

# On Super-Symmetry, Anti-Gravity and Free-Energy

Lucian M. Ionescu

Associate Professor of Mathematics

Illinois State University, Campus Box 4520, Normal, IL 61790-4520

e-mail: [LMJones@ilstu.edu](mailto:LMJones@ilstu.edu)

A new paradigm in science is emerging: Quantum Information Dynamics models quantum processes as communications of quantum information; plainly said, the Universe is a “Quantum Computer”. QID is a background space-time independent theory, finally implementing Mach’s Principle, based on a rigorous Feynman Path Integral approach, and “upgrading” General Relativity mathematically while resolving the conceptual mystification from Quantum Mechanics, the way Einstein would have liked.

The astounding implications, essentially due to the fact that there is no prescribed “space”, just matter to be engineered, and there is no linear “time”, just interacting matter (causality) which may contain feedback loops (“resonance”, instead of “interference”), will be discussed: super-symmetry where Tesla “meets” Hertz, gravity derived from an electroweak version of electromagnetism with prospects for anti-gravity, and non-conservation of energy in magnetic circuits, yielding sources of force-free energy.

It is the author’s hope that this presentation will initiate a collective effort to develop the foundation needed for the academia to take the corresponding technological proofs more seriously into consideration.

## 1. Introduction

This article presents the author’s conclusions after a long research journey through mathematics and physics [1], from the perspective of a computer analyst and software developer. The discourse is kept at the level of interpretation of the physics interface and its confirmation through the many breakthroughs at technological level: scalar waves of Tesla and grand unification / super-symmetry, charge conjugation Biefeld-Brown Effect and charge conjugation violation, Searl anti-gravity effect and electrogravity coupling, ORBO technology and magnetic sources of energy, etc. Details are present in other publications [2], although a comprehensive presentation is of this moment unfortunately missing [3].

In order to compare the new paradigm of QID with the current paradigm represented by the Standard Model (SM), a brief annex was included.

## 2. On Super-Symmetry

In the current paradigm, super-symmetry is considered to be a unification of external and internal degrees of freedom, in other words enlarging the symmetry gauge group so that it transforms fermions representing particles (“particle-matter”), into bosons representing “fields” (“wave-matter”).

In contrast, a physics theory formulated in the object-oriented language of category theory, like Topological Quantum Field Theory and QID, will automatically unify fermions and bosons at the level of external space model, since they do not considered separately particles as points and fields as properties of those points. Therefore there is no need any more to unify the “external” symmetries with the internal symmetries. In fact, TQFTs have trouble defining what external symmetries are, i.e. what are the classical space-time structures on which the Lorentz group acts?

A closer inspection [4, 5] shows that Lorentz group is not different from internal degrees of freedom, say SU2, but it corresponds to it: the well known Klein correspondence (Hermitian

model) whose role was not well enough understood at the level of Penrose’s twistor theory.

In plain words, the qubit (universal unit of quantum information), as an element of SU(2), is the elementary piece of space (compare [6]) which connects to other such pieces of space via quantum channels called gates [7]. They form the Q-net (The Quantum Matrix).

There are several previous mathematical models of this kind: spin networks, foam space-times, etc. The trouble was with the research methodology used to develop them: constructive, bottom-up, using a computationally non-tractable mathematics based on continuum spaces (manifolds and cobordisms).

String Theory is a hybrid theory. It uses Riemann surfaces which play the role of the Q-net, but it is developed as a theory of configurations of RS in an ambient space-time-symmetries manifold, called landscape, which has enough dimensions to include internal degrees of freedom of the SM. It is a “generalized singular homology theory”, with a lot of topology and analysis slowing down its development. In contrast, QID is a cohomological theory, using only algebraic tools. If ST is stuck trying to find the unique landscape of reality, QID already found the answer: none!

Let us return to the technological level. The main point from above is that qubits (spinors), which as 3D-spheres and “pieces of space”, may be thought of as spinning 3D-fuzzy balls (like quantum orbitals, with “form factors” corresponding to the vibrational modes), should explain “everything”. But what are photons and electrons in this picture? They should appear as aspects of qubits once we break the symmetry by investigating particular phenomena.

