

Fenechka-model, Path Integrals, and AP

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Fenechka-model

A path integral deals with some “arrows”, amplitudes, instead of probabilities. Summation is conducted on all “phase space” taking into account all “equipped paths” – equipped with arrows (which rotate in some internal space – set of “arrow labels”; speed of arrow rotation along a path corresponds with momentum). This Feynman formalism of quantum mechanics is remarkable that explains, makes physically clear the principle of least action: ‘a chaos’ tries all paths ‘on a tooth’ and finds extrema, the minimal trajectories.

Two moments still seem to be not clear: (i) where these trajectories are hidden? (ii) why it is necessary to sum “arrows”?

The model suggested – for gedankenexperiment or computer simulation – should serve to illuminate these moments, and also to give an illustration (some rough, but based on custom concepts) describing very complex, stochastic solutions to the five-dimensional theory of frame field. In this theory, field configurations with a topological charge or/and quasi-charge are possible, and therefore some statistical phenomenology, i.e. a system of accounting of topological quasi-charges (such as the quantum field theory) is required.

Model. A long thread with beads – “fenechka” – is placed between parallel planes of a wave guide together with two kinds of waves (not interacting with each other): (i) chaos-1 – “sound waves” propagating under appreciable angles (say, 10^{-3} rad) to the plane of wave guide; (ii) chaos-2 – “electromagnetic waves” moving almost tangentially to planes (full internal reflection; angles about, say, 10^{-10}). Beads have no friction (time reversibility), but have opticity, or birefringence; so one can attribute some “arrow” to every bead (as an amplitude of scattering of waves-2).

What does this metaphor mean for the frame field theory? The wave-guide is a large-scale, or cosmological part of the solution: the solitary spherically symmetric wave running along radius (additional dimension) with a speed of slightly less than unit. In co-moving reference frame (system), the wave-guide size along radius is very large – Huge extra dimension. Two kinds of chaos are rather weak waves of frame field, and only three modes (polarizations) from fifteen are of special significance (chaos-2): only these three modes (f-component) give the contribution in the energy-momentum tensor and “do not distinguish” additional dimension.

At last, “fenechka” is a topological quasi-soliton, or an extremum – a maximum of realization probability – on the nonlinear field configurations, relating to one or another group of symmetry and to corresponding topological quasi-charge.

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Why AP ?

It seems that Absolute Parallelism (AP) is of great interest (for mathematical physics as well as for cosmology and particle physics; better to say – for physics) because of the following reasons and features:

(1) Great symmetry of this theory:

This symmetry group includes symmetries of both special and general relativity theories [irreducible (vector) representation is also very important feature favoring to avoid free parameters].

In my opinion, space(time) signature without Lorentz-group [as it takes place in GR] looks like decaffeinated coffee, or like beer-foam without beer (I mean that the choice of signature in GR is the separate postulate having no relation to the symmetry group of GR).

(2) (Absence of) Singularities and Uniqueness:

There is the unique variant (non-Lagrangian) of AP (including unique D; well, D=5) which solutions of general position seem to be free of singularities. Extension of compatibility test (applied for second order AP-equations) to the cases of degeneration of either co-variant frame matrix (co-singularities) or contra-variant frame (or contra-frame density of some weight) may serve, I believe, as a local and covariant (no coordinate choice) test for singularities of solutions; in AP this test singles out the unique equation and dimension mentioned above.

“Any change of fundamental theory should to destroy this theory” – this Einstein’s expert estimation (somewhere in his autobiographical notes; translated from Russia by me) is a sort of principle, or ideal [principle of uniqueness, I mean]; so, this ideal of uniqueness seems to be achievable in AP, if Nature does not like singularities.

(3) Energy-momentum tensor and energy-less (or weightless) solutions (including “cosmological solution”)

Although non-lagrangian, the unique equation leads to the (symmetrical, “covariantly conserving”) energy-momentum tensor where the key role belongs to the second order differential covariant $f_{\mu\nu}$, which looks like electromagnetic field (however, there are no gradient transformations in the theory). We note that a wave-packet of this energy-transferring f-component (there are solutions with f=0 in the theory) should move along usual riemannian geodesics – as in GR; however the spin or polarization evolution should depend also on rank three skew-symmetric tensor $S_{\mu\nu\lambda}$, which is certainly absent in GR.

Neglecting extra dimension and using the unique equation, one may introduce pseudoscalar ϕ :

$$\phi_{,\mu} = h\epsilon_{\mu\nu\alpha\beta}S^{\nu\alpha\beta}, \quad h = \det h^a_{\mu}.$$

(The presence of dipole-like pseudoscalar ϕ -field near rotating Earth could be of interest in view of forthcoming results of GP-B mission – relating to some unknown forces.)

(4) Non-static spherically symmetric solutions (as expanding cosmological model)

(5) Properties of topological theory (for singularity-free variant of AP).

Starting with topological charge group, one can introduce then the concept of the topological quasi-charge group for field configurations having some symmetry. It seems that possible variety of quasi-charges in 5D case [on the “cosmological background” of O_4 -symmetrical solution filled with weak stochastic waves] could be sufficient to explain qualitatively many (or most of) features of Standard Model (including superposition principle and Feynman’s path integral - as a result of integration over 5-th dimension in “cosmological waveguide”).

Well, you see that I believe that the true theory has to have some cardinal difference from false ones; hence, the true theory has to have no free parameters.