Tessellation of Diophantine Equation Block Universe

by

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Abstract

Some of the most fundamental Diophantine equations are hard to unravel by current, "infinite descent" mathematical approaches. When instead deploying concrete number embodiments and operations from the era in question, an ascending type of differentials and cubicular building bricks can be retrieved by which it is possible to regenerate a total Diophantine equation space matrix productively, that is, by virtually splicing instead of splitting it. Even at that 'canvas' stage, it directly solves Fermat's Last Theorem and the Beal Conjecture by its completeness, and strongly supports an analytically spacefilling compartment constitution of Block Universe. From an organic point of view this may be considered as cellular in the sense that the performed literal tessellation of the cell wall/cytoskeleton counterpart fully allows and may even guide the integration of a variety of other viable mathematics and interactions in the system just like the cells as the basic units of biological structure incorporate diverse but synergistic life components and mechanisms, and then may join to larger creatures, which together form societies - and so on.

Introduction

The inspiration and motto of this presentation I found in Professor R. M. Santilli's encouraging maxim that "There cannot be really new physics without really new Mathematics, and there cannot be really new Mathematics without really new numbers".[1] The only modification I would like to do is to exchange "new" with "old" since the aim is to review a latent complementary *Proto-mathematics* in harmony and integration with all the exciting novelties and their common quest: What is Physics, what is Mathematics, what are hence numbers?

The ultimate understanding is of course that they are finally one and the same. Mathematics spans a space, our space, consisting of bits of itself, numbers as they immediately are, the substance of which, however, is a matter of widely diverse interpretation. At one extreme “the followers of Noam Chomsky argue that numbers are just an aspect of language” (world is words), whereas in particular psychologists find support that they are more constant, neuro-anatomically founded mental engrams and ordering roughly corresponding to the linear arrangement of the motor cortex in our brain but still essentially abstract (world is a dream).[2] That they are on the opposite real and concrete and directly mutual with the void they are the stuff of yet seems to be the prevailing apprehension, and not only today since, as J.T. Fraser has put it, “Plato would have insisted that God created triangles, out of which the universe is made. Platonists of the early 21st century may insist that what God created were mathematical objects, called superstrings, out of which the world is made”.[3]

Methods

It would thus seem that future is ready to turn backwards to the roots, where a classical atomistic Cosmos virtually built by reciprocally congruent, explicitly (by Pythagorean death penalty) integer elements is waiting. In other words, as formulated by Emile Noel: “the old Greek are famous for a completely brilliant idea, namely, to use spatial images to represent numbers”, where, foremost, “Euclid’s mathematics was closely associated with his concept of the world, which in accordance with Aristotle was that the Universe was enclosed in a sphere, in the interior of which space and the bodies full-filled the properties of Euclidean Geometry”.[4]

Tentatively settling there again, recombining the available terms and compositions many centuries away from algebra and the retrograde, “infinite descent”[5,6] differential equations which somewhat dissociatively evolved from the same platform[4], the game is an optimal brickpacking – not with triangles, however, but with cubes; during thousands of years between the hieroglyphs of Egypt and *tessellas** of Rome the most refined and perfected of manufactured forms, for God’s and Man’s mosaic architecture of the flat earth and orthogonal temple emulation, respectively. Accordingly, the irreducible number embodiment at hand, **One**, constitutes a cube - cubicle, cubit - of arbitrary unit side, providing the ground set of a myriad literal dice not alone for God to throw but for themselves to stow by consequential fulfilment of their own properties.[4]

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* 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* are derived from another Latin word, *tegula*.

If so, in an era when counting and calculation were much like surveying[4], such veritable number cells almost automatically deliver the measuring-rod by longitudinal, plus or minus, stacking over a single axis, here the vertical (Fig. 1). This as well de-mystifies the intricate problem what the individual figure be of, perhaps not ($\pm$) 2 or 3 or 4, or even 17, but, say 13^{47} or 1234^{56789} and how that differs from (1234^{56789}–1). It is true, that at this altitude the height is as out of sight as on the continuous number line, but the digits are none-the-less separate and exact and one-dimensionally space-filling also in the sense that operations (of fractional amounts, too) like addition/subtraction and multiplication/division take place discretely along the same extension.

