Observables which support a pre-fermion hypothesis

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This paper sets out to show what observable features in nature exist that can be used to support a pre-fermion hypothesis that all observable particles are loops composed of pairs of positive and negative fundamental particle/antiparticles chasing each other, and that these fundamental particle/antiparticles are the only real objects in the universe. The hypothesis is that the base material of the universe is a myriad of partially merged particle/antiparticles through which all loops have to travel, and from which random interactions cause some to unmerge – starting a local big bang event whose inflation of subsequently formed loop sizes decides whether that big bang event succeeds or fails in terms of its lifetime. Here a local big bang event is a small volume within the existing universe, not the source of a new universe.

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Introduction

The pre-fermion hypothesis has been presented in many papers [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15] and suggests that what we observe is the emergent result of the unmerger of fundamental particle/antiparticle partially merged pairs that form the base material of the universe, called the background. In the hypothesis all observable energies, charges and forces are the result of the motions of the particle/antiparticle pairs whose only fundamental properties are one single size of mass, charge and volume. The unmerger of each partially merged pair requires the same energy in every case and is the source of the value of the fine structure constant, the only number, other than the size of the subsequently formed loops' inflation, that the hypothesis requires and is why all loop charge sizes are multiples of one-sixth the charge on the electron or zero.

Significance and Objectives

The significance of the paper is in taking a current hypothesis that can explain most of the features of the universe and showing how the different interpretation of a building block system for our quarks and leptons can be observed.

The objective is to show how observations either already exist, or can be made, that support the hypothesis, even if current technology cannot do so yet.

Outline

The list of observables will be set out in bold with the reasoning displayed beneath each observable and potentially how to make the observation in italics at the end.

The observables range across many fields, from the largest sizes to the smallest, and will begin with the cosmological scale.

Observables

Unexpectedly well-developed galaxies at extreme red shifts

This requires some related small scale explanation, in two parts.

For the first part of the explanation, in the hypothesised loop system, to create a photon requires a loop and its anti-loop to stack with both rotating parallel in the same sense and each particle in one loop partially merging with an anti-particle in the other loop, and vice versa. Each such pair is chasing along the path of the overall photon direction of travel.

As these pairs travel through the background material of the universe, the myriad partially merged pairs, they experience the viscosity of that background. The viscosity produces a terminal velocity at which any particle/antiparticle can travel, which, for the double-loop photon, we call light speed. This terminal velocity is dependent on the local background and local mass density and has the 'empty space' value that we normally ascribe to it when not close to dense background or large mass environments.

Since each three-pair loop contains the same number of particle/anti-particles, the photon itself experiences the same viscosity, on the particle/antiparticles, over distance, regardless of the size of its loops, meaning that the viscosity experienced is frequency-independent. It is the particles/antiparticles that experience the viscosity of the background so, except at very high frequencies, the distance travelled by the photon is directly related to its viscosity red shift.

The action of viscosity on the photon is to take energy from it and pass it to the background as heat and is observable as a red shift. This viscosity red shift has not been accounted for in any red shift observations to date.

So the farther away an object is, the larger the viscosity red shift. Therefore an object at extreme distance from us will have an extreme red shift just from the viscosity aspect.

For the second part of the explanation, the random unmerging of partially merged pairs that form the material of the universe, the background, is a local big bang within the total universe using the same particle/antiparticles every time.

The volume that the local big bang eventually expands to depends on the imbalance of the subsequent expansion rate versus gravitational collapse set by the amount of inflation of the loops formed after the initial unmerger. The larger the imbalance in favour of expansion, the more successful that local big bang and the greater the volume that it expands to encompass, within the larger total volume of the universe.

Local big bangs do not form new universes since their base material is always the same particle/antiparticle partially merged pairs.

What differentiates each local big bang event is how much the subsequent loops formed from the unmerged particle/antiparticle pairs inflate from their initial size at near Planck energy to their final size and how many unmerged particle/antiparticles pairs there are in each loop. It is the loops that inflate, not space.

If the inflation amount, different along the three spatial axes, is small then the energy available for expansion away from the unmerger sites will consequently be small and the loop sizes small – meaning large masses. Gravity will overcome the expansion energy and the result will be a failed local big bang. Whether the result is a black hole or a galaxy will depend on the inflation amount.

If the loop inflation amount is large, then the energy available for expansion will be large and consequently the loop sizes will be large – meaning small masses. Expansion will overcome gravity and the result will be a successful big bang that will last for a long time.

Our own big bang appears to be successful as it has lasted a long time. Viewing local big bangs that happened a long time ago outside our own big bang volume will look like they have not had time to develop, but they have no relationship to our big bang timescale and could have developed over a very long timescale even before our own big bang.

Observation has already been made, but has been misinterpreted.