The author’s conclusion is this “experimentally breaking the symmetry” led to the two fundamentally different theories of electromagnetic phenomena studied separately by Tesla and Hertz.

While the latter had the brilliant Faraday to pave the wave for a marvelous theoretic formulation by Maxwell, unfortunately the followers, like Heaviside, not understanding to role of the vector

potential, truncated the theory to the point where only transverse waves were possible. Then the experiments of Hertz, even if exhibiting “scalar waves behavior”, would only lead to a confirmation of the transverse EM-waves; the rest is history: Tesla, the engineer, working with high voltages, high frequencies and high power studied the other side of the picture: longitudinal waves. But he did not have any help from the theorists camp; and seeing is not believing, if you have preconceived ideas. Unable to understand what was happening, academia gave up, and refuted the theoretical claims of Tesla, since the whole education system and “everyday technology” was based on transverse waves. They classified Tesla’s work, after his death, as marvelous but “weird” / “unexplained”.

In the present extensive work is done to understand “scalar waves”, e.g. [8]. The theory of EM evolved; there are many new versions based on  $SO(3)$  or  $SU(2)$ , explaining what  $U(1)$ -EM cannot [9].

The vortexes of scalar waves, correspond to qubits/spinors. Alternative studies call them torsion waves. The author’s “big picture” is as follows. In Meyl’s experimental configuration, or in a Sagnac effect configuration or in a Mach-Zehnder Interferometer experiment, there are two Dirac spinors traveling in opposite directions (the two arrows of time; probably related to Whittaker’s two scalar potentials - see [10]), which interfere and form a standing wave, which is a quantum orbital of the same nature as those in atoms. As a side remark, QID teaches us that there is no size-barrier between classical and quantum; all is vibration and resonance or transfer of energy-momentum in the Q-net. Now the quantum orbital has a topological quantum number; 1-periods are quantized magnetic charges and 2-periods, quantized electric charges [11-13]. So the quantum “bridge” formed under this hand-shake of spinors (see Feynman-Wheeler Theory [14], the Transactional Interpretation of QM [15] and Two-states formulation of QM [16]) has a charge, both electric and magnetic (the unit of magnetic charge is the fluxon; the magnetic charge is not point-like, and the magnetic “monopole” is in fact a vortex, with the axis a filament but distinct from Dirac’s strings - see Fallacco solitons [12]). What appear as “photons” are transfers of energy-momentum at the input-output ports of the system (e.g. in the MZI, at laser site and detectors sites; inside the MZI there is NO photon! only the Q-orbital as a duplex quantum information channel; therefore there is no “which-way” paradox anymore, and we do start understanding quantum phenomena, finally; neither delayed choices experiments [17] present an interpretation challenge anymore; any strong measurement intervention in the delicate standing-wave resonant cavity will obviously collapse the Q-orbital, deforming and destroying the initial quantum wireless-channels the same way approaching a screw-driver to a LC-resonant circuit in a radio would change the reception into random noise, since stations form a discrete spectrum; by-the-way the continuum is only an old and not computationally tractable mathematics construction: the world is digital, quantum digital. The strong measurement represents the creation of an additional I/O-port, which can short-circuit the original quantum electronic circuit.

The over-unity effect reported by Tesla and [8] is conceivably the result of a qubit stimulated emission of radiation, similar to the cascade effect in a photo-multiplier, or LASER. Since more

energy is collected at the output, we call it EASER (energy amplification by stimulated emission of radiation). We are surrounded by micro-vortexes, which probably corresponds to “vacuum energy” or “zero-point energy”, and possibly macro-vortexes which we do not notice just because they are force-free fields (see Beltrami flows and force-free vector potentials).

In conclusion, super-symmetry as a unification of particles and fields is automatic in a background space-time independent interaction physics theory.

