Preferred Frame Physical Unification with Teleparallelism

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Abstract. We report the progress made since the Vigier III Symposium of 2000 in developing the program of physical unification with teleparallelism (TP). Preferred frame physics was already implicit in "the theory" since TP, which amounts to equality of vectors at a distance, defines preferred frame fields (just one if one ignores rotations reflecting isotropy in those fields). We shall show by argument of mathematical structure that, paradoxically, a preferred frame naturally makes relativistic electrodynamics evolve into particle physics, first leptons then quarks. We shall deal mainly with that evolution. Our starting point is a little known derivation by E. Cartan of the equations of structure of Euclidean space that explicitly exhibits that differential geometry is just a theory of moving frames. It relegates particles to a secondary role. We shall show that, in a Kaluza-Klein theory without compactification of the fifth dimension, the standard spacetime metrics become null metrics. The usual $d\tau$, i.e. the ds for Lorentzian metrics, is the natural coordinate for the fifth dimension. Its dual tangent vector is the former 4-velocity, now seen as a unit vector whose projection on spacetime has the same components as the traditional 4-velocity. The subspaces (t,x^i) and (x^i,τ) appear as custom made for classical and quantum physics. But the quantum sector consistent with a special relativistic classical sector would not be what one rightly believes it to be, namely independent of the velocity of the rest frames of systems with respect to a hypothetical preferred frame. Velocity independence of quantum physics with respect to that frame is a consequence, to put the argument in reverse, of a classical sector whose defining frames are not orthonormal. But this is masked, when dealing with the associated coordinates, by the fact that time dilation causes slow clock transport to unavoidably yield Einstein's synchronization. The aforementioned quantum-mechanical evolution reinforces the view, already presented in Vigier 2000, of classical Maxwell electrodynamics as being geometric, in context of Finsler bundles on pseudo-Riemannian metrics. In both sectors, classical and quantum mechanical, we have the same fundamental (i.e. horizontal) differential invariants, $(\omega^\mu, \omega_0{}^i)$, where $d\mathbf{u} = d\mathbf{e}_0 = \omega_0{}^i\mathbf{e}_i$ in notation for the Finslerian bundle.