SPACE-TIME CONJUNCTION (Sep 2020)

Simplified General Relativity

Bruce Toy, B.S., Physics; M.S., EE

1.0 Introduction

Attempts to represent time in scalar terms have never been quite satisfactory. Definition of time as a vector quantity as a part of a linear dimension structure has had limited success. In order to address the problem areas, complex multi-dimensional structures are currently popular but still don't quite complete the picture.

A slightly different structure of space-time can solve problems and resolve paradoxes.

Consider that we might define physics with six dimensions, divided into two sets of three. This rather basic structure can enable us to resolve nagging issues of relativity.

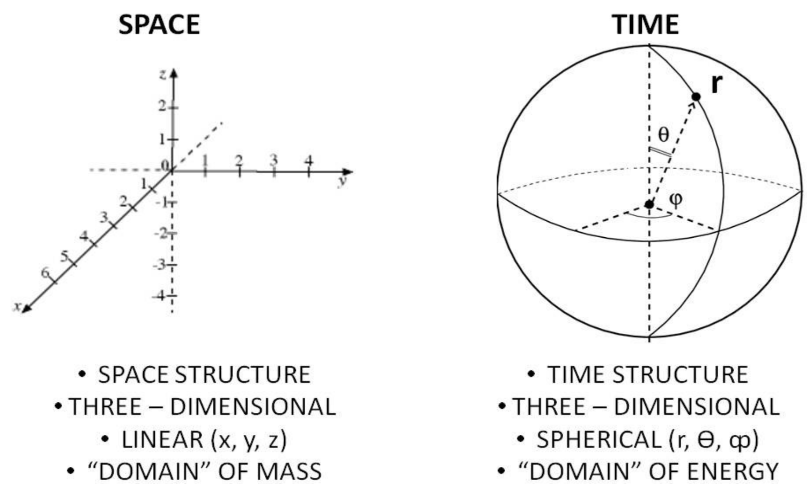

Figure 1: Space and Time as two separate Three-dimensional Domains.

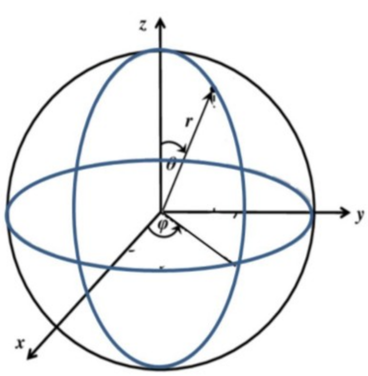

Figure 2: The Conjunction of Space and Time into a linked Six-dimensional Structure.

The first set of three dimensions comprises the domain of space and gives us a structure for defining the nature of physical matter. You are certainly familiar with this linear set and its x-y-z coordinate structure.

The second set of three dimensions comprises the domain of time and gives us a structure for defining the nature of energy. This set is represented by a spherical geometric structure, measured with radius, and two angles. The radius value represents traditional time. You can visualize the progression of time as expanding spherical layers around a chosen reference point (t-zero, if you will) like the spherical layers of an onion. The two angular parameters have relevance when defining magnetic forces, which will later be represented by ellipsoid variations in the otherwise spherical time surface.

Energy is defined within the time structure itself. It is represented by harmonic variations of the radius (r) parameter. This can be envisioned as a sort of pulsing of the time "sphere" and can be linked with a mass (such as thermal energy) or exist independently (such as light). The variations exist in full agreement with established laws of physics. In addition, the structure allows for better understanding and extended analysis of particle behaviors and interactions.

Both matter and energy can, in theory, exist entirely within their own parent domains of space or time but in practice there is a conjunction or interaction of mass and energy that links the two domains together in order to characterize the laws of physics.

Using these two linked three-dimensional structures it appears that we can achieve a Unified Field Theory. One consequence, however, is that the term space-time continuum should perhaps be replaced by the more appropriate phrase "Space-Time Conjunction."

2.0 Schrodinger's Wave Functions

Schrodinger's ubiquitous equations are generally accepted for describing the wide array of sub-atomic particles in terms of wave functions. The solutions to the differential equations are dependent upon sets of assumptions and boundary conditions. We recognize three general types for the equations: (1) time-dependent only, (2) space-dependent only, (3) time-space dependent in combination; with each being further broken down into one or more dimensions.

