

# Summary, Conceptual Design Elements, Scope, and Opportunities

of the

## Unified Field Theory

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February 2025

### Prologues

Richard Feynman

There isn't any theory today that has  $SU(3) \times SU(2) \times U(1)$

*„The standard model is that the one that says that we have electrodynamics, we have weak interaction, and we have strong interaction; .. They're not put together. ... Three theories, strong interactions, weak interactions, and electromagnetic ... The theories are linked because they seem to have similar characteristics ... Where does it go together? Only if you add some stuff that we don't know. There isn't any theory today that has  $SU(3) \times SU(2) \times U(1)$ “; (GU) p. 433.*

Alexander Unzicker

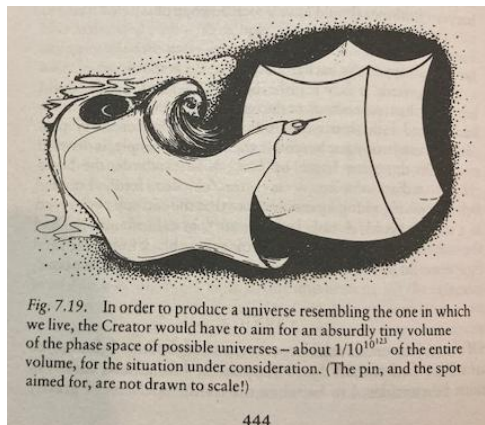
The standard model of particle physics is not a well-defined theory

*„A particularly worrying symptom of the current state of affairs in physics is the so-called discovery of the Higgs boson at CERN. ... But what was actually discovered were a number of unexplained signals obtained by extensive filtering methods, raising many questions for everyone who takes a sober perspective. ...*

*Nevertheless, these signals are pushed to serve as evidence for the long-theorized Higgs boson supporting the „standard model“ of particle physics, although this standard model is not even a well-defined theory. Such an interpretation speaks more of desperation to validate the past six decades of research and to shore up a model that is wobbling precariously under the weight of all the bits and pieces glued onto it to make it work“; (UnA) Prologue.*

Roger Penrose

There is an „absurdly tiny probability  $1/10^{10^{123}}$  producing the universe in which we live.“



Penrose R., The Emperor's New Mind, Oxford University Press, Oxford, 1989

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## 1. Summary

The proposed Unified Field Theory (UFT) provides an all-encompassing theory, where physical models of different physical areas are no longer decoupled and differently scaled according to their different levels of granularity.

The mathematical modelling framework of the UFT is based on the Hilbert-Krein space theory and the concept of a Krein space intrinsic self-adjoint (Hamiltonian) potential operator. The physical modelling framework is governed by a deductive structure of dynamic resp. mechanical quanta accompanied by a related scheme of correspondingly defined  $\kappa_n$ -quanta numbers.

The baseline dynamic quanta pair, the electrino and the positrino, defines the mathematical, time independent *a priori* vacuum („ground state energy“) dynamics system. The „creative“ vacuum enables the building of the physical, time independent plasma dynamics system; the related dynamic quanta pairs, the electron and the positron, are characterized by inherent (implicate) potential differences of both quanta, (BoD1). Those potential differences may be interpreted as two „Mie pressures“ of the Mie theory, ((WeH) (WeH1)). However, there is a nearly 50: 50 balance between the affected quantum numbers, i.e., from a physical modelling perspective there is no need for an explicate „Mie pressure“, unless there is the requirement to link to the various current one-component plasma dynamics models.

The „creative“ physical plasma system enables the building of a physical mechanical quanta pair, the electroton and the magneton. In opposite to the dynamic plasma quanta pair, there is no nearly 50:50 balance of the related quanta numbers. Therefore, this system enables an electromagnetic mechanical two-component Maxwell-Mie system, which is in line with Ehrenfest's discovery, the photophoresis phenomenon, which he interpreted by electric and magnetic ions, (BrJ). It is also in line with Goethe's conviction that there is no matter w/o attraction and repulsion, (BöG2) S. 111.

„The „creative“ physical electromagnetic system enables the building of further physical quantum types, accompanied by correspondingly defined mechanical quanta with increasing mechanical quantum numbers and correspondingly reduced dynamic quantum numbers. The possible related  $\kappa_n$ -quanta numbers enable three types of mechanical atomic nuclei. This is called the one-mechanical-component „Dirac<sup>2.0</sup>“ system. It is in line with the three possible physical types of atoms (conductor, semi-conductor, non-conductor), providing a theoretical model that the „*quantum particles may have positive masses, even though the classical waves travel at the speed of light*“, (see „YME mass gap problem“).

The symmetry group of the dynamic quanta pair systems is the complex Lorentz transformation  $S^3 \times S^3 \cong SU(2) \times SU(2)$ , which is the hidden symmetry group of the Coulomb problem. It is the set of all pairs of  $2 \times 2$  matrices with determinant one, which are connected (!) by a multiplication law. The group  $S^3$  (the unit quaternions of the quaternion algebra  $|\mathbf{H}$ ) contains the isomorphic normal subgroups  $G := \psi(S^3 \times e)$ ,  $G' := \psi(e \times S^3)$  of the group  $SO(4)$ , where  $\psi$  denotes the surjective orthogonal mapping  $\psi(a, b) : |\mathbf{H} \rightarrow |\mathbf{H}$ ,  $x \rightarrow ax\bar{b}$ . Accordingly, the symmetry group  $G \times G'$  becomes the most appropriate candidate for the mechanical  $\times$  dynamic quanta pair systems.