The effects which are attributed to the “ether” are due to the deformation of the Q-net, when modeled as embedded in a rigid space-time with a fixed metric, and under the assumption of existence of “inertial systems”. Since Descartes we should know that there is no “free motion”, as in linear, but everything is correlated (not necessarily interacts via an E/p-exchange) with everything, and periodic motions are the rule, not the exception, as long as we zoom-out to see the whole picture at the proper scale.

What the traditional super-symmetry intended to do, namely unify external and internal degrees of freedom, is in fact achieved at the level of the  $SU(2)$  group of symmetries ( $SL(2, C)$  to include “acceleration”). Technologically this can be expressed as a unification between the work of Tesla on longitudinal waves (magneto-dielectric) and Maxwell-Heaviside-Hertz transverse waves (electro-magnetic).

This dichotomy is similar to the particle-wave duality from QM, which is implemented in QID as a homological-cohomological duality (local properties/classical information/external space vs. global properties/quantum information/correlations from internal / non-differentiated properties); except it is an internal “duality”, or rather a fibered product, the Hopf bundle with its triple role: unit of quantum information, harmonic oscillator, and “piece of space”.

Maybe not emphasized enough, time “per se”, as a physical dimension does not exist. In various theories, “time” models the change of the structure of matter, and its properties (energy and moments), similar to the way colors of pixels change on the TV-screen giving us the impression of “objects moving”. There is only the present matter-structure, with its sub-structures as recordings of what we call “past”, or other sub-structures representing seeds of the future, obviously harder to recognize. So, in the 3D-picture of qubits and quantum gates, the change of the qubit’s properties occur in a preferential spatial direction we call “motion’s direction”, which corresponds to the time variable under the “ $2 + 2 = 1 + 3$ ” Hermitean model correspondence [QR]; the corresponding “ $z = ct$ ” binding is dependent on the choice of a spin axis direction, therefore yielding the vorticity aspects of “motion” (helicity, scalar waves vorticity, Kozyrev’s time variability etc.).

In conclusion: “Super-symmetry unifies Tesla and Hertz experiments”.

### 3. Anti-Gravity

Since the classical - quantum information duality is a logically fundamental framework, gravity should be a consequence.

A review of the framework of EM [5] shows that electric and magnetic forces are not “physical”, but the mathematics decomposition of the general concept of force (Newton-Lagrange) into a

longitudinal-tangential, work producing component and a normal-orthogonal, curvature producing component (Helmholtz-Hodge decomposition). At a simpler level, this is just the moving frame (Frenet) decomposition of acceleration. At a more sophisticated level, it is the consequence of relative Hodge theory.

In conclusion, with charges due to boundary components and cycles (see [18]) in the Q-net (not simply connected), the electric force is uniquely determined by transversality and being “exact”, due to the unique harmonic potential  $1/r$ , while the magnetic force is “closed”, being determined by the vector potential flow through the “vortex” cycles (see London Theory of superconductivity [19]). So, it looks like there is no “need” for “gravity”.

Now recall that U(1)-EM is really an SU(2)-theory, and the Hopf fibration is not a direct sum of the electron and proton symmetry groups in a neutral H-atom. It is therefore natural investigate that the positive charge of the “proton”, as an S2-valued 1-period is not the opposite of negative charge of the “electron”, which is the S1-valued 1-period [20].

The conclusion is that Gravity is a deformation of EM, in the usual sense of Deformation Theory used to quantize classical mechanics. At the level of statics, the conservative part, work producing part of the force is due to the harmonic potential  $1/r$ , which in the macroscopic effective theory look like this:

$$F_{\text{stat}} = F_{\text{EM}} + F_{\text{G}} \quad F_{\text{EM}} = \frac{kee'}{r^2} \quad F_{\text{G}} = \frac{kmm'}{r^2} \quad (1)$$

