

BACK TO THE ETHER

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Introduction

The elusive Ether*, eluding cancellation as well as observation, remains quintessential. Seamlessly sliced to the rendered world: it's alien ghost, or incidental void, or autonomous warp, or inert medium, or reciprocal template, or mutual or even to a phase-shift identical substance? The latter is where back to the future may open up, because the ancient Greek modelled the Universe by the five perfect solids variously referred to as Pythagorean, Platonic and Euclidean, and Aristotle (384 – 322 BC) played the instrumental role of dubbing the Ether as Quinta Essentia (actually: Pémpte Ousia) from the fifth of these, i.e., the dodecahedron.

Thus, Universe carried fabric and form coherent up to a configuration shift between its polyhedral bits, all, in turn, according to Plato (428 – 347 BC) made up by identical triangular planar parts (Sutton [2002]). However, the views of the cosmic arrangement differed, whereby the elder of the protagonists, Pythagoras (569 – 475 BC), was paradoxically the most modern insofar as embracing

* Wikipedia (<http://en.wikipedia.org/wiki/Aether>): The word *aether* means "pure, fresh air" or "clear sky", imagined in Greek mythology to be the pure essence where the gods lived and which they breathed, analogous to the *aer* breathed by mortals (also personified as a deity, Aether, the son of Erebus and Nyx).

an original heliocentric world picture later reversed to the geocentric by both Plato and Aristotle. With other Greek naturalists of the era Pythagoras shared much of the Indian view of a dynamical vital force in everything, calling it the fiery pneuma: “the primordial energy that pervades all phenomena. The expansions and contractions of this fiery pneuma produce a space that includes hot and cold areas, as well as light and heavy areas of concentration” (www [2004]). The still two-pole combustion was exerted by “the five archetypal elements ether, air, fire, water, earth. The constant ebb and flow of these primordial five elements created the interchange of mass and energy which manifested the galaxies, solar systems and planets” (Ib.) as well as Earth and every substantial grain of it.

Pythagoras and his *Mathematikoi* (adepts) further “symbolised the five elements as geometric forms as part of the theorem that numbers were the language of physics and psychology” (Ib.). Of these constitutional forms, the literally pyramidal tetrahedron represented the atom of the fire, the ground atom of the air was the octahedron, of water the icosahedron and of Earth the cube. The dodecahedron was left over and so was chosen – first more prophetically (Seife [2003]) than contemplated – for “everything else”: Cosmos and its planets. Before Aristotle, the ether designation of this rest was more sporadic, and it was not used by Plato at all.

It is interesting to compare the above with, e.g., the Wikipedia summary of ether as originally “a concept used in ancient and medieval science as a substance. The *aether* was believed to be the substance which filled the region of the universe above the terrestrial sphere...It corresponds to the concept of *akasha* in Hindu philosophy...Aristotle added *aether* to the system of the classical elements of Ionic philosophy as the “fifth element” (the *quintessence*), on the principle that the four terrestrial elements were subject to change and moved naturally in straight lines while no change had been observed in the celestial regions and the heavenly

bodies moved in circles. In Aristotle's system *aether* had no qualities (was neither hot, cold, wet, nor dry), was incapable of change (with the exception of change of place), and by its nature moved in circles”.

Back to the future

However, beyond such latter-day literal reconstruction from the fragments of the centuries-long classical epoch, the paradigm was more profound than a fortunately provided, fortunately fitting primary Meccano of separate pieces. The deeper understanding involved what might quite provisionally (and duly apologising for the metapoetic licence) be depicted as the one-dimensional arrow of existence's levelled instep, along one of its two simultaneous end-route alternatives forking from the other's relationless straight-flight, towards its infinite extension modality's also in three dimensions fully contained Idea: the perfect sphere. The linear elements thereby three-dimensionally distributed by necessity imports an equal infinitesimal distribution of the whole process, too, where their unit length segments are next convoluted to the sides of Platonic triangles by which as in modern nanotechnology all the hence up to an assembly variation isomorphic regular polygons are "folded from planar substrates" (Whiteside and Grzybowski [2002]) to surface cage envelopes which “in turn form assemblies or self-organize, possibly even forming hierarchies” (Ikkala and ten Brinke [2002]).

Inflating itself like an *origami* flower, the space thus forms a vacuolar matrix, a virtual quantum foam of polyhedral cells with corresponding minimal spheroidal surfaces sandwiched under, to which the so automatically dispersed particle events perpetually leap. As such reciprocal ‘mortise and tenon’ (MacKenzie [2002]) moieties there is an immanence between ether and matter, the latter of which with its instantaneous interaction lattice around continuously precipitating from the former as the next operative interval of the joint geodesy, just as Aristotle explained the purely relational nature of hence apparent time; no extra dimension accomodable on the three-dimensional stage.

Due to the infinitesimal scale, the triangle legs are of just that limes last decimal of π length coalescing with the circular path that in macroscopic polygons can be approximated as Archimedes did by iterated halving of their sides. And the dodecahedron being the configuration that itself comes closest to the sphere, there was nothing strange with Aristotle's cosmic association of *pémte ousia* in which the running transition between ether and matter explained the radical density difference between the material planets and their ethereal orbits.

Once more excusing for the metapoetic parables, one may visualise a local interstitial bootstrap agglomerating to self-similar global domains *ad infinitum* and remarkably akin to current postmodernistic scientific rethinking, where the by its effective possibility imperative bottom-up 'mortise and tenon' self-inflation of an actual - and by its binary logics unique - real world delineation and the indispensable role of the regular polygons and their topological transferences thereby are, again, quintessential.

However, before coming back to this, it should be re-emphasised that it was all clear in principle to Aristotle and his contemporaries, too. There were the medieval Western ecclesiastic sophists like Augustinus who could not accept other than monistic divine creation of the world and for that reason meddled away the classical insights by cosmic censorship falsification, in turn opening the exit door for the ether as an outside void, medium, lightbearer ("luminiferous Ether") and the like, which arrested progress for so many centuries up till quite recent time. It would be superfluous to review these abortive misconceptualisations here, though, so back to the re-geometrized (Duffy [2004]) future anew:

What happened toward Euclid's era (325-265 BC) was that the cube was more and more assigned to the structure of general mathematical and therefore also mathematical space, the reason being its exhaustive mosaic division and filling of this. It has been said that

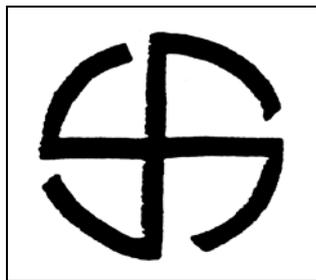
"Plato would have insisted that God created triangles, out of which the Universe is made" (Fraser [2001]) and this is true for the cube as for all the regular polygons in the sense that the "triangular part is a diagonally divided quadrangle, four of which recreate the whole square, which then form cubes" (Sutton [2002]).

And with a large leap forward in history, the cubical shape of space's 'canvas' (Kamionkowski [2002]) became both philosophically, mathematically and physically cemented by the rectilinear Cartesian co-ordinate system, which is implicitly distributed along with the particulate components over the entire space and hence also accompanying them into their smallest domains; only so and then allowing a like orientation of local events at all. Actually it seems almost a truism that when the Cartesian coordinate system is a persistent representation of the flat space metrics, this must evenly extend into the infinitesimal reaches, too, as the differential replica of itself: apart from the proportionately downscaled size an equal cube as the global Cartesian segment of same axis signs. Otherwise it is hard to see that, for instance, Lie transformations and geodesics can happen if not relating to an essentially identical co-ordinate frame in their miniature setting as in their global environment.

In Eastern science, the notion of all-pervading, i.e. identical one-by-one local and aggregated global reciprocity between space and matter, and that they commutually engender and sustain each other has remained primordial. In the recent Kolkata PIRT conferences reference was made to the ancient Vedas (Trell [2003c, 2004a, 2005 b,c]), probably the oldest written texts on our planet and supposed to have been passed through oral tradition for over 10,000 years before written down in their mnemonic Sutra form between 6,000 to 4,000 years ago. As here extensively quoted from Haselhurst [2003], especially the Rigveda epically envisions how "the Universe reveals itself in two fundamental properties: as motion and as that in which motions take place, namely Space...This space is called Akasa and is that through which things step into visible appearance, i.e. through which they possess extension and

corporeality...Akasa is derived from the root Kas, "to radiate, to shine" and therefore direct part of the "breath of life...that underlies and make possible all the multiplicity...that form the cosmic rhythm...through the vibrations, and the action and interactions of vibrations produce all the phenomena."

A wave constitution of matter is thus realised, spun by radial outflow and coupling together of the propulsion between the curved loop and the straight cap and spokes of that "wheelwork of the Universe" (Ib.) bipolar generator - in modalities of sound or thrust, too, if so be - which is symbolised in the original, regrettably later so abused, Veda "mill of motion" (Fig. 1).



***Fig 1** The Veda wheel of procreation and movement, generated between the inter-facing straight frame and round perimeter extremities with the step gradient outlined by the divergence between equal length of them.*

And due to its profound ontological truth and consistency this dynamic ether/matter hybridization was bound to reincarnate in the scientific evolution, for instance, under the evocative designation "vortex sponge" as strongly advanced but in the end rejected by, above all, William Thomson, later Lord Kelvin, around the turn of the 19th century (Lindley [2004]). With forerunners in the moving particle Ether concept of both Descartes and Newton, it was designated from heuristic and mechanistic considerations to resolve "the Electromagnetic World View" and wave equations not only as "a reference frame"...through which all action was transmitted" but simultaneously the inherent generator and, in current terminology, "event-particles" and vehicle per se of its own "dynamical ether...activity". Such a hybrid necessitates an internally and externally coherent "two-way reaction" and interaction (Duffy

[2004]), calling to mind analogies like the cell's wall and nucleus, or an engine's piston and cylinder block. From the data available to him, Thomson proposed "a fine mixture of rotating and non-rotating elements", which 40 years later, as Lord Kelvin failing "to pin down...the exact nature of the little rotating element in his sponge ether...permissible under Newtonian mechanics", he denounced so radically that direct pursuit on that instant classical track became and has remained virtually barred since then (Lindley [2004]). When now rendered up-to-date again by recent developments, this leaves an entire avenue of Science opened for renewed exploration.