The „Dirac<sup>2.0</sup>“ quanta energy system may be approximated by a simple  $H_{1/2}$  Hilbert space system. In this case the mechanical energy of the classical fluid element is complemented by a dynamical energy component  $H_1^\perp$ . The  $H_{1/2} = H_1 \otimes H_1^\perp$  Hilbert space is the natural extension of the standard variational mechanical energy Hilbert space  $H_1$  with inner product defined by the Dirichlet integral  $(u, v)_1 := D(u, v) := (\nabla u, \nabla v)$ .

The Prandtl operator plays a key role in aerodynamics, as well as in fluid dynamics (especially in the context of a well-posed NSE problem and the related (pressure) Neumann problem). The considered „fluid“ quantum particle may be interpreted as a „rotating fluid“, (see „NSE problem“, (BrK9)).

It also turned out that the norm  $\|x\|_{1/2}^2$  of such a dynamic 1-fluid-component is isometric to an inner product in the form  $(Qx, Px)_0$ , where  $Q, P$  denote Schrödinger's position & momentum operators, indicating an alternative Schrödinger<sup>2.0</sup> operator, (BrK6).

## 2. Scope

The proposed UFT is governed by two kinds of energy, the today's mechanical energy (kinetic and potential energy) and (in line with Planck's dynamic type of physical law) a newly proposed dynamic energy.

In the calculus of variations the Dirichlet integral defines the inner product of the standard mechanical energy Hilbert space  $H_1$ . Krein (energy) spaces are proposed as mechanical  $\times$  dynamic energy spaces. Those are indefinite inner product vector spaces with a symmetric (in the complex case: hermitian) bilinear form prescribed on it so that the corresponding quadratic form assumes both positive and negative values, (BoJ).

The physical scope of the UFT starts from an *a priori* dynamic vacuum energy field, which may create dynamic plasma energy fields; the latter one may create dynamic electromagnetic fields. The dynamic quanta pairs of the electromagnetic field may create three related types of atomic nuclei, in line with the three physical groups of atoms, the conductors, the semiconductors, and the non-conductors. This combined mechanical  $\times$  dynamic quanta energy system is called the Dirac<sup>2.0</sup> energy field. The all-encompassing Krein energy space of this hierarchical structure of energy spaces is the dynamic vacuum energy space. The Dirac<sup>2.0</sup> energy field model is included in all other Krein spaces according to the above sequence.

The mechanical Dirac<sup>2.0</sup> energy (Krein-Hilbert space based) model can be approximated by the energy (Hilbert space based) model  $H_{1/2} = H_1 \otimes H_1^\perp$ ; the standard mechanical energy Hilbert space  $H_1$  is compactly embedded into  $H_{1/2}$ ;  $H_1^\perp$  is a closed sub-space of  $H_{1/2}$ , which may be interpreted as dynamic energy field. The dynamic quanta elements of  $H_1^\perp$  may be interpreted as alternative field intrinsic "potential functions", alternatively to physical case specific defined potential functions like the potential function  $V(r)$  in Schrödinger's harmonic quantum oscillator equation).

The mechanical Dirac<sup>2.0</sup> (Krein space based) quanta energy field model (with indefinite metric) solves the *YME mass gap problem* of the Clay Mathematics Institute. The extended mechanical  $\times$  dynamic (Hilbert space based) quanta energy field model  $H_{1/2}$  solves the *3D-NSE problem*.

There is a consistent bottom up hierarchy of the above Krein-Hilbert (energy) spaces starting from an *a priori* dynamic vacuum energy field (the largest field) up to the classical mechanical energy field  $H_2$ ; this is the standard domain of elliptic, parabolic, and hyperbolic PDE equations, which is compactly embedded into the mechanical (variational) energy Hilbert space  $H_1$  accompanied by a related self-adjoint extension of the symmetric Laplace potential operator with domain  $H_2$ . The mechanical model "potential" operators of elliptic and parabolic PDE are the Laplace potential and the related heat equation operator; the related appropriate domains with regards to well defined convergent energy norms are the well-known Sobolev spaces, which correspond to the (variational)  $H_1$  resp. the (classical)  $H_2$  energy Hilbert spaces. It turned out that the mechanical model "potential" operator of hyperbolic PDE, the wave operator accompanied by the domain of the baseline Hilbert space  $H_{(\tau)}$  of the proposed Krein spaces, is also well defined.

## 2. Out of scope

While the anorganic chemistry is in scope of the UFT, the organic chemistry (and a field theory of light, see below) is out of scope. In the context of this UFT this especially excludes Schrödinger's related topics like „what is life?“, "the principle of objectivation", and "two ways of producing orderlines".

C. Rovelli  
(PfM1) S. 213

*„It is not energy what the sun delivers to Earth, but low entropy (a.o. enabling photosynthesis)“*

If the organic chemistry is assumed to be governed by oxygen („the assistant of the sun at Earth“), carbone (i.e. more than just carbon) and the molecular hydrogen as the "carrier" of both, (UnA4), the three types of physical nuclei of the proposed UFT may enable the construction of appropriate quanta numbers to build appropriately related nuclei types for oxygen and carbone in combination with additional magnetic dynamic quanta provided by the magnetic field of Earth.