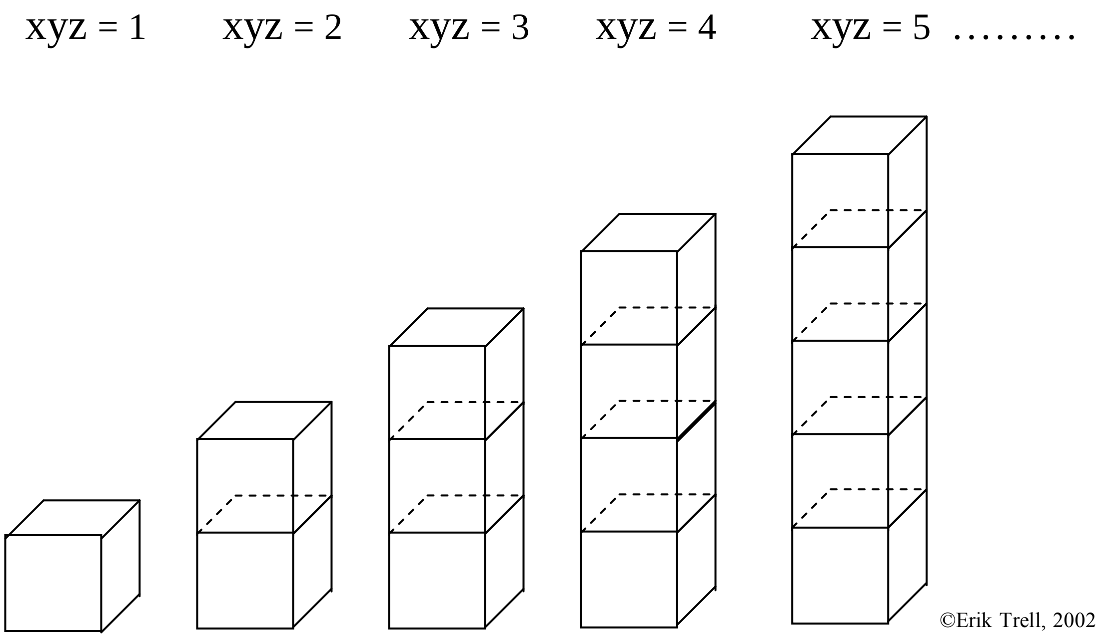

Fig. 1. Proposed three-dimensional whole-number cells (Tecellas©, or, after Penrose[7], polyominoes), one-dimensionally joined together in the arbitrary vertical direction to infinite series of integers of the first degree by the same discrete amount of the ground unit cubicle.

But the facultative, in a double sense manifold value of the direct spatial realisation of whole numbers does not become apparent until with Diophantos introducing their exponentiations and subsequent equations. 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 as it were (Fig. 2). When this is again multiplied by the same number in the third free direction, a third degree cube results (Fig. 2).

Fig. 2. Diophantine equation Universe of consecutive tesselation of all whole-number powers and constellations (Contessellations©) in maximum three dimensions, endless both along the number and the exponent axes and totally closed from n = 3. It is immediately recognisable 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} blocks, i.e., throughout the infinite discrete field: $Z^{n-1} + (Z-1)Z^{n-1} = Z^n$ ($= Z^n + (Z-1)Z^n = Z^{n+1}$ etc.) One also realises that not only are all Z^n sums embodied in the fully extrapolated map but likewise, one power level lower and hence the independent part of the addition, all integer X^n:s (and Y^n:s) there are.

In turn, that 'hypercube of the first order' re-multiplied vertically by the number yields a 4^{th} power in the shape of a quasi-one-dimensional 'hyper-rod of the second order', which in iterated multiplications generates a 5^{th} degree second order hyperplane, then 6^{th} degree hypercube, then 7^{th} degree hyperrod, 8^{th} degree hyperplane etc. in an endless cyclical propagation that eventually contains all whole-number (and fractional) powers that there at all are (Fig. 2). It is important to emphasise that the build is successive also within each sheet by an undulating lining up of the individual tessellas so that they never clash. [6]

The entire Universe of Diophantine equations is thus generated by a recursive, perpendicularly revolving algorithm in a maximum of three dimensions, thereby likewise reproducing the hierarchically retarded, non-overcrossing, i.e. analytical space-filling of consecutively larger constellations, imaginable up to and beyond the size and of twist of galaxies, no matter if taking place during actual time or an instantaneous phase transition in the sufficient ordinary Cartesian co-ordinate frame. As will be accounted for in the discussion, this is of considerable relevance in the present physical context, since, with bearing to Fermat's Last Theorem (FLT), "far from being some unimportant curiosity in number theory it is in fact related to fundamental properties of space".[6,8]

Results

To substantiate the aforesaid by the *abacus*-type transactions of those days, inspection and extrapolation of Figures 1, 2 and 3 visualise the patterns (and others) to be recapitulated, equally clear as the algebraic notations and formulas which then did not exist but for matters of brevity will in the following be intermingled.