Dark energy observations are measuring the rate of viscosity red shift outside our own big bang volume

Where the rate of expansion appears to increase is the point at which our own big bang volume ends. This external rate provides the underlying average at which photons lose energy as they travel through the background of partially merged pairs which comprise the underlying material of the whole universe.

For those galaxies beyond our big bang volume, their red shift will almost entirely be viscosity red shift and the red shift versus distance relationship will be almost exact.

When this viscosity red shift is then applied to the Hubble rate within our big bang envelope, the result is that our own big bang is collapsing, not expanding, with the furthest reaches of our big bang collapsing faster than the closer regions.

Treating observed stellar objects beyond the 'faster expansion' inflection point and those inside that point differently will enable the identification of the average viscosity red shift versus distance relationship beyond to be used to separate out the actual real Hubble rate inside.

Dark matter is loops formed from other that three pairs. Observables are limited by loop rotational asymmetries.

Stacking loops requires that the asymmetries of each loop in the stack are balanced overall within the stack so that the stack is stable overall, like a balanced wheel. The symmetry or asymmetry of a loop is based on the relative positions and signs of the one-sixth charges around the loop.

Nucleons are stacks of three-pair loops whose asymmetric loops, the quarks, need to balance rotationally up the stack and whose charge sums to a total of zero or integer electron charge size.

Symmetric three-pair loops, the charged leptons and some neutrinos, can also exist within a stack because they add no asymmetries.

Loops of four-pairs have different asymmetries and cannot balance in a three-loop stack. The same is true for all other non-three-pair loop asymmetries. Stable stacks containing different pair-number loops cannot be formed.

We have three-pair loops forming our nucleons and atoms because a balanced stack of three-pair loops will always have a net spin. A charged nucleon net spin needs to be balanced by an orbiting three-pair loop with opposite charge and the same size spin in order to form an atom. So our three-pair loops make chemistry possible. Odd number pair loops can form chemistry, with the lowest and most likely of such loops to be formed are our three-pair loops.

The even number pair-loops cannot form atoms because their balanced asymmetries always have zero net spin, like some mesons, since the spin of such stacks alternates along the stack. So their only means of being observed by our three-pair loops is through net charge or gravity.

Looking for the right sort of dark matter, as described, with charge and mass properties only, other than single loops with spin ½ h (in the current definition), should facilitate observation.

Failed local big bangs exist within our big bang volume

Whether a failed local big bang occurred before our own big bang or afterwards, these can be observed as unexpected red shift galaxies or large black holes that are considered to be coincident in space with different co-moving objects whose red shifts are consistent with being part of our own big bang motions.

Failed local big bangs are likely to be galaxies or large black holes because the remerger of unmergered pairs, other than temporarily within photons, is unlikely. A large black hole is a star in which the loops entering have been broken back into chains, which was the initial form of unmerged pairs chasing before they caught their own tails to form loops. A black hole is therefore a chain star.

The loop properties of spin and mass, which are the emergent properties of the rotation of the loops are lost to the black hole as the loops enter. The properties of the particle/antiparticles remain with them as their fundamental mass, fundamental charge, one-sixth electron charge and twist energy (spinning about an axis, not loop spin). Photons can be formed within the black hole near the surface if of sufficient energy and parallel to the surface, but most of the energy is lost on exiting.

The rarity of failed local big bangs studded separately within our co-moving big bang flow implies that the overall CMB radiation of the former will not show in the latter to any great extent. The overall system is like a mix of steady state star creation and inflation.

Observing the anomalous red shifts between apparently conjoined stellar objects will enable the flow of our big bang co-moving part to be separated and the distribution of the two sets to be understood.

Quantum mechanics only exists in black holes at their surface

Since black holes break loops into chains as they enter, and QM requires loops to create tunnels through the background, that internally exclude the background, then QM does not work in black holes, except at the surface to create photons as explained above.

Relativity exists in the background and QM where there is no background, so they will never be reconciled. The negative proof will be difficult to prove, but should become accepted over time.

We exist because our electron is so small

This is a difficult observable to prove, but arises because our big bang has been so successful that it has lasted long enough to have sentient beings arise.

The reason for the longevity of our big bang is the large size of our loop inflation. The largest loop inflation is shown in our smallest mass particle loop – the electron/positron.

The amount of inflation is different along three spatial axes and dependent on the loop charge with the size of any loop being the result of which two-axis plane of inflation that loop ended in. The outcome is three families of loops at different sizes but the same charge set.

Because all loops are composed of the same unmerged particle/antiparticles, then all physics is based on the sizes of those loops and their charges. Any local big bang will have the same component particles and antiparticles forming chains then loops, and even if three-pair loops are formed it is unlikely that the masses of their loops will be the same as in our big bang.