Lord Kelvin's "tragedy" (Ib.) was largely related to his vortex sponge debacle and determined by his living before of the 20th century's elementary particle discoveries (Ib.). These would almost certainly have enabled him to verify and explain his intuition of strikingly simple ordinary geometrical patterns and transformations, fulfilling the stipulated wave-mechanistic criteria of rotational symmetry and torque of the vortex (or 'piston') component in the non-rotational real space rectilinear sponge wall (or 'block') moiety together making up the virtual dualistic dynamo that each vacuole in the mesh so constitutes and yields with true and obligate continuity all from the central interior to and through the connected collective periphery.

Whether of primarily substantial or immaterial stuff is of no consequence when everything is part of the same binary give and take. One might take for granted a ready-made Lego kit strewn out in primary distance space and immediately coggling in (and be baffled why the pieces are all kin). Or one might feel the profound need of a more logical phase motor; the imperative potential, spark and twist between no more – or less - than two contrasting and yet infinitely approximating principal philosophical (cum mathematical cum physical) categories always kept in juxtaposition and confrontation with each other. With deep historical roots, the present consensus goes in the latter direction whether the complex-forming agonists are designated "string and loop quantum gravity" (Cho [2002]), or

“eternal-universal Branes” (Seife [2002]), or Yin-Yang, or the dual interplay (Trell [2005 a-c]) “between the curved and the straight...at the heart of Greek geometry and indeed of geometry in general” (Netz [2002]).

In any case there must be a commensurate structural and dynamic emergence. With the triumph of verbatim web-manufacturing Victorian engineering and the industrial revolution at large, it was natural that “the Maxwellians”, in that golden age of Science unsurpassed since the Renaissance “believed that we are immersed in a medium in intense spinning motion, the equal counterpart of matter...a complex system of strains and vortex motions in the ether, that tenuous but all-pervading medium” (Coeys [2004]). And “to deepen their understanding and get ideas of the working of the ether the Maxwellians turned to their models”, the finest of which was George Francis FitzGerald’s now regrettably lost “array of brass wheels mounted in a large array on a mahogany base and connected by indiarubber bands which were strained as the wheels turned” (Ib.).

It displayed several functions illustrating the “real electromagnetic phenomena” (Ib.) but the missing links of the replication were those of the interior of the spinning wheels and of the ether “base”, or actually encasement that they were co-acting in and with, and of which later elementary particle spectroscopy findings as well as still dormant Lie group and algebra neighbourhood geodesics would doubtlessly have provided sufficient clues for consummation. Which were the inner springs, the “standing waves” (Duffy [2004]) that the outer ones were the harmonic continuations and iterations and resultants of? And what was the conformation of the coalescing resonating cavity rather than inert base plate of the oscillations? For mere lack of information the black box became sealed for forthright further exploration.

Only recently has casually imitated “quantum foam” replaced vortex sponge with “strings” instead of springs and with a disjoint and

heteromorphic instead of interrelated and harmonic “spin network” (Cho [2002]); and on such an incredible, not to say absurd scale - billions of times smaller than the electron and yet inflatable to that of the Universe - and hypercomplicated constitution - eleven dimensions wrapped up into themselves - that for this reason alone a revisit to the more tangible and verifiable prototype would seem highly profitable. The moratorium that initial failure and ensuing quantum mechanics and misunderstood general relativity laid on the pioneering contrivance has had its day so it is high time to open up the promising corridor anew. Some striking results of this venture will be the aim of the present discourse together with a brief recollection of associated philosophical, mathematical and physical merits and utility. These findings are noteworthy and convincing as such, but it is hoped that still more outcome-oriented research will be stimulated, above all on the electron and associated second- and ensuing generation external properties, eventually allowing also an animation of the “Protein Universe” (Service [2005 a,b]).

Geometrization of numbers and arithmetic

It is important that such a veritable ether incubator is fully compatible with special as well as general relativity. Einstein himself, in his famous Leyden lecture [1920] was quite “in favour of the ether hypothesis. To deny the ether is ultimately to assume that empty space has no physical qualities whatever. The fundamental facts of mechanics do not harmonize with this view...the ether of relativity...helps to determine mechanical (and electromagnetic) events...at every place determined by connections with the matter...which are amenable to law in the form of differential equations...We know that it determines the metrical relations in the space-time continuum, e.g. the configurative possibilities of solid bodies as well as gravitational fields but we do not know whether it had an essential share in the structure of the electrical particles constituting matter...there can be no space nor any part of space without gravitational potentials for these confer upon space its metrical qualities, without which it cannot be imagined at all...two

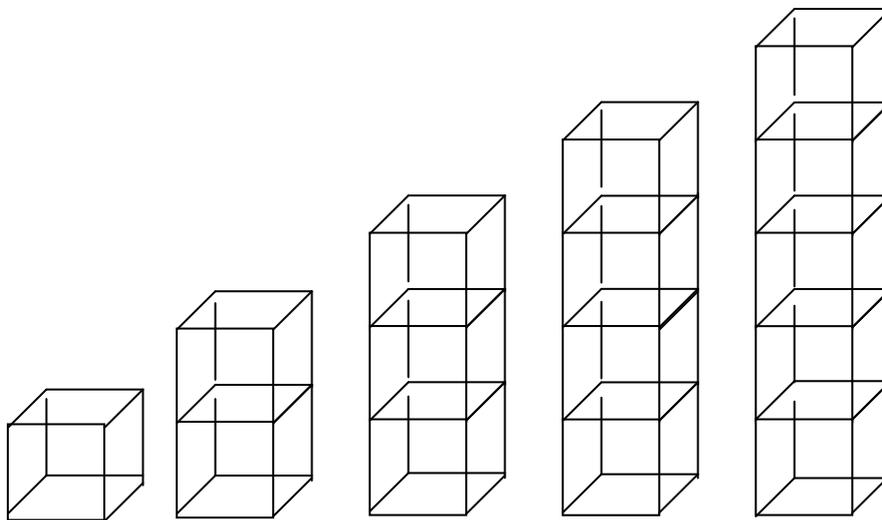
realities completely separated from each other conceptually, although connected causality, namely, gravitational ether and electromagnetic field, or as they might also be called space and matter...the elementary particles of matter are also, in their essence, nothing else than condensations of the electromagnetic field...Of course it would be a great advance if we could succeed in comprehending the gravitational field and the electromagnetic field together as one unified conformation...Recapitulating we may say that according to the general theory of relativity space is endowed with physical qualities, in this sense, therefore, there exists an ether...space without ether is unthinkable, for in such a space there not only would be no propagation of light but also no possibility of existence for standards of space and time (measuring rods and clocks), nor therefore any space-time intervals in the physical sense.”

The extensive quotations may be justified by their canonical nature in support of a necessary ever-present distribution also of the Cartesian co-ordinate system, i.e., of commensurable cubical space segments, in any localized mathematical or physical realization. Or, as expressed in the colloquial present-day idiom of string and loop quantum gravity, where “area-conveying links connect little chunks of space...: a recipe for transporting direction-indicating vectors through space-time...in order to tell you which chunks of space that talk to each other” (Cho [2002]).

However, there were “the ancient Greek” that first formulated the “completely brilliant idea...to use spatial images to represent numbers” (Noel [1985]). And “for the Pythagoreans and through the sixteenth century, one was seen as the root of every number” (Fraser [2003]), and was in three dimensions since time immemorial in ground form represented as a unit cube. For instance, the geometry that Euclid learnt from his Ionian teachers "was originally based on watching how people built", and "the measurement of volume by the number of cubes with sides of standard length required to fill a solid space was probably first used by the Sumerians, who built with bricks" (Hogben [1937]).

It is possible to reconstruct this original whole-number bit system (Fig. 2), by which the genuine Euclidean space as well as Diophantine equations and the operations and constellations therein can be directly brick-laid. Regarding next question - how did the building proceed? - there are at least two main continuous alternatives, one of which has been brought to the fore again both theoretically by e.g. Penrose [1995] and in recent nanotechnological "layer-by-layer" material self-aggregation and -organisation (Velikov et al [2002]).

$xyz = 1$ $xyz = 2$ $xyz = 3$ $xyz = 4$ $xyz = 5...$



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Fig. 2 *Three-dimensional Diophantine whole-number cells (or, after Penrose [1995], polyominoes), one-dimensionally joined together in the vertical direction to infinite series of integers of the first degree by the same discrete amount of the ground unit cubicle, or 'cuBit'.*

It can be described as a stepwise eccentric winding over the surface of the expanding box and has been used to literally underpin a previous proof of Fermat's Last Theorem (FLT) (Trelle [1997,1998a,

2002, 2003c,d]). The other, and most straightforward at the bottom level is to first pave the floor, starting by a row from a corner along the side, after that turning for the next row, and so on till the ground square or rectangle is filled. Then, with unbroken succession in reverse order in the next tier, and so on, till the box is filled in a hence really analytical way, too, i.e. continuous, spacefilling and non-overcrossing.

Although this mode would probably be closest at hand for Diophantus as well as for Pierre de Fermat, both may be used facultatively. For it is important, that the comparatively late Diophantus himself "stated the traditional definition of numbers to be a collection of units" when in his equations they "were simply put down without the use of a symbol" (Heath [1964], Zerhusen [1999]). The effective quantum leap in relation to modern linear functions is of course the integer and spatial instead of point and imaginary nature of the numerical unit.