Fig 3. Stepwise hexagonal coating, or 'doping' of Z^3 ad modum Penrose[7], illustrated by a modification of a painting by Victor Vasarely, which shows (a) by an extract and dissection of 3^3 how this (in that projection) is grown by a 3^3 roof plus a 3 x 2 front plus a 2^2 side according to ascending $Z^2 + Z(Z-1) + (Z-1)^2$ differential formula, and (b) by the optical illusion in the 6^3 block how the function works both out- (+) and inwards (-).

At any event, it may first be parenthetically reflected that also Fermat, facing the same primordial panorama could well have had that total sensation of its exhaustiveness as ground for the *demonstrationem mirabilem* of his famous theorem that he exclaimed in the margin of his copy of (Bachet's translation of) Diophanto's *Arithmetika*; Why he preferred not to release the virtual blockbuster in another enigma but perhaps he did not want to destroy the future fun.

With reference to Fig. 3, setting out with the general procedure of eccentric (in the geometrical sense) growth of any power by systematic stacking of the unit tessellas, the compound cube offers an instructive example. Penrose has showed how the members are ”built up successively, starting at one corner” in one of the eight Cartesian co-ordinate quadrants ”and then adding a succession of three-faced arrangements” over the free surfaces there (Fig 3).[7] The procedure generates all consecutive third power positive whole numbers (and fractional by their portions), and by projection in the diagonally opposing quadrant the wholly negative variety, whereas perpendicularly opposing quadrants interestingly enough yield partially negative but apart from that indistinguishable twins.

The fundamental advantage is that whole-numbers and their powers have been rendered a physical substance where their properties and interactions are ”formed by the combination of” their elementary units.[9] Besides this veritable quantum leap, an ascending instead of descending differential emerges in the integral expansion. From the visualised growth of consecutive cubes, Z^3, and as expressed in terms of Z it can immediately be seen to be (Fig. 3):

$$Z^2 + Z(Z-1) + (Z-1)^2,$$

from which follows a proof of Fermat's Last Theorem (FLT) for n = 3.[6]

Moreover, the function is valid in all higher powers (and in spherical geometry by the appropriate proportionality constant) according to the general formula:

$$Z^{n-1} + Z^{n-2}(Z-1) + Z^{n-3}(Z-1)^2 + \dots Z^2(Z-1)^{n-3} + Z(Z-1)^{n-2} + (Z-1)^{n-1},$$

which provides a universal proof of FLT, since in each magnitude of n, every higher whole-number is represented by adding a new mono-layer to the physical representation. In FLT, which briefly states that $X^n + Y^n \neq Z^n$, this ”growth stratum” corresponds to the Y^n term, while its substratum is X^n, and the sum of them naturally constitutes Z^n. It has been shown that the only possible integer n:th root, also in multiple-layer integration of the stated growth function, in all magnitudes of n equals the number of such layers and, since the function is expressed in Z, the sole FLT outcome always is $Z^n = Z^n$.[6]

Next coming back to the stepwise tessellation of all whole-number powers, or manifolds, Fig. 2 demonstrates that the second degree corresponds to a two-dimensional square in the arbitrary z direction by the addition to the one-dimensional number column, X^1 (= X), of one less further such columns: $X + (X-1)X = X^2$. The ensuing stage is equally straightforward – and straight-angular. It is a periodical twisting, or unwinding of the space, where the third degree in like manner is entered along the x axis by the continued zigzag addition of $(X-1) X^2$ planes: $X^2 + (X-1)X^2 = X^3$.

It is again evident that the process, innermost perpetually propelled by the assiduous bricklaying of the ground units, can be carried on in and over to every forthcoming manifold generation; covering first the vertical, then the sagittal, then the horizontal extensions again and again in a proportionally retarded fashion, soon even somewhat reminding of a galactic disc.

