# MINT-Wigris Tool Bag and Book

**Gudrun Kalmbach H.E.**
**MINT, PF 1533, D-86818 Bad Woerishofen, Germany**

The MINT-Wigris Tool bag has in its handbook more than a thought experiment: it is claimed that the first three Gell-Mann matrices λ1,2,3 represent a spin-like Gleason frame GF as *rgb*-graviton which has at the endpoints the three quarks mass of a nucleon. This orthogonal base of space generates in a discrete dynamics together with the gluon exchange barycentrical coordinates and a barycenter B in the nucleon triangle. As well the neutral color charge red r, green g, blue b of nucleons is experimentally measured as the Higgs boson or field setting of a renormed nucleon mass at B, computed through QCD. Gravity in the quantum range is not independent of QCD. The dynamics has as symmetry the factor group of the nucleon tetrahedron M, spanned by the *rgb*-graviton and the nucleon/quarks triangle. The symmetry of M as $S_4$ is factored by the Klein group $Z_2$ x$Z_2$. The factor group is $D_3$ , the symmetry of the nucleon quark triangle which makes the former mentioned dynamics, called a strong interaction SI rotor. Deuteron's atomic kernel contains two nucleons as dinucleon, joined at the tips at their two *rgb*-graviton centers. An octahedron shaped model is in the Tool bag for all this. It is stored as in chemistry tool bags for molecules or crystal structures. For these dinucleons an exciton can act as quasiparticle: in atomic kernels the tips are splitted, but the exciton keeps the pairing of the two nucleons as known for electrons Cooper pairings. Hence atomic kernels arise on the same geometry and dynamics. This view fits to all data of the standard model, but replaces old views from quantum theory.
The deuteron atomic kernel has three such rotors, not only the SI: a POT motor acts for quarks as field quantums of a unified 5-dimensional projective field, described in a book of E. Schmutzer. They have a mass pole and a pole for their electrical charge. They are stored 1-dimensional in a dark matter Horn torus which is a tool in the MINT-Wigris Tool bag As lemniscate with two foci they are inverted at the Horn torus Schwarzschild radius. This is a natural mass dependent function with the scaling of mass known from the Einstein general relativity. In the mathematical inversion at a circle the single, free lemniscate gets in the universe a radius which is larger than its own Schwarzschildradius. A solid 3-dimensional brezel with a surface of genus 2 with a potential flow (field) about the two foci is generated. These act like field quantums for the 5-dimensional Schmutzer field POT for a projector. The claimed projective spaces araising from POT are three 4-dimensional spaces, an electical fields space 1237, a Higgs field for gravity with mass 1235 and a third neutral field of spacetime 1234 as environemental universe. In octnian coordinates 123 is a 3-dimenional universes space, 4 is for time, 5 for mass and momentum, 7 for the electromagentic interactionas a rolled circular U(1) Kaluza-Klein coordinate for its symmetry. The 123 symmetry is SU(2) generated by the three Pauli spinmatrices σj. The quark dihedral $D_2$ symmetry is the Klein group Z2xZ2 of order 4 which have as elements an identity id and the three CPT operators of physics of order 2. It is commutative and the SU(2) is its noncommutative extension, introducing the real cross product σ3 = σ2σ1 for space 123. σ2 acts for getting 2-dimensional complex numbers with i, $i^2 = -1$, from reals by matrix and functional descriptions: φ→exp(iφ), the complex polar exponential function describing the symmetry U(1).
This belongs to Heegard splittings of the weak interaction geometry, a 3-dimensional sphere $S^3$. Quarks decay by releasing the mass carrying weak WI bosons $W^+$,$W^-$ . Also the neutral $Z^0$ is generated. The weak WI rotor in the deuteron atomic kernel sets similar to the barycentrical SI dynamics Euclidean coordinates by a u-,d-diquark pairing through an isospin exchange. Described as a decay, a u-quark releases on one of the x-,y-,z-axes a $W^+$ boson which is absorbed by the partner d-quark on the generated axis. They have exchanged their place this way. From the octahedron model is derived that these axes are actually two half rays, connecting the vectors for the Heisenberg uncertainties: the +x-ray is for position, the (-x)-ray for momentum. The +z-ray is for time as interval, the (-z)-ray frequency as inverse time interval. For heat as energy the complex polar angle phi is measured towards the +y-ray and its differential, taking inverses, is used for angular frequency as its time derivative, sitting with angular momentum as vector on the (-y)-ray. Since the rays on an axis are connected by differentiation they cannot be measured

simultaneously sharp. Quantum measures are different from macroscopic measures

For the parts of the deuteron atomic kernel it is necessary to rescale a common Higgs mass set at B. This is done through the Minkowski rescaling factor for mass. The three quarks mass sits on one ray, after gnerating barycentricalcoordinates with this ray the WI rotors mass ray on the (-x)-ray gets a turning special relativitic angle θ for its cosine projection of the WI rescaled mass.

