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Subject: **Physical meaning of Waldyr's Minkowski-Non-Metricity connection split & Kleinert's world crystal**

Date: July 18, 2009 4:32:28 PM PDT

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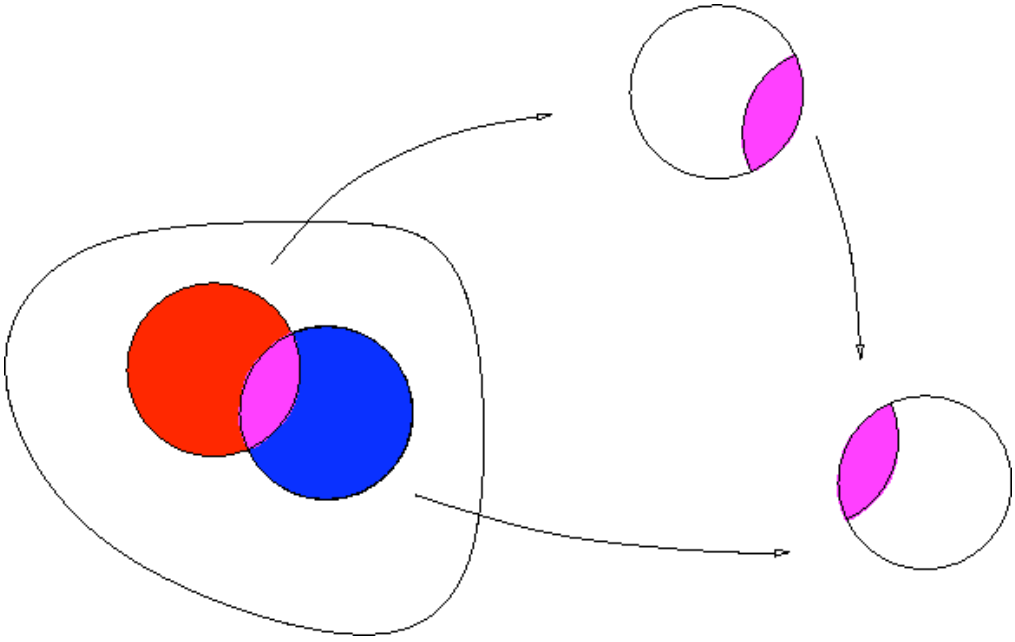
11 Attachments, 765 KB



I give the complete local Poincare group Λ = 0 geometrodynamical field coupling to leptons, quarks, electroweak-strong gauge bosons below.
This also includes the effect of rotating frames e.g. Sagnac effect et-al.

It also includes, in principle, rotating superconductors as in the alleged Podkletnov effect that has not been replicated. Gravity wave calculations can also be made in this simpler spin 1 tetrad/spin connection approach in which spin 2 waves are composite effects with spin 0 and spin 1 gravity waves predicted in addition to the spin 2 waves.

From: Paul Zielinski <iksnileiz@gmail.com>
Date: July 18, 2009 8:13:40 AM PDT
To: JACK SARFATTI <sarfatti@pacbell.net>
Cc:
Subject: **Re: Physical meaning of Waldyr's Minkowski-Non-Metricity connection split is obscure**

JACK SARFATTI wrote:

> So when one writes 3.15

The first thing to notice is that the difference of two connections is a $(1,2)$ tensor. If we have two sets of connection coefficients, $\Gamma^{\lambda}_{\mu\nu}$ and $\hat{\Gamma}^{\lambda}_{\mu\nu}$, their difference $S_{\mu\nu}{}^{\lambda} = \Gamma^{\lambda}_{\mu\nu} - \hat{\Gamma}^{\lambda}_{\mu\nu}$ (notice index placement) transforms as