To understand the dynamical consequences, recall that the other main feature of QID, of being background space-time independent theory, implies that the usual generalized momentum  $\vec{P} = m\vec{v} + e\vec{A}$  ( $\vec{A}$  is the EM vector potential, analogous with velocity  $\mathbf{v}$  [19]), consists of the term  $m\vec{v}$  due to the possible embeddings Hom(G,M) of the Q-Net G (graph) in a rigid manifold M (fixed metric and topology), as a complex system with parts rather than the Newton's point  $\ast \rightarrow M$ , together with a “vibrational-rotational term”  $e\vec{A}$  due to the flow of quantum information in the Q-Net (EM waves in the “ether”). Note that this “singular homology” external-internal duality makes velocity  $\mathbf{v}$  a gauge field which is Hom-dual to the EM-vector potential (change of frames should be interpreted as gauge transformations; Lorentz transformations correspond to SL2(C)-transformations).

We obtain that the “generalized Lorentz force”, i.e. the analog of  $\vec{F} = \vec{F}_{\text{EM}} + \vec{V} \times \vec{B}$ , where  $\vec{B} = \text{curl } \vec{A}$ , but corresponding to the rate of change in the generalized momentum, is

$$\vec{F} = \vec{F}_{\text{stat}} + \vec{F}_{\text{curv}} \quad \vec{F}_{\text{curv}} = \vec{P} \times (\vec{V} \times \vec{P}) \quad (2)$$

The correct formulation would be in terms of quaternions (SU(2)-conjugation), but for qualitative features the above form, assuming small velocities and low intensity currents, is enough.

$$\text{Expanding} \quad \vec{V} \times \vec{P} = m\vec{V} \times \vec{v} + e\vec{V} \times \vec{A} = m\vec{X} + e\vec{B}, \quad (3)$$

with vorticity  $\vec{X}$  yields four curvature (work-free) terms:

$$\vec{F}_{\text{curv}} \leftrightarrow \vec{v} \times \vec{X}, \quad \vec{v} \times \vec{B}, \quad \vec{A} \times \vec{X}, \quad \vec{A} \times \vec{B} \quad (4)$$

Since we focus on the types of forces, we avoided the explicit formula with several adjustment constants involved (and  $m/e$  factors etc.).

The first term is the classical centripetal acceleration:

$$\vec{F}_{\text{c}} \sim \vec{v} \times \vec{X} \quad (6)$$

The 2nd term is the “pure” Lorentz force term, i.e. without the Coulomb force contribution:

$$\vec{F}_{\text{L}} \sim \vec{v} \times \vec{B} \quad (7)$$

We call the 3rd term

$$\vec{F}_{\text{PKS}} \sim \vec{A} \times \vec{X} \quad (8)$$

the de Palma-Kozyrev-Searl force field term, since it is observed in experiments involving rotating and falling bodies, e.g. gyroscopes falling in the gravito-rotational field of the Earth  $\vec{F}_{\text{G-Earth}}$  and  $\vec{X}_{\text{G-Earth}}$ , latitude dependent) [21-22].

Finally we will call the 4th term

$$\vec{F}_{\text{AG}} \sim \vec{A} \times \vec{B} \quad (9)$$

the London-Searl-Sagnac force field, since A~J was proposed by London [19], and we believe it is responsible of the feedback loop in the homopolar generator which accelerates the Searl generator (see also [Russian] experiments), as well as affecting the “light” flow (two opposite orientation propagating spinors) in the Sagnac effect.

In summary, the coupling between EM and G is due to the absence of a background space-time. The two theories emerged “decoupled” because it was assumed that there is a space and a time (Newton mechanics) and there is an “ether” (Maxwell-Heaviside Theory). The fact that  $\vec{P} = m\vec{v} + e\vec{A}$  is the correct momentum is well known in EM and QM, especially since at a closer scrutiny EM and Dirac's spinor theory are mathematically equivalent [23-25].

From a practical, technological point of view, this was experimentally discovered by engineers like de Palma, Searl, etc., who were concerned with “will it work?” type of questions.