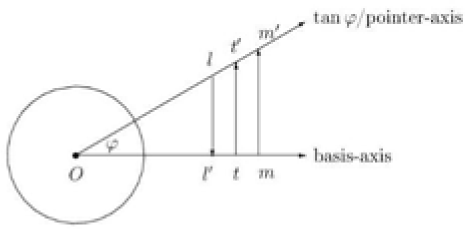



Figure 1 Minkowski special relativistic rescaling of length l, time t and mass m

The projective spiralic gravitational scalings with cosine with sin θ = v/c, c speed of light, v relativistic speed, is due to the Gleason frame GF (see below) for the *rgb*-graviton. It generates the group speed for momentum p = mv with which the deuterons octahedron moves in its environment. The newly bifurcating forces SI, WI from gravity require for the new model eight dimensions as available through the strong SU(3) symmetry of QCD. Setting momentum adds an octonian coordinate 6 for a complex 3-dimensional space 123456 with an Einstein enrgy plane 56 added to spacetime 1234. It allows the energy transfer $mc^2 = hf$, $f = 1/\Delta t$ frequency, h Planck constant. The affine Minkowski metric, in differentials is $ds^2 = dr^2 - c^2dt^2$, s distance, r radius. Speed is linear v = dx/dt or angular ω = dφ/dt.
Gravitational projections are either orthogonal, spiral or projective normings for the general relativistic factor as tensor, central or stereographic. For the stereographic projection the geometry can be read in the Tool bag articles. Here it is mentioned that the octahedron has a 2-dimensional sphere $S^2$ as boundary and this sits above (use the z-axis) a stereographic projection plane E for $S^2$. The *rgb*-graviton can shift the octahedron through the symmetry of Moebius transformations MT against E: up-down in z-direction is for rescaling and the degenerate orbit for basic spin lengths is normed ½, 1, 2. In a spiralic projection of two $45^0$ angles first √2 is contracted to 1 and 1 to 1/√2, using the Pythagoras theorem. Another MT can let $S^2$ rotate against E and spiralic orbits with orthogonal projections can be generated this way. Projective geometry is essential for gravity, Minkowski metric has affine coordinates (x,y,z,ct) 1234 of space and are homogeneous extended to 12345 for a Higgs field.
Other transforming MT actions are for translations (momentum or time) and for inversions. One Schwarzschild radius Rs inversion was mentioned beforefor quarks. The second one is for speeds at the Minkowski light cone where dark energy has inside another horned (or spindle) torus a speed v'>c and energy outside in the universe has speed v<c. The inversions are $v'v = c^2$ and $r'r = Rs^2$, r radius.
New in the MINT-Wigris model is
(a) the use of Rs as a natural scaling of mass, also available (and computed for the scaling) through general relativity, the use of Euclidean axes rays for the Heisenberg uncertainties and projective geometry for gravity,
(b) the new symmetry of MT. Also new is the use of the factoring $S^4$ to $D_3$ and the use for the scaled G matrix with coordinates a11 = 1 = a21, a12 = -1, a22=0 of order 6 which generates the 6 (or 12 using the conjugation operator) series known from physics: six color charges, electrical charges, masses for fermion series. Added are six basic energies: electrical, magnetic, frequency/kinetic or rotational, heat and mass. The equivalence classes of the factored $D_3$ from $S^4$ have attachd to the matrices of $D_3$ a coordinate 1,…,6, a color charge and an energy. Energy is shown through oriented vectors which carry a measuring unit set by an octonian 01234567 coordinte $e_0$.
(c) Gleason spin-like frames GF which as positive real scaled triple base vectors generate many

quantum measures with a probabilty attached. They are for quasiparticles and measure according to the Copenhagen intrpretation of physics. (Call it *Kalmbach theorem*, extending the geometrical *Noether theorem*.) The parity P operator identifies diametrical opposite points on the sphere +p,-pε$S^2$, spanned by the base. This generates the projective space $P^2$ for them with a Moebius strip inside. On it the GF can change vectors like spin in up-down direction. The hedgehog model of the MINT-Wigris Tool bag has six such polar hemisphere caps with centers at the x-,y-,z-axis endpoints on $S^2$. The up-down change is for them as input-output vectors where the deuteron atomic kernel exchanges its six energies with the environment.