$$\begin{aligned} S_{\mu'\nu'}{}^{\lambda'} &= \Gamma^{\lambda'}_{\mu'\nu'} - \hat{\Gamma}^{\lambda'}_{\mu'\nu'} \\ &= \frac{\partial x^{\mu}}{\partial x^{\mu'}}\frac{\partial x^{\nu}}{\partial x^{\nu'}}\frac{\partial x^{\lambda'}}{\partial x^{\lambda}}\Gamma^{\lambda}_{\mu\nu} - \frac{\partial x^{\mu}}{\partial x^{\mu'}}\frac{\partial x^{\nu}}{\partial x^{\nu'}}\frac{\partial^2 x^{\lambda'}}{\partial x^{\mu}\partial x^{\nu}} - \frac{\partial x^{\mu}}{\partial x^{\mu'}}\frac{\partial x^{\nu}}{\partial x^{\nu'}}\frac{\partial x^{\lambda'}}{\partial x^{\lambda}}\hat{\Gamma}^{\lambda}_{\mu\nu} + \frac{\partial x^{\mu}}{\partial x^{\mu'}}\frac{\partial x^{\nu}}{\partial x^{\nu'}}\frac{\partial^2 x^{\lambda'}}{\partial x^{\mu}\partial x^{\nu}} \\ &= \frac{\partial x^{\mu}}{\partial x^{\mu'}}\frac{\partial x^{\nu}}{\partial x^{\nu'}}\frac{\partial x^{\lambda'}}{\partial x^{\lambda}}(\Gamma^{\lambda}_{\mu\nu} - \hat{\Gamma}^{\lambda}_{\mu\nu}) \\ &= \frac{\partial x^{\mu}}{\partial x^{\mu'}}\frac{\partial x^{\nu}}{\partial x^{\nu'}}\frac{\partial x^{\lambda'}}{\partial x^{\lambda}}S_{\mu\nu}{}^{\lambda} \,. \end{aligned} \tag{3.15}$$

That's the transformation between local detectors in the overlap of the above picture.

Z: What 3.15 represents mathematically or physically depends on the nature of the connections Γ and Γ^.

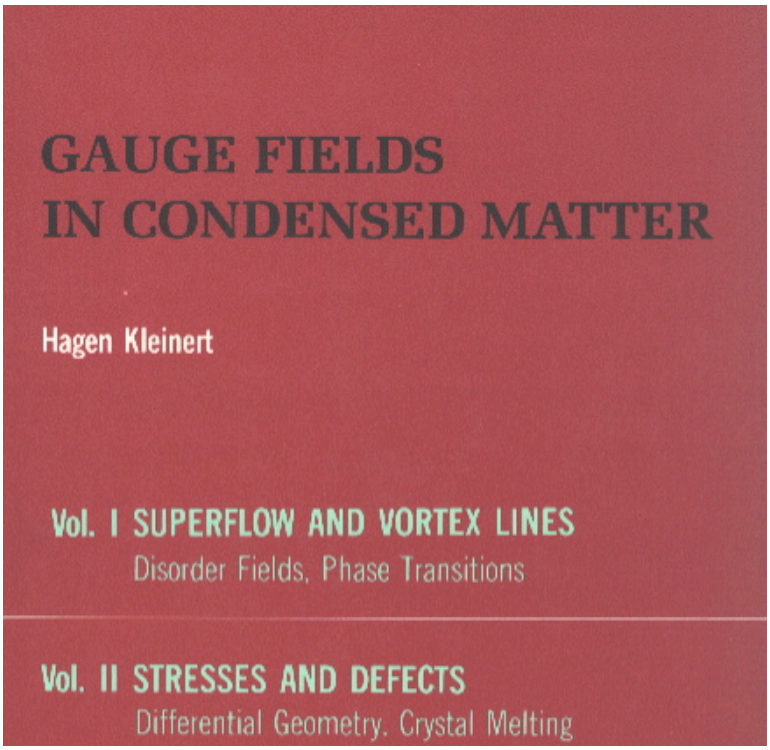
J: Yes, and so?

