A model of a universe.

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Abstract:

This paper describes a fully causal-deterministic model of a universe without any non-localities.

The model provides an explanation of how Inertia, Matter, the Strong Nuclear Force, the Weak Nuclear Force, Time, Spin, Superposition, Entanglement, Gravity, the Gravity field, the Electric field, the Magnetic field, Dark Matter and Dark Energy all could emerge from Electromagnetic principles and how Electromagnetism could emerge from what is called Electroelectrism.

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Rationale and caveat:

The reason we are curious about things is that we want to understand how things work in reality. But as we think about this, we find that it is often impossible to be certain because we can only prove models of reality which is not the same as proving accordance to reality.

All we can do is 1: Observe, 2: Make a hypothesis that could explain this observation, 3: Make a model of that hypothesis, 4: Test this model and then 5: Prove or disprove this model.

All we can say is that a better model has a higher chance that it accurately describes reality. But no matter how good a model is, we can never be certain, and must never assume, that any model accurately describes reality.

Introduction:

Current understanding is that there are 4 fundamental “forces” in the universe: the Strong Nuclear Force, the Weak Nuclear Force, Electromagnetism and Gravity.

The Strong and Weak nuclear forces are required in the standard model of particle physics. At this point the only thing that can be said about these forces is that none of them seem to be good candidates to start looking at first.

Electromagnetism seems to be the best understood “force”.

The basic mechanism of electromagnetism is electromagnetic induction. In this model electromagnetic induction is assumed to be essentially a series of self-inducing electric and magnetic effects where each of these effects cause a perpendicular effect of the other type and every other effect is an inverse effect of the same type. For example: an electric effect (ee) induces a magnetic effect (me), which induces an

inverse electric effect (-ee) which induces an inverse magnetic effect (-me) which induces an electric effect (ee), etc. (**Assumption 1**).

Electromagnetism also does not seem to be a good candidate to start looking at first however.

That leaves Gravity, which is related to Inertia because the effect of Gravity is equivalent to the effect of Inertia during acceleration.

The following section is a possible explanation for the underlying mechanism of Inertia which lead to possible explanations for the 4 fundamental forces (and more).

Inertia:

The assumption is that some matter in an otherwise empty universe would exhibit Inertia. In other words: Inertia is a property of matter alone and does not depend on anything else (**Assumption 2**).

This means that if we apply a force to some matter, it accelerates, and if we stop applying a force the acceleration stops and the matter stays at a constant velocity. How can we explain this Inertia? What is "resisting" the applied force in an otherwise empty universe where nothing is holding the matter in place?

We know that matter and Electromagnetism have an energy equivalent and we know that they can be converted to, and from, energy and to each other.

The first step towards finding an explanation for Inertia is to assume that Matter and Electromagnetism do not only have an energy equivalent, but that Matter and Electromagnetism both are equivalent to energy (**Assumption 3a**).

The second step is to also assume that Matter and Electromagnetism are equivalent to each other (**Assumption 3b**).

If Matter is equivalent to Electromagnetism, then matter could be some kind of localized Electromagnetic (EM) phenomenon. Questions that needs to be answered then is how such a phenomenon can be EM neutral externally and exhibit particle properties like Inertia and solidness.

An EM phenomenon could be virtually EM neutral externally if the basic principle of Electromagnetism is as described earlier (ee, me, -ee, -me, ee) and if it is possible that these effects can exist in a circular, or otherwise repeating, configuration (**Assumption 3c**) where each EM effect is cancelled out externally by a self-induced anti-effect.
This would make it possible that an externally EM neutral, roughly spherical vortex (for lack of a better word) of EM effects could exist in principle. This behavior would basically be circular or 2-dimensional (2D), and effectively behave like a standing or "circular" EM wave. This is different from the EM behavior of the known EM spectrum where the EM effects induce circular EM effects in 3 dimensions (3D), but fundamentally it would still be an EM phenomenon.

If this is the case, then particle creation from EM radiation and particle conversion into EM radiation becomes logical because this is then only a change in configuration of EM effects.

If matter is such an EM phenomenon, then it is obviously not Electromagnetism as we understand it until now. It must be something else. The analogy of aggregation states seems to fit here and so the assumption is that Matter and Electromagnetism are different aggregation states of energy (**Assumption 3d**). And finally assumptions 3a, 3b, 3c & 3d can be taken one final step and that is to assume that Everything that exists is either an aggregation state of energy, or emergent from something else that is an aggregation state of energy (**Assumption 3**).