In conclusion, a new propulsion system can be engineered by exploiting the vorticity field  $\vec{X}$  (Earth) and magnetic vector potential  $\vec{A}$  (Earth) of the Earth (and maybe stronger “ether winds” not yet identified. Recall that the celebrated Michaelson-Morley experiment did not report “negative”, but only a low-level of change of interference fringes pattern, which did not conform to the currently working hypothesis of ether wind. It should be emphasized that such MM-experiments, without a loop allowing for a flux to pass through, will not detect geometric phase effects (terms like  $\vec{A} \times \vec{B}$  and  $\vec{A} \times \vec{X}$ ). These effects can be detected in experimental configurations containing a loop (not simply connected), like Aharonov-Bohm and Sagnac effect; for “small loops”, i.e. involving spin, the corresponding effects are probably the Barnett effect and Einstein-de Haas effect [26].

## 4. Free-Energy

Another consequence of QID, due to the fact that the Q-net is not simply connected and one can engineer circuits exhibiting a non-trivial geometry phase (Foucault, Berry phase, ABE, Sagnac effect, magnetic motors etc.), is that one can build sources of energy.

In contrast, batteries, accumulators, electro-motors, etc. are energy storage devices, or respectively transformers of energy from one form into the other.

An energy storage device like a battery has a “life-cycle” composed of two stages: 1) the energy extracted from some system is pumped/fed into the storage device at manufacturing time (single-use batteries), or periodically as in the case of accumulators; 2) the extraction of energy by the user, until exhosting the battery/accumulator (“destroying” the source, as put by T. Bearden).

In contrast, an energy source uses the property of a non-simply connected system of having a multi-valued potential function. Such a system is called non-integrable, i.e. the differential form of local work is not exact, and has no “anti-differential”. In mathematical-physics integrable systems are the special case, in comparison with the non-integrable case where geometry phase / holonomy is present, yet it pervades the textbooks because there are comprehensive theories regarding them. Therefore integrable systems are almost exclusively used as models in physics. The corollary: the physical forces are conservative.

In a non-integrable system, potential energy is not well-defined; it is a multi-valued function. In contrast, local forces are conservative (sort of a physics counterpart of Poincare Lemma for differential forms), even if space is discrete, but locally “start-shaped”, i.e. the loops are too big to fit into the system.

So, what remains from “conservation of energy”?

Let’s step back and review what is “conservation”. It is essentially a book-keeping of changes: credits and debits. If in a system a force/differential form is not exact, one can always introduce a “cut”, called “singularity”, in order to define an anti-derivative / anti-differential as a potential of that force or flow form. Electric charges  $e$  and gravitational charges  $m$  play exactly this role of singularities hiding a non-exactness. Plainly said, when there is a local non-conservation, put a label “source/sink here”, taking the blame for a sudden appearance or disappearance act.

Now Wheeler and Misner have shown long ago that there is no need for singularities, neither electric nor magnetic, if we abandon the idea of a continuum space, and if we introduce worm-holes, i.e. allow “space” to be multiply-connected [18]. And by now it is clear that the “universe” is a network (with hierarchy; at hardware level).

The other energy, kinetic energy, is local, since it involves velocity as a derivative (flow form). This energy is conserved (locally), and the fact can be formulated in an elegant way using Noether Theorem, relating local symmetries and current conservation.

When I say “source of energy”, I mean what I say: it produces energy! How? Essentially how T. Bearden explained with the “shuttle oscillator” (see T. Bearden and Whitaker’s paper on Tesla [10]). The key is: going once around a space loop with a non-trivial geometric phase, like a smartly engineered magnetic circuit, yields kinetic energy equivalent to the potential energy per loop. This defines the “charge” or rather the intensity of the energy source.

In a suggestive way said, building such an energy source is “space engineering”, except that we build a matter system with a non-trivial localized interacting parts, since there is no “empty

space”. So, in my theory there is no “energy from the vacuum” but rather “energy from ... nothing”. Of course, the distinction will fade away as usual.

Technologies which already provide energy sources are based on magnetic resonant circuits: ORBO technology in England [27], Parendev magnetic motors etc.

What was missing is the understanding of what “works”: is it overunity? “Sacrilege”, cried academia. “Is it energy from the quantum Dirac sea?” Academicians turned around, “... maybe”; and we called it Zero Point Energy.