That the laws of physics cannot be different anywhere is based on the relationships between properties. If the constants *h* and *G* are eliminated from all equations, because they are dimensionless ratios, and SI units adjusted for historic inconsistencies in the size of the electron charge, then all maximal property values are powers of one underlying property. So the relationships between properties cannot be anything other than what is observed already anywhere in the universe and laws are the same everywhere. Even in large black holes, because the particle/antiparticles are the most dense mass and charge possible, they cannot be broken apart and so there are no singularities anywhere.

The observables here are red shift frequency spectra that indicate frequency independent tired light and unusual spectra from the anomalous red shift galaxies which may show different loop masses and thus atomic energy levels, even if they have formed three-pair loops.

Negative fundamental masses exist

This is another difficult feature to observe, but is supported by a number of aspects to the hypothesis.

In a particle in the hypothesis, the proposal is that it has positive fundamental mass and positive fundamental charge, with the antiparticle having the opposite.

This means that when the particle and antiparticle are completely merged, there are no fundamental mass or charge fields observable beyond the radius of the sphere that is the particle/antiparticle size.

When the particle/antiparticle are partially merged, the pair can vibrate, rotate about their mutual axis, translate and each may twist. Each feature results in electromagnetic and gravitational forces beyond their combined volumes which contribute to the viscosity that they produce on loops moving through the background. When the particle/antiparticles form chains, they transmit those electromagnetic and gravitational forces between unmerged particles and antiparticles that are in the same or different loops. It is these chains that transmit all forces.

The negative mass energy of the antiparticles is effectively hidden in the chains and partially merged pairs and the result is that particles chase antiparticles, and vice versa, to try to remerge and form the zero mass black holes that are the fully merged pairs.

The same chasing effect drives the pairs around the loops and the newly formed pairs across the photon double loop, driving the pairs, and thus the photon, up to local light speed within the local background.

Without negative fundamental mass, there would be no chasing, no chains to transmit forces and no photons.

Underlying this is that every particle, antiparticle, chain, loop, stack and body has zero total energy at all times. What we observe as energy is usually only one side of the balance, meaning one type measures only the same type.

For a particle, the fundamental mass energy is balanced by its fundamental charge energy. The antiparticle has the same balance but its negative fundamental mass energy is the opposite of the particle positive fundamental mass energy, and its negative fundamental charge energy the opposite of the particle positive fundamental charge energy. It is how each type of energy interacts that decides how the interaction takes place and what is observed.

The hypothesis proposes that negative mass energies attract negative mass energies, in the same way as positive mass energies do. The chasing is where the two different types try to remerge.

In looking at where the different energies exist, it it vital to start from the base level, as for the particle and antiparticle themselves.

When a partially merged pair unmerge, the particle and antiparticle each twist about an interior axis with a twist energy of one-sixth the size of the electron charge energy whilst generating one-sixth of the electron charge, positive or negative depending on the direction of twist and motion of the pair. The result is always a total of zero charge and zero twist energy.

So the charge of each particle and antiparticle is always the same size (observable in total when summed in a loop) and the total across the universe always zero, but the twist energy is never directly observable. The latter defines the radius at which any particle/antiparticles rotates at within a loop, always producing $\pm h$ mass and charge angular momenta, with twice the one-sixth charges producing the loop magnetic moment, as explained below.

The sum of the fundamental mass and charge angular momenta around a loop is always zero, but, because of the chasing effect, the loop has rotational frequency

$w/2$, and their kinetic energies appear as the mass and spin of the loop respectively, both at $h(w/2)$. The negative mass energies are hidden within the loop.

At the loop level the total charge for a three-pair loop will always be the sum of the number of one-sixth charges present in the pairs because the fundamental charges always sum to zero.

What is observed externally is the rotational frequency of the loop, driven by the chase effect, on the background through the attachment to each particle/antiparticle of chains of partially merged pairs sweeping through the background. The density of the background affects how much viscosity is felt by the particles and antiparticles in the loop, and the frequency of the loop affects how the background reacts.

A faster loop will have longer chains because the particles and antiparticles have more energy, so the effect on the background will be larger, and we will observe this as a greater mass of the loop. But this is just the loop rotating, not due to the fundamental mass energies of the particles and antiparticles in the loop.

What is hidden within the loops is the Planck size of the fundamental mass and charge of the particles and antiparticles.

The overall outcome is that the mass energy of the loop $h(w/2)$ is the same size as its spin energy $(½\, hw)$. The two are equal and opposite, deriving from the same rotational action of fundamental mass and charge around the loop, but are externally emergent.

