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Short Communication

Color Charge Force and Gravity

Gudrun Kalmbach HE*

MINT, PF 1533, D-86818 Bad Woerishofen, Germany

***Corresponding Author:** Gudrun Kalmbach HE, MINT, PF 1533, D-86818 Bad Woerishofen, Germany.

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A short Review from the references is:

Color charges cc are in QCD a property of quarks in nucleons [1-3]. The use is for the gluon exchange between paired quarks q_j, j = r red, b blue, g green cc for their confinement in a nucleon. The two cosmic speeds hold for the nucleon (figure 1 left [4]) which means that the q_j rotate about a nucleon barycenter B. Postulated in this article is that the color charges are an independent force from quarks as cross ratios of a complex Riemannian sphere S^2. About B are Bohr spheres (figure 1 right) in xyz-space for them such that u = r has as energy a red cc hemisphere bounded by the yz-plane with center x = +1, u = b a blue cc hemisphere bounded by the xy-plane with center z = -1 in S^2 and u = g a green cc hemisphere bounded by the xz-plane with center y = +1 in S^2. This neutral color charge of nucleons is defined as a rgb-graviton Γ which alternatively can be presented as cc force vectors 3-dimensional base attached at the center of S^2 in the outer coordinates directions towards (x,y,z) = (1,1,-1). For Γ the hemispheres are extended to projective planes with antipods on S^2 identified. When this projective system is rotated about one of the x-, y- or z-axis by 180 degrees it remains identical. This means that Γ has spin 2. It is found experimentally. As 3-dimensional base for a nucleon it arises after a big bang by a radius inversion from a dark matter Dm system. Its Schwarzschild radius R_s has radii r' for its 1-dimensional mass particles r' < Rs and the mathematical inversion is $r'r = Rs^2$ for the nucleon radii r > Rs. This radius is projective dually xyz 3-dimensional replaced. The extended real projective space for this has octonion coordinates enumerated by indices 123456 for rgc(g)c(b)c(r)b, c(u) Heisenberg HU associated dual cc of u (figure 2 left). Setting the complex polynomials of the cross ratios equal, 15 gives z = 1/z, z = 1 (or z = -1), 23 gives z/(z-1) = (z-1)/z, z = ½, 46 gives (1-z) = 1/(1-z), z = 2 (or z = 0). These are the possible normed spin values for bosons, fermions and Γ or systems without spin. The metrical measure for the cc is generated by an application of the G-compass (figure 5) matrix G^3 = -id matrix as $w(-id)(-w) = w^2$, w = x,y,z.

The octonion cc force has coordinate 0, the octonion coordinate 7 is for the electromagnetic interaction EMI and has a universal helix cover as energy location for EMI on a cylinder (figure 2 right). The linear coordinate is U(1) circular S^1 rolled for the cylinder geometry. For the weak WI and strong SI interaction their are after a big bang two fiber bundles with fiber S^1. WI has the Hopf map defined by the three Pauli spin matrices with symmetry SU(2), SI has a space S^5 as factor of the SU(3) geometry and a projection to the complex projective CP^2 space 2356 with boundary S^2 for nucleons. Spacetime is 1234 (x,y,z,ct) for WI. 56 is a real projective space with coordinate [m.f.w], m mass, f frequency with the Einstein line $mc^2 = hf$. 1456 is for electromagnetism EM. In the Kaluza-Klein field theory EM is unified with gravity GR [5] in a projective 5-dimensional space P^5 with a topological 1-point compactification S^5. The dual 3-dimensional radius version from the 1-dimensional Dm radii arises in P^5. A projector maps P^5 to three 4-dimensional spaces 1456 for EM, 1256 for GR and a scalar space which can be 1234 spacetime. For GR the former rgb-gravitons have base 126. Radius r is measured on 1, 2 is for acoustic heat and 6 is for an angular frequency ω = 2πf, as force an acceleration. The experimentally observed GR waves have for squeezing/stretching of spacetime Γ in cylindrical helix (see EMI) form with three wave amplitudes as sequence in proportion 2:1:½ for Γ where a dual DΓ reverses the space orientation to left hand screws from the right hand screws

for Γ (figure 3 left). This squeezing/stretching arises in a nucleon for the quark triangle. The quarks on the circumference of their triangle chase by GR with constant speed one another in a spiralic rotation (figure 3 right) twice and DΓ reverses this action. The former Dm radius inversion sets the two cosmic speeds for mass systems in the universe. A barycenter B for the nucleon is generated by an inner dynamics as representation of the quark triangle symmetry D_3 (figure 4). Three barycentrical coordinates are generated with intersection B (figure 5 left).

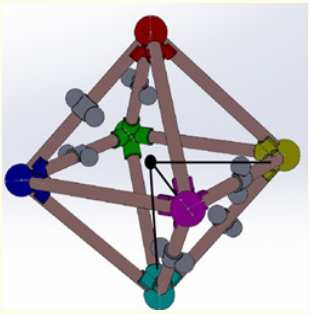

Figure 1: Nucleon tetrahedron left, three cc caps for an rgb-graviton.

