

A. Einstein: "We can't solve problems by using the same kind of thinking we used when we created them."

The proposed solution is about a distributional fractional Hilbert space with related generalized waves/modes. Classical short distance solutions of PDE are approximations of corresponding weak (variation) short distance solutions and not the other way around. There is only one fractional energy Hilbert space. The different forms of "forces" are expressions of "energy/actions" functionals per considered weak PDE.

In the proposed distributional Hilbert space framework a "differential" corresponds to an "energy" element:

- related to the concepts of causality and mind/body elements, we quote from (SCA) §18, p.151: *"Der Willensakt und die Aktion des Leibes sind nicht zwei objektiv erkannte verschiedene Zustände, die das Band der Kausalität verknüpft, stehen nicht im Verhältniß der Ursache und Wirkung; sondern sie sind Eines und das Selbe, nur auf zwei gänzlich verschiedene Weisen gegeben: einmal ganz unmittelbar und einmal in der Anschauung für den Verstand"*

- with respect to the laws of transformation of most physical quantities which are intimately connected with that of the differentials and differentiable manifolds we quote from (WeH1) p.86: *"While topology has succeeded fairly well in mastering continuity, we do not yet understand the inner meaning of the restriction to differentiable manifolds. Perhaps one day physics will be able to discard it ... Only in the infinitely small may we expect to encounter the elementary and uniform laws, hence the world must be comprehended through its behavior in the infinitely small."*

Schopenhauer gives four different forms of causality as part of the "world as representation" ("On the fourfold root of the principle of sufficient reason"). With the "world as will" principle Schopenhauer (inspired by the universal force and energy of the Upanishaden which they called "Brahma") does not mean neither a "conscious will" nor a "reasonable will" or a "chosen will". It is the purely opposite/counterpart of the "world as representation" principle with no common denominator or overlap. Therefore it is also not governed by the law of causality and has neither mind nor reason or space & time. As a consequence from the latter two ones the will cannot be split into individual wills. In simple words: "causality" (and related "force" phenomena) is part of the "world as representation" principle (which is related to classical PDE with weak energy Hilbert space $H(1)$), while "energy" (which is related to singular integral (Pseudo-Differential) equations with weak, fractional (energy) Hilbert space $H(1/2)$) is part of the "world as will" principle.

We give a trial to summaries the four forms of truths which build the baseline of the principle of sufficient reason:

- the logical truth (i.e. the formal logic; causality which is comprehends by mind with the three forms cause, appeal, motif)
- the empirical truth
- the transcendental truth
- the meta-logical truth (formal condition of thinking: principle of the identity, principle of contra dictionary, principle of excluded third identity, principles of sufficient reason).

Quotes related to interpretations to quantum mechanics and the mind-body problem we provided a list of

From (ScE1) we quote:

VIII, Consciousness and mneme: *"Thus Schopenhauer's line of demarcation may be regarded as highly suitable, when he says that in inorganic being 'the essential and permanent element, the basis of identity and integrity, is the material, the matter, the inessential and mutable element being the form. In organic being the reverse is true; for its life, that is, its existence as an organic being, consists precisely in a constant change of matter while the form persists' ..."*.

IX, On becoming conscious: *"consciousness is bound up with learning in organic substance; organic competence is unconscious. Still more briefly, and put in a form which is admittedly rather obscure and open to miss-understanding: Becoming is conscious, being unconscious."* We note that in same section of the original german issue Schrödinger uses the term "Differential", which has been translated into "change" and "difference". If a world class theoretical physicist and mathematician like Schrödinger chooses the word "Differential" in his mother language he does not mean "Wechsel/Veränderung (change)" or "Differenz (difference)", that's for sure.

With respect to the mentioned Schopenhauer quote above we refer to Schopenhauer's concept of "will" in "The world as will and representation". His definition of "will" is not about the capability of decision making, but it describes a principle of life which is about the energy of life as it is part of any anorganic object (matter) or organic object (organism). By this concept the human body (organism) is the visible form of appearance (manifestation/ image) of the not visible acting principle of life. Schopenhauer and Schrödinger were very much impressed from the Upanishads (EaS).

From (EaS) we mention A. Huxley's quote (p. 24): *"all science is the reduction of multiplicities (=manifolds) to unities (=entities)"* and quote further...p. 24 *" Nothing is more characteristic of Indian thought. In the context of the terms "multiplicity vs. entity", "autonomy vs. variety" we quote from (EaS), epilog:*

"multiplicity /manifold arises from entity/singularity in a regulated order".

Some commonality between mathematical and philosophical concepts

With respect to Schopenhauer's two world principles our central idea can be phrased in the following way:

Schopenhauer's "world as representation" principle (built on the four different forms of causality which are the root causes of the principle of reason) corresponds to the Lagrange world ("*principle of reason*") which is about classical PDE and related modelling of e.g. force phenomena. Its solutions are interpreted as approximations only to the Hamiltonian world ("*principle of purpose*"), which is about weak Pseudodifferential equations and related modelling of e.g. ("living force") mass/energy elements. By this the Hamiltonian world corresponds to Schopenhauer's "world of will" anticipating his concept of energy of life (which is part of any anorganic object (matter) or organic object (organism)). From a mathematical point of view both worlds are isomorphic only in case the Legendre (contact) transform is defined. With respect to this we quote from (WeH):

"...truly infinitesimal geometry ...should know a transfer principle for length measurements between infinitely close points only."

It is encouraging and at the same time still astonishing that classical (approximation) and related "truly" (fractional) energy Hilbert scale elements ($a=1$ and $a=1/2$) and its related weak (PDE resp. PDO) equations provide a model describing

- how the distribution of prime numbers are related to the behavior of subatomic particles and harmonic music based on same framework which is also applicable to the Maxwell & Einstein field equations

- how force phenomena versus energy entity concepts (including a length measurement concept between infinitely "close points") are related to the two "world principles" of the Western philosophical system of Schopenhauer and the Upanishads, an Indian collection of philosophical writings.

(EaS) Easwaran S. E. The Upanishads, Nilgiri Press, Tomales, California, 1987

(NaT) Nagel Th., Mind and Cosmos: Why the Materialist Neo-Darwinian Conception of Nature is Almost Certainly False, Oxford University Press, 2012

(ScA) Schopenhauer A., Die Welt als Wille und Vorstellung, erste Auflage, Leipzig, 1818

(ScE) Schrödinger E., The Interpretation of Quantum Mechanics, Ox Bow Press, Woodbridge, Connecticut, 1995

(ScE1) Schrödinger E., My View of the World, Ox Bow Press, Woodbridge, Connecticut, 1983

(WeH) Weyl H., Gravitation und Elektrizität, Sitzungsberichte Akademie der Wissenschaften Berlin, 1918, 465-480

(WeH1) Weyl H., Philosophy of Mathematics and Natural Science, Princeton University Press, Princeton, New Jersey, 1949, 2009