The $w/2$ frequency of the loop, rather than w, is because the relativistic effect of the rotation of the particle and anti-particles around the loop is the expansion of $(\gamma - 1)Mc^2$ or $(\gamma - 1)Qc^3$, producing the kinetic energies as $M(½\, v^2)$ and $Qc(½\, v^2)$ which in a loop when $v = rw$ produces kinetic energies of $E_m = ½\, Mvrw = ½\, h\, w = h(½\, w)$ and $E_q = ½\, Qcvrw = ½\, hw = h\,(w/2) = Uw$, either positive or negative depending on particle/antiparticle and considering only the fundamental mass and charge energies at the radius at which they would rotate in the absence on the one-sixth charges and twist energies. The fundamental mass and charge sizes do not change in this interpretation, it is the rotational frequency that does so.

A more detailed analysis shows that in the loop the velocity v actually changes to $\sqrt{½}\ v$ and the radius increases by $r/\sqrt{½}$ so the $h = Mvr$ is still correct, but the relationship between v and r becomes not simply $v = rw$ but $\sqrt{½}\, v/(r/\sqrt{½}) = ½\, w$. This ½ factor, set by the effect of relativity, is not related to M or h and is only exactly ½ when the loop frequency is low.

The loop mass and spin energies are both kinetic in type and so have the same direction of action outwards from their centre of rotation, meaning that both should be included in any orbital or orbiting equations.

Currently the force and energy equations for orbits are different, other than the distance factor, by the ½ factor in the energy equation. If the kinetic energy part of the spin energy, exactly the same size and direction of action as the kinetic energy part of the mass energy, is taken into account the ½ factor disappears in the energy equation..

The relative orientation of the spin energy itself does not matter in large objects, because it is the direction of the kinetic part that matters, but the orientation becomes important in atomic orbitals.

The observable here will be that photons can stack and, if at the same frequency and phase, multiple photons will merge together and yet appear to be a single photon.

This latter aspect supports the hypothesis in many ways. The current thinking is that n identical photons will have n lots of energy, whereas the hypothesis instead says that n merged photons will look like one energy in current terminology. But this actually further supports the hypothesis because it says that all photons always have total energy of zero, so that the two interpretations are identical when total loop energies of zero are accepted.

Furthermore, the merging of photons, as suggested, implies that the particles and antiparticles merge together, that what we term energy is just a counting mechanism of rotating systems, negative mass energies exist and photons are combinations of loops and particles/antiparticles.

That gravity is due to loop rotation acting on the background is shown in the merged n photons having the same action as a single photon because the merged loops attached partially merged particle/anti-particle chains will also be merged. What might appear to be n photon masses act as a single photon *mass, and yet can be split into n separate photons. Since the total energy of the photons is always zero, there is no conflict with the law of conservation of energy.*

The $g = 2 +$ magnetic moment factor implies structure in the electron

Following on from the above, the twist direction for a particle or antiparticle can be additive or reductive versus its fundamental mass energy. This means that there are only two radii at which they can rotate at around a loop.

The additive twist results in the smaller radius of rotation, whist the reductive leads to the larger radius, both resulting in the size of angular momentum being h, with the total internal angular momentum of a loop always zero.

The effect on the one-sixth charges, the balancing energy to the twists, might be that the additive one-sixth charges rotate at the larger radius with the reductive one-sixth charges at the smaller radius.

The effect over the loop is that the total magnetic moment of the electron loop is more than twice what would be expected if a single size electron charge rotated at a single radius.

One interpretation could be that half the magnetic moment is due to the fundamental charges and half to the one-sixth charges, with the total slightly higher than 2 but not as large as currently measured. This analysis has to use the electron mass in the magnetic moment calculation rather than the fundamental mass size because the kinetic energy $M \, ½ \, v^2 = h \, (½ \, w) = mc^2$, the mass energy of the electron, positive or negative for the particle/antiparticle respectively.

A better interpretation would be that the fundamental charge plus or minus the one-sixth charges of each particle or antiparticle is treated as being the same, larger or smaller size, as the fundamental mass plus or minus the one-sixth twist energies. This would mean that both the total mass and charge energies of each particle and antiparticle would take the rotational value of $\pm h$ angular momenta, leading to the externally observable loop mass and spin energies being the same at $h \, (½ \, w)$.

The one-sixth charges that were not used in equalling the mass plus twist energies would then be externalised as the magnetic moment of the loop because they should not exist at those rotational radii. For the electron and positron, the offsetting one-sixth charges would be slightly more than doubled in effect, leading to the $g = 2 +$ magnetic moment.

The total loop charge would remain as the total of the one-sixth charges and the two interpretations have exactly the same external values, but the second interpretation has greater clarity.

The same effect of two different radii of rotation affects all loops other than the symmetric neutrinos, whose particles and antiparticles all rotate either at the smaller or at the larger radii.