To clarify the concept "aggregation state", the following possible aggregation states of energy can be imagined:

- "Plasma" energy state: EM near field
- "Gaseous" energy state: photons
- "Liquid" energy state: matter
- "Solid" energy state: energy inside a black hole?

Based on the above it is postulated that matter or particles are externally EM neutral, EM vortices which will be called Magnetoelectric (ME) vortices in this model.

Note that the terms Magnetoelectric (ME) and Electromagnetic (EM) are identical in principal. It just depends where you start counting. For the purpose of this paper a different name was required to better distinguish these vortices from "normal" Electromagnetism.

Note also that the EM effects of a ME vortex do not imply the existence of a magnetic or electric "charge" in the vortex that is causing these effects. Instead, these effects are expected to be more fundamental. These effects are expected to be the underlying mechanism that causes magnetic or electric "charge".

The question now is: how can such a postulated ME vortex exhibit solidness and Inertia?

At the fundamental level "solidness" is equivalent to resisting penetration. And it seems logical that these postulated ME vortices will resist penetration if they have a stable configuration that requires a significant force or amount of energy to fuse or split these vortices.

Such a repelling effect is then perceived at larger scales as solidness. In other words: the intuitive understanding that solidness means that things are filled up does not apply at the fundamental level if matter is such a ME vortex, meaning that "solidness" is an emergent property.

As an analogy to these ME vortices we can use drops of a liquid with a certain surface tension like Mercury drops on a table. Depending on the surface tension, these drops can bounce without merging. If they bounce fast enough they merge and if they bounce to fast they break up again in different size drops after that.

Of course, particles do not have a surface or surface tension, but instead have an outer zone with an inward increasing "tension" like a force field. The principle is the same however as with liquid drops: To split or merge ME vortices (particles), a certain energy threshold needs to be exceeded to break this tension. Depending on the configuration and energy levels of the resulting ME vortices, energy can be released or absorbed (as photons typically) if the sum of the energy levels of the resulting ME vortices is different from the original ME vortices.

With the above-mentioned assumptions, the underlying mechanism of Inertia becomes logical:

The individual electric and magnetic effects in the ME vortices all have a certain shape, intensity and location which is completely determined by, the shape, intensity and location of the causing effect. To move or accelerate such a vortex, the EM effects needs to be "forced" to a location other than where they would have naturally occurred by induction. Trying to accelerate such a vortex will then result in a reverse induction force that will be perceived at larger scales as Inertia.

And, to explain Inertia completely, we must also assume that the applied force changes the ME vortex "permanently" in a way that the change in velocity is retained in all following EM effects of the ME vortex.

It follows from the equivalence principle that for a local (co-moving) observer the ME vortex will seem stationary and unchanged. Because of this, this velocity retention of a ME vortex must work in a manner that the vortex will appear identical to a co-moving observer. How this works exactly is unknown, but it is logical that a changed ME effect will induce different ME effects. And also, because a co-moving observer is made up out of ME vortices in identical conditions, it is expected that any deformations, like length contraction for example, in these vortices will only be detectable by external observers.

Note that this would also make the underlying mechanism of photon momentum logical because photons are made up of self-inducing EM effects also.

The problem now is "only" how to model such ME vortex configurations. How big are the series or loops of EM effects? Are this loops of 4, 8, 12 or more EM effects? Maybe these loops can exist in any multiple of 4 EM effects and/or multiple loops (counter "rotating" or randomly "rotating"?) can exist simultaneously in a single ME vortex?

The expectation is that that it is possible in the future to simulate this and that simulating these vortices will provide insight about things like chemical properties and radioactivity for example. It is also expected that new particles can be predicted with simulation.

Another thing that seems logical now is that such a ME vortex has a speed limit because there is a maximum distance and minimum time between any two following internal EM effects. It is then logical that forcing such a ME vortex "near" this maximum speed will cause an exponential increase in reverse induction effects which is perceived at larger scales as an exponential increase of Inertia or momentum. This is expected to be some kind of warping of the vortex such that it cannot "squeeze" further at some point. It also seems logical that this squeezing can be perceived at larger scales as length contraction in the direction of the speed.

This does however not explain the observed speed induced time dilation and speed induced length contraction effects. This will be addressed later in the Time, Time dilation and the speed of light section.