And pointless, too, would be to make this a heuristic controversy since it is all about reality: reality for the founders, reality of means and ends; reality of the very facts and findings of the case, i.e., that when ancient mathematicians well up to Cardano calibrated joint numerical and physical space they used what during thousands of years between the Sumerian bricks and Roman *tessellas** was the most refined of manufactured self-assembling forms: the cube, the irreducible (but in its products rationally divisible) whole-number bit; cubicle, kaba, 'cuBit[®]', "nanocube" (Murphy [2002]) of arbitrary unit side, providing the atomic set of a myriad literal dice not alone for God to throw but for themselves to stow by cumulative fulfilment (Noel [1985], Sutton [2002]) of their own, "nanobox" (Murphy [2002]) properties.

* Oxford Concise Etymological Dictionary of the English Language: *Tessella* is Latin for little cube, diminutive of *tessera* = a die (to play with), a small cube. *Tile*, *tiling* stem from the Latin word, *tegula*.

In order to reconstruct the original procedure, it may be reminded that computation in those days was much like surveying (Noel [1985]). For the first degree, *positio* alignment, the unit number cells (Fig. 2, 3) then automatically deliver the measuring-rod by longitudinal plus or minus stacking like in the contemporary *abacus* (and the Inca *Quipu* threads) over a single axis; here, referring to digits, chosen as the vertical.

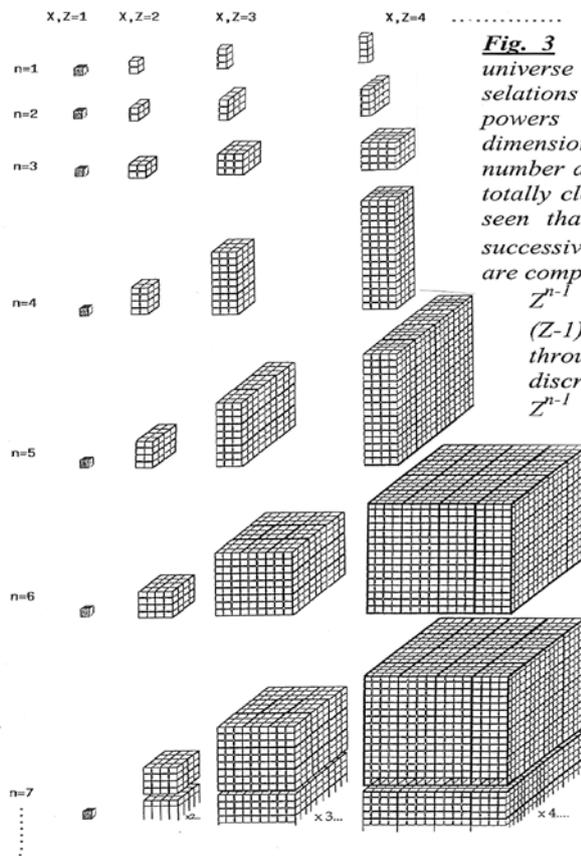


Fig. 3 Diophantine equation universe of consecutive tessellations of all whole-number powers in maximum three dimensions, endless along both number and exponent axes and totally closed from $n = 3$. It is seen that in all columns all successively expanded Z^n terms are composed by the preceding Z^{n-1} block plus one less, $(Z-1)$, Z^{n-1} block, that is, throughout the whole discrete infinite field: $Z^{n-1} + (Z-1)Z^{n-1} = Z^n$ ($= Z^n + (Z-1)Z^n = Z^{n+1}$). It is also seen that not only all Z^n sums but also, one power level lower, all X^n :s and Y^n :s are embodied in the fully extrapolated map.

However, the added, in a double sense manifold value of the direct spatial realisation of whole numbers does not become apparent until with Diophantus formalising their exponentiations and subsequent equations. As mentioned, the natural procedure that offers for a serial power expansion is a sideways instead of length-wise multiplication of the digit by itself, producing at the second degree stage a square tile, step-by-step like the Sumerians did till the quadrate or rectangle is continuously and non-overcrossingly tessellated (Fig. 3). This mode is also documented by Aristotle when, criticising its application to the passage of time, he wrote that "the movement of the units ($\mu\omicron\nu\alpha\delta\alpha$) will be lines" and "a moving line will be a plane" (McGinnis [2003]).

Then, in the same fashion, next layer is filled, and next, and next, till the resulting first-order third degree 'hypercube' is also analytically completed (Fig. 3). In turn, that 'hypercube of the first order' in same periodic progression re-multiplied by the base number yields a 4th power in the shape of a quasi-one-dimensional 'hyperrod of the second order', which in forthcoming multiplications generates a 5th degree second order hypersquare, then 6th degree hypercube, then 7th degree hyperrod, 8th degree hypersquare etc. in an endless cyclical "self-assembly at all scales" (Whitesides and Grzybowski [2002]) that eventually contains all whole-number (and fractional) powers that there at all are (Fig. 3).

In both this and the previously mentioned eccentric mode which may be geared in for physical realizations within and from any such hierarchical level, it is important to re-emphasise that the build is successive also within each sheet by the respectively zigzag and spinning alignment of the individual tessellas so that they never clash. The entire Diophantine equation Block Universe is thus generated by a recursive, perpendicularly revolving algorithm in a maximum of three dimensions, thereby reproducing the hierarchically retarded, non-overcrossing, i.e. analytical space-filling of consecutively larger constellations, imaginable up to the size and twist of galaxies, no matter if taking place during actual time or

an instantaneous phase transition in the sufficient ordinary Cartesian co-ordinate frame.

In such geometrized mathematical iteration, a stepwise continuous “rod-coil-rod...self-assembly of phase-segregated crystal structures” (Kato [2002]) - which “in turn form assemblies or self-organize, possibly even forming hierarchies” (Ikkala and ten Brinke [2002]) - precipitates in a completely saturating, consecutively substrate-consuming way, displacing other stepwise cumulative syntheses (Fig. 3). This is of utmost relevance, since, with bearing to and like Fermat’s Last Theorem (FLT), “far from being some unimportant curiosity in number theory it is in fact related to fundamental properties of space” (www [1996]) as well as of integers (www [1997]). And the uniformity, that all whole-number powers from $n = 3$ and onwards are realised in sufficiently three dimensions as saturated regular parallelepipeds which per definition are composed by integer blocks alone, is of equal cardinal importance for the demonstrations *ad modum* Cardano to be exposed in the continuation.

That the (Western) situation was essentially the same up to the days of Cardano and hence also current for Fermat is namely another undeniable mathematical and philosophical fact, as most clearly demonstrated by the former in his *Ars Magna* [1545]. Quoted from Parshall [1988]; “For quadratic equations, Cardano, like his ancestors, built squares, but for third degree equations, he constructed cubes”. He concluded “that only those problems which described some aspect of three-dimensional space were real and true. In his words: *“For as positio [the first power of the unknown] refers to a line, quadratum [the square of the unknown] to a surface, and cubum [the unknown cubed] to a solid body it would be very foolish for us to go beyond this point. Nature does not permit it”*” (Ib.). That indeed Nature does not allow a truly analytic (that is, continuous, space-filling and non-overcrossing) simultaneous physical distribution over more than three linearly independent dimensions had been shown already by Aristotle, and so was the state of the art

also for Fermat, when in the exclaimed (but unexplained) *demonstrationem mirabilem* in 1637 of his last theorem he manipulated plain "cubos" in equal *en bloc* manner without the use of algebraic symbols (www [1997]).

But whereas Cardano "was unable to conceive of....a four-dimensional figure" geometrically (Parshall [1988]), this, and its continuation may well have been that instant flash of insight for the one century younger Fermat mind: just perpetuating the identified row-rectangle-octagon cycle to ensuing powers by the same undulating iteration and reiteration of the ground unit cube which comprised the genuine whole-number atom of the still prevailing protagonist era. The consequences would have been immediately recognised, too, for Fermat, but why he did not pass on the veritable blockbuster remains as an enigma. Perhaps he did not want to destroy future number theory fun, or it was just an act of that cryptic jeopardy game which seems to have been going on in the esoteric circles when mathematics was often a jealously protected secrecy.

His plausible modus operandi will here be expressed by the simplest – but undeniable – ‘schoolboy mathematics’ formulas – by which yet his FLT (Fermat’s Last Theorem) as well as the latter-day progeny called Beal’s Conjecture (BC) can be proved. Expressed in the forefather FLT designation, BC states that all possible whole-number power, $X^n + Y^m = Z^p$, additions must share an irreducible prime factor in all its terms (Mauldin [1997-], Mackenzie [1997]). By extrapolation from Fig. 3, it can be observed that all manifold blocks grow from the preceding one in the same column by adding upon this one less of the same than its base number:

$$X^n + (X-1)X^n = X^{n+1}$$

This borders to trivial but has profound bearings and consequences, notably in regard of the prevailing $X = \text{integer}$ requisite. First, it is a universal relation; All X^n .s are represented, both by the first summand term and by the sum one step up (or gradually higher by

the relations $X^n + (X^2-1)X^n = X^{n+2}$ (as in $3^3 + (3^2-1)3^3 = 3^5$) and, with non-integer roots of the multiplicative coefficient, $X^n + (X^3-1)X^n = X^{n+3}$, $X^n + (X^4-1)X^n = X^{n+4}$ etc. ad infinitum, according to the general formula, $X^n + (X^p-1)X^n = X^{n+p}$. And with rare exceptions like in $3^3 + (3^2-1)3^3 = 3^5$, only $(X-1)$ can have a whole-number n:th root of power $n \geq 3$, and $(X-2,3,4\dots)$ is too small to raise the sum to higher power.

However, using X^n as coefficient in the second term generates a FLT/BC equation where all terms are integer powers and thus emptying the whole X^n set:

$$(X^n + 1)^n + X^n(X^n + 1)^n = (X^n + 1)^{n+1},$$

giving one solution alone to each X^n . It is easy to exemplify for any X^n , e.g. $(12345^{6789}+1)^{6789}$:

$$\begin{aligned} (12345^{6789}+1)^{6789} + (12345^{6789}) \times (12345^{6789} + 1)^{6789} &= \\ (12345^{6789}+1)^{6790} &= \\ (12345^{6789}+1)^{6789} + [(12345)(12345^{6789} + 1)]^{6789} &= \\ (12345^{6789}+1)^{6790} & \end{aligned}$$

And so it goes on, for every consecutive X and every consecutive n , and hence, for every whole-number X^n introjected in the second term there is but one pure FLT/BC equation where all terms are ground whole-number powers, i.e., in the irreducible form with all external coefficients = 1, screening off other solutions. Since the equation thus drains the whole space of binary additions of integer powers it also proves both FLT and BC because (stated in most general form) $(X^n+1)^n + X^n(X^n+1)^n = (X^n+1)^{n+1}$ excludes n.th power sums (FLT), and the mutual (X^n+1) shares least prime factor (BC).

