(REVIEW ARTICLE)

Dynamical interaction geometries for physics with models

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Abstract

The MINT-Wigris Tool bag is presented with its models for color charges as a G-compass the hedgehog for the energy exchange of a nucleon system with its environment, an inner quark-gluon flow in it as 6-roll mill, two nucleon tetrahedrons for the gluon exchange between nucleons quarks, a radial contraction/expansion pulsation for deuteron, two fusion states of the tetrahedrons, a neutrino Gleason operator bound geometry and oscillation dynamics.

Keywords: Interaction; Models; Geometry; Dynamics

1. Introduction

In two Tool bags the author demonstrates with models how the geometries and symmetries of basic interactions make the technical oriented dynamics in the quantum range. This is not the view, quoted from an internet source:

Quasiparticles are studied in connection with solid-state physics and nuclear physics because they play an important role in determining the properties of matter. There is reason to suspect, however, that all particles may actually be disturbances in some underlying medium and, hence, are themselves quasiparticles. (Encyclopedia Britannica.)

The fermion series of 12 shows spin ½ as a property while quasiparticles have not spin ½. In the first two Tool bags, the geometries and symmetries of fermions is modelled. For the quasiparticles is mentioned here that one approach of the author has been taken up by physics in a list of 32 quasiparticles under Wikipedia in the internet:

Responsible for the quantum measuring process are orthogonal base triples GF like spins, generating Gleason operators T. They act as transformations on (pseudo-)metrics $\langle x,x \rangle$ by $\langle xT,x \rangle$ where for the quanta range the underlying Hilbert space H^4 is 4-dimensional and provided with a Euclidean metric.The Boolean block structure 2^4 is responsible for extending the real space to the complex and quaternionic 4-dimensional spaces C^4 and Q^4 . This is for measuring purposes and technical oriented dynamics for quantum structures. The often projective geometrical described dynamical models use different properties and geometries of the basic interactions. There is no need for a common underlying medium. Original dark matter or black hole energy is used, but not responsible for the universes future development after a big bang. A system evolving is more than its original parts.Why interactions evolved in our universe? In brief: 1-dimensional dark matter quarks and nucleons are 3-dimensional extended in space H^3 by the Pauli matrix real cross product. The Hopf geometry is modelled, but has nothing to do with dark matter. Before the weak interaction WI evolved, physics claims that the strong interaction SI separated from gravity. Looking at SU(3) as the SI geometry, it has a twisted fiber bundle geometry $S^3 x S^5$.The authors view is that rgb-gravitons act as projections for mapping this S^3 down to the Hopf S^3 in spacetime H^4. Also this projection from SI down to a WI has nothing to do with dark matter. The second twisted bundle space S^5 is not used in physics, but from the author for an SI atomic fiber bundle

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which maps it to a projective complex inner spacetime CP^2 with a bounding Riemannian sphere S^2 for atoms. This is not spacetime H^4 but observable for the chemists periodic system projected into H^4.

Important new symmetries are the Moebius transformations and the cross ratios where for the latter a reference triple of complex points $0,1,\infty$ is chosen such that together with the complex variable z of S^2 six energies are generated: electrical, magnetic, frequency in two versions, angular $\omega = 2\pi f$ and helix rolled (or linear) f, mass, heat. The electromagnetic interaction EMI which allows atoms to send out spectral series, light, is generated after the dark universe is evolving further in time. All this has nothing to do with dark matter. The author reminds to the biologial evolution which generate on earth dinosauriers which died out because of food lacking. Now Humans may die out because of covid. This has nothing to do in biology with their double helix DNA's. The Tool bags show an evolution, not a common (energy) medium. Energies are measured by the GF in meter (length), second (time), kg (mass), and allow with complex or quaternionic coefficients the different properties. Also chemistry attribute properties like being ferromagnetic not to nucleons.

The dynamical geometries and symmetries are modelled and not unified. Cross ratios allow six energies and candela cd for light as measure evolves later on for EMI. Moebius transformations allow the six energies, cd is a seventh and filling up the SU(3) 8 dimensions by doubling the quaternions to octonian coordinates, the cc color charge measure is added for a gravitational G-compass as the first octonian coordinate. The G-compass allows a new Heisenberg uncertainty, this time as an upper bound through speed of light c. It has the Minkowski light cone geometry and uses mathematical inversion for dark energy speeds v'>c inside a pinched torus surface to matter speeds v in the universe v in $v'v = c^2$. The G-compass sets also, maybe as a Higgs boson geometry, Schwarzschild radius Rs for matter/mass systems and allows inversion of for their radii r>Rs to dark matter radii r' in $r'r = Rs^2$. Octonians have seven GF, SI can have seven GF too, WI has one GF. But physics adopted now the GF view in their list of 32 quasiparticles. Fermions acccount for 12 + 12 = 24 GF plus 32 makes 56 combinations of 3 orthogonal base triples arising from an 8-dimensional vector space. It has not necesarily the octonian or SU (3) multiplication for matrix or numerical presentations, but for the usual calculus in physics it has its use as a complex 4-dimensional space, working with complex subspaces. The dimension is 4, not 8 for this purpose.