However, returning to the number theory (and practice) consequences: albeit the tessellation is self-similar, there is a mathematical difference because when not the separate numbers are fractions or multiples of each other there will be gaps and overlaps, respectively, between their distinct exponential series. Only the n = 3, 6, 9, 12, 15, 18, 21.....(∞-3), ∞ cubes are all automorphic and in raising order harmonically incorporated between themselves so that the mathematical proof of FLT is the same for all of them, whereas the vertical hyper-rods and the sagittal hyper-planes are not periodic. But it is evident that the rendered “toy model universe”[7] in just three dimensions provides all integer Diophantine terms and, importantly, sums, products and expansions, power- as well as number-wise, that there at all are.

It strikingly reminds of the actual world where three dimensions likewise are the most in which a continuous physical realisation can be simultaneously distributed in a non-overcrossing and space-filling, that is, analytical order. Already Aristotle deduced that with additional extensions the geodesics will get entangled by their equally higher-dimensional co-ordinate points no longer being able to avoid colliding with each other within one and the same static compartment. Also by observations on the own free mobility in experienced space but fixed transport in time he reached conclusions akin to modern expressions like that ”invariant...orthogonal transformation of co-ordinates” can lastingly keep clear of obliterating themselves in a given neighbourhood over at the most three linearly independent axes so that when ”in the theory of relativity, space and time co-ordinates appear on the same footing”, the corresponding Lie algebra, or 4x4 matrix ”inhomogeneous Lorentz transformations” must contain a ”translational part”.[10] The latter is here offered, too, as the perpetual way out from the final cubicle recess in a filled power box to the next one.

The aforesaid might catalyse some musing also over the nature of that constant vast amount of vacant space all around us at every moment, which we call empty, including the possibility of excursions into its hidden strata, for example, that fourth one which we call Time.[11,12] However, focusing in on the stepwise growth of the exponents of all separate integers, FLT and the latter-day progeny called Beal’s Conjecture (BC) can be proved, too, by a complementary ”dynamical evolution of our toy model universe”[7], which will here be performed in algebraic notation. 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. [13,14]

From what has been said earlier and by extrapolation from Fig. 2, 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:

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

This borders to trivial but has profound bearings and consequences, notably in regard of the prevailing X = 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 successively higher by the relations $X^n + (X^2\text{-}1)X^n = X^{n+2}$ and, with non-integer roots of the multiplicative coefficient, $X^n + (X^3\text{-}1)X^n = X^{n+3}$, $X^n + (X^4\text{-}1)X^n = X^{n+4}$ etc. ad infinitum, according to the general formula, $X^n + (X^p\text{-}1)X^n = X^{n+p}$, where the specific case, p = n or multiples thereof, is excluded from integer solutions since when by definition X^n has a whole-number n:th root, $(X^{n\pm 1})$ cannot have one).

Anyhow, such varieties do not change the principal conditions that all X^n.s are regenerated in the Z sum one power higher whereas the Y term is a full member only when its (X-1) or $(X^p\text{-}1)$ multiplicator has an integer n:th root - and when not can still be retrieved and mobilised as a factor subset within the sum block. Then, one starts to realise that $X^n + (X\text{-}1)X^n = X^{n+1}$ (etc.) is also the unique, i.e., the only possible non-overlapping or non-gapping binary $n \geq 3$ manifold tiling in the entire whole-number $n > 2$ exponential space, which naturally verifies FLT by exclusion and the secondary BC by the inclusion in all terms of the common irreducible prime factor in X.

The qualification is as said even stricter because in FLT and BC alike, also the Y term is a whole-number. So whereas the product of (X-1) [and (X^2-1), (X^3-1) etc.] times X^n is always integer, the (X-1) [and (X^2-1) etc.] multiplicator can be incorporated in the whole-number Y base only if it has (and as) an integer n:th root. The second summand is hence $[(X-1)^{-n}X]^n$ (or $[(X^2-1)^{-n}X]^n$ etc.) and included in an integer Y term as well as in FLT and Beal's Conjecture only when (X-1) [or (X^2-1) etc.] has a whole-number n:th root.