Some additional remarks and consequences that seem logical now:

Explaining the Wave-Particle duality concept seems to become logical because a ME vortex (particle) would then be a "standing" Electromagnetic wave. In other words: Wave-Particle duality would be Wave-Particle equality at a fundamental level.

Explaining the disappearance of interference patterns when observing or detecting photons or particles in experiments also seems to become logical because detecting such a postulated ME vortex (particle) can only be done by some kind of EM reverse induction. This will (slightly) change the detected ME vortex, making interference which depends on perfect synchronization impossible.

The uncertainty principle also becomes logical now, because if matter is a ME vortex then the concepts "position" and "momentum" are emergent concepts that only exist at larger scales.

Spin, Superposition and Entanglement:

The concept Spin becomes better understandable if matter is a ME vortex: Any measured Spin would then be the rotation direction of individual ME loop(s) in the ME vortex at the measurement moment. Because particles are 3-dimensional and because the observed Spin is not constant, the ME loops must be circling and/or wobbling around in some configuration. The measured Spin would then be a snapshot of a 2-dimensional projection of this 3-dimensional and alternating ME loop rotation direction.

This would mean that the measured direction of Spin depends on the moment of measuring, making the measured Spin value a matter of probability, where this probability and the measured spin value depend on the configuration of the ME vortex.

Superposition of Spin could then be either multiple of these ME loops or a single ME loop that (depending on the moment of measuring) has one rotation direction or the other.

The higher correlations found in quantum entanglement experiments can be understood if we assume that the ME vortex configuration of particles have a polarization axle around which the ME loops of the ME vortex are circling and wobbling in a shape that is expected to be like an almost spherical spindle torus (**Assumption 4**). For example a motion like a combination of the motions of a spinning coin and an Euler's disc.

This assumption would also explain why particles, even the neutral particles, have an external net Spin polarization, or magnetic moment, in the "north" / "south" direction which is called Spin. And this would also explain that when measuring the Spin of such a particle from the "north" (0°) we would always see a (2-D projection of) Spin in the same direction and when looking from the "south" (180°) we would always see a Spin in the opposite direction. When measuring from the side (90°) we would see 50% Spin in one direction and 50% Spin in the other direction. A logical consequence of assumption 4 is that the mentioned circling and wobbling of ME loops will behave sinusoidal in some way. So: without knowing exactly what the configuration of this circling and wobbling is, if it is sinusoidal then the measured Spin will have a sinusoidal distribution when measuring from other angles than 0°, 90° or 180° from polarization. For example like the results found in entanglement experiments.

Another conclusion from entanglement experiments is that the act of measuring the Spin of a particle resets the Spin polarization in the measurement direction. Which would make sense because any measurement will cause a reverse induction effect on the ME vortex. This polarization reset is then the explanation of what is called wave-collapse.

The fact that these spin values are quantized can be explained if the measured spin value is a combination of 2 components that have a reverse dependence on the angle between the ME loop and

the measurement direction. These two components then always add up to the quantum value.
First component: a 2D spin projection in the measurement direction which ranges from the quantum value (when the angle between the ME loop and the measurement direction is 90°) to zero (when the angle is 0°).
Second component: a reverse induction component caused by a flip of the ME loop in the direction perpendicular to the measurement direction (resetting the polarization of the ME vortex) which ranges from zero (when the angle between the ME loop and the measurement direction is 90°) to the quantum value (when the angle is 0°).

If we assume that particles can consist of multiple ME loops then also the higher Spin values become logical. For example: A particle with a single ME loop will always reset either "up" (Spin ½) or "down" (Spin -½). With a particle that has 2 ME loops then both loops can be reset "up" (Spin 1), both "down" (Spin -1) or in opposite directions (Spin 0). With a particle that has 3 ME loops: 3 "up" (Spin 1½), 2 "up" & 1 "down" (Spin ½), 1 "up" & 2 "down" (Spin -½) and finally 3 ME loops "down" (Spin -1½). Etc.

That leaves spin 0 particles. Based on the above explanation these do not seem possible or these cannot exist long enough to detect their spin or their wave collapse? What could also be possible is that ME vortices can exist with ME loops that are somehow locked in permanent inverse synchronization? Or perhaps spin 0 particles are ME vortices in a configuration without polarization?

