FQXi Essay Contest 2009: What is Ultimately Possible in Physics?

Two steps back, one leap forward

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Abstract

"Science may be described as the art of systematic over-simplification —
the art of discerning what we may with advantage omit"

- Karl Popper [1]

In this essay it will be argued that during the last century physicists have lost their way due to a misguided pursuit of higher math, substituting that math for physical reality. It is necessary to return to the roots of physical theories and simple mechanical explanations in order to answer the challenge of this essay contest. Using the testimony of several contemporary authors, it will be shown that Unified Theories of physics are already hiding in plain sight, camouflaged only by a century of overly complex math.

1. Introduction

"No society can predict, scientifically, its own future states of knowledge."

– Karl Popper [2]

What is ultimately possible in Physics? This must be an open invitation to let imagination run wild. But should we? Since it looks like physics has already been traveling that road. To answer the challenge we may have to bypass the main road we have been presented with, taking another way altogether. The physics landscape on either side of the main road has in the course of the last century gradually become inhabited by a menagerie of fantastic creatures. We are told that curved space is now teaming with virtual particles heavier than most atoms, that black holes are built upon singularities, and that abnormal equations must be "renormalized" before they make sense. We are given particles without mass and particles that whisper to other particles, telling them to move away or move closer. How did these creatures end up in physical theory?

For most readers it is difficult to know, since the interpretation of physics these days is clouded by libraries full of dense math. This math has taken the place of simple explanations or transparent mechanics.

To demonstrate that, an excerpt of a typical contemporary peer-reviewed physics paper on gravity [7] is given: the introduction in Text box 1 and graphics in Figure 1 give an overview of EHT (Extended Heim Theory), a theory unifying the four known forces (a full introduction can be found in reference [8]). Please note that all coupling constants for the three gravitational fields "come from pure mathematical result" and it is asked which of the mathematical interactions actually connect with reality.

Text box 1: a short introduction to EHT (Extended Heim Theory)

"Here only a brief non-mathematical account of the fundamental assumptions of the underlying physical model termed EHT (Extended Heim Theory) is presented. According to EHT, each point in 4-dimensional spacetime is equipped with an 8-dimensional internal symmetry space (tangent space), called Heim space H^8 . Heim space comprises four subspaces. Combining these subspaces by employing certain selection rules, a set of partial metric tensors is obtained, forming a polymetric that represents all of the known fundamental interaction forces. The partial metrics are interpreted as physical interaction field or group of elementary particles. As a consequence, this geometric approach predicts two further fundamental physical interaction fields, in addition to the four experimentally known ones. The nature of these two novel fields is gravity-like. The six fundamental interactions emerge in our 4-dimensional spacetime and represent real physical fields carrying energy. The two additional interaction fields are identified as gravitophoton interaction (i.e., the conversion of photons into a gravity-like field), and quintessence or vacuum interaction (a conversion of photons into a repulsive type of gravity-like field). The gravitophoton interaction is mediated by two massless, so called gravitophoton particles, one which is gravitationally attractive, and the other one is gravitationally repulsive. The massless quintessence or vacuum interaction particle mediates a very weak repulsive gravity-like force that is much smaller in magnitude than the gravitophoton interaction. The important question is under which experimental circumstances do these interactions manifest themselves as real physical phenomena?" [7]