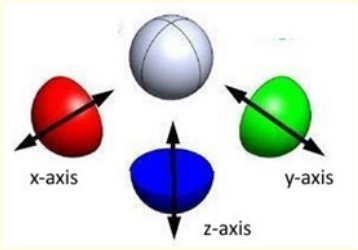

Figure 2: cc hedgehog left, right EMI cylinder, exponential function helix, spin cone.

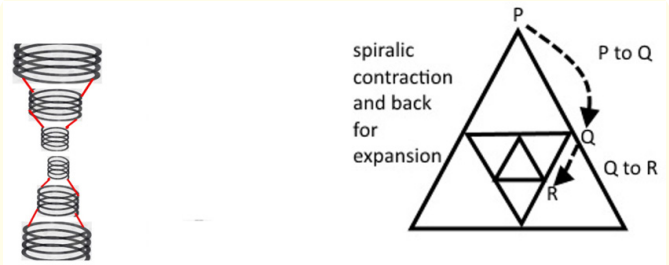

Figure 3: Three cylindric amplitudes for a graviton waves left, GR nucleon quarktriangle stretching/squeezing right.

Figure 4: Inner nucleon dynamics.

Higgs sets a huge mass value at B such that in a wave package presentation the nucleon can move with a speed v < c on its world line in spacetime. Mass systems Q have a Schwarzschild radius Rs.

The Schwarzschild metric rescales (cosine projected) nonlinear Minkowski metric for a P orbit rotating about Q, using $\sin^2\beta = Rs$. For the two (Rs defined) cosmic speeds v_j, j = 1,2, of a mass system Q a cusp catastrophe potential (figure 6) sets three surface levels. For a speed $v < v_1$ of a second mass system P the Heisenberg pairing of 46 reverses multiplicative a time differential to get the free fall 126 acceleration for P towards Q. For $v \geq v_2$ no common barycenter is set between P,Q, Minkowski relativistic metrical scaling applies for their energy measures (for 126 invert 23 z/(z-1) to (z-1)/z)). For $v_1 \leq v < v_2$ a common barycenter (inverting for 126 15 radius r to potential b/r) is generated for P,Q and a Minkowski cone which has for $v = v_1$ a transversal plane E to its central axis A such that the orbit of P about Q is a circle. Increasing speed v means that E gets a leaning angle towards A such that the orbit becomes a Kepler ellipse. When the plane reaches a line on the cone, a parabola as escape orbit of P from Q is generated. The former Schwrzschild metrical scaling means that after one full rotation of P about Q a constant positive angle is setting the main ellipse diagonal in an accelerated position such that a rosette orbit of P about Q is generated. In its control space the cusp values generate the third Kepler law for T^2/b^3 = constant, b length of the main ellipse diagonal, T orbital period rotational time.

The cc force chooses for the generation of cross ratios a reference triple 0,-1,∞ while D_3 uses a 0,+1,∞ triple. For the cc a G-compass (figure 5 right) exists where G is a rotational 2x2-matrix of order 6 with first row (1 -1), second row (1 0). It factors by its normal {G = id,-id} subgroup to a rotation group α with α^3 = id. The 126 presentation for Γ has α for 6. Acoustic heat (figure 7) released or observed for graviton waves has α^2 stretching/squeezing and has a tone c for the proportion value 2, an overtone c' for the proportion value 1 and an overtone c" for the proportion value ½.

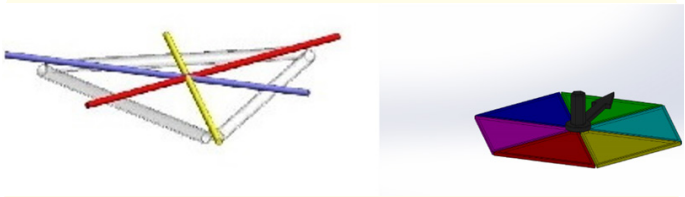

Figure 5: Nucleons barycentrical coordinates left, G-compass for the cc force right.

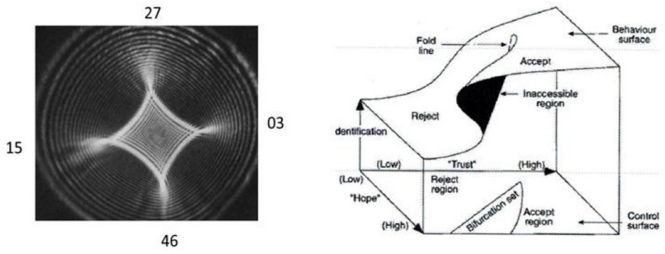

Figure 6: Control space left, at right cusp potential levels.

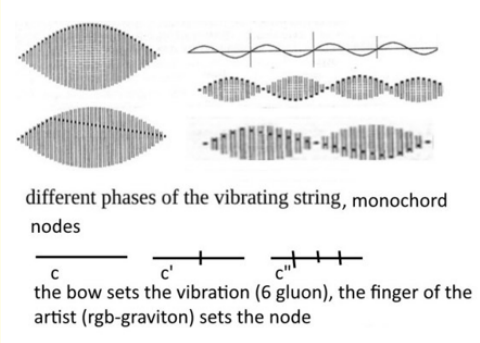

Figure 7: Acoustic heat.

The MINT Wigris Library has dynamical running models and many articles [6] for details of the new theory.

Figure 8: Tool box in the MINT-Wigris library.