Nature as we perceive is also out of scope. This includes Schauburger's alternative world view accompanied by topics like "water, source of life", "different kinds of energy and physical movements", "the vortex as the (mechanical) key to create evolution", "the sun as a fertilizing entity", "gravity and levity", "entropy and ectropy", and "biologic vacuum", (BaA). The „Hidden Nature, The Startling Insights of Victor Schauburger“ (BaA), "Viktor Schauburger, Das Wesen des Wassers" (by Jörg Schauburger) and "Lebendes Wasser" (AlO).

*However, if oxygen and carbone are considered as nuclei types of organisms interacting with the dynamic energy of the sun this may allow a top-down investigation approach from "water, the source of life" down to organic chemistry and biology<sup>(\*)</sup>.*

The conceptual element in Whitehead's „process & reality“ are „actual entities“, those processes create new entities, (PfM) S. 82 ff. They may be interpreted as a kind of Leibniz *monades*<sup>2.0</sup>. Whitehead's process philosophy very much influenced Deleuze's event philosophy in „difference & repetition“, (DeG).

A. N. Whitehead

*„Whitehead nennt sein Werk „Prozess und Realität“. Ein Prozess ist das Werden eines wirklichen Einzelwesens (actual entities). Realität besteht aus Prozessen. Realität ist ein gewordenes wirkliches Einzelwesens bzw. was viele gewordene Einzelwesen ergeben. Man kann auch sagen: Die Wirklichkeit ist die Innenseite der actual identities, ihr Werden, ihr Prozess. Die Realität ist die Außenseite, die gewordenen actual identities von außen erfahren. Eine Konsequenz daraus ist, dass in der Prozessphilosophie Zeit und Raum aus den Prozessen der actual identities entsteht. „Zeit“ ist somit eine spezielle Verknüpfung der Realität; sie ist metaphysisch fundiert vom Prozess“; (PfM) S. 84.*

*„The reformed subjectivist principle adopted by the philosophy of organism is merely an alternative statement of the principle of relativity. This principle states that it belongs to the nature of a „being“ that it is a potential for everything „becoming“; (WhA1) p. 166.*

Deleuze's constituting (or transcendental) *difference* and Whitehead's *actual entities* (with two pole, physical poles and purely potentials, (PfM) S. 87) are very much in line with Schrödinger's *differential* concept, (ScE)1, p. 96, and the *membrane* concept in biology, (PfM) S. 101. This may close the circle back to Schrödinger's *producing orderlines* and Bohm's concept of *wholeness and implicate order*, (BoD1).

G. Deleuze  
(PfM) S. 82

*„Die Monaden (von Leibniz) sind (zwar) alle miteinander kompossibel und jede Monade drückt gewissermaßen die ganze Welt aus. Aber sie sind nicht wirklich untereinander vernetzt. Die Monaden sind fensterlos. ... Die actual entities (von Whitehead) sind dagegen wirklich miteinander vernetzt. Ja gerade durch die Vernetzung entstehen neue actual entities. .... Die vielen actual entities werden in einem neuen actual entity eins und so werden diese um ein actual entity vermehrt. Es entstehen und vergehen also ständig neue actual entities.“*

<sup>(\*)</sup>(AlO): *living water; the secret of natural energy; birds are not flying, they are flown; a fish is not swimming, it is swum* (S. 135)

(BaA): *wrong and right form of motion; energies as creative process; water, source of life; Nature's silent methods of producing energy, which are inherently more effective and powerful than mechanical techniques; oxygen as a lower form of solar energy; the sun is responsible for all life, the oxygen is responsible for organic growing and development; hydrogen as the "carrier" of both, carbone (i.e. more than just "carbon") and oxygen*, p. 51  
(ScI) *organic vacuum; cycloid space curve; electrolysis doesn't work for distilled water.*

## 2. Conceptual Design Elements and Opportunities

### A new dynamic energy concept in line with Planck's dynamic type of law

(PIM) S. 90: „Immerhin erhellt aus der geschilderten Sachlage wohl hinreichend deutlich die überaus hohe Bedeutung, welche die Durchführung einer sorgfältigen und grundsätzlichen Trennung der beiden besprochenen Arten von Gesetzmäßigkeit: der dynamischen, streng kausalen, und der lediglich statistischen, für das Verständnis des eigentlichen Wesens jeglicher naturwissenschaftlichen Erkenntnis besitzt“.

"The phase space of a physical system is the set of all possible physical states of the system when described by a given parametrization" (Wikipedia). Today, there is only one type of energy concept, the mechanical energy with its two forms, the kinetic (movement related) and the potential (change of position related) energy. The related *statistical type of laws* are formulated as PDE (e.g. in thermo-statistics) accompanied by an underlying (mechanical) self-adjoint potential operator and a related Sobolev function domain (potential theory). In the proposed UFT there is an additional Hilbert-Krein space HK, which contains the full distributional Sobolev-Hilbert scale HS, providing the appropriate framework for a newly proposed dynamic energy concept. The full (polynomial-decay-mechanical) Sobolev-Hilbert scale HS is defined by a self-adjoint potential operator (potential theory for mechanical particles; elliptic & parabolic PDE); the extended (exponential-decay-dynamic) Hilbert-Krein space HK is defined by Krein-space specific self-adjoint potential operators accompanied by related inner products on all of the HK (potential theory for dynamic particles; hyperbolic PDE). The norms may be interpreted as dynamic potentials enabling the definition of dynamic quanta (i.e. dynamic quantum element types) on all of the Hilbert-Krein-space HK. A HK x HK orthogonal composition provides a two-component (purely) dynamic quanta system; a HS x HK orthogonal composition provides a two-component mechanical x dynamic quanta system. The latter systems support the below Dirac 2.0 quanta system; the first type of systems provides an appropriate framework for plasma dynamics and an enhanced Maxwell-Mie System; this Maxwell-Mie system is in line with the *photophoresis* discovery of F. Ehrenhaft.

