Abstract:

This paper is an elegant explanation how Inertia, Matter, the Strong Nuclear Force, the Weak Nuclear Force, Time, Spin, Superposition, Entanglement, Gravity, Dark Matter and Dark Energy all could emerge from Electromagnetic principles.

Introduction:

This is a model of a universe that could be our universe.

I make no claims that the following has any relation to reality or that it contains anything original or useful. This will be a work in progress and I hope this paper and the feedback I get will help me to complete and/or improve the description of the model.

This paper was written for personal use, but any feedback is welcome.

This model was motivated by problems, paradoxes or just things that I find counter intuitive in the current models and theories of our universe.

This is a non-exhaustive list:

- How can speed cause time dilation if there is no reference frame?
- How does gravity cause time dilation?
- The existence of dark energy.
- Why is electromagnetism called a force? Electromagnetism is the unification of 2 forces: the electric force and the magnetic force. What is the force carrier particle of the electric and magnetic force fields? Surely not photons?
- The concept of a force carrier particle in general feels archaic.
- Why does the electromagnetic spectrum stop at gamma radiation. What happens at higher frequencies?
- How can gravity be explained?
- How can inertia be explained?
- What is time?
- What is a field?
- What is space-time curvature?
- How can the energy/matter conversion be explained?
- The nuclear forces seem artificial.
- Quantum mechanics is non-deterministic.
- Quantum mechanics is incompatible with general relativity.
- Unsatisfactory explanations for many paradoxes and observations like: superposition, entanglement,
particle wave duality, accelerated expansion of the universe, dual slit experiment, wave collapse, the observer effect, Schrödinger’s cat, etc.

This model will give an intuitive explanation for all the above and more. It will provide a fundamental, fully deterministic explanation without any non-locality of: Inertia, Matter, the nuclear forces, Time, Spin, Superposition, Entanglement, Gravity and by that of fields in general, Dark Matter and Dark Energy.

This model will explain all these thing as being either superfluous or emergent from electromagnetic principles while being in accordance to all existing data and observations that I am aware of.

**The 4 fundamental forces:**

There is consensus that there are 4 fundamental “forces” in the universe that are to be explained and unified in a single theory: 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 I can say about these forces is that none of them seem to be good candidates to start looking at first.

Electromagnetism seems to be the best known “force”.

I am assuming that electromagnetic induction is the basic principle of Electromagnetism. In this paper induction is assumed to be essentially a chain of electric and magnetic effects where effects of one type induce a perpendicular effect of the other type and every other effect is an inverse effect of the same type. For example: a given electric effect (ee) induces a magnetic effect (me), which induces an electric effect (-ee) which induces a magnetic effect (-me) which induces an electric effect (ee), etc. (**Assumption 1**).

Despite that Electromagnetism seems to be the best known “force”, Electromagnetism also did not seem to be a good candidate to start looking at first. If not alone because Electromagnetism does not even seem anything like a “force” at all. Instead, Electromagnetism is the unification of 2 forces: the electric force and the magnetic force. But what is the then force carrier particle of the electric and magnetic force fields I wonder. Surely not photons?

That leaves Gravity. Gravity is however an incomprehensible force at this stage.

However: Gravity does seem to have many similarities with Inertia and I believe I have found an elegant possible explanation for the underlying mechanism for Inertia. And from that, explanations for the other forces (and more) will follow almost naturally.

**Inertia:**

Let’s assume that a particle or mass in an otherwise completely empty universe exhibits Inertia. In other words: Inertia is a property of matter alone. So not dependent of anything else like an ether or such concepts. (**Assumption 2**).
So, if we apply a force to this mass, the mass accelerates in accordance to the known laws of physics and if we stop applying a force the acceleration stops and the mass stays at a constant velocity. How can we explain this Inertia? What is “resisting” the applied force to a mass in an otherwise empty universe where nothing is holding the mass in place?

We already know that Matter and Electromagnetism have an energy equivalent and 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 essentially some kind of localized Electromagnetic (EM) phenomenon. The question 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 the time between these EM effects approaches zero. In that case, any given EM effect could be cancelled out externally by its anti-effect. In other words: if the anti-effect arrives “soon” enough (when the EM frequency is high enough) then it would not be possible for any EM effect to propagate outward, and it seems logical that a localized, externally EM neutral, vortex of EM effects could exist in principle. This behavior would basically be circular or 2-dimensional (2D) and effectively be a standing or “circular” EM wave. This is different than the EM behavior in the known EM spectrum where the EM effects induce circular EM effects in 3 dimensions (3D). It seems logical to assume however that this 3D behavior is either emergent from the postulated 2D behavior and/or this 3D behavior is suppressed when the EM frequency is higher than a certain value (Assumption 3c).