The total occupation of the FLT/BC space becomes even clearer when X^n and Y^n are entered together in the equation according to the formula:

$$X^n(X^n+Y^n)^n + Y^n(X^n+Y^n)^n = (X^n+Y^n)^{n+1} =$$

$$[X(X^n+Y^n)]^n + [Y(X^n+Y^n)]^n = (X^n+Y^n)^{n+1},$$

which likewise gives an infinity of integer solutions (like $16 \times 97^4 + 81 \times 97^4 = (2 \times 97)^4 + (3 \times 97)^4 = 194^4 + 291^4 = 97^5$). Clearly, and also when $X^n = Y^n$, the two first terms are thus permutatively engaged by every possible X^n and Y^n whole-number power pair and giving in the third term a sum whole-number power sharing prime factor but in a higher degree. Inserting each successively larger X^n and Y^n thus proves both BC and FLT *en bloc* by the ascending differential "layer-by-layer...complete close-packed" (Velikov et al. [2002]) sequential iteration gradually sweeping over and so covering the overall Diophantine equation space.

In conclusion, what has been done here is a "brute force" "infinite machine" (Davies [2001]) exposition that every discrete X, Y and Z power can be explicitly retrieved by the smallest = only possible solution from the first term, the second term, the first and second term, the sum term and all terms in the FLT/BC equation by a simple but universal numerical formula. The ascending addition acts infinitely and successively ties every second term specifically to the complementary first term, hence making also the sum sharing the mutual least prime factor. So, with BC in tow, the proper spelling-out of the FLT acronym should now righteously be Fermat's Last Triumph. Contrary to the assertion that "the problem may require a brand-new approach that would not only re-prove the Fermat theorem but a whole lot more" (Mackenzie [1997]), the brand-old directions yield even better.

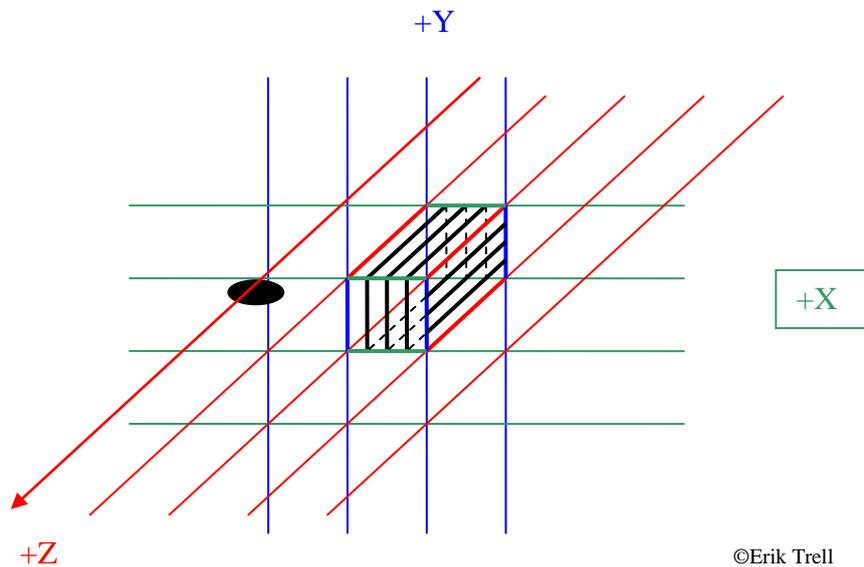
There are indeed a lot of further interesting things one can do with the Euclidean/Diophantine space numbers and equations, like natural 'self-parameterization' and 'self-encapsulation' likewise solving FLT and BC; three-dimensional rendering of prime numbers and prime number products etc. (Trell [1997, 1998a, 2003b, 2004 a-d, 2005 a-c]). However, the main aim here has been the direct and irrefutable demonstration of FLT and BC and showing that also an endless rigid cube can be of fundamental complementary relevance and interest for the true scientist.

Aristotelean ether dynamics

But it is still just the static part of the synopsis. How enters dynamics into the ether block? To that end the original Aristotelean concepts paired with modern theories again give direction. In fact, there are recent developments both in hypercomplex numbers and in re-geometrization topology (Duffy [2004]) to that end. However, they are separately accounted for, so here will be focussed upon the new 'nilpotent vacuum', quantum holography Rowlands/Diaz universal computation rewrite system [2003] and Santilli's iso-, geno- and hypermathematics [2001]. There is full rapport with both because, adjusting for the alternate modality at hand, an equivalent dualistic potential builds up, commencing between the antipodal Zero (=nothing) versus All (= anything) state vector set and eventually bootstrapping a three-dimensional volume-preserving orthogonal Lie algebra by the system's infinitesimal generators, which in both cases form a 3×3 diagonal matrix with $\text{Det} = 1$ (Trell [1991]).

In the real, recently reconfirmed perfectly flat (Bahcall et al. [1999], Kamionkowski [2002]) Euclidean space, the immediate make-up is infinite extension, whose converse is not a hollow void but just no extension at all. At this principal level, the null hypothesis of absolute non-being thus shrinks to: absolutely nothing, not even a point, and also without any charge or other property. It is total Absence; the bare Zero (annulled both if existing or non-existing) and in relation to which the equally radical and obligate, antipodal state of something at all has a monovalent and unlimited positive

category exposition, here endless extension whose ground stuff is length with immediate realization the infinite straight line (Fig. 4). However, a thought experiment consideration of any line in the figure, say, the arbitrary Z, shows the further expansion of an O(3) distribution space (Trell [1991]) as the full obligate contrast of the impossible non-being alternative. Everywhere along the line, the virtual observers may look forward in any other direction maximally covering a circumference of 360° and so setting up a dense radial array together filling the space, demonstrating it to be three-



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Fig 4 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 also and thereby spanning the endless Cartesian co-ordinate system and between them enclosing the infinitesimal cubical eigenvector bits of the matrix.

dimensional and rotationally symmetric and furthermore enclosing its infinitesimal cubical iso-vectors inside itself (Fig. 4).

Thus, textured space just is there, ready-made, though so far co-ordinate- and orientation-less. However, co-ordinates and orientation come automatically, too, because of the local observer-centred condition which brings in the $SO(3)$ group and so joins up with Rowland's nilpotent vacuum conditions [2003] "that physics has its origins in a symmetrical structure which preserves its conceptually zero content...a principle of duality...for instance...between + and - applied to the unspecified entities which are generically described as the reals". Putting the observer-site in the origin sets up the dichotomy of Fig.1, i.e., that there is a relational plus and minus side of the lines. In the whole space they still stretch out in every angle, but when ordered by means of the infinitesimal generators created by the 90° and 180° direction sines, they form the Lie algebra $SO(3)$ around each observer site, all of these in turn co-ordinated by their global interaction necessarily likewise aligned to remain in the algebra (Ib.).

While the nothing/everything, so called *categorical duality* refers to monistic fundamental category and is mutually exclusive (if nothingness exists, anything does not exist and game is over, if anything exists nothingness doesn't and anything is just the obligate offset), the +/- opposition may be called *bipolar duality*, as in pure mathematical terms also advanced in Santilli's pioneering hadronic mechanics [2001], which, like the universal rewrite system comprises an extra, +1 dimensionality for dynamics.

However, before revealing it in the present version, too, there is much more to say about perpetual Euclidean space as such, most of it remarkably overlooked/forgotten in the correspondingly detached modern postulations. Nonetheless, recent observations confirm that real Euclidean space as originally conceived is indeed absolutely flat (Bahcall et al. [1999]) and thereby unambiguously fulfils also its pure logical and axiomatic principle in three dimensions as an

endless cubical Cartesian coordinate system (Trell [1997, 1998a, 2003b, 2004 a-d, 2005 a-c]), or “canvas” (Bahcall et al. [1999]), Kamionkowski [2002]) for everything appearing in it (Fig. 4).

Hence, modern Cosmology’s equally mathematical as physical space in its total span from the infinitesimal to the infinite is by nature as well as definition not curved itself but, again, of “zero curvature” (Mackenzie [2004]), thus forming to actual curves a mutual complement and virtual blackboard. ‘Curved space’ is therefore a *contradictio in adjecto*; light-rays in space may be bent but were their medium bent, too, both would appear parallel. Only in their own reciprocal capacity the straight and round categories are equally much part of the full ‘mortise and tenon’ (Ib.) world panorama where “just as matter is made of atoms and elementary particles, space consists of tiny individual bits” (Cho [2002]), which in the faithful eigen-vector reduction come out as cubical (Trell [1997, 1998a, 2003b, 2004 a-d, 2005 a-c]) (Fig. 4).

It is important to emphasise that Euclid himself in the formulation of his geometry did not even consider a fourth dimension ([http \[a,b\]](#)), and that Ptolemy in his book *‘On Distance’* gave a proof (AD 150) that the fourth dimension, in Euclidean space, as defined, is antithetical: “Draw three mutually perpendicular lines, he suggested. Try to draw another line perpendicular to all of these lines. It is impossible. The fourth perpendicular line is entirely without measure and without definition” ([http \[c\]](#)).

The same appears from the following Aristotelian quotations: “A magnitude if divisible one way is a line, if two ways a surface, and if three a body. Beyond these there is no other magnitude, because the three dimensions...three directions...are all that there are...bodies which are classed as parts of the whole are each complete according to our formula, since each possesses every dimension...either straight or circular or a combination of these two...as body found its completion in three dimensions...its movement completes

itself...the reasoning which applies to the whole applies also to the part” (http [a]).

