Anticipating Real-Form Periodical System by Self-Templating Expansion of Platonic and Archimedean Solids in Original Digital Universe

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Abstract
When, collage-style quoted, a recent authoritative "scientific data mining for conserved quantities and meaningful and nontrivial invariants that underlie physical phenomena in nature, discovered Hamiltonians, Lagrangians and other concise analytical expressions", such "distilled conservation equations" are still analog since functions of the respective "system's partial derivatives". These, in turn, are of course all equal and the real non-trivial conserved quantity at the ground in any e.g. curve, intercept or identity/spin matrix therefore reduces to a sole infinitesimal straight line bit so that at smallest scale the world is digital - like in modern informatics and computing, the only sufficient letter and number and structural element alike is the binary unit, I, which then forms the reality it may by the canvas and lacework of its own. Showing that the current "digital revolution" is in fact the digital Renaissance, this is the profound meaning of the ancient regular solids, too, opening up long forgotten corridors also to the original Diophantine equations and onwards, e.g. to Keplerian Cosmography, Renaissance Arithmetic, and Fermat's Last Theorem and its offspring Beal's Conjecture. In fact, at the then available level of resolution, the anticipation of the possibly underlying common alphabet of the physical systems and processes around came down to the same ground invariant at hand, namely, anew, the straight line bit, I, from which a complete Universe could be filled by the elements outlined by the infinitesimal digit distributed via first-degree straight and square or diagonal wave sequences and second-degree self-closing equilateral quadrate, triangle and pentagon planes to the maximally three-dimensional, in all but five feasible regular solid expansions. As reported in the CASYS'07 meeting, a transfer to modern elemental counterparts yields exact and exhaustive, both channel, angular and electromagnetic quantum number, mass, and quark inclination reproduction of the meson symmetries by the (assigned to) fire tetrahedron, baryons by the air octahedron, and electrons/positrons by the only spacefilling, truncated octahedron distribution of the continuous 2-tetrahedrons/1-octahedron lattice complex of their unit root vectors. In principle, there is no difference between an orbital and an axially twisting truncated octahedron distribution of the stepwise path of the extra-nuclear electron domain, but the interesting advantage of the latter is its direct root vector constitution with concomitantly defined lattice segment shape, enabling further nanotechnological self-templating reduplication of its motif into serially enlarged atomic and onwards modules. However, there are problems with this solution as well, and other feasible alternatives are sought for a complete and faithful continuous replication of the periodical system.

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1. Introduction

In Casys'07[1], the simplest possible "distilling" of the "free-form natural laws from experimental data"[2] for a consistent scalar 'world function' of the elementary particle spectroscopy was performed by its iso-element, the straight line, repeating itself from the smallest to the largest scale by means of the equally material as mathematical as textual regular solids and their symmetries and constitution. Since the theoretical fundamentals were thoroughly reviewed then and elsewhere[1, 3-28], the present report will focus on the descriptive results which in accord with classical principles as well as modern nanotechnology shows that the observed Universe can be extensively and exhaustively reproduced by the real structural elements, internal symmetries, transformations and transitions, and thereby performed serial self-assembly of the system.

2. Methods

The primordial idea, that space and matter are two sides of each other and made by the same stuff has recently been revived in a four-dimensional, "loop quantum gravity"

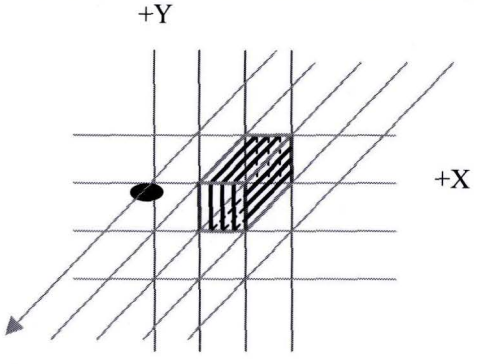

FIGURE 1. Say, that there comes a straight line out from one's closed eyes leaving in the forward direction (+Z). Then it must also endlessly extend towards one from behind, and there must be such lines infinitesimally tight over all the void's reach, because a linearly independent such axis can also come from below and rise up (+Y), or from the one side and leave on the other (+X), all of them together thereby spanning the endless Cartesian co-ordinate system and between them enclosing the infinitesimal cubical eigenvector bit of the matrix.

version so that directly "Constructing Spacetime - No Strings Attached"[29] is again an acknowledged physical enterprise. However, the regular solids outline – literally – a maximally three-dimensional system because their common irreducible building bit, the straight line, as first shown by Ptolemy[1] can span no more than three linearly independent space axes (Fig 1).

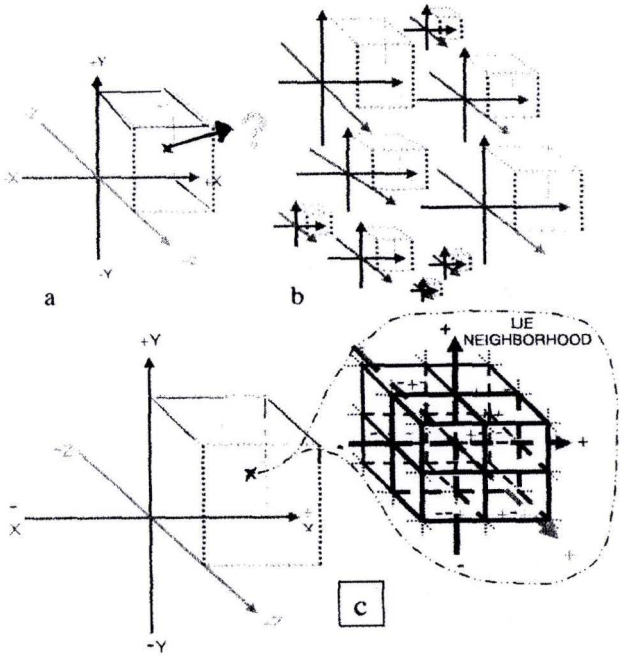

FIGURE 2. a) The Cartesian coordinate system spans the three-dimensional Euclidean space in eight cubical segments. What is the constitution of a local part (?) in any of them? b) Regardless of size it retains the Cartesian representation. c) Hence, the smallest composite space portion is a Lie neighbour-hood of eight indivisible ground unit CuBits.

At any scale, the consequential Cartesian eigen-coordinate system (Fig. 2) and the realizations within it are therefore both 'Gödel-immunized' and 'Popper-ratified' since defined and constituted and *sensu strictu* falsified purely by themselves.

Also Aristotle (384 – 322 BC) thought that the world is three-dimensional and that the formations in it are timeless, their simultaneous strands interpunctated by successive smallest steps which both as cause and effect mark the atoms of the sequence as well as of the interaction cone of the advancing front of apparent now. Without going into details here it adds up to an amazingly modern view with distributed geodesics perpetually undergoing the dynamic phase transition which is both unique and general since arched between the antipodal varieties of endless extension, namely, absolute straight and absolute round, or, as Aristotle put it: "everything that comes to be comes

into being from its contrary...and passes away likewise...by the action of the contrary into the contrary" and "if there is a contrary to circular....a straight line must be recognized as having the best claim to that name".[1] In consequence, it is, like the original Lie algebras[11,30], a transformation process between infinite surfaces, employing at the threshold just one irreducible element, the unit straight line, which is operative both as a direct structural building bit and an impulse/information as well as logical/computational digit, and has a deep philosophical underpinning as the eigenvector of Anything At All, or, technically speaking, as the obligate isodual contrast of the more philosophically unambiguous category of Nothing Whatsoever.[1,31-35]

3. Results

3.1. Root vectors/lattice elements

While there are remarkable Diophantine numerical properties, too, including straight proof of Fermat's Last Theorem and Beal's Conjecture[1,9,10,16-21,24], of the cubical eigen-element partition of flat Euclidean space visualized in Fig 1-2, the following exposition will focus on the infinitesimal morphogenetic outcome.