If matter is indeed some kind of EM phenomenon, then this must be at frequencies higher than the highest observed frequency of EM radiation because matter does not radiate. But still it would be an EM phenomenon in principle. If this is the case, then I postdict that particles can be created from the high frequency/energy EM radiation.

If matter is such an EM phenomenon, then it is obviously not Electromagnetism as we understand it now. It is something else. The analogy of aggregation states seems to fit very elegantly here and so I assume that Matter and Electromagnetism are essentially different aggregation states of energy (Assumption 3d). And finally, I think that assumptions 3a, 3b, 3c & 3d can be taken one final step further for maximal elegance and that is to assume that Everything that exists is an aggregation state of energy (Assumption 3). In other words, there is nothing that exists that is not an aggregation state of energy or that is not equivalent to matter or that is not equivalent to Electromagnetism.

Jumping to conclusions I can now see the following possible aggregation states of energy:

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

I postulate now that matter or particles are: externally EM neutral, EM vortices at a high frequency which I will call Magnetoelectric (ME) vortices in this paper.

Note that the terms Magnetoelectric (ME) and Electromagnetic (EM) are identical in principal. It is just a matter of where you start counting. For this paper, I just needed a different term for Electromagnetic.

To summarize Inertia so far: What is proposed here is basically that the EM spectrum is extended above the highest observed frequency of EM radiation and that at those frequencies the EM spectrum manifests itself as matter or particles.

But particles are assumed to be solid and ME vortices are not solid. So, how can such a postulated ME vortex exhibit the particle property called solidness?

I think that at the fundamental level “solidness” is equivalent to resisting penetration. And it seems logical that 2 of these postulated ME vortices can repel each other when coming close enough together and that 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 would not apply at the fundamental level if matter is a ME vortex.

As an everyday life analogy to these ME vortices we can use drops of a liquid with a certain surface tension like Mercury drops. 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 real surface but instead have an outer zone with 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. And depending on the configuration and energy levels of the resulting ME vortices, there can be (large amounts of) energy released or absorbed if the sum of the energy levels of the resulting ME vortices is (much) different than the original ME vortices.

With the above-mentioned assumptions, the underlying mechanism of Inertia becomes easy to understand as follows: the electric and magnetic effects in the ME vortices all have a preferred or natural location. And this location completely depends on, or is 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 occurred without the force. Trying to accelerate such a vortex will then result in a reverse EM induction force that will be perceived at larger scales as Inertia.

And of course, 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 it is unclear how this velocity retention of a ME vortex could work exactly. I do expect however that solving this problem will provide insights about the possible vortex configurations.
The problem now is “only” how to model such ME vortex configurations. How big are the chains or loops of EM effects? Are these 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?

I expect that it is possible to simulate this. This may require however (much?) more insight in what exactly Electromagnetism or energy is. At the same time, I expect that simulating these vortices will help to provide more insight in understanding Electromagnetism. I expect that “configurations” of all observed particles could be determined and properties of particles explained with simulation. Properties like stability, (chemical) reactability and radioactivity for example. I also expect that new particles can be predicted this way.

Another thing that seems obvious is that such a ME vortex will have a maximum speed because there is a maximum distance between any two following internal EM effects. It also seems logical that forcing such a ME vortex “near” this maximum speed will create an exponential increase in Inertia that is perceived as an increase in mass at larger scales. This is probably some kind of warping of the vortex that cannot “squeeze” further at some point. It even seems logical that this squeezing can be perceived as length contraction in the direction of the acceleration.

Some additional remarks and consequences that seem logical:

Explaining the Wave-Particle duality concept, in particular the observed interference phenomena of photons and other particles, seems to become easier or logical because a ME vortex (particle) would in essence be a “standing” Electromagnetic wave. In other words: Wave-Particle duality would become Wave-Particle equality.

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/ME reverse induction. This will slightly change the detected ME vortex, making interference that depends on perfect synchronization impossible.

The uncertainty principle also seems to be logical, because for such a vortex the concepts “position” and “momentum” cannot be separated anymore below a certain scale.