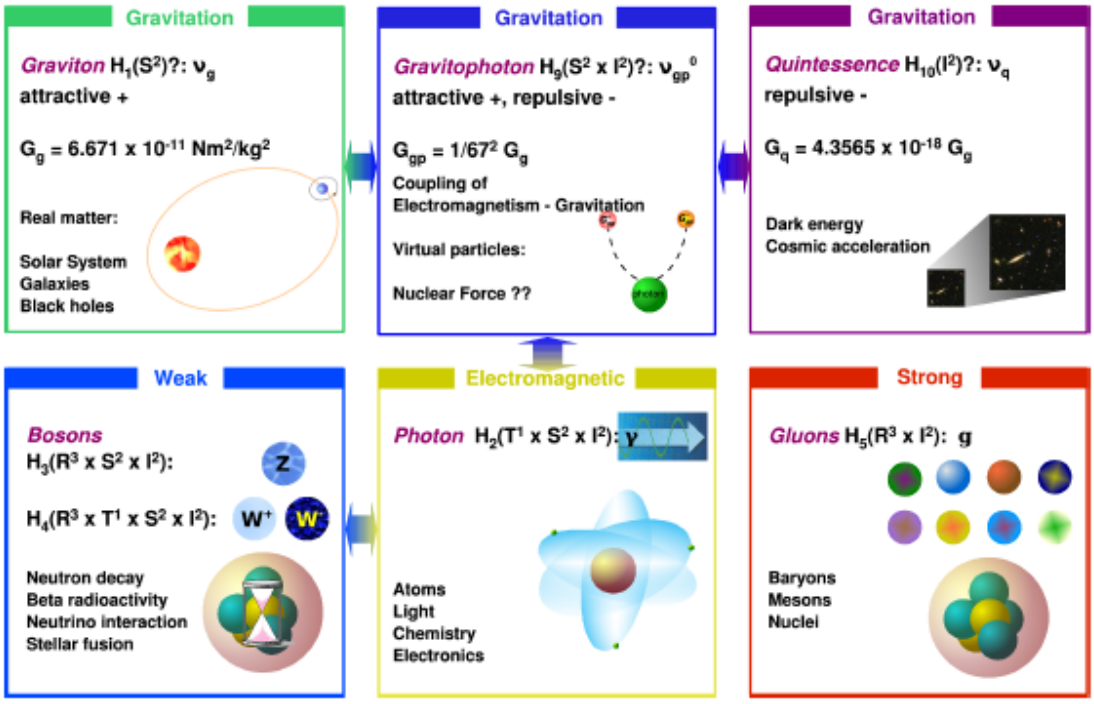


Figure 2. Six fundamental forces are predicted by *EHT*. Three of them are gravity-like fields, mediated by the graviton (attractive), gravitophotons (attractive and repulsive), and the quintessence particle (repulsive). The coupling strengths for the three gravitational fields were calculated from set theory, i.e., their values are obtained from pure mathematical considerations. H_i indicates the type of Hermetry form, that is, the partial metric tensor, which corresponds to this physical quantity, see Tables 1 and 2 in.[25,26] The arguments of a Hermetry form indicate the subspace coordinates that are forming this metric tensor. The internal symmetry space comprises four subspaces, namely $\mathbb{R}^3$ responsible for mass, T^1 accounting for charge, S^2, for organization, and I^2 for information. Hermetry forms can be converted into different Hermetry forms by experimentally canceling certain subspace coordinates. This is how mixing of particles can be achieved.

Figure 1: A graphical summary of the same EHT (Extended Heim Theory), a typical contemporary peer reviewed theory trying to unify the known basic physical forces [7]

The public should ask: “when did the study of physics become synonymous with mathematical mystification”? We must suppose that even a mainstream physicist would shrug at the mention of the yet unproven "*Gravitophoton*" and "*Quintessence*" particles, and he should also shrug at the "*Graviton*," which is equally theoretical. But the new LHC [12] must now compete with string theory [13], and would seem incomplete without a large list of colorful new terms. But neither string theory nor the LHC were the first to glorify novelty. Let us see where this trend started.

2. The age of Relativity, Quantum Mechanics and the loss of the path of reason

“Whenever a theory appears to you as the only possible one, take this as a sign that you have neither understood the theory nor the problem which it was intended to solve”

- Karl Popper [4]

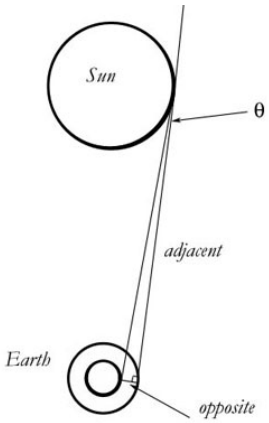
The most important physical theories of the last century have undoubtedly been the theories of Relativity and Quantum Mechanics.