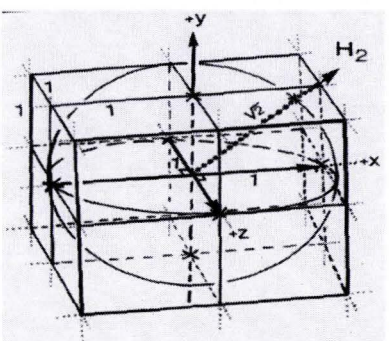

FIGURE 3. The hybridization of the unit sphere within the cubical Lie neighbourhood sets up an interstice, in the universal iteration of which the basic, tetra- and octahedral regular solid phase transition is immanent

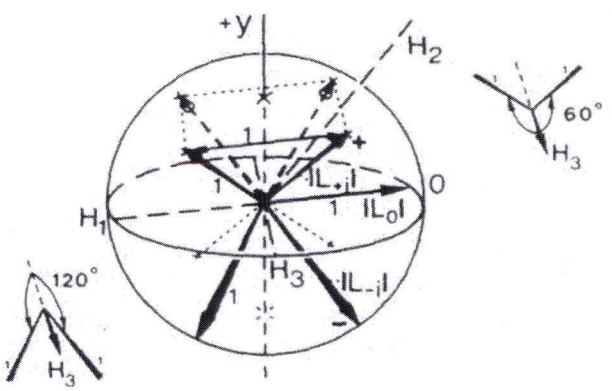

FIGURE 4. Real form three-dimensional spherical Lie algebra neighbourhood duplicated A_2 root space diagrams

Fig 3 summarizes the phase transition situation "between the Plücker line geometry and a geometry whose elements are the space's spheres[11,30], which twists the unit cubical neighbourhood vectors (Fig 3) into the spherical root space, here shown in about same scale and orientation as its neighbourhood encasement (Fig. 4). It is composed of two flat A_2 SU(3) commutation diagrams accommodated in the unit sphere, bringing the representation from the complex to the parent, ordinary threedimensional real space according to the canonical coset decomposition SO(3) x O(5) of SU(3).

3.2. Baryon transformations

It is seen that the continuation of the cubic sides and internal diagonals (Fig. 3) sets up an infinite space lattice around any observer origin, and likewise it is clear that the spherical A_2 root vectors (Fig. 4) from the mutual centre connect to a global lattice that is 60° skewed to the horizontal and vertical planes, and non-commutating with the latter. The correspondence to the quark three-dimensionality in the observed elementary particle spectroscopy is apparent and the close coincidences persist with all attributes of this. Fig. 5 summarizes the virtual 'binary phase motor' transformation system set up by the A_2 axes of the unit sphere domain assigned to the Nucleon[36] in relation to the straight space axes, and providing a faithful "eightfold eightfold" three-dimensional version of the plane Gell-Mann lattice diagram.

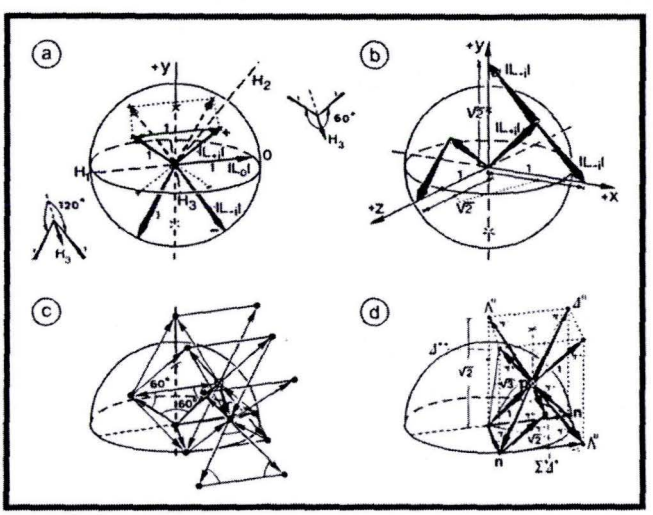

FIGURE 5. Spherical root vector space whose Neutral isospin vectors coincide with Cartesian X and Z axes (a) but whose thereby charged, t isospin axes (b) set up a non-commutative quark matrix with unit side (c), continuing in the global interstitium as space-filling regular tetra- and octahedrons, (d) none of which can fill the space separately due to different side length in lateral and bottom planes.

The diagonal A_2, so called charged *t* isospin root vectors (Fig. 5 a), connect also outside the sphere to an endless octahedral lattice (Fig. 5 b,c), skewed to the orthogonal Euclidean co-ordinate axes and thus, as mentioned, from a shared origin span a quark space matrix aberrant to the cubical arrangement and so directly providing the still rectilinear phase transition of this turned to the spherical symmetry. As discussed more in detail later it is quite significant that the charged *t* isospin vectors adjoin throughout space into an infinite continuous mesh of unit sides (Fig. 6), which is then the runner for the one-dimensional electron step distribution into atoms and larger coherent portions in a cyclically cumulative course with all the apparition of the likewise stepwisely sequential orbital model including quantum indeterminacy and related evasive behaviour at any in comparison vastly broader probing feasible with current instruments.

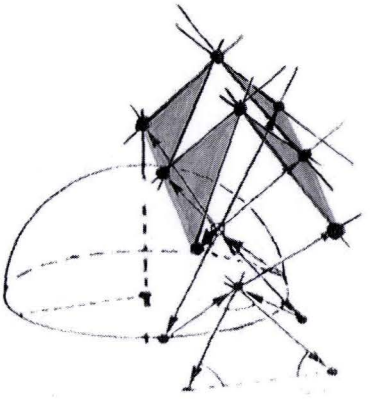

FIGURE 6. A dissection of a portion in the first and second extranucleon layer of the charged t isospin root vector lattice, showing that it connects as octahedron sides without involvement of any neutral root vector elements

Regarding the impenetrable nucleon, this infinitesimal, i.e. absolutely smallest sphere can of course not be further shrunk itself, nor can its complementary form of endlessness be effectively changed. But when impacted it can be shape transformed and then by necessity preserving both volume and, isomorphic to colour, spheroidal symmetry. Since described in detail earlier[1,4-8,12-14,16,21,23,25-28], it suffices to re-emphasize that it is exactly the Gell-Mann eightfold way in the real three dimensions instead of two and therefore an "eightfold eightfold way"[12,14], because the (diagonally into anti-versions mirrored) transformations may occur in any of the Cartesian space segments. Considering that all observed baryon particles and resonances in the Λ, Σ, Δ, N, Ξ, Ω and also full charmed series[12,13] are directly and reproducibly retrieved with just and no more than the actual states, channels, angular momentums, charge levels and precise mass numbers, and moreover in a faithful three-dimensional realization of the accepted eightfold way according to the original Lie prescriptions, the

results are true and lasting and it is remarkable, too, that they are projected over the regular solid space axes and sides (Fig. 7).