When observing the magnetic moment of electron or muon loops in Penning traps or cyclotrons, the targeting of a stable orbit is done at a frequency that, in the perfect situation of a loop rotating at relativistic factor $Q/q \; = \sqrt{(2\pi/\alpha)}$, there is a background density of magnetic, electric and gravitation fields at that velocity that requires all possible interactions in order to keep the loop at its locked-in frequency, and that these interactions are another mathematical representation of the increased moment of the components of the loops.

Looking at the single loop calculations of magnetic moment of the electron in the hypothesis, it has an anomalous moment even when stationary. The ‘magic’ velocity in a cyclotron produces a special anomalous figure. But between the two, and beyond, will be a continuous range of anomalous moments. The anomalous magnetic moment of the electron is not a physical constant, but a point of inflection that can be accurately set by repeated experiment and is more like the point at which a phase change in a liquid is repeatedly observable.

This shows that the loops are composite structures because they move differently to structureless point particles with the same overall mass, spin and charge when in magnetic, electric or gravitational fields. The paper which shows that g-2 experiments in cyclotrons which measure the muon anomalous magnetic moment can be interpreted as observing the distortion of the structure of the muons. The size of the distortion calculated to be required to produce the observed anomalous magnetic moment is shown to be physically feasible within a cyclotron beam.

The observables here are already observed, but interpreted differently. The hypothesis cannot yet produce the total observed anomalous magnetic moment of the electron, except in achieving the ‘magic’ velocity in Penning traps.

Asymmetric neutrinos have mass

Although symmetric neutrinos have their particles and antiparticles all at the same radius of rotation, either all larger or all smaller radius, the asymmetric neutrinos have a mix.

A consideration of how the twisting of a particle or antiparticle results in either a positive or negative one-six electron charge leads to the suggestion that a change in twist direction from one particle/antiparticle to the following antiparticle/particle results in a 'flip' effect on the background. It is this flip effect that coincides with the factor that produces the mass of the loop when combined with its frequency.

In symmetric neutrino loops, there are no flips. In symmetric charged lepton loops, there are six flips so that these loops show 100% of their frequency as the loop mass.

In asymmetric loops the flips produce either 1/3 or 2/3 factors, as is the case for the quarks. So in a beam of neutrinos, if the asymmetric ones could be separated from the symmetric ones, they would show mass fractionally proportional to their frequencies.

Additionally, the asymmetric neutrino loops would have a very small magnetic moment, due to the positions of the one-sixth charges at different radii – even though overall their charges sum to zero. This amount depends on where the one-sixth charges are located around the loop and takes the value of $\pm(1 \pm \sqrt{\alpha/2\pi}/6))/3$ relative to the electron charge for some asymmetries.

The suggestion is that current beams of neutrinos are a mix of symmetric and asymmetric and thus show a very small mass and magnetic moment overall, which would depend on the relative number of asymmetric neutrinos present in that beam.

However, it is unlikely that many asymmetric neutrinos would manage to pass through the magnetic fields surrounding Earth because of their magnetic moments.

The observables here would be possible if beams of neutrinos could be separated into symmetric or asymmetric types, probably only in space away from Earth's magnetic fields.

The strength of mass and charge fields is the same

The elimination of *G* from all equations means that the strength of mass and charge fields at the fundamental level is the same. It is only the generators of those fields that produce the relative strength effect.

The charges of loops is based on the size of the fine structure constant, which is relatively large, being not far from the size of the fundamental charge on the particles and antiparticles.

The mass of the loops is based on their rotational frequency, which are very small, in normal environments, compared with their creation near Planck energy at chain then loop formation, after an unmerging local big bang event.

So we usually observe mass energies that are much smaller than charge energies, but for an electron loop whose rotational frequency was made high enough to equal the same size as its charge energy, the field strengths would be identical, after elimination of G from calculations.

The reason loops stack is that they are experiencing fundamental mass and fundamental charge fields, and the one-sixth charges, of equal strength from the particles and antiparticles, as well as their asymmetries along the stack. This is why we have nucleons and atoms.

The observable here would be to accelerate an electron up to the energy that equals its charge energy and measure the two fields.

Superposition is digital

Although loop travel within the background is limited to light speed, set by the local background density, travel outside the background is not limited to light speed.

There are two environments where the background can be excluded. One example is when a photon has become separated into its two entangled loop and anti-loop components and a tunnel has been created between them by loops of partially merged pairs and the background has been excluded from within the tunnel.

In this environment the loop and anti-loop can move randomly along the tunnel without viscosity and so without any maximum speed, thus non-locally. Since the tunnel has no background, it has no chains to attach to the loops and so no external loop mass or charge forces act within the tunnel.

At the tunnel ends either the loop or the anti-loop will appear alternately and randomly. On disturbing the tunnel, it will collapse and whichever of the loop or anti-loop is at a tunnel end will be trapped in that physical locality.

