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An Empirical & Mathematical Program for Validating the 'Computational Unified Field Theory' (CUFT)

By Jehonathan Bentwich, Ph.D

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An Empirical & Mathematical Program for Validating the 'Computational Unified Field Theory' (CUFT)

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I. INTRODUCTION

The Computational Unified Field Theory has been recognized as a satisfactory "Theory of Everything" (TOE)(Brumfiel, 2006; Ellis, 1986; Greene, 2003) shown capable of resolving the principle theoretical inconsistency that exists between Relativity Theory (RT) and Quantum Mechanics (QM). Two 'Special-Issues' (Bentwich: 2017a-l) have been recently published comprising eleven articles delineating this new CUFT including their challenging of such basic assumptions underlying Modern Physics such as: challenging of the 'Big-Bang' Model, Relativity's Einstein's Equations, the probabilistic interpretation of Quantum Mechanics, negation of "dark-matter" and "dark-energy" as "superfluous" (i.e., non-existent), postulating that "time-reversal" may be feasible and revision of "Second Law of Thermodynamics"; Essentially, the CUFT identifies a new 'A-Causal Computation' Paradigm which postulates the existence of a singular higher-ordered "Universal Computational Principle" (represented by the Hebrew Letter "Yud": "י") which simultaneously computes all exhaustive spatial pixels in the physical universe at every minimal time-point: " $c^2/h=1.45\cdot 10^{42}$ sec", giving rise to an extremely rapid series of "Universal Simultaneous Computational Frames" (USCF's) each comprising the entire physical universe. The CUFT also hypothesizes

that "in-between" any two consecutive USCF's frames there doesn't exist any physical universe but only the singular Universal Computational (or Consciousness) Principle (into which the entire physical universe "dissolves" and from which each consecutive USCF's frame is produced and evolved)... The principle difference between this new 'A-Causal Computation' Paradigm and the current 'Material-Causal' Paradigm underlying both RT and QM is that according to this new 'A-Causal Computation' Paradigm, due to the 'Universal Computational Principle's' (UCP) simultaneous computation of all exhaustive spatial pixels in the physical universe (at each single/multiple USCF's frame) there cannot exist any "material-causal" physical relationships (or even interactions) between any two (or more) exhaustive spatial pixels existing either on the same- or different- USCF's frames (e.g., whereas both RT and QM assume that the determination of any 'space-time', 'energy-mass' relativistic 'phenomenon' or of any quantum subatomic 'target' value is determined based on the physical interaction between such relativistic 'phenomenon' and another relativistic observer, or between such subatomic 'target' entity and another corresponding subatomic 'probe' element). Ensuing from this CUFT's new 'A-Causal Computation' Paradigm stem the above mentioned new theoretical conclusions that challenge Relativity's Einstein's Equations which assume a 'material-causal' physical interaction between "massive objects" which are assumed to "cause" the "curvature of space-time" and conversely assume that it is this "curved space-time" which "causes" those "massive objects" travelling trajectories"; as well as the negation of QM's current probabilistic interpretation wherein it is assumed that it is the direct physical interaction between the subatomic 'probe' element with the subatomic 'target's' assumed "probability wave function" which "causes" this target's 'probability wave function' to "collapse" into a singular complimentary 'space-energy' or 'mass-time' value (Giacosa, Francesco, 2014); as well as the negation of both the purely hypothetical concepts of "dark-matter" and "dark-energy" due to the 'material-causal' assumption that the accelerated expansion of the physical universe is "caused" by the interaction of this (purely hypothetical) 'dark-matter' and 'dark-energy' with the exhaustive spatial components of the physical

Author: e-mail: drbentwich@gmail.com

universe; The CUFT's new 'A-Causal Computation' Paradigm was also shown to negate the 'Second Law of Thermodynamics' due its implicit 'material-causal' assumption wherein it is assumed that "passage of time" inevitably "causes" an increase in the "entropic value" of any given Physical System; Finally, it was shown that even the Big-Bang Model must be revised based on the CUFT's new 'A-Causal Computation' Paradigm since there cannot exist any such 'material-causal' physical relationship/s between any two (or more) exhaustive spatial pixels comprising the initial 'Big-Bang' USCF's frame or any subsequent (single or multiple) USCF's frame...