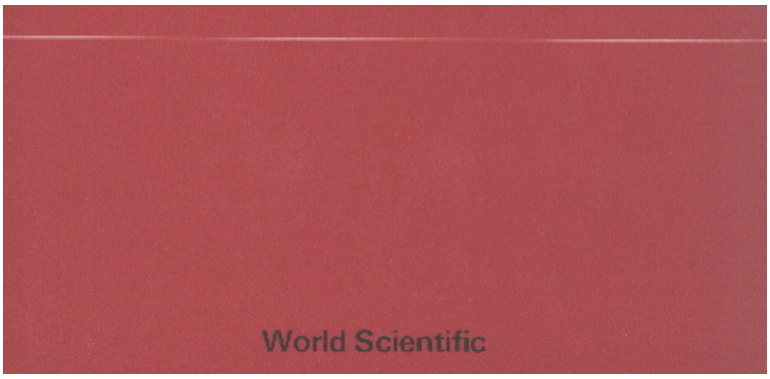
Z: The general meaning is that the difference between *any* two connections is a tensor.

J: I never disputed that. Many times I cited

Affine Connection = Levi-Civita Connection + Contorsion Tensor + Non-Metricity Tensor

out of Kleinert's lectures (a footnote in his Vol 2)





Indeed my own theory

http://www.iop.org/EJ/article/1742-6596/174/1/012045/jpconf9_174_012045.pdf?request-id=28a6b375-697d-46a2-97da-fdc6f5ab83c8

uses

Affine Connection = Levi-Civita Connection + Contorsion Tensor

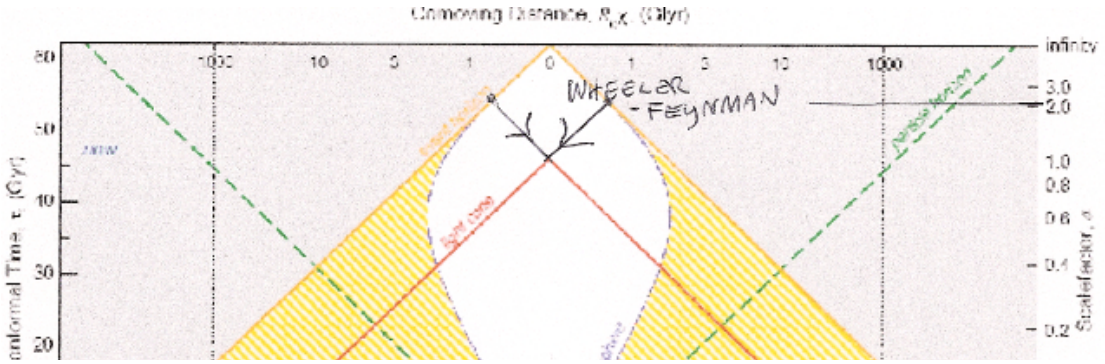
where the RHS comes from localizing the 10-parameter rigid Poincare symmetry invariance group P10 for all matter field dynamical global actions S universally of Einstein's 1905 Special Relativity (SR). This needs to be generalized to the $\Lambda > 0$ dark energy 10-parameter deSitter (dS) group as well as the 10-parameter $\Lambda < 0$ dark matter Anti-de Sitter (AdS) group (e.g. Maldecena conjecture). Also as Tony Smith suggests we need to go to 15-parameter Conformal (Penrose Twistor) group that is broken by rest masses of quarks, leptons & W-mesons from the macro-quantum coherent Higgs-Goldstone fields that Bose-Einstein condense at the moment of inflation's micro--> macro quantum vacuum phase transition.

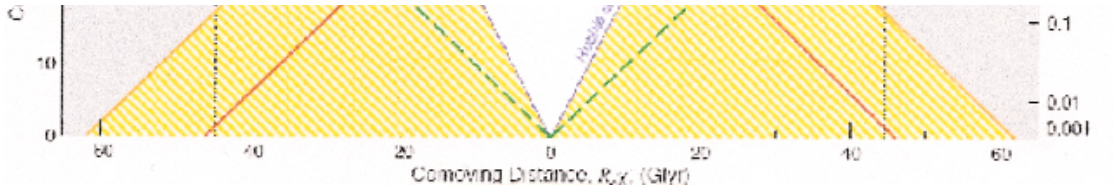
Note for $\Lambda > 0$ dS dark energy

Wheeler-Feynman retrocausality in Novikov loop in time

Λ(today) = (area of our future event horizon world hologram at intersection of our future light cone with it - has not happened yet but will)^-1

dark energy density = (string tension)Λ(today)





OK now what is Waldyr Rodrigues proposing in his non-metricity gravity?