Taking some easy examples, for X = 4 and n = 3,4,5 we have:

$$64 + 3(64) = 256 \ (= 4^4)$$
$$64 + 15(64) = 1024 \ (= 4^5)$$
$$64 + 63(64) = 4096 \ (= 4^6),$$

and, equivalently, $4^3 + (3)4^3 + (3)4^4 + (3)4^5 = 4^6$

None of these qualify for inclusion in FLT or BC. A valid entry is offered by, for instance, 27 + 8(27) = 243, because this is $3^3 + (2 \times 3)^3 = 3^5 =$

$$3^3 + [(3^2-1)^{-3} \times 3]^3 = 3^{3+2}$$

In both FLT and BC it is the pure integer requirement of all the X, Y, Z base numbers, i.e. that the simultaneous 'external' coefficient of their X^n, Y^m and Z^p terms = 1, which finally seals the proof. A single block has to fit with (the volume of) a single block to, exactly and exclusively, fill a single block, which obviously misses both and either of the summand tiles to be precisely filled. Since the X part is (chosen as) the independent one of these, the single sum block will always lack just the single X^n block and, as its other missing link, can only be completed by the (rearranged) reciprocal multiple of this which complements it, and by that alone be uniquely satisfied, and hence a multiple thereof itself. The decisive point is that all X^n:s are enrolled and consequentially used up and exhausted in this binary splicing: the substrate comprised by all bricks of the universe already at the outset absorbed in their mutual double-bonds and thereby neither room nor material for other couplings.

It works like a global Eratosthenes sieve[4], filtering the space from ascending $1^n, 2^n, 3^n, 4^n \ldots..(\infty-1)^n$ X exponential series so that the horizon for lower base number power inclusions is gradually pushed up precisely out of reach. This stages a unique combination panorama that, per se, goes over all magnitudes of n, even n = 1, since, for instance, 2 can only be combined with 2 to form 4.

However, in that power it is an unbound relation since 2 can be combined with endlessly many other integers to form endlessly other integer sums, all members of the X^1 subset. When the power of the sum is 2, the situation is the same because it is formed by two basically first-degree terms; $X^1 + (X-1)X^1 = X^2$, and X^2 can thus be formed by other first-degree terms which might even be squares. But from $X^2 + (X-1)X^2 = X^3$ and onwards the relation is locked in all its members; the first term X^2 piece exactly and exclusively determining also the unique missing second degree quantitative fraction delivered to the common set's sum member which exactly and exclusively has to be filled by the missing puzzle piece of the addition. It is a veritable palindrome that from this exponential level confines the feasible solutions to the universal and unique equation:

$$X^n + (X-1)X^n = X^{n+1} \quad (\text{and } X^n + (X^2-1)X^n = X^{n+2} \quad \text{etc.}).$$

There can be no larger solutions, because then, in all cases, the bottom single X^n tile, just because it is single and bottom and all and every X^n there are, would be too small to by its unique and ubiquitous self fill the gap between any larger tile separations than $(X-1)X^n$ to X^{n+1} [and $(X^2-1)X^n$ to X^{n+2} etc.].

The principal conditions remain that all X^n.s are regenerated in the Z sum one power higher whereas the Y term is a full member only when its $(X-1)$ or (X^p-1) multiplicator has an integer n:th root - and when not can still be retrieved and mobilised as a discrete factor subset within the sum block. Then, one starts to realise that $X^n + (X-1)X^n = X^{n+1}$ (etc.) is also the unique, i.e., the only possible non-overlapping or non-gapping binary $n \geq 3$ manifold tessellation in the entire whole-number $n > 2$ exponential space, which naturally verifies FLT by exclusion and the secondary BC by the inclusion in all terms of the common irreducible prime factor in X.

This is best mathematically expressed by the regular differential chain equation:

$$X^1 + (X-1)X^1 + (X-1)X^2 + (X-1)X^3 + (X-1)X^4 \ldots. + (X-1)X^{n-1} = X^n$$

Which can be further generalised to

$$X^p + (X-1)X^p + (X-1)X^{p+1} + (X-1)X^{p+2} + (X-1)X^{p+3} \ldots + (X-1)X^{p+(n-1)} = X^{p+n},$$

hence providing a formal mathematical proof of the uniqueness of the ascending, truly differential function by its "layer-by-layer…complete close-packed"[15] continuous iteration gradually sweeping over and so covering the entire Diophantine equation space. FLT and BC are demonstrated in the passing since all $integer^{n}$ + $integer^{n}$ additions in the exhaustive set yield $integer^{(\geq)n+1}$ sums, and the mutual X term obviously shares irreducible prime with itself.

