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New Mathematics for Nucleons

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Abstract

In this century it is clear that the nano range can use mathematics differently from 100 years ago where quantum mechanics QM formulated its axioms. A first news is that the postulate on ψ-waves is revised: indinite dimensions are replaced by 8 dimensions of the strong interactions geometry. It is not linear but a toriodal product of two 3-and 5-dimensional spheres. S^3 is already used in the QM spin calculus for the weak WI and electromagentic EM unit sphere in the 4-dimensional space used in physics to describe its systems through 4-vectors. Vectors can be exdended by an additional list of numbers to 8 digits. This is needed in this centrury to accomodate the findings in particle physics, not only for the 8 SI gluons. It provides in addition a unification of gravity with the standard models forces.

Introduction

An Einstein computation which sets mass m differently scaled by special relativity for nucleons and atoms shows that two digits are needed for frequency f and mass in $mc^2 = hf$, c speed of light, h the Planck number. This makes 6 not 4 vectorial digits. The sixth roots of unity correspond as angles to them. They are set by a G-compass which has a bounding U(1) symmetry circle of the electromagnetic interaction EMI and a radius vector as needle. It can turn its needle only in the discrete locations of these roots and covers in turning the areas between two such positions by a color charge, due to the strong SI quantum chromatics. It sets also six energies to be taught in physics courses of MINT for 15-18 year old youngsters. This belongs to a climate school for future.

The S^5 sphere of SI is the space for a fiber bundle with fiber U(1) and base space CP^2, a complex 2-dimensional space for nucleons and atoms. The complex vectorial space can be taken linear as (z1,z2,z3) space C^3 if needed. CP^2 has as boundary a 2-dimensional complex Riemannian sphere S^2. Added is a complex cross product for the G-compass plane as z4 = z1xz2xz3.

S^2 is already available through the Hopf fiber bundle with fiber U(1) from the QM spin calculus 100 years ago. The Hopf projection map h: $S^3 \rightarrow S^2$ uses the three spin/Pauli matrices which introduce the noncommutative operator bound structure for describing physical systems. Usually the complex quaternionic matrix notation for spacetime is z1 = z+ict, z2=x+iy in the first 2x2-matrix row and in the second row -c(z2) and c(z1), c conjugation. For z3=(m,f) can be new coordinates. States of systems are then described by the 8-tuples and ininite dimensions of a Hilbert space are not needed. This is the first QM revision in 2020.

The Hopf fiber bundle projection can be composed with the geographical stereographic map. Complex spacetime coordinates allow then division for the planes coordinate z = z2/z1 where the S^2 point at infinity is z1=0. S^2 is the 1-point compactification of the plane. In a real projective closure of the plane it is closed at infinity by a real projective line at infinity. This space extension is treated by adding to the xy-plane a projective w-coordinate [x, y, w]. This is for closing the Einstein (x=f, y=m) plane to a projective plane P^2. For the gravitational GR orbits all normal forms arising from P^2 correlations quadrics can be used, also division by real numbers is possible now. A good visualization is by Heegard decomposing an S^2 along an equator into two hemispheres and identify diametrical points on their boundary.

Technical models

The second tool in the MINT-Wigris tool bag (figure 2) for the nano/climate teaching is a hedgehog where three such spheres of a central nucleon or atom P as atmosphere are set and Heegard decomposed. They carry in the middle a vectorial pole as energy or force. The exchange of energies between P and its environment is made through changing the input/output direction spin-like from up to down. This is projective done in P^2 by rotating the vector along a nonorientable Moebius strip inside P^2.

It is not a QM postulate from 100 years ago where SI was not known. The spin-like orthogonal, vectorial GF triples are for quasiparticles and new measures.

In teaching the hedgehog in figure 1 it is observed that the Heisenberg uncertainties come in pairs along a x-, or y- or z-axis as spheres S^2 splitting equators. The color charges cc for them are red r (not radius!), green g, blue b and the dual cc‘s. The *rgb*-gravitons are set as GF superposition of three SI GellMann matrices and are experimentally found as the neutral color charge of nucleons. They generate tetrahedrons in the chemical sense as a sceleton which have as pairwise orthogonal spin-like triple at their ends a quark of a nucleon attached. In form of a dinucleon for deuteron two such tetrahedrons are joined at their GF tip and form an octahedron sceleton for dinucleons. The common center can be

split and the two nucleons, a proton and a neutron, kept together like Cooper pairs by a exciton in weak interaction at distance in forming atomic kernels. The distances are bound and too large distances make nuclear decays. As an introduction for the teachers lecture it can be useful to add one demonstrating tool before the hedeghog, showing the central nucleon ball by emiiting only one red colored energy, used for the decomposition of the atmospherical spheres.