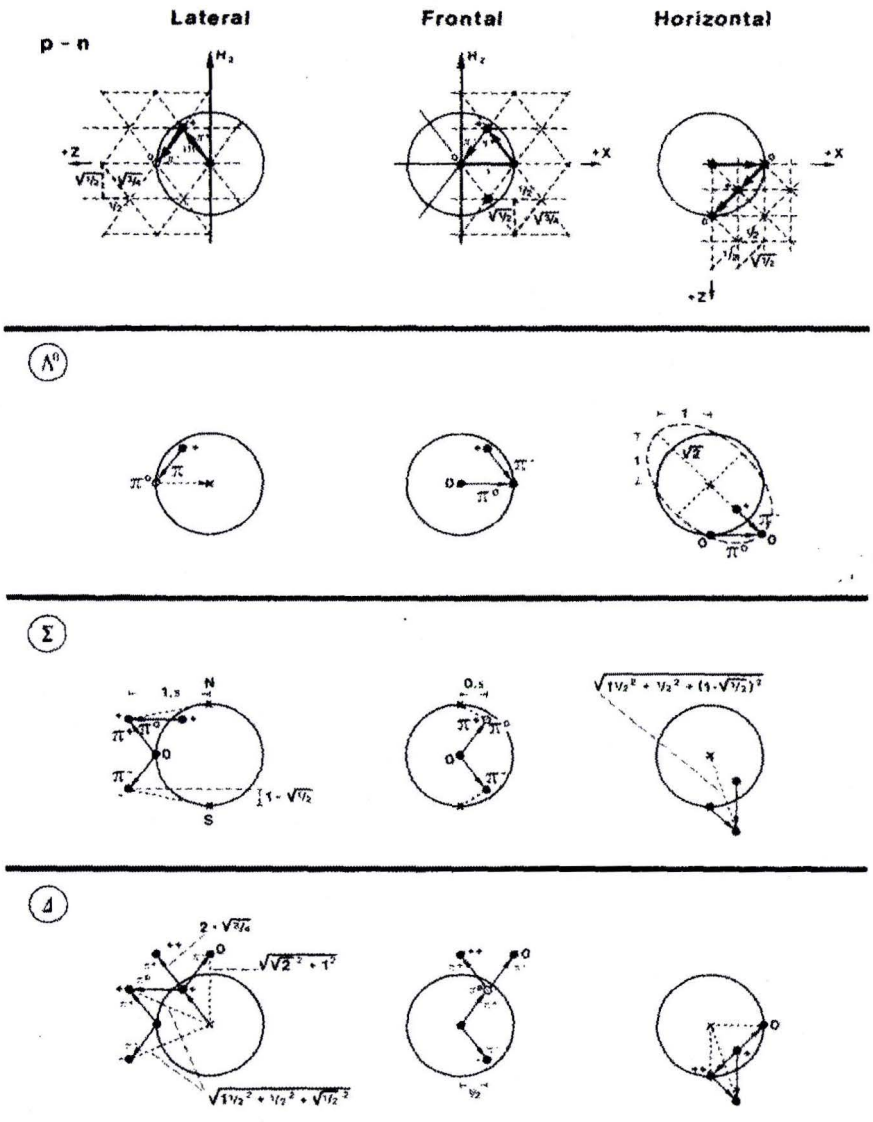

FIGURE 7. The Λ^0, $\Sigma^{+,0,-}$ and $\Delta^{++,+,0,-}$ transformations

To reach the transformation, the same root vector steps as in the Gell-Mann supermultiplet diagrams and the observed spectroscopy alike are taken, leading to new endpoints for an ellipsoidal reconfiguration of the parent State, whereby the masses (given in MeV) according to the quark pressure formula, $\Delta p = \hbar/\Delta x$, come out reciprocally to the proton mass by the minor semiaxis length. In fig. 7, the plane graphs show the channels and the major semiaxis endpoints arrived at in the Λ^0, $\Sigma^{+,0,-}$ and $\Delta^{++,+,0,-}$ hyperons with lengths to the origin given by the root expression, and further that also the charge levels are retrieved exactly and exhaustively as in reality. The global, quark-skewed hexagonal spherical root space lattice is shown in the p-n transposition and (the equatorial plane of) the volume-preserving ellipsoidal reconfiguration is shown in the Λ^0 state. It is to be reemphasized that albeit exemplified here only for the basic baryon multiplets of the Eightfold Way, the exact methods, as reported elsewhere[1,4-8,12-14,16,21,23,25-28] exhaustively, precisely and reproducibly comprise and yield all other observed *u,d,s* as well as *charmed* baryons and their channels, electromagnetical charges, J^P levels and mass numbers by faithful real geometrical rendition of the most well-established physical theories, and thus stand forth in the natural history records as lasting scientific facts confirming and advancing the established state of the art.

Table 1 shows the detailed correspondences in case of the masses in the basic baryon supermultiplets.

Table 1. *Lambda, sigma, delta, xi, sigma{1385}, lambda{1405}, xi{1530} and omega hyperons. Masses calculated according to formula: 938.28 · 1/minor semiaxis*

	Major semiaxis	Minor semiaxis	Mass	
			Calculated	Observed
Λ^0	$\sqrt{2}$	$\sqrt[4]{\frac{1}{2}}$	1115.8	1115.6
$\Sigma^{+,0,-}$	1.60804	0.788591	1189.8	1189.4 – 1197
$\Delta^{++,+,0,-}$	$\sqrt{3}$	$\sqrt[4]{\frac{1}{3}}$	1234.8	1230 – 1236
$\Xi^{0,-}$	1.975	0.7116	1318.5	1314.9 – 1321.3
$\Sigma(1385)^{+,0,-}$	$\sqrt{4.71} - \sqrt{4.75}$	0.679 – 0.678	1382.2 – 1385	1383 – 1386
$\Lambda(1405)^0$	$\sqrt{5}$	$\sqrt[4]{\frac{1}{5}}$	1403	1405 ± 5
$\Xi(1530)^{0,-}$	$\sqrt{7.06}$	0.6134778	1529.5	1528 – 1534
Ω^-	2.505 – 2.51	0.561 – 0.560*	1673.5 – 1677	1672 – 1674

* Minor semiaxis changed in the transformation (c).

3.3. The mesons

The mesons likewise appear in the root vector framework just as in reality as differentials between hadron states there. Their spatial shape is explicitly given by the ordinary geometric representation of the established (symmetric) SU(2) x U(1)

(antisymmetric) product group of the weak force[1,6-8,12-14,20,21,23,25-28], so that they come out as polyhedra, too, albeit not equilateral in all their extensions and therefore unsustainable in the universal lattice, which has the structure of a space frame (Fig. 8),

See the figure 8 in Wikipedia: http://en.wikipedia.org/wiki/File:SpaceFrame02.png

FIGURE 8. (adapted from Wikipedia) Simplified space frame roof with half-octahedron highlighted. A space frame or space structure is a truss-like, lightweight rigid structure whose geometry is most often based on the Platonic solids. The simplest form is a horisontal slab of interlocking square pyramids. A stronger purer form is composed of interlocking tetrahedral and octahedral crosspieces in which all the struts have unit length. More technically this is referred to as an isotropic vector matrix or in a single unit width an octet truss. More complex variations change the lengths of the struts to curve the overall structure or may incorporate other geometrical shapes

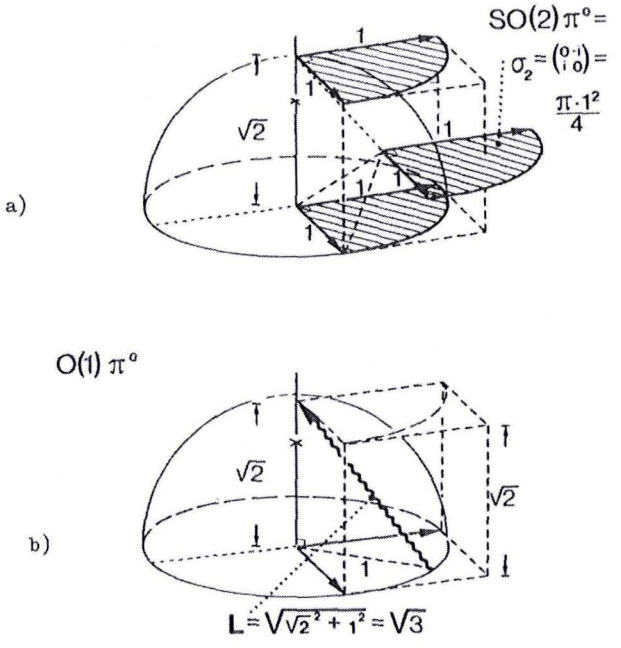

FIGURE 9. (a) A neutral *t* isospin root vector is inclinated 90° to adjacent neutral isovector doublets in the lattice. Between each other the form a circle sector amounting to one quarter of the equatorial plane of the proton. (b) The distance to the next neutral SO(2) counterpart of the $SU(2)_{wk}$ isospin planes in the transition lattice is $3^{1/2}$

in whose build and transitions the mesons and leptons form the permutation set of all possible bits and their building block assemblies in the methodical construction and deconstruction of the system. This becomes clearer in the following, starting with the neutral and charged which emerge naturally as the first differential elements of the cubical and hexagonal halfparts of the lattice, respectively. In Fig. 9 the neutral pion is shown, assuming the shape of a right circular cone segment with base area 1/4 of the unit Proton equatorial plane and length of spinning top generatrix $3^{1/2}$ so that the the mass expression of the enclosure of this ground neutral transformation step according to the aforementioned canonical group equation is $1/4 \times 938.27 \times 1/3^{1/2}$ MeV = 135.4 MeV in comparison with the measured value of 135.0 MeV.