II. METHOD

Instead, the CUFT postulates the existence of a singular 'Universal Computational Formula' through which the 'Universal Computational Principle' simultaneously computes every exhaustive spatial-pixel in the universe, e.g., including its four basic physical features of 'space' and 'energy' or 'space' and 'time' per each minimal time-point USCF's frame. According to the CUFT's new 'A-Causal Computation' Paradigm, this singular 'Universal Computational Formula' delineates the UCP's complete integration of these four basic physical features which stems from the UCP's extremely rapid (" $c^2/h = 1.45-42 \text{ sec}$ ") computation of every exhaustive spatial pixel in the physical universe based on the operation of three "Computational Dimensions", e.g., "Framework" ('frame' vs. 'object'), "Consistency" ('consistent' vs. 'inconsistent'), and "Locus" ('global' vs. 'local'). If we focus (initially) on only the two first Computational Dimensions, 'Framework' and 'Consistency', we obtain through their four possible combinations the four basic features of the universe, namely: 'space' and 'energy', 'mass' and 'time': 'space' and 'energy' are seen to comprise the 'frame-consistent' vs. 'frame-inconsistent' computational combinations of the Universal Computational Principle's 'Framework' and 'Consistency' Dimensions. Likewise, 'mass' and 'time' represent the UCP's 'object-consistent' vs. 'object-inconsistent' computational combinations. The third Computational Dimension supplements these four basic physical features of 'space' and 'energy', 'mass' and 'time' with relativistic effects based on the consideration of the "computational locus" – i.e., of whether the computation is carried out from the perspective of from within the object or relative to the whole frame. Interestingly, it was found that indeed this singular 'Universal Computational Formula' embeds within it "specific instances" of both RT's and QM's particular Representations:

Universal Computational Formula (Ucf)

$$\frac{c^2}{h} = \frac{s}{t} \cdot \begin{bmatrix} e \\ m \end{bmatrix}$$

- 1) *Relativistic Representation: $e \times s = m \times c^2$*

$$t \quad h$$
- 2) *Quantum Representation: $t \times mc^2 = s \times e$*

$$h$$

Now, in order to validate the CUFT as a satisfactory "Theory of Everything" (TOE), we need to advance in several parallel routes:

- a) Identify particular empirical instances in which the predictions of the CUFT may be significantly different than the predictions of both RT and QM; and empirically test these "differential-critical predictions" of the CUFT – e.g., to the extent that those 'differential-critical predictions' of the CUFT are validated empirically, then this provides an unequivocal experimental validation of the CUFT as more valid than both RT and QM.
- b) Mathematically test and validate the CUFT's 'Universal Computational Formula', i.e., in terms of its embedding of particular Relativistic and Quantum Laws as "special-instances" within the Universal Computational Formula (e.g., Relativistic and Quantum Representation).
- c) Internal Validation of the 'Universal Computational Formula' *visa vis*. The CUFT's Computational Definitions of 'space', 'time', 'energy' and 'mass'; Another important 'internal-validation' of the CUFT 'critical-predictions' comprises the full mathematical analysis of the coherency between its computational definitions of these four physical features and their complete integration within the singular Universal Computational Formula (as delineated below).

III. RESULTS

Preliminary results indicate an initial empirical and mathematical validation of the CUFT's above mentioned 'critical-predictions' (which cannot be accounted for by either RT or QM predictions):

- a) *Initial Empirical Validation: The 'Proton-Radius Puzzle' Findings*

Previously, based on the CUFT's computational definition of "mass" as a measure of an "object-consistent" measure (e.g., specific combination of the Universal Computational Principle's 'Framework' and 'Consistency' Computational Dimensions); it was previously predicted that relatively "more massive" particles would be measured as spatially more consistent across a series of USCF's frames in contrast to the measurement of relatively "less massive" particles. Initial empirical validation of this CUFT's critical-prediction was given through the "Proton-Radius Puzzle" findings (Bernauer & Pohl, 2014.) which indicated that indeed the more massive "Muon" particle Hydrogen nucleus is measured approximately 100 times smaller