### The baseline ("creative") dynamic vacuum energy field

and

- **Schrödinger's permanent form of „ultimate particles“**,
- **Bohm's "implicate order" in physical law,**
- **Unzicker's "mathematical reality", and**
- **Eastern philosophy's "ultimate reality" of a dynamic universe**

(ScE3) p. 125, „(But) when you come to the ultimate particles constituting matter, there seems to be no point in thinking of them again consisting of some material. They are, as it were, pure shape, nothing but shape; what turns up again and again in successive observations is this shape, not an individual speck of material.“

(BoD1) p. 111: „What we usually call „particles“ are relatively stable and conserved excitations on top of this vacuum. Such particles will be registered at the large-scale level, where apparatus is sensitive only to those features of the field that will last a long time, but not to those features that fluctuate rapidly. Thus, the „vacuum“ will produce no visible effects at the large-scale level, since its fields will cancel themselves out on the average, and space will be effectively „empty“ for an electron in the lowest band, even though the space is full of atoms.“

(BoD1) p. 199: „It is important to emphasize, however, that mathematics and physics are not being regarded here as separate but mutually related structures (so that, for example, one could be said to apply mathematics to physics as paint is applied to wood). Rather, it is being suggested that mathematics and physics are to be considered as aspects of a single undivided whole.“

(UnA2) p. 3: „... current ideas in physics, especially the standard models of particle physics and cosmology, offer very little help for a real understanding. ... I would like to present a mathematical

*alternative that could possible replace space and time. .... To achieve a satisfactory understanding of reality. Ultimately, we search for mathematical objects whose properties describe the various physical phenomena in purely mathematical terms."*

(CaP) Preface: *„In the Eastern view, the reality underlying all phenomena is beyond all forms and defies all description and specification. It is therefore often said to be formless, empty or void. But this emptiness is not to be taken for mere nothingness. It is, on the contrary, the essence of all forms and the source of all life.“*

(CaP) The dynamic universe: *"The central aim of Eastern mysticism is to experience all phenomena in the world as manifestations of the same ultimate reality. This reality is seen as the essence of the universe, underlying and unifying the multitude of things and events we observe."*

In the proposed UFT Schrödinger's form of the „ultimate particles“ (quanta) is provided by the so-called *kappa-quanta scheme*. It is enabled by appropriately defined quanta type specific inner products, related norms and corresponding self-adjoint dynamic-potential operators as part of a Hilbert-Krein space HK; this Hilbert-Krein space HK contains all polynomial degree Hilbert scales, which are defined by the eigenpairs of self-adjoint (classical) mechanical-potential operators. The energy Hilbert space pairs HK x HK are accompanied by the complex Lorentz transformation group  $SU(2) \times SU(2) \cong S^3 \times S^3$ , which is the hidden symmetry of the Coulomb problem, playing a key role in the proof of the PCT theorem.

### **The dynamic plasma quanta pairs as condensed vacuum quanta pairs**

(RoP): *"Forty lines of evidence will be presented that the solar body is comprised of, and surrounded by, condensed matter. These 'proofs' can be divided into seven broad categories: 1) Planckian, 2) spectroscopic, 3) structural, 4) dynamic, 5) helioseismic, 6) elemental, and 7) earthly.*

Expressed colloquially, *plasma is an ionized gas consisting of approximately equal numbers of positively and negatively charged particles."*

In the proposed UFT the (dynamic) plasma quanta pairs may be interpreted as condensed (dynamic) vacuum quanta pairs. Those plasma quanta pairs are characterized by an identical absolute amount of „charges“ close to 1/2, a property, which is in line with the Landau damping phenomenon. The composition of those pairs is called *neutron* accompanied by the quantum numbers one. The (purely mathematical) vacuum quanta pairs are characterized by nearly identical  $\pm$  „charges“ with quanta numbers only close to one; the related potential differences may be interpreted as „ground state energy“.

### **The dynamic electromagnetism quanta pairs as condensed vacuum and plasma quanta pairs**

The dynamic electromagnetism quanta pairs are built by appropriate compositions of plasma *and* vacuum quanta. Similar as the (dynamic) plasma quanta pairs the (dynamic) electromagnetism quanta pairs are accompanied by two nearly identical +/- „charges“; however, in this case the quanta numbers are close to one.

### **The atomic Dirac<sup>2.0</sup> quanta built from the three possible combinations of the electromagnetic quanta**

(FeE): *„Dirac's theory of radiation is based on a very simple idea; instead of considering an atom and the radiation field with which it interacts as two distinct systems, he treats them as a single system whose energy is the sum of three terms: one representing the energy of the atom, a second representating the electromagnetic energy of the radiation field, and a small term representing the coupling energy of the*

atom and the radiation field."

In the theory of quantum mechanics each considered (Dirac) system is an element of a related Hilbert space. This mathematical concept is also applied to the QFT, the QCD, and the QED. The prize to be paid for this "force specific" modelling approach are "three independent "theories" for „strong interactions, weak interactions, and electromagnetic ... which are linked because they seem to have similar characteristics", R. Feynman, (GU) p. 433.