**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 a certain moment. Because particles are 3-dimensional, an ME loop must be circling and/or wobbling around in some configuration in a 3-dimensional (roughly?) spherical area. 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 multiple of these ME loops. Although it seems more likely that superposition would be the Spin of a single loop that (depending on the moment of measuring) has one direction or the other.

The higher correlations found in quantum entanglement experiments now also seems to become understandable if we assume that the ME vortex configuration of particles have a polarization axle where the ME loops of the ME vortex are circling and wobbling around (Assumption 4). This assumption would explain why all particles, even the neutral particles, have an external net Spin polarization or magnetic moment in the “north” / “south” direction. 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. An obvious consequence of assumption 4 is that the mentioned circling and wobbling of ME loops behaves sinusoidal in some way. So: without knowing exactly what the configuration of this circling and wobbling is, the fact that it is sinusoidal makes it obvious that the measured Spin will have a sinusoidal distribution when measuring from other angles than 0°, 90° or 180° from polarization. Precisely like for example the results found in entanglement experiments.

Another conclusion from entanglement experiments seems to be that the act of measuring the Spin of a particle seems to “reset” the Spin polarization in the measurement direction. Which seems to make sense because any measurement will cause a reverse induction effect on the particle. And since the measured spin values are quantized it seems that this measured spin is always the spin value after the polarization of spin has been reset.

Another possibility to explain that the spin values are quantized is that the measured value is a combination of 2 components that have a reverse dependence on the angle between the ME loop polarization and the measurement direction at the moment of measuring:
First component: a 2D spin projection component (perpendicular in the measurement direction) which ranges from 0 (when the angle between the polarization and the measurement direction is 90°) to the quantum value (when the angle is 0°).
Second component: a reverse induction component (caused by, or “powering”, the “reset” of the Spin polarization) which ranges from the quantum value (when the angle between the polarization and the measurement direction is 90°) to 0 (when the angle is 0°). Both components will then always add up to the quantum value.

If we assume that particles consist of a certain number of ME loops then the measured spin values in experiments also seem 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 the following can happen: both loops are reset “up” (Spin 1), both are reset “down” (Spin -1) or they are reset in opposite directions (Spin 0). With a particle that has 3 ME loops the following can happen: 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.

Conclusions from assumption 4 are in my opinion:

1: Spin would be: a snapshot of the rotation direction of a ME loop.
2: Superposition of spin would be: an alternating spin.
3: Entanglement would be: synchronization of Spin polarization.
In other words: Entanglement and superposition of spin as they are hypothesized at the moment do not exist (Prediction 1).

**Strong and weak nuclear forces:**

If matter is a ME Vortex, then it seems logical now that the Weak Nuclear Force has become superfluous. (Prediction 2a):

Radioactive decay and spontaneous fission can be more elegantly 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 maybe 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) seem to have. There may be some probability that “enough” of these magnetic moments get aligned, causing parts of a particle to be expelled or weakening the structure or cohesion of a particle enough so that it cannot withstand some external influence.

If matter is a ME Vortex, then I also think that the Strong Nuclear Force has become superfluous (Prediction 2b):

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

For example: Current understanding is that the Helium nucleus is made up of 2 Protons and 2 Neutrons and that these Protons and Neutrons need to be kept together with the Strong Nuclear Force. The fact that the Strong Nuclear Force is assumed to exist implies that another assumption was made first, and that assumption is that the Protons and Neutrons are present “inside” a Helium nucleus completely identical and separate as they would exist externally. I think that the following facts are indications against this assumption: (1:) Neutrons are stable inside an atom and unstable outside and (2:) the mass of the Helium nucleus is not identical to 2 separate Protons and 2 separate Neutrons.

If matter is a ME vortex, then I see no reason to assume that Protons and Neutrons are present “inside” nuclei completely identical and separate as they would exist externally.

It seems more elegant to view the Helium nucleus as a single ME vortex of a certain (overall) ME vortex configuration with a total energy level (almost) equal to the energy level of 2 Protons and 2 Neutrons and with certain (overall) properties, like in this example a charge of +2. At the same time is seems likely that the Helium nucleus is made up of four 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-identicality) that makes the Strong Nuclear Force superfluous.

A similar effect may or may not happen between Electrons and nuclei?
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 will of course mostly break up into particles that are similar to those sub configurations (if possible) but there will also be many 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:**

We have equations to calculate with gravity fields and predict how those fields work. We can use that for all kinds of useful things. But the question remains: 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 the same as 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.
- 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 or is Gravity a result of an interlocking of the Gravity fields?