The perfect Euclidean space is entirely spanned by three coordinate axes, and hence three coordinate axes are all that simultaneously exist in the perfect Euclidean space. It is not a circular but truly peripatetic argument coming back to the identity. And when as constituent parts applying to the whole, the Euclidean eigenvector “bits” (Cho [2002]) according to both Aristotle, current nanotechnological self-similarity (Ikkala and ten Brinke, Kato, Velikov et al., Whitesides and Grzybowski [all 2002], Aizenberg et al. [2003]) and isomorphic differential reduction (Trell [1997, 1998a, 2003b, 2004 a-d, 2005 a-c]) come out as cubes, too, they instantly provide the primary building blocks and numeric units of the one simultaneous physical/mathematical space.

However, since ancient time, a profound insight in relation to the straight and round forms is that they are both absolutely endless, yet radically distinct and irreconcilable over a gap of limes (the last decimal of) π . They thus present a *facultative duality* with an eternal ‘*primum movens*’ subsidence potential fall between their maximally dilated versus maximally contracted form of infinity, respectively. One may here quote Aristotle: “everything that comes to be comes into being from its contrary and in some substrate, and passes away likewise in a substrate 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” (http [a]).

The still valid corollary of the above is that dynamics dualistically occurs between the pair-wise juxtaposed curvature extremes, as may of course also inert projections like parameterization, while upon and within each of them the non-inert processes, like travelling and transformations and assembly, are negentropic.

A similar awareness is now also re-entering Physics and Cosmology. Two decades after its inception, it has recently been concluded that

“string theory, humanity’s best attempts at the ultimate explanation of matter and energy, space and time...has yet to pass...fundamental scientific tests...especially in particle physics, in order to maintain the theory’s credibility” (Cho [2004]).

A critical obstacle thereby is that this “leading candidate for a ‘theory of everything’...suffers from a fundamental weakness...the strings move in a spacetime whose shape has been chosen from the beginning, as if they were actors on a previously constructed stage. A truly fundamental theory of gravity, everyone agrees, would build the stage itself”, to which end “a few physicists have...concocted a theory that precisely describes spacetime on the smallest length and time scales...just as matter is made of atoms and elementary particles, space consists of tiny indivisible bits” where the “warping of the very fabric” (Cho [2002]) forms the template for “untangling the Universe...into the equations of string theory” (Trefil [2004]).

In other words, a reciprocal ‘mortise and tenon’ (Mackenzie [2004]) relation with a “hope that the two approaches will merge someday” is envisaged in the mingled “string and loop quantum gravity theories” (Cho [2002]) in question, where, however, the mortise “moduli” conjectured in elementary particle physics, like the “versions of vacuum” in cosmology are virtually legion; “works on moduli stabilization suggest that there are a whopping 10^{300} different stable vacua, and theorists have no way to choose among them” (Cho [2004]). In consequence, there is a “feel that there’s some missing idea or some very difficult mathematics that needs to be done” (Ib.).

A prominent candidate in that regard is “Inflatory Cosmology”, aiming at “exploring the universe from the smallest to the largest scales” whereby likewise the “understanding...depends critically on insights about the smallest units” (Guth and Kaiser [2005]). At considerable credit costs in terms of suitably parameterizing and otherwise setting the stage, the theory manages to re-create flat and homogeneous global space, and also ripples in it, by the endless

expansion of the surface of the inflating “pocket...hopping up the wall of potential energy rather than down”.

But it fails at smaller scale and, again, at the remaining question: “What, then determined the vacuum state for our observable universe?....the authors hope that some principle can be found....it must have had a past boundary, before which some alternative description must have applied. One possibility would be the creation of the universe by some kind of quantum process” (Ib.).

So, it is back to the outset. What is around – “before”, and for ever? Where are the so far missing “insights about the smallest units” of matter (Ib.) as well as of space (Cho [2002]) that would hold the key to resolution? When today nanotechnology goes deeper and deeper in scale and everywhere reveals a coherent physical constitution from the infinitely large to the infinitesimally small (Ikkala and ten Brinke, Velikov et al., Whitesides and Grzybowski [all 2002], Aizenberg et al. [2003]), also the mathematical and chemical formulas and signs are taken back to their common origin as real composition and shape. Even string theory now feels the need to “get real” and “must find a way to account for experimental observations....especially in particle physics” (Cho [2004]).

To that end, there is in fact no “missing idea”, and although it is essentially mathematics that provides the way it is not “very difficult” (Ib.) at all. On the contrary, as often happens even in advanced science, the overlooked string of evidence may not be the very complicated, but the very simple one – where *one* has a double meaning and embodiment of real significance in the given context.

While the ordinary spatial characteristics are primarily retrieved in rectilinear geometry, the elementary particle symmetries are spherical, with the ‘mortise and tenon’ (Mackenzie [2004]) relation directly between them (Lie [1871], Trelle and Santilli [1998]) and genuine dynamics of particulate matter therefore first occurring in injective and surjective mappings (Adhikari & Adhikari [2003])

“between the curved and the straight...at the heart of Greek geometry and indeed of geometry in general” (Netz [2002]). In that regard, Aristotle can be quoted again: “everything that comes to be comes into being from its contrary and in some substrate, and passes away likewise in a substrate by the action of the contrary into the contrary...if there is a contrary to circular...a straight line must be recognized as having the best claim to that name” (http [a]). The present paper may show that this classical wisdom is true and yields highly valuable results.

One discerns that olden “wheelwork of the universe” (Haselhurst [2003]) as epitomized in the Veda mill of motion (Fig. 1) and Yin Yang metaphors; the tenseless juxtaposition, potential gap, spark and flow between polar, yet approximating infinite categories, one of the best verbal expressions of which to my knowledge is Mark Kurlansky’s in his very interesting book on salt [2003]: “Nature seeks completion...salt was a microcosm for one of the oldest concepts of nature and the order of the universe. From the fourth-century B.C. Chinese belief in the forces of yin and yang, to most of the world’s religions, to modern science, to the basic principles of cooking, there has always been a belief that two opposing forces find completion, one receiving a missing part and the other shedding an extra one”.

When the Aristotelian equally logical as real differential substrate and dynamo for what must after all be identified as Cosmic coming into being and passing away are the two alone ultimately irreducible endless forms that Straight and Round comprise, and, as he also noted, the latter one is the most condense to which straight thus strives but also may be reflected from, we may here contemplate the eternal theme of *Tao*, *Bhagadvita*, the elder *Edda* and other mythologies (Trell [2003a]):

We may perhaps also envisage the more fantastic outline of a binary phase motor with flat block and curved cylinder innumerably multiplied and overall dispersed between simultaneous observer-

centred Big Bang and Crunch apertures. In any case we would then, as mentioned, see something quite akin to the *Vortex Sponge* contrivance and even machine models of “a complex system of strains and vortex motions in the ether” brought to near fulfilment by “the Maxwellians” including William Thomson, later Lord Kelvin, around the previous turn of the century but withering away in lack of solid fine-scale observations just a few years before these started to arrive (Coe [2004], Trel [2004b,c]).

And now having them at hand, including an up-to-date English translation (Trel and Santilli [1998]) of Marius Sophus Lie’s Ph. D. thesis *Over en Classe Geometriske Transformationer* [1871], the evidence strengthens even more that the elementary particle generation is in the form of a homomorphism between the straight and the spherical curvature categories. The virtual cathode is the Euclidean space, whose constitutional “indivisible bits” (Cho [2002]), or “cuBits” (Trel [2003 b,c, 2004 a-d, 2005]), are necessarily cubical themselves and at their first interaction level gather into miniature Cartesian coordinate systems of 2^3 space segments according to the Aristotelian prescription ([http \[a-c\]](#)) that what “applies to the whole applies also to the part” (Fig 5 a-c).

We here have the Det = 1 Santilli isounits of individual and aggregated infinitesimal systems [2001] echoed in their parameter frames, where the first operative order with full Cartesian plus/minus range is the 2^3 “cubicule” (in analogy with molecule) outlined in Fig 5c. Thereby, paraphrasing Dr. Watson, “all the elements are falling to place”. When, in the words of a more recent observer, “untangling...the fabric of Cosmos...without recourse to anything more esoteric than words and pictures”, the first choice is henceforth not such “abstruse things” and “fantastic...quantum fluctuations” as the “six-dimensional Calabi-Yau space” and similar “implausible ideas” of fanciful computer complexity “floating around these days” (Trefil [2004]), but again that simple unit beat “between the curved and the straight” (Netz [2002] in a classical “geometrized vortex sponge” (Duffy [2004]) twosome.