During the time when the tunnel exists, observing a tunnel end will look like a superposition, with a mix of outcomes whose average will be based on probability, but is actually the average of the properties of the loops over the time spent at each tunnel end.

But on measurement and tunnel collapse, there will only be two outcomes – either the loop or anti-loop will get trapped at one end of the tunnel, with the opposite trapped at the other end.

The same effect is the case for two entangled photons separated. The path along which they travel is externally observed as the tunnel ends and within the tunnel has the two continuously swapping tunnel ends. A tunnel end put through a filter, will find that whatever photon was filtered can return to the path of that tunnel end after the filter.

The tunnel ends are constrained to travel at or below light speed, so that the tunnel ends can only separate at that speed. This limits the length of tunnels.

The second environment is that of the example of photon emission, where the photon travels within an expanding double-shell of partially merged pairs instead of within a tunnel. The double-shell width, within which the background is excluded, expands as it travels, losing energy to the background, and the photon skips around the shell randomly.

When either the shell gets disturbed, and the photon gets locked in place where it was at that instant, or the photon gets observed and the shell collapses, represent the only two outcomes.

These two events correspond to the particle-like nature of light and the wave-like nature of light.

So a photon is really both the physical loop and anti-loop as well as the expanding double-shell within which it travels non-locally as the outer shell expands at light speed.

Travel within the background is relativistic whereas travel without the background is quantum mechanical.

The observable here would be if it were possible to measure the mass and charge of the loops effectively within the tunnel since they should only show those properties at the tunnel ends.

Matter and antimatter have been formed in equal amounts

This is a definition issue. Because our quarks and leptons are loops, there are extra degrees of freedom in defining what is matter and what is antimatter that current definitions do not possess.

The consideration involves a system where a chain that will form a loop is sent towards a barrier in one direction and becomes deflected to form a loop either to the left or right. The loop formed is either spin up or spin down depending on the deflection direction.

In order to change a loop into an antiloop requires that the particles change to antiparticles, their twist directions reverse, the direction of chain motion reverses and the deflection direction changes.

The result is that the difference between a loop and its anti-loop is only the sign of loop charge. This means that a photon, composed of loop and anti-loop forms the perfect combination.

Therefore matter, if defined as positively charged loops, is balanced by negatively charged anti-loops – anti-matter.

Thus a proton will be matter with its positive charge and the negatively charged electron will be anti-matter. A battery is therefore a matter-anti-matter device.

Since all unmergers of the particle/antiparticle pairs always result in both signs of charge being created, then the balance at the fundamental level of matter and antimatter is assured.

This does not stop there being some strange consequences because the neutron, with its core two negatively charged loops balancing its single core positively charged loop must be defined as anti-matter.

It is therefore understandable that nuclei form with a preference for a balance of matter protons and anti-matter neutrons.

So overall there is no matter to anti-matter mismatch. There may be different numbers of loops of each type, but fundamentally with net zero charge in the universe overall, matter and anti-matter are balanced.

The observables here are best described as leading to *a better understanding and interpretation of the basic definitions within current physics.*

Pair creation is uncovering, not creation

In the sense usually used this means the QM phenomenon of an electron and positron appearing due to the temporary borrowing of energy as described in Heisenberg's uncertainty principle.

In terms of the hypothesis, because G and h can be eliminated, then Heisenberg's principle is reinterpreted as $ET = 1$ with no uncertainty.

The hypothesis suggests that there are myriad loops and anti-loops contra-rotating as zero spin photon-like double loops of all sizes at every point in the universe. When an external loop impacts one of those 'zerons' with the correct energy, it separates the zeron into its constituent parts – usually a positron and electron. The pair of loops already exists, but with total charge and spin of zero, its only property that can be observed is its rotational rate – its energy – which we call the zero point, or vacuum, energy of space ½ hw.

These same zerons also provide the pressure change between two plates when certain sizes of zeron become excluded from existing between the plates as their separation is altered– the Casimir effect.

This latter point is the observable, as it has already been observed.

Energy is a vector

Although the observables have been available for many years, they have been misinterpreted because Newton needed rotational motion to have an inward acceleration so that his equations fitted observations at that time.

The lack of knowledge that the kinetic energy of spin energy existed is understandable, but has clouded physics interpretations for years. Newton's bucket clearly demonstrates that force and energy are outward from the centre of rotation once energy is treated as acting in the same direction as the force present.

The bicycle is another example where there is a clear outward force in action. If a bicycle wheel is rotated without contact to the ground, it is clear that all forces and energies are in balance around the wheel, otherwise the wheel would collapse or break apart.