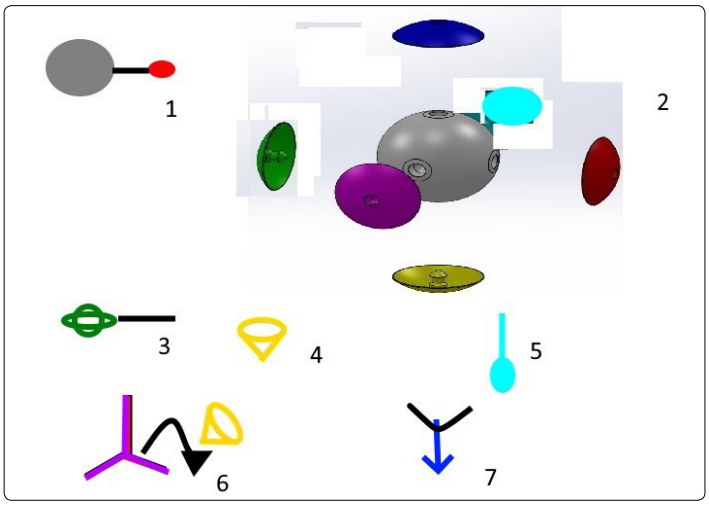

Figure 1: Hegehog 2 with polar caps for energies, geometries for the energies in 3-7

The next demonstrating tool in figure 1 shows the Hopf fiber bundle in one of its geometrical form: in S^2 an EM charge rotates along a latitude circle. Points of S^2 (see figure 2) are Hopf blown up to circles. The point charge e_0 is then a leaning circle about a central core which in rotation generates the torus geometry known from the orbitals of electrons in atoms shells. Other shell forms are spheres for the s-quantum shells and clubs or handles. The central core is the fiber of the south pole of the Hopf S^2 and carries mass. The north pole of S^2 has a magnetic momentum as a cones field quantum or a magnetic momentum μ attached which rotates together with spin. Orientations are according to a superposition of two GF's, one for EM with e_0 and the magnetic $\Phi_0 = h/(2e_0)$, the other GF for spin in the gyromagnetic relation with μ (tool 6).

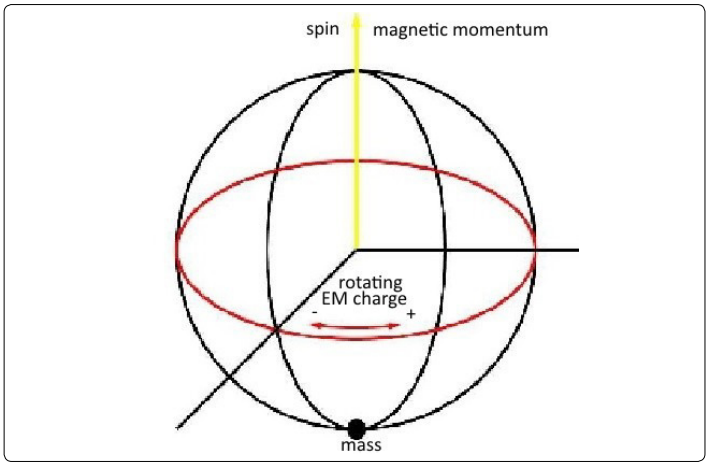

Figure 2: Riemannian Hopf sphere S^2 for leptons

The next tool 4 shows the conic nature of magnetism. Cones more general used, also for Minkowski metric as light cone. For astronomy it is suggested as a new axiom that its dark matter and dark energy local locations are extended to a triple, adding whirl cones for sound, heat/phonons. They miss the U(1) circle of EMI which is here only a bounding circle, not a linear expanding frequency at projective infintiy (figure 3 last tool for dark energy). The double projective closed whirl cone for heat/sound has inside higher speeds than light. For the location of dark energy the closure looks similar, but is a cylinder closed at projective infinity by one point. The linear EMI frequency expands on helix lines on cylindrical surfaces. Sound adds only its movement when attached to matter in the universe, it has no motion in a vacuum as light does. Phonons are volume bubbles generated which hide inside some entropy for heat. They transport their energy in matter by decaying into momentum p = mv, m mass, v speed, inside matter and some other oscillating energies. Inside the boundary of the bubbles or matter volumes this generates pressure on the bounding surface S^2 in form of the heat equation: *pressure times volumes equals scaled temperature*.

The conic geometry of Einstein's special relativity fits into this [12]. It rescales in the nucleon/nano range mass. Quarks mass is only 10 percent (see the quantum chromodynamics research for this) from that of nucleons mass and the Einstein rescaling adds through $mc^2 = hf$ inner energy of frequencies or speeds which are then locally measured as mass and give a common group speed for the nucleons parts (turquoise 5 and blue 7 tools). For this is necessary that nucleons have inside CP^2 an inner dynamics which generates barycentrical coordinates. A Higgs field can then set at a newly computed nucleon barycenter the enlarged mass.

This is an important new setting for QM, not available 100 years ago, collected for the MINT-Wigris models. States of a nucleon need no infinite dimensions, eight are enough to describe the models theory. MINT-Wigris has for also several videos since 2000. The new ones (on a disk) from later on can be shown by the teacher and explained. MINT-Wigris has DPMA patents and need a company for its production in future. Eight models and 6 videos exist.

