WIGRIS Nucleon

The symmetries of the standard model of physics is extended for nucleons by its presentation as a projective complex 2-dimensional geometry 2CN. Its bounding Riemannian sphere S2 carries the new symmetry of Moebius transformations MT. The invariants under MTs are the complex cross ratios. To them belong the Pauli spin matrices, generating the SU(2) symmetry for the weak interaction WI of the standard model, the Einstein relativistic scaling matrices as an affine Minkowski SR shearing M and the Schwarzschild factor G of general relativity AG. The SU(3) symmetry of the strong interaction SI in form of generating 3x3-GellMann matrices are essentially projection matrices, acting on a complex 3-dimensional space, called Gleason space GS. It replaces an infinite dimensional Hilbert space and its Gleason operators a ket-bra calculus of quantum mechanics for measures. Its unit sphere S5 as toroidal factor of the SU(3) geometry is projectively normed to 2CN. The norming uses the U(1) symmetry of the electromagnetic interaction EMI. Recall, that the symmetry of the standard model is U(1)xSU(2)xSU(3). The MT symmetry is not added as a new factor to this product. 2CN is independent of the old geometries: as a circle for U(1), the Hopf 3D-sphere S3 in spacetime and the SU(3) geometry as S3xS5. The symmetry group of order 12, generated by M,G is isomorphic to the nuclear quark-triangle geometry D3 (also cross ratios) and its product with the group of order 2, consisting of the conjugation operator C of physics and the identity operator as id = C^2. In case C is interpreted as complex conjugation, its associated MT is the third Pauli (spin) matrix which can also be used for the time reversal operator T of physics. The third discrete operator of physics, added to these two, is space parity P. This uses the 3x3-matrix -id. There is no need to extend spacetime dimensions above 7. GS has real 6 dimensions, added is a 7th rolled Kaluza-Klein dimension of U(1) for EMI: the affine Einstein 4D-spacetime is projectively extended to a 7D-WIGRIS geometry with the symmetries U(1)xSU(2)xSU(3) and the MTs for a mathematical nucleon.
Beside the affine matrix M, an affine Euler 2x2-matrix with an angle $\sin \theta = v/c$ (v SR speed, c speed of light) can be used for the length and time scaling of SR and similarly for AG an angle $\sin \beta = RS/r$, r radius, RS Schwarzschild factor for the scaling of metrical differentials dr, cdt in the tangent bundle of a nucleon. The rolled U(1) coordinate extends r to complex polar coordinates $r \exp(i\varphi)$ for complex functions, defined on 2CN and its environment as 2C, complex spacetime (real 4D).
The SU(3) GellMann projections map GS to three 4D spaces which arise according to a 5D Laplacian of E. Schmutzer with three projector Laplacians for EM electromagnetism, gravity AG and a scalar field Sc. The EM projection of GS is spacetime, the AG projection a space for dark matter (black holes) and Sc is for dark energy and a nucleon rotor, describing an inner nucleon dynamics through D3. The MTs, acting on S2 can have one or two poles in 2C. Quarks in a nucleon have, like a magnetic momentum, an MT with 2 poles associated. In case their 3 mass poles are taken as vertices of a quark triangle QT, flows or fields crossing through QT can be mathematical integrated from forces to potentials or speeds. This generates nucleons known properties like the EM or gravity potential, its linear and spin (rotational, angular) momenta, the coupling of spin with its magnetic momentum and an inner entropy (heat). The inverse process of mathematical differentiation can generate force vectors attached either to QT or to the S2 boundary of the nucleon. The figure hedgehog (see the Wikipedia article UserGKALMBACHHE) shows the coupling of energy carrying vectors on the spin generated Euclidean lines in +u or -u direction for u =x,y,z, as in the Heisenberg uncertainties.
The gluon exchange between quarks in a nucleon not only generate their confinement, but can be used for energy transfers, needed for the above mentioned integrations. There are four videos (and an older animation from 2000 under www.uni-ulm.de/~gkalmbac) available which can be demonstrated by macroscopically running machines, adding the new WIGRIS interpretation. They are called n cooroll mills, n = 1,2,3,4,6. The missing number 5 in this list is for the video **rotor**, a 5D spin which has beside 3 reflections of QT [replacing the 3 Pauli matrices of SU(2)] two orientations for a clockwise cw or counter clockwise mpo rotation of QT. n =1 is for the discrete action of the matrix G which generates 6 fold charges of EM or masses of the fermionic series. It has also a use for the 6 color charges of quarks. n =2 is for quarks as 3D blown up lemniscates having two poles. The video n = 3 **wheel** is for generating the Euclidean spin coordinates x,y,z of space. The case n = 4 can be of use for the EM Maxwell equations. n = 6 has the 6 roll mill associated from R. Thom's catastrophe theory. WIGRIS shows with discrete changing color charges their action for the nucleon integrations in a video. In case the gluon exchanges are added in between integrations, it is the video **12 Rollenmuehle**. For the video pulsation as **6 cooroll mill**, WIGRIS' claim is that the Minkowski EM/WI coordinates are in SR motion towards the spherical GS coordinates. Otherwise no inner oscillation with a common group speed of the three quarks in a nucleon can be generated. The mass defect of u-quarks is used for this scaling. It is the first step towards a matter wave presentation as claimed by de Broglie and Schroedinger in (quantum) physics. The videos are available through the MINT Verlag Bad Woerishofen, Germany. A mathematical theory can be read in the book, announced by rgn publications, Delhi, India, with the title *Quantum Mathematics: WIGRIS*. Gudrun Kalmbach H.E. is the author.

References:

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Gudrun Kalmbach H.E., *Hedgehog Balls for Nucleons*, PJAAM 7, 2013, 1-5;   *Quantum Mathematics: WIGRIS*, RGN Publishers, Delhi, 2014, ISBN 9788190422161; *Cross Products and Gleason Frames*, PJAAM 10, 2014, 1-15 (open access)