The charged pion (Fig.10) comes equally straight out in the faithful transition lattice as an oblique circular cone, wrapped between state transformations in the hexagonal half-part since happening between state transformations in the hexagonal lattice moiety where it occupies a base area of 1/6th of the proton equatorial plane with average generatrix length of $(5/4)^{1/2}$ so that the mass number is $1/6 \times 938.27 \times 1/(5/4)^{1/2}$ MeV = 139.9 MeV versus the observed 139.6 MeV.

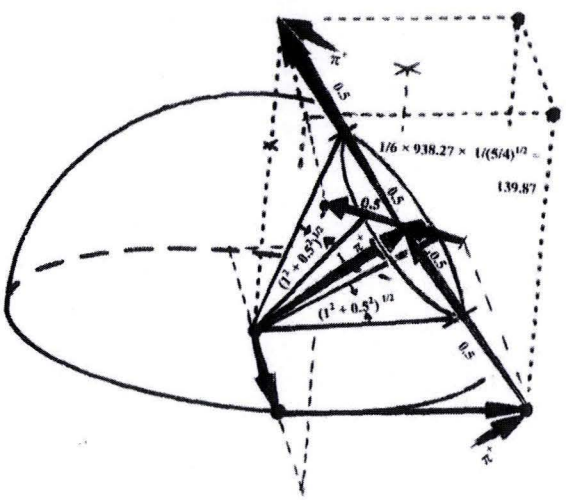

FIGURE 10. The charged Pion takes place in the lattice as the primary differential enclosure of single-step transformations between charged hadron states, covering a conical base area $1/6^{th}$ of the size of the proton equatorial plane centered along an 180^{o} (muonic) root vector sequence and with an (average) generatrix length of $5/4^{-1/2}$.

Again is noted an unprecedented identity between reality and replication also when it comes to exhaustiveness; no other varieties at the respective levels occurring in any of the systems. And the same correspondences according to the unmistakable scientific directions continue in all other mesons as exemplified in the next basic states (Fig. 11);

since long then by any probability testing and other rigorous authenticity criteria surpassing the slightest possibility of a chance coincidence.

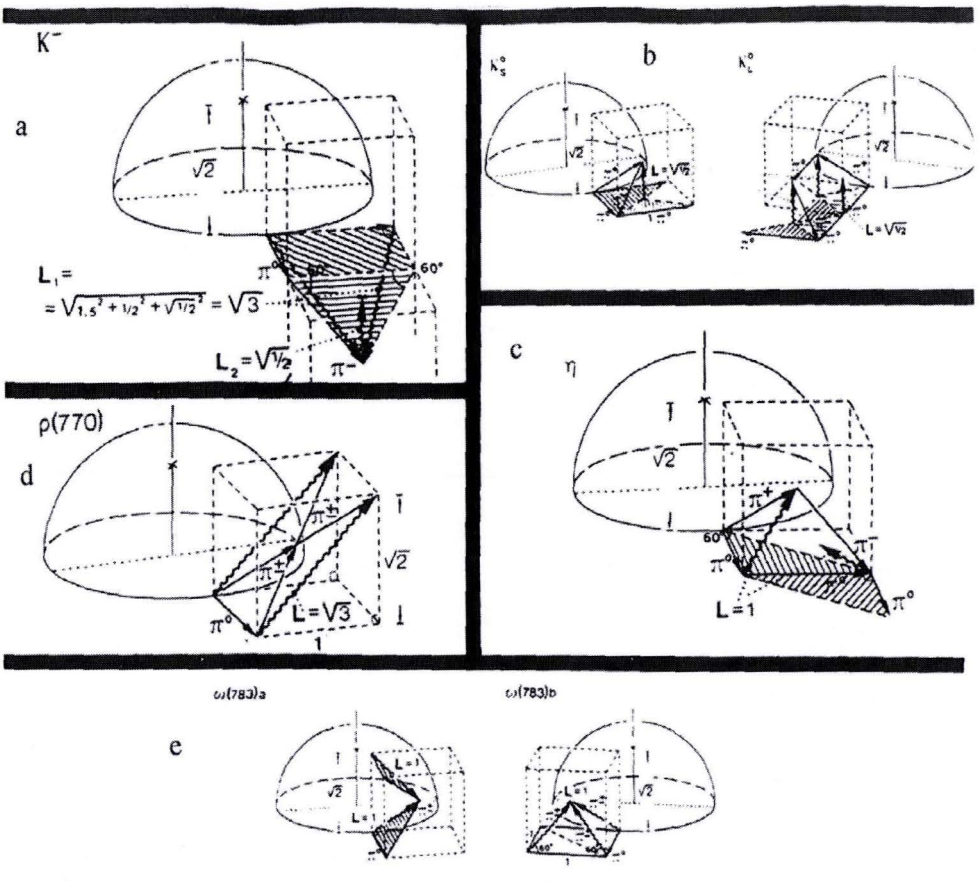

FIGURE 11. Chart of (a) charged kaon; (b) K^0 short and K^0 long; (c) η; (d) $\rho(770)$; (e) two forms of $\omega(783)$

It is striking and convincing that polyhedral root space elements, both differential and equilateral, are so in double sense straightforwardly involved and that it is possible to exactly and exhaustively match the observed elementary particle spectroscopy by classical regular solid metamorphoses.

Table 2 exemplifies the mass number calculations according to the SU(2) x 1/U(1) Lie algebra relation of the weak interactions, and the parallelism in every regard; also chargewise and channelwise is manifest.

Table 2. Basic mesons calculated and observed mass numbers (MeV)

π^0	$1/4 \times 938.27 \times 1/3^{1/2}$	135.4	135.0
$\pi^{\pm}$	$1/6 \times 938.27 \times 1/(5/4)^{1/2}$	139.9	139.6
$K^{\pm}$	$938.27/4 \times 1/3^{1/2} + 938.27/4 \times 1/3^{1/2} + 938.27/6 \times 1/2^{1/2}$	492.0	492.7
K^0_S	$938.27/(4 \times 1/2^{1/2}) + 938.27/(8 \times 1/2^{1/2})$	497.6	497.67
K^0_L	$938.27/(8 \times 1/2^{1/2}) + 938.27/(8 \times 1/2^{1/2}) + 938.27/(8 \times 1/2^{1/2})$	497.6	497.67
η	$938.27/6 + 938.27/6 + 938.27/4$	547.33	548.8 ±0.6
$\rho(770)$	$(938.27/1/2^{1/2})/(3/4)^{1/2}$ or $(938.27 \times 2^{-2})/3^{1/2}$	766.1	768.3 ±0.5
$\omega(783)$	$938.27/4 + 938.27/4 + 938.27/6 + 938.27/6$	781.9	781.95±0.14

And it continues in the entire plethora of mesonic differentials and transformations over the whole spectrum of towering hadrons up to *charmed* (Fig. 12) and *bottom* and even *top* flavours.[12-14]