On this vectorial base the models are constructed. Geometries, their symmetries, different kinds of dynamics make the technical shown properties. For the Moebius transformations, as an example, the internet listing [9] can be consulted: they allow through the identity matrix, used for numerical rescalings of energy measures, that a sphere S^2 jumps up or down towards a plane parallel to its southpole tangent plane and the shadow projection changes the spheres equatorial radius. This is attributed in phyics to the recently found graviton waves where physics claims spacetime curvature for it. In case the object is kept fixed, another interpretation can be that a nonlinear GF operator G rescales the spacetime metric to Schwarzschild metric in <xT,x>. G is obtained form the Rs scaling having as first row (1-1) and as second row (1 0). One of its eigenvectors generates the needle of the G-compass. The eigenvalue is used for scalings. Rotations are another use of Moebius transformations and show a 2-dimensional leptonic dynamics with S^2 as Hopf fiber bundle projection. Translation**s** are used for systems moving with a momentum on a world line in spacetime. The complex inversion 1/z is for the change of universe systems to dark systems, radius and speed are inverted at a circle. In the mathematical view, inside and outside is inverted for a bounding S^2.
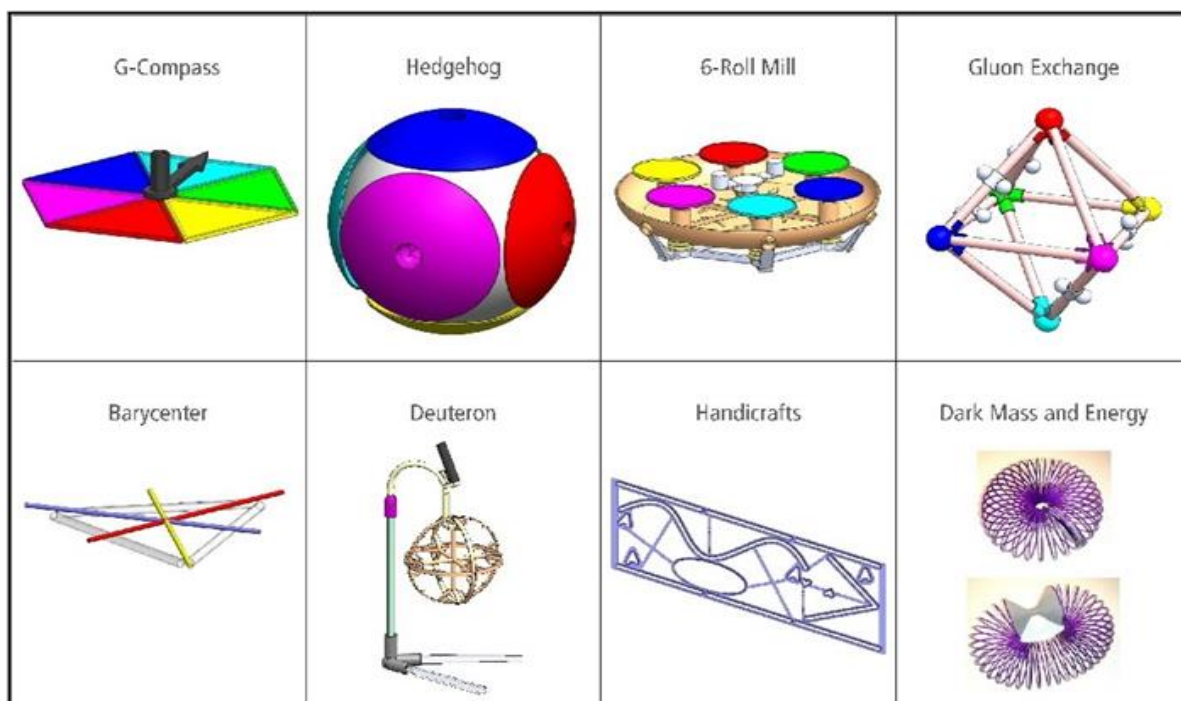
2. Models

From the existing models, some figures are shown. A computer progam is needed for demonstrating the dynamics. But nobody spends money to the MINT-Wigris project from which a programmer can be payed.