Yet it may be of interest to illustrate the situation more expressively. By the homogeneity of its algorithm, the totality of binary Diophantine additions comprised by the universal $X^{n} + (X-1)X^{n} = X^{n+1}$ (etc.) equation technically forms a folded but wholly even and dense X^{n} membrane, or 'n-brane', which, at all its point, by a mathematically equally constant, fixed and unbroken cog of itself lifts itself to the next level of itself. The totality elevates to the totality, in just one and the shortest rise, between one floor and the next, all monolayer shafts in the single interstice filled to the last unit corner, doubly obstructing other manoeuvres. The folded membrane is superposed on itself in infinitely many but strictly periodic points from which it continues; e.g., $3^{32} = 9^{16} = 81^{8} = 6561^{4} = 43046721^{2}$; but from such nodes - all there are - the succession is different, i. e., $3^{31} + 2 \times 3^{31} = 3^{32}$; $9^{15} + 8 \times 9^{15} = 9^{16}$; $81^{7} + 80 \times 81^{7} = 81^{8}$; $6561^{3} + 6560 \times 6561^{3} = 6561^{4}$; $43046721^{1} + 43046720 \times 43046721^{1} = 43046721^{2}$, and $3^{32} + 2 \times 3^{32} = 3^{33}$; $9^{16} + 8 \times 9^{16} = 9^{17}$; $81^{8} + 80 \times 81^{8} = 81^{9}$; $6561^{4} + 6560 \times 6561^{4} = 6561^{5}$; $43046721^{2} + 43046720 \times 43046721^{2} = 43046721^{3}$.

All still share irreducible prime factor within and between themselves and, although none of the above-mentioned is part of the FLT-BC subset, this is part of the space and its gear. In consequence, FLT and BC are proved by a displacement variety of *reductio ad absurdum* because of the inherent divergence of the flanking exponential growth so that as first term X^{n} is too small to fit in between larger cogs, and as potential second term can only abridge the distance between a smaller first term and a correspondingly smaller sum with which both it still shares irreducible prime factor.

Anew reflecting over the concrete tessellation panorama envisaged in Fig. 3 and its unending but strictly repetitious extrapolation, it is apparent that all of the tiles as such are discrete whole-number quantities, which regenerate in the demarcated power columns of the respective base number specifically by adding consecutive, identity-preserving multiples of that basic constituent and thus maintaining their numerical distinction in relation to all other discrete number series (except when multiple or fraction thereof and in such cases still sharing mutual least prime factor and translated in respect of n, for example, $9^3 + 18^3 = 9^4 = 3^6 + 18^3 = 9^4$).

From the whole-number condition of the second term it is possible to regenerate all FLT and BC additions, most transparently by reformulating the equation to:

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

This is clearly in ground level exponential state as shown when posed as

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

and is accordingly unique already because of one rational solution alone to equations with all base terms of degree 2 and over. It is easy to exemplify for any X^n, e.g. $5^{13} = 1220703125$, when the coupled equation becomes:

$$(1220703126)^{13} + (1220703125) \times (1220703126)^{13} = (1220703126)^{14},$$
that is, $(1220703126)^{13} + [5(1220703126)]^{13} = (1220703126)^{14}$,

and indeed for any magnitude , for instance when $X^n = 12345^{6789}$:

$$(12345^{6789}+1)^{6789} + (12345^{6789}) \times (12345^{6789} + 1)^{6789} = (12345^{6789}+1)^{6790} =$$
$$(12345^{6789}+1)^{6789} + [(12345)(12345^{6789} + 1)]^{6789} = (12345^{6789}+1)^{6790}.$$

This extraction of all second terms can be systematised by a variety of Eratosthenes' sieve that Davies suggested[19], first for X = 1, then X =2, etc.:

for 1^1 : $(1+1)^1 + [(1^1)^{-1}(1^1+1)]^1 = (2)^1 + (1 \times 2)^1 = (2)^2$;
for 1^2 : $(1+1)^2 + [(1^2)^{-2}(1^2+1)]^2 = (2)^2 + (1 \times 2)^2 = (2)^3$;
for 1^3 : $(1+1)^3 + [(1^3)^{-3}(1^3+1)]^3 = (2)^3 + (1 \times 2)^3 = (2)^4$;
for 1^4 : $(1+1)^4 + [(1^4)^{-4}(1^4+1)]^4 = (2)^4 + (1 \times 2)^4 = (2)^5$;
for 1^5 : $(1+1)^5 + [(1^5)^{-5}(1^5+1)]^5 = (2)^5 + (1 \times 2)^5 = (2)^6$;
etc. till n = (∞ - 1);