Through my undergraduate years I fought the idea that Schrodinger could describe all things with a wave function, mainly because I could not understand what, exactly, is the medium that supports the wave. You might say I was stuck on the question of what would be Schrodinger's "ether." This conceptual dilemma eventually led me to the hypothesis given here as a way to understand and interpret the space-time structure in which these waves could operate.

2.1 Mass, Space and Gravity

In one regard, current physics accepts the idea that space is a kind of ether. The theoretical position that has been accepted by many is that mass causes a distortion of the structure of space with the result being what we call gravity and/or gravity waves. This idea of space being the "ether" for gravity has been supported both practically and mathematically.

Now shift the view ever so slightly and suppose that rather than space only being the supporting ether for gravity, it is the supporting ether for both the mass and gravity in combination. If we say that the mass itself is the structural distortion of space, then gravity is not actually a separate thing. It is simply one of the measurable properties of matter.

This could be translated to say that Schrodinger's equations provide a mathematical description of mass as a spatial distortion; i.e., a structure in the spatial "ether." This is not quite revolutionary and may seem to be only a semantic distinction. This exercise will, however, produce some more important insights.

2.2 Time and Energy

If we accept the space-dependent functions for mass and gravity, what about time-dependent Schrodinger waves? Here it is important that we avoid treating time as just another parameter in an equation. Time itself must be seen as a separate domain with its own identifiable structure, just as we are treating matter as a spatial structure. So now we turn to the Three-dimensional Time Domain described earlier and examine its utility in more detail.

2.3 The Key that Unlocks the Secrets

Besides the six-dimensional structure, one, and only one, empirical assumption is included in this model. Previously, electric charge has been defined only by the measurement of the force it exerts. That approach is distinctly inadequate for defining the basic nature of electric charge. We can remedy that problem if we modify one constraint traditionally placed on solutions for Schrodinger's wave functions.

We are removing the conventional constraint that the Schrodinger wave function must establish continuity across the particle boundary by reducing to zero magnitude at that boundary. Instead, we assume or postulate a single-magnitude, discrete, wave function value at the particle boundary.

This may appear to violate the basic continuity constraint for Schrodinger's wave functions. That would be true if the magnitude abruptly shifted to zero outside the particle boundary. In our model the magnitude does not change at the boundary but the form of the function **does** change.

Outside the particle boundary we are left with a simple evanescent function (exponential decay.) Mathematically speaking, the wave function changes its form but still satisfies the continuity requirement. It would have a discrete magnitude at the particle boundary but could not exist in the harmonic form outside the boundary. Evanescent waves/fields are recognized in some other aspects of quantum physics.

We use the term discontinuity to characterize the shift of the functional form. By the nature of exponential decay of the evanescent wave, it exists only in a small fringe region of the particle.

3.0 Electric Charge

This evanescent fringe structure needs a name. I will call it Electric Charge.

This could be the actual, physical definition of electric charge that I have been searching for over the years. Furthermore, analyses using our siz-dimensional structure will allow us to characterize magnetic forces and nuclear binding forces into a unified theory. If true, this would make the fundamental definition of electric charge a sort of "missing link".

Charge has been traditionally described only by Coulomb's Law, which was nothing more than a measure of the numerical strength of the charge itself. So, if "charge" might really be this discontinuity, can we describe it in more detail?

It seems logical that the discontinuity should have a single plus-or-minus discrete value for its simple magnitude. That value should correspond to the wave magnitude as determined at phase points within one complete cycle of the Schrodinger wave function.

The first choice that stood out to me seemed to be at one-quarter wavelength intervals (pi/2 and 3pi/2. However, this did not match up with current quark theories (by sub-dividing the phase points.) This led me to assume that there are four basic phase points, multiples of one-third π. This allows for charge, spin, and the combinations of quarks. [*See the illustration below*.]