In any case, the conclusions from assumption 4 are that at a fundamental level:

1: Spin, is a snapshot of the rotation direction(s) of ME loop(s).
2: Superposition of spin, is an alternation of spin.
3: Entanglement, is the synchronization of Spin polarization.

In other words: Entanglement and superposition of spin are emergent and do not exist at a fundamental level (**Prediction 1**).

Strong and weak nuclear forces:

If matter is a ME Vortex, then it seems logical that the Weak Nuclear Force is an emergent concept. (**Prediction 2a**):

Radioactive decay and spontaneous fission can then be explained by ME vortex instabilities where the probability of such an instability event is determined by the vortex configuration. Or in other words: determined by the probability that a ME vortex ends up in a state that is unstable or vulnerable to a certain influence (internal or external) resulting in an event like radioactive decay or spontaneous fission.

A possible way how this could work physically is that this is somehow caused by the small magnetic moment that all particles (ME-vortices) have. There may be some probability that "enough" of these magnetic moments get aligned in a catastrophic direction and/or magnitude, causing parts of a particle to be expelled or weakening the structure or cohesion of a particle enough so that it cannot withstand some internal or external influence.

If matter is a ME Vortex, then this would also make the Strong Nuclear Force an emergent concept (**Prediction 2b**):

The reason is that the observed energies released and absorbed that have been attributed to the Strong Nuclear Force can be explained otherwise:

Current understanding is that Protons and Neutrons in nuclei are kept together with the Strong Nuclear Force. The fact that the Strong Nuclear Force is assumed to exist implies that an underlying assumption that the Protons and Neutrons are present "inside" nuclei completely identical and separate as they would exist externally. Neutrons are however stable inside an atom and unstable outside and the mass of nuclei is less than the separate Protons and Neutrons.

If matter is a ME vortex, then it logical to assume that Protons and Neutrons are not present "inside" nuclei completely identical and separate as they would exist externally.

Instead nuclei can then be viewed as a single ME vortex of a certain (overall) configuration with a total energy equivalent that is almost equal to the energy equivalent of its Protons and Neutrons and with certain (overall) properties. That could be a single charge of +2 for example instead of 2 separate charges of +1 which are repelling. At the same time is seems likely that the nuclei are made up of sub vortex configurations where each sub configuration has many similarities with either the Proton or Neutron. But the crux is that those sub configurations are not completely identical to either the Proton or Neutron, and that it is precisely this difference, this "non-identicalness", that would make the Strong Nuclear Force no longer required.

A similar effect most likely also happens with electrons that are absorbed into atoms. These electrons then do not exist anymore as they existed externally and their charge does not exist as a separate charge anymore.

To conclude this section: If the above description is correct then it is logical that in particle colliders many different "sub" particles will be detected. The reason for this is that those "sub" particles must not be viewed as fragments of smashed particles, but as newly created particles from energy fragments of smashed particles. In that case, any possible "sub" particle that can be created from lower energy levels will be created after smashing a particle. Particles with internal sub configurations that closely resemble certain smaller particles will of course mostly break up into particles that are similar to those sub configurations. But there will also be random "sub" particles created from energy fragments in a distribution solely based on probability that those possible "sub" particles can be created.

Gravity and Dark Matter:

What are gravity fields made of, how does the gravity mechanism work physically?

What we know, or seems safe to assume, about Gravity:

- The effect of Gravity is equivalent to the effect of Inertia during acceleration.
- Gravity influences particles at a fundamental level making them accelerate.
- Gravity, or a Gravity field, does not radiate energy in normal conditions.
- Gravity works both ways between particles: Each particle has a gravity field influencing the other particle.

A question about gravity that may be testable is: does Gravity effect particles directly and/or is Gravity a result of an interlocking of the Gravity fields?

To explain the difference: assuming two particles come into existence simultaneously at a distance x light seconds apart and assuming that their gravity fields deploy outwards at the speed of light, starting at the moment of creation of the particles. If gravity effects those particles directly then gravity would take effect after x seconds going from 0 to maximum instantaneously. If gravity does not affect those particles directly it would take x/2 seconds, when the gravity fields "meet" in the middle, for gravity to start taking effect. And then, gradually (linearly?) increasing (in quanta?) from 0 to maximum from x/2 seconds to x seconds.

In any case: the question that needs to be answered is: what could this Gravity field be physically?

