The evolution of embryo-protons into Bostick´s toroidal forms.

Osvaldo F. Schilling

Departamento de Física, UFSC, 88040-900, Florianópolis, SC. Brazil.

Email osvaldo.neto@ufsc.br

Abstract:

In recent work we have drawn a quantitative picture of embryo-protons condensation in loop form, from a state at 3.7 GeV, which we freely associated to a “vacuum”. We then found evidence for the actual character of such a state from the flux profile of protons in cosmic rays, which indicates 3.7 GeV as the environment energy in equilibrium with embryo-protons after the big-bang. We here extend our arguments to suggest the connection with W. Bostick´s work on a filamentary-helical-toroidal loop description of particles, which might probably be the final stabilized shapes of the simple loops considered in our work.

In recent work [1] we have drawn a quantitative picture of embryo-protons (loops of charge) condensation from a state at 3.7 GeV, which we freely associated to a “vacuum”. We then found evidence for the actual character of such a state from the flux profile of protons in cosmic rays[2,3], which indicates 3.7 GeV as the environment energy in equilibrium with embryo-protons after the big-bang.

We begin this discussion by inserting such finding into a pictorial representation of the Universe Time-Scale[4], as drawn by Olivier T. Godichet. This altered picture (Figure 1) indicates that the condensation of embryo protons in the form of loops would precede the stabilization of their inner constituents (i.e., it precedes the attainment of their definitive topology[5]). The final stage topology is not yet ready at 4 GeV, and is established to provide mechanical stability of the particle structure as the local environment cooled down. On the other hand, our results have shown that mass and magnetic moments of the proton and related baryons arise from the simple loop geometry. No detailed picture of inner constituents is as yet required. The question arises whether the final picture at lower temperatures(and under a different environment) should necessarily be so completely different from this successful loop model, since this is the conclusion taken from QCD: a theory with no bridge to QED.

As hinted in the previous paragraph, our proposed interpretation sheds light on another issue, that of the structure of vacuum at such high energies (temperatures). It is well-known that the density would be extremely high in the initial microseconds of what we call Universe. The model proposed in [1-3] actually requires an equilibrium with such a dense medium, where strong correlations-fluctuations might be established. Particles would condense in loop-form from fluctuations in such dense, strongly correlated medium at 4 GeV temperatures, something very different indeed from what the word vacuum presently means. The final topology is needed to stabilize the particle when the environment sdensity changes with expansion and cooling.

However, it seems that the attainment of a concrete description of how a particle would evolve from its embryonic form towards a definitive form is

still hindered by a gap in knowledge(represented in the time scale in [4] by a cut line at about 1 GeV energy). Again, the presence of such a line highlights the strange fact that QCD is so very different from QED, since they should be expected to merge into each other. Papers [1-3] demonstrate that conventional (quantum) electrodynamics holds up to the embryonic stages of particles. An investigation should then be carried out to analyze how it might be extended into the realm of QCD, but it seems this is not possible without the help of geometrical models, and such models are not considered in QCD.

In fact, such investigations exist from the 1950s on. At about the same time, Jehle[5], Bostick [6] and Post[7] (with Bostich probably being the first) developed quite sophisticated geometrical pictures of the electron and fermions in general, as *loopforms*. In a nowadays forgotten work, Bostick[6] developed an heuristic helical/toroidal/string picture for particles which is able to associate EM theory, gravitation and strong interactions, including obtaining the G constant from EM arguments. An Experimental Plasma Physicist, Bostick had a life-long experience with plasma structures of all sorts, including those developed in outer and galactic-scale space. His heuristic model was firmly based upon observations at large scale phenomena, and were extrapolated to the scale of particles. Both Bostick and Post recognized the importance of attainment of force-free configurations within the toroidal structure itself. The difference from Post´s and Jehle´s work is that Bostick treated such basic problems quantitatively, taking his heuristic assumptions as far as possible, while the other authors were more cautious in view of theoretical issues of the approach. Bostick´s toroidal/helical current strings are immediately associated with loops in our work. Standing (de Broglie) waves would circulate around the toroidal structure. A somewhat similar model in which waves interfere around the loop path was independently developed by the author [8]. This was eventually rewritten in FT terms and taken as the fundamental step towards the treatment in [1]. At this point one realizes that all such early work actually missed a translation in FT terms, since such step led to a definitive picture of the vortex as arising from vacuum instability As several other phenomenological models of particles previously proposed in the last

century, Bostick´s (and Jehle´s and Post´s) model is static: there is no mechanism establishing how the loops would come to be, no “phase transition”. At some point in his discussion Bostick uses the word “spontaneous”[6] but no mechanism was proposed. The same applies to the other authors´s work.

We however see the link between Bostick´s work and the present investigations(as we saw the link with Post´s work in previous occasions). A remarkable conclusion can be reached, which is that Bostick´s helical/toroids might indeed describe particles in their definitive form, which would represent the extension of QED into what is now the QCD realm. The present work covers the genesis (from vacuum instabilities) of vortex/loop-like embryo particles, while in a latter stage Bostick´s detailed geometrical structures would settle as definitive for the same particles after environment expansion and cooling. He also proposes EM counterparts for Gravitational and Strong interactions, and the nature of “gluons” as squashed, confined EM fields. We see that Bostick´s work might represent the definitive extension of [1-3,8] into what might be called therealm of QCD.

The author is grateful to Dr Indranu Suhendru for calling his attention to Bostick´s work.

References:

[1] O. F. Schilling, Prog Phys(ptep-online.com), 15, 185 (2019).

[2] _____15, 197(2019)

[3] O.F. Schilling, vixra: 2007.0122

[4] http://www.olicognography.org/drawings/bigbangscale.html

[5] For a model of quarks and leptons topology see H. Jehle, Phys. Rev. D11, 2147 (1975).

[6] W.H.Bostick, IEEE Trans. Plasma Sci. PS-14(6), 703 (1986), and Phys.Essays 4(1), 45(1991).

[7] In the 1980s, Evert J. Post proposed a related model for the electron as a trefoil, without citation to Bostick´s work but citing Jehle. Cf. Phys. Lett A119, 47(1986).

[8] O.F.Schilling, vixra: 1710.0236

Figure 1: The Universe Time-Scale, as freely adapted from [4]. At 4 GeV environment energy, vacuum should be a quite dense structure, allowing fluctuations to give rise to embryo particles.