Let’s start with Einstein: the notion that no observer is preferred, that every observer is allowed to consider himself at rest and that the laws of physics are locally invariant is a major departure from the worldview of Newton. Relativity does not invalidate Newton but rather extends his equations with transforms. Unfortunately, Einstein chose to express his General Theory of Relativity with non-Euclidean math and tensor fields. This choice of his opened the door between the math department and the physics department, and was one of the first instances of the general modern

trend to co-opt one department by the other. By this choice, Einstein empowered Hilbert, Klein, Weyl, Minkowski, and many others. Hilbert even tried to steal GR from Einstein outright [9]: which is enough by itself to prove the point. From the beginning the math and mathematicians were invasive and invaders and they continue to be so. But all this was unnecessary. A contemporary author has shown that by applying Einstein's own Equivalence Principle we can reverse the acceleration vector in any problem, finding the same results as the tensor calculus with high-school algebra. Einstein himself allowed that explicitly: *"We shall therefore assume the complete physical equivalence of a gravitational field and a corresponding acceleration of the reference system"* [6]. The essay quotes here from Miles Mathis [10]:

Doing General Relativity with Plain Algebra

Assuming a lightray passing the sun travels to earth in about 500s and assigning the acceleration of gravity to an expansion of the Earth, we can then calculate the observed position of this lightray on earth:



s	= ½ at^2 = (9.8m/s^2) $(500s)^2$ / 2 = 1225000m
tan θ	= s/1 AU = 1225000m/1.5x10^{11}m
θ	= 1.68 seconds of arc

Voila, the result that made Einstein a celebrity.

Quantum Mechanics decides to override reality

Perhaps Einstein was only dressing up his theories with a math to impress his colleagues, but the mathematicians of Quantum Mechanics learned from his success. To quote Miles Mathis again [11]:

> *The entire problem (in QM) is in assuming that the math is the reality. It is not. The math is the math, and the reality is the reality. The math in QM is statistical. The wave is a probability wave. Therefore the math can never transcend the probability. Probability math cannot fully represent reality. Even regular math cannot fully represent reality, in that the dimensions will always be incommensurate: mathematical fields cannot match physical fields due to the fact that you cannot mathematically represent (or graph) a zero-dimensional variable. But probability math represents reality even less fully, for obvious reasons. Probability math gives us only probabilities.*
>
> *This used to be common sense. Mathematicians understood that probabilities were probabilities. Probabilities were imprecise, due to the very definition of the word. But scientists in the 20th century could not live with this imprecision. They were so proud of their new theory that they could not bear to admit that it was not a full expression of reality. They couldn't live with the "gap" in knowledge. So they simply closed the gap, by main force. They just defined probability as reality. They said, in effect, "This is what we know. Our math is all we know and it is all we can know. Therefore, it is reality for us. Therefore it is reality."*

From here it is not such a great leap to the abstract math shown in the introduction, the math of string theory or the LHC. Considering all this, it appears that the future of physics will be determined not by more and more esoteric theories embedded in more and more difficult, extensive, and opaque math, but by a thorough scrubbing of physics and its expression by simple math and mechanical postulates. Let us take a look at some more ways that we can scrub the math and theories of physics.

3. A return to basics

"The history of science, like the history of all human ideas, is a history of irresponsible dreams, of obstinacy, and of error. But science is one of the very few human activities — perhaps the only one — in which errors are systematically criticized and fairly often, in time, corrected. This is why we can say that, in science, we often learn from our mistakes, and why we can speak clearly and sensibly about making progress there."

- Karl Popper [3]

So, it might be clear that the essence of this paper is that instead of more flights forward into imagination a good step back to basics is what is really necessary to advance physics theory forward. As inconsequential as it looks, I think we must conclude that the actual advancement in physics application the last century is by large from the work of engineers and not from advances in basic physics theory.

Space, Time, Motion and Photons

It is already accepted that space and time are aspects of the same four-vector field. It is also know that motion occurs in this field and that all motion is relative to real photons. The author Dewey Larson has shown [16] that the physical universe as we know it is equivalent to three independent dimensions of scalar motion. Although Larson's theory is abstract, Miles Mathis has mathematically deconstructed Planck's constant to prove that all photons (even charge photons) are real particles with size, spin and mass [17]. Both Larson and Xavier Borg [19] have shown that all physical constants can be expressed as ratios of space and time, lending more credence to the fact that photons are the basic mediating particles.