The Dirac <sup>2.0</sup> quanta scheme provides three atomic nuclei quanta, which are called positronium, electronium, and neutronium accompanied by correspondingly defined quanta numbers  $> 2$ . They are built by the three possible combination of the two (dynamic) electromagnetic quanta, the electroton and the magneton. The three Dirac <sup>2.0</sup> nuclei basic types are in line with the three groups of anorganic atoms, the precious metals, the base metals, and the non-metals.

### **The simple of $H_{1/2}$ energy Hilbert space approximation model of the atomic Dirac <sup>2.0</sup> quanta model**

The (polynomial-decay) energy Hilbert space  $H_{1/2}$ , which contains the standard (variational (!)) mechanical energy Hilbert space  $H_1$ , provides the approximation mechanical x dynamic quanta energy model to the Dirac <sup>2.0</sup> model:

in the calculus of variations the ("weak" mechanical energy) Hilbert sub-space  $H_1$  of  $H_{1/2} = H_1 \otimes H_1^\perp$  is governed by Fourier waves, while the related complementary closed ("weak" dynamic energy) sub-space  $H_1^\perp$  of  $H_{1/2}$  (which is not a Hilbert space (!)) is governed by Calderón wavelets.

Note: It turned out (see below) that the non-linear energy term of the 3D non-linear, non-stationary NSE system is bounded with respect to the  $H_{1/2}$  energy norm as a simple consequence of the Sobolevskii inequality (BrK9).

The tool to build the orthogonal relationship between the mechanical and the dynamic (energy) worlds are the Riesz transforms (resp. the 1D Hilbert transform).

### **Dirac's new basis for cosmology (DiP2)**

(UnA2) p. 73: "*Dirac's first conjecture: In the hydrogen atom, nature's simplest stable structure, the constituent proton and electron are held together by electric force. Yet their gravitational attraction, however small it may be, can also be calculated theoretically. Dirac noticed that the ratio of the two forces ... was an incredibly huge number (about  $10^{39}$ ) with almost 40 digits.*"

(UnA2) p. 74: "*Dirac has discovered a second conjecture, connected to the first conjecture, which make a random coincidence extremely unlikely. After the first estimates of the total mass  $M(U)$  of the universe in the 1930s, Dirac divided  $M(U)$  by the mass of the proton  $m(p)$ , thus arriving at the ball-park figure of the number of particles in the universe,  $10^{78}$  the square of that other mysterious, but lent substance to the first observation. For decades, Dirac's second observation has defied all attempts at explanation. In particular, it seems to jeopardize all established cosmological models. For normally the number of particles should be proportional to the volume, i.e. the third power of the linear dimensions of the cosmos, not just to the second. All the more remarkable, however, is that Dirac's cosmology ultimately follows from Einstein's pivotal idea of a variable speed of light back in 1911, if one consequently applies Dicke's formulation of 1957", (see also (UnA1).*



### **Schrödinger's hour of glory "potential is simply energy per mass" (UnA1)**

(UnA1) pp. 116, 118, UFT, pp. 146/147: „Dividing the visible mass of the universe (estimated  $10^{53}$  kilogram) by the size  $R(U)$  of the universe (estimated  $10^{26}$  meter) yields  $10^{27}$  kilograms per meter, coinciding with the value derived from the ratio of the square of speed of light and the gravitational constant  $G$ . ... There is a real gem of physical reasoning in a completely unknown article on cosmology published in 1925 by E. Schrödinger (ScE4). ... Whereas the relation above as such is only numerical, Schrödinger went a step further and realized that the concept of gravitational potential was concealed in this formula. Potential is simply energy per mass, for which Newton had derived an expression in his theory of gravitation with the distance  $r$  from the Sun (with mass  $M$ ) in the denominator. ... It looked plausible to him that the influence of the even more distant masses in the Milky Way had to be larger, even though it was impossible to perceive a force. ... With amazing intuition he suspected that all the potentials in the universe might just add up to the square of the speed of light. ... In a way Schrödinger had thus anticipated the discovery of the size of the cosmos in the 1930s. He further insisted that Mach's principle had to be incorporated into the theory of relativity. In this respect, Schrödinger's intuition went beyond Einstein's.“

### **A Mach<sup>2.0</sup> principle (UnA1)**

(UnA1) p. 156: „To round off the value of Dirac's observation, however, one should mention that it is in complete harmony with Ernst Mach's thoughts on gravity, though Dirac apparently never dealt with Mach. ... The fact that Dirac considered the size and the mass of the universe, the two quantities that Mach also related to the origin of gravity, constitutes another piece in this fascinating puzzle.

However, Dirac's observation goes beyond Mach's principle. Imagine that the number of particles in the universe was billion times larger, while simultaneous their mass was a billion times smaller. This would change nothing about Mach's principle (or ‚flatness‘) but it would alter Dirac's observation. In other words, Dirac was the first to insinuate that the size and the mass of elementary particles had a meaning, and that it is no coincidence that they are as large and heavy as they are. Who thought so the same? You've guessed it – Albert Einstein:

„The real laws of nature are much more restrictive than the ones we know. For instance would it not violate our known laws, if we found electrons of any size or iron of any specific weight. Nature however only realizes electrons of a particular size and iron of very specific weight.“

### **A suggestion out of the Dirac conjectures (UnA)**

(UnA) p. 225: "Dirac's conjecture – that the number of particles in the universe  $10^{80}$  is related to its size (which is  $10^{40}$ ) proton radii- clashes with all established concepts .... It suggests that the quantum effects of gravity start at the size of an atomic nucleus and not at the far smaller, unobserved Planck's length of  $10^{-35}$  ) meters that this is 20 powers of ten below the nucleus' radius is the result of Dirac's hypothesis. (However, it doesn't have any fundamental meaning.)"