(and more accurate) than its equivalent electron-Hydrogen nucleus – which could not be accounted for by either RT or QM; As delineated previously, these 'Proton-Radius Puzzle' findings closely correlate with the CUFT's abovementioned 'critical-prediction' which predicted that such heavier 'Muon' (embedded nucleus) would be measured spatially "more consistent" than the lighter 'electron' (related nucleus); Further empirical validation of this 'critical-prediction' of the CUFT comprises a direct comparison of the number of USCF's frames (e.g., minimal resolution time sampling) in which the heavier 'Muon' particle may be measured as opposed to the lighter electron particle: specifically, the CUFT's 'critical prediction' predicts that such minimal time resolution measurements would yield a greater percentage of those time-measurements in which the Muon particle would be detected in comparison with the number of measurement in which the (lighter) electron could be detected (e.g., an empirical result which could not be accounted for by either RT or QM).

b) *Direct Experimental Validation of the CUFT's "Critical-Prediction"*

A further direct experimental validation of the CUFT's 'critical-prediction' can be tested utilizing a minute-temporal measurement comparison of the presence of relatively more massive particles across a greater number of USCF's frames, in comparison to the number of USCF's frames in which relatively less massive particles could be detected; due to the extremely rapid temporal rate of the Universal Computation Principle's computation of the USCF's frames (e.g., "c2/h"=1.45-42sec) such minute-temporal measurement testing of the difference in the number of USCF's frames at which more massive particles (such as the Muon) would appear relative to less massive particles – the suggested minute-temporal measurement experiment would (in practice) "sample" a

given number of USCF's frames (based on the ratio of the "c2/h"=1.45-42 sec' USCF's computation to the minimal time resolution of the experimental apparatus) in order to test the CUFT's prediction regarding the appearance of the relatively 'more massive' particles across a greater percentage of the temporal measurements than the 'less massive' particle; In fact, it is hereby predicted that based on the computed ratio of the USCF's rate ("c2/h"=1.45-42 sec') to the given Experimental Temporal Measurement, a precise prediction could be made regarding varying masses of particles, e.g., in terms of the percentage of their Experimental Temporal Measurements' presence (based on the CUFT's computational definition of "mass").

c) *Mathematical Validation of the CUFT's 'Universal Computational Formula'*

Another avenue for validating the CUFT as a satisfactory "Theory of Everything" (TOE) comprises of a mathematical validation of the CUFT's Universal Computation Formula (UCF), e.g., as represented in its Relativistic and Quantum Representations:

- 1) Relativistic Representation: $e \times s = m \times c^2$
 $t \quad h$
- 2) Quantum Representation: $t \quad m c^2 = s \quad e$
 h

Specifically, it is suggested that an examination of the Relativistic Representation of the 'UCF', i.e., in terms of elucidating the "special-case" of Relativity's "Energy-Mass Equivalence" ($E = Mc^2$) as embedded within this Relativistic Representation of the UCF (as shown above) could reveal the precise embedding of Relativistic Laws within the broader theoretical framework of the CUFT's UCF. In particular, an "internal-validation" of the UCF can be accomplished based on the CUFT's "computational definitions" of the four basic physical features of 'space', 'energy', 'mass' and 'time':

$$S: (fj\{x,y,z\}[USCF(i)] + \dots fj\{x,y,z\}[USCF(n)]) / h * n\{USCF's\}$$

such that

$$fj\{x,y,z\}[USCF(i)] \leq fi\{x+(h*n),y+(h*n),z+(h*n)\} [USCF(i\dots n)]$$

wherein the 'space' measure of any given object (or event) is computed based on a "frame-consistent" computation of the UCP which adds the specific USCF's (x,y,z) localization across a series USCF's [1...n] –

which nevertheless do not exceed the threshold of Planck's constant per each ('n') number of frames (e.g., thereby providing the CUFT's definition of "space" as 'frame-consistent' USCF's measure).