2.1. G-compass

Needle an eigenvector of G, uses the characteristic polynomial z6 – 1 for the 6th roots of unity solutions (values of electrical charges) by setting six color charge of QCD on the six

2.2. Segments

They can be cut out and glued together to cones for color charge whirls (replacing for SI magnetic whirls of WI)

Figure 1 Eight Tool bag models

2.3. Hedgehog

The atom bubble CP^2 is shown in space, having an atmosphere of six color charge caps for the energy exchange with the environment, the caps are obtained by splitting the sphere S^2 along three equators in the xy-, xz-, yz-planes, adding color charges to them and a normal vector like a needle which can change like spin up/down its direction for an energy output or input; the geometry is projective where the hemisphere boundary has its diametrical opposite points p,-p identified for getting a projective plane P^2; on its Moebius strip the vector is rotating by 360 degrees for the up/down change of the state when needed

2.4. 6-roll mill

The n-roll mills have been constructed in catastrophe theory [10]; a polymer fluid can here present an inner gluon-quark plasma flow, having the potential for an elliptic catastrophe; cusps are taken up in the quasiparticle list as wrinkletons, making the dynamics geometry

2.5. Gluon exchange

The geometrical base of an octahedron is used in several models and presents in a scewed view the 4 spacetime coordinates, for instance in the upper or lower pyramid intervals with the north or south pole as origin as one endpoint, pointing to the equator as vectors; quarks are marked on the endpoints of the axes and the gluon exchange between quarks is marked between a nucleon pair on the two quark triangles sides; in a second pyramid interpretation, a 4D-Hopf electron torus (weak decay II) is added at the equator and this presents the spacetime coordinates generated for its Hopf geometry while the Hopf torus carries the rotating electrical charge, located as a 1-dimensional Hopf fiber bundle blow up leaning circle, winding about the rotating torus axis

2.6. Barycenter

In physics barycentrical coordinates are not investigated; a Higgs field attributes through a Higgs boson action mass to systems; this is philosophical but not technical motivated; for the G-compass was postulated that it can present a Higgs boson geometrically; it can be extended by a kg GF measure where G is then as Moebius transformation the Schwarzschild factor (r-Rs)/r, r radius of general relativity; the mass of universes systems has to be rescaled, not only by Minkowski metric; their wave package presentation for instance as Schroedinger's matter wave solution, requires that a group speed v<c is attributed to its momentum p = mv; mass m(v) is considered as a function of v and can be Minkowski scaled diffferentiated for getting the optical group speed v<c for the system; for this the former mentioned dark energy inversion at c has to take place; wave presentations are available only after atoms can send out spectral

series; the G-compass is generated much later on when the dark period of the evolving universe ends; the question for the Higgs philosophy is then where it shall set a barycenter as a new origin at which its kg-scalar can be measured; the answer is given by an SI rotor which is a dynamical oscillation (not wave), presenting the D3 symmetry of the gluon exchange model; it sets the three barycentrical coordinates and at their intersection Higgs is happy to set its kg measure for the rescaled nucleon mass; the GF adds the common mass of the quarks mq plus internal interaction speeds mf (transformed frequencies) and some other inner rotational energies mi and sets at the barycenter the nucleo mass as GF weight m = mq + mf + mi; this is the way more generally the GF set measuring observables, not only for kg

2.7. Deuteron

It demonstrates rescalings of the S^2 diameter in moving up or down against a gravitational plane kept at rest; S^2 can additional be rotating about its axes and in a modified

projection generate sprialic contraction/expansion orbits for systems rotating about a central barycenter; this can be for instance observed for two galaxies where Higgs has set a common barycenter and they hit after a long time; for deuteron the inner dynamics shows this as a pendulum motion where the nucleon radius is streched od squeezed in time for the SI rotor, using the scaled three basic spin lengths for the radii

2.8. Template

In many cases the useres of the Tool bags can draw additional figures on paper with pencil, cut out the figures and fold them 3-dimensional to meaningfull surfaces; linear rays for light expansion rolled up become helix lines expanding in time on a circular cylinder; conic figures can be folded, torus glued, Moebius strips too.