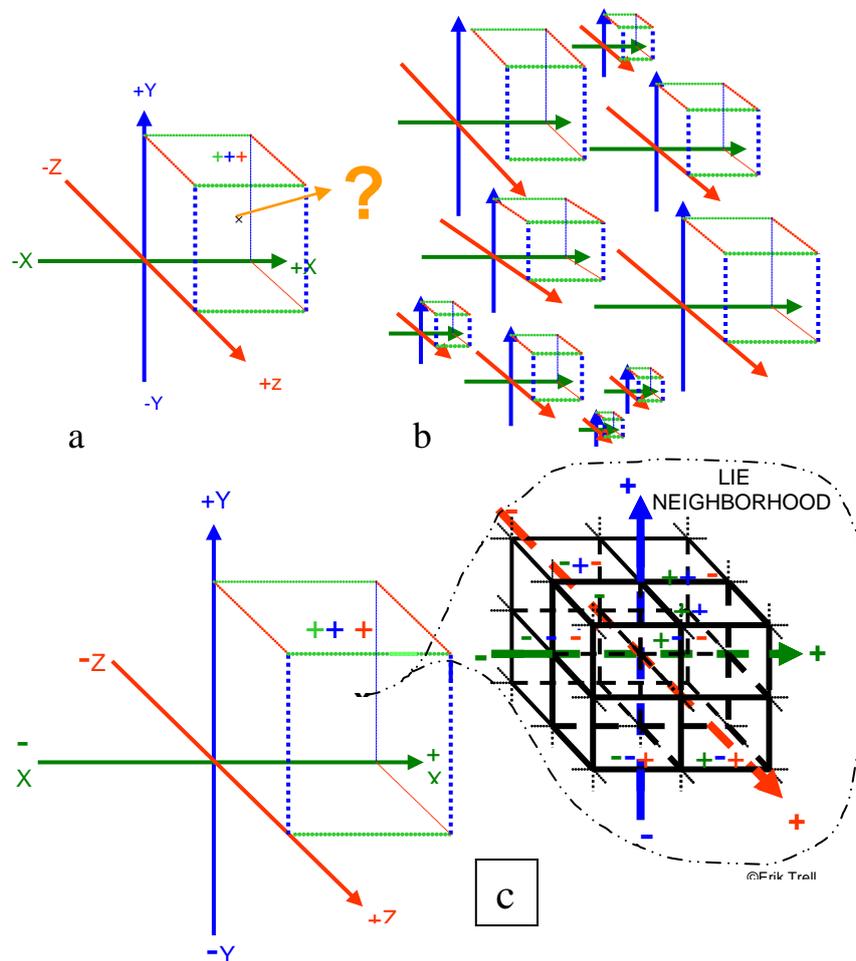


Fig 5 a) The full Cartesian co-ordinate system spans the three-dimensional Euclidean space in eight cubical segments. What is the constitution of a local part (?) in any such space segment? b) Regardless of size, a space portion (or a distribution or other collection) retains the Cartesian representation. c) Hence, both by inference and the meaning of the Aristotelian postulate on Euclidean space that what “applies to the whole applies also to the parts”, the smallest portion of composite space is a Lie neighbourhood, or “cubicule” of eight indivisible cuBits.

It is possible to envision a mutual interplay and intermorphing between the outlined cubical Cartesian matrix of the Euclidean "quantum foam" and the curved "superstring" geodesics of the interior and interstitial particulate symmetries by that $SU(3) = SO(3) \times O(5)$ group and algebra describing the elementary particle symmetries (Trell [1982, 1983, 1990, 1991, 1992, 1998c, 1999, 2000, 2003b,c, 2004a-d, 2005a-c]) as well as Lie's original, "on philosophical reflections upon the nature of Cartesian geometry" based, "transformations by which surfaces that touch each other are turned into similar surfaces...between the Plücker line geometry and a geometry whose elements are the space's spheres" (Lie [1871], translated in Trell and Santilli [1998]) (Fig. 6).

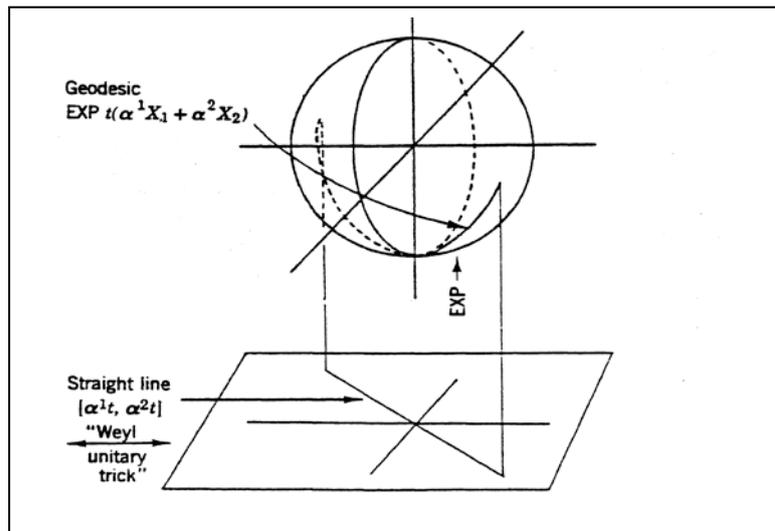
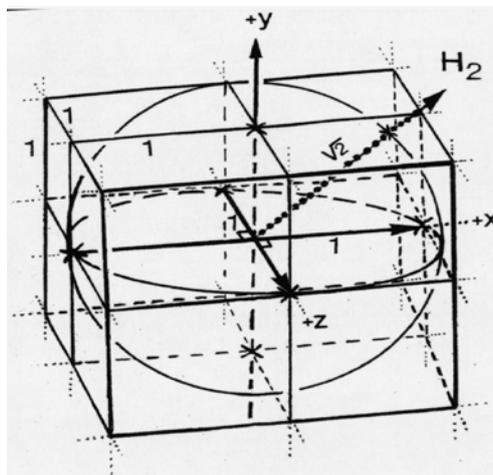


Fig. 6 Graphical exposition of Lie's projection of the surface "fundamental relation that takes place between the Plücker line-geometry and a geometry whose elements are the space's sphere" (after Gilmore [1974])

But it is significant of the present-day alienation of theoretical physics from the prime Lie groups and algebras that it has been

stated that these are only “mystically fit to describe mathematically” the elementary particles and their patterns and behaviour (Jaffe [1977]). On the opposite, and on the proper infinitesimal physical neighbourhood plane, by their direct geometrical, nowadays labelled $SO(3) \times O(5)$ decomposition of $SU(3)$ “we find between the corresponding transformations of R: all movements (translation-movement, rotation-movement and the helicoidal movement), semblability-transformation, transformation by reciprocal radii, parallel transformation...etc.” (Lie [1871]).

Bringing this in phase with the equally concrete as abstract vortex sponge dual motor is then a prescribed task of centrally accommodating maximally contracted endless Round, viz. the surface of the sphere here epitomizing the Nucleon, within the commensurate portion of maximally extended endless Straight, viz. the open-ended rectilinear space grid of the eight cuBits of the surrounding positive and negative Cartesian co-ordinate quadrants of the same unit scale (Fig.s 5c and 7).



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Fig. 7 The core junction in the eight-cuBit Cartesian vortex sponge neighbourhood coincides with the orthogonal t isospin root vectors of the Neutron and realizes the $O(5)$ extra degree of

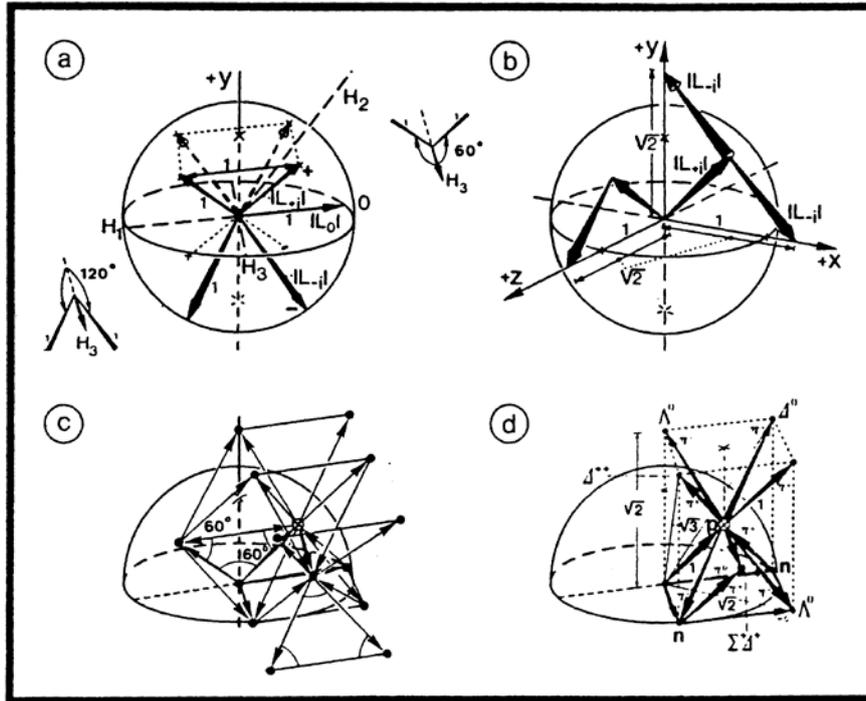
freedom as the diagonal 'Platonic fire' H_2 vector of length $2^{1/2}$.

That the sphere as the inner subsidence forms the matter heart (or 'clockwork orange') member is just as perceived also in modern quark, "Bag", QCD and related confinement theories (Trell [1993, 1998c]) where it is explicitly specified that "the hadron must be an extended, geometrical object" of spheroidal symmetry with the Nucleon as the spherical "preferred (ground) state of the system", whose all other "properties are attributable to this non-perturbative ground state" through "a semi-classic approach similar in spirit to Bohr's treatment of the hydrogen atom" (Jaffe [1977]).

The elementary particle states are governed by the complementary orthogonal subspace $O(5)$ coset of the "canonical real form involutive automorphism" of $SU(3)$ (Gilmore [1974], Trell [1991]), wherein the unit radii of the enclosed sphere are statically extended (e.g. in a Neutron star) along the ordinary x , y and z axes as the neutral t isospin root vectors directly ingrained in the core junction of flanking neighbourhood cubit segments (Fig. 7) (Trell 1982, 1983, 1990, 1991, 1992, 1998c, 1999, 2000, 2003b,c, 2004a-d, 2005a-c]). In addition there are over the walls of these the diagonal H_2 vectors (Ib.) of length $2^{1/2}$, bisecting the 60° inclined t isospin vectors over which the charged states are displayed (Figs 7, 8), and providing tracks for a rolling medial motion along any of the Cartesian space axes.

There is in consequence no deviation from them, so that this spherical mode is that of the Neutron. Two coordinate systems are discerned, where $SO(3)$ is that of the previously derived Euclidean space lattice, partially overlapping with the phase-shifted $O(5)$ generative matrix of the neutral and charged elementary particles, which are by step and/or angle divergently accommodated in the universal unit gauge so that their still three and ordinary physical extensions have the aberrant signature of quarks. The infinitesimal spectroscopic events necessarily originate in the individual cuBits

of which there are two in each geodetic neighbourhood half-plane so that $SO(3)$ like the A_2 diagrams is duplicated resulting in sum $2 \times 3 + 5 = 11$ dimensions (degrees of e.g. combinatorial freedom) of the canonical coset decomposition of $SU(3)$ (Fig. 8 a-d).