Gleason frames GF occur for real, complex or SU(2) quaternionic numbers for spaces coordinates $M^n$ of dimension n≥3. They generate measuring operators T which rescale quadrics of the standard metrics in $<Tx,x>$, xε$M^n$. For n = 3 and real numbers the values for GF are a maximum a, a minimum c>0 and an intermediate value b which can be equal to c as in the case of nucleons. The weight of the real GF is w=a+b+c. For the weak interaction and leptons field quantums and particles the masses are obtained by a real GF, for quarks by a complex GF. The G and comjugation operator add beside the masses for color charged quarks the anticolors for getting their 12 particle series. The leptonic fermion 12 series adds a rotational direction cw clockwise or counterclockwise for their rotating charge on a latitude circle of the Hopf maps $S^2 = h(S^3)$. The geographical coordinates on $S^2$ are used for constructing from frame functions the Gleason operators T and use for the above cosine rescalings the latitude circles C on $S^2$ through an angle θ≤π/2 of a ray with initial point as north pole p and endpoint sεC (Piron lemma). The latitude of s is given by $\cos^2\theta$ and the descendent of s is the great half circle through s on the northern hemisphere.

For Minkowski metric the Moebius transformation M with base vectors for the matrix G exchanged acts on the Mink-GF, setting sin θ = v/c for the affine cosine rescaling of coordinates (first figure), for the nonlinear central projection scaled G matrix set sin β = Rs/r; v,r are for the GF taken as constants determined by an experimental gravity interaction between a central barycenter and a system in motion, for instance a star or comet. The metrical scalings are local, not global. In the

M case mass m, time are rescaled to u/cos θ, u = m,t and length l to l·cos θ (coordinates l,m,t), in the G case m is rescaled to Rs, the angle has sin β = Rs/r, the metrical radius, time units dr, dt are rescaled to dr/cos β and cos β·dt (coordintes $dr^2 = dx^2+dy^2$, $dt^2$). The real GF frame functions f(x,y,z)

= $ax^2+by^2+cz^2$ can have a constant scaling a=b=c, two thresholds a = b<c or three values a<b<c. The GF are defined for n = 3 on unit spheres, the real $S^2$ or the spacetime extended $S^3$ of the SU(2) symmetry, the complex $S^5$ in $C^3$ 123456 of the SU(3) symmetry and of (the unused - see the fermionic 12 series) quaternionic $S^{11}$. For xε$M^3$ the homogeneous scaling is with |λ|=1 in f(λx) = f(x). The scaling is geometrical a fiber, a real, complex or quaternionic sphere $S^j$ , j = 0,1,3, {+1,-1} parity P operator, exp(iφ) Pauli id, σ2 operators, Pauli matrices id and σ1,2,3 operators as base triple for space for fiber bundles. Hopf/Pauli has it as for the Hopf map h, mapping the SU(2) unit sphere $S^3$ in $C^2$ with the three Pauli matrices onto $S^2$ in space with fiber $S^1$. MINT-Wigris use $S^1$ as fiber for projecting $S^5$ onto a complex 2-dimensional spacetme $CP^2$ for deuteron atomic kernels. They are observed as bubbles, grid in the environmental universes spacetime. SU(3) has a toroidal geometry $S^3$ x $S^5$ as trivial fiber bundle. The *rgb*-graviton projects this $S^3$ down to the Hopf $S^3$ and to space. A homogeneous factoring of $S^2$ with $S^0$ gives the projective planes $P^2$ from above. The fiber bundle geometry belongs to the Kalmbach theorem.