2.9. Dark mass and energy

For them the weak interations Heegard decompositions are used; dark mass has the torus shrinked in the middle such that the vertical inner circles parts are touching to become a singularity; in its inside the nucleons are inverted to 1-dimensional butterflies having six wings for the color charge energy circles red r, green g, blue b and their anticolors where the orientation of (conic) rotations cw clockwise is reversed to mpo counterclockwise c(x), x = r,g,b; the butterfly centers can be fixed at the singularity or they move freely with an unknown speed; Higgs sets a huge kg mass at the singularity; for dark energy a pinched torus is used where the EMI cylinder is closed at projective infinity by a point; inside some unknown energies are moving with speed v'>c,

maybe the quantized E = hf form of photons can be shown as finite cylinders with one helix winding where the motion is an oscillation like LASER reflection at the upper and lower bounding circle

2.10. Fusion states

For two protons Higgs has set a common barycenter in the center of the two nucleon tetrahedrons; an rgb-graviton attributes to the nucleons quark triangle the orthogonal base GF triple of the tetrahedron and on them are added two polar caps for a splitted positron as electrical charge; the cap geometry is only used for attaching the S^2 surface suitably; in fusion, the uu-pair in the model requires that the upper u-quark decays and emits a weak boson W+, becoming this way a

2.11. D-quark which can exchange energy with its partner u-quark after fusion

The W+ outer observable decay is further in an outer emitted positron and neutrino, the upper caps are removed from the model: in the change of states, the two tetrahedrons rotate against one another; in the first state, the color charge combinations according to Heisenberg uncertainties are on vertical lines and two intervals as complex vectors zj join them to the center; these 2-dimensional screwed complex planes are mapped down using the Hopf fiber bundle projection to the three space coordinates which are locally generated for the deuteron in this effect; the Heisenberg rays are then on the x-axis marked as octonian coordinate indices 15 for position x 1 and p momentum/m mass 5, on the y-axis 23 for the complex polar angle φ and angular momentum L = rxp, r radius, on the z-axis 46 for magnetic momentum 4 time t or Δt and 6 for freqeuncy as inverse time interval 1/Δt; the generation of the three axes has another model wheel; the way physics generates quaternion multiplication matrices is that it replaces the axes by Euler angles being transformation 2x2-matrix rotational symmetries; the wheel shows this in turning the single wheels in the indicated directions where the axis appears then as its rotational axis; this noncommutative operator bound mulitplication is mathematical the real cross product; it allows to measure areas and integrations, for instance of a magnetic field crossing an electrical currents loop such that induction is generated which drives electrical motors.
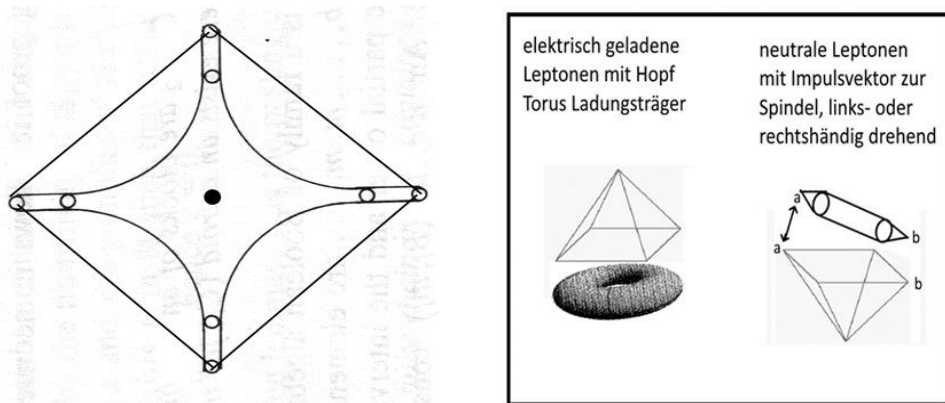
2.12. Neutrinos