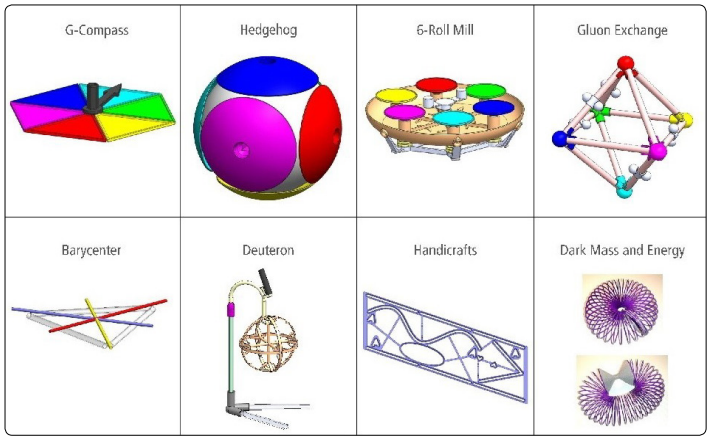

Figure 3: The eight models in the tool bag

In the tool bag is also a demonstration *deuteron model* which shows the gravities length stretching or squezing (general relativity). The atomic kernel AK is hanging in the 8-dimensional

space above spacetime as a projection plane and GR changes in three steps the height of it above this space, The TV-like shadow stretches/squeezes not the AK, it can also rotate in this projection. The projective calculation is for real w-quotients in the Einstein [m,f,w] plane. The three basic spin values are used. They are obtained as degenerate numerical orbit of the SI rotor dynamics of nucleons as represenations of the polar quark triangle symmtery D3. The central GR projection calculates the distance measures for AK towards a barycenter B unsymmetric for a linearization of GR. The radius is |BAK|= r and unsymmetrical |AKB|=r – Rs, Rs a Schwarzshild radius for the B mass.

For the G-compass in figure 3 as z4-dimension of the underlying octonian vector space is mentioned that its complex polar coordinates set with the U(1) symmetry the exponential, periodic function exp for physics Ψ-waves. Inverting radius at the Schwarzschild radius (taken as a measured constant) gives potentials a/r, a real. This is the derivative of the inverse exp function as the complex logarithm which is infinite valued with the periods of Ψ added.

Concluding Remarks

The six energy color charges are not further described in this article (see the references). For octonians as vector space is mentioned that z4 acts as input and output vectors for the bifurcating six energies in a big bang or Higgs boson/dark matter situation. Octonians have seven GF‘s, SI only one. They are for measuring in the nano range according to the Copenhagen interpretation.

Symmetries added to the physics standard model U(1)xSU(2) xSU(3) for EMI, weak WI and strong SI interactions are the dihedrals for nth-roots of unity and Moebius transformations MT. In an internet video the students can see what the MT‘s can do: translations, rotations, scalings and inversions [9]. The last one occur in 2- and 3-dimensions. The mathematical complex, projective inversion is on a U(1) circle of radius r with center B where a point P outside is drawn on the x-axis and a tangent to the circle. From the intersection point of them is drawn a projection onto the x-axis for the image point P‘. Then the inversion is $|BP||BP‘| = r^2$. The 3-dimensional case is by inverting at the light or whirl cone speeds at the bounding surface with speed c. Universes matter speeds v<c invert with dark energy or whirls speed v‘ in $v‘v = c^2$. EMI with speeds c are the boundary where mass is set 0. The dark mass/energy models (last figure in figrue 3) are a visualization for this.

The old mass-particle duality of physics has to be extended to wave-particle-whirl for heat and sound whirls [22, 23]. The derivation for the models theory fills books of the author. A short handbook is found in the tool bag. The research spreads from 1986 on to today and is offered in the intenet as the MINT-Wigris project where other researchers can join in. Instead of the old quantum mechanical view there are new tools under consideration: use the Riemannian sphere with the symmetry of Moebius transformations, use projective geometry and other projection maps for desrcribing locations of energies in lower dimensions. Eight dimensions suffice as maximum for this project. Study quasiparticles by Gleason measures and their spin-like frames. They generate many metrics, forms and shapes. The dihedrals and their finite symmetries are added together with a tetrahedrons symmetry S_4 of order 24. The dihedrals arise as 1-dimensional tool for the nth roots of unity on a circle $S^1 \equiv U(1)$. The charge or other singular poles are characterising Heegard decomposiitons of the weak Hopf unit sphere S^3. There are several rotos for inner dynamics inside an atomic kernel or lepton. One is in figure 3 the 6 roll mill (see 10, 6th roots of unity for 6 energy vectors, the G-compass), Figure 2 can be associated with a weak 4 roll mill. A 2-roll mill is for quarks two poles, three polar charges are for nucleons three quarks, kept together by the gluon exchange and a *rgb*-graviton. One pole is for the torus location of leptonic charges. Both, the weak and strong rotors have theoretical a fiber bundle geometry (S^3,S^2,h) and (S^5,CP^2, g) with fiber S^1. The Hopf geometry is from the early 20th century, all other mostly geometrical and measuring devices news are from the author or found in the quoted literature below. Articles in the internet are also available for more information and research for the modern particle physics [1-23].

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