First, there does not appear to be any connection to the local gauge principle, which is

Connection fields for parallel transport of tensor/spinors along vector fields in spacetime and internal fibers are always compensating gauge potentials from localizing globally rigid symmetry invariance groups of the matter field sources of the gravity field.

Waldyr pulls his Mathematical Mule out of the Magician's Top Hat.

Also Waldyr is not adding new physics, he claims he is only reinterpreting Einstein's plain vanilla 1915 GR.

Note I say

Levi-Civita curved space-time connection comes from locally gauging 4-parameter translation T4 subgroup of P10. The actual gauge potentials are the four warped tetrad Cartan 1-forms e^I (LIF)that are "diffeomorphic" invariants, but which form a single 6-parameter Lorentz group 4-vector. Whose invariant is Einstein's local differential space-time interval

ds^2 = e^I(LIF)eI (LIF) = guv(LNIF)e^u(LNIF)e^v(LNIF)

[e^u,e^v] = B^u^vwe^w

LIF and LNIF are physically locally coincident

LIF = free float (zero g-force felt inside it) non-rotating timelike LC-geodesic Local Inertial Frame.

LNIF = locally covariantly tensor accelerating (non-zero g-force felt inside it) possibly rotating timelike off-geodesic Local Non-Inertial Frame.

Note a local Cartan "frame mobile" whose center of mass (COM) is on a timelike geodesic, but which is rotating about its COM is LNIF.

this automatically expresses the Einstein Equivalence Principle EEP ("Einstein's happiest moment" of epiphany - the falling workman in Zurich is weightless!)

In addition the constraint of zero torsion field 2-forms is imposed leading to the 24 spin connection coefficients derived from the 16 tetrad coefficients and their gradients as

$$\omega[e]^{IJ}_{\mu} = 2\, e^{\nu[I}\partial_{[\mu}e_{\nu]}{}^{J]} + e_{\mu K}\, e^{\nu I}\, e^{\sigma J}\partial_{[\sigma}e_{\nu]}{}^{K}. \qquad (2.89)$$

Waldyr makes the very bizarre physical claim

LC curved connection = LC flat connection + Non-Metricity Tensor (W1)

it is consistent with 3.15 above, and it looks formally consistent, but that does not make it ipso-facto good physics.

It is purely a mathematical trick whose physical meaning and importance is not adequately explained as yet by Waldyr.

It seems to evade the local gauge principle.

There does not seem to be a way to *separately* measure the two terms on RHS of (W1) in all possible frames.

Therefore, the split is not physically interesting.

That is, Waldyr proposes

Affine Connection = LC flat connection + Non-Metricity Tensor(W1) + Contorsion Tensor + Non-Metricity Tensor

The mainstream non-metricity tensor comes from localizing the dilation subgroup of the conformal group.

Also, what is the LC flat connection?

It is zero in the Global Inertial Frames (GIF) of 1905 SR.

It's non-zero in accelerating Global Non-Inertial Frame (GNIF) of 1905 SR.

There is a conceptual mismatch since GIFs and GNIFs disappear and are replaced by LIFs and LNIFs in 1905 SR ---> 1915 GR.

Analogy with elementary vector calculus in 3D Euclidean geometry

Given a 3 vector field **V**

V = $\mathbf{V}_L$ + $\mathbf{V}_T$

V_L = **Grad**(Non-Singular Phase)

exact Cartan 1-form

V_T = **Grad**(Singular *Multi-Valued* Dirac-Kleinert Phase)

closed non-exact Cartan 1-form

consider the homological Betti number dimension of the quotient space of Closed p-Forms/Exact p-forms

In algebraic topology, the **Betti numbers** can be used to distinguish topological spaces. Intuitively, the first Betti number counts the maximum number of cuts that can be made without dividing the space into two pieces.