Given the assumption that matter is a ME vortex and that the time between the EM effects of the ME vortex is not zero then maybe there is another ME/EM effect possible that emanates outward and this could then be what the gravity field is made of physically?

Other questions are: What is the mechanism that a gravity field uses to accelerate particles? How is it possible that there is an effect at a distance? What is this sphere of influence physically?

Part of the answer seems obvious in hindsight: something of particle A is present at the location of particle B and/or vice versa. And it must be this "something" (the gravity field) that is causing the particles to accelerate.

Then, based on the assumption that everything that exists must have an energy equivalent (assumption 3) and must be quantized like everything else seems to be at a fundamental level (**Assumption 7**), the gravity field must be equivalent to energy and equivalent to particles.

And since the gravity field is also part of a particle the conclusion must be that the definition of a particle needs to be changed to not only include the known "hard" bit in the center.

It would seem logical now that a gravity field is like a gas cloud of energy quanta that is in some way connected or bound to the particle center. In this paper, these gravity energy quanta or gravity field quanta are called Gravianta. These Gravianta are expected to be massless and do not seem to interact with anything else other than that they cause the gravity effect.

Because these Gravianta are quantized they must also have a minimum (quantum) gravity effect which inevitably leads to the conclusion and prediction that gravity fields are finite in size (**Prediction 3**).

Given that we know that energy is the fundamental cause of gravity another conclusion that seems logical is that (the energy equivalent of) this Graviantum must be causing additional gravity. And because such a field of Gravianta must also be bound to a gravitating object, there could also be binding energy in the field.

In any case, this Gravianta energy is expected to add extra energy above 1/r^2 in the gravity field and this would then be a logical possible explanation of what is currently called Dark Matter (**Prediction 4**). The observed dark matter effects would then be caused by a mechanism that is equivalent to pressure in gas clouds where gravitating centers build up extra pressure that causes a halo of more densely packed Gravianta resulting in a higher energy density which then causes the extra gravity that is observed.

Another thing that seems logical now is that this kind of gravity field must have a range that is dependent on the energy equivalent of the gravitating object because quantized Gravianta have a minimum value, which is “reached” earlier with small gravitating objects.

The radius of the gravity field of a proton for example could be in the order of magnitude of 1 cm for example.

Based on dark matter observations the total energy equivalent of a gravity field is at least 5 times higher than the energy equivalent of the gravitating objects.

The distribution of the Gravianta in relatively short distances, like in solar systems, then causes the 1/r^2 gravity ratio like that we observe and with larger gravitating objects these Gravianta accumulate to add significantly more gravity than 1/r^2 near these larger gravitating objects like we observe in galaxies.

In solar systems these effects are negligible because any extra Gravianta density above 1/r^2 from the solar system itself is insignificant compared to the “normal” 1/r^2 Gravianta from the solar system. Although, it may be detectable with sufficiently sensitive equipment that outer planets or asteroids of large solar systems orbit a bit faster than expected (**Prediction 10**).

Note that it would seem logical to assume that, because of energy conservation, the total energy equivalent in a gravity field of an object is equal to the sum of energy equivalents of the gravity fields of all fundamental particles that make up that gravitating object. This would means that the total gravity range of large gravitating centers is expected to decrease as the density/pressure in the center increases. This would then also mean that there is a certain distance outside objects like galaxies where the gravity effect starts to drop faster than 1/r^2 because the outer Gravianta have been pulled into the center.

This would also explain the observed galaxy clusters where dark matter does not seem to move with the bulk of the mass of the galaxy (the Intra Cluster Medium) and the diffuse galaxies that do not have any detectable dark matter because in those cases there is not sufficient pressure of Gravianta.

Electric field:

An Electric field is assumed to be equivalent to a gravity field with the difference that the source of the field is charge and the field particles are called Electrianta. It is expected that the electric field in principle also exhibits a “Dark Charge” effect analogous to the “Dark Matter” effect of gravity fields. This effect is however not expected to be relevant because it is not possible for charges to become large enough to make this effect detectable.

A question is if these Electrianta are fundamentally different from Gravianta or if one is a special case of the other. Assuming they are both emergent from the same principles and that both have an energy equivalent and that both exhibit binding energy and that both are quantized then it would seem logical to assume they are not fundamentally different.

The difference is of course that Electrianta have positive and negative directionality while Gravianta are mono-poles. This mono-pole behavior of Gravianta could be emergent from the positive/negative directionality of Electrianta if Gravianta would be alternating or rotating Electrianta where the gravity

effect is then only a small net attractive effect that remains. This would at least explain why the gravity force is so much weaker than the electric force.