If the wheel is then placed in contact with the ground, by symmetry, all forces and energies are still in balance across the axis of rotation, except where the wheel is in contact with the ground. At that arc of contact, the reaction force from the ground must be equal and opposite to the downward force from the centre of rotation towards the ground, otherwise the wheel would collapse or sink into the ground.

It is on the opposite arc of the wheel away from the arc of contact that the outward energy of the wheel is no longer balanced by an opposite outward energy. The latter outward energy is now zero since it is in contact with the ground. Therefore the opposite, outward and upwards energy has no balancing energy or force across the wheel. The result is that the wheel has a net upwards energy due to the rotation of the wheel, and the wheel is more vertically stable than expected. This is a great help to cyclists in motion on bicycles, and the effect is greater the faster the wheel rotation and the mass of the wheel.

Another observable already exists in the failure of the electron to decay whilst in orbit around an atom. By also considering the kinetic energy of the spin energy of an electron loop, both the forces and energies on the electron sum to zero, producing a stable orbit where the energies and forces are always in the same vector directions.

The observable would be to reinterpret the stability of rotating wheels in contact with the ground.

Inertial mass and gravitational mass are the same

By eliminating the gravitational constant G, it becomes clear that there is no difference in the type of mass, inertial versus gravitational, on each side of an orbital system calculation.

Reinterpreting without G, and finding more accurate methods of measuring whether there is an observable difference, should eventually prove the case.

Acceleration, whether due to motion or gravity, can be determined

The motion of particle/antiparticles loses energy to the background. A loop in a stationary frame of reference has the viscosity of the background affecting the motion of the particle/antiparticles around the loop. By contrast, a loop in a frame of reference where it is accelerating has the extra viscosity due to the loop's transverse velocity as well as the particle/antiparticle motions around the loop.

In a gravitational field, the stationary loop will have additional viscosity as it is drawn towards the gravitational source, which might be thought to equal the accelerating loop case. However, the loop in a gravitational field will have a total mass energy that is negative, since the gravitational potential must exceed its motional energy to allow it to move towards the source. In contrast, the accelerating loop must have a positive overall mass energy in order for it to be accelerating. So the two cases are not identical at the most basic level.

Additionally, the shape of the fields that each loop exists within will be different. For an accelerating loop, in empty space, the background and its fields will be consistent in all directions. In the gravitational case, the fields will be directed towards the gravitational source and have a conic shape.

Observing the gravitational field around an object to high accuracy will show the conic shape of a gravitational field.

Laws of physics are constant but loop sizes change results

This is another difficult observable since it requires that stellar observations can identify unusual red shift spectra and attribute them to loop sizes that are different to those of our own big bang.

The reason is that many failed big bangs will exist throughout the universe and because they have failed, will have different quark and lepton loop sizes, even if they have formed three-pair loops.

Their spectra will be very different to our standard loop sizes, with their atomic and molecular energy levels significantly different. This may also be another reason why adjacent stellar objects have significantly different red shifts, being co-moving with our big bang or not, but our use of their spectra may have misidentified specific energy signals.

The observable is a very unusual spectra for a stellar object, which when analysed using the existing laws and properties of nature (adjusted as proposed in the hypothesis) are consistent with different loop sizes for the equivalent quark and lepton loops.

Loop masses are not conserved in interactions

In an interaction where two quarks become two leptons, the incoming and outgoing loop sizes – meaning their mass energies, are not conserved.

This is despite the conservation of the properties of the underlying particle/antiparticles. The symmetry of a loop, and its flipping number, as described earlier, are reflected in the observable mass of a loop.

This means that, for a simple example, two asymmetric neutrinos could interact and the result would be two symmetric neutrinos. The former asymmetric loops would show mass, but the symmetric ones would not.

In this example, although mass has been lost to observation, the underlying energies of the particles/antiparticles is unchanged.

The same would be for two asymmetric loop quarks, with fractional loop masses, that interacted to become symmetric loop leptons with either 100% or zero masses relative to their rotational frequencies.

The observation of this type of interaction is again very difficult, but may be possible if incoming and outgoing total energies of a simple interaction can be measured.

There is no contiguous space-time, only an average over distance

This arises because each loop has its own time – the inverse of its frequency of rotation. So the volume over which an observation of time is made will have many loops, each with different energies, meaning times. Over a distance travelled, the result will be an average effect.

What is deflected by gravity or charge across the universe is the background material of myriad partially merged pairs of particle and antiparticle. They are concentrated around loops and larger masses and are less dense away from larger masses.

The effect of the increases in density around a loop, caused by the rotation of the chains attached to particles and antiparticles within a loop, is like a space-time, but does not have the direct relationship with time, other than the frequency of the loop.

The effect of relativity between observers will still occur, but the underlying background densities must be known so that the actual value of the local terminal velocity, light speed, can be correctly included in calculations.