But the interpretation proposed by the author comes naturally as the next logical step in the unification of energy and information. It is known that erasing information requires energy (Landauer’s Principle), and that extracting energy from a system requires information (Maxwell’s Demon). So, there must be an energy-information conversion formula, a la Einstein’s  $E = mc^2$ , besides the one relating Shannon entropy and thermodynamic temperature  $S = kT$ , which ties internal energy and entropy:  $dQ = kT dS$ . Or is it the same?

It seems that mass is of topological nature, in other words the winding number times the magnetic charge of a magnetic circuit, measured in fluxons, is equivalent to a rest mass contribution:

$$c^2 dm \sim \frac{1}{2\pi i} \int \frac{eA}{z - z_0} dz \quad (4)$$

$$c^2 dm \sim 1/2\pi i \int eA/(z-z_0)dz.$$

Rest mass is conceivably a quaternionic residue. This formula is the quaternionic analog of Cauchy formula for analytic functions; recall that the quaternions form an algebra which is the double of the complex numbers:  $H = C + C^*$  (see [4]; also [28] and [29] for categories with duality in regard with time arrow and Dirac hand-shake spinors).

In plain words, winding or unwinding a magnetic circuit converts the rest mass (information stored as in a quantum register) into energy (Planck’s constant is the unit of angular momentum). And from this a new physics emerges.

But let us return to technology.

## 5. Conclusion

The new findings, unexplained theoretically and threatening the established order, were previously deemed as being not “scientific”. That a non-explained and hard to reproduced phenomenon is not incorporated in textbooks is somehow understandable; that mainstream research totally ignored them, is also understandable [6], and quite acceptable until the moment a real crises sets in, with its resolution depending on the new paradigm [30].

Building energy sources (not energy storage devices) solves the energy problem for mankind, but creates a dilemma for economy, power companies and politicians; it’s like printing money being legal. Except that it is time to understand that as a race we face global challenges, and multi-national monopolies can always focus on information control (whether we like it or not), instead of blocking the new economic paradigm of “free energy”.

What is now needed, is to systematically test the above new force terms in the laboratory, the scientific way, to find the ways which experimentally exhibits them in a systematic. The “theory”

is in some sense not under question, since it is rather a natural framework, logically mandatory; the engineering protocols have to be established, i. e. documenting the protocol for efficiently exhibiting these effects. Then, the textbooks would be updated. Once “scientifically approved”, the new paradigm will be targeted by mainstream research, keeping at bay the new sporadic breakthroughs, looking like “magic” until a new crisis sets in [Kuhn].

In this transitory period of paradigm shift, the scientists developing Science 2.0 (as by now a long overdue term for “alternative science”) should shake-hands with the engineers developing the new technology. A suitable framework for this would be an “Employment Center” being organized at conferences on free-energy and new technologies, etc. Then this particular sector of industry, mainly represented by small enterprises, would benefit from consultants developing the theory and documenting the technology, instead of wasting time and effort trying to convince academia [27]. The new off-spring Science 2.0 has matured, and no longer depends on the approval of its forefathers.

At the same time, it is “OK” to accept that the crisis has arrived, since we have a solution. The problem of global climate change and over-population, with the associated exhaustion of Earth’s resources can be “easily” solved using anti-gravity and free energy technology.

For example, we can replant deserts by easily transporting the necessary equipments and vegetation; and we can build space ships which will help us colonize the Solar system (any Pandora in mind?). To conclude, it is time for Gaea to have an “offspring”, or maybe several, developed with hindsight from the past trials and errors; no wars and no revolutions this time.

## 6. Appendix

The Standard Model is at the mathematical level a Gauge Theory (differential geometry: theory of connections: parallel transport) formulated on a bundle with base the continuum space-time manifold and fiber some gauge group controlling the internal degrees of freedom. In fact there is a ladder of such GTs corresponding to “upgrades” of the gauge group from  $U(1)$  of EM, to  $U(1)\times SU(2)$  of electro-weak theory and  $U(1)\times SU(2)\times SU(3)$  to include chromodynamics. As it can be plainly seen from [31] the group extensions were implemented routinely as “patches” of the old theory.