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Fig. 8 (a) $SO(3) \times O(5)$ mapping of duplicated Lie algebra A_2 root space diagram into unit sphere with (b-c) three-dimensional transition lattice by unit length pion and lepton vectors there, and (d) some basic super-multiplet transitions produced by eight-fold way steps of them in either of the eight Cartesian space segments. Note the double horizontal displacements of $1/2$ and (non-accommodable) vertical one of $3/4^{1/2}$ as the impulse moment between the $O(5)$ frame and the $SO(3)$ nuclear root space diagrams.

Without going much into detail since earlier extensively reported (Ib.), a veritable - and verifiable - 'eightfold eightfold way' (Trell [1998c, 2000, 2003b,c, 2004a-d, 2005a-c]) is thus provided where unit transitions and differentials over the composite orthogonal and unitary root space vectors extensively reproduce the complete Baryon, Meson and Lepton spectroscopy including flavours, channels, angular moment and exact mass numbers and force category. By the virtual piston movements of the steps in a Cartesian space segment over the transition gaps in the inner inscribed sphere of radius 1, the ground Proton-Neutron Nucleon isodoublet is projected (and against the pole the Σ Hyperon and further series); while in the intermediary inscribed sphere of radius $2^{1/2}$ and its continuation the Λ Hyperon and from there the Λ series arise; and in the outer circumscribed sphere of radius $3^{1/2}$ the Δ (and N) and their series (Fig. 8 a-d).

All these and their anti-states plus here not shown Baryon varieties including the charmed ones are gauge- and symmetry-preserving ellipsoidal surface deformations in a Cartesian segment "nanocube" (Murphy [2002]) enclosure upon the per se irreducible unit spheroid volume part there, with suggestive bearings to dark mass/energy beneath the interstice to which the event is thus confined (Trell [2003a,b, 2004a-d, 2005 a-c]), and further to inverse states in opposite segments, and to co-ordination as automatic condition of (self-) assembly (Ib.), first at the atomic level within single, then at the molecular scale in "stacks of cubical modules" (Mackenzie [2003a]). And so on, and so on in sequential magnitudes. The fewer the involved/observed such cuBit "nanobox" (Murphy [2002]) modules, the more quantum indeterminate the display, while with larger aggregation the precision increases. And due to the pronounced neighbourhood and surrounding interdependency, relativity prevails, too, equally intact as quantum mechanics.

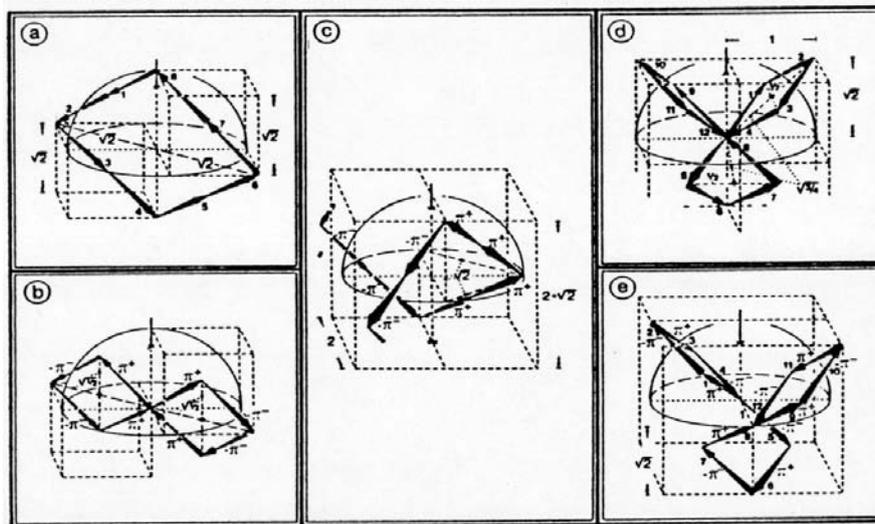
It is important to emphasize that the exposition here is confined to the basic taxonomy, i.e. classification of the transformations. The exact channels, masses and other properties and how they directly

occur and can at once be determined have been reported in detail before (Trell [1982, 1983, 1990, 1991, 1992, 1998c, 1999, 2000, 2003b,c, 2004a-d, 2005a-c]). It is an eightfold eightfold way (Ib.) resulting from an entirely faithful re-geometrization (Duffy [2004]) of the quark and gluon fields, the latter of which is the combined orthogonal-diagonal symmetry of the whole cubicle neighbourhood, and the former the transferred spatial extensions in the single cuBit segment in which the individual strong force transformations rise and are predestined to recoil after calculable lifetime and in that process shed off the corresponding areal weak force meson (remarkably enough as shell tetrahedrons or rhombi) and linear electromagnetic and neutral lepton and boson differentials and collections as likewise exhaustively retrieved in the system. Again, since earlier reported, it suffices to conclude that we envision the workings of a real form two-stroke turbine with polygonally twisting output in the form of the muon tightly surfacing, and the electron and (here shown) positron rising over its outside (Fig. 9), and with a tangential emission (not shown) of end- and hence massless, straight neutrino and sinusoidal photon resultant trains.

Relayed by what in current theoretical physics' flamboyant mélange of parables (Cho [2002]) might be described as the perpetually oscillating pencil-stroke (or fall) between the standing wave conduction plates (or electrodes as it were) of straight frame versus core spherical symmetry, it is this output that joins up and operates in the wider habitat. With that, its further utility is the morphogenetic induction also of composite matter, where the electron/positron emerges as the instrumental agent because its spiralling single-orbit or two- or three-pronged wave-front (Fig. 9) is relegated from the nucleon surface to outer saturated shells which it polygonally outlines; in each axial half-plane of its advancement holding and enclosing the three dimensions of space there.

This enables a facultatively duplicated concentric lattice realization of atomic and larger structures in stepwise orbital shell stratification with 'analytic' (continuous, non-overcrossing, space-

filling) lodging and conveyance capacity proportionate to the square of the discretely increasing radius (and in periods of 2π , circumference) of the so folded shell section. The first instances are the saturation with 2×1^2 electrons in the atomic k shell, 2×2^2 in the l shell, 2×3^2 in m shell and 2×4^2 in the n shell before the storage power perturbatively tapers off.



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Fig 9 a-c: The muons (here positive variety) are formed by either 90° (as here shown) or $60-120^{\circ}$ to each other inclined t isospin root vectors linked in closed (a) or helical (c) or “propeller”(b) orbits rotating over the Nucleon surface with relative length of $2\pi \times 2^{1/2}$ and $2 \times 2\pi \times 1/2^{1/2}$, respectively, and consequential mass number in relation to Proton mass and unit radius = $938.28/(2\pi \times 2^{1/2}) \text{ MeV} = 105.59 \text{ MeV}$, versus actual 105.66 MeV .

d-e: Surface geodesics occupied, the electron and (here shown) positron formed by the t isospin vectors as here shown inclined 60 and 120° to each other are translated into cloverleaf (or “Mercedes”) neighbourhood (d) or helical (e) orbital trajectory of path length $3 \times 2\pi \times 1/2^{1/2}$ covering the three sides of the space and of relative momentum in first Bohr orbit of $938.28/(137.03602 \times 3 \times 2\pi \times 1/2^{1/2}) = 0.514$ versus actual 0.511 MeV .

It is fairly easy to project further molecular and onwards interaction and coupling with the outside, but for the moment this departs from the vortex sponge engine itself, where the electron quantum numbers still warrant brief additional consideration. Especially the mass and its relation according to the formula, $938.28/(137.03602... \times 3 \times 2\pi \times 1/2^{1/2}) = 0.514...$ to the fine structure constant ($\alpha = 1/137.03602...$), to π , ε (the base of natural logarithms) and thereby the golden section forms a decipherable “20th century mystery” (Gilson [2004]), profoundly connected with the self-“untangling of the Universe” (Trefil [2004]) in space-filling hierarchical layers.

In all shells there is a close interdependency between their apparent electron velocity (v_e) and perimeter length and the α (Trell [1982]), which in the ground Bohr orbit precisely equals v_e/c but in outer orbits with increasing v_e to keep pace with the collective progression more and more hinges on the length so that this with v_e approaching c can maximally be 137.03602... times larger than that of the bottom orbital. That the fine structure constant can now also be derived from two-component trigonometric functions of π relative to orthogonal displacement resultant vectors (Gilson [2004]) very much like those of the $n - p$ decay even more points at the deep contiguity between the outer electro-magnetic rotational and inner vortex sponge nuclear machinery spectroscopies, where needless to say very much more numerical and topographic and other work remains to be done.

And the same applies to the molecular and larger structural-dynamical extrapolations where in general the "expanding-cube design" and algorithms for wiring, “morphing” and "navigating that world" (Mackenzie [2003a,b]) would seem to be a promising self-similar approach. Its continuous and space-filling modus operandi through individual topological "body plan" (Ib.b) adaptations has close counterparts in the symmetry co-ordination and cubical-rectangular parallelepiped and size modulations of the smaller cuBit

relatives. By the reciprocity to spherical geometry, the self-assembly periodicity will primarily come in frequency of the golden section. That there will be a tendency to aggregation is also natural, as is collective dextro- or levorotation from equal corner occupancy, and hence to helicity and innumerable other modes of folding due to neighbours who "compete for the same space" (Ib.a,b). When the turns of the "self-folding delivery boxes" (Service [2006]) are 90 degrees the resulting form will be cubical, too. But with more intricate and heterogeneous ingredients and neighbours one might anticipate phenomena like when "in a lattice robot...stacks of lattice modules can reshuffle themselves into a nearly limitless variety of shapes...also attach end to end and form wheels" (Mackenzie [2003a]).