This observable will only be made when loops have been observed, and the viscosity of the background confirmed, such that contiguous space-time has no *place to exist in physics.*

Width of the photon double-shell

The width of the double-shell within which a photon travels is the same at evaporation as the photon diameter, reflecting the effect of viscosity energy loss on the shells since photon emission and the energy of the photon at that point in space. Insertion of a filter into the gap in the double-shell of an expected photon, just after the photon is expected, may disrupt the shell so that, if a photon is present at that point, it will be observed. But if it does not disrupt the shell, the photon will continue skipping around the shell and may not appear to the observer.

Without a filter, in a double slit experiment, the shell front goes through both the slits, but the photon may not be in that part of the shell as the shell passes through the slits. The result with look like a wave if the photon skips to that part of the shell after it has gone through the slits.

By adjusting the frequency of photon under analysis, it is possible to extend the size of the double shell gap, so that it may be possible to alter the wave or particle result after the photon/shells have passed through the slits.

The shells are not made from travelling partially merged pairs, but each partially merged pair in a shell passes its shell properties to the next adjacent partially merged pair, so the shells are really waves in the background and the physical double-loop photon travels in a double-wave.

The observable here would be based on effectively inserting a filter after the front shell and photon have passed through the slits and measure the effect.

There is a maximum distance a photon can travel

For a travelling photon and double shell, there are points where the inter-shell gap becomes zero when a photon gets trapped by stacking at that point and the shells will evaporate leaving the photon with the historic energy of the shells as affected over their distance travelled.

But the shells lose energy to the background viscosity, effectively the same effect as on a photon considered in the background itself. So although the photon ought to expand in loop size as it loses energy to the background, it is constrained to travel within the double shell until, on shell evaporation, it takes the size from the shell gap.

As the shell loses energy to the background, there will be a maximum distance it can travel before its energy is zero. At that point the photon will be stranded somewhere in the gap and should evaporate itself.

This is another very difficult observable, but there will be a cut off of red shift beyond which nothing will be seen at very longer distances.

Conclusion

Some of the observables outlined above are already observed – but have been misinterpreted. Some observables are within current technology and some beyond at the moment. Some may never be observable.

However, using the pre-fermion hypothesis, it is possible to understand the universe far better than we currently do, and many paradoxes are explained simply as not seeing the properties of the particles/antiparticles at the foundation level separately from the loop properties.

References

1 Lawrence, M.: "How SI Units Hide the Equal Strength of Gravitation and Charge Fields". J Phys Math 7:151. (2016) doi:10.4172/2090-0902.1000151

2 Lawrence, M.: "A Viscosity Hypothesis – That the Presence or Absence of Viscosity Separates Relativistic and Quantum Systems Based on the Simplest Possible Theory of Everything." J Phys Math 7: 200. (2016) doi: 10.4172/2090-0902.1000200

3 Lawrence, M.: "A viscosity hypothesis – that the presence or absence of viscosity separates relativistic and quantum systems based on the simplest possible theory of everything". LAP Lambert Academic Publishing (2017) ISBN: 978-3-330-08736-111

4 Lawrence, M.: "A Hypothetical Pre-Fermion Particle Theory of Everything in Diagrammatic Form". (pre-print), Researchgate, (2022)

5 www.maldwynphysics.org

6 Lawrence, M.: "A hypothetical pre-fermion particle theory of everything based on 95 theses". (pre-print), Researchgate, (2018)

7 Lawrence, M.: "Analysing and defining matter and anti-matter in a pre-fermion framework". (pre-print), Researchgate, (2022)

8 Lawrence, M.: "Eliminating the Gravitational Constant G from General Relativity and Cosmology". (pre-print), Researchgate, (2020)

9 Lawrence, M.: "Symmetry group definitions underlying normal and dark matter". (pre-print), Researchgate, (2021)

10 Lawrence, M.: "Why the intrinsic spin quantum number of a fermion is h and not ½ h and how to correctly reconcile velocities in momentum and energy equations". (pre-print), Researchgate, (2020)

11 Lawrence, M.: "The inevitability of one type of universe, one set of the laws of physics and where to observe failed inflation events within our universe". (pre-print), Researchgate, (2014)

12 Lawrence, M.; "Wave-particle duality explained within a pre-fermion framework". (pre-print), Researchgate, (2021)

13 Lawrence, M.: "A physical explanation for why the electron spin g-factor exceeds 2". (pre-print), Researchgate, (2020)

14 Lawrence, M.: "Anomalous magnetic moments as evidence of a pre-fermion lepton structure". (pre-print), Researchgate, (2021)

15 Lawrence, M.: "Relative motion of our contracting Big Bang and atomic dark matter ratios". (pre-print), Researchgate, (2021)