Relatively recently the Higgs mechanism was introduced to explain the concept of mass. It is based on breaking the symmetry from a bigger gauge group  $G$  to a smaller, little group  $H$ . This in fact leads to a fibration.

In contrast, QID was designed, and is currently being developed, as the object-oriented language for the physics laws as a new “operating system of the universe” (The MS-Windows vs. Linux paradigm). The analog of the gauge group is the monopole Hopf fibration  $S^3$  (essentially  $SU(2)$ ), with base  $S^2$  (Bloch sphere) corresponding to the proton and fiber the circle  $S^1$  ( $U(1)$ ) corresponding to the electron. Breaking the symmetry corresponds to a reduction to  $S^1\times S^2$ .

Additional details can be found in [4, 5].

## References

- [1] L. M. Ionescu, Mathematical-physics publications, [http://arxiv.org/find/all/1/au:+ionescu\\_lucian/0/1/0/all/0/1](http://arxiv.org/find/all/1/au:+ionescu_lucian/0/1/0/all/0/1).
- [2] L. M. Ionescu, **The Digital World Theory** (Olimp Press, 2006); **Q++ and a Non-Standard Model** (Trafford Publishing, 2007), <http://my.ilstu.edu/~lmiones/ResearchProjects.htm>.
- [3] L. M. Ionescu, Reading notes (2005-2011, unpublished).
- [4] L. M. Ionescu, “Quantum Relativity”, [arXiv:1005.3993](http://arxiv.org/abs/1005.3993) (2010).
- [5] L. M. Ionescu, “On Some Points of Mathematical-Physics from a Computer Science Perspective”, *General Science Journal* (2009) <http://www.wbabin.net/ntham/ionescu.pdf>.
- [6] Lee Smolin, **The Trouble with Physics: The Rise of String Theory, the Fall of a Science, and What Comes Next** (Mariner Books, 2007)
- [7] N. S. Yanofsky, M. A. Mannucci, **Quantum Computing for Computer Scientists** (Cambridge University Press, 2008).
- [8] Konstantin Meyl, “Potential Vortex, Scalar Waves & Alternative Energy” [http://www.meyl.eu/go/index.php?dir=30\\_Books&page=1&sublevel=0](http://www.meyl.eu/go/index.php?dir=30_Books&page=1&sublevel=0).
- [9] A. Lakhtakia, Ed., **Essays on the Formal Aspects of Electromagnetic Theory**, pp. 268-286 (World Scientific Pub., 1993).
- [10] Tom Bearden, <http://www.cheniere.org/books/index.html>.
- [11] E. J. Post, **Quantum Reprogramming** (Kluwer Academic Publishers, 1995).
- [11a] E. J. Post, “Can Microphysical Structure be Probed by Period Integrals?”, *Phys. Rev. D.* **25** (12): 3223-3229 (June 1982).
- [11b] E. J. Post, “The Constitutive Map and Some of its Ramifications”, *Annals of Physics* **71** (2): 497-518 (1972).
- [11c] E. J. Post, On the Quantization of the Hall Impedance”, *Phys. Lett A* **94** (8): 343-345 (Mar 1983).
- [12] Robert Kiehn, <http://stores.lulu.com/kiehn>.
- [13] A. F. Ranada, J. L. Trueba, “Topological EM with Hidden Non-linearity”, in M. Evans, S. Kielich, Eds., **Modern Nonlinear Optics**, Part 3, 2nd Ed.: Advances in Chemical Physics, Vol. 119 (2001), pp. ???; also T. W. Barrett, “Topological Foundations of Electromagnetism”, *Annales de la Fondation Louis de Broglie* **26**: 55-79 (2000).
- [14] Wikipedia, “Wheeler–Feynman Absorber Theory”, [http://en.wikipedia.org/wiki/Wheeler%E2%80%93Feynman\\_absorber\\_theory](http://en.wikipedia.org/wiki/Wheeler%E2%80%93Feynman_absorber_theory).
- [15] Wikipedia, “Transactional Interpretation” of QM (TIQM), [http://en.wikipedia.org/wiki/Transactional\\_interpretation](http://en.wikipedia.org/wiki/Transactional_interpretation).
- [16] Yakir Aharonov, Lev Vaidmann, et al, “Publications on the Two-Vector Formulation of Quantum Mechanics”, [http://www.physics.sc.edu/~quantum/Publications/Two-Vector\\_Formulation/two-vector\\_formulation.html](http://www.physics.sc.edu/~quantum/Publications/Two-Vector_Formulation/two-vector_formulation.html).
- [17] [http://en.wikipedia.org/wiki/Delayed\\_choice\\_experiment](http://en.wikipedia.org/wiki/Delayed_choice_experiment)
- [18] Misner, C.; and Wheeler, J. A. (1957). "Classical physics as geometry". *Ann. Phys.* **2** (6): 525
- [19] [http://en.wikipedia.org/wiki/London\\_equation](http://en.wikipedia.org/wiki/London_equation) ; see also London, F., Superfluids, Vol. I: Macroscopic Theory of Superconductivity, Dover Publ., 1960. 2nd ed.
- [20] L. M. Ionescu, Quantum Relativity: an essay, [arXiv:1005.3484](http://arxiv.org/abs/1005.3484).
- [21] Bruce de Palma, “Spinning Ball Experiment”, <http://www.bruce-depalma.com/n-machine/spinning-ball-experiment/>.
- [22] Rex Research, “Nikolai Kozyrev, Time”, <http://www.rexresearch.com/kozyrev2/kozyrev2.htm>.
- [23] Wikipedia, “Relation between Schrödinger's Equation and the Path Integral Formulation of Quantum Mechanics”, [http://en.wikipedia.org/wiki/Relation\\_between\\_Schrödinger's\\_Equation\\_and\\_the\\_Path\\_Integral\\_Formulation\\_of\\_Quantum\\_Mechanics](http://en.wikipedia.org/wiki/Relation_between_Schrödinger's_Equation_and_the_Path_Integral_Formulation_of_Quantum_Mechanics),”