$$E: ((fj\{x,y,z\} [USCF(n)]) - (fi\{x+n, (y+n), (z+n)\} [USCF(i\dots n)])) / c * n\{USCF's\}$$

such that

$$fj\{x,y,z\} [USCF(n)] > (fi\{x+(h*n),y+(h*n),z+(h*n)\} [USCF(i\dots n)])$$

wherein the 'energy' value of any given 'object' (or event) is computed based on the subtraction of that object's "frame-pixel/s" location/s across a series of USCF's frames, divided by the 'speed of light' multiplied by the number of USCF's frames (being measured).

$$M: \Sigma[o_j\{x,y,z\} [\text{USCF}(n)] = o(i\dots j-1) \{(x), (y), (z)\} \{\text{USCF}(i\dots n)\} / h * n\{\text{USCF}'s\}$$

such that

$$[o_i\{x,y,z\}\text{USCF}(n)] - [o_i\{(x+j),(y+j),(z+j)\}\text{USCF}(1\dots n)] \leq n * h[\text{USCF}(1\dots n)]$$

wherein the 'mass' value of an object is computed based on a measure of the number of times an "object"

is presented "consistently" across a series of USCF's, divided by Planck's constant.

$$T: \Sigma[o_j\{x,y,z\} [\text{USCF}(n)] \neq o(i\dots j-1) \{(x), (y), (z)\} \{\text{USCF}(i\dots n)\} / c * n\{\text{USCF}'s\}$$

such that

$$T: \Sigma o_i\{x,y,z\}[\text{USCF}(n)] - o_j\{(x+m),(y+m), (z+m)\} [\text{USCF}(1\dots n)] \leq c * n\{\text{USCF}'s\}$$

wherein the 'time' measure of a given "object" is computed based on the number of times that 'object' is presented 'consistently' across a series of USCF's frames, divided by Planck's constant.

relationships between any two (or more) relativistic or quantum exhaustive spatial pixels in the physical universe (e.g., at any single or multiple USCF's frame/s). Instead, the new 'A-Causal Computation' Paradigm postulates that the singular 'Universal Computational Principle' (UCP) simultaneously computes every exhaustive spatial pixel in the physical universe relating to its four basic physical features of 'space', 'energy', 'mass' and 'time' – based on the four possible combinations of two (of its three) Computational Dimensions, i.e., 'Framework' and 'Consistency': according to this new CUFT's 'A-Causal Computation' Paradigm (of 21st Century Physics) 'space' and 'energy', 'mass' and 'time' comprise a "frame-consistent" and "frame-inconsistent" computational measures of the 'UCP', whereas 'mass' and 'time' represent the UCP's computation of "object-consistent" and "object-inconsistent" measures. –

Further, more detailed mathematical analysis of the Universal Computational Formula's Relativistic Representation and its relationship to the "special-case" of 'E = Mc²' found in Relativity Theory is underway. Likewise, it is suggested that an examination of the Quantum Representation of the 'UCF', i.e., in terms of elucidating the "special-case" of QMs' Heisenberg's Uncertainty Principle's complimentary pairs (e.g., "mass-time" and "energy-space") Planck's constant (h) accuracy constraint - could reveal the precise embedding of Quantum Laws within the broader theoretical framework of the CUFT's UCF. Specifically, an implementation of the above mentioned computational definitions of the four basic physical features would elucidate the precise embedding of Heisenberg's Uncertainty Principle's complimentary pairs' accuracy constraint as a "special-case" within the CUFT's exhaustive UCF. (Such detailed mathematical analysis is currently underway.)

As mentioned above (and delineated previously), this CUFT's new 'A-Causal Computation' Paradigm was shown to resolve the principle theoretical inconsistency between RT and QM, i.e., based on the CUFT's discovery of the singular (higher-ordered) 'Universal Computational Principle' (UCP) which embeds within it RT's single spatial-temporal 'object' measures with QMs' 'multi spatial-temporal' 'wave' measure (e.g., thereby resolving the apparent contradiction between RT's strictly "causal" "Speed of Light Constraint" with QMs' "Quantum-Entanglement" phenomenon – which are both "embedded" and integrated into the UCP's exhaustive-simultaneous 'A-Causal Computation' Paradigm). Furthermore, this new 'A-Causal Computation' Paradigm's negation of the possibility of the existence of any "material-causal" physical relationships between any two (or more) exhaustive spatial pixels in the physical universe (existing at any single- or multiple-) USCF's frames also led to the challenging of the "Big-Bang Model", discarded "dark-energy" and "dark-matter" as "superfluous" (i.e., non-existent) and also challenged the 'Second Law of Thermodynamics', i.e., due to the fact that all of these laws and (purely hypothetical) concepts are based on a "material-causal" assumption which is negated by the CUFT's A-Causal Computation' simultaneous