Life-ether

Thereby inspired to "animal metaphors, such as snakes, spiders, and centipedes" (Ib.) one approaches a new principal division line of twofold Nature: that between the inorganic and organic realms. While both of them share and obey the proposed general ether-mechanical dualities; Categorical, bipolar, facultative, and beyond them parity, racemic form etc., their own couple is highly uneven, yet quite satisfied.

It is remarkable that an exactly corresponding discrepant dichotomy is discerned in the faithful Lie algebra $SO(3) \times O(5)$ machine, too. As seen from Fig. 8, there are two possible alignments of the root vector netting, i.e. along the orthogonal or the diagonal space axes. The outcomes will be correspondingly different. From appropriate nodes in the lattice expansion the further scaffolding may of course continue in the previous orientation, or, if so induced, turn into or combine with the other.

In the orthogonal orientation the charged electron vectors form a polyhedral network, that (again excusing for the *licentia metapoetica*, because the precise numerical relations are not given here) like the milky cracks in a compressed glass bowl

simultaneously fills the interstice between stepwisely larger Cartesian segment ‘cubicules’ and the underlying spherical sector, hence forming shells with the observed squared increase of electron lattice modules to completion. It suffices here to point out that the structure will be that of the inorganic compounds; stable, regular, crystal, stereotypic.

The organic counterpart is different. Its name was coined in the 19th century by the Swedish chemist Jöns Jacob Berzelius, and related to the ancient protagonists by invoking a vital force in its generation. Now of course, the proper designation is carbon chemistry, which to some extent overlooks its quite remarkable characteristics; covering some 95 per cent of all compounds, to exhaustion combining the lightest of elements, and filling such narrow a slot of admissible physical habitat...that precicely therefore in an endless ether it is bound to iterate.

Not repeating the unique nilpotent vacuum properties of carbon that enables this ‘hyperbolic jungle’ (Mackenzie [2004]) of life, it will just be pointed out that it may form inorganic compounds but that it may also gather and twist around the diagonal axis, for instance, H₂ in Fig. 8a, and thereby form microtubules. Then, with various radicals or other carbons joining the four empty positions of its l shell, it is in the position to form various tetrahedrons from the single or paired tubule by the likewise Swedish *Tetrapac* procedure, i.e., a 90° or other angular plication and seaming of it. In that way, pyramidal building blocks of different sizes and angles are generated out of lines and planes just the ancient Greek way, and it is possible to *Lego* style build up the biologic structures including DNA as is already going on, e.g. by the Hill-Rowlands group [2006]; also realizing how fragile they are, virtually slanting themselves over their orthogonal bed and in constant need of propping up in order to withstand flattening out into it.

Eventually. the ‘Protein Universe’ will be better understood by such “topology from the bottom up” (Kamien[2003]), ascending

reconstruction of and “insights into how proteins interact to choreograph life’s most fundamental processes (Service [2005a]), and “cluster into four structural classes...as four elongated arms emerging from a common center (whereas) much of the protein structure space is empty because proteins with certain shapes are unstable...the global protein landscape is a bit like the cosmos, where galaxies cluster together amid vast regions of emptiness” (Service [2005 b]). The preferential structure of four types of protein with main diagonal orientation in a straight 3×3 matrix becomes natural, and by the ascending architecture at hand specifically folded organic matter including DNA and polypeptides is rendered extremely exact, stable and reproducible. This is of importance when possible to emulate in detail since it is increasingly recognized that, for instance, proteins exert their distinctive vital actions directly by interlocking form and, conversely, may cause neuro- and other degenerative disorders by certain fold-induced conformation changes.

Discussion

The strength of the present scheme is that it produces real form and results in unsurpassed rapport with both theory and observation. In that regard it lends credibility also from the author’s considerable scientific experience and critical ability in the field of rational medical research (freely accessible searching for Trell at “PubMed” Website: <http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?DB=pubmed> and other databases). The concrete outcome is a literal phase motor extruding linear elements by which the patterns of rendered matter can be reproduced from the threshold level of observable entrance into the actual world.

It is the well endorsed conclusion that any forthcoming execution must take its origin and means in the present verified and reproducible methods. When we are able to animate real structure we have to start at the bottom, the very edge where existence, however entangled and stringy behind that threshold, concretely enters our observer horizon in embodied shape.

However, the attainment of the goals of the present, ascending approach to structural genomics, e.g. “the development of computer models to predict the structure of a new protein from its amino acid sequence” (Service [2005a]) is still in the future. None-the-less, when the results are judged by their reproducibility, extent and precision, they are of lasting value. Also, as earlier summarized (Trell [2002, 2003b,c, 2004a-d, 2005a-c]) they comply very well with existing paradigms and theories, for example, philosophical “infinite machines” (Davies [2001]), Wittgenstein matter-of-factness (Hossack [2000]), Hilbert's formalism and so endorsed “Euclidean geometry games” (Devlin [2002]), Scientific Realism (Kukla [1998]), Kant's teleological *als ob* archetypes (Laubichler [2003]), the Turing computer (Earman and Norton [1996]), the Klein bottle (Purcell [2006]), quantum holography (Marcer [2006]), Fibonacci number ontology (Johansen [2005, 2006]), deployable mathematical software (Petti [1995]), nanotechnological self-assembly (Whitesides and Grzybowski, Velikov et al. [both 2002]), fluctuations in reinstated flat universe (Bachall et al. [1999], Rees [2000]), eternal-universal brane inflation (Seife [2002], Guth and Kaiser [2005]), and, not the least, the “bright bio-inspired future” (Douglas [2003]) where “crystals with exquisite micro-ornamentation directly develop within preorganized frameworks” (Aizenberg et al. [2003]).

Further, the employed *tetrapac* and other parables are no more profane than the “tables and chairs” of Scientific Realism (Kukla [1998]), and the exposition at large no more jargon and verbose than many a trendy cosmological text (Cho [2002]), and no more outlandish than dramatic Eternal-Universal Branes (Seife [2002], Guth and Kaiser [2005]). On the contrary, when the rational scientific criteria are applied that among “alternative interpretations...the one which finds the most widespread acceptance is the one which provides the most comprehensive, simple and accurate interpretation of phenomena, and which solves outstanding problems without introducing complex *ad hoc* conceptual or methodological devices” (Duffy [2004]), then the present updating

of classical “geometrized vortex sponge World-Ether” (Ib.) and its reproducible results deserve serious consideration.

There is in effect no ontological conflict with other, and more sophisticated models (Ib.), but the contribution lies on the descriptive and quantitative plane and with the appropriate adaptations fully complies with them. It is hard to see a more congenial alternative or come around it, when deeper and deeper ever-sharper nanotechnology confirms the fundamental self-similarity of the physical world all from its very entry. When Quantum Chromodynamical (QCD) “tamed equations of quark theory” (Seife [2004]) have recently been awarded the Nobel Prize and together with Quantum Electrodynamics (QED) found to be “the final solution to relativistically invariant quantum mechanics” (Royal Swedish Academy of Sciences [2004]), their real form representation and animation should be useful and valuable.

Extremely simplified, both QED and QCD are local gauge symmetries, where “in order to compute a physical quantity we must constrain the field, i.e. specify a gauge” (Ib.). Thereby, in a geometrical/geodetical rendition, QED is volume-preserving and QCD (spheroidally) symmetry-preserving, and concretely performed by the canonical coset decomposition, $SO(3) \times O(5)$ of $SU(3)$, yielding both precise and exhaustive reproduction of all elementary particles and their properties (Trell [1981, 1982, 1983, 1990, 1991, 1992, 1998c, 1999, 2000, 2003b,c, 2004a-d, 2005a-c]) and also reintroducing the respective Lie groups and algebras in their original geodetic neighbourhood form [1871]. Therefore, this is basically a mathematical exposition and serves to bridge the unnecessary split between Philosophy, Mathematics and Physics and in the end reconciling relativity and orthodox and quantum mechanics. Starting with the latter, the very synonym of a quantum is a unit. And the customary conceived reference/rendition of a quantum in an implicitly rectilinear quantum cavity ‘incubator’ stages strikingly equal equation circumstances as the direct geometrical projections here. In fact, the corresponding local quantum mechanics has since

the late sixties been extensively developed in the iso-, geno- and hypermathematics of Santilli and associates [2001]. Taking into account that “the most fundamental quantities...of physical and chemical theories are not abstract mathematical notions (but) the basic units”, a rich spectrum of “Lie-admissible” formulas by the respective double-valued, $\text{Det} = 1$ isodual operators and operations transfer and connect global quantum mechanics to the internal elementary particle fields and systems, hence, like the present graphical reproduction, actually bringing further support and homage to the acknowledged standard model (Ib.).

Also relativity is maintained because, as noted already by Aristotle, “each part is determined relatively to that part which is next to it by contact” ([http \[a\]](#)). Moreover, at any single moment the realized spheroidal matter/wave-front by the same mechanism will dispense the quantum indeterminacy and randomness in individual interactions and scatterings that further leads on to the “fantastically filigreed hyperbolic jungle” typically occurring as iterated “cylindrical (or convex)...mirror hall.. reflections” along diagonal instead of orthogonal directions (Mackenzie [2004]). So produced, the hyperbolic geometry is not autonomous in the same way as it’s constitutive, round and straight form elements. But it is the composed space of vibrant nature where the prevailing “three-dimensional topology” (Ib.) still does not hold an independent time extension.

As an extra spin-off in a sufficiently three-dimensional world, the altogether plausible and paradox-free opportunity of temporo-spatial excursion therefore warrants constructive elaboration (Trell [1984, 2004e]). And due to the hyperbolic jungle’s after all limited amount and permutations of workable carbon lightweight alloys wherever else in endless ether, no matter how rare and fragile the appropriate circumstances are destined to exist for the inventory and manufacture, not only of life’s feasible structures and optimal organism rendering but in parallel of information and language (Johansen [2006]), there is not only a fair chance but a likely event

that when we debark the time-lagged spacecraft on that nearest Trafalador planet we are met by the quite humanoid meeting officer with “Tellurians, I presume”.

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