The first philosophy (Metaphysics) is universal and is exclusively concerned with primary substance. ... And here we will have the science to study that which is, both in its essence and in the properties which, just as a thing that is, it has. ... That among entities there must be some cause which moves and combines things. ... There must then be a principle of such a kind that its substance is activity. (Aristotle, 340BC) [10]

Relativity Rules

According to modern authors, the Theory of Relativity has not been finalized, either as a theory or as math. As one example, Mathis [15], who agrees with time dilation and mass increase, has shown that Einstein's velocity transform is for two degrees of relativity, and that it is possible to derive a transform for one degree of relativity with simple math. This gives us a velocity variable Einstein never knew about, as well as a hatful of new applications for Relativity as a whole. What is perhaps most promising about this is that Mathis' new first-degree transform for velocity is the same as the frequency transform in optics.

It should be highlighted that the consequences of the Theory of Relativity have not been taken to its ultimate conclusions. From his position every observer is allowed to assign speed and acceleration to his or "the other" side, even if that side is just empty Space. So it becomes a

matter of choice to assign a physics value to matter or empty space. Since the Theory of Relativity also postulates that photons have a constant speed, it must be illogical to assign any other property to Space than that it is the straight paths that photons follow. We must also logically conclude that gravity should be assigned to an expansion of matter and that 'virtual' particles popping out of space are either real photons or a hole in a physics explanation or formula.
It is even a question whether the constant speed of photons should be assigned to photons or matter. Larson assigns constant lightspeed to the motion of matter [16], while Mathis assigns it to photons [15].

The Unified Field Theory: hiding in plain sight

The future of physics is shown most clearly in the discovery by a contemporary author that it is not necessary to unify the gravity and E/M fields, since they are both already unified field equations. Mathis [18] has shown that Newton's gravity equation and Coulomb's electrostatic equation are both the same equation in a different guise, and that both equations contain both fields. He has pulled apart the equations, showing both fields and how the equation constants act as the scaling constants between the two fields. For example, Mathis shows that G is just a scaling constant between the photon field and the atomic field, allowing unification. Specifically, it is shown that the photon has a radius G times the radius of the proton. This keeps the photon size and mass below current experimental limits, but allows the E/M field to be inserted into Newton's gravitational equation without changing it at all. The entire field unification is done within the constant G. He is also able to connect the photon size to the size differential between the electron and nucleon. As is known, the size differential between the two is about 1821. He shows that the size differential between nucleon and photon is 1821^3, and again connects this number to G. G is approximately the inverse of 1821^3.
So, what is required has never been unification, it has been separation. The discovered unified field then shows that there are only two basic forces instead of four: a constant expansion of all matter leading to gravitational attraction and inertia, and a real photon emission field from that same matter leading to repulsion and E/M forces.

An ultimate dimension for the universe?

As a final example, let us consider the question of dimensions. The three dimensions of space are an observed fact, understood by most people. But the dimensionality of time is not so clear. It is now assigned to an imaginary orthogonal dimension, but Mathis has shown that to be physically false [15]. If time were orthogonal to any of the other three dimensions, then our accepted notation of velocity would make no sense: $v = \Delta s/\Delta t$. One cannot express a velocity in a fraction when the denominator is orthogonal to your numerator. We also would not be able to accelerate in a straight line. The fact that we can is physical proof against Minkowski's proposed mathematical symmetry. Dewey Larson [16] holds that three time dimensions are the reciprocal of the space dimensions and are visible as a scalar only from any point in space. Mathis holds that there is only one time dimension in any problem, and that it must run parallel to one of the space dimensions. Operationally, time is no different than space, since it always acts mathematically like a distance. Even so, it cannot be scripted like distance in all situations. From the viewpoint of the mediating photon, time may represent the spin dimension while space represents the linear dimension. But how would time be represented to an observer in a unified field?
J.W. Dunne [21] holds that time is only a perception of the human mind. It is an infinite regression of reality caused by the positioning of ourselves as an "observer" of this universe. It is illustrated by the story of a painter trying to paint a complete picture of the universe. If he does so, the results are like the picture X_1 (see Figure 2). On examining this picture, however, the painter was not satisfied. Something was missing. After a moment's reflection, he realized that something was himself. So the question arose: How was he to add to the picture a representation of himself? He takes his easel and steps three meters back, then engages a passing yokel to stand as a model, enlarging his picture into the sketch shown as X_2. But still he was dissatisfied. He thought. "This

picture is perfectly correct as far as it goes. X_2 represents the real world as I see it, and X_1 represents that world as an artist who was unaware of his own existence would suppose it to be. No fault can be found in the pictured world X_2 or in the pictured artist, or in that pictured artist's picture X_1. But I the real artist am aware of my own existence, and am trying to portray myself as part of the real world. The pictured artist is, thus, an incomplete description of me, and of my relation to the universe. So saying, he shifted his easel again, seized his brush and palate, and, with a few masterly strokes, expanded his picture into X_3. Needless to say the argumentation was repeated ad infinitum.

