Response to the FQXi RFP: Agency in the Physical World

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To bring scientific rigor to FQXi challenges[1] is the greatest challenge. Given the diverse community and vexing manner in which our organizers delight in framing issues, prevalent absence of rigor follows. Yet a substantial subset of the community is comprised of physicists, with no obvious tightening there of reason's web. How so?

The RFP question of agency[2] finds relevance in themes of the two most recent FQXi essay competitions[3–5]. Our submission to last year's contest[6] rephrased its theme as

"What mathematical laws are most useful in modelling the physics that gives rise to aims and intention?"

Our response then seems appropriate now:

"... if a mathematical model is ever to begin to approach the mind-body problem, that model will have its roots in the language of geometric algebra. Indeed, this might be taken as the point of this essay."

Geometric Clifford algebra[7, 8] is that of the physical spacetime in which we live. It's an algebra not of numbers or symbols, but geometric objects - point, line, plane, and volume elements of 3D Pauli and 4D Dirac algebras of space and spacetime in which our bodies exist.

"... if a mathematical model is ever to begin to approach the mind-body problem..."

This year's contest[4] tightened our focus on geometric wavefunctions and their interactions as described by geometric products[9]. It defined emergence to permit straightforward delineation of fundamental as that which is not emergent, and put us at the phase-coherent boundary between classical and quantum, between observables and our models. Put us in the interactions, expanding Feynman diagram vertices to reveal geometric details lost in abstract Dirac equation matrix representations.

Absence of **geometric interpretation** from mainstream physics is a most remarkable historical accident. That there should parallel a second equally remarkable absence of fundamental conceptual structure is surprising. However, given dearth of progress since 1970s QCD ascendance, in hindsight such absence is to be expected and understood as another historical accident. With spatial scale defined by the Compton wavelength and the fields quantized, **interaction impedances** cannot be otherwise.

Our essays outline these two histories, presenting detailed examples of their synthesis opening new windows on elementary particle spectrum observables[10]. Real consequences of electromagnetic geometric wavefunction models will be felt not at elementary particle Compton wavelengths, but at condensed matter deBroglie wavelengths. This is the next frontier.

How does one match full eight-component Pauli electron wavefunctions to carbon nanowires? the graphene lattice? DNA helix? sentient cell?

We have two immediate interests.

First is to make our work accessible to larger communities, to focus on the theoretical minimum, on quantum interpretations as applied to the geometric wavefunction, to express geometric wavefunction physics in languages of most closely related disciplines. To function as interpreters[11].

Second is quantum impedance matching in nanoelectonics, beyond scale invariant quantum Hall impedance of vector Lorentz forces to those associated with all forces and their potentials. It appears the present status in that community is black art. Nobody knows what they're doing. Impedance governs amplitude and phase of energy flow. One has to quantum impedance match if one wants to quantum compute effectively. This is just common sense.

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[1] https://fqxi.org/community/contest

[2] https://fqxi.org/community/forum/topic/2947

[3] https://fqxi.org/community/forum/category/31425

[4] https://fqxi.org/community/forum/category/31426

[5] https://fqxi.org/community/essay/rules

[6] https://fqxi.org/community/forum/topic/2913

[7] D. Hestenes, Spacetime Algebra, Gorden and Breach, NY (1966)

[8] D. Hestenes, Spacetime Algebra 2nd ed, Springer (2015)

[9] https://fqxi.org/community/forum/topic/3100

[10] P. Cameron and M. Suisse, "Electromagnetic Synthesis of Four Fundamental Forces from Quantized Impedance Networks of Geometric Wavefunction Interactions", (Nov 2017) http://vixra.org/abs/1701.0567

[11] M. Suisse and P. Cameron, "Quantum Interpretation of the Impedance Model", accepted for presentation at the OSA-sponsored 2014 Berlin Conference on Quantum Information and Measurement http://vixra.org/abs/1311.0143

[12] M. Suisse and P. Cameron, "Quantum Interpretation of the Impedance Model as Informed by Geometric Clifford Algebra" (2016) http://vixra.org/abs/1608.0129

[13] M. Suisse and P. Cameron, "Quantum Interpretation of the Proton Anomalous Magnetic Moment", Proc. 22nd Int. Spin Symposium, Urbana-Champaign (2016) Poster available at http://vixra.org/abs/1609.0422