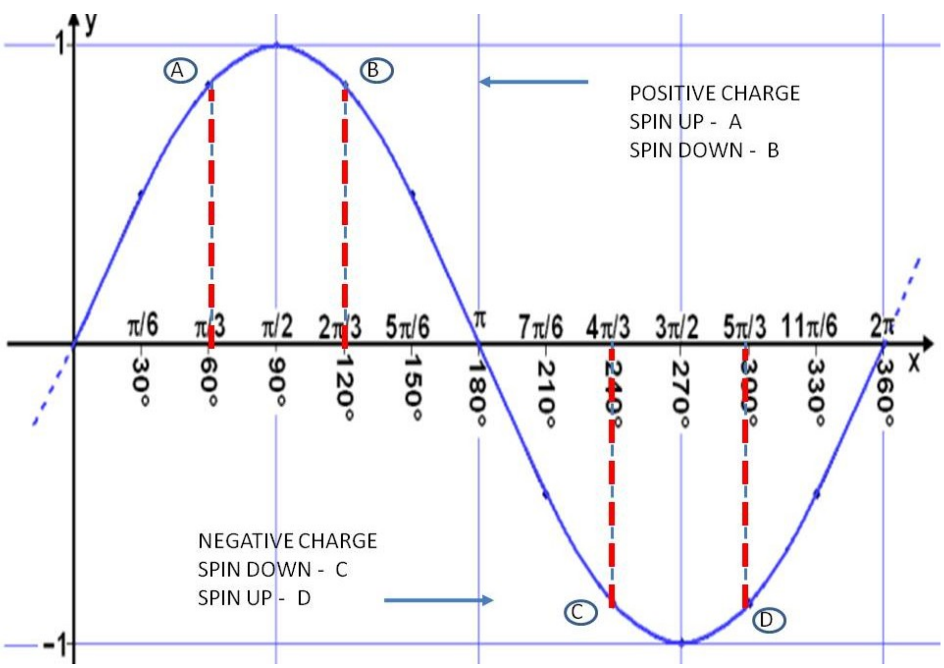

Figure 2: Time Discontinuities for Charge and Spin (direction is chosen arbitrarily)

It is more than just a coincidence that, in this construct, "spin" can be represented by the first derivative of the wave function, either positive or negative, at the phase point of discontinuity. It also allows us to understand the idea of "electron pairs" in the electron shells of atoms as the exclusion or matching of energy states of wave structure of the particles.

All of these assumptions are not only compatible with traditional electromagnetic theory but will also offer better understanding of interactions and effects, particularly if we make full use of the spherical geometric energy domain offered here.

For example, one perplexing paradox of electrons is that the vague definition of charge used in general physics requires that electrons, as charged particles, must somehow retain the nature of "charge" during the period when they are functioning purely as waves. This difficulty is seldom discussed but until now this always left me, in particular, with an open question of how the property called 'charge' could be embodied in an electron both when it is a particle and when it is a wave.

3.1 Electrostatic Force

Understanding the charge parameter as a unitary time step actually gives a simple and logical reason for charges to attract or repel each other (the electro-static force). The simple explanation for the behavior of charged particles is that systems of differently charged particles would seek the lowest energy state that would produce the minimum composite time offset. The corollary would be that particles with the same time offset (charge) repel each other, where moving together would increase the energy state (increasing the time offset.)

This, of course, is the fundamental rule is that systems of particles act to minimize total energy states.

3.2 Magnetic Force

The mathematics of magnetism does not change but we can more easily understand the connection between the motion of charges and magnetism within the spherical geometry of the system.

Basic Rule: Magnetic structure is derived from the time offset of the electric charge by virtue of motion or, more specifically, acceleration, both linear and angular. Put simply, accelerating the charged particle distorts the time structure in specific ways.

If you accept the concept of a three-dimensional time domain this is quite logical. Charged particles being accelerated can be expected to stretch the normally spherical time domain into a slightly ellipsoid structure.

TIME ELIPSOIDS PRODUCED BY MOTION OF A CHARGED PARTICLE

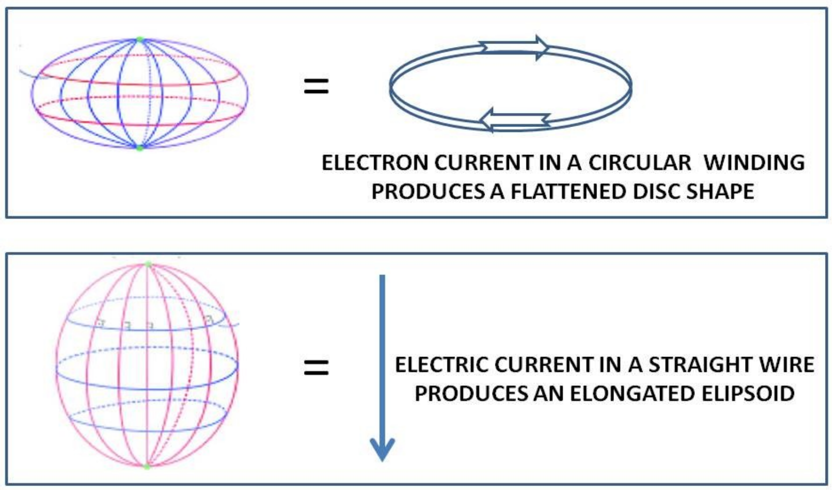

Figure 3: Time distortion produced by accelerated electron

At the risk of repeating myself, do not continue to think of time as just a passing parameter in these equations. It is part of the Space Time Conjugation structure and the electron's motion distorts that structure by virtue of its time discontinuity.