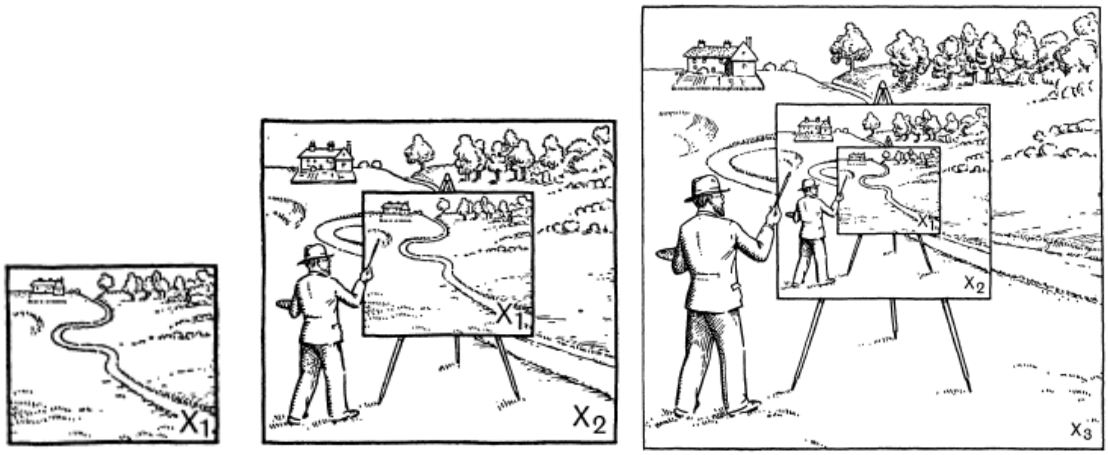


Figure 2: The artist's paintings: X_1, X_2 and X_3

Let us finish by quoting the vision on time of Xavier Borg [20]:

> *For those mathematically minded, let's take a car accelerating on a road. If we integrate the observed acceleration m/s^2 with respect to time we get a car driving at a velocity measured in m/s. We have thus moved the motion of the car one dimension up with respect to time. If we integrate further the velocity with respect to time, we get the total distance covered in meters, in no time. So did the road distance exist before or after the car started accelerating? As you see the 'road'-- the time independent dimension-- is necessary for all other actions (differentiations with respect to time) to take place, and hence the universe should be limited in its number of dimensions, with the highest dimension being time independent, and being the universal observer itself [18].*

So, is the universe a three-dimensional cage and is time a human illusion or does it point at a road towards the ultimate dimension or towards infinite dimensions? Even with a UFT that is still a path to be explored.

4. Conclusion

"If we are uncritical we shall always find what we want: we shall look for, and find, confirmations, and we shall look away from, and not see, whatever might be dangerous to our pet theories.
In this way it is only too easy to obtain what appears to be overwhelming evidence in favor of a theory which, if approached critically, would have been refuted."

- Karl Popper [5]

Instead of a continued flight into mathematical esoterica, we need a dramatic "return to basics". Only in that context can a question like "What is ultimately possible?" hope to be answered sensibly.

As Miles Mathis suggested, *"The sort of math that physics requires is a math of rigorous definitions and transparent variables, with as little abstraction as possible."*

Such a suggestion runs counter to all we have been taught, but it acts as a small elfish light of clarity in our trek into the future.

Acknowledgements: The content of this essay is mostly inspired by the work of the following 'fringe' artists (listed here with their web reference):

- **Miles Mathis** - *The Greatest Standing Errors in Physics and Mathematics*,
- **Dewey Larson** - *Reciprocal System Theory*,
- **Xavier Borg** - *Blaze Labs Research*,
- **J.W. Dunne** - *The Serial Universe*

I am indebted to Miles Mathis for proofreading the essay and correcting both my grammar and "European English".

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