Each Betti number is a natural number or infinity. For the most reasonable finite-dimensional spaces (such as compact manifolds, finite simplicial complexes or CW complexes), the sequence of Betti numbers is 0 from some points onwards (Betti numbers vanish about the dimension of a space), and they are all finite.

The term "Betti numbers" was coined by Henri Poincaré after Enrico Betti.

Relationship with dimensions of spaces of differential forms

In geometric situations when X is a closed manifold, the importance of the Betti numbers may arise from a different direction, namely that they predict the dimensions of vector spaces of closed differential forms *modulo* exact differential forms. The connection with the definition given above is via three basic results, de Rham's theorem and Poincaré duality (when those apply), and the universal coefficient theorem of homology theory.

There is an alternate reading, namely that the Betti numbers give the dimensions of spaces of harmonic forms. This requires also the use of some of the results of Hodge theory, about the Hodge Laplacian.

http://en.wikipedia.org/wiki/Betti_number
form electromagnetism in **p** + 1 dimensions has an **exact** solution which reduces when **p** = 1**.....** Modding out by the action of G on A gives the **quotient** space A/ G consisting **.....** on analogous decompositions of **closed** (**p** + 1)-manifolds. **...**
http://math.ucr.edu/~derek/pform/pform_cqg.pdf
http://www.math.ucdavis.edu/~derek/pform/pform.pdf

e.g. quantized circulation vortex line in the macro-quantum coherent ground state superfluid

curlV_L = 0 irrotational local fluid flow of longitudinal Faraday hydrodynamic field lines

divV_T = 0 incompressible local fluid flow of transverse Faraday hydrodynamic field lines

there are now TWO different kind of non-metricity tensors - very Rube Goldberg. As Isador Rabi asked about the neutrino "Who ordered that?"

Obviously Waldyr's Flat LC connection is analogous to the single-valued phase longitudinal fluid flow because the

Curvature Tensor = Covariant Curl of the Connection with itself

"Flat" means Curvature Tensor = 0 in a finite set of point events (finite region of 4D spacetime continuum).

In terms of Kleinert's world crystal lattice, the LC connection curvature tensor (4th rank) are disclination lattice defects).

The contorsion tensor describes dislocation defects in the world lattice.

The non-metricity tensor describes non-uniform lattice spacings in the world lattice - I think?

What does Waldyr's *different* non-metricity tensor describe?

Note also, that in EM the spin 1 transverse vector potential describes the wave propagation of energy into the far field via transverse polarized waves.

The longitudinal vector potential describes the confined non-propagating near field with longitudinal polarization.

Now in gravity it's nice if we had at least a fictitious globally flat Minkowski spacetime on which we can do Fourier transforms to get momentum space Feynman diagrams. The tetrad fields allow this because they are the true geometrodynamical fields on Minkowski spacetime that encode the gravity curvature of Einstein's 1915 GR and their universal minimal coupling to all the matter fields is the equivalence principle in deepest form.

The universal geometrodynamical coupling to matter fields is then via the tetrad e and spin connections w

Pu = e^IuPI + ***w***^I^JuPIJ + e^IuA^aIQa

Pu = (***I***^Iu + ***A***^Iu)PI + ***w***^I^JuPIJ + (***I***^Iu + ***A***^Iu)A^aIQa

{PI, PIJ} generate the Lie algebra of the 10-parameter spacetime symmetry Poincare group P10 of 1905 Einstein SR

this generalizes to the dark energy dS Lie algebra and the dark matter AdS Lie algebra

For Dirac spinor (spin 1/2) fields

PI = Dirac 4x4 Gamma Matrices

PIJ ~ Commutators of Dirac Gamma Matrices

{Qa} generate the electro-weak-strong force internal symmetry U1 SU2 SU3 groups

[Qa,Qb] = f^cabQc

LNIF "acceleration field" gravity coupling to the electro-weak-strong force spin 1 vector gauge bosons (photon, W-mesons, gluons)