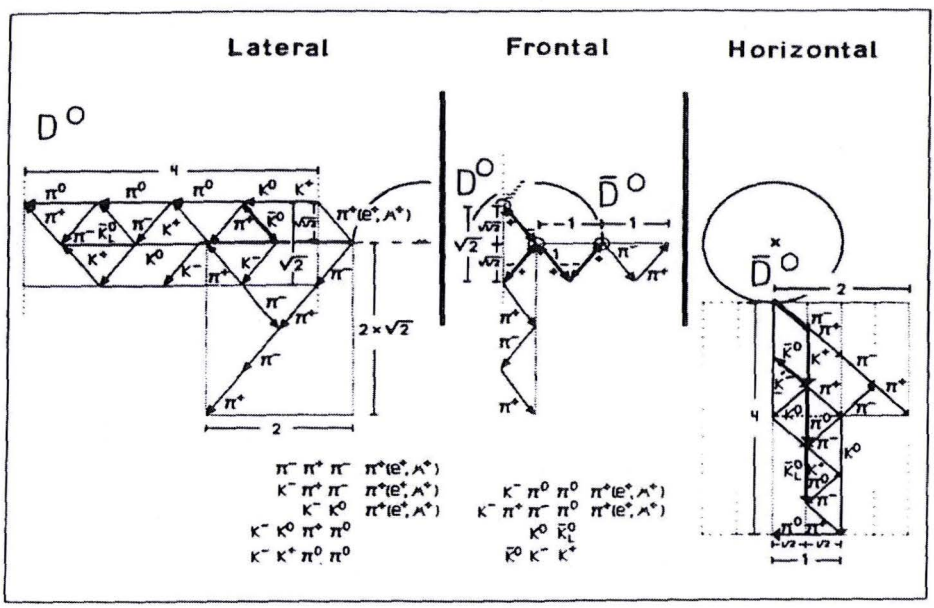

FIGURE 12. The identity between reality and _animation is here exemplified by the *charmed* D^0 and its $\bar{D}^0$ antiparticle equally many levels out in the lattice as in practice.[13] All channels can be retrieved (only a sample shown here), spanning SO(2) planes along the vertical axis tentatively assigned to D^0, and the horizontal axis assigned to its antiparticle. The area in the first case is $\pi \times 4/2 \times 2^{1/2}$ or $\pi \times 2/2 \times 2(2^{1/2})/2$; both $2^{1/2}$ larger than Proton equatorial plane. With distance to next $D^0 = 1/2^{1/2}$, the mass number is $2^{1/2} \times 1/(1/2^{1/2}) \times 0{,}93827$ GeV ≈ 1.88 vs the recorded ≈ 1.86 GeV. In the antiparticle the spheroidal area equals the Proton and with interdistance ½ gives the same result.

3.4. The leptons

The mesons have been faithfully replicated here as spinning residual volumes comprising the additive partial differentials of the involved transformations between all hadron states, very much like bubbles bursting to smaller bubbles before they end up in a spray of linear jets. The latter are the (except the muon further irreducible, stable structural and differential beams of the real elementary particle spectroscopy as well as of the transition lattice where they appear in exhaustive parallel array, too: i.e., the leptons.

Paradoxically, despite their plain one-dimensionality and limited number of states, the leptons stand forth as the perhaps most elusive of the elementary particles. Their antisymmetric Lie algebra is U(1), whose geometric isomorphism is the ordinary real line, the composed length of which may accordingly vary. However, already in the existing wave model it is at the limes level put together by infinitesimal derivatives which are straight unit bits meaning that, innermost, the lepton scalar world function emerges as digital. So is likewise the case in the regular solid lattice. The infinitesimal straight line digit, or 'pixel' is immediately embodied in the uniform, sole ingredient unit root vector element of either neutral or charged inclination, whose iteration is everything that constitutes the lattice and the hence eigen-spacefilling geodesics there. That close matches with the leptons are indeed manifest in it is therefore not surprising in regard of the regular solids' (slightly oxymoronic) 'unique universality', but nonetheless truly remarkable. In fact, the leptons weave the extra-nucleon world, and with such extreme simplicity that is has been overlooked for that very reason.

Starting with the particulate leptons, there are two principal ways of connecting the needle-like sharp charged root vectors of same sign, here exemplified by the positive muon and the positron, namely, in the first case, by 90-180° turns (Fig. 13 a-c), and, in the second case, 60-120° turns (Fig 13 d,e).

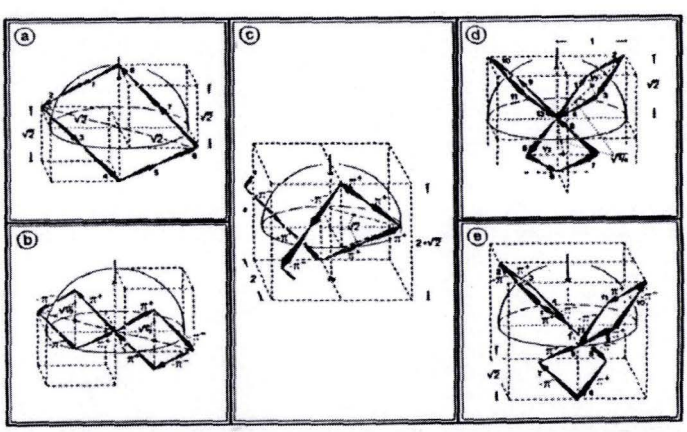

FIGURE 13. Cores of (in this case positively charged) lepton geodesics over nucleon surface

The first alternative forms plane or helical orbits from, over and outside of the nucleon surface with a unit scalelength in all varieties of $(2\pi \times 2^{1/2})$ or $(2\pi \times 2{\times}1/2^{1/2})$ and resulting mass number $1/(2\pi \times 2^{1/2}) \times 938.27 = 1/(2\pi \times 2{\times}1/2^{1/2}) \times 938.27 =$ 105.59 MeV in comparison with the measured muon$^{\pm}$ mass of 105.66 MeV. In the second alternative, a three-winged orbit can be tied together (Fig 13b) and leads out of the nucleon surface, so that it is natural to associate it with the positron/electron trajectory. The circular orbital length of the ground rosette is easy to calculate as $3 \times (2\pi \times 1/2^{1/2})$ in unit gauge, but it is well known that one has to multiply with the fine structure constant, 137.035986.., to obtain the first, in this case 'Mercedes star' three-pronged circumference, so that the ground state positron/(mirror)electron mass number comes out as $1/(137.035986 \times 3 \times 2\pi \times 1/2^{1/2}) \times 938.27 =$ 0,514 MeV in comparison with the recorded 0,511 MeV.

However, there are problems with the orbital model, for instance, in terms of the then alien, empty region under and between its rings. For consistency, a truly spacefilling distribution is wanted. Being a sequence of unit steps there would be no difference in principle in relation to the orbital model, which, as mentioned, is also composed of iterated infinitesimal straight line intervals. And there exists such a possibility which can be patched together to larger structures in a hierarchically periodic fashion just as in modern nanotechnological self-assembly.[1] One of them is the truncated octahedron which is a composite space-filling Archimedean solid that already Kepler saw as fundamentally engaged in the cosmographical architecture.[1,28] The truncated octahedron distribution of a full positron/electron turn may follow from the only space-filling sequence of the charged root vector lattice, namely (Fig.s 5d, 6, 10), a twelve-step, two-tetrahedrons/one octahedron triple coil node, or 'rosette', generated by the distributed local quantum fluctuation of the six free corners of the unit cube conjugating their twelve sides into the coherence of the spherical root vector lattice, as shown below in one variety of a twelve-step loop returning to the origin as a veritable casting-on stitch of the web (Fig. 14). Fig 15 demonstrates another alternative where the tetrahedral rosette wings turn 45° around the corner enabling a variety of continuous patterns and also (Fig. 15b) that it consists only of (equally) charged root vector steps.

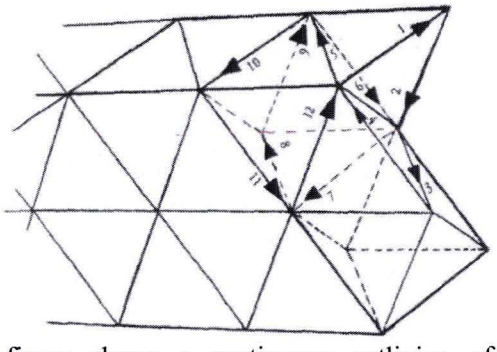

FIGURE 14. The figure shows a continuous outlining of the spacefilling one octahedron/two-tetrahedra root vector lattice coming back to the origin and thus a closed loop. Only the charged root vectors are involved.