To explain the difference: Let’s assume there are two particles created simultaneously at a distance x light seconds apart and assume their gravity fields emanate or 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 max in an instant. 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. Gradually (linearly?) increasing (in quanta?) from 0 to max 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 completely zero then maybe there is some ME/EM field possible at a frequency higher than an ME vortex (and lower wavelength) that does propagate outward after all?

I see no obvious explanation how this could work so maybe I rephrase the question then: What is the mechanism that a gravity field uses to accelerate particles? How is it possible that a force is applied at a distance?

There can be only one conclusion that even seems obvious in hindsight and that is:
Something of particle A is present at the location of particle B and vice versa. And it is this “something” that is causing the particles to accelerate. Another obvious conclusion is that this “something” must exist, in the sense that it is not nothing. And anything that exists must have substance, meaning that it must have an energy equivalent (assumption 3) and it must be quantized like everything else seems to be on the most fundamental level. In other words: gravity fields are equivalent to energy and are equivalent to particles. And since they are also part of a particle the conclusion must be that the definition of a particle needs to be changed to not only include the “hard” bit in the center.

It would seem obvious now that a gravity field is a cloud of energy quanta that are in some way connected to the particle center. In this paper, these energy quanta will be called (gravity) field “particles”. Note that these are not particles in the classical sense because they have no mass and do not interact with normal matter other than that they cause the gravity effect. Gravitons would seem to be a good descriptive name for these field “particles”, but to avoid confusion with existing theories the name graviton will not be used in this paper.

If these field “particles” are quantized, like everything else seems to be, then this means that these field particles must also have a minimum (quantum) gravity effect which inevitably leads to a conclusion and prediction that gravity fields are not infinite in size (Prediction 3).

Another conclusion that almost seems obvious now is that this field “particle” could very well be causing extra gravity like the extra gravity we observe in galaxies from Dark Matter. After all, such a field must have a kind of cohesion or binding energy in addition to its intrinsic gravitational force effect. And this binding energy would then have to add up, or cumulate as the gravitational field get larger to match the observational data attributed to Dark Matter.

This would mean that the additional gravity attributed to Dark Matter would be identified as being the binding energy of the gravity fields. Gravity fields at least do seem to have the correct location, distribution and observed behavior that Dark Matter has.

Another thing that seems obvious now is that this kind of gravity field must have a size that is dependent on the size of the gravitating object. To explain this: Assuming that the gravity field “particle” is quantized, and thus has a minimum value, then this means that the gravity field of a very small particles can only have a very small radius because the minimum gravity field strength quantum is “reached” quickly so to speak. So, the radius of the gravity field of a proton for example could very well be in the nanometer range, or even below that.

To get a “feel” for this, to see if this could make any sense at all, let’s take some crude numbers and calculate what the gravity range of the Earth \((gr(e))\) would be if we assume that the gravity range of a proton \((gr(p))\) is 1 nanometer for example. Based on the above, the gravity range of the Earth is the distance from the Earth where the gravity field strength is equal to the gravity field strength of the proton at the end of the gravity field of the proton (1 nanometer in this example). This can be calculated with the following equation based on the law of gravitation \((g = Gm/r^2)\):

\[
\frac{G m(p)}{(gr(p))^2} = \frac{G m(e)}{(gr(e))^2}
\]

Which yields:
Given that the Earth mass \( m(e) \) is about \( 6 \times 10^{24} \) kg and the mass of a proton \( m(p) \) is about \( 1.67 \times 10^{-27} \) kg and assuming that the gravity range of a proton is 1 nanometer then according to equation 2 the gravity range of the Earth would be approximately \( 6 \times 10^{16} \) meters which is a “little” over 1 lightyear (9.46 x 10^15 meters) which seems like a very plausible outcome. That is of course if the Earth was alone in empty space and its gravity field would not merge with the gravity fields of the planets and Sun of our solar system resulting in a larger total gravity range of our solar system. This mechanism would continue at larger and larger scales until a point where things are no longer gravitationally bound because they are outside each other’s gravity fields.

Of course, all this depends on the actual gravity field radius of a proton, and this may very well be several orders of magnitude smaller or larger than a nanometer. But the basic premise that a gravity field could be a cloud of quantized field “particles” seems sound.