Simple electron motion in a circle creates a time domain ellipsoid flattened on the axis of rotation, while moving in a straight wire the result is an ellipsoid elongated on its axis of motion. Magnetic windings can, of course, be tailored to produce a variety of structures.

The intrinsic spin of elementary particles, which mathematically represents angular acceleration, produces the magnetic dipole moment properties of particles where the time domain is apparently flattened on the axis of rotation to an ellipsoid. Even neutral particles produce this effect, whenever they possess a non-charge time domain structure (though with far less intensity.)

Principles of magnetic attraction and repulsion can now be understood as arrangement of these time ellipsoids to minimize system energy. Unfortunately, this would all tend to deny the existence of magnetic monopoles. Still, however, it would be possible to think of magnetic "quanta" in terms of Plank layers of the distorted time structure.

3.3 Time Domain Structure

Because this idea of structures in the time domain is not generally accepted at this point we must be explicit. This theory assumes two separate and distinct aspects of time dimension structure. The one just discussed, magnetism, is a flattening or elongation of the spherical form of the time domain. It is described using the two angular coordinates of the time domain, which otherwise do not appear in non-magnetic conditions.

3.4 Time and Electromagnetic Energy

There is the harmonic distortion that can use the time dimension as a kind of ether. It rides on the time dimension **without disrupting** its spherical nature. We call this energy.

What does a time-dependent solution to Schrodinger's equation represent?

The time-dependent wave function is a structure imposed upon that spherical time domain. This includes what we call photons (among other things) but the concept is more broadly defined not just as photons but as "energy" in general.

I find it satisfying to note that now we have the ether through which light travels. It is also useful to note that the time domain can be mathematically treated as quasi-two dimensional structure when considering the nature of electro-magnetic waves (energy) on a spherical surface of quantum thickness.

The logical interpretation is that Maxwell's Equations describe the dynamic wave structure found on a spherical time domain. Other things fall into place in this view. For example, a Planck-related energy quantum can be geometrically regarded as the smallest (or thinnest) layer of a time domain that can be recognized as an individual photon and is based on the frequency (or wavelength) of the domain structure.

There is also an obvious link to the quantum problem of action at a distance or quantum entanglement involving pairs of partially defined particles/photons linked through a time domain structure. This occurs because the two "share" a single layer of the time structure relative to a point of origin. If an interaction initiates a collapse of the time domain structure it results in the two particles being defined in separate locations.

Now go back to the Holy Grail of relativity – specifically $E = mc^2$. Conversions between mass and energy are quite acceptable but it never seemed reasonable (to some of us, anyway) that the speed of light should have any role in this relationship.

Others have noted that the speed of light seems to be a sort of conversion factor but there has never been an explanation of how it became this factor. It is now easier to visualize if you recognize that in converting mass to energy you are transitioning from a structure in the spatial domain (three dimensions) to a structure in the time domain (quasi-two dimensions). It simply defines the relationship of measurements taken in one domain compared to measurements in another – meters per second. The fact that it also has the units that represent velocity simply adds confusion to the matter. As for why the "speed" of light would be constant, clearly, by definition, conversion factors are constant.

4.0 Electrons and Photons

Electrons are simple but they have always been difficult to define explicitly. Their erratic behavior becomes more understandable if you accept the structure given here.

If you look at the wave-particle duality of an electron there is one thing that appears to be consistent. When not being subjected to an electric field, electrons behave as particles. When they are subject to an electric field they behave as waves.

What exactly does the presence of the field do? It would appear that the solution to Schrodinger's Equation for an electron changes from a primarily space-dependent wave function to a primarily time-dependent wave function when the electric field is included in the constraints.

The electron can be represented in its unstressed state (i.e., no electric field) as a simple structure of the spatial domain. The presence of the electric field alters the solution to Schrodinger's equation such that it becomes a representation as a structure of the time domain. The transfer is reversible and when the field is removed the electron will revert to a spatial structure. Note that any particle with a charge or energy fraction will have some time-dependent structure. We can, nonetheless, refer to the basic particle structure as being spatial-dependent only.