- [dia.org/wiki/Relation\\_between\\_Schr%C3%B6dinger%27s\\_equation\\_and\\_the\\_path\\_integral\\_formulation\\_of\\_quantum\\_mechanics](http://en.wikipedia.org/wiki/Relation_between_Schr%C3%B6dinger%27s_equation_and_the_path_integral_formulation_of_quantum_mechanics).
- [ 24 ] Hans H. Sallhofer, "The Maxwell-Dirac Isomorphism", in A. Lakh-takia, Ed., **Essays on the Formal Aspects of Electromagnetic Theory**, pp. 268-286 (World Scientific Pub., 1993).
- [ 25 ] L. M. Ionescu, "Notes on QID and Dirac equation / Weyl spinors", (IHES, 2009, unpublished).
- [ 26 ] [www.Wikipedia.org](http://www.Wikipedia.org) (for everything else).
- [ 27 ] "Steorn: Sean MacCarthy with SkyNews" (2006) <http://www.youtube.com/watch?v=YDA0oyAtNBA&feature=related>.
- [ 28 ] L. M. Ionescu, "On the Arrow of Time", [arXiv:0708.4180](https://arxiv.org/abs/0708.4180) (2007).
- [ 29 ] Bojko Bakalov, Alexander Kirillov, **Lectures on Tensor Categories and Modular Functors** (American Mathematical Society, 2000).
- [ 30 ] Thomas Kuhn, **The Structure of Scientific Revolutions** (University of Chicago Press, 1962).
- [ 31 ] John Baez, John Huerta, "The Algebra of Grand Unified Theories", *Bull. Amer. Math. Soc.* **47**: 483-552 (2010), <http://www.ams.org/journals/bull/2010-47-03/S0273-0979-10-01294-2/home.html>.