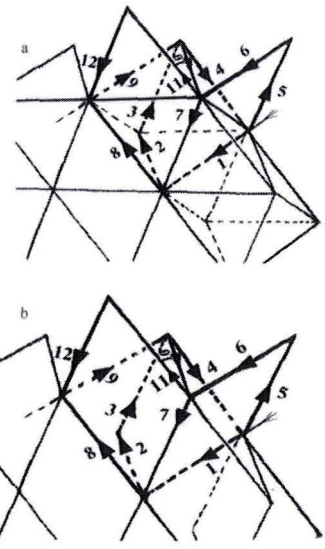

FIGURE 15. Another open loop allowing a spacefilling continuous, e.g. helical path by the charged root vectors alone. Each (quarter) turn consists of six two-side corners, which are present also in the ground cube.

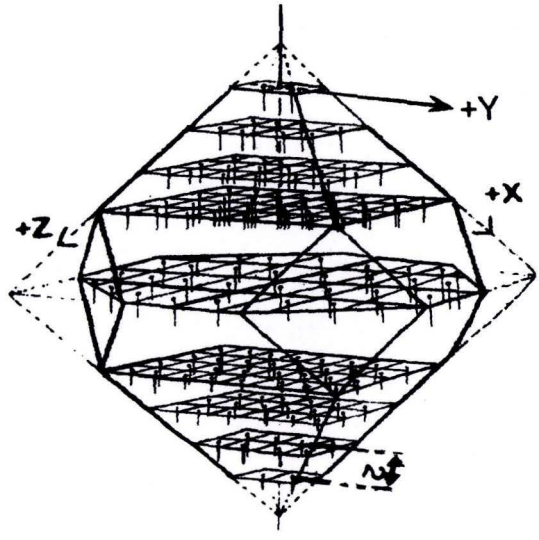

FIGURE 16. Truncated octahedron distribution of 152 electron twelve-step nodes (their triple coils just indicated as rods) in two vertically joined Cartesian segments. The corresponding Bohr orbital shells are shown to the left

Figure 16 above sketches how 152 such 12-step Electron rosettes in Bohr orbital layering may fill, by in all 1852 charged root vector steps (half) a truncated octahedron, so that the inertia/mass is 1/1852 x 938.27 = 0.514 MeV in comparison with with measured 0,511 MeV. Before coming back to this projected primary electron cloud of the Hydrogen ion and its onward atomic an Periodic Table expansions, the remaining leptons; the photon and the muon and electron/positron neutrinos and antineutrinos (tau is not included here) will be briefly considered. They occur as one-dimensional differentials, e.g., when a larger differential slice such as the neutral pion decays like an imploding bubble into two γ.s (Fig. 17). The charged pion regularly decays into a muon and a muon neutrino and these channels also appear in the root vector lattice (Fig 18). The neutrino is a straight momentum vector of infinite length and conveying no charge which is carried on by the muon (compare fig 13 a,c). The inertia of the endless antisymmetric O(1) neutrino trajectory will be $938.27/\infty = 0$.

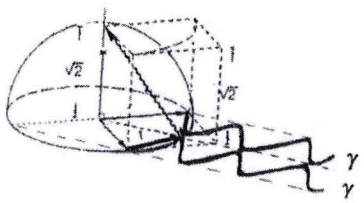

FIGURE 17. Example, in the rotating top differential neutral pion, how photons are generated when root vectors in e.g. particle decay or Brehms-strahlung bendings within same charge plane snap back to their space axes setting up a zig-zag ripple between them of infinite length, thus zero mass and amplitude/frequency also determinable

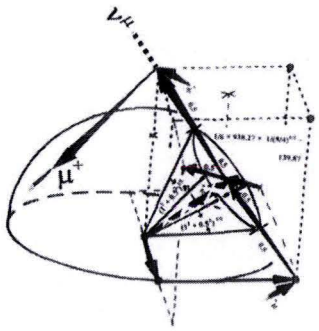

FIGURE 18. As indicated in the axis and demonstrated in the neighboring site, the charged pion decays by a muon (compare Fig. 13a) and an ongoing ν^{μ} momentum vector.

And this extensive correspondence of nothing more, nothing less and all the same persists in the metastable muon, which outside of the nucleon is destined to bend its 90-180° surface track into the extranuclear lattice course of the electron/positron thus setting up a muon neutrino and electron antineutrino (Fig. 19).

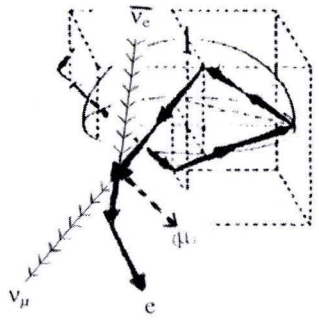

FIGURE 19. Example (compare Fig 13 c) how a transition of, in this case, the muon into the electron geodesics leaves straight forward Bra/backward Ket momentum vectors corresponding to muon neutrino and electron antineutrino, respectively, both end-lessly extending over successive space lattice inter- vals and hence of $1/\infty$ = zero mass and nil amplitud

Table 3 summarizes the results in the leptons accounted for here.

Table 3. Basic lepton calculated and observed mass numbers (MeV)

$\mu^{\pm}$	$1/(2\pi \times 2^{1/2}) \times 938.27$ or $1/(2\pi \times 2\times 1/2^{1/2}) \times 938.27$	105.59	105.66
$\varepsilon^{\pm}_{orbital}$	$1/(137.035986 \times 6\pi \times 1/2^{1/2}) \times 938.27$	0.514	0.511
$\varepsilon^{\pm}_{solid}$	$1/(152 \times 12) \times 938.27$	0.514	0.511
γ	$1/\infty \times 938.27$	0	0 ($<3\times10^{-33}$)
$\nu_{\mu,\varepsilon....}$	$1/\infty \times 938.27$	0	0 (<17 - 35)

3.5. Atomic expansion

As an experienced and rational natural History researcher in a closely related field of descriptive Science dealing with morphology and structural composition and function (see *Pubmed* for credentials), I feel quite safe when stating that what has been presented so far establishes beyond doubt that it is possible to disclose a classical spaceframe structure for the double stringed elementary particle spectroscopy, in which the nucleon holds pivotal position, the mesons are the pylon sections and the leptons their beam and suspension elements. The warp, the string, the knots, the pattern; all comply, but how to weave the tapestry: the Atom that is ten thousand times larger? It must be by filling it by the same stuff because spacefilling goes with the provision of three dimensions alone

where the self-referential filament is the sole thread available and allowed. This holds also when there are more dimensions because our distinct Universe still consists only of itself and then also consummates itself and as the three spatial dimensions in it are linearly independent the situation prevails. Since the spaceframe grid is infinitesimal at the elementary particle threshold, there are no loopholes, and the expansion must go on by it, so the atom can only be a periodical enlargement of its arrangement in order to accommodate in the global coherence.

With the leptons all elementary particles are reproduced by an instantaneous principal phase transition where the electron cloud in one variety pursued here comes out as a spacefilling mesh segment of defined, second-order regular solid form. This truncated octahedron module can be seen as a diagonal cube (Fig. 20) possible to tessellate into different shapes which, in turn, may self-template into cyclically larger portions of same or modified form to go on filling space in a three-dimensional Tetris way, and, at any such stage, to combine with each other in various full-packing conformations. There is nothing different from the orbital model in that regard, under one crucial provision: that the continuous transition lattice can also be continuously delineated. Fig. 21 shows that this is indeed the case under a Fermion half-spin rotation around the forward diagonal axis bringing the end of the line one charged root vector step and one or two (or at lowest quantum, Bose-Einstein Condensate state zero) neutral space axis steps from the origin which, not taking part in the electron formation, appears as the reciprocal pivot, each point of which is 1852 times longer lasting than the electron with proportionately higher inertia and consequential mass number: $1852 \times 0.514 = 938.27$ MeV. The advantage is that the distribution solid can be used as structural bricks, and this double cast of the electrons as "wave functions or transition matrix elements" is in line with recent Hydrogen ground state research[37] and the instant material "modular building block"[38] nature of the electron is pending in modern nanotechnology, molecular biology etc.