And X = 2
for 2^1 : $(2+1)^1 + [(2^1)^{-1}(2+1)]^1 = (3)^1 + (2 \times 3)^1 = (3)^2$;
for 2^2 : $(4+1)^2 + [(2^2)^{-2}(4+1)]^2 = (5)^2 + (2 \times 5)^2 = (5)^3$;
for 2^3 : $(8+1)^3 + [(2^3)^{-3}(8+1)]^3 = (9)^3 + (2 \times 9)^3 = (9)^4$;
for 2^4 : $(16+1)^4 + [(2^4)^{-4}(16+1)]^4 = (17)^4 + (2 \times 17)^4 = (17)^5$;
for 2^5 : $(32+1)^5 + [(2^5)^{-5}(32+1)]^5 = (33)^5 + (2 \times 33)^5 = (33)^6$;
etc. till n = (∞ - 1);

and $X = 3$;

$$\text{for } 3^1: (3+1)^1 + [(3^1)^{-1}(3+1)]^1 = (4)^1 + (3 \times 4)^1 = (4)^2 ;$$
$$\text{for } 3^2: (9+1)^2 + [(3^2)^{-2}(9+1)]^2 = (10)^2 + (3 \times 10)^2 = (10)^3 ;$$
$$\text{for } 3^3: (27+1)^3 + [(3^3)^{-3}(27+1)]^3 = (28)^3 + (3 \times 28)^3 = (28)^4 ;$$
$$\text{for } 3^4: (81+1)^4 + [(3^4)^{-4}(81+1)]^4 = (82)^4 + (3 \times 82)^4 = (82)^5 ;$$
$$\text{for } 3^5: (243+1)^5 + [(3^5)^{-5}(243+1)]^5 = (244)^5 + (3 \times 244)^5 = (244)^6 ;$$
$$\text{etc. till } n = (\infty - 1);$$

And so it goes on, for every consecutive X and every consecutive n, till both $X = (\infty - 1)$ and $n = (\infty - 1)$, 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 [that, for instance $(82)^4 + (3 \times 82)^4 = (82)^5$ can be expressed as e.g. $(6724)^2 + (60516)^2 = (37073984321)^1$ does not alter that], excluding other solutions. Because the equation thus drains the whole space of binary additions of whole-number powers it also proves both FLT and BC since (here stated in most general form) $(X^n+1)^n + [(X^n)^{-n} (X^n+1)]^n = (X^n+1)^{n+1}$ excludes n power sums (FLT), and the mutual (X^n+1) obviously shares least prime factor (BC).

Discussion

It is no exaggeration that the objective findings have the strongest philosophical footing and relevance, faithfully carrying forth the ancient Greek mathematics in an original form conceived also by Diophantos who “stated the traditional definition of numbers to be a collection of units” and in whose equations “the results were simply put down without….use of a symbol”.[16,17] Still in Fermat’s time a direct manipulation *en bloc* was the option, and in today’s quantum mechanics there is, in Winterberg’s words, a “return to the Greek natural philosophy of mathematical beauty and perfect symmetry”.[18]

And above the ephemera of trade and denomination abides the supreme omniscientific, hence philosophical principle of Truth, or, as Wittgenstein has put it: ”the world is the totality of facts”.[9] In that respect as well, the reproducible findings are amply and undeniably (save for tribal or superstition reasons) qualified. For the ‘task experiment’ philosopher of the classical school, when verbatim “building infinite machines” they offer a practicable means of ascending production instead of those infinitely descending thought experiment ones which in that particular enterprise lead to a Zeno paradox cul-de-sac of utmost impracticability.[19] How mathematics at large deviated exclusively into such inwardly derivative routes poses a fascinating epistemology per se but falls besides the scope of the descriptive account of the verifiable prototype revisited, which, it is important to stress, is no usurper to well settled interior dynamics but just a useful complement when spanning and distributing a restored Euclidean space matrix.