These calculations do not account for the “dark matter” factor. If the postulate is correct that the binding energy of the gravity field adds extra gravity, then the gravity equivalent of the gravity field is (based on “dark matter” observations) about 5 times higher than the mass of the gravitating bodies. This would result in a total mass/gravity equivalent that is 6 times higher. But because this extra gravity applies in the example to both the proton and Earth, this factor cancels out and has no impact on the above calculations.

Some random thoughts that seem relevant:

1. This gravity model seems to explain, or be compatible with the holographic principle in that the gravity field is “constructed” inside out, resulting in a 2D projection at geodesic spheres?

2. How can momentum be preserved if the gravity range depends on the mass of a gravitating body? The only way this is possible is that if a particle enters the gravity field of another particle that there is either feedback to the other particle through the bonds of the “other” gravity field, or that the universal law of gravitation only applies when two gravitating masses are each within the gravity field of the other?

3. There may also be a relativistic effect that seems to cause additional gravity because of time dilation of moving bodies. This time dilation may make the rotation speed of Earth around the Galaxy center appear to be higher in our (Earth’s) reference frame than it “actually” is?

4. How does the gravity mechanism work? How does the interaction work physically between gravity fields and particles?

The first thing that comes to mind is that this is some kind of particle-internal effect caused by field “particles”, when these field “particles” end up inside a particle and disturb or change that particle (the ME vortex) in a way that causes acceleration?

Another possible explanation is that gravity fields interact only with each other and that the particles
are pulled along by their own gravity field (binding energy/force)?

Another explanation could be that a gravity field is pushing particles just like particles are pushed by their neighboring particles in an acceleration. This could be some kind of inverse buoyancy effect where particles are “sinking” down in the cloud of field “particles”. The way this could work for example is that the field “particles” have a repulsive force between themselves in the direction perpendicular to the direction of gravity and an attractive force in the direction of gravity.

A matter particle that would enter such a field would then be engulfed or absorbed by the field particles that easily makes way in the direction perpendicular to the direction of gravity and then pile on top of the particle and this pile then pushes the particle inwards with a force that increases with “depth”.

5. The notion of frame dragging seems logical when assuming that the gravity field of rotating bodies rotate, or drag, along with the rotation of the gravitating body. This may be testable by repeating the Hafele-Keating experiment with planes with atomic clocks flying in the north-south direction around the Earth instead of east-west?

6. The measured value of the gravitational constant is observed to have a periodically altering value. Given the above possible explanations I suspect that this may have something to do with the gravity field density as opposed to gravity field strength (Prediction 4). To explain the difference: the gravity field density between 2 gravitation bodies is the absolute value of the gravity field strengths of the individual gravitating bodies at that location. For example, the gravity field strength half way between 2 equal gravitating bodies is 0, but the gravity field density at the location would be twice the individual gravity field strength of the gravitating bodies at that location.

This prediction may be testable by looking at distances of nearby massive matter bodies like the Moon, Sun and possibly some of the other planets (maybe even in combination with the orientation towards the center of the galaxy?) and correlating that with the observed variations in the measured values of the gravitational constant.

### Time, Time dilation, the speed of light:

Time as we have defined it now must be called perceived time. This perceived time is 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, chemistry, etc.) rises and the perceived time passes faster when observed by an external observer.

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

It would 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 past or future. The only thing that exists is: “now”.

There is evidence that speed also causes time dilation and current explanations for the paradoxes that this seems to imply involve concepts like relativity of simultaneity and (an apparent) universal length contraction.

As argued in the “Inertia” paragraph, it seems plausible that acceleration and/or Gravity field density can cause local time dilation and length contraction. This however does not explain how fast-moving particles at a constant speed could also experience time dilation and length contraction.

For speed to cause time dilation and length contraction the only possible explanation is that there must be a reference frame where the speed is relative to. There must be something in that reference frame that is causing the time dilation and length contraction. Assuming there is no ether (assumption 2) the only possible reference frame left is a gravity field. I have already argued in the “Gravity and Dark Matter” paragraph that gravity fields are an ether-like cloud of field “particles” and this seems to be an almost obvious candidate now for a reference frame that could cause time dilation and length contraction for moving objects relative to a gravity field.

If that is the case, then I predict that the speed-induced time dilation and length contraction depends on local gravity field density (Prediction 6).