This would then mean that the mechanism of a gravitational source is an alternating source of an electrical charge?

In other words: Gravianta would then be emergent from Electrianta.

Time, Time dilation and the speed of light:

If matter is a ME vortex then it seems logical that time as we have defined it is not fundamental and must be called perceived time. This perceived time is then determined by, and proportional to, the frequency of the EM effects in the ME vortices. If the frequency of these EM effects rises then the speed of any particle/matter interactions (radiation, fission, fusion, chemical, etc.) rises and the perceived time passes faster relative to an external observer.

A local observer will not perceive any difference because a local observer is subject to the same relative frequency change.

In other words: Time, and with that special relativity and general relativity, are then emergent from this ME vortex frequency.

It would also seem logical that such a frequency change of the internal EM effects of ME vortices could be the result of ME vortex warping or internal induction effects resulting from acceleration and/or gravity field density.

To summarize this section so far: Time is not fundamental (**Prediction 5**). There is no fundamental past or future. The only fundamental thing that exists is: “now”.

There is evidence that relative speed causes time dilation and length contraction and in this model there must be something that is causing this. Assuming there is no ether the only possibility that remains, because there is nothing else, is a gravity field or more precise: gravity field density.

It has been argued in the “Gravity and Dark Matter” paragraph that gravity fields are a cloud of Gravianta and this seems to be the logical candidate now for causing speed induced time dilation and speed induced length contraction (**Assumption 6a**).

If gravity fields are a cloud of Gravianta then this would explain gravity waves as moving Gravianta through the field. It would also explain frame dragging if one assumes that relative movement of Gravianta and acceleration of Gravianta changes the effects that these Gravianta have (**Assumption 6b**). Properties like for example changing direction, magnitude and pressure of the field.

If that is the case, the prediction is that the speed-induced time dilation and length contraction depends on local gravity field (Gravianta) density (**Prediction 6**). It would be logical that speed-induced time dilation also depends on electric field (Electrianta) density but this effect will be insignificant because it is not possible for electric fields to become large enough in size to have a detectable effect. Any high speed particles will travel an insignificant amount of time through significant electrical fields.

If indeed speed-induced time dilation is higher when the gravity field density is higher and time dilation is, as assumed in this model, a lowering of the EM frequency in a ME Vortex, then this also explains the mechanism that causes the speed of light to be lower in stronger gravity fields.

Because this would mean that speed induced time dilation is not relative anymore, the expectation and prediction is that the concept relativity of simultaneity is no longer required (**Prediction 7**).

This would also mean that time dilation and length contraction effects only occur in regions where there is a non-zero gravity field density, and that the magnitude of time dilation and length contraction depends in the gravity field density. If this is true, then it seems plausible that relative velocities higher than the speed of light are possible in Gravianta free regions or between regions that are gravitationally unbound. This would explain how it is possible that remote galaxies are receding at speeds higher than light speed.

Because this effectively has the same effect as the postulated space expansion, space expansion is not required in this model (**Prediction 8**).

Dark Energy:

The evidence for Dark Energy is, amongst others:

1: The distances of remote galaxies are larger than expected from the observed redshifts. The conclusion from this is that the speed that these galaxies are receding at this moment must be higher than the speed was when the light was emitted that we are receiving now.

2: Evidence from the Cosmic microwave background shows that the universe is close to the so called critical density. The total amount of matter in the universe, including dark matter, however only accounts for about 30% of the required matter for this critical density. This implies the existence of an additional form of energy to account for the remaining 70%.

This model provides an explanation for these larger than expected distances and lower than expected matter density, that makes the existence of Dark Energy not required (**Prediction 9**):

A prediction from the “Gravity and Dark Matter” paragraph (Prediction 3) is that gravity fields have a finite range. In that case most galaxy clusters or super clusters in the universe will be out of gravity range from each other, meaning that the expansion of the universe at a large scale is effectively not affected by gravity. This means that the universal expansion is independent of the energy density of the universe as long as this energy density is below the so-called critical density.

1: This results in slightly more distance than expected for galaxies at larger distances compared to when assuming that the range of gravity is infinite. Just as was first observed by Riess and others.

2: There is no need for any additional gravitational sources or additional energy other than the observed matter, radiation and dark matter to explain the observed expansion.