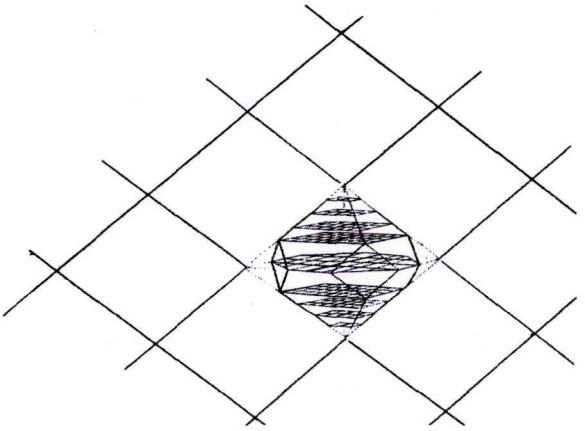

FIGURE 20. The electron module is surrounded by other modules in the second-generation global lattice, and thus doubly bound to its segmental shape

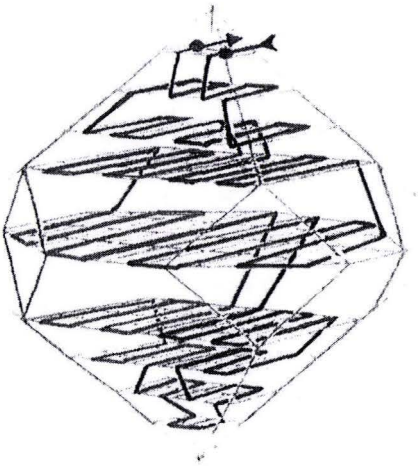

FIGURE 21. One possible, net Fermion continuous sequence of singlet rosettes in Hydrogen electron module connecting with likewise Fermion proton root vector at the origin forming the net Boson Hydrogen atom. The module tiers correspond to the Bohr orbital shells and hold same numbers of rosettes as the electrons there; also in the P to S levels where higher amounts have not been seen in reality.

Fig. 22 a illustrates the complex of one electron module linking with the proton in an upper Cartesian segment and so matching the Hydrogen atom. The opposite end of the complex is free to bind with another open-ended ion, here a second H into the H_2 molecule (Fig. 22 b). It is a variety of "nested polyhedra...which can in turn be put together in spatial arrangements", e.g. "helicoidal progression"[39]; in the present case creating the Bohr orbit signature of the singlet nodes in the forward plane.

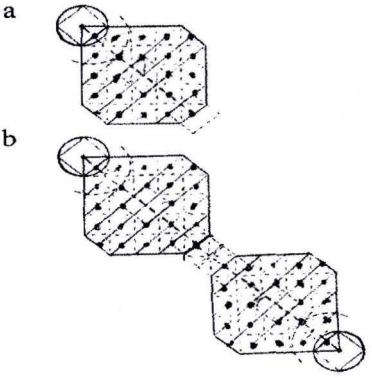

FIGURE 22. a) Horizontal plane projection of single extranucleon module with open end and so realizing H. b) When two H ions are linked end-to-end (or side) the H_2 molecule is formed

And when instead under strong pressure two Hydrogen ions will fuse so that one is pushed a step upwards, still rooting with the upper proton pole in the nucleon and the other with the under and thereby also the in-between neutrons' space axis points are involved, a two-module truncated octahedron honeycomb is generated (Fig. 23), closing the ground (K) sheet of lattice intersections and therefore very stable so as to faithfully realize the Helium atom.

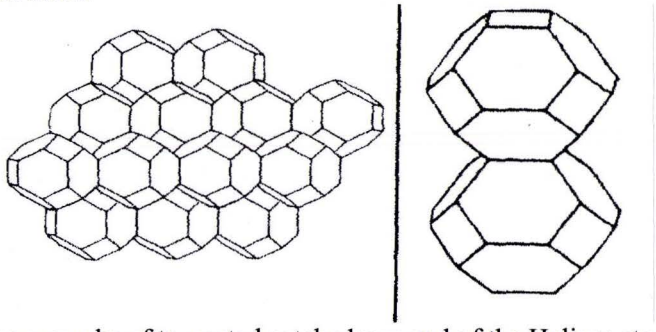

FIGURE 23. Honeycombs of truncated octahedrons and of the Helium atom

In that way the singlet sites can be dragged in under an expanding central boundary as nucleon centres of consecutively larger honeycombs, which thereby are templated in steps and constellations of the periodical system and onwards to further self-similar spacefilling, for instance, of crystalline lattices, deposits, rocks, planets etc. Exemplifying the mechanism only in the first three atoms from the next (L) sheet (Fig. 24), the Lithium honeycomb is variably triangular with one free end for molecular coupling whereas the square or rhombic

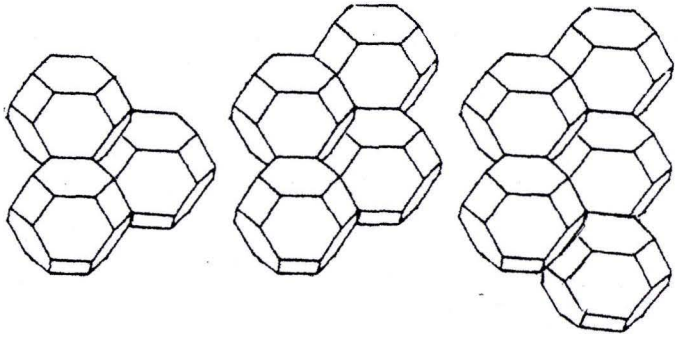

FIGURE 24. The Lithium (one Module in L sheet), Beryllium (2 L modules) and Boron (3 modules) Electron Honeycombs

Beryllium can combine with two atoms/ions/complexes and Boron with three. Not illustrated, Carbon can permutatively couple/chain with four including itself, whereas Nitrogen holds five of the L positions and so has three to offer; Oxygen then two, and Fluorine very strongly one; and when the L shell is filled a new saturated and hence stable atom, Neon, is established.

And so it continues and the correspondences are so extensive, and also non-trivial, that there can be little doubt that it is along these principles that matter will be ultimately reconstructed in forthcoming nanotechnology. The paradoxical aspect is that even in the heavier elements there is only one root vector string fulfilling the respective honeycomb by an extended and convoluted figure-of-eight course so that head-on intercepting by an observation instrument with that individual electron arrow is a matter of quantum indeterminacy and probability statistics. And so far the reproductions only comprise the first extranucleon level, or quantum state of the elements. This is the situation prevailing in the Bose-Einstein condensation but also at the other extreme of the temperature scale[40] where the Hydrogen electron modules are extended virtually to straight lines and may merge with each other into the fusion cascade.

Therefore, it is group-theoretically relevant and interesting that as an inverse at the other, zero Kelvin end of the temperature range, the charged root vector suit runs back into empty space, that is, into the rectilinear lattice moiety by the same route it appeared. This can only be by a honeycomb singlet, which can come so close whereas larger constellations are too distanced. But also in the singlets there is a difference, first exhibited by the Fermion Hydrogen ion which comes back ½ step along the projection planes away from the origin so that retrograde access to the Euclidean space is blocked as it were, whereas the larger Boson Helium will come at +1 and so hitting the entrance; which Hydrogen can do by pairing. [40] Similarly, the Fermion Lithium settles at 1½ + 1½ = 3, while the Boson Beryllium arrives at 2 at once...and so on in the same pattern as observed in experiments throughout the Periodical System.[40] Apart from supporting the faithfulness and pertinence of the regular solid scheme it also illustrates that perfect precision, which after all characterises clarified physical reality[2], can only run through all magnitudes of this if generated already at the outset by the not only perfect but categorical precision of an absolutely unique and universal quantum phase transition; the only that exists per se by itself and thus guaranteeing its perpetuation.