IV. DISCUSSION

This article set to construct an Empirical and Mathematical Program for validating the 'Computational Unified Field Theory' (CUFT) as a satisfactory 'Theory of Everything' (TOE); it began with a demonstration of Twenty-First Century's basic 'Paradigmatic Shift' from the current 'Material-Causal' Paradigm underlying both RT and QM to the CUFT's new 'A-Causal Computation' Paradigm. The essential difference between the Old 'Material-Causal' Paradigm and the New 'A-Causal Computation' is that whereas the 'Material-Causal' Paradigm assumes that it is the direct physical interaction between 'massive-objects' with space-time' that "causes" those 'massive objects' to travel in particular travelling trajectories), or that it is the direct physical interaction between the subatomic 'probe' and 'target' element which "causes" the "collapse" of the target element's (assumed) 'probability wave function'; the new 'A-Causal Computation' Paradigm asserts that there cannot exist any such 'material-causal'

computation all of exhaustive spatial pixels in the universe at any minimal time-point USCF's frame/s.

In order to empirically validate this new 'A-Causal Computation' Paradigm several mathematical and empirical "critical-predictions" have been identified including: a) a critical-empirical prediction regarding the CUFT's greater "spatial-consistency" of a more "massive" particle, relative to a "less-massive" particle: Indeed, an initial empirical validation of this 'critical-prediction' of the CUFT was given based on the "Proton-Radius Puzzle" findings wherein the more massive "Muon" (e.g., approximately 100 times more massive than its equivalent negatively charged 'electron' particle) was measured to possess more "spatially-consistent" measures, i.e., possessing an approximately 100 times smaller "nucleus" size (of a Hydrogen atom in which this Muon "sinks" into) and being 100 times more accurate; b) A call for Experimental Physicists to directly test the CUFT's critical empirical prediction, predicting that such a more massive (Muon) particle would be measured across a greater number of USCF's frames relative to a less massive particle (such as an electron): given the fact that the rate of the Universal Computational Principle (UCP) is extremely rapid (" c^2/h ") transcending even the fastest available measuring device it is suggested that even a sampling of an "x" number of USCF's frames provided by a (given) minute-temporal measuring device would suffice to yield an equivalent manifestation of this critical-prediction of the CUFT (namely: that a more massive particle such as the 'Muon' would be measured across a greater number of given fine-temporal measurements relative to a less massive particle such as the 'electron'); c) A Mathematical validation of the CUFT's Universal Computational Formula (UCF), i.e., that would elucidate the precise mathematical "special conditions" in which this singular UCF manifests (through its Relativistic or Quantum Representations) as the known RT or QM Laws (and phenomenon): two first instances for this Mathematical Validation were RT's (known) 'Energy-Mass Equivalence' ($E=Mc^2$) and QM's Uncertainty Principle's complimentary pairs simultaneous measurement accuracy constraint – which were shown to represent 'special-cases' embedded within the exhaustive UCF (RT and QM Representations).

Hence, the current article provides an initial empirical validation of the CUFT as a satisfactory new 'A-Causal Computation' Paradigm which is found to be more valid than the Old 'Material-Causal' Paradigm of 20th Century Physics, e.g., underlying both RT and QM; A complete Empirical and Mathematical Program is outlined which can provide a full theoretical validation for this new CUFT's 'A-Causal Paradigm' of Twenty-First Century Physics, e.g., which was already (previously) shown to embed- integrate- and indeed transcend- the Old 'Material-Causal' Paradigm's Relativity Theory and Quantum Mechanics' Models of the physical reality.

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