F^aIJ = A^aI,J - A^aJ,I + f^abcA^bIA^cJ

F^auv = eu^Iev^JF^aIJ + ***w***^I^Ku***w***K^JvF^aIJ

F^auv = (***I***^Iu + ***A***^Iu)(***I***^Jv + ***A***^Jv)F^aIJ + ***w***^I^Ku***w***K^JvF^aIJ

includes torsion field coupling to the elementary particle forces i.e.

w^I^Ku***w***K^JvF^aIJ

A^aI = Yang-Mills gauge potentials

Sarfatti Conjecture: unification of long-range gravity with QCD SU3 massless gluon IR confined UV free short-range strong force

Eight post-inflation SU3 gluon vacuum superconductor *multi-valued* condensate Goldstone phases @^a, a = 1 ... 8

The gluon Yang-Mills strong force multi-valued gauge potentials are

A^aI = @^a,I

,I is ordinary partial derivative in LIF coordinate patch

where

@^a = Z^aITheta^I + Z^aJPhi^J

I,J = 0,1,2,3,4

Theta^I & Phi^J are Cartan 0-form *multi-valued singular* Goldstone phases forming two Lorentz group SO(1,3) first rank tensors (4-vectors)

Theta^2 = Theta^IThetaI

Phi^2 = Phi^JPhiJ

raise & lower with Minkowski metric nIJ

multi-valued tetrads

e^I = (Inertial)^I + (Non-Inertial)^I = (zero g-force)^I + (non-zero g-force)^I = (LIF)^I + (LNIF)^I = ***I***^I + ***A***^I

||(LIF)^Iu|| = 4x4 Identity Matrix

(LIF)^Iu = Kronecker-delta

Note that the coefficients

e^Iu encode the actual physical transformation between *arbitrary* locally coincident LIFs & LNIFs.

It is a first rank tensor under the LNIF(u) ---> LNIF(u') "diffeomorphic" local T4(x) GCT "curvilinear" transformation group.

It is a first rank tensor under the LIF(I) ---> LIF(I') SO(1,3) Lorentz group.

(LNIF)^I = diagM-Matrix

M-Matrix = M^I^J = (dTheta)^I/\(Phi)^J - (Theta)^I/\(dPhi)^J

dM^I^J ~ 2 (dTheta)^I/\(dPhi)^J

non-zero dynamically independent torsion field spin connection to be added to w(tetrad) in (2.89)

$$\omega[e]_{\mu}^{IJ} = 2\, e^{\nu[I}\partial_{[\mu}e_{\nu]}{}^{J]} + e_{\mu K}\, e^{\nu I}\, e^{\sigma J}\partial_{[\sigma}e_{\nu]}{}^{K}. \qquad (2.89)$$

w(torsion)^I^J = M^[I,J]

[I,J] means antisymmetrize

w = w(tetrad) + ***w***(torsion)

w(tetrad) from local T4(x)

w(torsion) from local SO(1,3)(x)