### **Does a neutron feel the age of the universe? (UnA2)**

(UnA2) p. 95: „From a philosophical point of view, the half-life of the neutron of about ten minutes is a basic quantity that calls for an explanation. ... Claiming that the decay of the neutron can be deduced within the variable speed of light model would certainly be premature. In any case, however, the phenomenon of radioactivity will only be thoroughly understood once the half-life of the neutron is calculated from first principles. .... However, if the mass ratio of proton/electron does depend logarithmically on the age of the universe, then it follows that at the time of the „Big Flash“ the electron and proton were of equal weight. ... The hydrogen atom would then be similar to an object now called positronium, consisting of an electron and its antiparticle positron that orbit each other. .... This would imply that the orbital speed of the electron in the hydrogen atom was equal to the speed of light.... This, in turn, suggests that the hydrogen atom – at that time an orbiting electron-positron pair – could simply be

seen as a rotating light wave.“

### The "creative" dynamic vacuum and a liquid (hydrogen) sun

(RoP): "*The Sun on trial, Liquid metallic hydrogen as a solar building block.*"

(RoP1): "*Blackbody radiation and the loss of universality.*"

(RoP2): "*Water, Hydrogen Bonding, and the Microwave Background.*"

Anticipating that gravity start at the size of an atomic nucleus puts the spot on the Big Bang *story* (creatio ex nihilo), which is basically the physical (!) "explanation" of the observed Cosmological Background Radiation (CMBR). Anticipating that nearly all of the universe is vacuum, and that nearly most of the space within the atoms is also vacuum, a physical (!) "creatio ex vacuum" concept sounds more reasonable than a (physical) "creatio ex nihilo" concept.

The assumption that the observed quantum effects of gravity start at the size of an atomic nucleus (governed by mechanical energy accompanied by the concept of physical time) is in line with the (one-component concept of the) proposed UFT.

The hydrogen atom, nature's simplest stable structure, shows three states, the molecular, the semi-metallic, and the metallic states; the concept of a *positronium*, (UnA2) p. 95, is in line with the Dirac<sup>2.0</sup> quanta systems scheme; it also supports the concept of "*a fluid sun, the coming revolution in astrophysics*", (UnA4).

Expressed colloquially, the one-component quanta scheme of the proposed UFT may be interpreted as condensed dynamical energy accompanied by a related emerging potential difference to the underlying two-component quanta systems (creatio ex vacuum). The corresponding potential equalization (interitus in vacuum) is governed by the "least (mechanical) action principle" of Nature accompanied by the concept of "physical time".

Water is the combination of molecular hydrogen and oxygen and was the fundamental prerequisite to build organisms on Earth. The current theory „*how the water came to our planet*“ is that water reached Earth via meteorites and asteroids. This sounds very unlikely, as the given amount of water reached just our planet from outer solar system delivered in one or just a few units. At the same time the *hydrogen* particle is basically the only relevant atomic structure in the universe, whereas oxygen is a very Earth-specific atomic structure. In fact oxygen is the most prevalent element on Earth.

The *theory of a liquid sun* in combination with the (0) vacuum-, (1) plasma-, (2) electromagnetic-, and, (3) Dirac<sup>2.0</sup>-quanta creation processes of the UFT may provide an alternative idea about the phenomenon of water. This idea may support Schrödinger's „order from order“ mechanism by which orderly events can be produced in the unfolding of life springs (ScE1) p. 80. Regarding the above quanta creation processes we note the key differentiator between the Earth and the other planets of our solar system is its magnetic field caused by the hot core of our planet.

### Einstein's ether and Davidson's creative vacuum & dynamic quanta w/o motion

(EiA5): „*Lorentz succeeded in reducing all electromagnetic happenings to Maxwell's equations for free space.*“

*As to the mechanical nature of the Lorentzian ether, it may be said of it, in a somewhat playful spirit, that immobility is the only mechanical property of which it has not been deprived by H. A. Lorentz. It may be added that the whole change in the conception of the ether which the special theory of relativity brought about, consisted in taking away from the ether its last mechanical quality, namely, its immobility. ...*

Generalizing we must say this: -- There may be supposed to be extended physical objects to which the idea of motion cannot be applied. They may not be thought of as consisting of particles which allow themselves to be separately tracked through time."

(DaJ) p. 26: "In other words, what looks to us as solid is actually a dance of tiny particles in a vacuum. In fact, if all the space were compressed out of our planet earth, it would end up the size of a tennis ball, or some say, even a pea. The exact final dimension is irrelevant because firstly it is not likely to happen and secondly the point is made either way.

In summary, then, according to modern physics: physical material substance is mostly nothing or vacuum."

### **A Goethe-Newton field theory of light enabled by Fourier's waves and Calderon's wavelets?**

Goethe's color theory is about a light field; the colors are a limited (light) field and the ray of light is the visible boundary of that limited field, (MüO) S. 9/10, (Nul) S. 85/86. Additionally to the refraction and the Reflexion "Forces" of Newton's optic, there is a third "force", which hasn't been discovered yet or not sufficiently described in more detail yet, (Nul) S. 69/70.