Again indicating its backwards to future merits, it highly responds also to the recent pragmatic challenges that "mathematical research as well as physics and many other fields would benefit from increased emphasis on development of deployable mathematical software and relatively less emphasis on abstract mathematical results" and that "such software can lower the barriers between those who think in 'practical' terms and those who think in 'abstract' terms".[20] Thus, "the scientific content in a physical model might in the future be captured in simulation" and it "is challenging…to make an intellectual contribution to operational mathematics and its applications…to interpret geometry and mechanics….to make numerical analysis easier and more accessible by automating the front end", namely, the tangible "production-possibility" outcome.[20]

For which the pieces of the present digital jigsaw puzzle deliver the concrete; not one-dimensional bytes, not two-dimensional pixels, but full three-dimensional cubits for material as well as figurative gauge and template animation. In that capacity they most certainly do not convey absurdities like that atoms be cubic. However, in an updated cosmology where the world returns as the possible analytical substantiation, or "inflation", from some singular scintillation, or "fluctuation", of an elementary quantum against an already available, again essentially "flat universe"[21], they provide the exponentially enlarging dispersion of the thereby re-instituted Cartesian co-ordinate frame for a stratified realisation of the spark and current between contrasting logical categories (such as from straight to round) at all the consecutive, analytically coherent and non-overcrossing, sheet-wise expanding micro- to macrolevels.

At the lowest end this parallels the conjectured 'quantum foam' mesh wherein superstrings and fibers may be spun, and on the upper end the majestic settings of galactesimals. From a biological angle the analogy with cells[22] and organisms and societies is natural, where the metric box corresponds to the cell 'hull', i.e. walls and cytoskeleton, enabling and to some extent guiding the intracellular as well as inter-cellular events, which are quite multifarious, often helical and, e.g. in the nucleus, include a domain aspect which renders three-dimensional spheroidal transformations of elementary particle neighbourhoods entirely consequential and contributing to existing physical theories and observations.[23-27] In such a synthesis and its hybrid, the eventual reconciliation might well reside, because it appears less and less likely that the grand unification will be a Delphic monopole.

On the other hand it might seem a bit heretic to pass the bar by a simplistic "Fosbury flop" of inverse approach. Setting a stage of real-life performance, it is, however, more profound than such a disconnected quantum saltomortale. All-embracing Philosophy includes Natural History, and when a tenet of Mathematics as blueprinting actual physical process is tested, the direct counterpart of Diophantine equations of integers (and fractions) indeed exists, viz. nanotechnological self-assembly[15,22,28,29], where a columnar "rod-coil-rod…self-assembly of phase-segregated crystal structures"[22] (which "in turn form assemblies or self-organize, possibly even forming hierarchies"[28]) precipitates in a completely saturating, gradually substrate-consuming way, displacing other stepwise cumulative syntheses. Just like for Diophantus "the results were simply put down"[17] in similar fashion (Fig. 2), and like manifolds can expand in successive monolayer coating (Fig. 3), "an essential part of nanotechnology is self-assembly"[29] by binary "layer-by layer growth" including "formation of…superstructure…as a result of the templating effect" of the primary deposition.[15]

As the ubiquitous distribution of a natively orthogonal "canvas"[30] and virtual cathode of preferentially spheroidal interior dynamics, the present reproducible results moreover tally with recent observations that "during the past few decades, it is the canvas itself that has increasingly become the focus of study"[30], as well as "ekpyrotic" theories that "all the matter and energy in our universe" is perpetually created when "colliding sheetlike 'brane' universes stamp out repeated big bangs" over the whole, thus "full circle" re-instituted endless and eternal *a priori* space.[31]

While such a cataclysm mainly pushes the fundamental question one step ahead (from where come the branes?), it parallels the intertwined dichotomy of polar and yet infinitesimally approximating logical categories that is the quintessence of the hardly more fantastic self-engendering version here, in the philosophical-mathematical-physical phase motor of which the tenseless spark and transition is in the interstice between the conduction plates (or 'branes') of openly endless Straight and closedly endless Round (and so leaves latitude for hermetic dark matter below the perfect spherical surface everywhere landed at).

For this meeting and its forum the cross-disciplinary findings would seem to be of considerable pertinence, inter alia with respect to 'a practically absolute reference frame', 'epistemology', 'methodology', 'geometrised physics', 'quantitised ether', 'the vortex sponge analogues', 'the remechanised world-picture' and 'models of matter': all by the universal formation plan endowed with a constant phase angle, too, and resulting relativistic communication mode. Whereas under the top-down direction of ruling infinitesimal calculus,

”cosmology would not be tractable in a fractal-like universe of clusters within clusters ad infinitum, such as Carl Charlier envisaged early in the 20th century”[32], the situation is exactly the opposite in the ground-up parity of the mirror moiety for which it might rather be said that “sky is the limit”.

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