Re: What happened to Jack Sarfatti?

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- *From*: Rock Brentwood <markwh04@xxxxxxxxx>
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On Jan 31, 6:07 pm, FLASH <flash.starwal...@xxxxxxxxx> wrote:

> From a recent discussion in Sarfatti_Physics_Seminars Yahoo Groups
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>
> PS Here's a piece of beef− using minimal coupling in QED & QCD gives
> the correct high energy scattering cross−sections!

Actually, most of it is pretty interesting and intelligent. I'm not new. I've been here longer than any of you, and will be here long after you're all gone. So I know who he is.

But it does raise some problems. I'm not sure that, even now, the connection between a locally gauged affine group and the diffeomorphism group has been made clear in the present−day literature. It's not a trivial problem, because the affine part of the connection somehow has to be soldiered onto the manifold, much the same way that the vector part is to give you integral curves.

Translations, themselves (locally gauged or not) are not a symmetry in any known present−day formulation of gravity −− possibly except for some formulations based on a teleparallel setting. The situation is made clear by Utiyama's Theorem. If you have a gauge symmetry and assuming the Lagrangian of the underlying field theory also shares that symmetry exactly (as opposed to only sharing it up to a +/− divergence term), then the Lagrangian can NOT involve any explicit dependece on the gauge potentials. Moreover, the only dependence it can have on the gradients of the potentials is via their field strengths.

For a geometry based on the affine gauge group, the potentials are the frame one−forms, themselves; as well as the connection one−forms. If the underlying dynamics are to be gauge−invariant (with a gauge invariant Lagrangian) there can be no explicit involvement of either of these objects in the Lagrangian.

The Einstein−Hilbert Lagrangian looks like this, in the language of differential forms: A epsilon_{abcd} theta^a ^ theta^b ^ Omega^{bc}, for some constant A. The frame one−forms (theta^a) are explicitly involved. The connection one−forms are not; only their field strengths, Omega^{bc}, the curvature 2−forms.

Hence, the law is NOT invariant with respect to a locally gauged affine group, but only with respect to a locally gauged *linear* group. No local translation operators are involved or permitted.

Your only route for a prospective Lagrangian is one that involves only the field strengths: (Theta^a) the torsion 2−forms and (Omega^a_b) the curvature 2−forms. There are only so many ways to put these together to give you a Lagrangian. So, your options are extremely limited.

On conceptual grounds, it doesn't make sense to equate the underlying geometry with a carrier of an affine group. In that respect, I think that it is *he* (and others like Hehl, who once (and probably still) advanced the general idea) that is trying to force−fit things. Dirac showed how the Poincare' group is generalized in his 1964 treatise on the constrained dynamics of classical and quantum Hamiltonian systems. When going over from Cartesian to curvilinear coordinates, the Poincare' group generalizes into what's today called the "Dirac group" −− a group that describes the deformations of 3−dimensional spacelike surfaces. Poincare' is recovered by restricting one's attention to flat spacelike surfaces (assuming the underlying geometry is globally flat, that is). In a curved geometry there is no recourse in this direction, so no Poincare' group.

The second way that you see that it doesn't fit is that when generalizing the concepts from Cartesian coordinates, you begin to notice just how much an amalgamation the affine symmetry group actually is. The different parts of it don't really belong together and you also start to see that relevant distinctions were being confused when you were still in the confines of Cartesian coordinates. There are actually *several* senses of "translation" that emerge out of the false unity of the lost paradise of Descartes.

One sense is best seen on a sphere: spherical symmetry (around the Earth, for instance). This involves *non−linear* translations. The translations, moreover, don't commute with one another (rotations on a sphere don't commute). They form a Lie group. The Lie group, in turn, defines vector fields on the manifold (by way of expoentiation) that produce the flow lines of the symmetries. This generalizes on the concept of coordinate lines of a coordinate grid. The manifold is then deemed a *homogeneous space*, the flow lines termed the Killing vectors.

Not all manifolds have Killing fields; only those of special forms. The maximum number of Killing fields I think is 10 (which is realised by a flat space, the 10 being the generators of the affine symmetry group, but also by the hypersphere and hyperbolic geometry). The space in the vicinity of the Earth has only 4: an SO(3)'s worth of spherical symmetry and a E(1)'s worth of temporal symmetry. And even that's only approximate (the Earth is not an *exact* sphere, and it is not unchanging in time).

The second sense is the one that defines the fundamental element of fluid dynamics −− the stress tensor. This is the "current" corresponding to the flow lines of a general *diffeomorphism*. That symmetry group is MUCH larger (infinite dimensional); and more closely connected to the Dirac algebra.

My take on the affine group is that when going over to curvilinear coordinates, the linear part of the group gives you the locally gauge symmetry group; while the translational part becomes the diffeomorphism group. There is no bona fide gauged translation group; other than that represented (in generalized form, at that) by whatever Killing fields may reside on the manifold.

And take a look: Sarfatti's been harping the "all things are affine gauge group" idea for all these years, yet with no evolution in the conception or nothing majorly new coming out of it. That alone says volumes.
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