It should seem obvious that, since the wave function is dis-continuous, an electron shifting back and forth between the two domains could result in a phase difference with a periodic pattern. This will translate into periodic differences in the momentum vectors associated with individual particles.

This allows one to easily explain electron slit experiments that produce interference patterns even when the electrons pass through the slit one at a time. The phase dependency will produce a patterned distribution of the trajectory as the electron changes to and from the wave form (time domain) as it enters and exits the electric field of the constraining region, or slit.

Electrons bound to an atom are constantly constrained by a strong field and thus are represented as a wave; a time domain structure. At some time in the 1990s there was an interesting experiment that cooled hydrogen atoms to near absolute zero. The electron was then stimulated to a highly elliptical "orbit." The result was that at the apogee the electron behaved as a particle while at the perigee it behaved as a wave. [Note: I cannot find a current reference to this experiment.]

If we now consider photons, we find a structure that is complementary to the electron. Photons in free space tend to behave as waves. Photons that are subjected to an electric field behave as particles. I generally dislike using the term photons because the natural state of light is a wave function but I am compelled to defer to the popular use of the term.

The photon makes the transition from time domain to spatial domain when subjected to some very specific field conditions, usually when interacting with molecular structure. Like the electron, this transition can be reversible but can also be long-term, as happens when a photon is captured by an atom. All or a portion of the energy can be accumulated by an actual particle while a portion can be re-emitted as energy. Regardless, the time domain distortion of a photon is transferred to a spatial domain structure and (sometimes) back again.

5.0 Nuclear Bonds

Now we come back to that evanescent wave structure that surrounds the proton. It is possible to see how this can have greater implications than just electric charge. Focus on the idea that it is part of a quantum wave function that, when it is inside the particle boundary, represents real matter.

When forced into close proximity the neutron and proton can eventually reach a point where the fringe region of the proton will intrude inside the particle boundary region of the neutron.

When this happens a transformation occur, specifically because the solution to the governing differential equations changes. When this happens the evanescent wave can revert to a harmonic function – a physical particle that is bonded with the neutron. This is a shift of a mass fraction from the time domain to the spatial domain.

This phenomenon can actually be demonstrated with a pair of prisms and an air gap. An evanescent wave can transfer light across a "forbidden" gap that is, in theory, blocked by the law of total internal reflection.

By virtue of the physical linking within the boundary of the neutron the nuclear binding force is created. The newly-formed particle would be the equivalent of a pion or pi meson. We can only see these particles as products of nuclear decay. This bond can be broken when sufficient energy (from an impacting neutron, for example) opens a gap large enough to eliminate the overlap region resulting in the fission process.

6.0 Weak Nuclear Force

This is not an extended analysis of the weak nuclear force but an observation. This force is generally associated with fission or beta decay. Given the structure of the nucleus described here, this decay would involve the re-ordering of the Schrodinger equations, quite possibly releasing the bonding particle from the neutron as a beta particle and leaving a proton in place of the neutron (or, similarly, the alternative proton-to-neutron decay.)

7.0 Frame of Reference and Relativity

In the world of physics the discussion of "frame of reference" has been incorrectly characterized in terms of a three-dimensional structural entity. The first problem is that this relegates time to nothing more than a scalar variable. The second problem is that a structural object, such as a rocket ship or the ubiquitous flying-meter-stick, does not accurately qualify as a "frame of reference "

In that characterization the term "frame of reference" is self-contradictory. Every single point in space is a single reference point with the result that any three-dimensional object consists of an infinite number of unique "reference points." This becomes vital when examining relativistic effects.

This is important for another reason as well. We need to visualize the basic units of mass and energy as being "anchored" at a single reference point and characterized by wave functions that define the features of mass and energy in the space and time domains relative to that point. .

7.1 Point of Reference

Given this geometric structure, each point in the universe is unique in its combined set of values for x, y, z, and (especially) time.

While geometric intersections may share the value of t (time) among separate "reference frames", no two points will ever have an identical set of values for all four parameters simultaneously.

This means, for example, that two points on opposite ends of a one-meter ruler, in addition to having different spatial coordinates, will have different time values in the relativistic sense. The difference can be calculated using the value of 'c'. The time difference of the two points would be one meter divided by 'c', or roughly .000000000033 second.

