

# Frank Wilczek's book Lightness of Being

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*Source:* <http://sci.tech-archive.net/Archive/sci.physics.relativity/2009-04/msg01534.html>

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- *From:* FLASH <[flash.starwalker@xxxxxxxxxx](mailto:flash.starwalker@xxxxxxxxxx)>
  - *Date:* Mon, 20 Apr 2009 18:09:11 -0700 (PDT)
- 

The W, Z lepton & quark masses do not come directly from the SU3 color condensate, but from the SU2 flavor condensate.

<http://www.fys.uio.no/forskning/drgrad/forskerskoler/irtg/Eigen/SM-3.pdf>

[http://en.wikipedia.org/wiki/Higgs\\_mechanism](http://en.wikipedia.org/wiki/Higgs_mechanism)

However, the latter may be a facet of the former.

Since the eight condensate strong tri-color force Goldstone phases that give the emergent gravity tetrad & spin connection fields split into 2 homogeneous Lorentz group 4-vectors, their two magnitudes (when real) seem to be the degenerate vacuum manifold for the SU2 flavor group of the weak force. The three internal rotations of SU2 correspond to 3 flavor condensate real vacuum order parameters with two relative Goldstone phases.

Begin forwarded message:

From: JACK SARFATTI <[sarfatti@xxxxxxxxxxxxx](mailto:sarfatti@xxxxxxxxxxxxx)>  
Date: April 20, 2009 3:16:47 PM PDT  
To: Sarfatti\_Physics\_Seminars  
<[Sarfatti\\_Physics\\_Seminars@xxxxxxxxxxxxxxxxxx](mailto:Sarfatti_Physics_Seminars@xxxxxxxxxxxxxxxxxx)>  
Cc: "SarfattiScienceSeminars@YahooGroups.com"  
<[SarfattiScienceSeminars@xxxxxxxxxxxxxxxxxx](mailto:SarfattiScienceSeminars@xxxxxxxxxxxxxxxxxx)>  
Subject: Re: Wilczek on Einstein's changing views on "aether" – emergent gravity from QCD sigma condensate?

Look carefully at Tamara Davis's Figs 1.1 & 5.1 for large-scale cosmological IR structure of universe.

Fig 1.1

Fig. 5.1

<http://www.dark-cosmology.dk/press-releases/dark-cosmologist-returns-to-australia-for-prize>

There are two simple geometrical constructions to note.

The hologram principle works for our spacelike separated event horizon

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(intersection of thin blue horizontal "now" line with past light cone of our future Omega Point.

i.e.  $L_p(t)^* = (L_p^2 L(t))^{1/3}$  hologram equation

i.e. # hologram 2D pixels = # hologram image 3D voxels  $N$

$$L(t)^2 \sim N(t) L_p^2$$

$$L_p^*(t) = N(t)^{1/6} L_p$$

where  $L$  is square root of horizon area in this spacelike sense.

$N(t)$  plotted in Fig 5.1

On the other hand,

the present-day dark energy density  $\sim$  (area of horizon where our future light cone intersects our event horizon) $^{-1}$

On Apr 20, 2009, at 1:54 PM, JACK SARFATTI wrote:

On Apr 20, 2009, at 12:22 PM, Paul Zielinski wrote:

"Vacuum", "ether", whatever you want to call it — the point is that inertia originates from an objective \*local\* interaction between accelerating masses and the physical vacuum. Gravity then alters the objective conditions of inertial motion by acting on the same physical vacuum in a manner that can be described in terms of a 4D geometric model ("curved spacetime").

Isn't that the whole point of the Higgs model for inertia?

RIP "Mach's principle"

Yes for the 19th century naive version – no for the 21 st century retro-causal hologram version.

The more things change, the more they stay the same! Back to the future!

More precisely

Back FROM the future.

———, 1973, "Regge Trajectories as Rotation Black Holes in Strong

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Gravity", Collective Phenomena, H. Frohlich & F.W. Cummings, eds. there were actually two papers there. In one I suggested a close connection between the 8-fold way (hadronic physics back then) and gravity. Very vague glimmer of today – a precognition remote viewing in hindsight. Frohlich was very interested and invited me to Liverpool. The idea was half-baked – too soon – no QCD et-al.

Higgs mechanism in QCD is origin of inertia, i.e. small rest masses of leptons & quarks  $\sim 1$  mev, supplemented by confined virtual gluon/quark pair vacuum fluctuations to get to the 1Gev hadronic rest masses as explained by Wilczek.

But from Einstein & Wheeler's "Mass without mass" we also know that inertia and gravity are also closely linked.

Remember, on a timelike geodesic in curved space-time (to a good approximation) for the COM of a test particle – the inertia cancels out!

That's part of the equivalence principle – no g-force on geodesics.

You only see inertia when a non-gravity force pushes the test particle off-geodesic – g-force.

What we call (Newton's) "gravity force" is a misnomer – it's simply the electrical reaction g-force in a static LNIF – when one exists (outside event horizon).