They are similar to dark energy presented as spindle torus; the spindle surface is obtained differently by adding to a double Minkowski cone a projective circle at infinity for a doubled whirl; maybe they have also a helix on the spindle surface, but 3-dimensional extended the spindle is inside a Hopf torus; the GF for them adds quaternionic coefficients to the three orthogonal base vectors and interprets with the four quaternionic numbers properties of the neutrino; one is its kg mass; in contrary to the usual fermionic kg GF's, this one oscillates in a time motion when the neutrino expands on its world line; observable are then at different states in time different neutrinos.
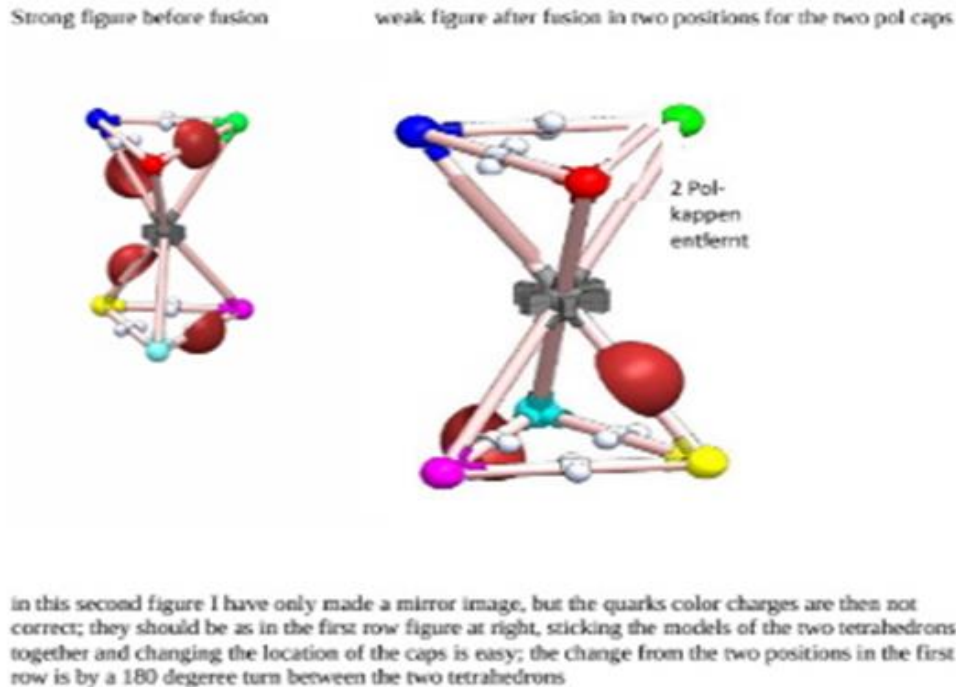

Figure 2 Wheel, spindle torus for neutrinos, flash

The wheel at left, spindle torus for neutral leptons in the middle, the figure at right: in the real Hilbert subspace geometry H4 the Boolean 4-cycle subspace lattices require for keeping the lattice structure that a 4 Boolean blocks flash as in this figure exists; two adajcent blocks have two atoms (base vectors) in common and the figure requires octonian coordinates for enumerating atoms, doubling up the four spacetime coordinates at the outermost vertices. This is modifyfing the Heisenberg doubling: 15,46 are kept, but the newly generated G-compass adds to 27 and 03 in octonians where 0 is the compass needle and 7 is Kaluza-Klein rolled up to a circle U(1) for the EMI symmetry. The subspace 4-cycle vertices for the xyzt-space coordinate base vectors is marked in the next figure at left, a central origin for the coordinates is added.

Figure 3 Flash, electron torus and neutrino spindle qith 4-dimensional coordinates attached

At right is a cut out paper figure as model for the xyzt-coordinates of leptons in form of the vertical oriented pyramid sides while on the pyramid base has to be attached a torus geometry for electrical charged leptons or a spindle for the neutral ones.

Strong figure before fusion   weak figure after fusion in two positions for the two pol caps

2 Pol-
kappen
entfernt

in this second figure I have only made a mirror image, but the quarks color charges are then not correct; they should be as in the first row figure at right, sticking the models of the two tetrahedrons together and changing the location of the caps is easy; the change from the two positions in the first row is by a 180 degeree turn between the two tetrahedrons

Figure 4 Fusion states

In this figure is shown the fusion states model, described earlier.

As a concluding remark is added: the dynamics needs money for instance paying for a computer program which shows more available inner dynamics for changing states; solid models are not as good and cheap to be constructed while motion is simply programmed on a computer. For researchers and sponsors are added an extended list of articles and books relevant for the two Tool bags with some repetitions in parts 1-4 for those asking back. For manifolds, retracts, bowl functions (Morse theory) or homology theory for subspace structures (posets, lattices) are recommended II,9, III 3,4,8,10 and for logic and philosophers III 6,14.

2.13. Press reports

on Gudrun Kalmbach's activities as scientist and educator, 1985-2000, yearly for her MINT programs and many listings in international biographies.

2.14. Videos

5 MINT-Wigris Tools videos, 3 talks at conferences videos.

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3. Conclusion

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Compliance with ethical standards

Disclosure of conflict of interest

There is no conflict of interest. For the figures, the author has the copyright. They are partly available in the internet under MINT-Wigris figures or in open access articles of the author.

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