Curvature 2-form

R^I^J = dw^IJ + w^IK/\w^KJ

Torsion 2-form

T^I = de^I + w^IK/\e^K

Einstein's 1915 GR has w(torsion) = 0

T^I(tetrad) = de^I + w^IK(tetrad)/\e^K = 0

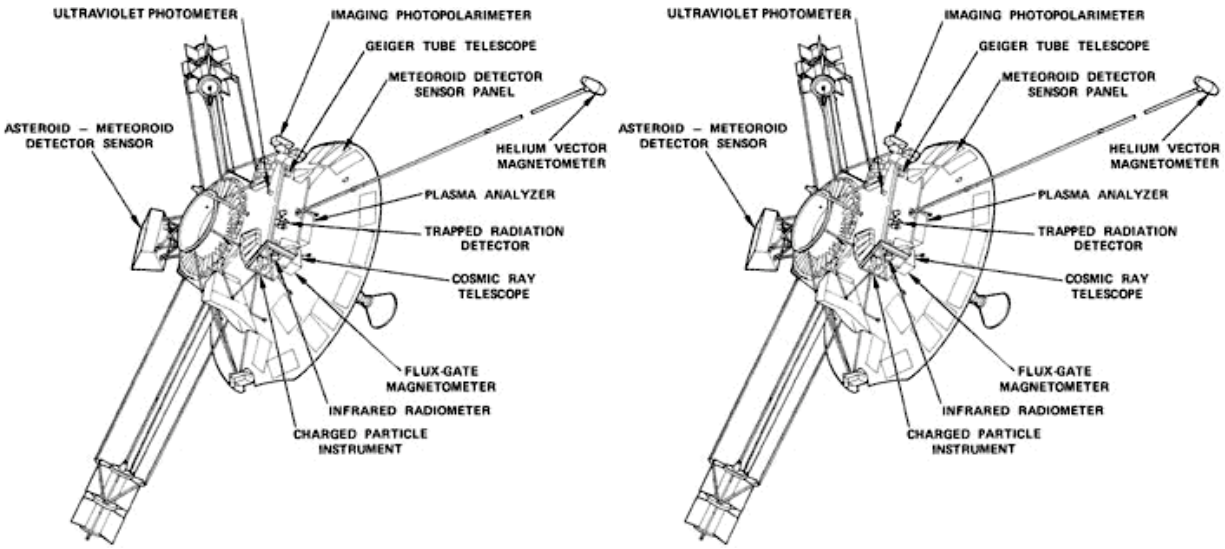
d***I***^I = 0

d***A***^I + w^IK(tetrad)/\(***I***^K + ***A***^K) = 0

w^IK(torsion) = ***w***^IK

w^IK/\(***I***^K + ***A***^K) = T^I =/=0

> > > S^luv is an objective local field configuration of some kind as measured by one detector, whilst S^l'u'v' is the same local field configuration as measured by the locally coincident other detector. That's the physical meaning of (3.15)



PS this is the Pioneer 10 that has the anomaly.

> > The two detectors are in close proximity to each other but in arbitrary relative motion to each other. They are pointing their detectors at the same events. This is the key meaning of relativity - not the theorems of differential geometry which you guys are applying willy nilly perhaps not correctly in my opinion.

The tetrad Cartan 1-forms e^I are objective non-tidal gravity fields because e^Iu is a u-tensor, and e^I is a GCT scalar invariant - no problem there.

Waldyr Rodrigues Jr's non-metricity gravity calculation is

> **10.** In the spherical coordinate chart we have
>
> $$\nabla_{\partial'_\mu}\partial'_\nu = L'^{\rho}_{\mu\nu}\partial'_\rho, \nabla_{\partial'_\mu}dx'^{\alpha} = -L'^{\alpha}_{\mu\nu}dx'^{\nu}$$
> $$D_{\partial'_\mu}\partial'_\nu = \Gamma'^{\rho}_{\mu\nu}\partial'_\rho, D_{\partial'_\mu}dx'^{\alpha} = -\Gamma'^{\alpha}_{\mu\nu}dx'^{\nu} \qquad (12)$$
>
> and the $L'^{\rho}_{\mu\nu}$ and $\Gamma'^{\rho}_{\mu\nu}$ are not all null.

Spherical coordinate chart means static LNIF physically. See John A. Wheeler's books.

We have the following general relation between $L'^{\rho}_{\mu\nu}$ and $\Gamma'^{\rho}_{\mu\nu}$ (see [?], Section 4.5.8)

$$L'^{\rho}_{\alpha\beta} = \Gamma'^{\rho}_{\alpha\beta} + \frac{1}{2} S'^{\rho}_{\alpha\beta} \tag{13}$$

11. Now, since in the Cartesian chart $L^{\rho}_{\alpha\beta} = 0$ but not all $\Gamma^{\rho}_{\alpha\beta}$ are null we get that

$$\Gamma^{\rho}_{\alpha\beta} = -\frac{1}{2} S^{\rho}_{\alpha\beta} \tag{15}$$

and we have, e.g.,

$$g_{1\rho}\Gamma^{\rho}_{00} = -\frac{1}{2} S_{100} = \frac{1}{2} Q_{100} = \frac{mx^1}{r^3}. \tag{16}$$

(16) is for the static LNIF detector whose rocket engines fire keeping it at fixed r without orbital angular momentum.