How gravity emerges from the QCD color force.

The post-inflation sigma meson condensate, i.e. coherent macro-quantum superpositions (Glauber states) of virtual off-mass-shell ? quark-antiquark pairs has THE NINE (count them) real Higgs sigma field ODLRO entangled-virtual quark-antiquark pair coherent order parameters!

(R1R2) (R1G2) (R1B2)

(G1R2) (G1G2) (B1G2)

(B1R2) (G1B2) (B1B2)

This is a 9-Dim degenerate vacuum manifold with my 8 Goldstone phases in <http://arxiv.org/abs/0902.0032>

It has stable topological "brane" defects in a 9Dim spacelike hypersurface consistent with the bosonic dimensions of superstring theory.

Appropriate linear combinations of the above 9 matrix elements of the order parameters must be taken to get the two Lorentz group 4-vectors for the M-Matrix giving the emergent tetrads and spin-connections for

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the gravitational field of curved spacetime (possible torsion as well).

That's our universe in a nutshell. ;—)

JACK SARFATTI wrote:

"As the structure of the atom was patiently worked out in the twentieth century, it became clear that the overwhelming majority of the mass of atoms resides in a nucleus which makes up a minuscule fraction of its volume, later that the nucleus is composed of protons and neutrons, and still later that those particles were made up of quarks and gluons, but still physicists were left with no explanation for why these particles had the masses they did or, for that matter, any mass at all. ...

In this compelling book, Nobel Physics laureate and extraordinarily gifted writer Frank Wilczek describes how one of the greatest intellectual edifices ever created by the human mind: the drably named standard model of particle physics, combined with what is almost certainly the largest scientific computation ever performed to date (teraflop massively parallel computers running for several months on a single problem), has finally produced a highly plausible explanation for the origin of the mass of normal matter (ourselves and everything we have observed in the universe), or at least about 95% of it these matters, and matter itself, always seems to have some more complexity to tease out. ...

And what's the answer? Well, the origin of mass is the vacuum, and its interaction with fields which fill all of the space in the universe. The quantum vacuum is a highly dynamic medium, seething with fluctuations and ephemeral virtual particles which come and go in instants which make even the speed of present-day computers look like geological time. The interaction of this vacuum with massless quarks produces, through processes explained so lucidly here, around 95% of the mass of the nucleus of atoms, and hence what you see when stepping on the bathroom scale. Hey, if you aren't happy with that number, just remember that 95% of it is just due to the boiling of the quantum vacuum. Or, you could go on a diet.

....

everything we observe and the basis of all sciences from antiquity to the present makes up less than 5% of the total mass of the universe. This discovery, and the conundrum of how the standard model can be reconciled with the equally-tested yet entirely mathematically incompatible theory of gravitation, general relativity, leads the author into speculation on what may lie ahead, how what we presently know (or think we know) may be a piece in a larger puzzle, and how experimental tests expected within the next decade may provide clues and open the door to these larger theories. All such speculation is clearly labeled, but it is proffered in keeping with what he calls the

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Jesuit Credo, It is more blessed to ask forgiveness than permission.

re: <http://www.fourmilab.ch/fourmilog/archives/2009-03/001126.html>

Puthoff's PV theory is not needed to explain the origin of inertia.  
That is one of the implications of Wilczek's Nobel Prize.

The basic small rest mass of quarks comes via the Higgs mechanism from the 8-parameter internal localized SU3 (x) anti-screening IR confined UV free multi-colored (Jacob's Coat) macro-quantum coherent superconducting post-inflation vacuum state with emergent gravity  
<http://arxiv.org/abs/0902.0032>

However, as mentioned above most of the ~ 1Gev hadronic rest mass comes from the virtual quanta of the boiling vacuum.

What's wrong with Puthoff's model is that it uses only the U1(x) em coupling and ignores the all-important SU3(x) coupling needed to explain the actual hadronic jet data. Puthoff's model is simpler than is possible.

Finding the free Higgs boson is not directly relevant to the above because the basic coherent effect for the initial small quark rest mass only involves macro-quantum superposition of off-mass-shell virtual Higgs bosons not excited on-mass-shell outside the superconducting vacuum.

How to have Puthoff's cake and eat it also! ;-)

PS With the tetrad formalism it seems to be easy to write U1xSU2xSU3 Feynman propagators in strong gravity fields as if they were still in a fictitious Minkowski spacetime because

$$e^{i\int A^{\mu\nu}(x)} = (\text{constant}) (4 \times 4 \text{ identity matrix})^{i\mu\nu} + (\text{variable}) A^{\mu\nu}(x)$$

is not perturbation theory, i.e.  $A^{\mu\nu}(x)$  is not "small" relative to first term on RHS.

$A^{\mu\nu}$  is the compensating spin 1 Lorentz group gauge potential from localizing T4 spacetime displacement group.

$A^{\mu\nu}$  has a vacuum ODLRO macro-quantum c-number part + the micro-quantum 2nd quantized creation/destruction piece

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Haisch, Puthoff and ...

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