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

I believe this is a more elegant explanation for all observed phenomena of time dilation and length contraction than the explanations based on universal length contraction and relativity of simultaneity. Because of this, I expect and predict that many of the expected and predicted, but not yet observed, phenomena based on universal length contraction and relativity of simultaneity will turn out to be not correct (Prediction 7).

This also would mean that time dilation and length contraction effects only occur in regions where there is a non-zero gravity field density. If this is true, then it seems plausible that relative velocities higher than the speed of light are possible when out of gravity range, and this would explain how it is possible that remote galaxies are receding at speeds higher than light speed. Since this seems like a more elegant explanation than space expansion, and effectively seems to have the same effect, the existence of space expansion is predicted to be superfluous (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 remote 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 very close to the so-called critical density. The total amount of matter in the universe, including dark matter, 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%.

3: The so-called Large-scale structure of the universe confirms the data from observed redshifts.

4: Late-time integrated Sachs-Wolfe effect indicates larger than expected gravitational potential energy wells and hills, indicating that the density of matter in the universe is about 30% of the critical density.

This paper provides a more elegant and intuitive explanation for these larger than expected distances and lower than expected matter density, making the existence of Dark Energy superfluous (Prediction 9):

A prediction from the “Gravity and Dark Matter” paragraph (Prediction 3) is that gravity fields have a finite range. A conclusion from this would be that most galaxy clusters or super clusters in the universe are out of gravity range from each other and that the expansion of the universe at a large scale is effectively not affected by gravity anymore. And since the galaxies that are the farthest away have been out of gravity range the longest, those galaxies will have the highest extra recession speed resulting in some extra distance.

On top of this, I would expect that there is an additional factor that causes additional distance towards remote galaxies if the assumption is correct that light is slightly faster than c in space with zero gravity field density.

I expect that there will be a certain value for the range of gravity where the observed data can be made to fit Prediction 9 without the need for Dark Energy. Or in other words: I expect that the gravity range can be determined from cosmological data.

These explanations are based on the additional assumption that the observed extra distance of remote galaxies is relatively small (Assumption 6). And judging from discussions about the so-called coincidence problem this seems to be the case. If the given explanations are correct then at any moment in the history of the universe the extra distance of remote galaxies always has been, and always will be relatively small. This would effectively solve the coincidence problem because the observed extra distance would then effectively be the result of gravity having a finite range.

**Conclusion:**

I believe I have given elegant explanations how, based on the assumptions listed below, Inertia, Matter, the Strong Nuclear Force, the Weak Nuclear Force, Time, Spin, Superposition, Entanglement, Gravity, Dark Matter and Dark Energy all could emerge from Electromagnetic principles.

Admittedly, the individual assumptions that lead to these explanations and predictions are debatable. However: I find the way how everything has fallen into place from these assumptions to be very remarkable.

The question I ask the reader now is: Does this paper have merit or not?
Assumptions made:

1: Electromagnetism is essentially a chain of electric and magnetic effects where effects of one type induce a perpendicular effect of the other type and every other effect is an inverse effect of the same type. For example: a given electric effect (ee) induces a magnetic effect (me), which induces an electric effect (-ee) which induces a magnetic effect (-me) which induces an electric effect (ee), etc.

2: Inertia is a property of matter alone. So not dependent of anything else like an ether or such concepts.

3: Everything that exists is an aggregation state of energy.

4: The postulated ME vortices (a.k.a. particles) have a polarization axle where the ME loops of the ME vortex are circling and wobbling around.

5: Dark Matter has no gravitating effect on Dark Matter. (?)

6: The extra distance of remote galaxies is relatively small. (?)

Predictions:

1: Entanglement and superposition of state do not exist.

2: The nuclear forces do not exist.

3: The range of Gravity fields is finite.

4: The gravitational constant measurements are affected by gravity field density (not gravity field strength).

5: Time is not fundamental.

6: Speed-induced time dilation and length contraction depends on local gravity field density.

7: Universal length contraction and relativity of simultaneity do not exist.

8: Space is not expanding

9: Dark Energy does not exist.

Abbreviations:

2D: 2-Dimensional
3D: 3-Dimensional
ee: Electric effect
EM: Electromagnetic
ME: Magnetoelectric
me: Magnetic effect
Version History:

v1: 20140729: Explanations for Inertia, Matter, the Nuclear Forces and Time.
v2: 20150306: Various clarifications and improvements in readability.
v3.1: 20161027: Minor updates and clarifications.