revisit the Reichenbach–Einstein relationship in the late 1920s in light of Reichenbach's neglected contributions to the epistemology of the unified field theory program. Thus, this study hopes to provide a richer account of Reichenbach's philosophy of space and time.

Keywords: Hans Reichenbach • Albert Einstein • Relativity Theory • Unified Field Theories • Teleparallelism • Unification • Geometrization

Introduction

According to his recollections, Einstein (1949a, 73-75) had always considered his 1915 field theory of gravitation, the general theory of relativity, as nothing but a stepping stone toward a 'unified field theory',[1]

The energy and the entropy

In the inertial frame we have

$$\nabla_\alpha \left(\sqrt{-g} H^{\alpha\mu}{}_\nu\right) = \sqrt{-g}\left(T^\mu{}_\nu + \cancel{t^\mu{}_\nu}\right)$$

2nd lesson in Q-gravity:
Integrating a vanishing energy density may give a non-vanishing energy charge!

- **Energy-momentum** from Noether's theorem:
  $P_\mu = \int \mathrm{d}^2 S \sqrt{-g} \mathring{H}^{i0}{}_\mu n_i$.
- **Entropy** from Wald's theorem:
  $S = -\int \mathrm{d}^3 V \sqrt{-g} \mathring{H}^{\alpha\mu}{}_\beta n^\beta{}_\alpha n_\mu$.

Complementary approach.

Time. A scalar.

Energy. A GL matrix.