These explanations are based on the additional assumption that the observed extra distance of remote galaxies is relatively small (**Assumption 5**). And judging from discussions about the so-called coincidence problem and that the total density of the universe is “flat”, meaning equal to the critical density within

measurement accuracy, this seems to be the case. If the given explanations above are correct then from a certain point in the history of the universe the extra distance of remote galaxies will always be relatively small when compared to calculations that assume that the gravity range is infinite. The universe will also always be “flat” for any matter density below critical density.

Magnetic field:

The nature or mechanism of the interaction of Electrianta and Charge is unknown, just like the nature or mechanism of the interaction of Gravianta and gravitating objects is unknown.

Assuming however that relative movement and relative acceleration of Electrianta could change the effect these Electrianta have on charges (**Assumption 6c**), like for example changing the direction of the field, then it could be that this is the mechanism from which magnetism emerges.

The way this could work is if speed and acceleration of a charge causes waves or ripples in the cloud of Electrianta where these waves or ripples causes these Electrianta to change their orientation or alter some other property that affects other charges directly in a manner that magnetism does.

In other words, one could say that Magnetism is emergent from the electric field and that the underlying mechanism of Electromagnetism would be what could be called Electroelectrism.

This would also mean that magnetic monopoles are not possible (**Prediction 11**).

Conclusion:

This model has given fully causal deterministic explanations without any non-localities how Inertia, Matter, the Strong Nuclear Force, the Weak Nuclear Force, Time, Spin, Superposition, Entanglement, Gravity, the Gravity field, the Electric field, the Magnetic field, Dark Matter and Dark Energy all could emerge from Electromagnetic principles and how Electromagnetism could emerge from what is called Electroelectrism.

The assumptions that have led to these explanations and predictions are debatable, but the way how everything fell into place from these assumptions was unexpected and remarkable.

Assumptions:

1: Electromagnetism is essentially a series of electric and magnetic effects where each of these effects cause a perpendicular effect of the other type and every other effect is an inverse effect of the same type.

2: Inertia is a property of matter alone and does not depend on anything else.

3: Everything that exists is an aggregation state of energy or is emergent from something that is an aggregation state of energy.

4: The postulated ME vortices (a.k.a. particles) have a polarization axle around which the ME loops of the ME vortex are circling and wobbling in an almost spherical spindle torus shape.

5: The observed extra distance of remote galaxies in dark energy evidence is relatively small.

6: Relative movement and/or acceleration of gravitational sources and charges change the effects that their field particles (Gravianta and Electrianta) have.

7: At a fundamental level, everything is quantized.

Predictions:

1: Entanglement and superposition are emergent concepts.
2: The nuclear forces are emergent concepts.
3: The range of Gravity is finite.
4: Dark Matter is an increase of the energy density of the gravity field.
5: Time is not fundamental.
6: Speed-induced time dilation and length contraction depend on local gravity field density.
7: The concept relativity of simultaneity is not required.
8: Space expansion is not required.
9: Dark Energy is not required.
10: Outer objects of large solar systems rotate a bit faster than expected.
11: Magnetic monopoles are not possible.

Abbreviations and definitions:

2D:	2-Dimensional
3D:	3-Dimensional
ee:	electric effect
EE:	Electroelectrism
Electriantum:	Electric field particle
Electroelectrism:	The underlying mechanism of Electromagnetism
EM:	Electromagnetic or Electromagnetism
Graviantum:	Gravity field particle
ME:	Magnetoelectric or Magnetoelectrism
me:	Magnetic effect

Version History:

v1: 20140729: Explanations for Inertia, Matter, the Nuclear Forces and Time.
v2: 20150306: Various clarifications and improvements in readability.
v3: 20161024: Added explanations for Gravity, Spin, Superposition, Entanglement and Dark Matter.
v3.1: 20161027: Minor updates and clarifications.
v4: 20180206: Added explanation for Dark Energy, clarified explanation for Dark Matter, added

explanation of quantum gravity, identified predictions, added version history, new introduction section, various updates, clarifications and corrections.
v4.1: 20180305: Improved Dark Energy explanation.
v5: 20210215: Changed title of paper. Added Rationale and caveat section. Removed mistake in explanation of ME vortex (assumption 3c). Added explanations for the Electric field and the Magnetic field. Many updates, fixes, clarifications and decluttering.