The counter argument of physics to Goethe's comprehensive concept is (just) that the theory does not allow quantitative predictions, as there is no corresponding mathematical provided.

Newton's optic is about a ray theory of light, where the phenomenon of light is basically about rays of light consisting of smallest parts. Newton's light/prism experiment is governed by the two principles, refraction & deflection.

The counter argument to Newton's optic is the fact that it demands that the rainbow spectral colors are indecomposable.

Newton's indecomposable (rainbow) spectral colors are in line with the concept of Fourier waves accompanied by the  $H(1)$  domain and a discrete spectrum. Goethe's comprehensive field model and his proposed concept of an "effective cloudy" (the third force) might be consistently modelled by wavelets with the related domain, i.e. the complementary closed ("weak" dynamic energy) sub-space of  $H_{1/2}$  accompanied by a continuous spectrum.

In the calculus of variations the ("weak" mechanical energy) Hilbert sub-space  $H_1$  of  $H_{1/2}$  is governed by Fourier waves, while the related complementary closed ("weak" dynamic energy) sub-space of  $H_{1/2}$  (which is not a Hilbert space (!)) is governed by Calderón wavelets.

**Note:** Our sky is blue and the oxygen photosynthesis convert the energy of light in combination with green colored plants to molecular oxygen. According to Viktor Schaubergger "the sun is responsible for all life, the oxygen (a lower form of solar energy) is responsible for organic growing and development; .. hydrogen (is considered) as the "carrier" of both, carbone (i.e. more than just "carbon") and oxygen. ... From a detached view, far outside the atmosphere, our planet, composed of carbon and fertilized by oxygen, is indeed floating in the hydrogen gas ocean of space", (BaA) p. 51.

**Note:** Regarding the growing of organic and the creation of life, the working assumptions (1) "the sun is responsible for all life, (2) the oxygen is responsible for organic growing & development, (3) there is a field theory of light, and (4) hydrogen is the gas ocean of space in the universe, (the "carrier" of both, carbon and oxygen) may lead to the following working hypothesis: "let there be light".

**Kant's external resp. internal sense shaped  
space resp. time as a priori forms of knowledge**

(RoC1) p. 159: „*Inquiry into perception of the internal rather than external nature of time reoccurs frequently in Western philosophy. Kant discussed the nature of space and time in his Critique of Pure Reason, and interprets both space and time as a priori forms of knowledge, that is to say, things that relate not just to the objective world but also to the way in which a subject apprehends it. But he also observes that, whereas space is shaped our external sense, that is to say, by our way of ordering things that we see in the world outside of us, time is shaped by our internal sense, that is to say, by our way of ordering internal states within ourselves. Once again: the basis of the temporal structure of the world is to be sought in something that closely relates to our way of thinking and perceiving, to our consciousness. This remains true without having to get tangled up in Kantian transcendentalism.*“

(ScE1) Science and Religion, p. 145-146: „*However, the supreme importance of Kant's statement does not consist in justly distributing the roles of the mind and its object – the world – between them in the process of „mind forming an idea of the world“, because, as I just pointed out, it is hardly possible to discriminate the two. The great thing was to form the idea that this one thing – mind or world – may well be capable of other forms of appearance that we cannot grasp and that do not imply the notions of space and time. This means an imposing liberation from our inveterate prejudice. There probably are other orders of appearance than the space-time-like. It was, so I believe, Schopenhauer who first read this from Kant.*“

(BöG) S. 145, Die Zeit als Thema der Astronomie: „*Kosmologisch gesehen sind die Gestirne um der Zeit willen da, und nicht umgekehrt. Sie sind, wie es im Timaios heißt, Werkzeuge der Zeit (42 d 5) oder Werkzeuge der Zeiten (41 e 5). Die Zeit ist der kosmologische Sinn der Gestirne, sie ist deshalb das eigentliche Thema der Astronomie.*“

(RoC) p. 143: *The thermal time hypothesis: In Nature, there is no preferred physical time variable t. There are no equilibrium states preferred a priori. Rather, all variables are equivalent: we can find the system in an arbitrary state ; if the system is in a state, then a preferred variable is singled out by the state of the system. This variable is what we call time. .... In other words, it is the statistical state that determines which variable is physical time, and not any a priori hypothetical „flow“ that drives the system to a preferred statistical state.*“

(RuB1) p. 680/681: „*According to Kant, the outer world causes only the matter of sensation, but our own mental apparatus orders this matter in space and time, and supplies the concepts by means of which we understand experience. Things themselves, which are the causes of our sensations, are unknowable; they are not in space and time, they are general concepts which Kant calls „categories“. Space and time are subjective, they are part of our apparatus of perception. But just because of this, we can be sure that whatever we experience will exhibit the characteristics dealt with by geometry and the science of time. If you always see blue spectacles, you could be sure of seeing everything blue (this is not Kant's illustration). Similarly, since you always wear spatial spectacles in your mind, you are sure of always seeing everything in space. Thus geometry is a priori in the sense that it must be true of everything experienced, but we have no reason to suppose that anything analogous is true of things in themselves, which we do not experience.*“

*Space and time, Kant says, are not concepts; they are forms of „intuition“.*

#### 4. The Solutions of Two Millennium Problems

The proposed UFT solves two problems of the Clay Mathematics Institute:

**a. the 3D non-linear, non-stationary Navier-Stokes Equation problem**

*"... making substantial progress from a theoretical point of view toward a mathematical theory which will unlock the secrets hidden in the Navier-Stokes equations"*

where the mechanical energy of the classical fluid element is complemented by a dynamical energy enabling convergent related energy norm estimates.