Do not start thinking that this means we need to change the accepted formulas for relativity. However, it is necessary to recognize that calculations for each individual reference point must be made separately. You may be pleasantly surprised to find that in this way we are able to remove certain persistent paradoxes that seem to haunt the calculations of relativistic motion.

For example, when measuring the length of the flying meter stick at relativistic speeds, calculations **must** be made separately for each end point. The results, using this approach, will show that the meter stick does not become shorter in any sense of the word. It will simply show that when the problem is presented incorrectly the positions of the two ends (reference points) are not being measured simultaneously. This error produces the result that "length" measurements are not correctly represented.

Perhaps the best way to picture the situation is to look at someone holding a meter stick at the other side of a large room. When held perpendicular to your line of sight you see it as one meter. However, if it is turned on its short axis it will appear shorter if your brain does not adjust for the different physical distance from your eye to each end of the ruler. In real life, your brain (thanks to binocular vision) generally makes that adjustment automatically.

When the time differences of the measurement of the two ends of that meter stick are accounted for, the more accurate calculations do not reflect any change in length, whether real or hypothetical in a kind of binocular form of observation.

In addition, the relativistic (apparent) increase of mass is dealt with in a similar manner. Relativistic mass is "measured" through secondary calculations of momentum, either linear or angular. The standard formula for momentum is mass times velocity. When making these calculations, however, the term dx/dt should be substituted in place of the standard term for velocity.

If you do not adjust for the difference in reference points in this part of the equation the "dt" value approaches zero, sending the calculated mass toward infinity. The mass does not change. It only appears so because the frames of reference are not properly defined. When differences in reference frame time measurements are considered, the mass changes disappear – even though they can still be "measured" and "verified" using the flawed concepts for calculating momentum.

7.2 No. That Can't Be Right.

But, wait. You are about to point out that particles accelerated near the speed of light have exponentially increasing energy because of their increase in mass. This means that we must remind you that the energy is always accumulated in the time domain. The mass, in the space domain is not changing. It only appears so because of the dx/dt nature of the measurements.

If we might make a somewhat philosophical argument at this point, it would be fundamentally impossible for the actual mass to increase as a smooth regular function because that would invalidate the basic quantum nature of matter where the mass can only increase in quantum units while the energy increase for a mass under acceleration is continuous (i.e., there is no allowance for quantum steps in the calculations)..

7.3 The Math is Actually Pretty Simple

How do we mathematically describe the relationship of these two reference frames (two ends of meter stick) in relativistic motion? The Lorentz Transformation, when properly applied, actually represents this relationship and measurements of relativistic motion for two reference frames in which time is characterized in the spherical coordinates. You must simply recognize that rather than showing an actual change of length, it shows the correction factor that must be applied when you are attempting to measure a physical length of objects moving at relativistic speeds.

The origin of the (flawed) logic for representing time as a one-dimensional, linear coordinate is not quite clear but that would seem to be an extension of the one-dimensional spatial components. That is to say, professors always start explaining the mathematics with a one-dimensional space. Then each additional dimension is assumed to be an extra line added in until you reach the conventional x, y and z structure. It just seemed logical and natural that the next dimension, time, should be represented by one more linear dimension. Efforts to mathematically describe space-time when it is constrained in this way have led to ever-increasing complex mathematics of multiple dimensions that continues to be slightly incomplete.

What puzzles me is that, when confronted with the difficulty and complexity of adding a fourth linear dimension became obvious, why would the scientific community not suspect that there must be some simpler alternative that was being overlooked. While slightly more complex than a single three- or four-dimensional framework, the six dimensions of this structure are much simpler than the multi-dimensional versions that are hypothesized in today's physics.

8.0 SUMMARY

This model combines mass, energy, gravity, magnetism, electric force, strong nuclear force, space and time. Details of the weak nuclear force are to be resolved later.

There was a time when I could offer the complete mathematical representations but it has been many years and my skills with differential equations (probably rather antiquated anyway) have deteriorated significantly. The arguments here are, by necessity, focused on analysis through geometric descriptions.

Like all good theories this one comes with a prediction that would help to verify its validity. We all accept one of the first predictions of relativity; the idea that light would be bent by large massive celestial bodies. If the theory presented here is correct the bending should be caused by both the mass and the energy of the object. There should be a difference in the amount of deflection for high-energy bodies (like stars) versus low-energy bodies (like planets).