3.6. Stacking the Atom hives

When proceeding from the singlet honeycombs to the atoms there is a cyclical expansion of the respective basic motif which can be described as a stacking of exponentially larger boxes in a Tetris-like manner, each generation templated by the previous along adapted route that worked in the preceding ones so that the single electron geodesics remains unbroken. The number of generations is then, as cause and effect, temperature-dependent. From just one at both the hot and cold extremes, it increases towards the logarithmic mean which for many reasons would be around where water flows and life is formed, and where, as also in other quantum levels, the equal Avogadro pressure of equally many atoms (in gaseous state) reflects the different number of root vector steps in their completion. Fig. 25 shows the principle in a horizontal plane projection towards three cycles in the Hydrogen atom stacking, and it is seen that it does not take many cycles before the cross-section is increased ten-thousand-fold as is also the ratio between the actual elementary particles and atoms.

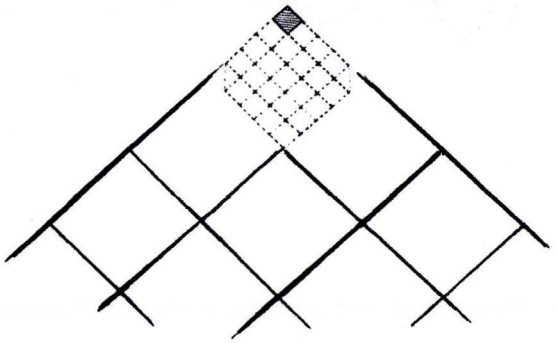

FIGURE 25. Schematic equatorial plan projection of first three self-similar cycles of electron module in the Hydrogen atom as well as of the vertically doubled (Fig. 23) Helium atom

Single as well as fused in honeycomb and molecular aggregates, the modules heap up the joint structural architecture as veritable Lego pieces, patching together already at the infinitesimal level every three-dimensional real shape from their consecutive own and composed combinations. This does not mean that they are some static wire bundles, but the second-generation, $2^3)^3$ periodical partition of the continuous space-filling charged root vector lattice (Fig.s 5, 6) into the first self-similar extra-nuclear segment of the global transition matrix (Fig.s 16,21). Its outline may be distended in, for instance, accelerations, but then the surrounding modules, whether occupied or empty at the moment, will, too, and the apportioned volume share remains preserved. One possible sequential ordering of the electron singlet subunits (Fig. 16) runs through the (here) upper Cartesian segment from its origin and returns in the one below, and so gradually shifts the proton one unit step down and changes the module progression to the opposite direction so as to describe a virtual cross-section rotation with Bohr orbital signature. And when in larger atoms their respective nuclear hub extends over a larger domain of singlets, which in turn magnify their (sometimes isotopically varying) constellation to the honeycomb they co-ordinate, the interstitial charged and neutral root vector content in them will manifest as the corresponding atomic number of protons and neutrons.

For instance, since the electron geodesic is wrapped throughout the entire atom it matches the "quantum superposition...qualitative picture of all possible electron paths conspiring together"[41] with correspondingly low probability of hitting it in a particular infinitesimal interaction cone. And the propagation of the atoms themselves when they occupy their consecutively inflated domains would be determined by their template form so that highly symmetrical shapes, like the noble gases, would proceed in one-dimensional curves and accordingly be gaseous while sharply bent honeycomb modules, like Lithium, regardless of its low weight would go into dense, net two- or three-dimensional convolutions so as to be solid (until heated/excited so that it starts to boil into orbit). And since the offset 'caps' that the honeycombs' collective truncation leaves at the top contain the abandoned central isospin vectors there will be a reciprocal

nucleus, always with as many charged, proton roots as the atomic number, while the Neutrons can be more numerous reflecting the lateral displacements possible under acceleration, e.g. in ^{11}Li.[41]

4. Discussion

Obviously, these rough sketches as well as all other atoms leave a lot of further, but rewarding, work to be done. Nonetheless it can be discerned that they represent a general procedure from which the full inorganic realm and its likewise regularly polygonal macroscopic minerals and crystals can be reconstructed with all the attributes of the periodical system. It has been a very condensed survey, focussed on the reproducible descriptive results. It stops at the atom stage, but can be extended over molecules and larger compounds to the cosmological scale.[43,44] Like many other current models, it is a lattice system, however, almost embarrassingly simple in comparison. Therefore, the verbal report tends to assume a slightly surrealistic ring so that is has been aimed at an illustrative account hopefully catching some of the ideas behind. Yet, it has been said that there is a crisis in today's physics[45] so that the merit lies in the concrete, up-to-date nanotechnological outcome as well as in the eminent 'back to the future' legacy: such as the eightfold way, the Lie groups and algebras, the Diophantine equations and, first and foremost, the ancient regular solids, of which in the inorganic realm here dealt with only the static cube of the geocentrically inferred space matrix and the tetrahedron and the octahedron of the dynamic brew of fire and air, respectively, are employed. They can all be formed by successive straight line steps from the infinitesimal stage, rendering them genuine solids.

The straight line is a direct structure but also the irreducible vector element of pure existence, of anything at all. Another, more antrophic argument for Straight is that we and our perceptions are directly parts of and resonating with actual reality all from the quantum level. In other words, we should pay much attention to testimonies like the following (cited from Tate Modern): "Piet Mondrian (1872-1944) believed that all complex forms could be reduced to a 'plurality of straight lines in rectangular opposition'...his paintings...also represent a physiological reality about the brain...the cells of the visual brain are responsive to straight lines of specific orientation and the field of view to which they respond is rectangular in shape".

And this applies to our binary branching thought processes as well, i.e. intelligence and logic[46] where the straight line bit and its Platonic concatenations and expansions constitute a faithful morphogenetic ground modality of NUCRS[31-34] and likewise are engaged in the three-dimensional orthogonal twist "processes of Encryption/Decryption" utilized in "Quantum Holography, defined by means of the Heisenberg nilpotent Lie Group" and "applied at Bletchley Park in World War Two using various machines including the Turing Bombes and Colossus" [47] as well as more recently in Magnetic Resonance Imaging. [48]

But the strongest argument, again, is the reproducible outcome. It is obtained by genuine first principles and in many instances comprises a first itself. And the results are what counts and persists; Some day, some model will prevail, and the simpler and

more akin to the world at large the better and more plausible and workable. At the elementary particle/atomic stage the direct structural reproductions cover the inorganic realm with unprecedented resolution and completeness. Organic matter, however, predominantly rises from much more composite, molecular building blocks but still applies the regular bodies in enlarged form-specific casts, including the pentagonal and mixed symmetry dodecahedrons and icosahedrons. Fundamental morphological work is here under way above all by Hill and Rowlands.[35]

In conclusion, the present paper is but a brief summary in need of further clarification. Especially, this applies to the question whether the truncated octahedron and the honeycombs it can put together really are the building elements of the continuous Atom delineation. The electron singlet rosette (Fig.s 14,15) is an octahedron/tetrahedron complex and it seems more likely that if it isomorphically templates the ensuing period of its form it would be by iterating this composition in the half-turn twist (Fig. 21) because "if this is done in the same way as the faces...a second generation of polyhedra is formed, which takes the place of the polygonal faces of the first. This can be done repeatedly"[39] with multiplicative enlargement of the motif, that can be carried forth in a helical propagation[39], conveying the Nucleon hub along its eccentrically dilating spiral whereas the honeycomb stacking doesn't have a centre of revolution. Accordingly, something like a sunflower offers a prototype model of atomic constitution which will be focussed on in the forthcoming, hopefully final, stage of this pursuit of the bottom line.

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