**b. the mass gap problem of the Yang-Mills Equations**

*"... making progress in understanding from a theoretical point of view that the quantum particles have positive masses, even though the classical waves travel at the speed of light."*

where the Dirac <sup>2.0</sup> model resp. the Maxwell-Mie equations are accompanied by three possible one-component (mechanical) nuclei types resp. by a two-component mechanical (electroton-magneton) quanta pair.

**a. A well posed 3D-NSE system governed by a  $H_{1/2} = H_1 \otimes H_1^1$  mechanical x dynamic energy Hilbert space**

[Navier-Stokes Equation - Clay Mathematics Institute](#)

*"This is the equation which governs the flow of fluids such as water and air. However, there is no proof for the most basic questions one can ask: do solutions exist, and are they unique? Why ask for a proof? Because a proof gives not only certitude, but also understanding."*

*Waves follow our boat as we meander across the lake, and turbulent air currents follow our flight in a modern jet. Mathematicians and physicists believe that an explanation for and the prediction of both the breeze and the turbulence can be found through an understanding of solutions to the Navier-Stokes equations. Although these equations were written down in the 19th Century, our understanding of them remains minimal. The challenge is to make substantial progress toward a mathematical theory which will unlock the secrets hidden in the Navier-Stokes equations."*

The (polynomial-decay) energy Hilbert space  $H(1/2)$ , which contains the standard (variational (!)) mechanical energy Hilbert space  $H(1)$ , provides the approximation mechanical x dynamic quanta energy model to the Dirac 2.0 model; in the calculus of variations the ("weak" mechanical energy) Hilbert sub-space  $H(1)$  is governed by Fourier waves, while the related closed ("weak" dynamic energy) sub-space of  $H(1/2)$  (which is not a Hilbert space (!)) is governed by Calderón wavelets. It turned out that the non-linear energy term of the 3D non-linear, non-stationary NSE system is bounded with respect to the  $H(1/2)$  energy norm as a simple consequence of the Sobolevskii inequality (BrK9). The tool to build the orthogonal relationship between the mechanical and the dynamic (energy) worlds are the Riesz transforms (resp. the 1D Hilbert transform).

**Note:** The second unknown variable of the NSE is the *pressure function*  $p$ ; it can be represented as an appropriate function of Riesz transforms of the unknown *velocity function*  $u$ ; the corresponding Neumann problem of the pressure field  $p$  may be modelled by the *Prandtl operator* accompanied by the domain  $H(1/2)$  enjoying appreciated properties, (Lil).

**Note:** Already this first approximation layer of a complementary mechanical x dynamic quanta energy field model provides an appropriate physical modelling framework for the alternatively proposed Schrödinger (-Calderon) quantum momentum operator, (BrK7), and the physical (mechanical (!)) "frictionless" boundary modelling problem of the NSE, (GaG).

**In summary,** the  $H(1/2)$  energy Hilbert space based proof of the 3D-NSE problem governing the flow of fluids such as water and air gives *understanding*. The combination with the *understanding* by an aligned Schrödinger (-Calderon) quantum momentum operator provides a kind of *proof of concept* (PoC) of this first approximation layer of the complementary mechanical x dynamic quanta energy field model (being followed by the second approximation layer, the Dirac 2.0 quanta dynamics model) as part of the proposed UFT.

**b. The Dirac <sup>2.0</sup> quanta dynamics model  
solving the YME mass gap problem**

[Yang-Mills & The Mass Gap - Clay Mathematics Institute](#)

*„The laws of quantum physics stand to the world of elementary particles in the way that Newton’s laws of classical mechanics stand to the macroscopic world. Almost half a century ago, Yang and Mills introduced a remarkable new framework to describe elementary particles using structures that also occur in geometry. Quantum Yang-Mills theory is now the foundation of most of elementary particle theory, and its predictions have been tested at many experimental laboratories, but its mathematical foundation is still unclear. The successful use of Yang-Mills theory to describe the strong interactions of elementary particles depends on a subtle quantum mechanical property called the “mass gap”: the quantum particles have positive masses, even though the classical waves travel at the speed of light. This property has been discovered by physicists from experiment and confirmed by computer simulations, but it still has not been understood from a theoretical point of view. Progress in establishing the existence of the Yang-Mills theory and a mass gap will require the introduction of fundamental new ideas both in physics and in mathematics.“*

The so-called *standard model* of elementary particles (SMEP) is about three de-coupled theories with similar characteristics; the underlying independent three groups of elementary particles are governed by Fourier waves with standard domain  $H(1)$ . Accordingly the theory specific „wave dynamics“ requires similar but not identical wave equation models accompanied by related bounded energy norms. The considered exponential-decay Hilbert space of the UFT provides an appropriate domain framework for well defined hyperbolic wave operators. Accordingly, not the simplest energy Hilbert space model  $H(1/2)$  but the Dirac 2.0 modelling layer accompanied by well defined wave operators (i.e. including the necessary appropriately defined domains (!)) makes the YME system obsolete. The Dirac 2.0 model resp. the Maxwell-Mie equations are accompanied by three possible one-component (mechanical) nuclei types resp. by a two mechanical (electroton-magneton) quanta pair.

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