(d) MINT-Wigris uses the Cayley-Dickson construction of extending quaternions in pairs to the 8-dimensional octonian number system. They have another multiplication table than the eight SU(3) Gell-Mann matrices for gluons. This is useful for generating seven octonian GF‘s in addition to the λ1,2,3εSU(3) *rgb*-graviton GF. They are lines in the octonian Fano memo containg three points for the GF frames real base triple of a space $R^3$. 123 is the universes and physics space and spin, (1234 is for spacetime). The other octonian triples are 356 for the SI rotor, 167 for the cylinders of the electromagnetic interaction EMI with a rolled angluar exp(iφ) Kaluza-Klein coordinate, 246 is for the heat formula: pressure times volume is scaled temperature inside the volume, 257 sets barycenters, for instance in a nucleon triangle through the use of the SI rotor, 347 is for rotations (spin s as eigenrotation of particles, angular momentum L = rxp for orbiting systems about a barycenter, and vectorial addition gives rotation axes J = L + s, 145 for magnetic induction as cross product of an electrical charge (a loop current) moving in (and transversal crossed by) a magnetic field. To the time coordinate 4 is added magnetic energy as field quantum whirl or momentum. The gyromagnetic relation for spin s and magnetic momentum μ or helicity of neutral leptons adds for the s coordinate direction these vectors μ or p =mv parallel or antiparallel, according to the leptonic charges rotation on a latitude circle of $S^2$. For the above mentioned Heisenberg projections of octonian $C^3$ coordinates, set in octonians complex quaternionic z1= z+ict, z2= x+iy (xyz-space, t time) coordinates and z3 = (e5,e6) with x on the +x-ray, e5 on the (-x)-ray, y on the +y-ray, z on the (-y)-ray, t on the +z-ray and e6 on the (-z)-ray; z3 = z1xz2 is obtained by the complex cross product. One octonian coordinate e7 is rolled to the EMI circle, also used as fiber $S^1$ and a last octoninan coordinate e0 is taken as input for setting vectorial units as GF measures, - meter for length, second for time, kg for mass, an inverse second interval for frequency (linear f = 1/Δt or angular ω = dφ/dt), Kelvin for heat and electrical units in Ampère, Volt, Watt.

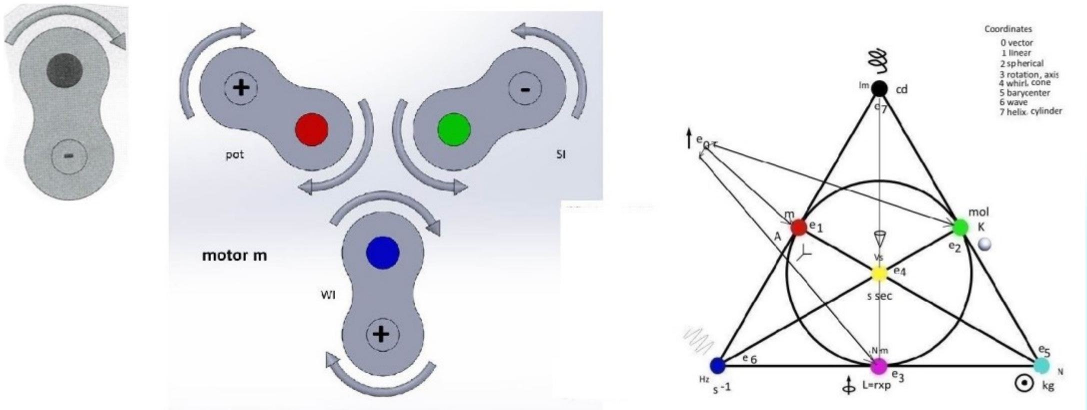
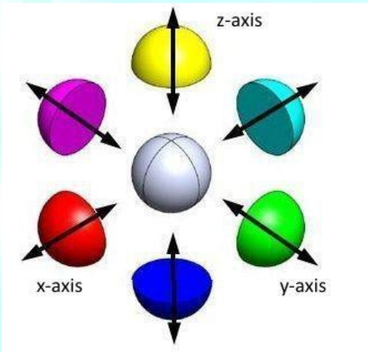



Figure 2 quark with two lemniscate foci, SI nucleon rotor, Fano memo, hedgehog

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**Biography**

Kalmbach H.E., Gudrun got her PhD 1966 in Mathematics at the University of Goettingen and worked until 1975 as Research assistant, Lecturer and Assistant Professor at the Universities of Illinois, Massachusetts and Pennsylvania State University USA. Her research is on Quantum Structures for which she published many articles and also books. From 1975-2002 she worked as Mathematics Professor at the University of Ulm Germany where she founded the educational program MINT.

mint-01@maxi-dsl.de